Impact of NIRF higher-order ranked institute Research Publications: A study

M. Tamizhchelvan
Librarian
The Gandhigram Rural Institute
Gandhigram – 624 302
tamizhchelvan@gmail.com

S. Gopalakrishnan
Assistant Librarian (Retd)
Madras Institute of Technology, Anna University,
Chennai, gopallong@gmail.com

Muthuraj Anbalagan
Assistant Librarian
Fisheries College and Research Institute
Thoothukudi – 628008
muthurajmphilbdu@yahoo.com

Abstract

The institution's data have been collected from the NIRF ranking top universities list. The information related to research publications, citation, and h-index is retrieved from the Web of Science database. This study deals with ten years of research from the top 25 selected institutes, five years after NIRF ranking, and five years before ranking (2011-2015 and 2016-2020).The study found that Publications and Quality Research Publications are a major phenomenon of the university and higher educational institutions. NIRF provides 70 weight age of publications and quality of publications. It is found that Indian Institute of Technology Madras ranked 1st with an overall score of 86.76 and followed by Indian Institute of Science, Bangalore ranked 2nd with an overall score of 82.67.

Keywords
NIRF framework**;** Ranking; Institutional Ranking; NIRF Ranking; Publications and Citations

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1. Introduction

Nowadays, research publications are most important for higher educational institutions—Journal articles, books, book chapters, edited volumes, etc. The National Institution Ranking Framework has been assessing and evaluating the quality of education institutions by giving top ranks in India since 2015. The NIRF has formulated five parameters broadly covering "Teaching, Learning and Resources," "Research and Professional Practices," "Graduation Outcomes," "Outreach and Inclusivity," and "Perception".(1) The importance of quality publications is highlighted in Research Publications metrics. In Outcome Based Education, every faculty member in the institution must contribute towards Quality Research Publications. The quality of publications is about publication indexed in Scopus, Web of Sciences and Google Scholar. (2)

1.2 NIRF Parameters

Out of five NIRF parameters, the second parameter is the research and professional practices (RP).The second parameter has four categories such as combined metric for Publications (PU), combined metric for Quality Publications (QP), IPR and Patents: Filled, Published, Granted and Licensed (IPR) and Food Print of Projects, Professional Practice and Executive Development Programs (FPPP). The researcher has selected the first and second categories for the analysis.

	Research and Professional Practice (RP) Ranking weight: 0.30	**Marks**
A	Combined metric for Publications (PU)	30
B	Combined metric for Quality of Publications (QP)	40
C	IPR and Patents: Filed, Published, Granted and Licensed (IPR)	15
D	Footprint of Projects, Professional Practice and Executive Development Programs (FPPP)	15

The methods of calculation of the first two parameters are shown below:

A. Combined metric for Publications (PU): 30 marks

$$PU = 30 \times p(P/F)$$

- P is the number of publications = weighted average of two largest numbers given by
- Scopus, Web of Science, PUBMED, FT 45 (as feasible) over the previous three years.
- Let P1, P2 = Two largest of {PW, PS, PUBMED, FT45, ...etc.}*, #
- P = 0.45P1 + 0.45P2 + 0.1PI
- PW: Number of publications reported in Web of Science.
- PS: Number of publications reported in Scopus
- PUBMED: Number of publications reported in PUBMED, etc.
- PI: Number of publications reported in Indian Citation Index.
- F is the nominal number of faculty members as calculated on the basis of an FSR of
- 1:10.
- Sources: WoS, Scopus, PUBMED, FT45 etc., and ICI.

Anna University NIRF Report 2018

- Assistant Professor – 278
- Associate Professor – 150
- Professor – 160

Example:
PW = 4475 ; PS = 7251 ; PM = 4126 (Microsoft Academic) ; F = 588
Web of Science= (4475/588)/100 = 0.07
Scopus = (7251/588)/100 = 0.12
Microsoft Academia= (4126 /588)/100 = 0.07
Total = 0.07PW +0.12PS +0.07PM
Total: 0.26

B.Combined metric for Quality of Publications (QP): 40 Marks

QP = 15 ×p (CC/P) + 12.5 × p(NCI) + 12.5 × p(TOP25P)}

- Here CC is Total Citation Count over previous 3 years.
- P is the total number of publications over this period as computed for PU.
- CC, NCI and TOP25P computed as follows
- CC = 0.45CCW + 0.45CCS + 0.1CCI
- NCI = 0.5 NCIW + 0.5 NCIS
- TOP25P = 0.5 TOP25PW + 0.5 TOP25PS
- NCI: Field normalized citation index averaged over the previous three years.
- TOP25P: Number of citations in the top 25 percentile averaged over the previous three years.

Example:
CC: citation count
CCW (Web of Science): 15144
CCS (Scopus): 19931
CCM (Microsoft Academic): 70972
P: publications
PW = 4475
PS = 7251
PM = 4126 (Microsoft Academic)
CC= 15144 CCW +19931 CCS +70972 CCM
NCI: no data in website
TOP25P = 1243 TOP25PW + 1130 TOP25PS

QP = 15 ×p (CC/P) + 12.5 × p(NCI) + 12.5 × p(TOP25P)}
Total = 25.88

2. Review of Literature

Anbalagan, Muthuraj and Tamizhchelvan, M. (2021)[3] analyzed both Times Higher Education (THE) and National Institutional Ranking Framework (NIRF) ranking of top 25 Indian institutions. The study shows that "Indian Institute of Science" has got the highest 301–350th rank from THE ranking and received 84.18 scores from NIRF and placed 2nd rank in NIRF list. It is also found that "Indian Institute of Science" has the highest 58.1 scores received from THE's and 82.22 scores obtained from NIRF in Teaching. It is also found that "Indian Institute of Science" has the highest 53.1 scores received from THE's and 92.16 scores from NIRF in the research parameter. The NIRF ranked IIT's, faculty members and their publicationswith citation impact study indicates that "Indian Institute of Technology Madras" has the highest 85.31 scores received from NIRF.The highest number of faculty members of Indian Institute of Technology, Bombay (690, 12.48%)has their publication that has received 452743 (14.18%)citations from Scopus with 381731 (13.70%) citations towards CrossRef. (Anbalagan, Muthuraj, Balasubramani and Jeyapragash. (2021)[4]

Dadhe, P. P and Dubey, M.N. (2021)[5] reports a comparative study of the scientific publications of nationally ranked engineering institutions five years on both sides of the launching of NIRF. The study aims to check the research pattern and discover the connection between the ranking of institutions in terms of research output and the overall ranking per NIRF with four essential parts of research, i.e. productivity, research impact, funding to these research and international collaboration. The impact of the NIRF ranking on research publications, with

special reference to North-East Indian Universities, study reveals that only eight universities from NE India got ranked in NIRF ranking. Tezpur University is the most prolific university in the region. The rank of universities is in a state of fluctuation year after year.(Deka P and Sarmah, M. (2021)[6]) . The study of the top 10 Pharma education institutions of the NIRF Ranking 2020 indicates Hamdard University NIRF score of (80.5).(Kappi, M., & Biradar, B. S. (2021)[7]). Performance of Indian Medical Schools In National Institutional Ranking Framework (NIRF) has been studied by Subbarayalu, A. V. et al. (2019)[8]Similarly Higher Educational Institution (HEI) (Mandhirasalam, M. (2017)[9]; Management and Pharmacy institutions Mandhirasalam, M. (2016)[10] were also studied. Abhishek Kumar (2019)[11]investigates the growth of publication in the different subject categories and the impact of growth before and after NIRF of 20 universities from the top 25 top universities ranked last three years, i.e.2014, 2015, 2016 in NIRF.The scientific research productivity of Indian Institute of Science (IISc), Bangalore, India's NIRF first ranked higher academic & research institute, for a period of 05 years during 2014-2018 has been studied by Satish Kumar and Senthilkumar, R. (2019)[12]. The research output of scientists of Five Central Universities of NIRF ranking by exploring during last three years, i.e. 2013, 2014 and 2015, has been analyzed byMukherjee, B. (2016)[13]. Few case studies of NIRF ranking were also carried out (Chugh, K. L., et al. (2016)[14] Chugh, K. L., et al. (2016)[15])

3. Research Methodology

The institution data were collected from the National Institutional Ranking Framework (NIRF) (https://www.nirfindia.org/Home) website, and the publication data were collected from the Web of Science database (https://www.webofknowledge.com/)[16] for the period 2011-2020. The researcher has selected the top 25 institutions for this study. The study aims to analyze the top 25 NIRF ranked Indian institutions, publications and quality publications, University wise research publications, citations and h-index and comparison of 2020 and 2021 scores. The Data were analyzed using simple calculations.

4. Objectives of the Study

These are the major objectives of the study.

- To list out the first 25 NIRF rank Institutions.
- To identify the publication and quality publications scores of 25 NIRF ranked institutions.
- To analyze the ranking status of the top 25 institutions during the period 2017 to 2021
- To identify the institution wise research publications in a web of science for 2011-2020.
- To identify the publication trend of Top 25 NIRF Ranking institutions before and after ranking.
- To determine the impact of five NIRF parameters among the first ten higher-order ranked institute Research Publications.

5. Data analysis

5.1 Top 25 NIRF ranked Indian Institutions

The top 25 NIRF ranked Indian institutions that are taken up for the study has been shown in Table 1.

Table 1: Top 25 NIRF ranked Indian Institutions

S.No	Name	City	State	Score	Rank
1	Indian Institute of Technology (IIT) Madras	Chennai	Tamil Nadu	86.76	1
2	Indian Institute of Science	Bengaluru	Karnataka	82.67	2
3	Indian Institute of Technology (IIT) Bombay	Mumbai	Maharashtra	82.52	3
4	Indian Institute of Technology (IIT) Delhi	New Delhi	Delhi	81.75	4
5	Indian Institute of Technology (IIT) Kanpur	Kanpur	Uttar Pradesh	76.5	5
6	Indian Institute of Technology (IIT) Kharagpur	Kharagpur	West Bengal	75.62	6
7	Indian Institute of Technology (IIT) Roorkee	Roorkee	Uttarakhand	71.4	7
8	Indian Institute of Technology (IIT) Guwahati	Guwahati	Assam	69.26	8
9	Jawaharlal Nehru University (JNU)	New Delhi	Delhi	66.61	9

10	Banaras Hindu University (BHU)	Varanasi	Uttar Pradesh	63.1	10
11	Calcutta University (CU)	Kolkata	West Bengal	61.45	11
12	Amrita Vishwa Vidyapeetham (AVV)	Coimbatore	Tamil Nadu	59.87	12
13	Jamia Millia Islamia (JMI)	New Delhi	Delhi	59.54	13
14	Jadavpur University (JU)	Kolkata	West Bengal	58.93	14
15	Manipal Academy of Higher Education (Manipal Edu.)	Manipal	Karnataka	58.91	15
16	Indian Institute of Technology (IIT) Hyderabad	Hyderabad	Telangana	58.53	16
17	University of Hyderabad (UH)	Hyderabad	Telangana	57.67	17
18	Aligarh Muslim University (AMU)	Aligarh	Uttar Pradesh	57.38	18
19	University of Delhi (UD)	Delhi	Delhi	56.03	19
20	Savitribai Phule Pune University (SPPU)	Pune	Maharashtra	55.83	20
21	Vellore Institute of Technology (VIT)	Vellore	Tamil Nadu	55.39	21
22	Bharathiar University (BU)	Coimbatore	Tamil Nadu	55.38	22
23	National Institute of Technology (NIT)Tiruchirappalli	Tiruchirappalli	Tamil Nadu	54.97	23
24	Indian Institute of Science Education & Research Pune (IISER, Pune)	Pune	Maharashtra	54.47	24
25	Anna University (AU)	Chennai	Tamil Nadu	54.42	25

It is found that Indian Institute of Technology (IIT) Madras (Chennai) has received the highest number of (86.76) NIRF Score and placed the first rank followed by Indian Institute of Science (Bengaluru) has received 82.67 scores have placed the second rank. In Tamil Nadu, it is found that only five institutions are placed top 25 NIRF ranked list. It is further found that Anna University has received a 54.42 score have placed the twenty-fifth rank.

5.2 **Research and Professional Practice (RP)**

The National Institutional Ranking Framework (NIRF) has five parameters, and the second parameter is called Research and Professional Practices. The Research and Professional practices has four categories like Combined metric for Publications (PU), Combined metric for Quality of Publications (QP), IPR and Patents: Published and Granted (IPR) and Footprint of Projects and Professional Practice (FPPP). The researcher has selected the combined metric for Publications (PU) and the metric for Quality of Publications (QP) parameters. Indicates that top 25 ranked institutions Publications (PU) Vs Quality Publications scores were shown in Table 2 and figure 1.

Table2: Publications (PU) Vs Quality Publications

S. No	Name	Publications (PU)	Quality of Publications (QP)
1	IIT Madras	31.38	32.78
2	IISc Bangalore	35.00	35.00
3	IIT Bombay	30.47	31.93
4	IIT Delhi	31.17	32.23
5	IIT Kanpur	27.24	27.00
6	IIT Kharagpur	28.93	32.21
7	IIT Roorkee	28.16	29.15
8	IIT Guwahati	27.80	28.15
9	JNU	20.15	20.56
10	BHU	18.18	23.64
11	CU	15.86	18.04
12	AVV	19.82	18.37
13	JMI	16.60	19.93
14	JU	22.54	24.27
15	Manipal Edu.	18.30	19.29
16	IIT Hyderabad	21.70	22.42
17	UH	18.84	19.05
18	AMU	15.84	20.94
19	UD	21.13	26.34
20	SPPU	18.52	19.05
21	VIT	23.23	27.91
22	BU	22.64	21.29
23	NIT Tiruchirappalli	19.09	19.09
24	IISER Pune	20.59	21.45
25	AU	17.90	19.60

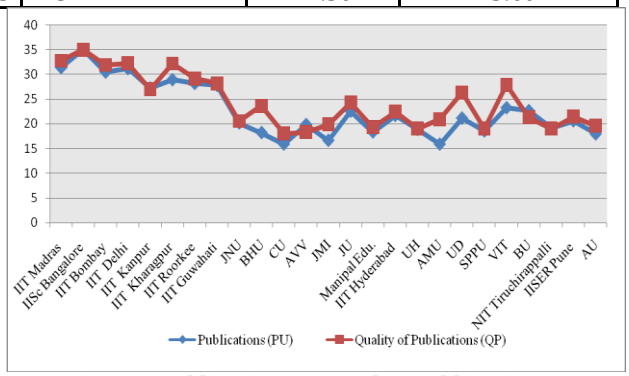


Figure1 Publication Vs Quality publication

The publication scores of 25 institutions were ranged between 15.84 and 35.00, whereas the Quality Publication (QP) scores ranged between 18.04 and 35.00. The IISc, Bangalore, has the highest publication scores (35.00). It is followed by IIT Madras (31.18), IIT Delhi (31.17) and IIT Bombay (30.47). The least score can be seen in AMU (15.84), CU (15.86) and JMI (16.60). In the case of Quality publications (QP), the highest score IISc, Bangalore (35.00). It is followed by IIT Madras (32.78), IIT Delhi (32.23) and IIT Kharagpur (32.21). The least score can be seen in CU (18.04), AVV (18.37), and UH as well as SPPU (19.05). It can also be seen that there exist an increasing trend in quality publications.

5.3 **Top 25 Institutions status in Indian Rankings 2017-2021**

The top 25 institute's status of Indian Rankings during2017 to 2021 has been shown in table 3 and figure 2.

Table 3: Top 25 Universities status in Indian Rankings 2017 to 2021

S. No	Name	2017 Rank	2018 Rank	2019 Rank	2020 Rank	2021 Rank
1	IIT Madras	2	2	1	1	1
2	IISc Bangalore	1	1	2	2	2
3	IIT Bombay	3	3	4	4	3
4	IIT Delhi	5	4	3	3	4
5	IIT Kanpur	7	7	6	6	5
6	IIT Kharagpur	4	5	5	5	6
7	IIT Roorkee	9	8	8	9	7
8	IIT Guwahati	8	12	9	7	8
9	JNU	6	6	7	8	9
10	BHU	10	9	10	10	10
11	CU	27	21	12	11	11
12	AVV	16	15	15	13	12
13	JMI	20	19	19	16	13
14	JU	12	13	13	12	14
15	Manipal Edu.	30	18	16	14	15
16	IIT Hyderabad	26	22	22	17	16
17	UH	14	11	11	15	17
18	AMU	19	17	18	31	18
19	UD	15	14	20	18	19
20	SPPU	18	16	17	19	20
21	VIT	22	24	32	28	21
22	BU	45	20	21	21	22
23	NIT Tiruchirappalli	34	31	24	24	23
24	IISER Pune	29	32	23	25	24
25	AU	13	10	14	20	25

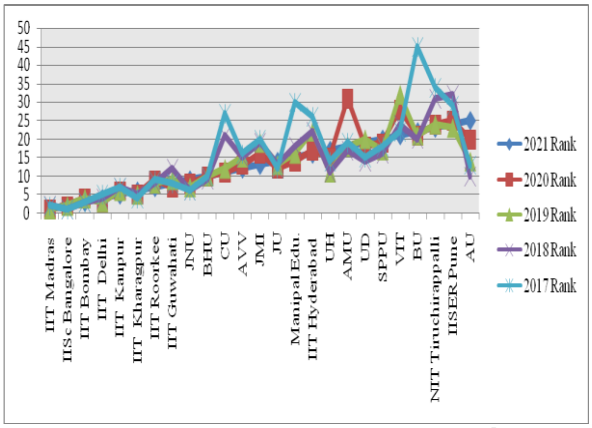


Figure 2Top 25 Universities status in Indian Rankings 2017 to 2021

It is found that Indian Institute of Technology (IIT) Madras placed 2nd rank in 2017, 2018 and the further year 2019, 2020 and 2021 has placed 1st rank followed by Indian Institute of Science has placed 1st rank in 2017, 2018 and the further year 2019, 2020 and 2021 has placed the second rank. It is found that Indian Institute of Technology (IIT) Kanpur, Calcutta University, Amrita Vishwa Vidyapeetham, Jamia Millia Islamia, Manipal Academy of Higher Education, Indian Institute of Technology Hyderabad and National Institute of Technology Tiruchirappalli has improved their ranks in the last five year NIRF rank. It is further found that Anna University has placed 13th rank in 2017, 10th rank in 2018, 14th rank in 2019, 20th rank in 2020 and 25th rank in 2021.

5.4 **Institution wise research publications**

The university wise research publications in the web of science for the year 2011-2020 has been shown in Table 4 and figure 3.

Table 4: Institution wise research publications (Web of Science) (2011-2020)

S. No	Name	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
1	IIT Madras	971	905	954	1067	1242	1394	1668	1895	2189	2122
2	IISc Bangalore	1490	1600	1715	1838	1862	1875	2025	2210	2240	2253
3	IIT Bombay	855	937	1046	1165	1290	1420	1642	1770	1969	2183
4	IIT Delhi	827	888	1020	1134	1170	1361	1559	1571	1852	2099
5	IIT Kanpur	738	746	805	885	981	1091	1163	1221	1271	1335
6	IIT Kharagpur	1081	1156	1253	1356	1518	1671	1726	1880	2169	2193
7	IIT Roorkee	623	727	759	909	1025	1191	1228	1239	1417	1580
8	IIT Guwahati	492	522	596	690	695	892	1037	1230	1350	1338
9	JNU	342	394	348	463	512	601	626	746	783	831
10	BHU	1106	1056	1160	1207	1223	1212	1230	1328	1495	1635
11	CU	583	630	711	771	778	784	823	779	822	956
12	AVV	185	203	232	247	247	284	336	488	586	615
13	JMI	243	304	294	284	349	382	451	572	677	800
14	JU	742	779	840	911	969	988	1001	1093	1130	1153
15	Manipal Edu.	452	462	525	540	595	755	775	921	1164	1390
16	IIT Hyderabad	64	94	144	207	256	290	382	504	600	729
17	UH	470	537	555	567	594	614	602	569	685	719
18	AMU	574	667	589	611	598	625	695	760	932	995
19	UD	1127	1211	1276	1305	1283	1376	1403	1504	1518	1735
20	SPPU	339	354	363	393	413	600	578	564	666	651
21	VIT	372	358	421	549	714	814	1008	1141	1386	1714
22	BU	212	269	284	356	387	470	605	640	599	585
23	NIT Tiruchirappalli	229	252	290	324	341	389	424	484	733	794
24	IISER Pune	101	151	188	217	280	397	489	525	522	489
25	AU	565	640	786	922	1019	1049	1047	1110	1412	1569
	Total	**14783**	**15842**	**17154**	**18918**	**20341**	**22525**	**24523**	**26744**	**30167**	**32463**

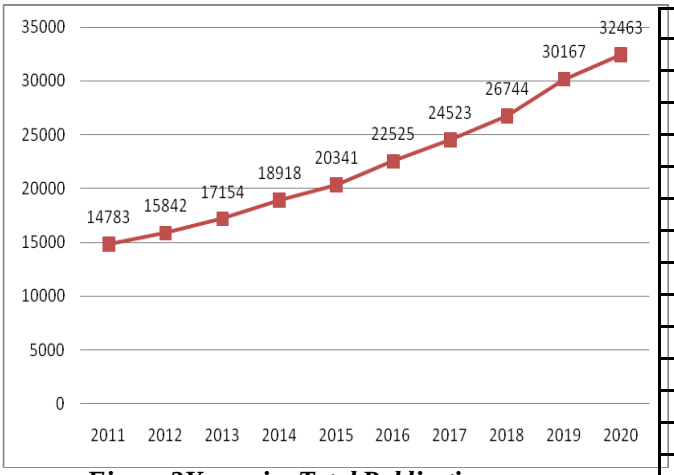


Figure 3Year-wise Total Publications

There were only 14783 research publications in 2011 and 15842 publications in 2012. It means there is a positively 1059 research publications growth in universities. It is found those 30167 publications in 2019 and 32463 research publications in 2020. It is further found that Indian Institute of Science has produced many research publications for all the years to compare the other institutions.

5.5 **Total publications before and after five years of ranking**

Top 25 institutions total publications before ranking years 2010-15, and after ranking years 2016-2020 has been analyzed. The h-index and citations were also found, and the same has been shown inTable 5

Table5: Top 25 NIRF Ranking institutions total publication before and after ranking

S. No	Name	Before Ranking 2010-2015	After Ranking 2016-2020	H-index (2016-2020)	Citations
1	IIT Madras	5139	9268	89	106688
2	IISc Bangalore	8505	10603	147	118112
3	IIT Bombay	5293	8984	91	106338
4	IIT Delhi	5039	8442	79	92023
5	IIT Kanpur	4155	6081	74	65806
6	IIT Kharagpur	6364	9639	79	106741
7	IIT Roorkee	4043	6655	79	77639
8	IIT Guwahati	2995	5847	74	65806
9	JNU	2059	3587	74	65806
10	BHU	5752	6900	74	65806
11	CU	3473	4164	74	65806
12	AVV	1114	2309	74	65806
13	JMI	1474	2882	74	65806
14	JU	4241	5365	74	65806
15	Manipal Edu.	2574	5005	74	65806
16	IIT Hyderabad	765	2505	74	65806
17	UH	2723	3189	74	65806
18	AMU	3039	4007	74	65806
19	UD	6202	7536	74	65806
20	SPPU	1862	3059	74	65806
21	VIT	2414	6063	74	65806
22	BU	1508	2899	74	65806
23	NIT Tiruchirappalli	1436	2824	74	65806
24	IISER Pune	937	2422	74	65806
25	AU	3932	6187	74	65806

It shows their positive impact on the NIRF ranking of university research' publications before and after the NIRF. As the popularity of the NIRF, all know that it was started in 2015 and launched the first ranking in 2016 in their selected categories. It was observed that the NIRF required the research publications' details and provided 30% weightage, which is also important to get top rank. After that, many research articles were published in the journals. One can see the growth and development of research productivity of Indian universities before and after the impact of NIRF Indian Rankings, as shown above in Fig. 1. It is found that Indian Institute of Science has published 10603 publications with 147 h-index after NIRF and received 118112 citations, followed by Indian Institute of Technology Kharagpur has published 9639 publications with 79 h-index and received 106741 citations. It is further found that Indian Institute of Science Education & Research Pune has published 2422 publications with a 71 h-index.

5.6 **Top 10 NIRF Institutions Scores for the years 2021 and 2020**

The top 10 NIRF institutions scores for the years 2020 and 2021 are shown in Table 6.

Table 6: Top 10 NIRF Institutions Scores for the years 2020 and 2021

S. No	Name	2020 Rank	Total (TLR+RPC+GO+OI+ Perception)	2021 Rank	Total (TLR+RPC+GO+OI+ Perception)
1	IIT Madras	1	419.73	1	425.14

2	IISc Bangalore	2	410.11	2	407.23
3	IIT Bombay	4	393.37	3	401.63
4	IIT Delhi	3	400.51	4	405.41
5	IIT Kanpur	6	367.31	5	372.74
6	IIT Kharagpur	5	375.73	6	371.98
7	IIT Roorkee	9	328.96	7	340.8
8	IIT Guwahati	7	330.9	8	331.25
9	JNU	8	348.07	9	338.7
10	BHU	10	303.05	10	312.01

(Teaching, Learning & Resources (TLR) + Research and Professional Practice (RP)+ Graduation Outcomes (GO) +Outreach and Inclusivity (OI)+ Peer Perception)

It is found that Indian Institute of Technology Madras has placed 1st rank in 2021 and 2020 and received 425.14 scores for the year 2021 and 419.73 scores for 2020, followed by Indian Institute of Science has placed 2nd rank in 2021 and 2020 and received the 407.23 and 410.11 scores respectively. It is further found that Banaras Hindu University has placed 10th rank in 2021 and 2020 and received the 312.01 scores for 2021 and 303.05 scores for 2020.

5.7 **Comparison of top 10 NIRF Institutions scores**

The NIRF has five parameters like Teaching, Learning & Resources (TLR), Research and Professional Practice (RP), Graduation Outcomes (GO), Outreach and Inclusivity (OI) and Peer Perception.The comparison of 10 NIRF institutions scores on the above parameters and the rank for two consecutive years, such as 2020 and 2021, were shown in Table 7.

Table 7: Comparison of top 10 NIRF Institutions scores

S. No	Name	2020 Rank	TLR (100)	RP (100)	GO (100)	OI (100)	PERCEPTION (100)	2021Rank	TLR (100)	RP (100)	GO (100)	OI (100)	PERCEPTION (100)
1	IIT Madras	1	81.86	90.67	88.26	62.78	96.16	1	85.61	92.51	86.32	63.57	97.13
2	IISc Bangalore	2	82.22	92.16	82.89	52.84	100	2	79.13	91.48	78.23	58.39	100
3	IIT Bombay	4	79.32	86.46	82.48	54.14	90.97	3	83.52	87.81	80.86	57.48	91.96
4	IIT Delhi	3	80.59	87.16	77.18	66.41	89.17	4	84.02	84.46	75.07	67.97	93.89
5	IIT Kanpur	6	75.64	74.76	81.87	55.61	79.43	5	80.5	75.23	80.74	56.97	79.3
6	IIT Kharagpur	5	68.6	79.73	86.12	59.07	82.21	6	74.25	76.23	83.23	55.35	82.92
7	IIT Roorkee	9	68.29	67	85.21	64.29	44.17	7	76.68	68.37	83.16	65.31	47.28
8	IIT Guwahati	7	74.06	63.55	81.85	62.35	49.09	8	73.75	66.25	81.26	62.95	47.04
9	JNU	8	74.98	44.8	100	75.1	53.19	9	71.19	44.96	95.07	73.36	54.12
10	BHU	10	70.91	44.89	85.65	58.76	42.84	10	64.5	45	100	53.13	49.38

Teaching, Learning & Resources (TLR) score for the year 2020 ranges between 68.29% and 82.22%, whereas, for the year 2021, it ranges between 64.5% and 85.61%. A minimum of 4 to 7% raise in TLR Score can be seen in six institutions, and in the remaining institutions, there is a decrease in TLR score from 3 to 6%. The decrease in TLR Score does not impact the ranking of IISc Bangalore (2) and BHU (10), whereas IIT Guwahati and JNU pushed one rank below.

Research and Professional Practice (RP) score for the year 2020 ranges between 44.8% and 92.16%, whereas, for the year 2021, it ranges between 44.96% and 92.51%. There exist only a minimum of 0.11% to

2.75% raise in RP score between 2020 and 2021 among seven institutions, whereas there is a decrease in RP score 0.68% to 3.68% in three institutions. IISc Banglore, IIT Bombay and IIT Kharagpur have decreased in RP score. Graduation Outcome (GO) score for the year 2020 ranges between 77.18% and 100%, whereas, for the year 2021, it ranges between 75.07% and 100%. There exists a substantial decrease in GO scores except for BHU. Outreach and Inclusivity (OI) score for the year 2020 ranges between 52.84% and 75.81%, whereas, for the year 2021, it ranges between 53.13% and 73.36%. Peer Perception (PERCEPTION) score for the year 2020 ranges between 42.84% and 100%, whereas, for the year 2021, it ranges between 49.38% and 100%. There exist substantial increases in Peer Perception score except for IIT Guwahati.

6. Conclusion

The NIRF uses five parameters broadly cover "Teaching, Learning and Resources," "Research and Professional Practices," "Graduation Outcomes," "Outreach and Inclusivity," and "Perception". Out of five NIRF parameters, the second parameter is the research and professional practices (RP).The second parameter has four categories such as combined metric for Publications (PU), combined metric for Quality Publications (QP), IPR and Patents: Filled, Published, Granted and Licensed (IPR) and FoodPrint of Projects, Professional Practice and Executive Development Programs (FPPP). In this study, the first and second categories viz., combined metric for Publications (PU) and Quality Publications (QP) were considered. The publications and Quality publications are primarily dependent on citations. In other words, the Richness of publications and Reach of publications were prime factors of publication and quality publications. The quality of publications depends on the number of authors, the reputation of authors, the affiliation of authors, the journal in which the publication appeared, and the publication's country. Moreover, the number of publications of an organization directly depends on the number of faculty. Therefore the numbers of publications were directly proportional to the number of faculties. The same views were expressed by Tamizhchelvan and Gopalakrishnan. (2018a,2018b,2019). The factors such as number of authors, number of publications produced by each author and every year, the projects are undertaken by the individuals, the reputation of the organization is directly proportional to the number of publications and the citations. Likewise, it is applicable for all NIRF ranking factors. Therefore it is quite natural that IITs, IIS, NITs are occupying the top order ranks. Moreover, NIRF ranking depended on Manpower, Number of Projects, and other outcomes.Further, NIRF five ranking parameters made the institutions maintain the level of the standards/score in a growing / improving manner than the quality of those institutions.

References

[1.] Chugh, K. L., Karthik, R., & Ram Mohan Rao, P. (2016). Quality Research Publications and Its Impact on National Institutional Ranking Metrics. *International Journal of Control Theory and Applications*, *9*(42), 259-266. https://serialsjournals.com/abstract/22475_cha-31.pdf

[2.] National Institute ranking framework (NIRF). (n.d.). https://www.nirfindia.org/Parameter

[3.] Anbalagan, Muthuraj and Tamizhchelvan, M. (2021). Ranking of Indian Institutions in Global and Indian Ranking system: A Comparative Study. *Library Philosophy and Practice (e-journal)*. 5100. https://digitalcommons.unl.edu/libphilprac/5100\

[4.] Anbalagan, Muthuraj and Balasubramani, Jeyapragash. (2021). An Analysis of NIRF ranked Indian Institute of Technology (IITs) Profiles: Special Reference to Indian Research Information Network System (IRINS). *Library Philosophy and Practice (e-journal)*. 5446. https://digitalcommons.unl.edu/libphilprac/5446

[5.] Dadhe, P. P and Dubey, M.N. (2021). Ranking and Research Trend: A Comparative Study of Research Output of Top Ten NIRF Ranked Engineering Institutions of India Based on Scientometric Indicators. *Library Philosophy and Practice (e-journal)*. 5083. https://digitalcommons.unl.edu/libphilprac/5083

[6.] DEKA, P and Sarmah, M. (2021). Impact of NIRF Ranking on Research Publications: A Study with Special Reference to North-East Indian Universities. *Library Philosophy and Practice (e-journal)*. 5135. https://digitalcommons.unl.edu/libphilprac/5135

[7.] Kappi, M., & Biradar, B. S. (2021). Evaluation of the Indian Top 10 Pharma Education Institutions Research Output Listed By National Institutional Ranking Framework (NIRF) 2020: A Scientometric Study. *International Journal of Pharmacy and Pharmaceutical Sciences*, *13*(7), 1-10. https://dx.doi.org/10.22159/ijpps.2021v13i7.41709

[8.] Subbarayalu, A. V., Kuwaiti, A. A., & Mohanraj, K. (2019). Performance Of Indian Medical Schools In National Institutional Ranking Framework (NIRF) And Appropriate Strategies For Its Improvement. *INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH*, *8*(9), 842-849.

[9.] Mandhirasalam, M. (2017). NIRF (National Institutional Ranking Framework) India Rankings 2016: An Analysis with Special Reference to Tamil Nadu. *In* UGC Sponsored International Conference on Knowledge Resources and Library Technologies. Bharathidasan University, Tiruchirappalli.

[10.] Mandhirasalam, M. (2016). *NIRF India Rankings 2016: Ranking of Engineering Institutions in Tamil Nadu*. In *DRDO Supported National Conference on Creativity, Innovation and Transformation in Libraries (SALIS 2016)* (pp. 25-30). K S Rangasamy College of Technology, Tiruchengode & SALIS.

[11.] Abhishek Kumar, Sanjay Tiwari, Ashish Kumar Chauhan&RamswaroopAhirwar (2019) Impact of NIRF on research publications: A study on top 20 (ranked) Indian Universities, *COLLNET Journal of Scientometrics and Information Management*, 13:2, 219-229, DOI: 10.1080/09737766.2020.1741194

[12.] Satish Kumar and Senthilkumar, R. (2019). Scientometric mapping of research output of NIRF first ranked institute of India: IISc,Bangalore. Library Philosophy and Practice (e-journal). 2890.https://digitalcommons.unl.edu/libphilprac/2890

[13.] Mukherjee, B. (2016). Ranking Indian Universities through Research and Professional Practices of National Institutional Ranking Framework (NIRF): A case study of Selected Central Universities in India. *The Journal of Indian Library Association (JILA)*, *52*(4), 93-107.

[14.] Chugh, K. L., Karthik, R., & Rao, P. R. (2016). Quality Research Publications and Its Impact on National Institutional Ranking Metrics. *International Journal of Control Theory and Applications*, *9*(42), 259-266.

[15.] Chugh, K. L., Rao, P. R., & Karthik, R. (2016). A Schema for Optimizing Research Publications Metrics for National Ranking of Engineering Institutions in India. *International Journal of Innovations in Engineering and Technology (IJIET)*, *7*(4), 129-136.

[16.] Web of Science. (n.d.). Clarivate. https://www.webofknowledge.com/

[17.] Tamizhchelvan, M. & Gopalakrishnan, S. (2018a). Measure the Reach of Scientific Publications: A Scientometric Study. *International Journal of Research in Library Science*, 4(2) 40-54. https://doi.org/10.26761/IJRLS.4.2.2018.1293.

[18.] Tamizhchelvan, M. & Gopalakrishnan, S. (2018b). Measuring Richness of the Research Output: A Scientometric Method. *Journal of Advances in Library and Information Science*, 7(3): 212-226.

[19.] Tamizhchelvan, M & Gopalakrishnan, S (2019). Reach and Richness Factor Index for scholarly publications: a new alternative approach. *International Journal of Advance and Innovative Research*, 6(1) (XXVI): 2394-7780