Quality Research Publications and Its Impact on National Institutional Ranking Metrics

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Abstract: National Institutional Ranking Framework (NIRF) has been developed by Ministry of Human Resource and Development (MHRD), Govt. of India. The NIRF was drafted in 2015 to provide an Indian context to educational aspiration and needs for two categories of institutions viz category 'A' mainly research and category 'B' mainly teaching. The NIRF provides for ranking of institutions under five broad generic parameters namely: *i*) Teaching, Learning and Resources *ii*) Research, Professional Practice and Collaborative Performance *iii*) Graduation Outcomes *iv*) Outreach and Inclusivity and *v*) Perception. The National Ranking metrics is a quantitative indication of the degree to which an institution has practiced the generic five parameters. The importance of quality publications is highlighted in Research Publications metrics. In Outcome Based Education, every faculty member in the institution is required to contribute towards Quality Research Publications. The quality of publications is in relation to publication indexed in Scopus, Web of Sciences and Google Scholar in that order. Publications indexed in Scopus, Web of Sciences and Google Scholar can be assigned quality level of high, medium and low due to their weightages of 0.6, 0.3 and 0.1 respectively. These weightages have been specified in the NIRF – 2015 document. We have developed four case studies to demonstrate the effect of Quality Research Publications in producing high score in Research Publications Metrics. The high score obtained by an institution in Research Publications Metrics has a direct impact on its overall score in National Institutional Ranking Metrics. Four case studies can also be used by institutions to fix the target for publications both in terms of number of publications and quality of publications by each category of faculty viz. Professor, Asso. Professor, Asst. Professor.

Keywords: Research Publications Metrics, National Institute Ranking Framework (NIRF), Research Professional Practice and Collaborative Performance (RPC) parameter, Quality Research Publications.

1. INTRODUCTION

The NIRF is a moderated version of Quality System (QS) and is self-reporting [1]. The NIRF was launched in September 2015 and institutions were asked to submit online applications by December 2015 for the First National Ranking [2]. A total of 1438 Engineering Institutions submitted the online applications for Ranking. The Ranking list called India Ranking 2016 was published in April 2016 showing the top 100 Engineering Institutions in India [3].

NIRF provides the ranking of institutions under five broad generic parameters viz. 1) Teaching Learning Resources (TLR), 2) Research Professional Practice and Collaborative Performance (RPC), 3) Graduation Outcomes (GO), 4) Outreach and Inclusivity (OI) and 5) Perception [1]. TLR parameter is related to faculty student ratio, faculty qualification and experience, library and laboratory facilities etc. RPC parameter forms the ultimate test of the effectiveness of research activities which is assessed by publications, citation, and IPR metrics. GO parameter is about student outcomes, assessed based on Results, Placements, higher education and salary packages of placed students. OI lays special emphasis on representation of Women and Socially Challenged Persons in student and/or faculty populations, and also on outreach activities of the institution. Perception gives a significant importance to the awareness of the institution by its Stakeholders which is accomplished through stakeholder survey.

Research Publications form an important component of Research, Professional practice and Collaborative Performance (RPC) parameter. Research Publications Metrics contribute 30 marks to the RPC parameter. The NIRF will be referring the data bases of Scopus [4], Thomson Reuters (Web of Science) [5], Google Scholar and Indian Citation Index [6] for the calculation of Research Publications metrics [1].

This paper discusses the impact of Quality Research Publications on National Institutional Ranking Metrics. This paper also proposes a method to derive the target for Research Publications constituting two parameters viz. number of publications and quality of publications per faculty per year.

2. NATIONAL INSTITUTIONAL RANKING

The National Institutional Ranking was based on the information and data provided by the institutions. The scores obtained by the institutions in the five parameters viz TLR, RPC, GO, OI and Perception each carrying 100 marks, was averaged taking into account their respective weightage and assigned Ranking for the top hundred institutions. A sample of ten institutions taken from the list of hundred institutions [3] is shown in Table 1.

Table 1
Experiment Result

S. No	*Name of the Institutions*	*Overall Rank*
1.	IIT Madras	1
2.	VIT Vellore	13
3.	PSG College of Technology, Coimbatore	24
4.	RV College, Bangalore	35
5.	Koneru Lakhmaiah Education Foundation, Guntur	59
6.	Nirma Institute of technology, Ahmedabad	48
7.	CBIT, Hyderabad	71
8.	BVRIT, Bhimavaram	73
9.	Vignan Foundation, Guntur	88
10.	University Institute of Chemical Technology, Chandigarh	100

3. METHOD AND IMPLEMENTATION

The method explained in the National Institutional Ranking Framework has been followed to compute the value of Research Publication Metrics [1].

3.1. Research Publications Metrics

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The Research Publications (PU) metrics carries 30 marks. The PU metrics is calculated as shown below:

$$PU = 30 \times P/F$$
$$P = 0.6PS + 0.3WS + 0.1GS \tag{1}$$

Where,

$$PS = \text{No. of papers indexed in Scopus}$$
$$WS = \text{No. of Papers Indexed in Web of Sciences}$$
$$GS = \text{No. of Papers Indexed in Google Scholar}$$
$$F = \text{No. of faculty in the institution}$$

3.2. Calculation of Research publications (PU) metrics

The calculation of research publication metrics is explained below with the help of an example:

1. Number of faculty in the institution = F

2. Number of Professors = F1

3. Number of Assoc. Professors = F2

4. Number of Asst. Professors = F3

Let $n11$, $n12$ and $n13$ be the number of publications by each Professor, Assoc. Professor and Asst. Professor respectively indexed in Scopus. Total number of publications indexed in Scopus (PS) can be computed as follows:

$$PS = F1 \times n11 + F2 \times n12 + F3 \times n13 \tag{2}$$

Let $n21$, $n22$ and $n23$ be the number of publications by each Professor, Assoc. Professor and Asst. Professor respectively indexed in Web of Sciences. Total number of publications indexed in Web of Sciences (WS) can be computed as follows:

$$WS = F1 \times n21 + F2 \times n22 + F3 \times n23 \tag{3}$$

Let $n31$, $n32$ and $n33$ be the number of publications by each Professor, Assoc. Professor and Asst. Professor respectively indexed in Google Scholar. Total number of publications indexed in Google Scholar (GS) can be computed as follows:

$$GS = F1 \times n31 + F2 \times n32 + F3 \times n33 \tag{4}$$

Once PS, WS, and GS have been computed, the next step is to calculate the values of P.

$$P = PS \times 0.6 + WS \times 0.3 + GS \times 0.1 \tag{5}$$

Finally, we can compute the Research Publication Metrics as shown in equation 6.

$$\text{Research Publications Metrics} = P \times 30/F \tag{6}$$

To explain the calculation of Research Publications Metrics, four case studies have been developed and tabulated based on number of research publications indexed in Scopus, Web of Science and Google Scholar by each category of faculty viz Professors, Assoc. Professors and Asst. Professors. Further, we have taken an example of an institution which has 279 number of faculty to elaborate the four case studies. Assuming the cadre ratio of 1:2:6, number of Professors, Associate Professors and Assistant Professors are 31, 62 and 186 respectively.

3.3. Case Study 1- one publication per faculty per year

Table 2 shows one publication by each category of faculty and demonstrates the method to calculate the research publication metrics. It is observed that if each category of faculty has one publication per year, then the score in Research Publications metrics will be 6.0 marks out of a maximum of 30.

Table 2
One publication per faculty per year

Categories	No. of Faculty members	No. of paper published per faculty per year indexed in		
		Scopus	Web of Sciences	Google Scholar
Professor	31	1	–	-
Assoc Professor	62	–	1	-
Asst Professor	186	–	–	1
Total	279	$31 \times 1 = 31$	$62 \times 1 = 62$	$186 \times 1 = 186$
Calculation of Research Publication Metrics	$(31 \times 0.6 + 62 \times 0.3 + 186 \times 0.1) \times 30/\ 279 = 6.0$			

3.4. Case Study 2- Two publications per faculty per year

Table 3 shows 2 publications by each category of faculty and demonstrates the method to calculate the Research Publication metrics. It is observed that if each category of faculty has two publications per year, then the score in Research Publications metrics will be 12 marks out of a maximum of 30.

Table 3
Two publications per faculty per year

Categories	No. of Faculty members	No. of paper published per faculty per year indexed in		
		Scopus	Web of Science	Google Scholar
Professor	31	2	–	–
Assoc Professor	62	–	2	–
Asst Professor	186	–	–	2
Total	279	31x2 = 62	62x2 = 124	186x2 = 372
Calculation of Research Publication Metrics	(62x0.6 + 124x0.3 + 186x0.1) x 30/ 279 = 12			

3.5. Case Study 3-Three publications per faculty per year

Table 4 shows three publications by each category of faculty and demonstrates the method to calculate the Research Publication metrics. It is observed that if each category of faculty has three publications per year, then the score in Research Publications metrics will be 15 marks out of a maximum of 30.

Table 4
Three publications per faculty per year

Categories	No. of Faculty members	No. of paper published per faculty per year indexed in		
		Scopus	Web of Sciences	Google Scholar
Professor	31	2	–	1
Assoc Professor	62	–	2	1
Asst Professor	186	–	–	3
Total	279	31x2 = 62	62x2 = 124	31x1 + 62x1 + 186x3 = 651
Calculation of Research Publication Metrics		$(62 \times 0.6 + 124 \times 0.3 + 651 \times 0.1)$ x 30/ 279 = 15		

3.6. Case Study 4-Four publications per faculty per year

Table 5 shows four publications by each category of faculty and demonstrates the method to calculate the Research Publication metrics. It is observed that if each category of faculty has four publications per year, then the score in Research Publications metrics will be 30 marks out of a maximum of 30.

Table 5
Four publications per faculty per year

Categories	No. of Faculty members	No. of paper published per faculty per year indexed in		
		Scopus	Web of Sciences	Google Scholar
Professor	31	2	2	-
Assoc Professor	62	1	2	1
Asst Professor	186	-	2	2
Total	279	31x2 + 62x1 = 124	31x2 + 62x2 +186x2 = 558	62x1 + 186x2 = 434
Calculation of Research Publication Metrics		$(124 \times 0.6 + 558 \times 0.3 + 434 \times 0.1)$ x 30/ 279 = 30		

The case studies 1 to 4 have demonstrated scores ranging from 6 to 30 (maximum). This is summarized in Table 6.

Table 6
Target for Research Publications

Case study No.	Score	No. of publications per faculty per year	Professor publications indexed in			Assoc. Professor publications indexed in			Asst. Professor publications indexed in		
			Scopus	WoS	GS	Scopus	WoS	GS	Scopus	WoS	GS
1.	6	1	1	0	0	0	1	0	0	0	1
2.	12	2	2	0	0	0	2	0	0	0	2
3.	15	3	2	0	1	0	2	1	0	0	3
4.	30	4	2	2	0	1	2	1	0	2	2

The four case studies can be used for fixing the target for Research Publications by each faculty based on the scores expected by the institution. For example, if the expected score is 6.0, then each faculty should be given the target to publish one paper per year. Further the publications by the Professors, Assoc. Professors and Asst. Professors are required to be indexed in Scopus, Web of Sciences and Google Scholar respectively. The example is highlighted in the above table.

4. RESULTS AND DISCUSSION

The results of four case studies have shown that the score in Research publications metrics depends on two parameters namely *i*) number of publications per faculty per year and *ii*) quality of publications. The results of the four case studies are plotted in the form of a graph for better visualization and understanding. The graph is shown in Fig. 1.
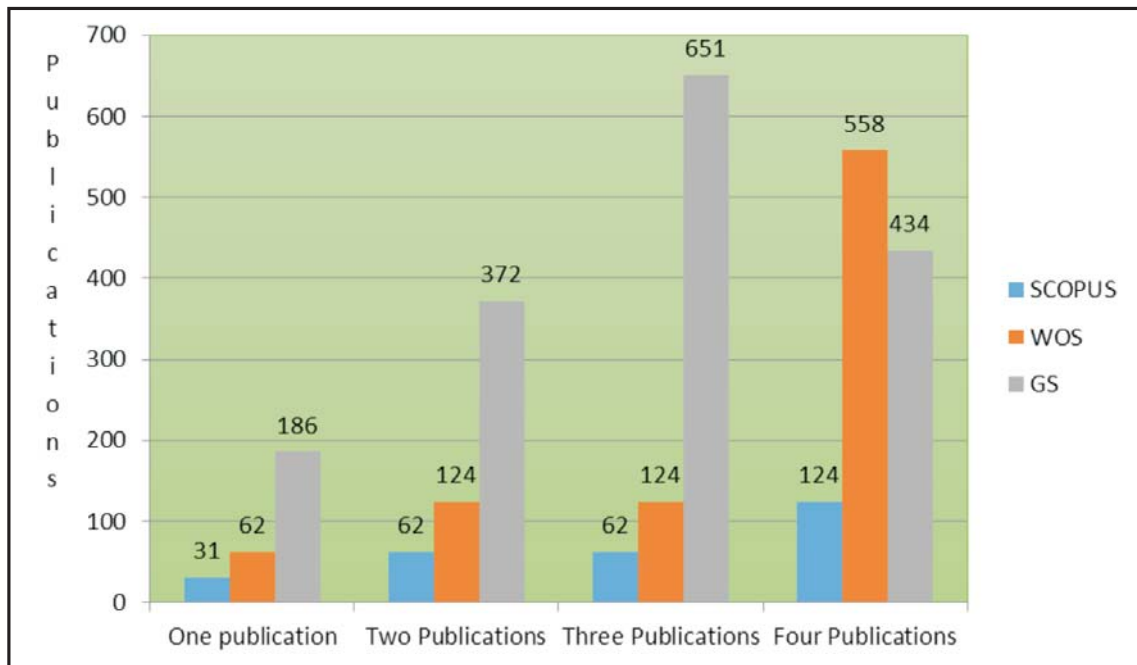

Figure 1: Number of publications per faculty per year

We have found that case study 4 has given us the maximum score of 30.0 out of 30.0 in the Research Publications Metrics. Based on the results of the case study 4, we are proposing two requirements to be fulfilled to score maximum marks in the Research Publications Metrics.

The requirement 1 pertains to the number of publications per faculty per year. This requirement stipulates that every faculty need to publish a total of four papers per year or two papers per semester in case the semester system is followed. The less number of publications will have a diminishing effect on the score in the Research Publications Metrics. This is evident from the case studies 1, 2 & 3, where the score obtained are 6, 12 & 15 respectively.

The Requirement 2 is related to the quality of publications, which is the theme of this paper. The quality of publications is in relation to publications indexed in Scopus, Web of Sciences and Google Scholar due to their weightages of 0.6, 0.3 and .1 respectively as specified in the NIRF-2015 document. As such we can define three levels of quality viz. high, medium and low quality for publications indexed in Scopus, Web of Sciences and Google Scholar respectively.

We are proposing that Professors must have publications of high quality. Assoc. Professors need to maintain publications of medium quality. The Asst. Professors are allowed to have publications of low quality. The movement from low level to higher level of quality is desirable.

In practice, it may not be possible to produce all publications of prescribed quality due to a number of constraints. The case study has taken in to account these constraints. Based on the analysis of the case study 4, we are proposing % age of publications indexed in Scopus, Web of Sciences and Google Scholar for each category of faculty. The proposal is shown in Table 7.

Table 7
Quality of publication (% age)

Category	Indexed in Scopus	Indexed in web of sciences	Indexed in Google scholar	Remarks
Professor	50%	50%	–	Out of prescribed four publications per year, two publications each indexed in Scopus and Web of Sciences
Assoc. Professor	25%	50%	25%	Out of four publications, two publications indexed in Web of Sciences and one each indexed in Scopus and Google Scholar.
Asst Professor	–	50%	50%	Out of four publications, two publications each indexed in Web of Sciences and Google Scholar.

⟵———— Indicates movement from lower level of quality to neat higher level of quality. The four case studies developed by us have established the fact that higher the quality of publications better is the score in Research Publications Metrics. The better score in Research Publications Metrics has an impact on National Institutional Raking Metrics.

5. CONCLUSION

The importance of Quality Research Publications is highlighted in this paper. The publications indexed in Scopus are given top priority, next priority be assigned to papers indexed in web of Sciences and the last priority be allotted to papers indexed in Google Scholar. Four case studies presented in this paper will help the institutions to understand the importance of quality Research Publications in the context of ranking of engineering institutions in India. These case studies can also be used as reference model for fixing the target in terms of number of publications per year and quality of publications for each category of faculty. We are proposing a minimum percentage of quality publications for each category of faculty as follows: i) Professor publications %age (50% in Scopus and 50% in Web of Sciences), ii) Assoc. Professor publications %age (25% in Scopus, 50% in Web of Sciences and 25% in Google Scholar) and iii) Asst. Professors publications % age (50% in Web of Science and 50% in Google Scholar). The improvement from the proposed minimum percentage of quality publications to the next higher level of quality is preferred to achieve better score in Research Publication Metrics. The result of four case studies has established the fact that it is not only the number of publications but also the quality of publications which plays a vital role in scoring better marks in Research Publication Metrics. The better score in Research Publication Metrics will finally show its impact on the overall score in the National Institute Ranking Metrics.

The present study is based on NIRF-2015 document. The work carried out by us will be reviewed in the light of NIRF-2016 document, which has been released in August-2016.

6. ACKNOWLEDGMENT

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