A Correlation Investigation among ResearchGate Metrics of Science Faculties at Central Universities of North-East India through Altmetrics Approach

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Abstract This paper investigates the correlation of ResearchGate among the faculties of sciences in the central universities of North-East India using Altmetrics approaches. As more innovation is seen and the discipline is in its early stages, the Department of Biotechnology and Microbiology is the primary study area. The study focuses primarily on faculty activities on the ResearchGate platform, which include frequency of publications, citations, research interest, number of followers and followings, and various publication formats. It has also sparked interest in determining the relationships between different ResearchGate metrics. According to the study, most faculties have good citation scores and an average number of publications. The survey analysis reveals a lack of awareness, concentration, and dedication to the development of the disciplines. The result of the investigation shall serve as a pathway for various future goals for self-improvement.

Keywords: Social Media; Correlation; Altmetrics; ResearchGate; Citations; Metrics and Research Interest

1. Introduction

Historically, it is evident from the fact that the Journal Impact Factors have been used as a tool for academic communication and evaluation[1]. The advent of impact factors or h index has been used as a medium for measuring the impact of research. But in recent years, it has been found that researchers are using social networking sites such as blogs, posts, Twitter, and many others not only for discussion but also to identify ideas and concepts[2]. However, the researchers are also using web-based reference management tools for sharing bibliographic information within the field of interest[3]. As the ongoing activities are occurring over online platforms, the researchers use the platform to perform various activities[4]. Social media has gained the attention of researchers as the information can be accessed quickly, and there is tangibility in the products that indicate scientific works of literature, journal articles, generating data, and many more[5].

A known academician name written in an article i.e., Mas-Bleda et al (2014)[6], has defined three types of "web presences" that include personal, institutional, and social [7]. If we talk of the latter, social web presence is the medium that permits the researchers to share their research output either automatically or manually, but for the study purpose, ResearchGate is the highlight of the paper[8].

The new methodology or alternative metrics has become a new array for measuring the collision of research using some discoveries. Altmetrics, also pronounced as Alternative metrics, can be defined as the extent of measures to which the scientific publications or research data have interacted with the new media[9]. As the popularity of Altmetrics is gaining attention among the academic community, there rises a considerable demand for web-based application programs[10]. This, in return, led to the development of tools such as altmetrics.com by Euan Adie, Impact Story, and PlumX, developed by Plum Analytics Inc[11].

It is also essential to be noted that academic social network sites play a significant role in exchanging scientific information[12]. Popular among them includes ResearchGate, with the help of which the researchers can increase the visibility and tranquility of scientific activities[13]. The activities of a researcher are recorded and leveled by the score[14]. The users can access this network by creating a profile and performing scientific activities[15].

The study aims to analyze and evaluate the faculties, and their activities in ResearchGate, creating consciousness among the faculties about the role and importance of academic and social networks and developing enthusiasm for new

work that led to self-development and development of the whole nation. The paper also examines the research status of faculties, their contribution to their dedicated disciplines, and new invention and innovation of mechanisms. The study is one of the first to conduct a detailed analysis of the faculties profile on the ResearchGate platform of the faculties of central universities in Biotechnology and Microbiology. It shall act as a data-driven sheet for its self-improvement in the future.

2.   Overview of the Institutions

The Union universities or central universities in India are public institutions established by an Act of Parliament under the jurisdiction of the Department of Higher Education of the Ministry of Education, these universities, in general, are recognized by University Grants Commission and other 15 professionals councils are empowered for different accreditations and coordination[16] [17]. A total of 64 central universities are being established with specialization in various subjects[18] [19]. In the case of North-East India, there is a total of 11 central universities were established, which were distributed as Arunachal Pradesh-1, Assam-2, Manipur-3, Meghalaya-1, Mizoram-1, Nagaland-1, Sikkim-1, and Tripura-1 .[20] [21]

Biotechnology and Microbiology research in North-Eastern India is at the emerging stage. Universities and Research Institutions cater to the diversified needs of the society that demands the most[22] [23]. The universities of North-East India have obtained a NIRF ranking with good academic performance. The central universities in North Eastern Region include North-Eastern Hill University, Assam University, Tezpur University, Nagaland University, Tripura University, Mizoram University, Sikkim University, Manipur University, and Rajiv Gandhi University[24] [25].

The present study population mainly focuses on the faculties of central universities in the field of biotechnology and microbiology research and development. The area undertaken for the study includes the Central Universities of North-East India, which has a Biotechnology and Microbiology Department.

3.   Review of Published Literature

When it comes to the analysis of review of related kinds of literature, various studies have made their attempts to address various research activities and explore the pros and cons of ResearchGate as an academic social network. The different types of activities by faculty members in ResearchGate and their correlation between RG scores and other related metrics are to be investigated.

Some of the recent studies which have been consulted for the study include the following studies.

Ali and Richardson (2017)[8] in their articles analyze the research performance of Pakistan Scholars in the field of Library and Information Science by adopting altmetrics as the approach for the study. Researchgate has been used as the medium for abstracting information. The study reveals that there is a positive correlation between publications, reads, and citations for scholars who had made a record for at least one publication. It is noticed that the publications are not accepted in the top rated journals. The study has highlighted that academic networking sites create the potential for collaboration, building connections, and exchanging information.

Kolahi et al (2019)[26] in this article highlight the scientific article's knowledge structure in the field of Endodontology which possesses' high Altmetric attention. The result reveals that only 192 articles have altmetrics scores greater than five. Journal of Endodontics has the highest mention of Altmetric resources. It was found that Twitter is the popular Altmetrics data source that is followed by patents and Facebook. Some of the latest topic mainly found in the study includes meta-analysis, systematic review, and pulpitis.

Zahedi, Costas, and Wouters (2014)[10] analyzed and viewed the presence and possibilities of Altmetrics in performing different evaluation functions. The study has adopted Impact Story, a web-based tool wherein they collected 20,000 random publications from a web of science. The study emphasizes the presence and distribution of Altmetrics across different sets of fields, publications, and types of documents and the correlation of Altmetrics with citation indicators. One of the important findings of the study is that Menedely provides the most metrics Altmetrics sources.

Mokhtari et al (2020)[27] in their study aim to portray bibliometric overview and visualization and Altmetric analysis to the scientific literature output of Anatolia. The data were extracted from Scopus and the respective journal website. The result of the study found that there are increasing trends in the publications of scientific literature and these publications have also received many citations to their account throughout the study. It is to be noted that some of the leading scientific kinds of literature have cited works of literature published in Anatolia. It was found that some of the topics which were frequently and co-occurrence patterns were having relation to tourism and hospitality discipline.

Moradi and Dokhani (2020)[13] in their articles discuss the impact of health-related research in the countries such as Iran, Turkey, Pakistan,

Bangladesh, Indonesia, Malaysia, Egypt, and Nigeria that falls under the category of D8 countries. The study abstracts data from the journals indexed in the web of science having Altmetrics scores. The analysis of the study reveals that the topics such as innovation and knowledge were hot chapters of discussion and there seems to have imbalances in Quadruple among the countries. Much more attention has been gained in clinical sciences.

The study undertaken by **Cho (2016)[2]** focuses on the measurement and comparison of the impact of Korean study on four major subjects which are published in International journals by adopting Altmetrics as the method of evaluation. Around 383 Korean Research Articles published in the field of medical science, engineering, social science, and arts and humanities were analyzed for the study purpose. The analysis of the study reveals that Twitter is the highest means of social media communication in the field of medical sciences than any other related discipline and Mendeley seems to owe the highest number frequency of research articles that were saved by employing reference management tools. The study concludes that there seems to have a positive correlation between the numbers of saved articles in Mendeley and cited in the study.

Hassan et al (2017)[28] in their paper investigate 15 broad scientific disciplines about social media activities that were indexed in Scopus databases using Altmetric.com data. The result of the study reveals that there is a rapid increase in Altmetric.com data that are indexed in the Scopus database which has increased from 10.19% to 20.46%. It was also found from the study that the Blog count is considered the most important factor in the discipline of Health Professionals and Nursing professionals.

The contribution made by **Thelwall (2021)[9]** in his research articles gives a glimpse of current alternative indicators and sums up the empirical research and prepared a list of common problems and mistakes to be avoided while using them. Some of the major issues include Choosing indicators that correspond to goals; aggregating them in a way that is sensitive to field and publication year differences; largely avoiding them in formal evaluations, and understanding that they reflect a biased fraction of the activity of interest and internalizing the nature of the effect reflected rather than taking individuals at face value.

Sener and Polat (2022) [31] in their paper have analysed and viewed the most cited articles on the area of retina that were published in ophthalmology. The findings of the study suggested that Altmetrics is sufficient to determine the

scientific value of articles and there are several factors that affect the traditional metrics

4.   **Methodology Followed**

The present study includes all the faculty members from departments of Biotechnology and Microbiology of different central universities in North-East India that possess account in ResearchGate **(N=40)**.

To extract the name and number of the faculties, we used respective Indian university's websites that are designed and maintained by university authorities. According to the survey, the number of faculties' members was 55, of which only 40 of them have their account in ResearchGate and these RG accounts were evaluated and examined. The data which were extracted are directly through observation in the respective account of RG account[29]. For the analysis of data, software such as MS Excel and SPSS 18 version was used. Pearson Correlation co-efficient has been adopted for have in-depth information and P and r value is also calculated to understand the significance of correlation. Mean, Median, Standard Deviation, Minimum and Maximum is also calculated and interpreted. The following methodology is adopted for the study:

Figure 1
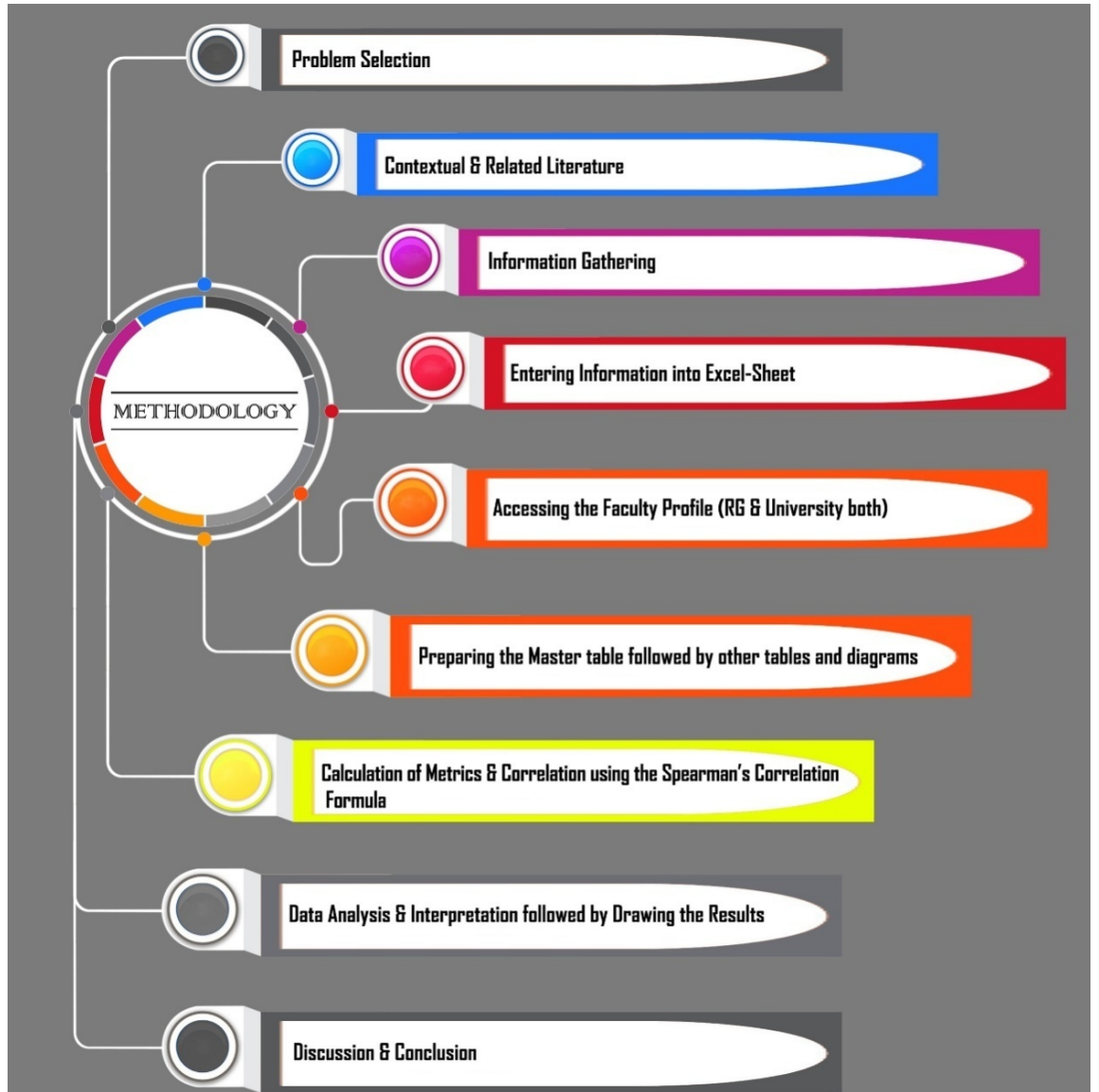
5. Objectives of the Study

For the study purpose, some objectives were taken into consideration. These include

a. To identify the publication pattern of faculty members in Biotechnology and Microbiology;

b. To detect the frequency of publication and types of publication;

c. To identify the number of followers and followings of faculty members; and

d. To identify the correlation between RG scores and other related metrics.

6. Result and Analysis

A sum of 55 faculties of the Department of Biotechnology and Microbiology in central universities of North East India were found, out of which 40 have their ResearchGate account. The remaining 15 of the faculties have not created their profile in ResearchGate. So primary emphasis or rather focus of the study is mainly on the faculty members who have an account in ResearchGate of Central Universities in North-East India.

6.1. Citations

The frequency distribution of citations among the faculties of Biotechnology and Microbiology is shown in Table 1. All the faculties seem to have received the citation, and only 62.5 have received more than 500 in their respective ResearchGate profiles. The average citation of faculties is 20. Figure 2 shows the correlation between publications and citations of published literature.

Figure 2: Publication and citations
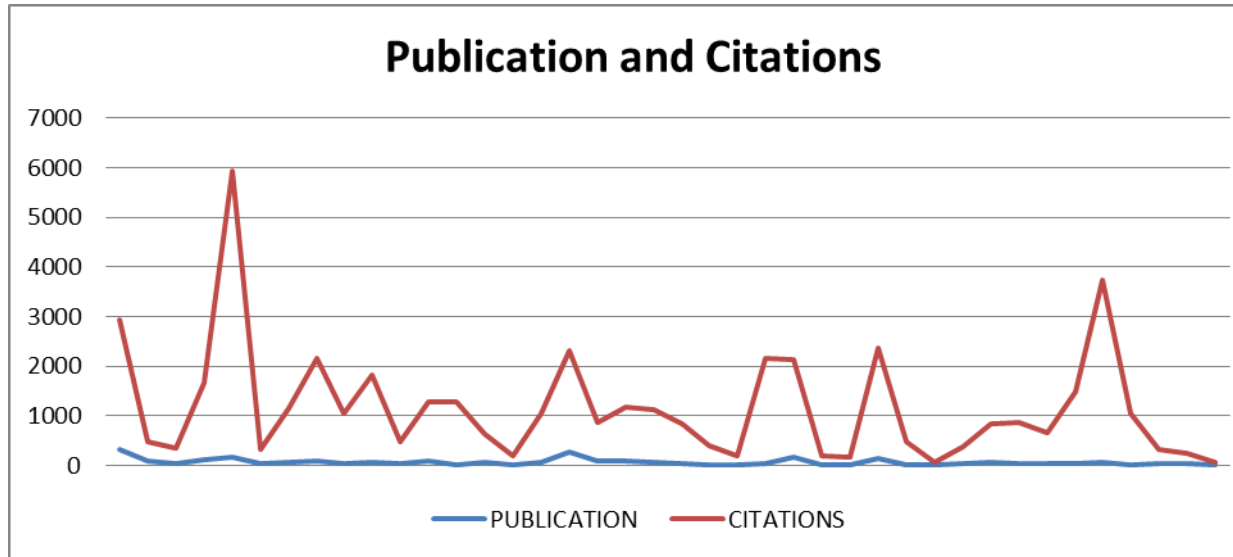
Table 1: Frequency Distribution of Citations

Sl. No	Citations	Members	Members (%)	Mean	Median	SD	Min	Max
1.	0	0	0	0	0	0.00	0	0
2.	1-100	2	5	1	2	1.41	0	2
3.	101-200	4	10	2	4	2.83	0	4
4.	201-300	3	7.5	1.5	3	2.12	0	3
5.	301-400	4	10	2	4	2.83	0	4
6.	401-500	2	5	1	2	1.41	0	2
7.	>500	25	62.5	12.5	25	17.68	0	25
	Total	**40**	**100**	**20**	**40**	**28.28**	**0**	**40**

5.2 Publications

The frequency of publication among the faculties is shown in Table 2. There is more than 45% of the faculties have publications greater than 50. The average score of publications is 20.

Table 2: Frequency of Publications

Sl. No	Publications	Members	Members (%)	Mean	Median	SD	Min	Max
1.	0	0	0	0	0	0.00	0	0
2.	1-10	2	5	-	-	-	-	-
3.	11-20	4	10	2	4	2.83	0	4
4.	21-30	6	15	3	6	4.24	0	6
5.	31-40	6	15	3	6	4.24	0	6
6.	41-50	4	10	2	4	2.83	0	4
7.	>50	18	45	9	18	12.73	0	18
	Total	**40**	**7**	**20**	**40**	**28.28**	**0**	**40**

5.3 Full-Text

The finding that is shown in table 3 indicates that 22.5% of the faculties have their full-text addition to the ResearchGate profile in the range of 1-10. The standard deviation score of the faculties is 28.28. Only 5 (12.5%) of the faculties have their publications greater than 50.

Table 3: Frequency of Full-Text Addition

Sl. No	Full-Text	Members	Members (%)	Mean	Median	SD	Min	Max
1.	0	0	0	0	0	0.00	0	0
2.	1-10	9	22.5	-	-	-	-	-
3.	11-20	9	22.5	4.5	9	6.36	0	9
4.	21-30	10	25	5	10	7.07	0	10
5.	31-40	5	12.5	2.5	5	3.54	0	5
6.	41-50	2	5	1	2	1.41	0	2
7.	>50	5	12.5	2.5	5	3.54	0	5
	Total	**40**	**100**	**20**	**40**	**28.28**	**0**	**40**

5.4   No. of Followers

The finding of the study indicates the distribution of the number of followers among faculties that is shown in table 4. It is found that 37.5% of the faculties have followers in the range of greater than 150. The standard deviation of the faculties is 28.28.

Table 4: Distribution of No. of Followers

Sl. No	No. of Followers	Members	Members (%)	Mean	Median	SD	Min	Max
1.	0	2	5	1	1	1.41	0	2
2.	1-10	0	0	0	0	0	0	0
3.	11-20	1	2.5	0.5	1	0.71	0	1
4.	21-30	2	5	1	2	1.41	0	2
5.	31-40	2	5	1	2	1.41	0	2
6.	41-50	2	5	1	2	1.41	0	2
7.	51-100	8	20	4	8	5.66	0	8
8.	101-150	8	20	4	8	5.66	0	8
9.	>150	15	37.5	7.5	15	10.61	0	15
	Total	**40**	**100**	20	40	28.28	0	40

5.5   Number of followings

The findings has indicates that 30% of the faculties have their followings in the range of greater than 100. The average score of the faculties is 20 which is shown in table 5.

Table 5: Distribution of No. of followings

Sl. No	No. of Followings	Members	Members (%)	Mean	Median	SD	Min	Max
1.	0	1	2.5	0.5	0.5	0.71	0	1
2.	1-10	4	10	-	-	-	-	-
3.	11-20	8	20	4	8	5.66	0	8
4.	21-30	3	7.5	1.5	3	2.12	0	3
5.	31-40	3	7.5	1.5	3	2.12	0	3
6.	41-50	2	5	1	2	1.41	0	2
7.	51-100	7	17.5	3.5	7	4.95	0	7
8.	>100	12	30	6	12	8.49	0	12
	Total	40	100	20	40	28.28	0	40

5.6 Frequency of Research Interest

The finding indicates Research Interest among the faculties' members in Central Universities of North-East India that is portraying in table 6. The frequency of Research Interest is seen to be higher in the range of greater than 800 with a score of 32.5%. The maximum frequency of Research Interest is 13.

Table 6: Frequency of Research Interest

Sl. No	Research Interest	Members	Members (%)	Mean	Median	SD	Min	Max
1.	0	0	0	0	0	0.00	0	0
2.	1-200	7	17.5	3.5	7	4.95	0	7
3.	201-400	5	12.5	2.5	5	3.54	0	5
4.	401-600	5	12.5	2.5	5	3.54	0	5
5.	601-800	10	25	5	10	7.07	0	10
6.	>800	13	32.5	6.5	13	9.19	0	13
7.	**Total**	40	100	20	40	28.28	0	40

5.7   ResearchGate (RG) Score

The findings indicate that the RG Score of the faculties is shown in Table 7. 42.5% of the faculties have their RG Score in the range of 21-30. The median of the faculties is 101 and the average score is 50.5.

Table 7: Frequency of RG Score

Sl. No.	RG Score	Members	Members (%)	Mean	Median	SD	Min	Max
1.	0	0	0	0	0	0.00	0	0
2.	1-10	1	2.5	-	-	-	-	-
3.	11-20	9	22.5	4.5	9	6.36	0	9
4.	21-30	17	42.5	8.5	17	12.02	0	17
5.	31-40	12	30	6	12	8.49	0	12
6.	>40	1	2.5	0.5	1	0.71	0	1
	Total	**101**	**100**	**50.5**	**101**	**71.42**	**0**	**101**

5.8   Pearson Correlation between RG Score and Research Interest

5.8   Pearson Correlation between RG Score and Research Interest

Regression Statistics	
MultipleR	0.757577
R Square	0.573924
Adjusted R Square	0.562711
Standard Error	497.5874
Observations	40

ANOVA

	df	SS	MS	F	Significance F
Regression	1	12673273	1267327 3	51.1858 7	1.52E-08
Residual	38	9408541	247593.2		
Total	39	22081814			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-980.321	265.3561	-3.69436	0.000691	-1517.51	-443.136	-1517.51	-443.136
RG SCORE	71.66509	10.01688	7.15443	1.52E-08	51.38697	91.9432	51.38697	91.9432

The finding indicates that there is a positive and significant relation between the RG Scores and Research interests. The P-value between RG Scores and Research Interest is .000691. The R-value is 0.75.

5.9 Frequency of Publication in Different Format

The findings indicate that 35% of the faculties have their article publications in the range greater than 50 as shown in figure 3 and table 8. In terms of conferences, the average score of the faculties is 50.5. The publications in other formats such as chapters, pre-prints, and data have an average score of 20.

Table 8: Frequency of Publication in Different Format

Sl. No	No. of Articles	Members	Members (%)	Mean	Median	SD	Min	Max
1.	0	0	0	0	0	0.00	0	0
2.	1-10	3	7.5	-	-	-	-	-
3.	11-20	9	22.5	4.5	9	6.36	0	9
4.	21-30	8	20	4	8	5.66	0	8
5.	31-40	4	10	2	4	2.83	0	4
6.	41-50	2	5	1	2	1.41	0	2
7.	>50	14	35	7	14	9.90	0	14
	Total	**40**	**100**	**20**	**40**	**28.28**	**0**	**40**
Sl. No	**No. of Conferences**	**Members**	**Members (%)**	**Mean**	**Median**	**SD**	**Min**	**Max**
1.	0	26	65	13	13	18.38	0	26
2.	1	4	10	2.5	2.5	2.12	1	4
3.	2	2	5	2	2	0.00	2	2
4.	3	2	5	2.5	2.5	0.71	2	3
5.	4	1	2.5	2.5	2.5	2.12	1	4
6.	>4	5	12.5	2.5	5	3.54	0	5

	Total	101	100	50.5	101	71.42	0	101
Sl. No	No. of Chapters	Members	Members (%)	Mean	Median	SD	Min	Max
1.	0	6	15	3	3	4.24	0	6
2.	1	6	15	3.5	3.5	3.54	1	6
3.	2	4	10	3	3	1.41	2	4
4.	3	3	7.5	3	3	0.00	3	3
5.	4	5	12.5	4.5	4.5	0.71	4	5
6.	5	3	7.5	4	4	1.41	3	5
7.	>5	13	32.5	6.5	13	9.19	0	13
	Total	40	100	20	40	28.28	0	40
Sl. No	Pre-Prints	Members	Members (%)	Mean	Median	SD	Min	Max
1.	0	23	57.5	11.5	11.5	16.26	0	23
2.	1	6	15	3.5	3.5	3.54	1	6
3.	2	6	15	4	4	2.83	2	6
4.	3	3	7.5	3	3	0.00	3	3
5.	4	1	2.5	2.5	2.5	2.12	1	4
6.	>4	1	2.5	0.5	1	0.71	0	1
	Total	40	100	20	40	28.28	0	40
Sl. No	Data	Members	Members (%)	Mean	Median	SD	Min	Max
1.	0	9	22.5	4.5	4.5	6.36	0	9
2.	1	6	15	3.5	3.5	3.54	1	6
3.	2	2	5	2	2	0.00	2	2

4.	3	4	10	3.5	3.5	0.71	3	4
5.	4	2	5	3	3	1.41	2	4
6.	>4	17	42.5	8.5	17	12.02	0	17
	Total	**40**	**100**	**20**	**40**	**28.28**	**0**	**40**

Figure 3: Distribution of Publication
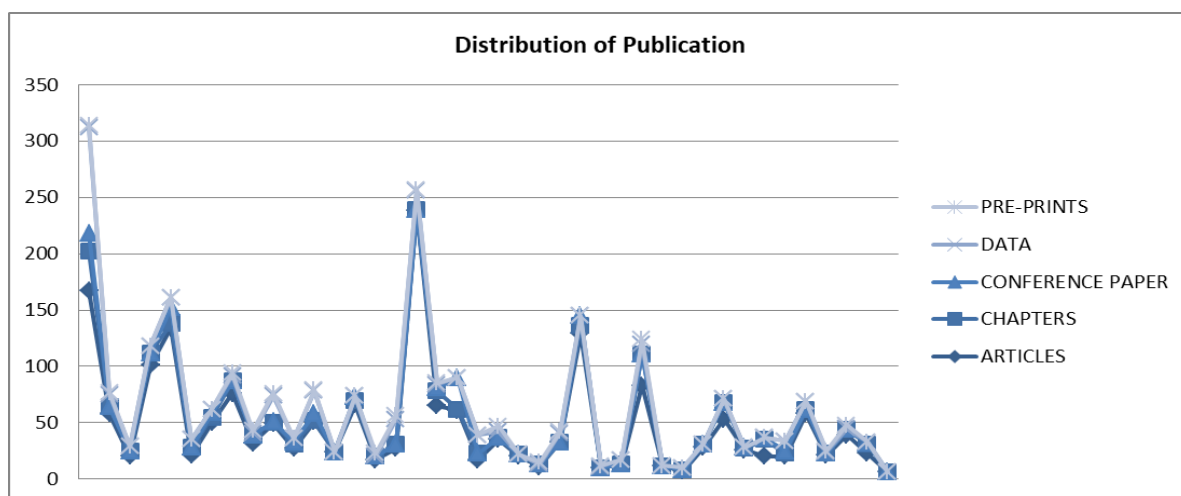
7. Discussion

In a general sense, the prime aim of ResearchGate is to connect the academic community and make research accessible and visible. The present study has made a correlation investigation of faculty members who have an account in ResearchGate among the central universities in North-East India. The study was primarily focused on the Department of Biotechnology and Microbiology as the main focal point. The study also emphasizes understanding the correlation between the RG Metrics and ResearchGate scores. It has implemented the Altmetrics approach to study the current phenomenon.

The present study's findings reveal that the publications of the majority faculties' members have a greater number that marks more than 50. However, some of the faculties have their publication in the other ranges. It seems that all the faculties who have a ResearchGate account have published their publications. The rate appears to have more as compared to the findings of Ali and Richardson[14]. Though few of the faculties seem to have higher publications majority of the faculties failed to create any ResearchGate account. The issues might be due to lack of knowledge or feelings of necessity are some of the treats

for creating the scenario of negligence. A deeper study is necessary to understand why scientific literature publications are important in ResearchGate. The results of the present study show that the mean of publication of faculties in the Department of Biotechnology and Microbiology among the central universities of North-East India showed that mean of faculty publication is almost similar to the other studies conducted internationally.

The present study's findings reveal that the full-text addition to the ResearchGate Account seems less, as seen in other studies. The standard deviation score is 28.28, and the mean is 20. The faculties with the majority of full-text addition are in the range of 21-30. The less full-text addition might be due to the lack of faith and trust of the faculties in ResearchGate as the medium of scholarly communication. In the context of citations, most faculty members have received more citations than other similar studies. The study reveals that biotechnology and microbiology research is proliferating, and more people are reading and becoming aware of the productivity due to which citations are being received. A platform such as ResearchGate is helping academia to remain connected.

The frequency of distribution of the number of followers and followings has received significant attention in the academia/academic community. It also defines one's popularity and the status of one's research work. The findings of the present study reveal that most of them have gained a sufficient amount of followers and followings compared to other similar studies. But the faculties need to pay much more attention to their development and go online in contemporary times.

Research Interest can be defined as the sum of interest for each scientific literature an author added to their account. The RI and TRI scores are utilized by the RG squad to estimate scientists' interest in the work of RG members. The findings of the present study indicate that majority of them seem to have greater research interest as compared to the other ranges. The average score is 20 and the standard deviation seems to be 28.28. It needs to add that the research community across the globe is showing interest in the emergence of the subject.

The current study results indicate that only a few sums of faculties have their ResearchGate (RG) Score in a standardized range. It is also noticed that only one of the faculty has an RG score greater than 40. The average score of RG score of the faculties is 50.5 and the standard deviation stands at 71.42. This indicates that the faculties need to form or built a scholarly community for expansion of knowledge and also carry out some developmental activities such

as Conferences, Seminars, and Workshops which shall enhance development skills and build new ideas. To have an insight, a correlation analysis was carried out to investigate using the Pearson Co-relation coefficient. The statistics show that the value of r=0.75 and the p-value is 0.000691. This indicates that there is a positive correlation between the RG Score and Research Interest among the faculties.

The faculties have published their pieces of literature in different formats and forms such as articles, chapters, conferences, pre-prints, data, and other forms. The majority of the faculties seem to concentrate their publications in article format as the analysis speaks. One of the key components for the increasing number of articles is demand from the parent organization as tends to access the faculties in terms of publications as per the Indian education scenario since the area of study is Indian Universities. 65% of the faculties have no conference proceedings to their account. It seems that faculties are paying less attention to conferences and the creation of more awareness about its importance is necessary. Again in terms of Chapters, Pre-Prints, and Data, the faculties seem to have given some attention and they have done much to deliver some new and authentic information or invention of new techniques or methodology in this evolving world.

As the goal of the current study is to comprehend the relationships between ResearchGate metrics and the faculties of Biotechnology and Microbiology at central universities in North-East India, the analysis reveals that these faculties may view ResearchGate as a communication channel for making their research visible and achieving a significant level of status within the same academic community.

8. Conclusion

Information and Communication Technology (ICT) has made it easy to access and retrieve information in a much more comfortable space[30]. The growing space of the Internet has led to the creation of ResearchGate, a platform that helps enhance and increase the visibility of research output. The result of the study reveals that the participation of members in ResearchGate helps create an excellent academic community and enhances the capability of faculties that directly help increase their citations and h-index in their RG profiles. As per the analysis, it is also suggested that university authorities pay more attention to creating an RG account and imparting awareness about the merits and demerits of ResearchGate so that they can have a clear picture of this platform. Not only the authorities but at the same time, library and information professionals should explain the significance and importance of ResearchGate to faculties and also organize community services such as holding seminars, workshops,

conferences, and other activities, especially on topics such as Altmetrics, Altmetrics indicators, and various academic social network so that they can outreach the communities and help in building community were prosperity and development should be the prime motive. They can also give some live examples and explain the benefits of sharing scientific works of literature on various social academic networks.

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