

Assessment of ResearchGate to Unfurl the Academic Pursuits of Physics Scholars

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ABSTRACT

The present study intends to explore the overall research performance/engagement of the faculty members on the ResearchGate from the Physics discipline working at Indian Central Universities. The analyzed data revealed that 473 faculty members were found, but only 361 (i.e., 76.32%) have their profile on ResearchGate. Further analyses include the distribution of RG metrics which indicated that 98.89% and 98.06% of the faculty members had added at least one research item and at least one full-text research item over the RG, respectively. The findings stated that Kriti Ranjan from the University of Delhi secured highest ranking across all metrics, except followers and followings. The mean value for the Reads and Citations were found to be 27525.59 (std. dev. = 163029.86) and 1555.2 (std. dev. = 5838.76), respectively. In addition, RI Score exhibits a strong positive correlation with other RG-based metrics excluding the 'following'. This study can be considered the only ResearchGate analyses that has included the working researchers of the Physics discipline by analyzing their research engagement and active presence over it.

Keywords: Academic Performance, ResearchGate, Physics, Faculty Members, Central Universities, India.

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INTRODUCTION

By the turn of the twenty-first century, an incredible technological advancement was observed, which paved the way for colossal accessibility to scholarly materials. The swiftness and lenience in information sharing have made possible due to the ever-expanding world wide web. It has revolutionized the world of Information exchange. When Social Networking Sites (SNSs) emerged, it was just viewed as a virtual way for social interaction.^[1] Over a while, SNSs have influenced academics to a great extent, and as a result, many Academic Social Networking sites (ASNS) have emerged, paving information globalization. It has overturned many traditional ways of scholarly interaction, connected billions of scholars, and encouraged academicians to develop more research areas. The remarkable usage of ASNSs gave rise to information collaboration, cross-field research, and cross-border participation, which have taken the academic world to the next level. With the rise in the volume of scholarly literature, the efficiency of the traditional citation-based metrics is lagging due to the transition of research communication to an online mode.^[2] Henceforth, these academic social platforms have

assisted the researchers in reading quality journals and motivates them to publish in an impactful journal. In this direction, ResearchGate (RG) provides different assessment measures of an author, which does seem like an "icing on the cake", which can catalyze and synchronize the scholarly process.

Thus, the creation of the RG intended to measure the impact of an individual article's dissemination pattern^[3] and measures online scholarly interactions like how often research has been blogged out, twitted, or bookmarked.^[4-6] In Indian scenario, 61% of the web of science indexed research output is available on RG, whereas in the context of physics domain, 64.5% of the total research output indexed in the web of science was found over Research Gate.^[7] The emerging online tools of scholarly communication allow the researchers to spread their scholarly wings that reflect the broad, rapid impact of scholarship in the burgeoning ecosystem.^[2] This justifies the role of various ASNSs in assessing the authors' research engagements/contributions, as it extracted their research pursuits from the social web.^[8] The analysis of research gate unveils the authors' presence over the social webs and acts as a promising way to unpack and measure their disciplinary variation. The objective of the present study is to unfurl the physicists' scholarly activities working in central universities of India through ResearchGate. This research would help identify the most active physicists on RG, their collaboration and impact, in Indian universities and provides an overview of the intellectual contributions in the physics domain.



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REVIEW OF RELATED LITERATURE

In the present section, investigators reviewed a few scholarly databases, viz., Scopus, Web of Science, Google Scholar, emerald insight, to handpick the most relevant and related research articles covering the national and international perspectives. ResearchGate (RG) is a research community based social network with over 19 million users to discover, share, discuss, and collaborate the research. Various measures on RG show the research engagement and academic progression of researchers. After receiving several critics from researchers, RG discontinued RG Score in July 2022, and then gave priority to RI Score and make it as a prominent and a holistic indicator to assess the impact of a person's research more efficiently. It is a combination of full text read, other reads, citations and recommendations.^[9] On the other hand, RI Score has two significant issues i.e., lack of transparency and redundancy.^[10]

Previous studies have been carried out to calculate the inter-correlation between RG metrics and other social media metrics at the article level,^[11,12] at the author level^[13-18] and institutional level.^[19,20] It was found from a study that average social media coverage in India is around 28.5%, whereas its coverage varies from 5% to 60% for different institutions. It was also observed that research output in some specific disciplines (such as Medical Science and Biological Science) attract more social media coverage as compared to others (Solanki *et al.*).^[21] Nikkar *et al.*^[22] found that most surgery researchers (i.e., 86.24%) have created their profile on RG. Sheeja & Susan, (2019) showed that 65 % of Indian Naval Architecture Scientists were active RG members. Asnafi *et al.*^[23] explored that over half (64.16%) of the lecturers at technical colleges were RG members. Nasibi-Sis *et al.*^[24] found that most (66%) lecturers working in the school of Allied Medical Sciences had a profile on ResearchGate. Verma & Madhusudhan^[25] explored that only 27.32% of faculty members of medical sciences from University of Delhi have their RG profiles.

In contrast, Nemati-Anarak *et al.*^[16] observed that 45% of the faculty members from the Iran University of Medical Sciences (IUMS) have RG profiles. Vinay *et al.*^[26] revealed that 61.17% of science faculty members from the various universities of Karnataka state, have their profiles as well as presence on RG. Ali and Richardson (2017) found that 75.73% of Pakistani library science scholars were active on RG, and found a positive correlation between research items, citations, and read for researchers, who uploaded at least one research item. Another qualitative study by Ali *et al.*^[27] explored the role of ASNSs amongst LIS professionals, which again reveals that RG is the most favourable ASNSs amongst others. Similarly, Banshal *et al.*^[28] concluded that ResearchGate and Mendeley was found to be most popular ASNS in the India scenario.

Hence, the preceding discussion has explored a few ResearchGate analysis in connection with evaluating on the author level,

article-level, and institutional level to know the research activity of researchers on the social web and to explore the inter-correlation and intra-correlation between different metrics. In the same way, Shrivastava and Mahajan (2017)^[29] conducted a study on physics researchers at the University of Delhi. They found that 28.32 % of physicists with RG profiles did not upload a single Research Item and revealed the correlation of RG metrics, which connotes that RG Score has the highest correlation with publications and other metrics. To the author's knowledge, the present study is exceptional in revealing the research performance and academic engagement of physics faculty members working in all the central universities of India through ResearchGate, which can be considered as the research gap for conducting the present study. With this intent in mind, researchers posed the following objectives to accomplish the study's primary purpose. It further examined the correlation between the RG metrics to explore how effectively these metrics influence each other.

RESEARCH OBJECTIVES

To identify the RG profile of the Indian physicists, and their research engagement/contribution reflected through the ResearchGate.

To ascertain the top-ranked faculty Members from the Indian Central Universities, based on several ResearchGate measures.

To examine the distribution of Indian physics researchers on RG according to research items, full-text, RI Score, Reads of Research Items, Citations, h-index, followers, and followings.

To establish the correlation coefficient among different ResearchGate Measures.

LIMITATION OF THE PRESENT STUDY

The present study is limited to one of the academic social networking platforms i.e., ResearchGate, and took those prominent metrics which reflects altmetric and bibliometric aspects. It has focused only those physics faculty members who are working in all the Central Universities of India, having the designations of Professor, Associate Professor, and Assistant Professor. Further, this study has included only those universities which have a full-fledged department of Physics and also who have their scholarly profiles/ accounts over ResearchGate.

METHODOLOGY

In the present section, the list of central universities was extracted from the website of the University Grants Commission (as of 31.03.2022), in which 54 central universities were retrieved. After that, investigators set a few criteria for the study's limitations. These criteria were: only those central universities were identified and selected with a full-fledged Department of Physics across India; at least one faculty member working there should have

their profile over RG; only three designations were targeted, i.e., Professor, Associate Professor, and Assistant Professor. Applying these three criteria, 37 out of 54 universities were identified. For the identification of faculty members, their name, designation, and affiliation details over RG were matched with their profiles on their university’s website. In mid-March 2022, a few prominent ResearchGate metrics were extracted manually from their RG profiles, like RI Score, Research Items, Full text, Reads, Citations, *h*-index, Following, and Followers. The data were collated on MSExcel-365 and analyzed with the help of SPSS (Version 20.0), whereas JASP (version 0.16.2.0) software was used to establish the association between different selected RG metrics by correlation coefficient.

DATA ANALYSIS AND INTERPRETATION

Assessment of Normality

Before the analysis, it is likely to assess the normality of the retrieved dataset. It is observed from previous research that there are different tests to check the assessment of normality. Still, in most studies, it is recommended to check the normality of the data by observing the values of skewness and kurtosis.^[30] “Skewness is a measure of the asymmetry, and kurtosis is a measure of ‘peakedness’ of a distribution.” For sample size greater than 300, the skewness and kurtosis values fall between normal ranges, i.e., ± 2 for skewness and ± 7 for kurtosis.^[31-33] From Table 1, it is evident that all the values of skewness and kurtosis are beyond the criteria of ± 2 and ± 7 , respectively, and it can be inferred that data is not normally distributed.

Correlation between different ResearchGate Metrics

The correlation coefficient ‘*r*’ is a statistical measure that articulates the strength of the relationship between two variables. There are two prominent types of correlation, i.e., Spearman’s Correlation Coefficient and Karl Pearson’s Correlation Coefficient. The Spearman’s Correlation Coefficient is abbreviated as ‘*Rho*’ (ρ) and calculated with the ranks of the values of each of the variables instead of their actual values and used when the data is not normally distributed.^[34] Analogous to Karl Pearson’s coefficient, a spearman coefficient also ranges from -1 to +1, showing a ‘weak’ to ‘strong’ correlation depending on the values.

From Table 2, spearman’s rank correlation coefficient (ρ) was calculated to establish the relationship between different RG metrics. It is revealed from Table 2 that the maximum correlation was found between RI Score and Citations (C), i.e., 0.978. It indicates that the RI Score has a robust positive correlation with Citations being shared over RG. It is followed by the correlation coefficient between citations and *h*-index, i.e., $\rho = .970$, whereas the minimum correlation was found between ‘Citations’ (C) and ‘Following’ (FG), i.e., $\rho = .168$. According to ResearchGate, RI score gives the highest weightage to citations which is in line

Table 1: Testing of Normality.

RG Metrics	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
RI Score	361	7.99	0.128	70.39	0.256
Research Items	361	6.91	0.128	60.17	0.256
Full-Text	361	8.31	0.128	80.58	0.256
Read	361	9.58	0.128	93.48	0.256
Citation	361	8.17	0.128	73.15	0.256
<i>h</i> -index	361	3.49	0.128	16.52	.256
Follower	361	2.62	0.128	11.21	0.256
Following	361	3.06	0.128	10.83	0.256

Note: N represents the total number of faculty members from the Physics discipline working in the Indian Central Universities

with the findings of the present study, that is, there is a highest correlation between RI Score and citations. From the above analysis, it is evident that only one metric i.e., following (FG) exhibited a weak correlation with the rest of the chosen RG metrics.

Analyses of ResearchGate Metrics

In the following section, investigators analyzed various metrics parameters by their distribution and the ranking of the faculty members reflected through them. The analyzed parameters were number of research items, reads, full-text, RI score, followers, and followings. Moreover, the ResearchGate also explains two bibliometric aspects, i.e., citations and *h*-index which were also analyzed to determine the ranking of faculty members and their distribution in terms of mean and standard deviation.

Distribution of Membership

Before initiating the detailed analyses, investigators assessed the presence of faculty members over the RG. That means, investigators initiated the study by presenting the distribution of faculty members with membership status on RG. From Figure 1, it is evident that 361 (76.32 %) out of 473 faculty members have their profile on RG. The remaining faculty members, i.e., 112 (23.68%), do not have their accounts on ResearchGate. This implies that there might be the possibility that either they are not interested in sharing their research via RG or may be active on other ASNS platforms. The rationale of this finding corroborates with the results of the study conducted by Ortega,^[35] which say that the majority of the researchers use to handle only one social profile.

Table 2: Correlation Matrix

	RI Score	RI	FT	R	C	H	FR	FG
RI Score	1.000	0.864**	0.756**	0.839**	0.978**	0.955**	0.677**	0.221**
RI		1.000	0.853**	0.773**	0.839**	0.859**	0.632**	0.202**
FT			1.000	0.698**	0.715**	0.725**	0.604**	0.262**
R				1.000	0.745**	0.743**	0.684**	0.316**
C					1.000	0.970**	0.624**	0.168**
H						1.000	0.639**	0.197**
FR							1.000	0.536**
FG								1.000

Note: RI Score = Research Interest Score; RI = Research Items; FT= Full Text; R= Reads; C= Citations; H = *h*-index; FR= Follower; FG= Following; $p < .05$ if the correlation is significant at alpha = .05 level; ** $p < .01$ if the correlation is significant at alpha = .01 level; *** $p < .001$ if the correlation is significant at alpha = .001 level.

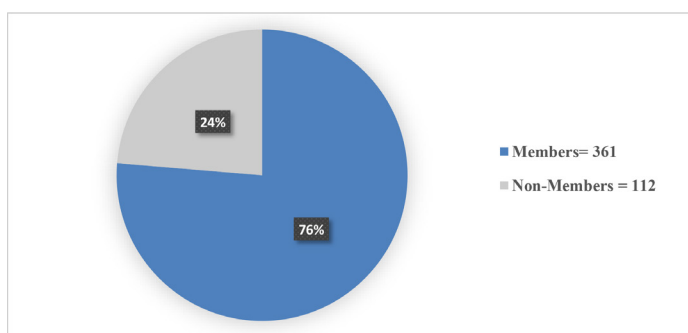


Figure 1: Distribution of Membership.

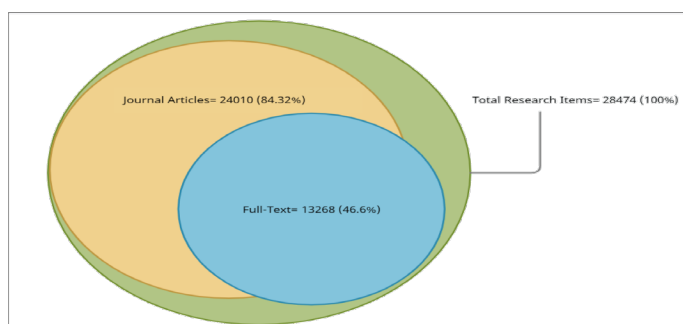


Figure 2: Distribution of Document Types

Distribution Analysis of Document types

The research items may include journal articles, books, book chapters, conference papers, preprints and so on. In Figure 2, investigators analysed the distribution of document types in the form of a Venn diagram. The Venn diagram indicates that there are 28474 total research items (indicated by green colour), out of which 84.32% of the total research items are journal articles (indicated by yellow colour). It is noteworthy to show the distribution of research items in terms of full-text uploads and non-full-text uploads by the identified faculty members who are the RG members. Figure 2 shows that a maximum number of publications, i.e., 28,474 publications (i.e., 54%), are available in non-full-text mode, while the remaining 46% of the total research items shared by faculty members are available in full-text mode (indicated by blue colour). It connotes that faculty members might not be willing to share their publications in full-text mode, or it may be due to the restrictions related to the sharing policies guided by the publishers.

Frequency Distribution of Faculty Members in terms of RG Metrics

Investigators analysed altmetric aspect and bibliometric aspect which are integrated into the ResearchGate, whose distribution can be seen in Table 3. These metrics are Research items, full-text,

RI Score, Reads, Citations, *h*-index, followers, and followings. It is necessary to analyse the research items faculty members shared on their respective RG profiles.

It was revealed from Table 3 that the number of research items shared by the faculty members ranges from zero to 1669, connoted with an average of 78.88 and 144.96 as their standard deviation. In the study²⁹ the average number of research items shared by physics researchers was 32.35, which is very low compared to the present study. This variation was revealed as they have included research scholars in addition to the faculty members. Moreover, there were 357 faculty members, i.e., (98.89%) who have added at least one research item. This finding may be corroborated with the findings of^{16,36,25} representing the sample population from medical sciences showed that there were 97.04%, 95.9%, and 92% distribution respectively, who had RG profiles and added at least one ‘research items’ each. In all, 26 (7.2%) faculty members had an outstanding performance and contributed more than 166 research items with a mean of 424.38 and a standard deviation of 381.92. Moreover, the least number of faculty members, i.e., 4 (1.11%), did not add any publications. This finding contradicts the findings of Shrivastava & Mahajan, (2017), where 28.32 % of members who had RG account did not contribute any publications.

The second RG metric analyzed the full-text research items the faculty members shared. The full-text added by faculty members

Table 3: Distribution Analyses of ResearchGate Metrics

Sl.No.	Research Items	Frequency (%)	Mean	Std. Deviation
1.	0-20	83 (22.99)	12	5.85
2.	21-40	82 (22.71)	29.48	5.57
3.	41-60	64 (17.73)	49.38	5.83
4.	61-80	37 (10.25)	69.68	6.9
5.	81-100	23 (6.37)	88.26	5.71
6.	101-120	15 (4.16)	111.47	5.01
7.	121-140	9 (2.49)	125.44	3.78
8.	141-160	15 (4.16)	153.73	5.97
9.	161-176	7 (1.94)	164.57	2.76
10.	>=177 (Outliers)*	26 (7.2)	424.38	381.92
11.	Total	361 (100)	78.88	144.96
Sl. No.	Full-Text	Frequency (%)	Mean	Std. Deviation
1.	0-10	126 (34.9)	5.4	2.99
2.	11-20	85 (23.55)	15.18	2.89
3.	21-30	47 (13.02)	24.83	3.03
4.	31-40	34 (9.42)	35.09	3.2
5.	41-50	12 (3.32)	44.67	3.47
6.	51-60	16 (4.43)	55.38	3.12
7.	61-70	11 (3.05)	65.64	3.35
8.	>=73(Outliers)*	30 (8.31)	226.43	274.21
9.	Total	361 (100)	36.75	97.87
Sl. No.	RI Score	Frequency (%)	Mean	Std. Deviation
1.	0-200	142 (39.34)	0.57	0.79
2.	200-400	78 (21.61)	213.49	6.45
3.	400-600	41 (11.36)	417.54	5.43
4.	600-800	25 (6.93)	635.27	14.45
5.	800-1000	15 (4.16)	853.09	22
6.	1000-1200	7 (1.94)	1078.43	70.87
7.	1200-1497	15 (4.16)	1277.86	37.83
8.	>=1498 (Outliers)*	38 (10.53)	1546.29	47.51
9.	Total	361 (100)	948.08	3199.04
Sl. No.	Reads	Frequency (%)	Mean	Std. Deviation
1.	0-4000	162 (44.88)	59.7	78.44
2.	4000-8000	79 (21.88)	4330	201.77
3.	8000-12000	34 (9.42)	8371.6	225
4.	12000-16000	22 (6.09)	1279	451.89
5.	16000-20000	17 (4.71)	17479.7	573.67
6.	20000-24400	10 (2.77)	21922.2	756.27
8.	>=24401 (Outliers)*	37 (10.25)	27690.8	2692.14
9.	Total	361 (100)	27525.6	163029.86

continued...

Table 3: Cont'd

Sl. No.	Citations	Frequency (%)	Mean	Std. Deviation
1.	0-400	185 (51.25)	0.33	0.52
2.	400-800	64 (17.73)	412.5	10.39
3.	800-1200	39 (10.8)	813.83	12.25
4.	1200-1600	14 (3.88)	1239.83	23.62
5.	1600-2000	14 (3.88)	1729.33	47.95
6.	2000-2293	6 (1.66)	2216.67	75.48
7.	>=2294 (Outliers)*	39 (10.8)	2357.5	68.59
8.	Total	361 (100)	1555.2	5838.76
Sl. No.	h-index	Frequency (%)	Mean	Std. deviation
2	0-10	186 (51.52)	6.2	2.65
3	11-20	114 (31.58)	14.8	2.52
4	21-29	39 (10.8)	24.28	2.64
5	>=30 (outliers)*	22 (6.09)	53.5	23.55
6	Total	361 (100)	13.75	13.31
Sl. No.	Followers	Frequency (%)	Mean	Std. Deviation
1.	1-50	140 (38.78)	28.01	13.91
2.	51-100	89 (24.65)	71.48	14.9
3.	101-150	48 (13.3)	125.21	14.13
4.	151-200	30 (8.31)	171.47	15.99
5.	201-250	19 (5.26)	220.74	14.86
6.	251-313	15 (4.16)	273.87	16.57
7.	>=314 (outliers)*	20 (5.54)	427.2	149.96
8.	Total	361 (100)	106.05	109.78
Sl. No.	Following	Frequency (%)	Mean	Std. Deviation
1.	0-50	242 (67.04)	17.57	14.7
2.	51-100	52 (14.4)	72.9	15.12
3.	101-150	31 (8.59)	122.7	13.25
4.	151-177	3 (0.83)	160.33	12.1
5.	>=178 (outliers)*	33 (9.14)	342.9	133.34
7.	Total	361 (100)	65.5	103.61

Note: Outliers* were identified through boxplot to represent the faculty member whose performance was outstanding.

ranged from 0 to 1203, and an average full-text was found to be 36.75 with 97.87 std. deviation. There were 7 (1.94%) faculty members who did not share any full-text research items on ResearchGate. Most faculty members, i.e., 354 (98.06%), added at least one full-text research item. Only 30 (i.e., 8.31%) faculty members have outstanding contributions and added more than 70 full-text research items with a mean value (226.43) and standard deviation (274.21).

The third metric analyzed was the RI score, which is considered as a convenient way to help you track the impact of your research within the scientific community.^[37] The analysis reveals that the total faculty members showed RI scores ranging from 0 to 34359,

with the mean value of 948.08 and std. dev of 3199.04. Moreover, most of the faculty members there were 4 (1.1%) faculty members who did not possess RI score.

The fourth RG metric examined 'Reads', which suggests that faculty members were having the 'Reads' of their research items falls in the range of 0 to 1745469, and the mean value of 'Reads' was found to be 27525.6 with 163029.86 as the standard deviation. As per the distribution of faculty members, the maximum number of faculty members, i.e., 162 (44.88%) were having the 'Reads' of their research items below 4000, while the lowest number of faculty members, i.e., 10 (2.77%), were in the range of 20000 to 24400. There were four faculty members, i.e., (1.1%) who did

not receive any 'reads' for their research items, and a total of 37 faculty members (i.e., 10.25%) received more than 24400 'Reads' indicating a mean value of 27690.8 and a standard deviation of 2692.14 (as indicated by the outliers). It shows that some faculty members were having an unparalleled research reach on ResearchGate compared to their counterparts.

Investigators analyzed 'Citations' according to the distribution of faculty members on ResearchGate. A total of 361 out of 473 profiles of faculty members (i.e., 79.08%) were found on ResearchGate, whose 'citations' fell in the range of 0 to 62552, with a mean value of 1555.2 and standard deviation of 5838.76. After examining their 'citations', it was found that four faculty members (i.e., 1.11%) did not share any research items over the ResearchGate. Hence, they did not receive any citations. Out of 361 faculty members, 314 of them (i.e., 98.89%) received at least one citation. Moreover, 39 (i.e., 10.8%) faculty members got more than 2293 'citations' with a mean value of 2357.5 and a standard deviation of 68.59. Further, it was found that the highest number of the faculty members, i.e., 185 (51.25%) had received citations below 400.

The h-index of total faculty members represented a mean value of 13.75 with a standard deviation of 13.31. Moreover, it was found that 356 faculty members (i.e., 98.61%) have at least one h-index. It shows that most faculty members have shared at least one research item on RG and received at least 1 citation to their publications. Thus, a total of 22 faculty members (i.e., 6.09%) have a very high h-index (>30) as compared to their counterparts having a mean value of 53.5 and a standard deviation of 23.55, which is far from the overall value. In the age of social media, the trend of followers and following is now on the zeal, which creates an influx amongst scholars to be more active on social media networks. In this connection, RG also provides metrics regarding followers and following, similar to other social sites like Instagram, Twitter, etc.^[20]

From the analyses of Table 3, the average number of followers was found to be 106.05, which falls in the range of 2 to 886 with a standard deviation of 109.78. An average of 65.5 "followings" were found, spread from 0 to 689, with 103.61 as the standard deviation. All faculty members have at least one follower. Under the 'following', the distribution of faculty members shows that only 20 (i.e., 5.54%) did not follow any other fellow RG member. Moreover, 341 (94.46%) faculty members followed at least one RG member. The highest number of faculty members, i.e., 242 (67.04%), were "following" below 50 RG fellow members. As indicated by the outliers, 5.54% of the faculty members have "followers" of more than 313, whereas 9.14% of the faculty members followed other RG members, i.e., more than 177.

Ranking Distribution of the Faculty Members in terms of RG Metrics

In the present section, investigators explored top-five ranked faculty members who have contributed extensively with their peers through RG. Table 4 indicates that *Kriti Ranjan* and *Brajesh Choudhary* from the University of Delhi have received the first and second rank in terms of the highest number of shared research items, i.e., 1669 and 1217, respectively. Manas Maity followed this with 1166 research items, *Ashok Kumar* with 734 research items, and *Venkatesh Singh* with 627 research items. These three faculty members were associated with Visva Bharati University (VBU), University of Delhi (DU) and Central University of South Bihar (CUSB), respectively. It is essential to mention that the top two faculty members have collaborated with Fermi Laboratory, while third and fourth rank holders have collaborated with CMS collaboration. The next metric analyzed the top five outstanding faculty members who have shared their full-text research items through RG. It was found that *Kriti Ranjan* had shared the highest numbers of full-text publications, i.e., 1203 (72.08 %), followed by *Manas Maity* with 835 full-text (i.e., 71.61%), and *Brajesh Choudhary* with 815 (i.e., 66.97%) full-text research items. The fourth and fifth rank holder *Ashok Kumar* with 543 full-text, i.e., 73.98% of his total shared research items and Venkatesh Singh with 349 full-text, (i.e., 55.66%) of his total shared research items. The third analyzed metric determines the rank distribution of faculty members as per their RI Score, which indicates that '*Kriti Ranjan*' from the 'University of Delhi' had the highest RI Score, i.e., 34359 and received the first rank. Similarly, the second, third, and fourth rank goes to the credit of '*Brajesh Choudhary*' from the University of Delhi, '*Manas Maity*' from the Visva Bharati University (VBU), and *Ashok Kumar* from the University of Delhi, with an RI Score of 30539, 28275, and 19012 respectively. The fifth rank was credited to '*Mohd. Danish Azmi*' from the Aligarh Muslim University with a 13749 RI Score.

In terms of 'reads', the ranking distribution of the faculty members connotes that '*Kriti Ranjan*' from University of Delhi (DU) got the highest reads, i.e., 1745469, which is followed by '*Manas Maity*' from Visva Bharati University (VBU) with 'reads' is equals to 1691358. The third rank was given to '*Brajesh Choudhary*' from the University of Delhi with reads equals to 1644107, whereas the fourth and fifth rank was achieved by '*Ashok Kumar*' and '*Pralay Kumar Karmakar*' from the Tezpur University got 1009766 and 234076 'reads' respectively.

The next analyzed metric was the 'citations' with respect to the distribution of the top five faculty members over RG. Table 4 indicates that the highest number of 'citations' was achieved by the faculty member of University of Delhi, i.e., '*Kriti Ranjan*', i.e., citations of 62552. This was followed by '*Brajesh Choudhary*' from University of Delhi with citations of 57278, '*Manas Maity*' from

Visva Bharati University (VBU) received citations of 52011. The fourth and fifth rank was clinched by 'Ashok Kumar' from the University of Delhi with citations of 31883, and 'Mohd. Danish Azmi' from Aligarh Muslim University with citations of 25029, respectively. Now, it has been opined by various researchers that citation metrics and h indices are complementary to each other and do vary as per different bibliometric databases.^[38] Further, the ranking of faculty members in terms of h-index suggests that the first, second, and fifth rank goes to the faculty members of the University of Delhi, i.e., 'Kriti Ranjan' with a 100 h-index, 'Brajesh Choudhary' with 99 h-index, and 'Ashok Kumar' with an h-index of 78. The third and fourth rank goes to Aligarh Muslim University (AMU) faculty members and Visva Bharati University (VBU) with 93 and 80 h-index, respectively.

The last RG metrics studied were the 'followers' and 'followings' regarding their ranking. From Table 4, 'K Sreenivas' from the University of Delhi had the highest number of followers, i.e., 888, whereas 'Pawan Kumar Kulriya' from Jawaharlal Nehru University had the lowest number of followers, i.e., 429. Moreover, the second, third, and fourth rank in terms of 'followers' was credited to faculty members of the University of Delhi (DU), Banaras Hindu University (BHU), and Central University of South Bihar (CUSB) with 768, 565, and 481 followers respectively. On the other hand, in the ranking of faculty members in terms of 'following', it was observed that 'Surender Pratap' had been followed by 689 members of RG and got the first rank, followed by 'P K Bajpai' (670), 'Kamlesh Yadav' (495) and 'Achhhe Lal Sharma' (492). The fifth rank goes to 'G. Chandrasekaran' from Pondicherry University, who 484 members of RG have followed.

Findings of the Study

It was found that most of the physicists of central universities, i.e., 76.32%, do have their RG account, while the remaining faculty members do not have their account on ResearchGate. This may indicate that they are either not interested in sharing their research on SNS or active on other ASNS platforms.

Regarding the distribution of RG members, 98.89% of the faculty members have added at least one research item, and the mean value of 'Research Items' added to their profile was found to be 78.88 with 144.96 Std. Deviation. It indicates that most faculty members are sharing their research on RG.

It was revealed that only 46.6% of the total 'Research Items' added by faculty members on RG were in 'Full text' format. Moreover, 98.06% of the faculty members have shared at least one full-text research item, whereas the mean value of 'full-text' research was found to be 36.75 with 97.87 std. deviation.

The study indicated the 'outliers' representing the number of authors, which examined those 26 authors who have contributed

research items in the range of 177 to 1669 with a mean of 424.38 and 381.92 std. deviation. In outlier authors, "Kriti Ranjan" shared the highest number, i.e., 1699, whereas "Venktesh Singh" shared the least number of publications, i.e., 627 on ResearchGate.

Regarding the distribution of faculty members by full-text, faculty members who represented as outliers were found to be 30 who have contributed full-text in the range of 73 to 1203 with a mean (226.43) and std. deviation (274.21), and amongst them, "Kriti Ranjan" from the University of Delhi shared the highest number of full-text research (1203).

Regarding the distribution of faculty members by RI score, it was observed that most of the faculty members, i.e., 98.89% had at least one RI Score. The average RI score of faculty members was 948.08 with std. deviation 3199.04. As indicated by the outliers, only 10.53% of the faculty members had an RI score of more than 1497, and 'Kriti Ranjan' from the University of Delhi had the highest RI score, i.e., 34359.

It was found that the 'Reads' of the faculty members were in the range of 0 to 1745469, with a mean value of 27525.6 and a standard deviation of 163029.86. Moreover, 10.25% of the faculty members have received outstanding 'Reads' (above 24400), in which 'Kriti Ranjan' (Professor) from the University of Delhi had received the highest 'Reads', i.e., 1745469.

Regarding the 'citations' of the faculty members, the value falls in the range of 0 to 62552, with a mean value of 1555.2 and a standard deviation of 5838.76. Moreover, 10.8% of the faculty members had the highest citations, i.e., more than 2293, in which 'kriti Ranjan' from the University of Delhi had the highest citations, i.e., 62552.

Regarding the distribution of faculty members as per their h-index, it was revealed that 98.61% have at least one h-index. It portrays that most faculty members have shared one research item on RG and received one citation. The mean value of the h-index was 13.75, with a standard deviation of 13.31. Moreover, 6.09% of the faculty members have an outstanding h-index, i.e., above 29, and "Kriti Ranjan" recorded the highest h-index.

It was analyzed that 94.46% of faculty members followed at least one member on RG. The average number of followers was 106.05, from 2 to 888, with a standard deviation of 109.78. In contrast, the average following was 65.5, falling from 0 to 689 with a standard deviation of 103.61.

Regarding the spearman's rank correlation coefficient (ρ), the RI score has a very strong positive correlation with other RG metrics except 'following'.

Table 4: Ranking Distribution of the faculty members in terms of selected RG Metrics.

Rank	Faculty Members (Designation, Affiliation)	Research Items
1	Kriti Ranjan (Professor, DU)	1669
2	Brajesh Choudhary (Professor, DU)	1217
3	Manas Maity (Professor, VBU)	1166
4	Ashok Kumar (Associate Professor, DU)	734
5	Venktesh Singh (Professor, CUSB)	627
Rank	Faculty Members (Designation, Affiliation)	Full text
1	Kriti Ranjan (Professor, DU)	1203
2	Manas Maity (Professor, VBU)	835
3	Brajesh Choudhary (Professor, DU)	815
4	Ashok Kumar (Associate Professor, DU)	543
5	Venktesh Singh (Professor, CUSB)	349
Rank	Faculty Members (Designation, Affiliation)	RI Score
1	Kriti Ranjan (Professor, DU)	34359
2	Brajesh Choudhary (Professor, DU)	30539
3	Manas Maity (Professor, VBU)	28275
4	Ashok Kumar (Associate Professor, DU)	19012
5	Mohd. Danish Azmi (Assistant Professor, AMU)	13749
Rank	Faculty Members (Designation, Affiliation)	Reads
1	Kriti Ranjan (Professor, DU)	1745469
2	Manas Maity (Professor, VBU)	1691358
3	Brajesh Choudhary (Professor, DU)	1644107
4	Ashok Kumar (Associate Professor, DU)	1009766
5	Pralay Kumar Karmakar (Professor, TU)	234076
Rank	Faculty Members (Designation, Affiliation)	Citations
1	Kriti Ranjan (Professor, DU)	62552
2	Brajesh Choudhary (Professor, DU)	57278
3	Manas Maity (Professor, VBU)	52011
4	Ashok Kumar (Associate Professor, DU)	31883
5	Mohd. Danish Azmi (Assistant Professor, AMU)	25029
Rank	Faculty Members (Designation, Affiliation)	h-index
1	Kriti Ranjan (Professor, DU)	100

2	Brajesh Choudhary (Professor, DU)	99
3	Manas Maity (Professor, VBU)	93
4	Mohd. Danish Azmi (Assistant Professor, AMU)	80
5	Ashok Kumar (Associate Professor, DU)	78
Rank	Faculty Members (Designation, Affiliation)	Followers
1	K Sreenivas (Professor, DU)	888
2	Vinay Gupta (Professor, DU)	768
3	Abhay Kumar Singh (Professor, BHU)	565
4	Venkatesh Singh (Professor, CUSB)	481
5	Pawan Kumar Kulriya (Associate Professor, JNU)	429
Rank	Faculty Members (Designation, Affiliation)	Following
1	Surender Pratap (Assistant Professor, CUHP)	689
2	P K Bajpai (Professor, GGU)	670
3	Kamlesh Yadav (Assistant Professor, CUP)	495
4	Achchhe Lal Sharma (Assistant Professor, CUP)	492
5	G. Chandrasekaran (Professor, PU)	484

Note: DU: University of Delhi; VBU: Visva Bharati University; CUSB: Central University of South Bihar; TU: Tezpur University; HNBGU: Hemvati Nandan Bahuguna Garhwal University; AMU: Aligarh Muslim University; BHU: Banaras Hindu University; CUH: Central University of Haryana; JNU: Jawaharlal Nehru University; CUHP: Central University of Himachal Pradesh; GGU: Guru Ghasidas University; CUP: Central University of Punjab; PU: Pondicherry University.

CONCLUSION

The development of the social web gave a new way of communication. Academia also could not be beyond the influence of social networks. Online scholarships allowed us to self-publish a broad range of scholarly materials. Since diverse academic ecosystems are outside the scope of traditional metrics to measure the impact of scholarly output, in this regard, the emerging metrics measures the impact of the article through social media activities. In this line, ResearchGate provides a unique blend of metrics to analyse the researchers' scholarly activities. RG is an online platform where a researcher can share their research and also collaborate and build connections with other researchers. It also facilitates researchers with a "Question and Answer" space to let them engage in additional research work. However, the Q&A section of RG is considered to be an exciting platform to share

knowledge, and researchers can get insightful comments/studies on varied subject domains.

In the present study, the investigator analyzed the research activities of physics faculty members and their societal impact which has determined the correlation between the RG metrics to know the effect of selected RG measures. Also, sharing the full text of research output on RG was found to be less than 50% of total research items. Due to the high cost and closed access of the research articles, the researchers are not able to view and cite them. As a result, researchers should actively participate in promoting open access publishing and share their research in a full-text format via self-archiving platforms. It will be helpful for researchers to get more citations; hence, the academic society can benefit by keeping the research in an open access mode. The concerned authorities should also encourage the researchers to upload their work over open access journals. The availability of research in an open-access mode will enhance the research productivity of researchers in a developing country like India. Nowadays, collaboration is burgeoning amongst the research community, and RG is considered as one of the promising platforms for research collaboration. The study findings of the present research also highlighted that some faculty members show outstanding participation in sharing their research items, thus getting the reads and citations, and received greater attention over their RG profiles. Furthermore, one of the professors i.e., 'Kriti Ranjan' from the University of Delhi, has shared the highest number of research items, full-text, reads, citations, RI score and h-index, which is incredible and inspiring for other physics scholars. This study's findings will be helpful to many funding associations, librarians, and publishers to assess their research engagement and the academic performances of researchers.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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