

## The Use of Social Networks by Business Researchers. Comparison of Google Scholar and ResearchGate Usage by Scientists from Polish Economics Universities

Submitted: 03.09.19 | Accepted: 29.10.19

**Łukasz Wiechetek\***

Not only private but also professional contacts can be established and maintained with the use of social media. Specialized social media platforms like ResearchGate (RG) or Google Scholar (GS) can integrate scientists with similar interests, educational career or professional background. Web 2.0 tools and metrics offered by the platforms are used for both access to up-to-date research, quick communication and to build global research networks, create professional digital identities or evaluate/compare scientific achievements. The aim of the article is to show if ResearchGate and Google Scholar platforms are frequently used by Polish business researchers and indicate the differences between the values of metrics provided by RG and GS. The author explores the values of metrics provided by the platforms and their usefulness in the evaluation process. The paper presents the characteristics of metrics used by ResearchGate and Google Scholar. The author compares the values of three directly comparable metrics: citations, number of items and h-index provided by both RG and GS portals. The main part of the article is a comparative analysis of Google Scholar and ResearchGate usage by business scientists from Poland.

Data of 364 researchers from three faculties of economics (top, middle and least prestigious – according to the educational ranks) were collected. The performed literature review, the author's experience and a comparative analysis indicate that specialized social networks are very helpful and easy to use, however not frequently used by Polish business researchers. Both Google Scholar and ResearchGate offer many metrics useful for research, the researcher and the department evaluation. Metrics calculated by RG are more insightful and allow for an in-depth analysis of achievements and the impact, while GS metrics are calculated not only in total but also for the last five years; therefore, they may be particularly useful to monitor recent scientific achievements and progress. The comparative analysis also showed that values of comparable Google Scholar metrics are higher than RG indicators and present business researchers in a better light.

**Keywords:** social network, specialized social network, SNS, ResearchGate, Google Scholar, RG Score, h-index, researcher online, evaluation, bibliometrics.

---

\* **Łukasz Wiechetek** – dr, Department of Information Systems and Logistics, Faculty of Economics, Maria Curie-Skłodowska University, Poland. <https://orcid.org/0000-0001-7755-2282>.

---

Correspondence address: Maria Curie-Skłodowska University, Plac Marii Curie-Skłodowskiej 5, 20-031 Lublin, Poland; e-mail: [lukasz.wiechetek@umcs.pl](mailto:lukasz.wiechetek@umcs.pl).

## **Użytkowanie sieci społecznościowych przez naukowców. Porównanie wykorzystania Google Scholar i ResearchGate przez pracowników wybranych polskich uczelni ekonomicznych**

Nadesłany: 03.09.19 | Zaakceptowany do druku: 29.10.19

Za pomocą mediów społecznościowych można nawiązywać i utrzymywać nie tylko prywatne, lecz także profesjonalne kontakty. Specjalistyczne platformy społecznościowe, takie jak ResearchGate (RG) lub Google Scholar (GS), mogą integrować naukowców o podobnych zainteresowaniach, karierze edukacyjnej lub doświadczeniu zawodowym. Narzędzia i wskaźniki oferowane przez te platformy są wykorzystywane zarówno w celu uzyskania dostępu do aktualnych badań, szybkiej komunikacji, jak i do budowania globalnych sieci badawczych, tworzenia cyfrowego portfolio lub oceny/porównywania osiągnięć naukowych. Celem artykułu jest zbadanie czy platformy ResearchGate i Google Scholar są popularne wśród polskich badaczy biznesowych oraz wskazanie różnic między wartościami metryk dostarczonych przez RG i GS. Autor analizuje wartości wskaźników dostarczanych przez platformy i ich przydatność w procesie oceny dorobku naukowego czy realizowanych badań. Artykuł przedstawia charakterystykę wskaźników publikowanych przez ResearchGate i Google Scholar, autor porównuje wartości trzech bezpośrednio porównywalnych wskaźników: liczby cytowań, liczby publikacji oraz indeksu h. Główną częścią artykułu jest analiza porównawcza wykorzystania Google Scholar i ResearchGate przez naukowców z wybranych polskich uczelni ekonomicznych.

Prezentowane analizy bazują na danych dotyczących 364 badaczy z trzech uczelni ekonomicznych (najlepszej, średniej i najmniej prestiżowej – według rankingów edukacyjnych). Przeprowadzony przegląd literatury, doświadczenia autora oraz analiza porównawcza wskazują, że wyspecjalizowane sieci społecznościowe są bardzo pomocne i łatwe w użyciu, jednak rzadko używane przez polskich badaczy biznesu i ekonomii. Zarówno Google Scholar, jak i ResearchGate oferują wiele wskaźników przydatnych w procesie oceny naukowców oraz ośrodków naukowych. Dane prezentowane przez RG są bardziej szczegółowe i pozwalają na bardziej dogłębną analizę osiągnięć, podczas gdy wskaźniki publikowane na platformie GS liczone są także za ostatnie pięć lat, dlatego mogą być szczególnie przydatne do monitorowania dynamiki rozwoju naukowego i postępów pracownika. Analiza porównawcza wykazała również, że platforma Google Scholar publikuje wyższe wartości porównywalnych metryk niż RG i prezentuje badaczy w lepszym świetle.

**Słowa kluczowe:** sieć społecznościowa, specjalistyczna sieć społecznościowa, SNS, ResearchGate, Google Scholar, RG Score, indeks h, naukowiec online, ewaluacja, bibliometria.

**JEL:** D81, D83, L86

### **1. Introduction**

Social network sites are platforms where the content is generated not by administrators, journalists or specialized editors, but by common internet users. These tools use comments, blogs, wikis and offer a lot of mechanisms for sharing data, networking and developing communities. Social portals are mostly free and open, accessible for many common internet users, because they are easy to use, transparent, offer simple tools for data searching and content upload or creation. At present, social network sites can be used

not only for entertainment, education but also for business and scientific purposes. The social media platforms are quite easy to enter and use. They are free of charge, have a great scope and provide immediate feedback (Nature, 2018, p. 1). These services can integrate the scientific community and therefore are used by researchers, scientists, academics but also by business representatives.

Social media platforms bring many advantages: easiness of use, global access and connectivity, cost effectiveness, easy analysis, measurement and evaluation. They help to build loyal communities, provide immediate interaction and allow for gaining community insights (users' feedback). However, like every IT tool, they may also generate new problems and risks: addiction, exposure to cyberbullying, hacking, lack of privacy, time consumption and the easiness of analyzing by competitors or opponents (Nature, 2018, p. 1).

The most popular social media platforms for scientists are Google Scholar, ResearchGate, ResearcherID, LinkedIn. Those tools are frequently used by researchers for building a scientific portfolio, sharing information, establishing research networks, building global communication channels and getting access to other works or finding an interesting job (Van Noorden, 2014, p. 1). They also help to compare and evaluate scientific achievements.

The structure of the article is as follows. First, in the theoretical background the author presents the characteristics of ResearchGate, Google Scholar and metrics used by the portals. In the second paragraph, the research process and methods are described. The main part of the article is a comparative analysis of Google Scholar and ResearchGate usage by the business scientists from Poland. The author compares the values of three metrics: citations, number of items and h-index provided by both RG and GS portals. Finally, conclusions, limitations and directions of future research are presented.

Specialized social networks are more and more popular; therefore, their usage and analysis of new functionalities and provided metrics should be still an important area of research. Hence, the aim of the article is to show if ResearchGate and Google Scholar platforms are frequently used by Polish business researchers and to compare the values of the main metrics provided by those platforms among different types of faculties and researchers.

## **2. Theoretical Background**

### **2.1. Google Scholar and ResearchGate Metrics**

#### **Google Scholar**

Google Scholar is a free bibliographic database launched in 2004. The platform is available on <https://scholar.google.com>. It indexes many types of research items like articles, books, conference proceedings, disserta-

tions, preprints and patents. GS allows searching for research items and researchers. It offers many useful mechanisms for saving the article, making the references, viewing the list of related articles. Registered users can update the profile, build a scientific portfolio and automatically calculate the metrics (Fig. 1).

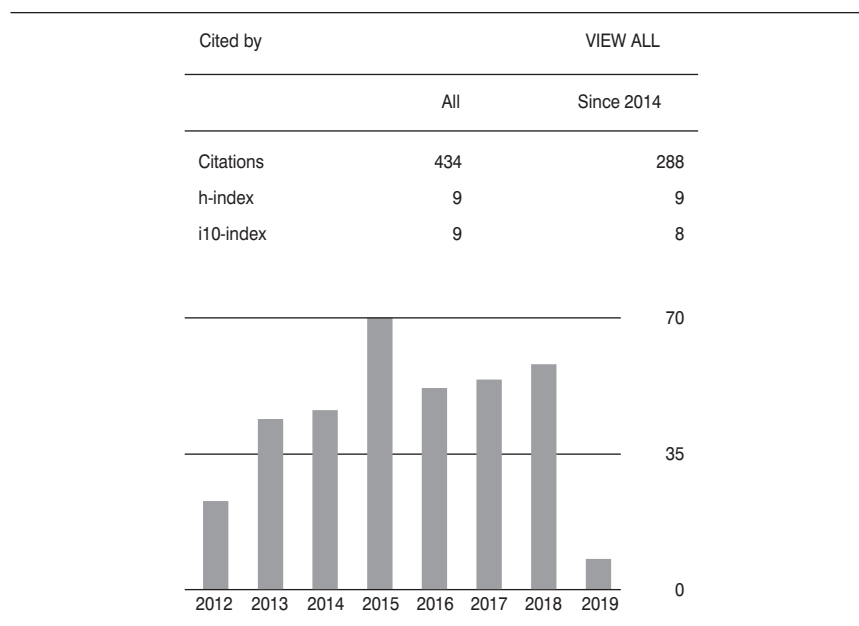


Fig. 1. The Google Scholar main metrics. Source: <https://scholar.google.pl> (access: 25.04.2019).

Google Scholar provides the total metrics of the researcher, but also calculates their values for the recent five years. The metrics provided by GS are:

- Citations – counts the number of citations of all publications,
- Citations\_5 – counts the number of new citations of all publications in the last five years,
- h-index – the largest number of at least h articles that were cited at least h times,
- h-index\_5 – the largest number of at least h articles that were cited at least h times in the last five years,
- i10-index – the number of publications with at least 10 citations,
- i10-index\_5 – the number of publications with at least 10 citations in the last five years,
- items – counts how many publications of the profile owner were indexed by Google Scholar.

### ResearchGate

ResearchGate is a specialized social network platform for researchers introduced in 2008. The platform is available at [www.researchgate.net](http://www.researchgate.net) and used mostly for sharing research, asking for feedback, finding collaborators and building research networks (ResearchGate, 2019). It has about 15mln users and contains 100mln publication pages. RG users can search and read the content. Registered researchers can also build the profile, add research items, follow the activities of other users, create groups and easily communicate with other users. RG offers many benefits but also generates some problems: intransparency, incorporating journals impact factor to evaluate a single researcher and not reconstructable changes in the RG score (Kraker & Lex, 2015, p. 1). Therefore, the RG score is sometimes seen as an unreliable indicator of scientific and academic reputation (Copiello & Bonifaci, 2018, p. 301).

ResearchGate offers an extensive system of metrics (Fig. 2) that can be used for evaluation of outcomes (Yu et al., 2016, p. 1002) but also for improving the recruitment process (Orduna-Malea et al., 2017, p. 443).

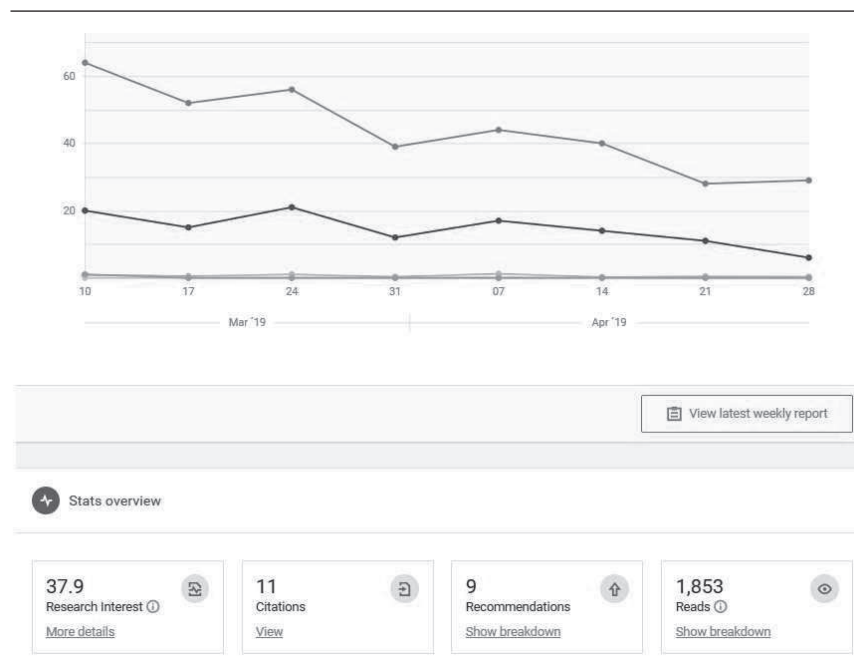


Fig. 2. The ResearchGate main metrics. Source: <https://www.researchgate.net> (access: 25.04.2019).

The metrics offered by ResearchGate include:

- RG Score – measures the scientific reputation of the portal user. It is based on published research and contributions to ResearchGate (questions, answers and followers),
- Total Research Interest – sum of the research interest of each research item added by the scientist. It is based on citations, reads and recommendations,
- Citations number – counts how many times a researcher's publication has been referred to in other scientific publications,
- h-index – the author-level metric that measures the productivity and citation impact of a given scientist's publications,
- Recommendations – indicates how many times the work of the profile owner was recommended by other members of the ResearchGate community,
- Reads – counts how often a researcher's work (full text or summary) was accessed on ResearchGate,
- Research items – counts how many publications and other items were uploaded to ResearchGate,
- Projects – number of projects created on the portal by the profile owner,
- Questions – number of questions asked by the profile owner. Shows how much of an impact the researcher has on the platform,
- Answers – number of answers given by the profile owner to other members of the ResearchGate community,
- Following – presents the number and list of researchers followed by the profile owner,
- Followers – provides the number and list of researchers that follow the profile owner.

## **2.2. Google Scholar and ResearchGate Comparison**

Google Scholar, ResearchGate and other specialized social networks for scientists are frequently analyzed and compared in the literature. The review of 91 comparative articles published from 2005 until 2016 which compared GS to various databases was performed by Halevi et al. The authors wanted to determine whether Google Scholar can be used as a suitable source of scientific information and data for scientific evaluation. They conclude that GS is a powerful and fast expanding database of scientific literature. However, the quality of resources is sometimes low and academics should not rely only on GS citations and metrics because they can be manipulated (Halevi et al., 2017, p. 338).

Martín-Martín et al. compared the user metrics generated by Google Scholar with those offered by ResearcherID, ResearchGate, Mendeley and Twitter. They concluded that Google Scholar provides a very precise and accurate picture of the bibliometric community. GS tool can be, therefore, very helpful to identify the most precious authors (Martín-Martín et al.,

2016, p. 56). They also assessed ResearchGate as the second most used specialized social network platform for scientists and indicated that RG provides both metrics related to academics performance and connectivity or popularity while Google Scholar profiles do not offer data about downloads or reads.

The performance behavior patterns in author-level metrics of Google Scholar, ResearchGate, and ImpactStory was investigated by Orduna-Malea and Delgado López-Cózar (Orduna-Malea & Delgado López-Cózar, 2017, p. 14). They wanted to verify the existence of diverse behavior patterns in academic production and impact. The authors examined 315 researchers and found out that the analyzed platforms had relatively few authors with high values of metrics and many with middle, low or zero performance. They noticed that some authors had many citations while others a lot of reads or online mentions. Researchers conclude that the values of provided metrics are related not only to the type of the research outcome but also to the type of readers (scientists cite, practitioners just read do not cite). Also Ortega analyzes the distribution of profiles from academic social networking sites Academia.edu, Google Scholar Citations and ResearchGate according to disciplines, academic status and gender. He concludes that ResearchGate is the most popular portal but GS and Academia.edu faster increase their population. The researcher also stresses that different platforms are preferred by researchers of different fields of studies. The author did not find differences in using internet platforms by gender or academic position (Ortega, 2017, p. 19).

Many research papers present also the comparison of strengths and weaknesses of specialized social portals. Falagas et al. compared the strengths and weaknesses of PubMed, Scopus, Web of Science, and Google Scholar (Falagas et al., 2008, p. 338). They compared the content coverage of explored platforms and claim that Google Scholar presents many benefits but also some drawbacks. It is free, offers full texts of the articles, it is connected to various websites; however, duplicate references, false-positive citations occur commonly. Google Scholar as a data source for research assessment is explored also by López-Cózar et al. The authors conclude that GS brings a broader view of the academic world. The platform made visible a great number of sources that were not previously unknown (López-Cózar, 2018, p. 1).

Bar-Ilan tried to answer the question which h-index, provided by WoS, Scopus or Google Scholar, is the best measure of reputation. The author indicates that in many cases the results presented by GS are different from the results provided by Scopus or WoS, so it matters which citation tool is used to compute the h-index that may cause the dilemma for the promotion committees and policy makers (Bar-Ilan, 2008, p. 257). A comparative study of Colombian researchers based on Google Scholar, ResearchGate and the National Measurement System was performed also by Aguillo et al. The

authors showed significant discrepancies between GS, RG and the National Measurement System. They suggest developing relative indicators for each discipline and advice Colombian academic and research organizations to use internet platforms for increasing visibility and impact of the research outcomes (Aguillo et al., 2016, p. 1147). Implications of the increasing use of metrics for scholarly communication and practices were explored by Ma and Ladisch. They examined Irish universities and found out that Google Scholar and ResearchGate are used by researchers for self-monitoring and that academics often perceive measures provided by the platforms as indicators of achievements (Ma & Ladisch, 2016, p. 132).

The analyzed literature shows that popular social media platforms for scientists are very helpful but offer various tools and metrics; therefore, they should be used with caution. They present various metrics and even comparable metrics have sometimes significantly different values. RG provides more metrics (RG Score, Total Research Interest, Citations, h-index Recommendations, Reads, Items, Projects, Questions, Answers, Following and Followers). They can be used for a profound analysis of the researcher and the research institution. Google Scholar presents fewer metrics, yet not only the total value but also the result for the last five years. Therefore, GS metrics could be the source of valuable information about the recent progress in the scientist's work. The comparable RG and GS metrics are shown in Fig. 3.

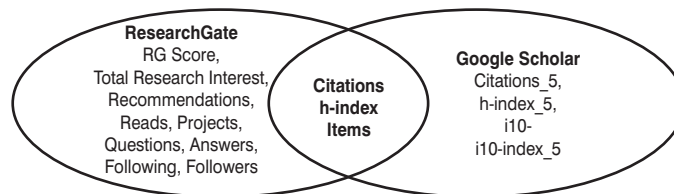


Fig. 3. Comparable RG and GS metrics. Source: Own work.

The emergence of new specialized social networking platforms for scientists, improving the existing ones and introduction of new tools and metrics but also development of digital societies require constant research addressing both strengths and weaknesses of the available SNS tools for scientists and the capabilities or limitations of their metrics. In the next paragraphs, a comparison of Google Scholar and ResearchGate usage by the scientists from Polish top, middle and the least prestigious economics departments will be presented.



### 3. RG and GS Comparison – Research Process and Methods

#### 3.1. The Research Questions

The author examined ResearchGate and Google Scholar profiles in order answer the following research questions:

- Do university staff use ResearchGate and Google Scholar to share information and build scientific portfolios?
- Do top departments have a higher percentage of employees with active ResearchGate and Google Scholar accounts?
- What are the average values of RG and GS metrics?
- What portal provides higher values of comparable metrics?
- Do researchers with higher metrics more frequently use both social networks?

#### 3.2. The Research Procedure

The research procedure consisted of five steps: literature background, choosing departments, preparing employees' list, collecting ResearchGate metrics, collecting Google Scholar metrics, comparative analysis, outcomes visualization. The research procedure is presented in Fig. 4.

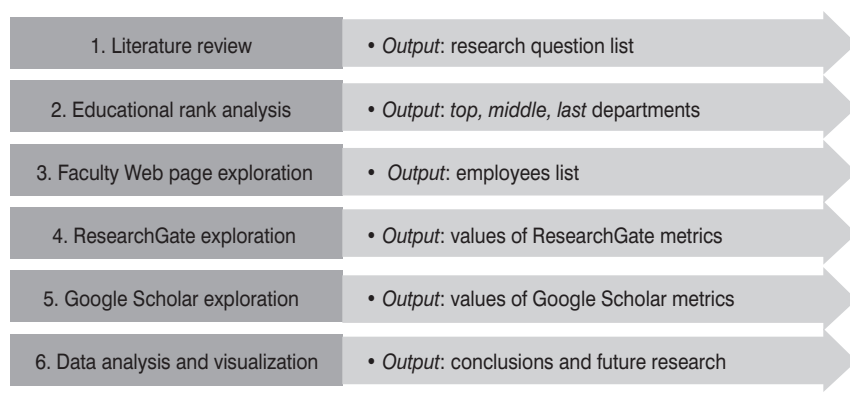


Fig. 4. The research procedure. Source: Own work.

The literature review was performed with Google Scholar. The author analyzed mostly articles published after 2015. The searched keywords were “ResearchGate”, “Google Scholar”, “Google Scholar and ResearchGate metrics”. The second step was the analysis of Perspektywy Fields of Study Ranking 2018 (Perspektywy, 2018). From the list of 32 departments, the author chose one from the top, one from the middle of the rank and one from the end of the list. The next step was collecting the employees data from the web pages of chosen departments. The employees list was developed

in Microsoft Excel. In the fourth and fifth step, data of 364 researchers were used to find out about their profile and collect the metrics form ResearchGate and Google Scholar. Data were collected manually to avoid the ambiguity of names. To find the right profile, the author used the title, name, surname and affiliation of the researcher. Data were collected at the beginning of April 2019. The acquired data were stored and initially analyzed in a Microsoft Excel spreadsheet (Fig. 5).

Title	Name_Surname	RG_Sci	RG_Int	RG_Cri	RG_Rev	RG_Rei	RG_Itel	RG_Prc	RG_Qui	RG_Ani	RG_Followi	RG_Fol	RG_h_i	GS_Cri	GS_h_i	GS_i10	GS_Itel
2		2,91	8,7	5	3	784	10	1	0	0	28	40	2				
5		6,68	65,1	102	8	948	26	2	0	0	23	51	6				
2		2,33	13,6	3	5	398	18	1	0	0	24	14	1				
4		2,73	1,8	0	0	348	10	0	0	0	2	4	0				
1														3	1	0	18
2		1,7	3,6	3	2	122	10	0	0	0	22	11	1	69	4	1	50
2		8,8	23,6	32	1	377	9	0	0	0	4	8	3	55	4	1	20
2		4,17	13,2	15	0	378	18	0	0	0	1	9	2	126	7	2	63
1																	
2		2,65	1,6	2	1	58	5	0	0	0	1	3	1				
2																	
2		4,21	1,7	0	0	181	9	0	0	0	5	8	0	15	3	0	23
4		2,78	23,3	1	2	1079	20	0	0	0	34	23	1	20	3	0	32
4																	
2		1,85	15,5	9	2	270	18	3	0	0	1	8	2	21	3	1	32
2																	
1		0	0,8	1	0	8	3	0	0	0	24	18	1	15	3	0	10

Fig. 5. Collected ResearchGate and Google Scholar data. Source: Own work.

The main part of the analysis was performed by means of IBM SPSS and for data visualization Microsoft Excel 2013 was used. The performed analysis allowed for developing final conclusions and questions for future research.

### 3.3. The Research Sample

The research sample consisted of 364 academics form three departments: the best, middle and the least prestigious. The characteristic of explored researchers is shown in Tab. 1.

Attribute		Count	Column N %
Gender	female	176	48.4%
	male	188	51.6%
Faculty	last	129	35.4%
	mid	125	34.3%
	top	110	30.2%
Title	MSc	56	15.4%
	PhD	204	56.0%
	PhD hab.	34	9.3%
	associate professor	41	11.3%
	professor	29	8.0%

Attribute		Count	Column N %
RG_Account	no	154	42.3%
	yes	210	57.7%
GS_Account	no	188	51.6%
	yes	176	48.4%
Both_Accounts	no	225	61.8%
	yes	139	38.2%
Least_One_Account	no	117	32.1%
	yes	247	67.9%
Only_One_Account	no	256	70.3%
	yes	108	29.7%

Tab. 1. The characteristic of explored researchers. Source: Own work.

Almost half of the explored researchers were women (48.4%). The investigated departments employed a similar number of employees, between 110 and 129. The most represented group of analyzed researchers comprised assistant professors with PhD (56%), the second biggest group included assistants with MSc. Also the profiles of 29 full professors were analyzed. Among the explored scientists, nearly 68% (n = 247) had a profile on ResearchGate or Google Scholar.

## 4. Research Findings

### Popularity of the Portals

The research sample consisted of 364 academics from three departments: best, middle and the least prestigious departments of economics. ResearchGate portal was more popular than Google Scholar. 57.7% of researchers possessed an account on RG, while only 48.4% had a Google Scholar profile. 67.9% of investigated researchers had a profile on at least one portal (Fig. 6).

There is no difference between the popularity of the ResearchGate portal in top, middle and least prestigious faculties. Researchers from middle class faculties more frequently had an account on Google Scholar (62.4%), while for the top and the last faculties it was respectively 42% and 40%.



Fig. 6. Popularity of RG and GS portals by faculty. Source: Own work.

Specialized social network sites were popular especially among researchers with habilitation and associate professors (mostly young professors). Above 76.5% of them owned at least one profile (Fig. 7). The analyzed portals were the least popular among the youngest group of scientists with MSc only. A little over half of them had an account on GS or RG.

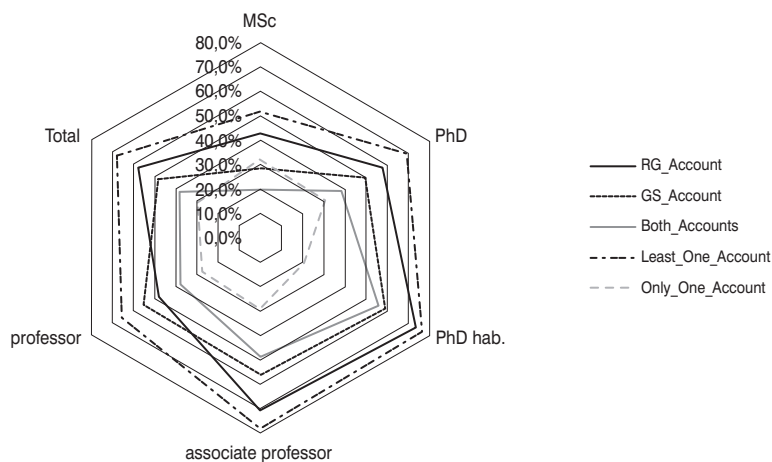


Fig. 7. Popularity of RG and GS portals by title. Source: Own work.

The ResearchGate portal is more popular among almost all groups of researchers (by title) except for full professors. 55.2% of professors have

a profile on Google Scholar and only 48.3% on ResearchGate. It can be concluded that RG is more popular among younger scientists, while the most experienced academics prefer Google Scholar (Fig. 8).

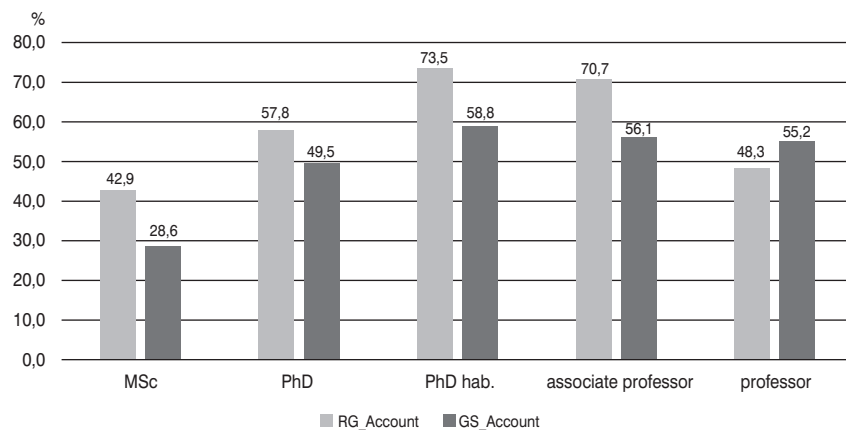


Fig. 8. Differences in popularity of RG and GS portals by title. Source: Own work.

The analysis showed also no differences between popularity of using RG and GS among female and male researchers (Fig. 9).

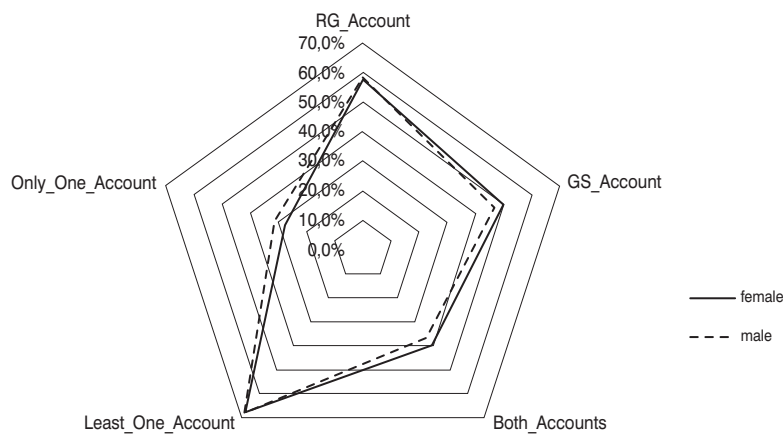


Fig. 9. Popularity of RG and GS portals by gender. Source: Own work.

About 58% of male and female scientists had a profile on ResearchGate and 50% of female (47% male) researchers owned a profile on Google Scholar.

### The Average Values of Main Metrics

Among 364 analyzed researchers, 210 had a profile on ResearchGate. The average values of ResearchGate metrics are presented in Tab. 2.

Metric	N	Mean	Median	Maximum	Standard Deviation
RG_Score	210	6.22	4.71	31.37	5.85
RG_Interest	210	44.85	17.15	943.20	90.39
RG_Citations	210	56.14	16.00	1119.00	121.55
RG_Recommendations	210	4.09	2.00	68.00	7.70
RG_Reads	210	1428.67	681.00	14718.00	2138.44
RG_Items	210	19.60	13.00	106.00	18.64
RG_Projects	210	1.27	1.00	16.00	1.97
RG_Questions	210	.20	.00	27.00	1.90
RG_Answers	210	.45	.00	45.00	3.31
RG_Following	210	33.42	21.00	1088.00	84.01
RG_Followers	210	32.94	20.50	333.00	42.64
RG_h_index	210	2.64	2.00	20.00	2.84

Tab. 2. The average values of ResearchGate metrics. Source: Own work.

The average RG score value was 6.22, its maximal value was above 31. The new RG metrics, Total Research Interest, was introduced to get more detailed information about the impact of the research items and researchers. Its average value was 44.85; however, more than half of the examined academics had its value at less than 17.15. An important metric is also the citation index. Its average value was over 56; the most cited researcher had 1119 citations. The average values of questions and answers indicate that the ResearchGate portal is rarely used for asking questions and giving quick answers via RG. The average values of these metrics were respectively 0.20 and 0.45. ResearchGate is used also for creating groups of researchers. The average RG user followed over 33 other academics and was also followed by a similar number of researchers. The h-index of the analyzed academics was rather low. Half of the explored researchers had the value of h-index of less or equal to 2.

Also Google Scholar provides its own metrics. It offers seven different metrics. Citations count, h-index and i10-index are counted in total and for the last five years, so they can be treated as six different metrics. GS presents also the number of research items published by the registered user. The average values of total Google Scholar metrics are presented in Tab. 3.

Metric	N	Mean	Median	Maximum	Standard Deviation
GS_Citations	176	209.13	94.00	2424.00	330.08
GS_h_index	176	5.77	5.00	25.00	4.15
GS_i10_index	176	4.70	2.00	54.00	7.59
GS_Items	176	47.83	37.00	171.00	32.61

Tab. 3. The average values of Google Scholar metrics. Source: Own work.

Among 364 explored researchers, 176 had profiles on Google Scholar. Half of them were cited more than 94 times and their h-index was more than 5. The average number of research items indexed by GS profile was nearly 48.

The mean values of the most important RG metrics differed between top, middle and least prestigious faculties (Fig. 10).

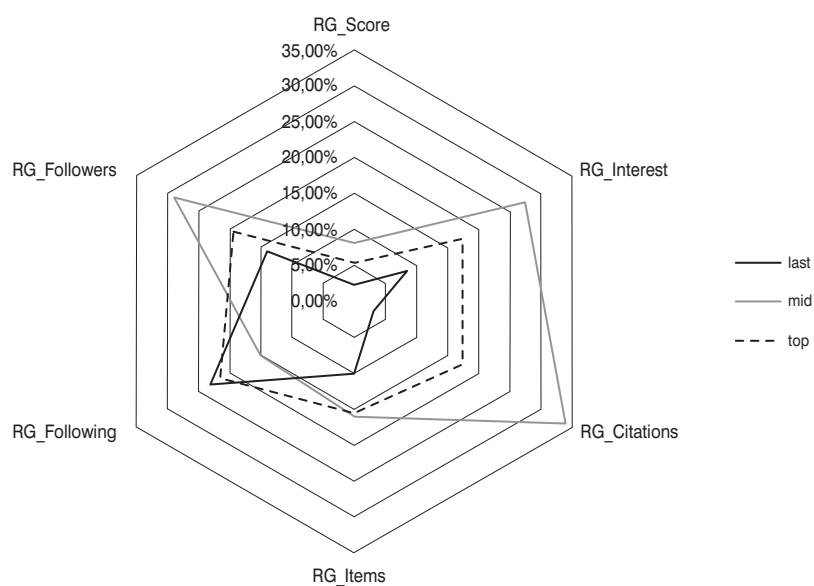


Fig. 10. The mean values of main RG metrics by faculty. Source: Own work.

In the last prestigious faculty, half of the employees had the RG score of less than 2.33 while in top faculty the mean value was 8.17. The same tendency was observed for Total Research Interest, Citations count and number of followers. The middle number of presented research items was similar for middle and top faculties. The reverse relation was observed for the number of following researchers. Academics from less prestigious and

middle faculties were following many more scientists than employees from the top departments.

Exploration of Google Scholar metrics shows that the major differences are related to the number of citations (Fig. 11). The median of citations for the top faculty employees was nearly six times bigger than in the least prestigious department. The number of published research items was quite similar for middle and top faculties. Half of the employees published on average one and a half times more research papers than their colleagues from the last department in the rank.

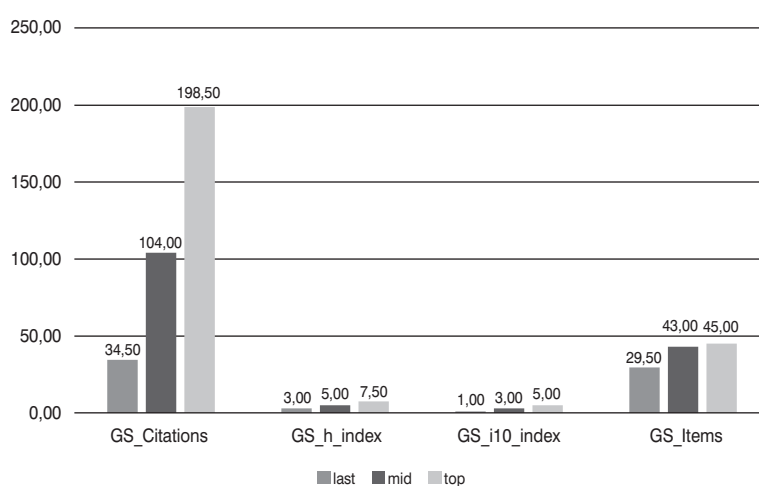


Fig. 11. The mean values of main GS metrics by faculty. Source: Own work.

### Metrics Comparison

To compare the average values of main RG and GS metrics only the researchers who possessed a profile on both analyzed portals were chosen. Among 364 analyzed academics, 139 had both profiles (38.2%). From nineteen analyzed metrics, only six: RG\_citations, RG\_h\_index, RG\_Items and GS\_citations, GS\_h\_index, GS\_Items could be compared in pairs. The average values of compared metrics are shown in Tab. 4.

The average values of all metrics are higher on Google Scholar. The average number of citations of the least prestigious faculty employees is almost five times higher on GS than on RG. For the middle and top faculties, this difference is not so big (about three times). As a consequence, also the value of average h-index is two times higher on Google Scholar than on the ResearchGate. The differences are also significant for the number of published research items, for all faculties (top, middle, and last in the rank). The average number of presented research items for last faculties



is 37, middle 53 and top 67, while the values for RG are respectively 18, 24, and 28, so twice lower. It can be concluded that Google Scholar indexes more research items from a bigger number of scientific databases. It indexes also less popular and known sources that contain less prestigious journals. The values of its metrics are higher and present scientists in a better light. Therefore, a comparison of scientific achievements should be performed using one portal. A comparison of data from many portals (even if they offer similar metrics) requires the development of mechanisms that standardize the values of metrics provided by compared platforms.

Metric	mean			
	last	mid	top	total
RG_Citations	21.6889	51.1636	128.5366	64.2553
GS_Citations	100.4222	176.5636	438.2821	225.3453
RG_h_index	1.7111	2.5741	4.7073	2.9214
GS_h_index	4.0222	5.6364	9.0769	6.0791
RG_Items	17.6667	24.3273	27.9756	23.2624
GS_Items	36.8222	52.6111	61.9487	50.1014

Tab. 4. The average values of comparable RG and GS metrics. Source: Own work.

### Using Both Portals

There were no statistically significant differences between possessing both accounts by male and the female researchers (Tab. 5).

Does the GS researcher have an account on both portals?	User type				Total		$\chi^2$	p
	female		male					
Answer	N	%	N	%	N	%		
no	106	60.2%	119	63.3%	225	61.8%	0.363	0.547
yes	70	39.8%	69	36.7%	139	38.2%		

Tab. 5. Differences in using both portals between male and female researchers. Source: Own work.

About 40% of female researchers and 37% of male scientists have profiles on both portals.

To find out if users with higher values of RG or GS citations more often own profiles on both ResearchGate and Google Scholar, the explored users were divided into two groups. If number of citations was higher than the median of all users (for RG the median was 16, for GS 94), then the user was assigned to the RG\_Hi or GS\_Hi group. Then the Chi-Square

test was used to check if users with higher number of citations more often have profiles on both portals (Tab. 6, Tab. 7).

Does the RG researcher have an account on both portals?	User type				Total		$\chi^2$	p
	Low citation		High citation					
Answer	N	%	N	%	N	%		
no	41	38.7%	30	28.8%	71	33.8%	2.268	0.132
yes	65	61.3%	74	71.2%	139	66.2%		

Tab. 6. Differences in using both portals between RG users with high and low number of citations. Source: Own work.

Does the GS researcher have an account on both portals?	User type				Total		$\chi^2$	p
	Low citation		High citation					
Answer	N	%	N	%	N	%		
no	21	23.6%	16	18.4%	37	21.0%	0.718	0.397
yes	68	76.4%	71	81.6%	139	79.0%		

Tab. 7. Differences in using both portals between GS users with high and low number of citations. Source: Own work.

The analysis indicated that more users with high values of citations on ResearchGate (higher than the median) more often have active profiles on both portals. 71.2% of users with a high RG citation index and 61.3% with a low citation metric (lower than the median) have accounts on both portals, but the Chi-Square test showed that this difference is not statistically significant ( $\chi^2 = 2.4268$ ,  $p = 0.132$ ). The Chi-Square test also indicated that Google Scholar users with a higher value of the citations index do not more often have an account also on ResearchGate ( $\chi^2 = 0.718$ ,  $p = 0.397$ ). Nearly 82% of users with a number of GS citations higher than the median and 76.4% of researchers with a lower GS citation index own both accounts.

## 5. Discussion

The performed comparative analysis of Google Scholar and ResearchGate usage by Polish scientists employed in prestigious, middle class and less prestigious economics departments allow for concluding that:

- ResearchGate and Google Scholar are very powerful and fast growing tools. They can be used not only for building a scientific portfolio, sharing information, establishing research networks, building global communication channels and getting access to others work, but also for comparing and evaluating scientific achievements of researchers and research units.

- RG provides more metrics. They can be used for a profound analysis of the researcher and the research institution. Google Scholar presents fewer metrics, yet not only their total value but also the result for the last five years. Therefore, GS metrics could be the source of valuable information about the recent impact of the scientist's work.
- Specialized social networks are widely accessible and easy to use; however, RG and GS are not very popular among the analyzed scientists. Only 38.2% of investigated researchers had profiles on both analyzed portals. The ResearchGate portal is more popular than Google Scholar. 57.7% of the researchers had an account on RG and only 48.4% on GS.
- No big differences between the popularity of the ResearchGate portal in top, middle and least prestigious faculties were observed (from 56% to 60% of users). Researchers from middle class faculties more frequently had an account on Google Scholar (62.4%). In the top and least prestigious faculties, the percentage of GS profile owners was respectively 42% and 40%.
- The ResearchGate portal is more popular among almost all groups of researchers (by title) except for full professors. RG is more popular among younger scientists, while the most experienced academics prefer Google Scholar.
- The average RG score value for the explored researchers was 6.22, its maximal value was above 31. The average value of new RG metrics, Total Research Interest, introduced to get more detailed information about impact of the research items and researchers was 44.85.
- The ResearchGate portal is rarely used for asking questions and giving quick answers. The average values of these metrics were respectively 0.20 and 0.45. However, the portal is used for creating groups of researchers. The average number of followed and following users was over thirty three.
- In less prestigious faculties, half of the employees had RG score of less than 2.33 while in top faculties the average value was 8.17. The same tendency was observed for Total Research Interest, Citations count and number of followers. However, academics from less prestigious and middle faculties were following more scientists than employees from top departments.
- The values of all comparable metrics are higher on Google Scholar, especially the number of citations. The differences for all faculties: top, middle and last in the rank are also significant regarding the number of published research items.
- The Chi-Square tests showed that researchers with high values of metrics on ResearchGate or Google Scholar do not more often create a profile on the second portal. There were also no statistically significant differences between possessing both accounts by male and female researchers.

## 6. Conclusions

Specialized social network sites are very powerful tools. Their providers offer lots of useful mechanisms and metrics, provided mechanisms are constantly improved. In the future, such platforms should be more popular among both researchers, university managers and business representatives. The analysis of SNS usage, their new functionalities and offered indicators should be an important area of research. The performed research showed that SNS are widely accessible; however, only 38.2% of the examined researchers used both RG and GS portals (GS was more popular). Therefore, the university authorities should encourage, sometimes even force, academics to use those tools. Researchers should use the portals not only for building a scientific portfolio, but also for fast communication, asking the questions and giving/getting quick feedback to improve the quality of research. Unfortunately, the examined scientists hardly ever used social network sites for communication and exchanging views. RG provides more metrics; however, GS presents not only their total value but also the result for the last five years. Therefore, GS metrics could be the source of valuable information about the recent impact of scientists' work. That information may be crucial for researchers trying to find valuable project partners, but also for managers who have to evaluate university employees or hire new specialists.

The results derived from the research can have some implications for the practice, both for university staff and managers. The analysis showed that using specialized social networks allows researcher to become more recognizable and can boost the scientific career. University managers can use portals like ResearchGate or Google Scholar for monitoring research outcomes and scientific career of both managed staff or future employees. Choosing the right metrics allows them also to build a more positive image of both individual scientists, research teams, and the entire faculties or universities. Specialized social network sites might be also a source of valuable information for business representatives who are looking for specialists, experienced scientists to carry out joint projects.

Since the author collected the data from the Polish economics universities and faculties, the results cannot be simply generalized to other fields of science and countries. Future comparative research is needed.

## 7. Future Research

The conducted research showed interesting results, but also became a source of new research questions. Therefore, future research should address two main issues: factors that encourage scientists to present their

achievements on specialized social networks (also the barriers of using SNS noticed by both specialized portals users and academics who do not have profiles on SNS), but also a comparison of ResearchGate and Google Scholar with other popular specialized social networks like Academia.edu, Mendely, LinkedIn.

## References

- Aguillo, I., Uribe-Tirado, A., & Lopez, L. (2016). Comparative study of Colombian researchers according to data from Google Scholar, ResearchGate and the National System for Measurement Science (Colciencias). In *21st International Conference on Science and Technology Indicators-STI 2016. Book of Proceedings* (pp. 1147–1156).
- Bar-Ilan, J. (2008). Which h-index? – A comparison of WoS, Scopus and Google Scholar. *Scientometrics*, *74*(2), 257–271.
- Copiello, S., & Bonifaci, P. (2018). A few remarks on ResearchGate score and academic reputation. *Scientometrics*, *114*(1), 301–306.
- Falagas, M.E., Pitsouni, E.I., Malietzis, G.A., & Pappas G. (2008). Comparison of PubMed, Scopus, web of science, and Google scholar: Strengths and weaknesses. *The FASEB Journal*, *22*(2), 338–342.
- Halevi, G., Moed, H., & Bar-Ilan, J. (2017). Suitability of Google Scholar as a source of scientific information and as a source of data for scientific evaluation – Review of the literature. *Journal of Informetrics*, *11*(3), 823–834.
- Kraker, P., & Lex, E. (2015). A critical look at the ResearchGate score as a measure of scientific reputation. In *Proceedings of the Quantifying and Analysing Scholarly Communication on the Web Workshop (ASCW'15), Web Science conference* (pp. 1–3).
- López-Cózar, E.D., Orduña-Malea, E., & Martín-Martín, A. (2018). *Google Scholar as a data source for research assessment*. arXiv preprint arXiv:1806.04435.
- Ma, L., & Ladisch, M. (2016). Scholarly communication and practices in the world of metrics: An exploratory study. In *Proceedings of the 79th ASIS&T Annual Meeting: Creating Knowledge, Enhancing Lives through Information & Technology* (p. 132). American Society for Information Science.
- Martín-Martín, A., Orduña-Malea, E., Ayllón, J.M., & López-Cózar, E.D. (2016). *The counting house: Measuring those who count. Presence of bibliometrics, scientometrics, informetrics, webometrics and altmetrics in the Google Scholar citations, Researcherid, ResearchGate, Mendeley & Twitter*. arXiv preprint arXiv:1602.02412.
- Nature. (2018). Social media for scientists. Retrieved on 25 April 2018 from <https://www.nature.com/articles/s41556-018-0253-6>.
- Orduña-Malea, E., & Delgado López-Cózar, E. (2017). Performance behavior patterns in author-level metrics: A disciplinary comparison of Google Scholar Citations, ResearchGate, and ImpactStory. *Frontiers in Research Metrics and Analytics*, *2*, p. 14. Retrieved on 25 April 2018 from <https://www.frontiersin.org/articles/10.3389/frma.2017.00014/full>.
- Orduña-Malea, E., Martín-Martín, A., Thelwall, M., & López-Cózar, E.D. (2017). Do ResearchGate scores create ghost academic reputations?. *Scientometrics*, *112*(1), 443–460.
- Ortega, J.L. (2017). Toward a homogenization of academic social sites: A longitudinal study of profiles in Academia.edu, Google Scholar Citations and ResearchGate. *Online Information Review*, *41*(6), 812–825.
- Perspektywy Fields of Study Ranking. (2018). Retrieved on 16 April 2018 from <http://www.perspektywy.pl/RSW2018/ranking-kierunkow-studiuw/kierunki-ekonomiczne/ekonomia>.

- ResearchGate characteristics. Retrieved on 25 April 2018 from <https://www.researchgate.net/about>.
- Van Noorden, R. (2014). Online collaboration: Scientists and the social network. *Nature*, 512(7513), 126–129.
- Yu, M.C., Wu, Y.C.J., Alhalabi, W., Kao, H.Y., & Wu, W.H. (2016). ResearchGate: An effective altmetric indicator for active researchers?. *Computers in Human Behavior*, 55, 1001–1006.