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Impact of Scholarly Output on NIRF Ranking: A Study of Top 15 NITs

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Abstract

The study aims to analyze the sub-parameters Combined metric for Publications (PU) of NIRF ranking parameter Research and Professional Practice and impact of various publications' parameter on it. The study investigates the scientific research productivity and authors productivity of the top 15 National Institutional Ranking Framework (NIRF) ranked in the engineering category National Institute of Technology in 2021. For this purpose, the data were collected from the NIRF website and Scopus database.

The study is focused on analyzing the total number of research publications of these institutions and the authors with the highest number of papers published, their publications and the citations received by them. The study also discussed the collaboration of authors having the highest number of papers published with other co-authors.

Key Words: NIRF, NITs, Ranking, Research Publications, Scopus

1. Introduction

The Union Minister of Education, Government of India, has released the National Institutional Ranking Framework (NIRF) 2021 rankings for the higher educational institutions on 9th September 2021. The NIRF provides the rankings in eleven different categories, i.e. Overall, University, Engineering, Management, Pharmacy, College, Medical, Law, Architecture, Dental, Research.

There is always scope for continual improvement in the ranking of an Institution. Globally, there are several ranking systems for the higher educational institutions like Times Higher Education World University Rankings (THES), QS World University Ranking, United States National Research Council rankings, Shanghai Jiao Tong University Academic Ranking of World University (ARWU) etc.

In this paper, the author tried to demonstrate and compare the significance of the research performance of the top 15 NITs in NIRF rankings (Engineering Category) of India 2021. The paper analyzed the weightage marks received under Research and Professional Practice (RP) parameters by the institutions under the study. This study aims to examine the relationship between the number of papers published and citations received by the institutes under study and their ranking. The paper also discussed the authors' productivity, citations received, preferred area of publications and collaborations with co-others.

The data collected from the NIRF website and the Scopus database are analyzed and interpreted to draw out the meaningful result in evaluating the scholarly publications of the Institute.

2. Ranking Parameters in National Institute Ranking Framework (NIRF)

The NIRF ranking is based on well-defined parameters. The ranking in the engineering category is based on five Parameters, namely 1. Teaching, Learning & Resources 2. Research and Professional Practice, 3. Graduation Outcomes, 4. Outreach and Inclusivity and 5. Perception and their weightage in ranking 0.30, 0.30, 0.20, 0.10, 0.10 respectively.

This study discussed one sub-parameter, "Combined metric for Publications (PU)", of parameter Research and Professional Practice (RP). There are four sub-parameters under the parameter Research and Professional Practice. These sub-parameters are Combined metric for Publications (PU), Combined metric for Quality of Publications (QP), IPR and Patents: Published and Granted (IPR), Footprint of Projects and Professional Practice (FPPP)

The ranking of the top 15 NITs in the engineering category and their four sub-parameters under parameter Research and Professional Practice are tabulated in table-01. The table sequence has been arranged according to NIRF ranked; Institutions names and other data have been taken from NIRF report 2021. The total marks and weightage marks for the parameter Research and Professional Practice has been calculated based on these data.

2.1 Top 15 NITs in NIRF (Engineering) ranking 2021 and details of parameter Research and Professional Practice

Sl. No.	Name of NITs	Rank	Research and Professional Practice (RP)				Total Marks	Weightage Marks
			Combined metric for Publications (PU)	Combined metric for Quality of Publications (QP)	IPR and Patents: Published and Granted (IPR)	Footprint of Projects and Professional Practice (FPPP)		
1.	National Institute of Technology Tiruchirappalli, Tamil Nadu	9	23.21	24.5	3	3.91	54.62	16.386
2.	National Institute of Technology Karnataka, Karnataka	10	23.44	22.97	1	2.76	50.17	15.051
3.	National Institute of Technology Rourkela, Odisha	20	25.11	28.24	1.5	1.72	56.57	16.971
4.	National Institute of Technology Warangal, Telangana	23	18.38	18.79	0	2.42	39.59	11.877
5.	National Institute of Technology Calicut, Kerala	25	15.39	15.21	3	1.02	34.62	10.386
6.	National Institute of Technology Durgapur, West Bengal	29	19.73	19.08	2	1.83	42.64	12.792

7.	Visvesvaraya National Institute of Technology, Maharashtra	30	18.2	18.92	5	3.94	46.06	13.818
8.	Malaviya National Institute of Technology, Rajasthan	37	18.77	20.97	2	1.46	43.2	12.96
9.	Motilal Nehru National Institute of Technology, Uttar Pradesh	42	15.49	16.67	0.5	1.4	34.06	10.218
10.	National Institute of Technology Kurukshetra, Haryana	44	19.66	19.53	0.5	0.96	40.65	12.195
11.	Sardar Vallabhbhai National Institute of Technology	47	14.75	16.16	2	1.49	34.40	10.32
12.	National Institute of Technology Silchar, Assam	48	18.45	19.28	2	0.63	40.36	12.108
13.	Dr B R Ambedkar National Institute of Technology, Punjab	49	11.94	14.29	1	0.49	27.72	8.316
14.	National Institute of Technology Meghalaya, Meghalaya	59	11.73	11.08	0	1.32	24.13	7.239
15.	Maulana Azad National Institute of Technology, Madhya Pradesh	60	13.31	14.22	0.5	0.86	28.89	8.667

(Source: https://www.nirfindia.org/2021/EngineeringRanking.html)

Table -01: Parameter Research and Professional Practice

The difference between weightage marks under parameter Research and Professional Practice of the 9th ranked NIT in the engineering category, i.e. National Institute of Technology Tiruchirappalli, Tamil Nadu (1st among NITs) and weightage marks of 60th ranked NIT in the engineering category, i.e. Maulana Azad National Institute of Technology, Madhya Pradesh (15th among NITs) is very high. It is about just double the 60th ranked NIT for the 9th ranked NIT.

The table clarifies that the weightage marks received for the parameter Research and Professional Practice is crucial for the ranking of the Institute.

3. Review of Literature

A review of literature in allied subject area is necessary to enable the author to get a precise understanding of the particular field of study. Many notable studies have discussed the parameters and sub-parameters of the NIRF ranking system. These studies have proved the role of Research and Professional Practice (RP) in the ranking process. Some prominent studies related to NIRF ranking and publications of the Institute are reviewed.

Chakraborty et al. (2021)[1], in their paper, discussed the various parameters of publications of the top twenty NIRF ranked in 2020 Indian institutions. They found that a good number of open access publications are there almost all the top NIRF ranked institutions in 2020. The analysis shows that the IISc has published the highest number of papers in open access journals while IIT-Kharagpur published the highest number of papers with commercial publications. They suggested to include open-access publication as a parameter in the NIRF. Sheeja et al. (2018)[2], in their paper, tried to establish

relationships among papers published and the NIRF ranking of the Institutes. In the ranking, the publications and the citations received by publications are one of the key factors. They also concluded that the role of the library is crucial for a more significant number of publications. Balasubramani and Thangavel (2019)[3] found in their paper that the research publications are one of the important factors of the ranking. They examined the publications of NIRF ranked IITs for different platforms. They found that the ResearchGate publications are higher than in comparison to the other commercial databases. Kumar et al. (2021)[4], in their paper, analyzed the top 100 NIRF 2020 ranked Universities in in terms of data visualization, effect of parameters on ranking, and the relationship among these parameters. They tried to established the relationship among parameters and the total scores acquired by these Universities. They found that the Teaching, Learning and Resources (TLR) score for all the universities under study were nearly similar while Research and Professional Practice (RP) score had a variation, and it played an vital role in NIRF ranking. The study also confirmations that the library spending has a positive correlation with Research and Professional Practice. Parameswaran et al., (2020)[5] in their paper stated that the Research and Professional Practice is a very significant parameter of NIRF. They found a strong correlation of 0.7702 between NIRF ranking and Research and Professional Practice ranking. The study also shows that the NIRF ranking of the University increases as Research and Professional Practice increases.

4. Objectives

The objectives of the study are as mentioned below:

1. To study the NIRF ranking sub-parameter "Combined metric for Publications"
2. To study the publications of NITs under study
3. To discuss the authorship pattern of these NITs
4. To know the authors' collaborations
5. To map the relation between ranking and publications
6. To examine the most preferred area of publication

5. Scope and Limitations

The scope of the present study is to discuss the sub-parameter of NIRF ranking "Combined metric for Publications (PU)" with respect to the publications. The study discussed research publication, authors productivity and collaborations with other authors. The data for this study has been collected from the NIRF website and Scopus database. The study is limited to the top 15 ranked NITs in NIRF (Engineering) ranking 2021.

The rankings of NITs have been taken from the engineering category of the NIRF ranking 2021, and this paper discusses ranking in the engineering category only.

6. Data Analysis and Interpretation

6.1 Top 15 NITs in NIRF (Engineering) ranking 2021, their publications and most preferred subject area

Ranking among NITs 2021	Name of NIT	NIRF Rank 2021	Total No. of papers published	No. of papers in most preferred sub. area	% of publication in preferred sub. area	Most preferred sub. area	Publication wise ranking
1.	National Institute of Technology Tiruchirappalli, Tamil Nadu	9	10478	5267	25.1	Engineering	2
2.	National Institute of Technology Karnataka, Karnataka	10	8785	4228	24.8	Engineering	3
3.	National Institute of Technology Rourkela, Odisha	20	12255	5870	24.9	Engineering	1
4.	National Institute of Technology Warangal, Telangana	23	6609	3472	26.8	Engineering	5
5.	National Institute of Technology Calicut, Kerala	25	5358	2757	25.9	Engineering	10
6.	National Institute of Technology Durgapur, West Bengal	29	6648	3118	24.4	Engineering	4
7.	Visvesvaraya National Institute of Technology, Maharashtra	30	4997	2736	28	Engineering	11
8.	Malaviya National Institute of Technology, Rajasthan	37	5992	2962	25.2	Engineering	8
9.	Motilal Nehru National Institute of Technology, Uttar Pradesh	42	6074	3297	28.6	Engineering	7
10.	National Institute of Technology Kurukshetra, Haryana	44	6339	3325	26.7	Engineering	6
11.	Sardar Vallabhbhai National Institute of Technology,Gujarat	47	5455	2624	25.1	Engineering	9
12.	National Institute of Technology Silchar, Assam	48	4534	2494	27.1	Engineering	12
13.	Dr B R Ambedkar National Institute of Technology, Punjab	49	4057	1770	22.2	Engineering	13
14.	National Institute of Technology Meghalaya, Meghalaya	59	1218	696	28.5	Engineering	15
15.	Maulana Azad National Institute of Technology, Madhya Pradesh	60	3940	1972	26.7	Engineering	14

Table -02: Publications and most preferred subject area

Table 02 shows the total number of papers published by the top 15 NITs in the engineering category of NIRF ranking. Graph 01 shows that the highest numbers of papers have been published by the NIT Rourkela, Odisha, but it became 3rd position among NITs in NIRF ranking. The 9th and 10th ranked NITs, i.e. National Institute of Technology Tiruchirappalli, Tamil Nadu and National Institute of Technology Karnataka, Karnataka, respectively, which are 1st and 2nd among NITs, have published 2nd and 3rd highest number of papers.

The 25th NIRF ranked and 5th position among NITs, the NIT Calicut, Kerala became 10th position in respect to their publication. Only 12th and 13th ranked among NITs, NIT Silchar, Assam and Dr B R Ambedkar NIT, Punjab are got similar ranking among NITs and ranking in their paper publications.

The graph of paper publications and the ranking of NITs are not linear. This shows that the Combined metric for Publications (PU) is one sub-parameter for ranking. The overall ranking depends profoundly on other parameters also.
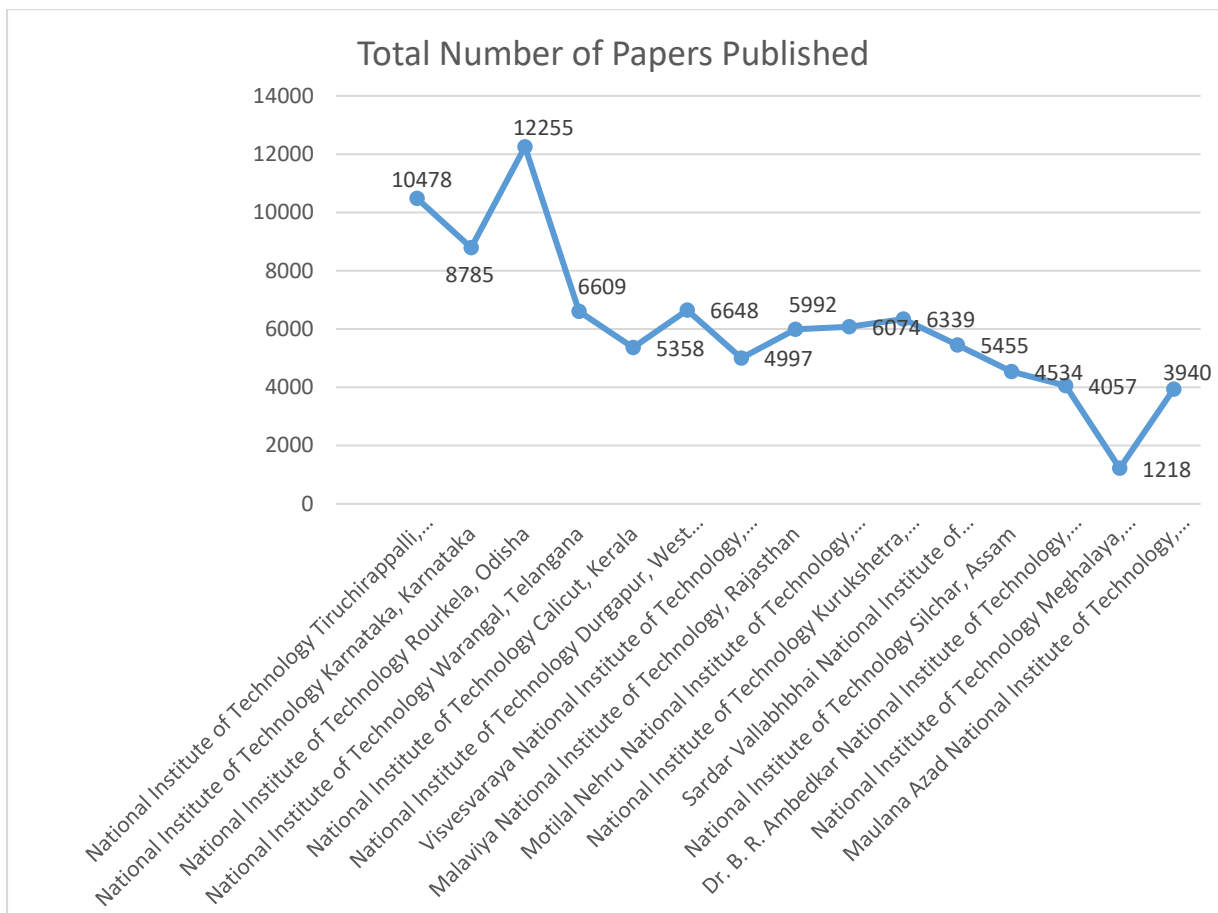

Graph-01: Publications of NITs

Regarding the preferred subject area for publication, all the NITs under study are publishing the maximum number of papers in the field of engineering. The average number of publications in the preferred subject area of these NITs is 26%.

6.2 Top 15 NITs in NIRF (Engineering) ranking 2021 and number of affiliated authors

Ranking among NITs 2021	Name of NIT	NIRF rank 2021	Affiliated authors
1.	National Institute of Technology Tiruchirappalli, Tamil Nadu	9	4173
2.	National Institute of Technology Karnataka, Karnataka	10	3994
3.	National Institute of Technology Rourkela, Odisha	20	3430
4.	National Institute of Technology Warangal, Telangana	23	2896
5.	National Institute of Technology Calicut, Kerala	25	2669
6.	National Institute of Technology Durgapur, West Bengal	29	2042
7.	Visvesvaraya National Institute of Technology, Maharashtra	30	1696
8.	Malaviya National Institute of Technology, Rajasthan	37	1701
9.	Motilal Nehru National Institute of Technology, Uttar Pradesh	42	1827
10.	National Institute of Technology Kurukshetra, Haryana	44	1930
11.	Sardar Vallabhbhai National Institute of Technology	47	1601
12.	National Institute of Technology Silchar, Assam	48	1452
13.	Dr B R Ambedkar National Institute of Technology, Punjab	49	1160
14.	National Institute of Technology Meghalaya, Meghalaya	59	424
15.	Maulana Azad National Institute of Technology, Madhya Pradesh	60	1392

Table -03: Number of affiliated authors
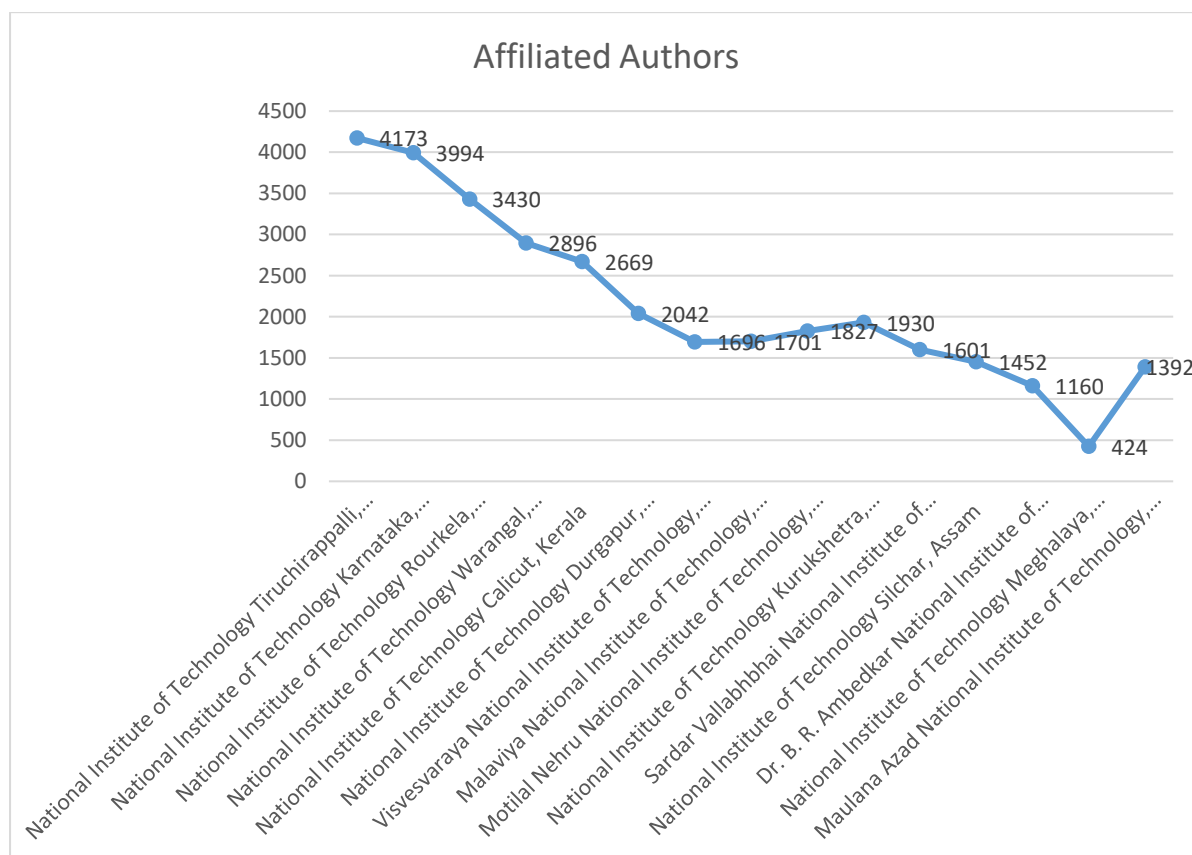

Graph-02: Number of affiliated authors

Among NITs, first ranked National Institute of Technology Tiruchirappalli, Tamil Nadu has the maximum number of afflicted authors, i.e. 4173. The first top seven NITs are showing consistency in decreasing the number of affiliated authors. From 8th ranked NIT, the number of affiliated authors are not consistently decreasing. It is also not showing direct relation with the ranking of NITs and the total number of affiliated authors.

6.3 Top 15 NITs in NIRF (Engineering) ranking 2021, authors with the highest number of papers published, citations received and co-authors

Ranking among NITs 2021	Name of NIT	NIRF rank 2021	Author with highest No. of	No. of papers published	Citations	Cited by No. of documents	Co-authors
1.	National Institute of Technology Tiruchirappalli, Tamil Nadu	9	Anandan, Sambandam	312	7590	6670	334
2.	National Institute of Technology Karnataka, Karnataka	10	Isloor, Arun Mohan	266	4878	3765	222
3.	National Institute of Technology Rourkela, Odisha	20	Mahapatra, Siba Sankar	320	7059	5525	224
4.	National Institute of Technology Warangal, Telangana	23	Chidambaram, Manickam	222	2746	1728	138
5.	National Institute of Technology Calicut, Kerala	25	Ashok, Sankar	183	1693	1448	156
6.	National Institute of Technology Durgapur, West Bengal	29	Mandal, Durbadal	398	2907	1790	236
7.	Visvesvaraya National Institute of Technology, Maharashtra	30	Chandra, Girish Hema	194	1543	1219	163
8.	Malaviya National Institute of Technology, Rajasthan	37	Kumar, Pradeep Harish	528	10864	8373	636
9.	Motilal Nehru National Institute of Technology, Uttar Pradesh	42	Agarwal, Suneeta	136	738	580	87
10.	National Institute of Technology Kurukshetra, Haryana	44	Gupta, Brij Bhooshan	303	5573	3765	361
11.	Sardar Vallabhbhai National Institute of Technology, Gujarat	47	Murthy, Z. V. P.	194	4021	3364	101
12.	National Institute of Technology Silchar, Assam	48	Pandey, K. M.	209	1820	986	147
13.	Dr B. R. Ambedkar National Institute of Technology, Punjab	49	Dutt, S.	556	21351	9543	10203
14.	National Institute of Technology Meghalaya, Meghalaya	59	Panda, Gayadhar	124	861	620	79
15.	Maulana Azad National Institute of Technology, Madhya Pradesh	60	Das, Satyabrata	162	4890	3407	103

Table -04: Authors with highest number of papers published, citations received and co-authors

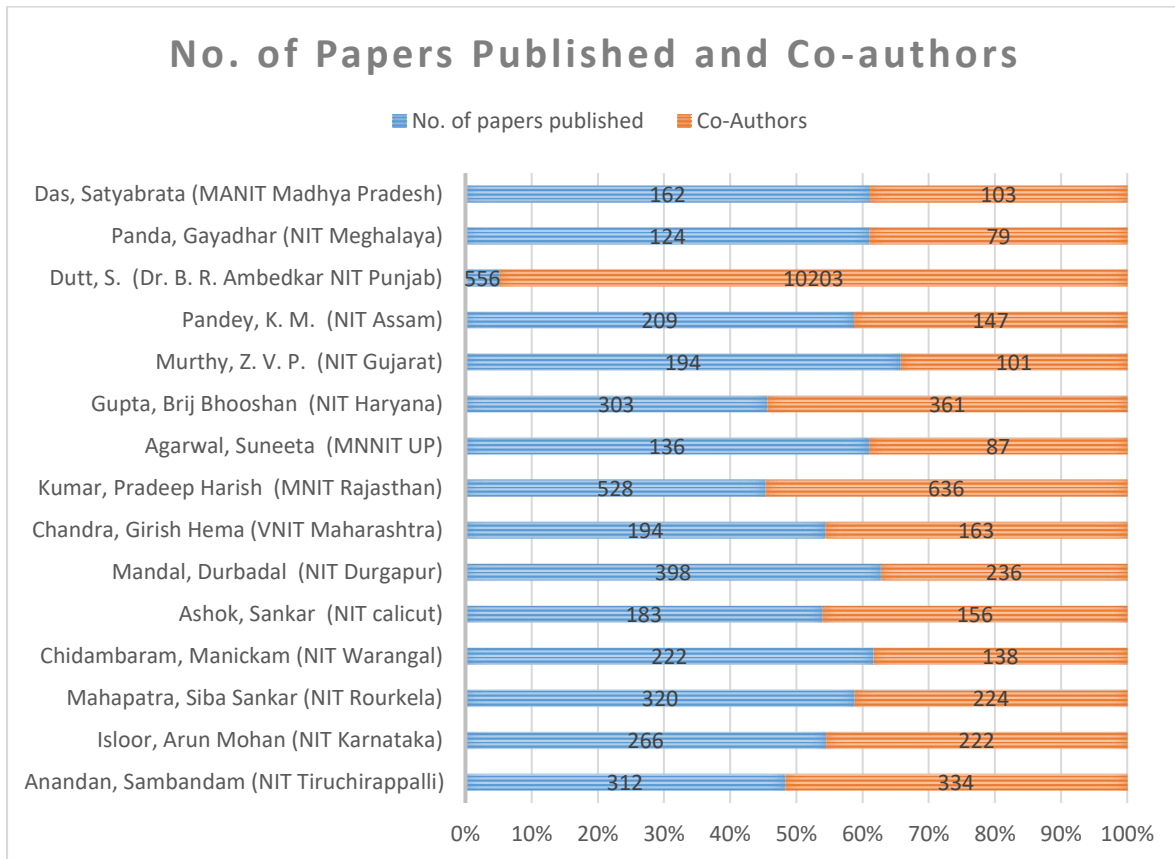**Authors with Highest No. of Papers and Citation Received**
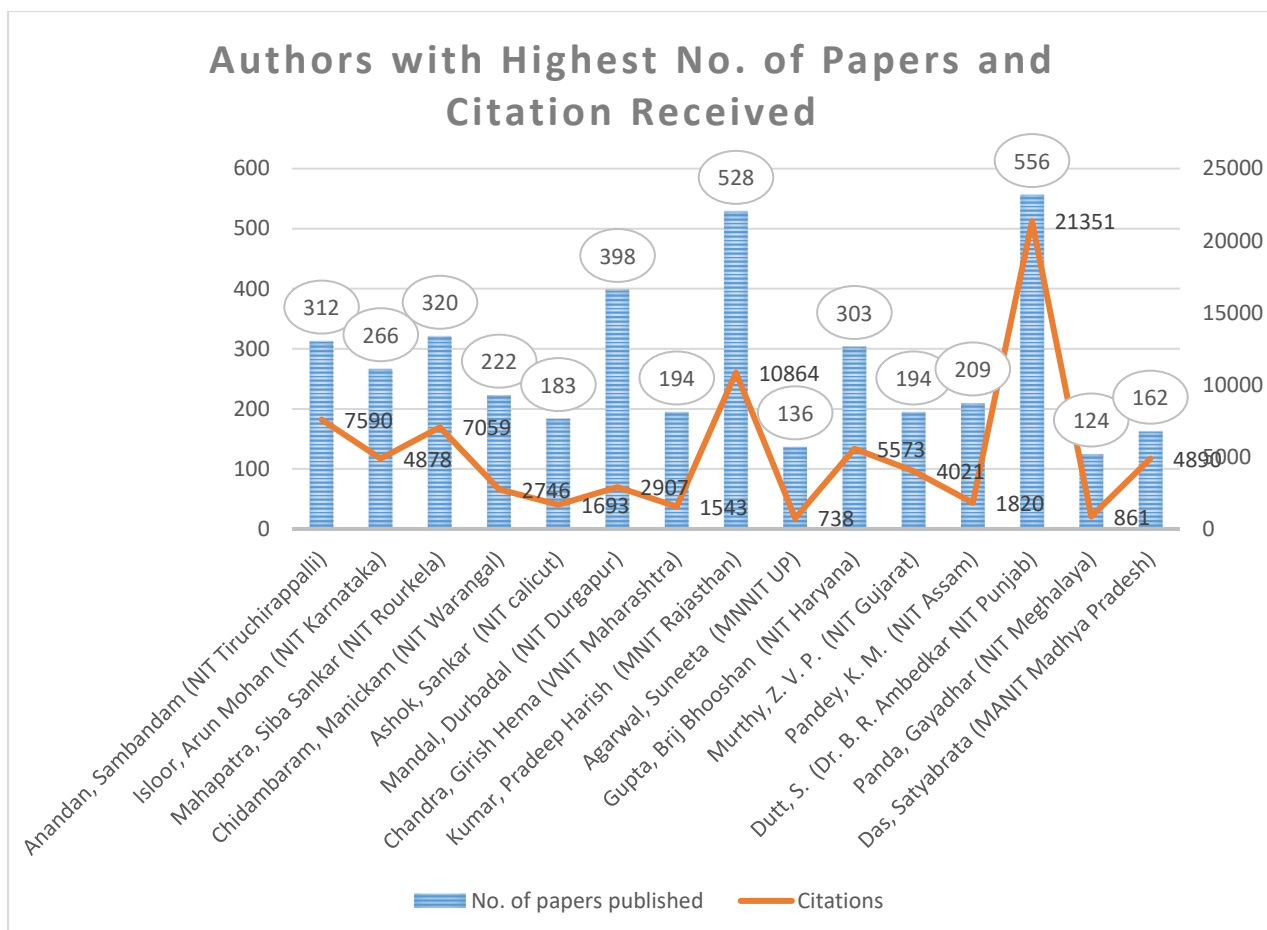
Graph-03: Authors with the highest number of papers published, citations received

Table 04 shows the authors from the NITs under study with the maximum number of papers published with citations received by these publications. The highest number of papers has been published by Dr S Dutt (Scopus Author Identifier- 7006834489), with the total number of papers 556 from Dr B R Ambedkar National Institute of Technology, Punjab. The highest number of citations are also received by the publications of Dr S Dutt. The total citations received by the 556 publication of Dr S Dutt is 21351, which is the highest citations received by an author among these 15 NITs. Dr B R Ambedkar National Institute of Technology, Punjab is at 49th ranked in NIRF engineering ranking and at 13th position among top 15 ranked NITs.

The author with the second-highest number of publications among these NITs is Dr Pradeep Harish Kumar (Scopus Author Identifier- 56942763000) from Malaviya National Institute of Technology, Rajasthan, with a total number of publications 528. The total citations received by the 528 publications of Dr Pradeep Harish Kumar is 10864, which is the second-highest citations received by an author among these 15 NITs.

The analysis shows that the author with the highest number of papers from the top-ranked NIT, i.e. National Institute of Technology Tiruchirappalli, Tamil Nadu is at 5th ranked as if we ranked these NITs as per authors with highest papers.

6.4 Authors with the highest number of papers and their co-authors

No. of Papers Published and Co-authors

■ No. of papers published   ■ Co-Authors

Author	No. of papers published	Co-Authors
Das, Satyabrata (MANIT Madhya Pradesh)	162	103
Panda, Gayadhar (NIT Meghalaya)	124	79
Dutt, S. (Dr. B. R. Ambedkar NIT Punjab)	556	10203
Pandey, K. M. (NIT Assam)	209	147
Murthy, Z. V. P. (NIT Gujarat)	194	101
Gupta, Brij Bhooshan (NIT Haryana)	303	361
Agarwal, Suneeta (MNNIT UP)	136	87
Kumar, Pradeep Harish (MNIT Rajasthan)	528	636
Chandra, Girish Hema (VNIT Maharashtra)	194	163
Mandal, Durbadal (NIT Durgapur)	398	236
Ashok, Sankar (NIT calicut)	183	156
Chidambaram, Manickam (NIT Warangal)	222	138
Mahapatra, Siba Sankar (NIT Rourkela)	320	224
Isloor, Arun Mohan (NIT Karnataka)	266	222
Anandan, Sambandam (NIT Tiruchirappalli)	312	334

Graph-04: *Authors with the highest number of papers published and co-authors*

The study reveals that Dr S Dutt from Dr B R Ambedkar National Institute of Technology, Punjab, Has collaborated with the maximum number of authors (10203) for 556 publications. The author Dr Pradeep Harish Kumar from Malaviya National Institute of Technology, Rajasthan, has collaborated with 636 authors to publish 528 papers.

The author Dr Anandan, Sambandam from National Institute of Technology Tiruchirappalli, Tamil Nadu, top-ranked NIT as per NIRF engineering ranking 2021has collaborated with 334 authors for the publication of 312 papers.

7. Conclusion

NIRF Ranking of the Institutes is based on five different parameters and their 17 sub-parameters. Among various sub-parameters, the sub-parameter combined metric for publications (PU) is one that plays a crucial role in the ranking, but there are sixteen other sub-parameters which are decisive for

the ranking. The number of scholarly articles published by the Institute and the number of citations received for these publications are important measures in NIRF rankings.

The most preferred area of publication of the Institutes under study is engineering since the core area of these Institutes are engineering. For the batter ranking the Institute have to facus on prameters teaching, learning & resources and research and professional practice which are having 30% weightage each.

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