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An altmetric analysis of ResearchGate profiles of physics researchers: A study of University of Delhi (India)

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A study of University of Delhi (India)

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Abstract

Purpose – The purpose of this paper is to carry out an altmetric analysis of faculty members and research scholars of Department of Physics and Astrophysics, University of Delhi (India) (Univ.Delhi P&A) who are members of the academic social networking site ResearchGate. ReserachGate is a rich source of altmetric indictors such as publications, reads, profile views, citations, impact points, RGScore, followers and following, etc. The RGScore, unique to ResearchGate, was further explored in depth in the study.

Design/methodology/approach – The data were collected manually by visiting the profile pages of all the members who had an account in ResearchGate under Univ.Delhi P&A during the first week of July, 2016. The authors found a total of 173 members in ResearchGate from the department. Data were collected for publications, reads, profile views, citations, impact points, RGScore, followers and following from the profile pages of the members. Correlations were calculated amongst the metrics provided by ResearchGate to seek the nature of the relationship amongst the various ResearchGate metrics.

Findings – The analysis revealed that the publications added by researchers to their profiles were relatively low, as 28.32 per cent of the members had not added even a single publication to their profiles. Average reads acquired per person was found to be 909.49 and the median value of reads was found to be 95. Average citation per member in ResearchGate was found to be 414.60 and the median value was found to be 7. Majority of the researchers (45.09 per cent) had impact points in the range of 0.2-50. Most of the members (35.84 per cent) had followers in the range of 1-10. Majority of the members (52.02 per cent) had profile views in the range of 1-100. Most of the members (26.01 per cent) had RGScore equivalent to 0.01. The highest correlation of RGScore was found with publications added by researchers to their profiles, followed by correlation between RGScore and reads, correlation between RGscore and profile views, correlation between RGScore and number of Full Texts and correlation between RGScore and number of followers of a researcher.

Originality/value – Not much research has been conducted in the area of altmetrics, especially using ResearchGate as a source of altmetrics. The findings of the study help in understanding the validity of ResearchGate as a source of altmetrics for research evaluation in a developing country such as India. Also, the novel ResearchGate indicator RGScore has been evaluated in great depth and its relationship with other ResearchGate altmetric and bibliometric indicators has been established.

Keywords Bibliometrics, Research evaluation, Altmetrics, Scholarly communication, Academic social networking, ResearchGate

Paper type Research paper

1. Introduction

Scientific research can be regarded as a social academic activity and its proper dissemination is of utmost importance for researchers as well as the readers. Many changes have affected traditional (formal) as well as non-traditional (informal) scholarly communication channels. Changes that have had the greatest impact on scholarly communication include the shift to online publishing, change in the mode of subscription of journals in academic libraries (i.e. from journals to packages of publishers and aggregators) and the open access movement (Houghton *et al.*, 2009; Stewart *et al.*, 2013). Institutional repositories and open-access publishing have brought colossal changes in formal scholarly publishing. Readers are not dependent on the publishers alone for accessing research. Various repositories provide access to research works helping researchers in finding alternative access paths. Web 2.0 tools such as blogs, wikis, social academic networks, etc.,

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have brought changes in informal scholarly publishing (Davidson, 2005; Barjak, 2006; Collins and Hide, 2010; Allen *et al.*, 2013). Various activities such as promotion of research and its dissemination and sharing of research on various platforms have remarkably refashioned scholarly communication and also the works of researchers (Procter *et al.*, 2010).

With the advent of Web 2.0, social networking sites (SNSs) have brought significant changes in scholarly communication, ranging from production of research work to its distribution and dissemination (Nentwich and König, 2014). Schmidt (2009) defined a SNS as one which allows creation of "sophisticated personal profile" by members and contains information such as members' interests, activities, etc. in a digital space that can only be accessed by other users after getting registered and becoming a member of that particular site. These SNSs are also rich in grey/unpublished literature (Pardelli *et al.*, 2012). Academicians and researchers use these SNSs for the purpose of tagging, bookmarking, sharing research, connecting with one another, collaborating on working papers, etc. Prominent SNSs that are used widely by researchers include Academia.edu, ResearchGate, Zotero, CiteULike, BibSonomy, etc., (Reher and Haustein, 2010). Online reference managers such as Mendeley have provided a new and more efficient platform for researchers to interact with one another and to disseminate research. A study found that the majority of the research scholars were aware of the SNSs and were registered with them. Majority of them were in the age group of 20-30 years. Facebook was found to be the most popularly accessed SNS in the two universities included in the study (Mahajan *et al.*, 2013). Other studies have found that the major reasons for researchers using SNSs are for expansion of ideas and knowledge due to the possibility of direct interaction with other researchers (Sauer *et al.*, 2005; Collins, 2010). Academic SNSs such as ResearchGate and Academia.edu place greater emphasis on communication between researchers in terms of informal messages and sharing of research on the social web to describe their works, list their likes and interests, and to connect amongst peers. Online reference managers such as CiteULike, Mendeley, Zotero, etc., on the other hand, although also include features of SNSs, yet generally place greater emphasis on serving as reference manager tools and organising one's own digital library.

Such social network sites and online reference managers are rich sources of metrics such as readership, total number of tags, total number of tweets, total number of profile views, total number of publication views, etc. that can potentially be used for the purpose of evaluation of a researcher, a research work, an institution or a country. These metrics are termed as "altmetrics" (Priem *et al.*, 2010, 2012). The definition of what constitutes an "altmetric" indicator is in constant change (Haustein *et al.*, 2015). "Altmetrics" is used as an umbrella term for the measurement of impact of research in social media through measuring the online activity (Bar-Ilan *et al.*, 2012; Priem *et al.*, 2010). Widely accepted definition of altmetrics is: "the study of scholarly impact measures based on activity in online tools and environments" (Priem *et al.*, 2012). It is used as a complementary metrics to give new insights and to capture different aspects of a research work that citations and citation-based metrics are unable to measure (Galligan and Dyas-Correia, 2013). Altmetrics is regarded as that metrics which excludes traditional citation-based metrics and is different from them (Priem *et al.*, 2010).

In the present study, an altmetric analysis of faculty members and research scholars of Department of Physics and Astrophysics, University of Delhi (India) (Univ.Delhi P&A) who are members of ResearchGate has been carried out. ResearchGate was founded in 2008 by physicians Dr Ijad Madisch, Dr Sören Hofmayer, and Horst Fickenscher and aims to connect researchers and share their research output, knowledge, and data for the advancement of research (www.researchgate.net/about). It offers a number of services such as sharing of publications, connecting and collaborating with colleagues and experts in the field, number of downloads, etc., asking and answering questions and even finding suitable job opportunities.

ResearchGate also serves as a source of bibliometric as well as altmetric indicators such as Publication Counts, reads, profile views, citations, impact points, RGScore, questions and answers contributed, number of followers, number of researchers following, etc. In the present study, an altmetric analysis of ResearchGate has been performed and all the indicators have been evaluated. The unique indicator RGScore, which has been developed by ResearchGate without disclosing the exact algorithm, has been explored in more depth and its relationship with other indicators has also been explored.

2. Related work and background

Little work has been done in the area of altmetrics. Few studies have been carried out on the reach of academic social networks like Academia.edu and ResearchGate. Most of the research in the field of altmetrics has focused on the online reference manager Mendeley. Li *et al.* (2012) studied CiteULike and Mendeley for measuring scholarly impact. Statistically significant correlations between Mendeley/CiteULike user counts and WoS citations were found for 1,613 articles from *Nature and Science*. Bar-Ilan *et al.* (2012) found that 82 per cent of the documents were at least bookmarked once and 28 per cent of articles were bookmarked in CiteULike. The study also found that all the sampled authors had at least 50 per cent of their publications bookmarked in Mendeley by others. For articles published before 1990 the coverage of Mendeley was found to be lower (44 per cent) in the study as compared to articles published since 2000 (88 per cent). It was revealed in the study that this may be due to the comparatively recent launch of Mendeley. Mohammadi and Thelwall (2014) found that an average of 44 per cent of the articles from the chosen social sciences disciplines existed in the Mendeley catalogue. However, only 13 per cent of the humanities articles existed in the Mendeley catalogue. In social sciences, psychology (54 per cent) had the highest coverage. In the case of humanities, linguistics (34 per cent) showed the highest coverage in Mendeley. Maflahi and Thelwall (2016) studied the impact of time on Mendeley readership of articles published in the journals such as *Library and Information Science, Information Processing & Management*, *Library and Information Science Research*, the *Journal of Documentation*, and the *Journal of the Association for Information Science and Technology*. The relationship between Mendeley readership counts and citations was also studied. They found that it took about seven years for articles to gain as many citations (in Scopus) as there was readership in Mendeley.

Evaluation and analysis of academic social networks is important to know about their uptake and reach (Thelwall and Kousha, 2014a, b). In a study conducted by Thelwall and Kousha (2014b) Academia.edu was revealed as a combination of a scholarly research network and a general SNS. Chakraborty (2012) conducted a survey at North Eastern Hill University (India) focusing on two SNSs, ResearchGate and Facebook, and found that 24 per cent of the studied population used them as a tool to be updated while 31 per cent used them to be updated with latest research. In all, 37 per cent of the studied population revealed that they used them as a tool to form study groups. Thelwall and Kousha (2014a) found that there was no significant correlation between Academia.edu metrics for scholars in philosophy and the established bibliometric indicators. Ortega (2015) conducted a study on the altmetric and bibliometric indicators from ResearchGate, Mendeley, Academia.edu, Microsoft Academic Search and Google Scholar Citations at the author level. No significant relationship was found between Academia.edu and Mendeley indicators. Further, relationship between altmetric and bibliometric indicators at author level was also not found to be significant. In a study conducted by Shrivastava and Mahajan (2015) it was found in the study that except for RGScore (RG) and citations (Scopus), the correlation between other ResearchGate metrics and Scopus metrics was strong and positive. Moderate to strong positive correlation amongst ResearchGate metrics was found. In a research conducted by Yu *et al.* (2016), ResearchGate metrics were compared with the metrics of

Research Excellence Framework (REF) and Quacquarelli Symonds (QS) World University Rankings to assess the quality of UK universities and global universities, respectively. A correlation analysis of ResearchGate metrics and SciVal metrics was also performed. In all, 300 ResearchGate members from the supply chain management field were selected as the sample size. Both the ResearchGate score and impact points exhibited significant strong correlations with all three QSmetrics. The ResearchGate score exhibited a moderate correlation with REF metrics while a strong correlation with selected QS metrics was found. The strong correlation between altmetrics and bibliometrics in the study indicated that the researchers who have greater academic impact enjoy better social impact among researchers sharing similar research interests.

3. Methodology

The data were collected manually by visiting the profile pages of all the members who had an account in ResearchGate under Univ.Delhi P&A during the first week of July, 2016. The department was chosen because it had a relatively higher uptake of ResearchGate and is one of the most reputed departments of the university. The authors found a total of 173 members in ResearchGate from the department. Data were collected for publications, reads, profile views, citations, impact points, RGScore, followers and following from the profile pages of the members. Correlations were calculated amongst the metrics provided by ResearchGate to seek the nature of the relationship amongst the various ResearchGate metrics.

4. Data analysis and results

4.1 Analysis of publications of members

The present study carried out an altmetric analysis of ResearchGate members of Univ. Delhi P&A. The data were analysed for the publications that were updated by researchers in their profiles on ResearchGate as shown in Table I. The average number of publications added by researchers was found to be 32.35. Members who have added publications in the range of 1-10 were found to be in the largest proportion (34.1 per cent). Only one (0.58 per cent) researcher has added publications in the range of 71-80. Only one(0.58 per cent) researcher has added publications in the range of 91-100. In all, 49 (28.32 per cent) researchers did not add any publication to their profiles. This shows the presence of new researchers who had just joined research degree courses and may not have publications to their credit yet. In all, 14 (8.09 per cent) researchers have added more than 100 publications in their profiles. This could possibly be because of the very few senior researchers and faculty members present in ResearchGate.

S.No.	Publications	Members	Members %
1	0	49	28.32
2	1-10	59	34.1
3	11-20	24	13.87
4	21-30	4	2.31
5	31-40	3	1.73
6	41-50	8	4.62
7	51-60	5	2.89
8	61-70	2	1.16
9	71-80	1	0.58
10	81-90	3	1.73
11	91-100	1	0.58
12	> 100	14	8.09

Table I. Distribution of ResearchGate members of Department of Physics and Astrophysics, University of Delhi (India) according to publications

Further, the distribution of ResearchGate members of Univ.Delhi P&A according to full-texts of publications added was carried out and it was found that 94 (54.34 per cent) researchers did not add full text of any of their publications to their profiles. In all, 61 (35.26 per cent) researchers have added full text in the range of 1-10 (Table II). Only one researcher has added the full texts of more than 40 publications. The median value of full-texts added by researchers was found to be 5 and the average number of full-texts was found to be 3.85. In ResearchGate, the contribution of a researcher is further classified as articles, conference papers, data sets, questions, answers, chapters, technical reports, etc. The analysis of the contributions of the researchers revealed that 52 (30.06 per cent) members did not add a single article. Articles were added by 122 (70.52 per cent) members. Conference papers were added by 62 (35.84 per cent) members. Chapters were added by 21 (12.14 per cent) members. Data sets were added by 30 (17.34 per cent) members.

In all, 63 (36.42 per cent) researchers have added articles in range of 1-10; 34 (19.65 per cent) researchers have added articles in the range of 11-50; 24 (13.87 per cent) researchers have added more than 50 articles to their profiles; 109 (63.01 per cent) researchers did not add any conference paper; 55 (31.79 per cent) researchers have added conference papers in the range of 1-10; and Nine (5.20 per cent) researchers have added more than ten conference papers. Only 21(12.13 per cent) researchers have added chapters to their profiles. The number of chapters that were added by researchers was in the range of 1-3. In all, 30 (17.34 per cent) researchers have added data sets to their contributions in their profiles. The data sets added by researchers were found to be in the range of 1-9. The addition of conference papers by researchers to their profiles indicates that ResearchGate can be a good platform for dissemination of such types of research work which are poorly indexed by indexing services.

4.2 Other contributions

The diverse nature of ResearchGate as being an SNS along with providing a platform for questions and answers was also revealed; however its use as a question and answer site still needs higher uptake. Only 12 (6.94 per cent) members have answered questions in ResearchGate; nine (5.2 per cent) members have asked questions in ResearchGate; five (2.89 per cent) members have added projects to their contributions; two (1.16 per cent) members have added technical reports to their profiles in ResearchGate; one member has added a book to his contributions; one member has added a presentation to his profile on ResearchGate; one person has added a thesis in his profile on ResearchGate. This shows that researchers are getting engaged in asking questions on ResearchGate, which is an additional advantage for researchers, especially from a developing country prospective. Also, ResearchGate can become a platform where researchers can come to know what others are working on currently rather than simply knowing what they have published.

Table II. ResearchGate members of Univ. Delhi P&A according to number of full-texts added

S.No.	Full-texts added	Members	Members %
1	0	94	54.34
2	1-10	61	35.26
3	11-20	9	5.2
4	21-30	2	1.16
5	31-40	6	3.47
6	41-50	1	0.58

Notes: Distribution of ResearchGate members of Department of Physics and Astrophysics, University of Delhi (India) according to full-texts of publications added

4.3 Reads and citations

ResearchGate along with being a SNS for researchers also provides various metrics such as how many times research works of a researcher have been cited or read by other researchers. The analysis of profiles of researchers in the study found that 54 (31.21 per cent) researchers did not receive any reads in ResearchGate. Researchers who received at least one Read was found to be 119 (68.79 per cent). Majority (52, 30.06 per cent) of researchers who have received at least one read were in the range of 1-200 (Table III). Only 24 (13.87 per cent) researchers have more than 1,000 reads. Average reads acquired per person was found to be 909.49, however, the median value of reads was found to be 95. The difference between the average (arithmetic mean) and the median shows that there are very few researchers whose work gains a lot of attention in ResearchGate.

The distribution of ResearchGate members of Univ.Delhi P&A according to citations received was studied. The analysis of the data showed that 65 (37.57 per cent) members did not receive any citations in ResearchGate. In all, 63 (36.42 per cent) members have received citations in the range of 1-100. Only 21 (12.14 per cent) members have received more than 500 citations with 13 members having received more than 1,000 citations and one member with more than 20,000 citations. Average citation per member in ResearchGate was found to be 414.60 whereas the median value was found to be 7. As researchers who are involved in research for a long time have higher citations, such a difference between the average citations and median value of citations indicates very few researchers who are highly cited have joined ResearchGate (Table IV).

4.4 Impact points

impact points is calculated on the basis of the JIFs of the journals in which a researcher has published. It shows how successful a researcher has been in publishing in journals with higher JIFs. The impact points of 116 (67.05 per cent) researchers were found to be more than zero with the average impact points per researcher being 136.50. impact points for researchers ranged from 0.2 to 4,621.62. impact points of 78 (45.09 per cent) researchers were in the range of 0.2-50. impact points of only 11 (6.36 per cent) researchers were more than 300 (Table V).

Table III. Distribution of ResearchGate members of Department of Physics and Astrophysics, University of Delhi (India) according to reads

S.No.	Reads	Members	Members %
1	0	54	31.21
2	1-200	52	30.06
3	201-400	18	10.4
4	401-600	10	5.78
5	601-800	7	4.05
6	801-1,000	8	4.62
7	> 1,000	24	13.87

Table IV. Distribution of ResearchGate members of Department of Physics and Astrophysics, University of Delhi (India) according to citations received

S.No.	Citations	Members	Members %
1	0	65	37.57
2	1-100	63	36.42
3	101-200	8	4.62
4	201-300	4	2.31
5	301-400	8	4.62
6	401-500	4	2.31
7	> 500	21	12.14

4.5 Followers and following

The analysis on the basis of number of followers a researcher had and the number of researchers the researcher was following was conducted. The number of followers of a researcher could possibly be an indicator of his popularity amongst his peers. It revealed that nine (5.20 per cent) members had no followers in ResearchGate. It was found that 62 (35.84 per cent) members have followers in the range of 1-10. Only 11 (6.36 per cent) members have more than 100 followers (Table VI).

Table VII shows the distribution of ResearchGate members of the Univ.Delhi P&A according to the number of members each researcher was following. The analysis of the data revealed that 19 (10.98 per cent) members did not follow any other ResearchGate member. It was further found that 59 (34.10 per cent) members were following 1-10 ResearchGate members. Only 13 (7.51 per cent) members were following more than 100 members. Unlike traditional metrics which focus on who is citing a researchers work, followers and following data could possibly also reflect the popularity of a researcher other than his own subject area. Researchers from other subject areas could be influenced with the researchers' work without actually citing him.

Table V.
Distribution of ResearchGate members of Department of Physics and Astrophysics, University of Delhi (India) according to impact points

S.No.	Impact points	Members	Members %
1	0	57	32.95
2	0.2-50	78	45.09
3	51-100	13	7.51
4	100-150	10	5.78
5	150-200	0	0
6	200-250	5	2.89
7	250-300	0	0
8	> 300	11	6.36

Table VI.
Distribution of ResearchGate members of Department of Physics and Astrophysics, University of Delhi (India) according to number of followers

S.No.	No. of followers	Members	Members %
1	0	9	5.2
2	1-10	62	35.84
3	11-20	35	20.23
4	21-30	20	11.56
5	31-40	13	7.51
6	41-50	8	4.62
7	51-100	15	8.67
8	> 100	11	6.36

Table VII.
Distribution of ResearchGate members of Department of Physics and Astrophysics, University of Delhi (India) according to number of following members

S.No.	No. of following members	Members	Members %
1	0	19	10.98
2	1-10	59	34.1
3	11-20	29	16.76
4	21-30	18	10.4
5	31-40	13	7.51
6	41-50	11	6.36
7	51-100	11	6.36
8	> 100	13	7.51

4.6 Profile views

The analysis of the data for profile views revealed that 45 (26.01 per cent) members had profile views in the range of 1-50 and 45 (26.01 per cent) members had profile views in the range of 51-100. Only six (3.47 per cent) members had profile views in the range of 301-500 and also in the range of 351-400. It was found that only 27 (15.61 per cent) members had more than 400 profile views with five (2.89 per cent) members having more than 1,000 views. The greatest concentration of members had profile views in the range of 1-100 (Table VIII). As an altmetric indicator, profile views indicate the popularity of a member in ResearchGate.

4.7 RGScore

RGScore, a novel indicator developed by ResearchGate, as a metric that indicates how a researcher is perceived by his peers was also analysed. Only four (2.31 per cent) researchers had RGScore equal to 0. In all, 45 (26.01 per cent) researchers had RGScore equal to 0.01. Totally, 39 (22.54 per cent) researchers had RGScore in the range of 1-10. Only seven (4.05 per cent) researchers had RGScore greater than 40 (Table IX). ResearchGate is a rich source of altmetric indicators. It helps researchers know their position within the scientific community and provides them with a metric that exhibits how their research is received by peers (ResearchGate, n.d.). The exact algorithm has not been disclosed. It is calculated on the basis of the reflection of other researchers' reaction to the researcher's work. Thus, RGScore of a researcher cannot be improved by him/her directly. To analyse RGScore in greater depth, we studied the relationship amongst RGScore and other ResearchGate metrics.

4.8 Relationship between RGScore and other ResearchGate altmetrics

Correlations were calculated between RGScore and profile views, reads, followers, publications, and other ResearchGate metrics. Spearman's rank correlation coefficient (ρ) was calculated for RGScore and reads and was found to be 0.84. Figure 1 shows the scatter

Table VIII. Distribution of ResearchGate members of Department of Physics and Astrophysics, University of Delhi (India) according to profile views

S.No.	Profile views	Members	Members %
1	1-50	45	26.01
2	51-100	45	26.01
3	101-150	22	12.72
4	151-200	9	5.2
5	201-250	9	5.2
6	251-300	8	4.62
7	301-350	6	3.47
8	351-400	6	3.47
9	> 400	27	15.61

Table IX. Distribution of ResearchGate members of Department of Physics and Astrophysics, University of Delhi (India) according to RGScore

S.No.	RGScore	Members	Members %
1	0	4	2.31
2	0.01	45	26.01
3	0.02-1	8	4.62
4	1-10	39	22.54
5	10-20	33	19.08
6	20-30	22	12.72
7	30-40	15	8.67
8	> 40	7	4.05

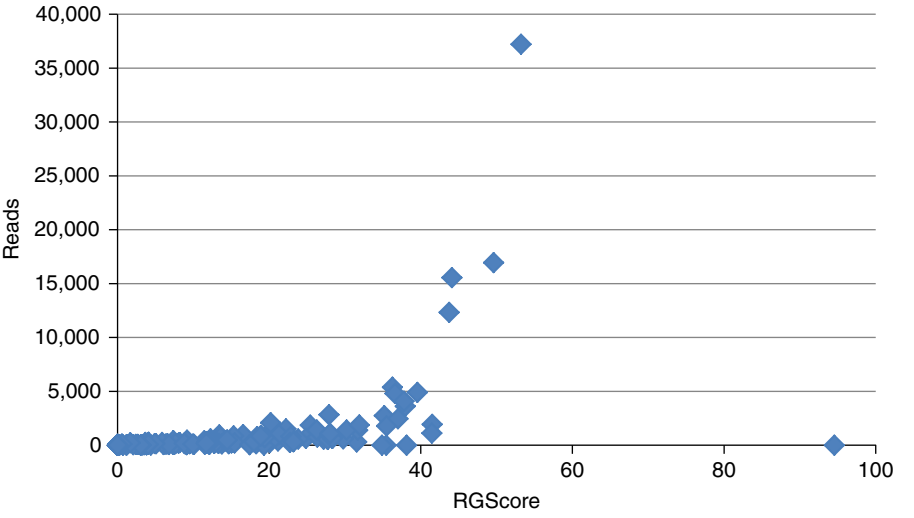

Figure 1.
Scatter plot for RGScore and reads

plot for RGScore and reads. This indicates a strong positive correlation between the two indicators. Higher readership of a researcher indicates the high popularity of a researcher's work. Researchers who had higher readership could possibly be more popular than others. A strong correlation between the two metrics could possibly indicate that RGScore can be used as an indicator for research evaluation.

Spearman's rank correlation coefficient (ρ) for profile views and RGScore was found to be 0.70 which is strong positive correlation. profile views indicate the popularity of a researcher. Researchers visit the profiles of other researchers to know what they are up to. Also, it may be possible that the popularity of a researcher may be due to his research work, but there are also cases where asking and answering questions resulted in higher profile views. Figure 2 shows the scatter plot for RGScore and profile views.

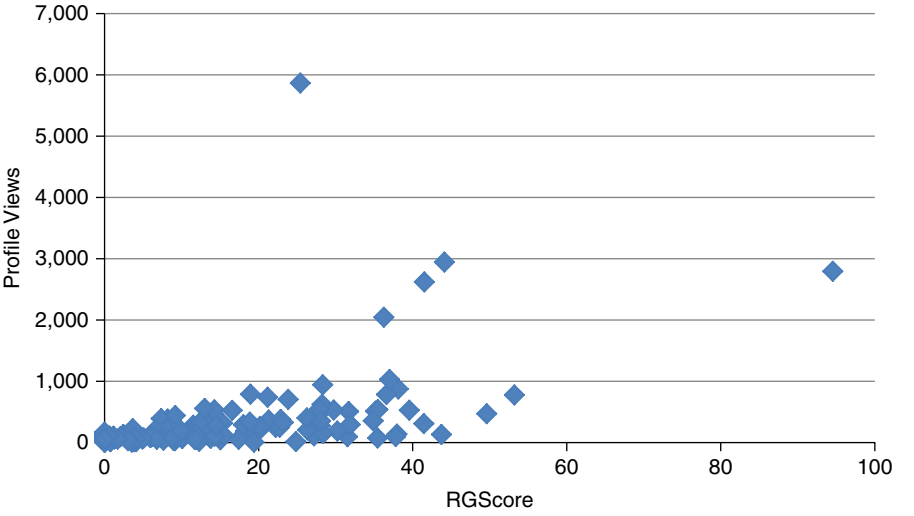

Figure 2.
Scatter plot for RGScore and profile views

Spearman's rank correlation coefficient (ρ) between RGScore and followers was found to be 0.61 which indicates strong positive correlation between the two ResearchGate indicators (Figure 3) Young researchers tend to follow senior researchers and their peers. But senior researchers could possibly be not following junior researchers. The reason to follow a researcher may vary. Colleagues of the same institution may follow each other but there may be some researchers who may be popular equally around the globe resulting in high number of followers. Therefore, it can be said that RGScore of researchers with a large number of followers is higher thereby indicating RGScore to also be a measure of popularity of a researcher.

Spearman's rank correlation coefficient (ρ) for RGScore and Full texts of publications added by researchers was found to be 0.63 indicating strong positive correlation (Figure 4).

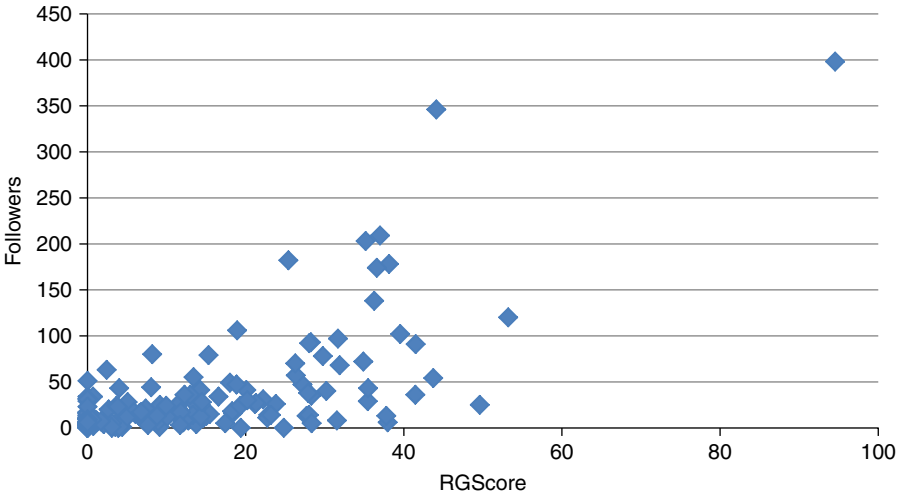

Figure 3.
Scatter plot for RGScore and number of followers

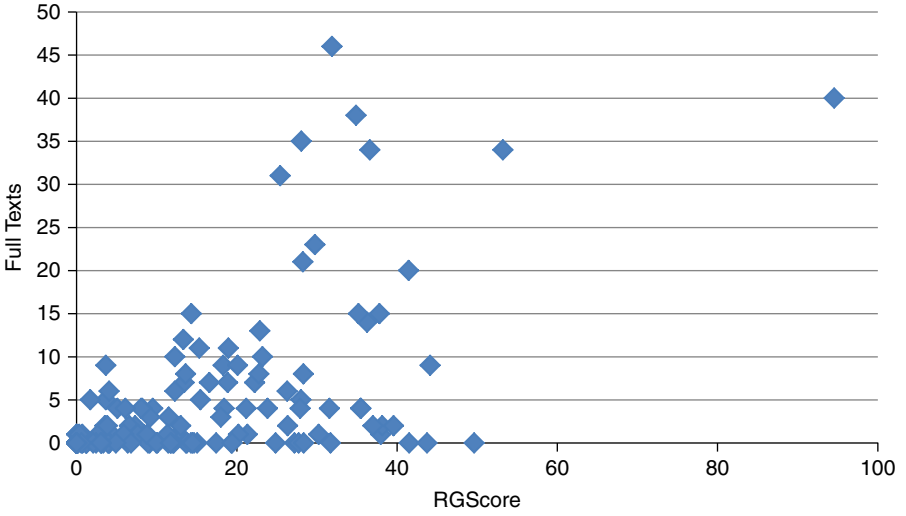

Figure 4.
Scatter plot for RGScore and full-texts of publications added

This indicates that those researchers who have added full texts of their publications had higher RGScores. This may be due to the fact that other members of ResearchGate may be visiting the profiles of researchers with full-texts, thereby increasing profile views. RGScore being an indicator that depends upon how a researcher is taken by his peers is thus expected to be higher for researchers who are popular. Adding full texts of one's contribution in ResearchGate makes it easier for researchers' followers to access research. Also, contributions in which there are multiple authors may result in the visibility of the other author through the publication. A researcher who might be following one of the authors of a work may start following other authors too as a result of similar interests.

Spearman's rank correlation coefficient (ρ) between RGScore and publications added by researcher to his/her profile was calculated and found to be 0.97 which is strong positive correlation (Figure 5). This indicates that those researchers who have added more publications to their profiles have higher RGScores.

4.9 Relationship between RGScore and citation based metrics

Although there are many sources for getting citation-based metrics such as Web of Science, Scopus and Google Scholar, yet we have taken citations from ResearchGate itself. This was because we wanted to know their relationship with RGScore and taking citation-based metrics from some other sources would not have been appropriate. Spearman's rank correlation coefficient (ρ) was calculated for RGScore and citation counts in ResearchGate and was found to be 0.95 (Figure 6). This indicates a very strong positive correlation between the two indicators. High citation counts of a researcher indicate the high popularity of a researcher's work and therefore may draw more attention towards a researcher and therefore researchers may have high RGScores.

Spearman's rank correlation coefficient (ρ) was calculated for RGScore and impact points and was found to be 0.99 (Figure 7). This indicates a very strong positive correlation between the two indicators. impact points is the result of the JIFs of the journals in which a researcher has published. A researcher who has high impact points has published more articles in journals with high JIFs. These results indicate that the altmetric indicator RGScore appears to give similar results as the traditional citation-based indicators.

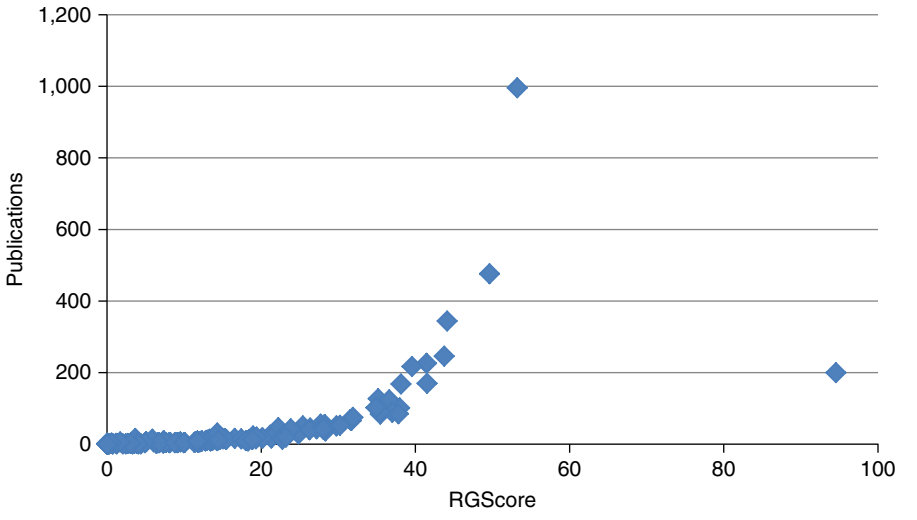

Figure 5.
Scatter plot for RGScore and publications

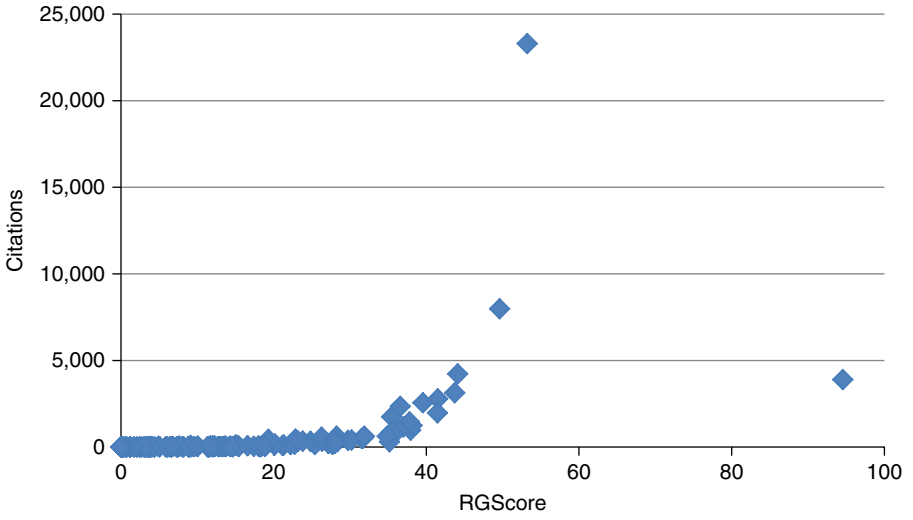

Figure 6.
Scatter plot for RGScore and citation counts

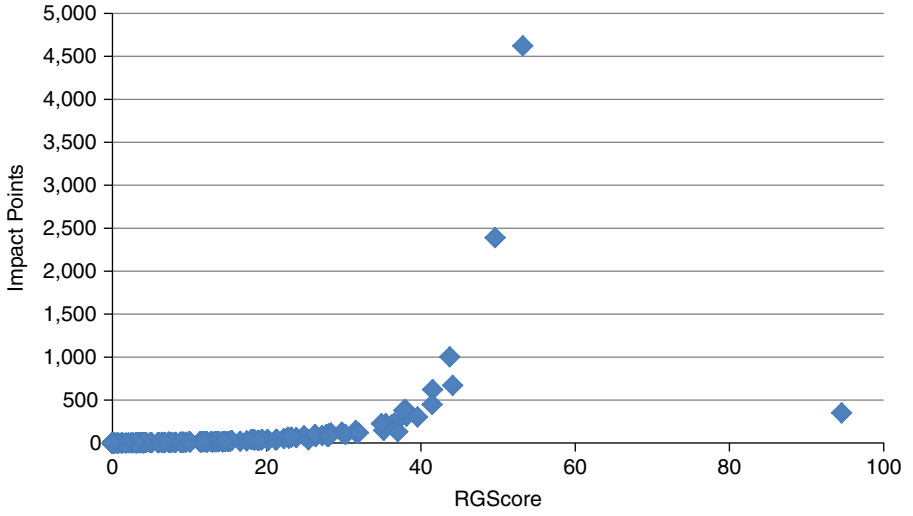

Figure 7.
Scatter plot for RGScore and impact points

5. Discussions and conclusion

The present study carried out an altmetric analysis of ResearchGate members of Univ. Delhi P&A. The analysis revealed that the publications added by researchers to their profiles were relatively low as 28.32 per cent of the members had not added even a single publication to their profiles, probably because a lot of young researchers who have just joined research degree courses and would not have published any research yet. This could also indicate the possibility that although researchers are joining ResearchGate, they are not adding their publications to it at the same time. It was further found that more than half of the members did not add any full text of their publications to their profiles. Articles were the most common type of contribution added by researchers, followed by conference papers, data sets and chapters indicating that ResearchGate can be a good platform for accessing and

retrieving conference papers and other non-article publications which are relatively poorly indexed by other indexing and abstracting services. The diverse nature of ResearchGate as being an SNS along with providing a platform for questions and answers was also revealed, however its uptake as a question and answer site still needs higher uptake.

The analysis of reads revealed that majority of the members (61.27 per cent) had received reads in the range of 0-20. This could possibly be because a lot of researchers did not add any publications to their profiles. The Spearman's correlation coefficient for reads and citations in ResearchGate was found to be 0.81 indicating strong positive correlation. This indicates that publications that were highly read were also highly cited in ResearchGate. impact points is another indicator of ResearchGate that is based on the JIFs of the journals in which a researcher has published. Majority of the researchers (45.09 per cent) had impact points in the range of 0.2-50. impact points, as a bibliometric indicator, may serve a good purpose in research evaluation. Number of followers of a researcher indicates his/her popularity in ResearchGate. The greatest concentration of members (35.84 per cent) had followers in the range of 1-10, followed by the range of 11-20 and so on. Similarly, the analysis of the Following data shows that most of the members in ResearchGate (34.1 per cent) are following other members in the range of 1-10. Followers and following data can be a new indicator for knowing the popularity of a researcher. With the rise of altmetrics such indicators can possibly be useful. Similarly, profile views is another indicator that shows the popularity of a researcher. Majority of the members (52.02 per cent) had profile views in the range of 1-100. This indicates that ResearchGate indicators like followers, following and profile views can serve a valid purpose of measuring the popularity of a researcher amongst his/her peers.

RGScore, a novel indicator developed by ResearchGate was studied in depth and it was found that most of the members (26.01 per cent) had RGScore equivalent to 0.01. These are generally those members who have either gained some followers or asked questions in ResearchGate or answered some questions in ResearchGate. As RGScore is an indicator that is dependent upon how a researcher is perceived by his peers, all the other indicators influence it indirectly (ResearchGate, n.d.). All the ResearchGate metrics correlated positively with RGScore. The highest correlation of RGScore was found with publications added by researchers to their profiles. This indicates that those researchers, who added their publications to their profiles in ResearchGate and made their research more visible, had higher RGScores. It was followed by correlation between RGScore and reads. As reads is a metric that is dependent upon the number of publications added by a researcher to his/ her profile, higher readership due to higher number of publications added could possibly cause a higher RGScore. It was followed by correlation between RGscore and profile views. It was followed by correlation between RGScore and number of Full Texts and correlation between RGScore and number of followers of a researcher. This may be because full texts of publications attract many other researchers thereby increasing profile views, followers and reads.

To establish relationship between RGScore and citation-based metrics, Spearman's correlation was also calculated between RGScore and citation counts, and RGScore and impact points. Both the correlations showed very strong positive correlation indicating that the altmetric indicator RGScore was higher for highly cited authors and researchers who had published in reputed journals. Thus, RGScore could be used along with citation-based metrics and can perhaps be used as an indicator for research evaluation although it is very different in nature from traditional metrics. The strong positive correlation of RGScore with impact points indicates that members with more publications in journals with higher JIFs had higher RGScore. The strong positive correlation between RGScore and citations in ResearchGate shows that researchers who gained more citations, had a higher RGScore. Therefore, RGScore could also possibly reflect how much impact a researcher had on others' work. However, as researchers have not added their publications completely to their accounts and the uptake of

ResearchGate is still not high, ResearchGate altmetric indicators should be used complementary to the established citation-based indicators. Also, future research in altmetrics can be conducted that would focus more on cross-discipline uptake or ResearchGate.

6. Limitations

The first limitation of this study is that as more researchers may join ResearchGate, with time the uptake of ResearchGate will increase therefore resulting in different data sets and results. Second, the study has been conducted only on the members of Univ. Delhi P&A. This, however, provides further scope for research using another sample by size or by characteristics.

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Further reading

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