

# Research Performance Analysis of Five Key Parameters of Top 20 Indian Universities: An Evaluation

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## ABSTRACT

NIRF by the Ministry of Education, formerly MHRD ranks all these institutions, on five parameters, namely, (i) Metric for Quantitative Research (QNR), (ii) Metric for Qualitative Research (QLR), (iii) Metric for Students' & Faculty Contribution (SFC), (iv) Outreach & Inclusivity (OI), (v) Peer Perception (PR). The article reveals the evaluation information in the year 2021, the contributions of 20 highest Universities among 50 HEIs and their scores of parameters and sub-parameters under the "Research" category. It is a well-accepted fact that an increase in high-quality publications by a university would invariably result in the growth of its ranking. This study reflects that ranking has influenced the performance of universities positively. The study underscores that quality publications positively impacted rankings, highlighting the significance of research investment for overall university ranking enhancement. Furthermore, it found that the parameters set for assessing Indian institutions under NIRF align with those of other world university-ranking agencies. Universities scoring high for research productivity under NIRF also featured prominently in global rankings. Notably, universities from South India excelled in NIRF, indicating a close relationship between scholarly productivity and institutional ranking.

**Keywords:** National Institutional Ranking Framework, Research category, Top 20 universities, Research Performances of the parameters.

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## INTRODUCTION

The institutional rating is a high phenomenon for measuring an institution's potentiality and highbrow power in converting contexts. The ratings of the universities and different academic establishments have turned out to be famous in countrywide and global scenarios. Higher academic establishments are a high section for countrywide development, and it has a full-size effect on studies productivity. The continuous rating can create a surrounding to assess the power and weaknesses of the establishments. It has an essential function in comparing, criticizing, competing, perceiving, and promoting a college or institution. Better function at the worldwide and countrywide ranges creates an acquainted getting to know surroundings for the scholarly community.

The reason behind the inclusion of research performance in NIRF by the government was to place Indian higher educational institutions in top world HEIs. The idea of NIRF was driven by the concept of QS world ranking though it was modified based on

the environment of Indian educational institutions. The ranking of the institutions is determined based on the authentic data given by the institutions. Unlike an accreditation score, the NIRF score is relative, not an ultimate score. Every year all the institutions are invited to participate in the NIRF ranking by registration through the NIRF portals but the research category is introduced in this year. Though all the institutions are invited accreditations are not given to all and the evaluation process is arranged every five years. Participating institutions are always alert to know the yearly performance of an institution whether it is increasing or decreasing.

## National Institutional Ranking Framework (NIRF)

The National Institutional Ranking Framework (NIRF) changed into accepted by the Minister of Human Resource Development (MHRD) and released through the Honorable MHRD on the twenty-ninth of September 2015. This framework outlines a technique to rank establishments throughout the country. The technique attracts from the general guidelines wide know-how arrived at through a Core Committee installation through MHRD to discover the wide parameters for ranking of HEIs.

## Key Parameters of NIRF Ranking

NIRF ranks higher education institutions based on five key parameters:



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- Teaching, Learning & Resources - assessing core activities in these institutions.
- Research and Professional Practice - linking high-quality teaching to scholarly pursuits.
- Graduation Outcome - evaluating the effectiveness of learning and teaching.
- Outreach and Exclusivity (OI) - Focusing on the representation of women emphasizes outreach and exclusivity.
- Perception (PP) - Additionally, highlighting an institution's perception underscores its significance.

## BACKGROUND AND LITERATURE REVIEW

This study examines how international university rankings control and exploit university performance. It evaluates leading global ranking systems, focusing on indicators related to input, production, and outcomes. The findings reveal a predominance of exploitation indicators, signaling a bias towards outcomes over processes. This imbalance has significant management implications, potentially influencing strategic decisions and resource allocation within institutions. Addressing this disparity is crucial for fostering a more balanced and equitable approach to assessing university performance globally. (Peris-Ortiz *et al.*, 2023). This study analyzed the Annual Rate of Growth (A.R.G.) of publications, which has shown a steady increase, resulting in a significant accumulation of total publications. It examined the growth trends from 2015 to 2020. However, it also revealed that the majority of published articles were not freely accessible to users and were instead available for purchase. (Ghani, N. A *et al.*, 2022). This study explored the impact of Open Access (O.A.) on Indian students, revealing a concerning trend. It found that many students were unfamiliar with O.A. journals and deterred by high publication fees. However, there was optimism for future O.A. publishing if cost barriers were removed. Motivational factors for O.A. publishing included research grants, impact, and citations. Despite challenges, young researchers showed a positive attitude towards O.A. journals. (Ishfaq, Sheikh & Baquee, 2022). This study explored the relationship between library budgets and university rankings, revealing a strong correlation. Institutions allocating more funds to libraries tended to achieve higher national rankings. The study also highlighted spending disparities among different types of Indian higher education institutions, with universities allocating significantly more per user compared to colleges. Overall, the findings confirmed that higher library expenditure correlated with better national ranking scores. (Vinit, Balaji & Monika, 2021). This study analyzes five years of India Rankings data (2016-2020) to assess its impact on key performance indicators of Higher Education Institutions (HEIs) regarding research and professional practices. It reveals a significant increase in publications, citations, and highly-cited publications among eligible institutions, indicating proactive efforts to enhance research output. While top-ranked institutions have

seen a slight decrease in these metrics, there has been a corresponding rise among other institutions, suggesting increased research activity across the board. Additionally, there's a positive trend in research engagement, with fewer institutions having no publications. Overall, the findings suggest that India Rankings have encouraged institutions to intensify research efforts, resulting in improved research output nationwide. (Nassa *et al.*, 2021). This study delves into the top 100 universities, employing data visualization to explore the relationship between rankings and various parameters. It finds consistent scores in Teaching, Learning & Resources (TLR) across these universities. However, Research and Professional Practice (RP) scores vary significantly, influencing rankings significantly and showing a strong positive correlation ( $R^2 = 0.746$ ) with the total score. RP also correlates strongly with Peer Perception (PR). Additionally, the study notes that top 10 universities have an average annual library expenditure of 9.45 crore, with a positive correlation between library expenditure and RP. Furthermore, it suggests that increased research productivity aligns with higher publication quality, evident through citations. (Kuamar *et al.*, 2020). This study assesses the effectiveness of the 'Research and Professional Practices' aspect in NIRF rankings by analyzing the research output of scientists from five Central Universities in India over the past three years. It finds that relying solely on international databases like Web of Science and SCOPUS may not accurately represent an institute's research performance, as these databases primarily cover Sciences and Applied Sciences, neglecting fields in Social Sciences, Arts, and Humanities. Additionally, international collaboration is limited among the studied institutes, and research output tends to appear in journals with moderate impact factors. Surprisingly, despite lower citation rates, Jawaharlal Nehru University (JNU) maintains a top rank in NIRF rankings, indicating that citations may not heavily influence rankings. The study emphasizes the importance of quality structures in universities to enhance research work and suggests that certain universities, especially those specializing in wisdom and applied wisdom fields, demonstrate significant research output. (Mukherjee, 2019). The study finds that the parameters used in NIRF to assess Indian institutions closely resemble those of other top global university ranking agencies. Scholarly output, a key parameter, is crucial in both NIRF and global rankings, with Indian universities showing high research productivity and achieving top NIRF rankings. Moreover, these universities feature prominently in global rankings as well. Particularly, South Indian universities excel in NIRF rankings, highlighting a strong link between scholarly productivity and institutional ranking. Additionally, the study reveals that the factors influencing NIRF rankings align with those observed in global systems such as the 'Times World University Ranking' and QS Ranking. (Mathew & Cherukodan, 2018). This paper offers a comprehensive overview of university ranking systems, identifying 24 systems and evaluating 13 of them. Notably, six focus solely on research

performance. It reveals that 76% of rankings are based on research indicators, while only 24% consider academic or teaching quality. Seven systems include reputation surveys and faculty/alumni awards in their criteria. Rankings heavily influence academic choices, with research performance carrying the most weight. However, there's a lack of universally accepted indicators for assessing academic quality across these systems. Overall, the paper provides valuable insights into the dominance of research measures and the need for standardized indicators in ranking academia. (Vernon *et al.*, 2018). The proposed two-stage hybrid deep learning-based collaborative filtering method explores user interests, facilitates communication between items and users, and offers personalized recommendations. A multilayer neural network is employed to handle nonlinearities in user-item interactions. Experimental results demonstrate that HBSADE outperforms existing methodologies across Amazon-b and Book-Crossing datasets. Furthermore, exploration trends within thirteen central universities established in 2009 were investigated. The study revealed a consistent increase in publications over nine years, with a focus on science, engineering, and social sciences. Collaboration in exploration extended beyond Indian institutes to foreign countries, highlighting the global reach of research collaborations (Vijayakumar *et al.*, 2018). This study assesses the websites of 9 out of 11 Iconic Public Libraries in India using various metrics such as webpage count, domain authority, and link analysis. The National Library of India emerges as the top performer across multiple categories, including Page Authority and Total Linking Root Domains. It achieves an overall Web Impact Factor of 92.90, leading in both SWIF and EWIF. The Nehru Memorial Museum and Library secured the second position with a significant SWIF and IWIF score among the selected libraries. (Verma & Brahma, 2017). This paper analyzes three major international university rankings, comparing their methodologies, criteria, and impact on stakeholders. It highlights a focus on research on teaching and learning environments. Rankings like QS and THE offer insights for universities to improve practices and enhance their positions globally. While they consider diverse indicators, they are heavily influenced by global surveys of faculty opinions on research strengths. Understanding these rankings' methodologies is vital for universities to stay competitive and enhance their practices. (Pavel, 2015). Examined the landscape of higher education, influential research, and university rankings in India. Findings revealed India's 9<sup>th</sup> position for notable documents across all subject categories, with the United States leading at 1<sup>st</sup> and China at 2<sup>nd</sup>. The study pinpointed three key factors shaping high-impact research: individual contributions, university characteristics, and country-specific dynamics (Reddy, 2015). This paper reviews global rankings, explores factors hindering India's visibility, and assesses government initiatives for world-class universities. It highlights challenges such as unrealistic objectives and insufficient planning. Bridging the gap between India's academic system and

envisioned universities requires significant resources and a reevaluation of strategies. (Yeravdekar & Tiwari, 2014). This study investigates linking patterns and evaluates the impact factor and content richness of national library websites across several countries. Results show that libraries in America, Australia, and Britain have higher visibility and more extensive content compared to those in India, Namibia, and South Africa. A survey reveals that out of 163 countries with national libraries, 106 have active websites. Additionally, the Web Impact Factor of selected public library websites indicates that those from the USA, Australia, and Britain offer richer content and greater prominence compared to those from India, Namibia, and South Africa. (Walia & Gupta, 2012). University rankings have emerged as a widely recognized metric globally, significantly influencing institutional reputation. This study represents the first comprehensive examination of rankings from a global standpoint, providing valuable insights into the ranking phenomenon. It is contended that rankings establish a societal benchmark against which all institutions are judged (Hazelkorn, 2011).

## METHODS

To conduct the study, the Indian universities have been selected for the list of NIRF ranking among the top 50 HEIs under the research category. Information related to five key parameters and each sub-parameter score is derived from the website of the National Institutional Ranking Framework (<https://www.nirfindia.org>) till September 2021. The data relating to five key parameters and sub-parameter scores under the research category for the year 2021 have been extracted for the study from the website of NIRF. The data thus extracted was exported to MS-Excel for further analysis.

## Hypothesis

NIRF scores of the Universities are do not influenced by the five key parameters for the ranking system.

## Scope and Limitation of the study

The study considered the top 20 universities among the top 50 ranks of Indian HEIs under the research category in the Indian Ranking (NIRF). The study has considered only the "Research" category. There are the top 20 universities listed in the top fifty HEIs under the research domain. Only those top 20 universities alone have been taken up for this study.

## Objective of the Study

To analyze the top 20 universities and their rank in the year 2021 NIRF system.

To assess the research performance of parameters, and score of selected NIRF-ranked institutions.

To compare the overall score of the Selected Universities under the research category.

## DATA ANALYSIS AND DISCUSSION

As per Figure 1, it is observed that among those top 20 Universities, 3 Universities located in the capital city of Delhi in the year 2021, managed to get into the top 20 ranking positions and all of these are Central Government funded Universities. Next to that, 5 Universities (2 are Government funded public Universities and 3 are privately funded universities), in the year 2021 located in the state of Tamil Nadu, whereas, 2 Universities in year 2021 located in the state of Uttar Pradesh (all of these are Government funded Universities) secured their slots in the top 20 ranking table. It is to be noted that there are 2 universities secured in the top 50 Universities in 2021 located in the state of West Bengal and 1 university from Karnataka and both of the University State Government universities in West Bengal and Karnataka. Among those top 20 Universities, 15 of them run by government and rest of the 05 run by private management in the year 2021.

### QNR parameter score

From the research (Table 1), it is observed that among the top 20 ranked universities, only five universities secured the total QNR parameter score of 50 above out of 100 in the year 2021, whereas IISc-B secured the highest score (i.e., 95.03) and got the 1<sup>st</sup> rank in this category. So, it could be said that out of top 20 universities only five universities performances are good in this parameter.

### QLR parameter score

As per results (Table 1), come out from the research work, only four universities (i.e., IISc-B, University of Delhi, VIT, and ICT-M) secured the QLR parameter total score of 50 above out of 100, whereas IISc-B secured the highest total score (i.e., 96) and got

the 1<sup>st</sup> rank in this category. It can be said that the performances of most of the universities are not well in this parameter except the Indian Institute of Science, Bengaluru. So, Universities should take more initiatives to improve the research.

### SFC parameter score

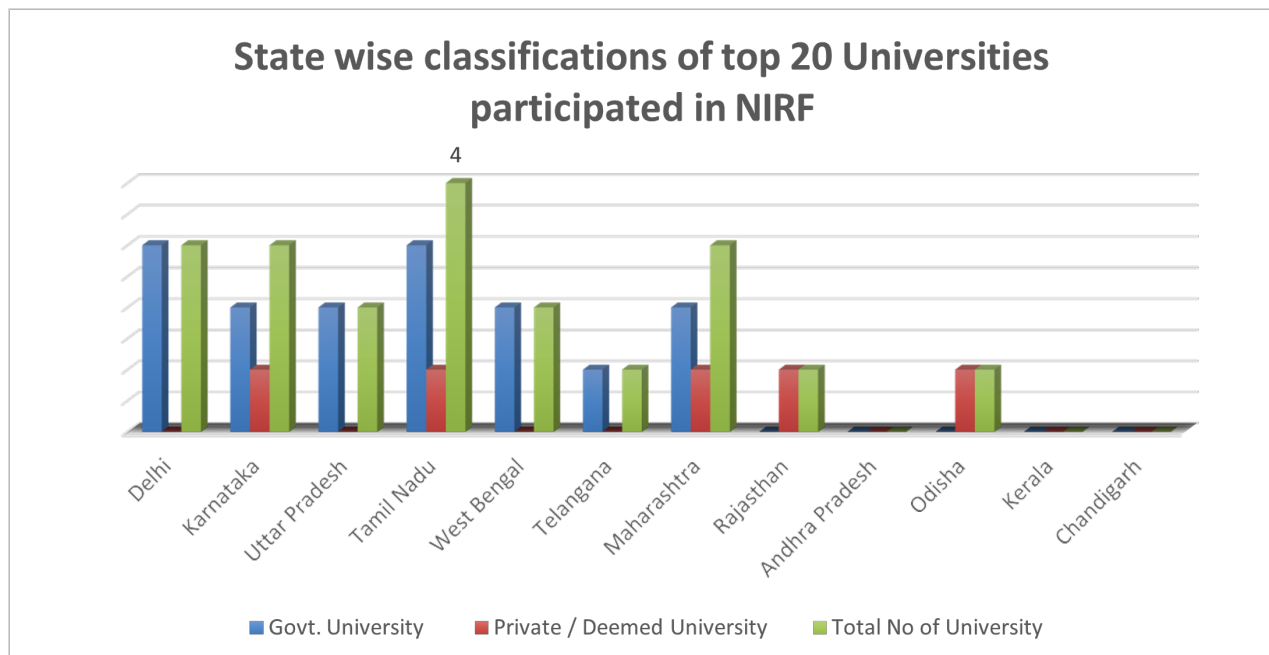
From the research (Table 1), it is observed that among the top 20 universities, 14<sup>th</sup> rank holder BHU secured the highest score (i.e., 89.76) in this parameter, whereas 1<sup>st</sup> rank holder IISc –B secured the total parameter score of 73.69. This means that the performances of most of the universities are not well in the GPHD sub-parameter except the Indian Institute of Science, Bengaluru. So, Universities should take more initiatives to enhance the numbers of Ph.D. awarded Students.

### OI parameter score

From the research work (Table 1), it is observed that only two universities (i.e., JNU and JMI) secured the total OI parameter score of 70 above out of 100, whereas JU and JMI got the rank 17<sup>th</sup> and 30<sup>th</sup> respectively in the research category. So, it could be said that performance of this parameter is better than others.

### Peer Perception (PR) parameter score

From the research work (Table 1), among the top 20 ranked universities under the research category, 1<sup>st</sup> rank holder university (i.e., Indian Institute of Science, Bengaluru) secured the score of 86.67, whereas "Anna University" secured the score of 80.30 with 32<sup>nd</sup> rank in the year 2021. However, under this parameter, most of the universities secured a score of below 50 in this category. This is to note that IISc-B has very good peer perceptions and secured the first rank.



**Figure 1:** State-wise classifications of the top 20 Universities that participated in NIRF 2021.

**Table 1: Performance of five key parameters in NIRF.**

Top 20 Universities under research category in NIRF 2021	Rank in NIRF	Overall Score	Performance of five key parameters in NIRF 2021				
			QNR	QLR	SFC	OI	PR
Indian Institute of Science, Bengaluru	1	86.48	95.03	96	73.69	57.58	86.67
University of Delhi, Delhi	11	56.96	48	57.27	69.47	59.13	55.83
Vellore Institute of Technology, Vellore	12	55.58	49.85	57.65	62.04	59.05	49.80
Homi Bhabha National Institute, Mumbai	13	55.24	78.69	29.32	68.62	58.25	40.86
Banaras Hindu University, Varanasi	14	54.96	42.61	49.06	89.76	52.9	42.22
Jadavpur University, Kolkata	17	54.02	52.24	44.03	71.39	50.14	58.45
Jawaharlal Nehru University, New Delhi	18	53.52	46.73	38.47	84.6	72.74	37.69
Institute of Chemical Technology, Mumbai	21	51.22	50.52	53.58	54.67	45.82	44.82
Bharathiar University, Coimbatore	23	50.88	54.83	38.19	65.77	53.14	45.07
Aligarh Muslim University, Aligarh	24	49.81	36.61	40.43	84.02	56.77	42.22
University of Hyderabad, Hyderabad	25	49.25	46.29	34.95	75.67	58.2	39.45
Manipal Academy of Higher Education, Manipal	27	48.73	41.77	36.53	73.8	64.77	40.02
Panjab University	28	48.71	36.49	48.18	64.17	53.04	51.77
Amrita Vishwa Vidyapeetham, Coimbatore	29	48.29	44.15	38.58	65.47	64.92	38.87
Jamia Millia Islamia, New Delhi	30	48.28	48.41	35.92	75.01	71.97	31.93
Anna University, Chennai	32	47.87	42.19	34.4	58.54	51.46	80.30
Calcutta University, Kolkata	33	47.74	38.4	35.48	51.52	60.89	31.93
Birla Institute of Technology & Science, Pilani	36	44.76	38.52	34.46	62.05	58.79	45.82
Savitribai Phule Pune University, Pune	37	44.51	46.64	33.29	68.38	51.23	17.28
Shanmugha Arts Science Technology & Research Academy, Tamil Nadu	50	38.53	36.98	29.11	59.77	57.4	14.24

So, it could be said that universities have a good peer perception which helps to achieve a good NIRF rank.

### Overall Score

From the research work (Table 1), among the top 20 ranked universities under the research category, 1<sup>st</sup> rank holder university (i.e., Indian Institute of Science, Bengaluru) secured the overall score of 86.48, whereas other (i.e., 19) Universities secured a score of below 60 in the year 2021. However, under this parameter, most of the university's performances are not well compared to other HEIs in this category. It is found that consecutively three years Indian Institute of Science secured the first rank in the National Institutional Ranking Framework (NIRF) under the research category and the overall score is 86.48 (2021). University of Delhi, Vellore Institute of Technology secured 11<sup>th</sup> and 12<sup>th</sup> rank in NIRF. It is also noted that all the 20 universities have been constantly improving and they have improved their overall score in each year.

### Testing of Hypothesis

NIRF scores of the Universities are do not influenced by the five key parameters for the ranking system.

### Regression Equation of the five key parameters for the year 2021

We test the relationship and impact between NIRF Score and five key parameters by estimating the following regression equation:

$$\text{NIRF Score } i = \alpha_i + \beta_1 \text{QNR}_i + \beta_2 \text{QLR}_i + \beta_3 \text{OI}_i + \beta_4 \text{SFC}_i + \beta_5 \text{PR}_i + e_i$$

Where,  $\alpha_i$  is constant and  $\beta_1, \beta_2, \beta_3, \beta_4$  &  $\beta_5$  are the coefficients of respective independent variables QNR, QLR, OI, SFC and PR.  $e_i$  represents error.

The variables in the regression model are defined as follows:

NIRF Score is the total score of a University in the NIRF ranking.

QNR is the metric for the quantitative research score of a university.

QLR is the metric for the qualitative research score of a university.

OI is the outreach and inclusivity score of a university.

SFC is the metric for students and faculty contribution score of a university.

**Table 2: Output of Regression Analysis of the five key parameters in the year 2021.**

Five key parameters	NIRF 2021	
	Coefficients	P-value
Intercept	4.40	0.26
QNR	0.27	0.00
QLR	0.32	0.00
SFC	0.14	0.00
OI	0.11	0.06
PR	0.09	0.01
	Adj. R <sup>2</sup> = 0.97	

PR is the peer perception score of a university.

### Output of Regression Analysis of the five key parameters

Dependent Variable: NIRF Score

Independent Variable: NIRF five key parameters i.e., QNR, QLR, SFC, OI, PR

For the year 2021, Table 2, shows the result of simple regression analysis to test the impact and relationship between NIRF scores and broad NIRF parameters. The model has a good fit, with Adjusted R<sup>2</sup> as 0.97, which indicates that 97% of the variance of the NIRF Score is explained by the independent variables. Further, the F value is significant, indicating that the independent variables jointly impact the dependent variable. While considering the coefficients of independent variables, it is observed that the p-values corresponding to them are 0.00, 0.00, 0.00, 0.06, and 0.01. They indicate that Metric for Quantitative Research (QNR) score, Metric for Qualitative Research (QLR), Metric for Students and Faculty Contribution (SFC), Graduation Outcomes (GO), and Peer Perception (PR) score significantly impact the NIRF Scores positively, although we notice a very little impact of Outreach & Inclusivity (OI) in determining the NIRF scores.

Although the overall model for the year 2021 proves to be significant with a quite high R<sup>2</sup> the same data shows that the coefficient value of Outreach and Inclusivity (OI) score is 0.11, which accounts for a very little contribution to our regression model in explaining the NIRF scores. In addition, this parameter OI does not come out to be statistically significant either, with P- value 0.06 which is much larger than the underlying level of significance 0.05. Overall, we also see that the hypothesis is rejected for the sample collected in the year 2021 with 5% level of significance.

### Role of the library in influencing the ranking process

The correlation between scholarly output and institutional ranking holds significant implications for the field of library and information science. While libraries traditionally support

scholars in accessing information, they now play a more direct role in influencing scholarly output through various programs and initiatives. These include selecting and acquiring databases from reputed publishers and highly researched resources, participating in consortiums to expand resources, offering document delivery services, and organizing author workshops in collaboration with publishers and experts in the field.

Moreover, libraries now a day's provide training on academic writing, reference format and tools, familiarize scholars with the institutional ranking process, and introduce them to online research tools such as Scopus, Web of Science, Google Scholar, Google Books, and metrics like the h- index, citation patterns, and plagiarism detection software, tools and how to avoid plagiarism.

By actively engaging in these activities, libraries not only support scholarly productivity but also contribute to their parent institutions' success in national and global rankings. Through focused programs and strategic partnerships, libraries can enhance the research capabilities and visibility of their institutions, ultimately bolstering their standing in the academic community.

### CONCLUSION

The ranking of educational institutions is the most important in any country. The Indian government both Central and State in India should initiate the ranking process regularly. It should be mandatory for all educational institutions to participate in the programme. It will help the institutions to bring out their activities to the world through a systematic ranking process. The student community will also know the reputation, and specialization of the institutions, departments, and also faculty members. One way of measuring any educational institution is by its publications in peer-reviewed national and international journals. This study has also considered the measures the performance of parameters and sub-parameters of the University. Based on the results of the study, the following are recommended:

The National Institute of Ranking Frame (NIRF) has adopted a good number of parameters to rank the educational institutions in the country.

Similarly, the authorities of the institutes should give equal publishing opportunities for teaching and non-teaching staff members and also encourage them to produce more publications in reputed national and international journals.

This article analyses data on the year 2021 of India Rankings to assess its impact on performance parameters of institutions of higher education in terms of publications, citations, patents, highly- cited publications, and research funding under the broad category of the five parameters and their sub-parameters. The analysis of data on the year 2021 of India Rankings, on colorful performance parameters of the Universities provides an intriguing sapience and reveals that sharing institutions are having

emphatic trouble ameliorating their performance on colorful parameters or sub- parameters linked by the NIRF for ranking of universities. Moreover, it is a well-accepted fact that an increase in high-quality publications by a university would invariably result in an improvement of its ranking. This study reflects that ranking has influenced the performance of universities positively.

## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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