Original Research

Relationship between Webometrics University Rankings and Research Gate Scores, Scopus and Web of Science

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Abstract

Interest in academic ranking systems increased substantially in the last two decades. The majority of existing ranking systems are highly exclusive and cover up to 1500 best-positioned world universities. An exception to these ranking systems is the Webometrics ranking, which ranks more than 31000 universities throughout the world. In this study, we wanted to examine what factors best predict the Webometrics rankings. The sample for this study consisted of 102 European universities, with the Webometrics ranks ranging from 18th position to 6969th position. We examined the effects of the number of Web of Science publications, Scopus publications, and ResearchGate-related data on Webometrics ranking. Data retrieved from the academic social network site ResearchGate predicted 72% of the variance in the Webometrics ranking. The number of Scopus publications was the single best determinant of whether the university will be positioned in the top 1000 ranked universities. These results indicate the potential use of ResearchGate scores in the rankings of universities and serve as a proxy for universities' excellence. This, in turn, can be useful to government policymakers and university leaders in creating better strategies for enhancing the reputation of universities.

Keywords: Academic Rankings, Webometrics University Rankings, Altmetrics, Webometrics, ResearchGate, ResearchGate Score, Scopus, Web of Science.

Introduction

Higher education is a highly competitive enterprise. Universities around the world compete to attract more students, more staff, and to build a better reputation. Due to these and other reasons, monitoring the relative position of universities has become a daily practice (Torres-Samuel, Vásquez, Viloria, Varela, Hernández-Fernandez & Portillo-Medina, 2018). In line with this, there has been a remarkable rise in systems for ranking universities around the world (Taylor & Braddock, 2007). Universities, in turn, can use these ranking data for marketing purposes as indicators of excellence. Some of the best-known university ranking systems are the Academic Ranking of World Universities (ARWU) also known as the "Shanghai Ranking", QS World University Rankings, Times Higher Education (THE) World University Rankings, and the Center for Science and Technology Studies (CWTS) Leiden Ranking. These ranking

systems are highly exclusive in their scope. For example, ARWU presents the world's top 1000 universities, the same number as the QS World University Rankings. On the other hand, THE covered more than 1500 universities in its 2021 Edition, while the Leiden Ranking, for the year 2021, covered around 1200 universities. These academic ranking systems apply their methodology in the assessment of universities, and there is a moderate to high correlation between these systems (Shehatta & Mahmood, 2016). All academic ranking systems try to measure academic excellence using various indicators such as number of publications, citations per faculty, number of students, awards, number of articles in Nature and Science journals, etc. Academic ranking systems can serve as a proxy for universities' educational and research quality. In addition, academic ranking systems are used to inform the universities about their relative position concerning the other universities worldwide (Lindblad, 2008). Although claiming to produce rankings of world universities, these ranking systems have the so-called geographical preference. For example, ARWU favors North America and Western Europe, Leiden prefers Asian countries and North America, QS and THE favor Anglo-Saxon countries, such as Australia, Great Britain, and Canada (Moed, 2017). It is important to note that none of these ranking systems can be regarded as definitive and there is still room for improvement in these rankings (Thakur, 2007).

It is extremely important for policymakers, especially in underdeveloped and developing countries, to be aware of these academic rankings. The role of higher education in enhancing economic and social development is enormous. There is a clear link between quality higher education and country's economy and sustainable development (Krstić et al., 2020). Higher education is positively, statistically significantly, correlated with economic growth and per capita income (Gyimah-Brempong, Paddison & Mitiku, 2006). Thus, it should be in every country's interest and its highest priority to improve the higher education system. However, the academic ranking systems mentioned above are limited in their coverage and many universities (and countries) are not represented in their ranking. Therefore, there is a need for a more comprehensive ranking that will cover most universities in the world. One such ranking system is the *Webometrics-* ranking web of universities (https://www.webometrics.info/en). *Webometrics* is by far the largest academic ranking of Higher Education Institutions (HEI), and it offers information about the performance of universities from all over the world. Currently, there are 31000 HEI from more than 200 countries that are covered by *Webometrics*. In *Webometrics*, universities are ranked based on three criteria: impact, openness, and excellence. Thanks to Webometrics, countries, and universities not represented in major academic ranking systems can see their relative position in relation to more universities that are prestigious.

This study will help policymakers at the state and university levels determine what factors are important in the ranking of universities. Knowing the factors that affect university ranking will, in turn, help create better strategies to improve the relative position of their universities. In this regard, this study aimed to examine how the ResearchGate scores, SCOPUS indices, and Web of Science indices, are related to the Webometrics ranking of the universities.

Literature Review

Universities in Bosnia and Herzegovina (BIH) are not covered in major academic ranking systems. The only academic ranking system that covers universities from BIH is *Webometrics*. The three best-positioned universities from BIH in Webometrics (January 2021 Edition) are the University of Sarajevo (1675th position), University of Banja Luka (2658th position), and

International University of Sarajevo (3557th position). These rankings indicate that universities from Bosnia and Herzegovina are on the so-called "scientific periphery" (Marusic & Marusic, 1999). One of the proposed ways to increase the visibility of BIH universities is through the increased use of social media sites such as ResearchGate (RG), Academia.edu, Mendeley, Zotero, etc. (Memisevic, Taljic & Hadziomerovic, 2017; Ovadia, 2014). Although certainly useful for promotion purposes, social media use is still very limited and restricted among researchers (Manca & Ranieri, 2016). Academic social media can have a positive effect on strengthening researcher's social capital through networking, sharing information, and sharing publications (Kapidzic, 2020). We already mentioned that most, if not all, ranking systems use the number of publications and citations from Web of Science (WOS) and Scopus as one of the most important criteria for academic rankings. On the other hand, research into the relationship between social networking sites with university ranking is scarce. RG is the most popular social networking site for scholars (Lepori, Thelwall & Hoorani, 2018), but its relationship with university rankings has not received enough scientific attention. RG enables researchers to advertise their scientific contribution and to be more visible (Martín-Martín, Orduna-Malea & Delgado López-Cózar, 2018). However, on the institutional level, it is still unknown whether the greater presence of RG will lead to better academic ranking as there seem to be conflicting results. An earlier study conducted in South Africa has shown a high correlation between RG, WOS, and Webometrics scores (Onyancha, 2015). On the other hand a study by Ali, Wolski and Richardson (2017) has found no direct correlation between institution's international ranking and RG score, although the lower-ranked institutions tended to have lower RG scores. Institutional visibility in RG is highly correlated with the number of academic staff (Lepori et al., 2018). Thus, it is useful to examine which RG indices have an impact on Webometrics rankings.

Knowing what factors contribute to academic rankings might help universities create more efficient strategies to improve their reputation. This is especially relevant for countries on the scientific periphery and decision-makers in the field of higher education in these countries. Thus, in this study, we wanted to examine the effects of several factors on the *Webometrics* university rankings. More specifically, we wanted to examine the effects of the number of WOS publications from 2020 and 2021 (until 15 July 2021), the total number of Scopus publications, and the number of authors from a university that have Scopus publications. In addition to these variables, we also examined the effects of three RG indicators on *Webometrics* rankings, namely: university RG score, number of university staff with RG profile, and number of publications registered by the RG.

Materials and Methods

We conveniently selected 102 universities from the *Webometric* academic rankings, edition January 2021. The university rankings were in the range between 18th positions to 6959th position. The Universities were pseudo-randomly selected. The only inclusion criteria were that half of the universities (51) are ranked below the 1000th position and half ranked above the 1000th position up to the 7000th position. The median score of the ranking was 995. We used this particular cut-off to determine the factors that best discriminate between top universities, defined as being ranked in the top 1000, and all the other universities ranked above the 1000th position. We first presented correlations between all the variables in the study. We next used stepwise multiple regression analysis to assess the impact of predictor variables (WOS 2020

publications, WOS 2021 publication (until 15 July), Scopus publications, Scopus authors, RG score, RG members, RG publications) on criteria variable, *Webometrics* ranking. Predictor variables were collected for each university. As the Webometrics ranking variable was highly skewed, we applied log transformation to normalize the variable. In addition to this, we also performed partition analysis to see what variables best differentiate universities ranked in the top 1000 and all the others. Statistical analysis was performed with the computer program SPSS v.27 for Windows (IBM, 2020).

Results

We first present correlations between all the variables. These results are shown in Table 1.

Table 1
Correlations between the predictor variables and criterion variables

	1	2	3	4	5	6	7	8
RG_score	1.00	0.88	0.94	0.93	0.94	0.92	0.92	-0.65
RG members	0.88	1.00	0.87	0.86	0.84	0.83	0.84	-0.64
RGpublications	0.94	0.87	1.00	0.97	0.92	0.93	0.93	-0.60
SCOdocuments	0.93	0.86	0.97	1.00	0.92	0.97	0.97	-0.62
SCOauthors	0.94	0.84	0.92	0.92	1.00	0.88	0.89	-0.64
WOS2020	0.92	0.83	0.93	0.97	0.88	1.00	1.00	-0.59
WOS2021	0.92	0.84	0.93	0.97	0.89	1.00	1.00	-0.60
Webom_rank	-0.65	-0.64	-0.60	-0.62	-0.64	-0.59	-0.60	1.00

Note. All correlations are significant at the $p<.001$ level.

As can be seen from Table 1, all correlations are strongly and statistically significantly correlated. We next performed the log transformation of Webometrics ranking (response) and conducted a stepwise regression analysis with 7 explanatory variables (WOS 2020 publications, WOS 2021 publications, total Scopus publications, Scopus authors, RG score, RG members, and RG publications). The statistically significant predictors are shown in Table 2.

Table 2
Stepwise multiple regression for predicting Webometrics rankings

Predictors	B	SEB	β	t	p
RG score	-0.02	0.004	-.56	-5.1	< .01
RG members	-0.05	0.02	-.32	-3.0	< .01

Note. $R^2 = .73$; $R^2 = .72$ (adjusted)

The model presented in Table 2 is statistically significant $F(2)=136.1$; $p<.001$, and it explained 72% of the variance in *Webometrics ranking*. The interpretation is that the higher the RG score of the university and the more RG members a university has, the better (lower) the *Webometrics* rank. Our second goal was to conduct a partition analysis to determine which single explanatory variable best discriminates whether the university will be in the top 1000 or not. According to the partition analysis, the best predictor was the number of Scopus documents that the universities published. In particular, the exact number of Scopus documents that makes the best division between the top 1000 universities and the rest is 12532. This is illustrated in Table 3.

Table 3
Classification table for top 1000 Universities based on the number of Scopus publications

Number of Scopus documents	Top 1000		Other Universities	
	N	%	N	%
<12532	1	3	45	97
>=12532	50	89	6	11

As can be seen from Table 3, there was only one university in the top 1000 universities that had less than 12532 Scopus publications. However, given that 6 universities not in the top 1000 had more than 12532 Scopus publications, we can conclude that number of Scopus publications is a useful measure that should be used in conjunction with other metrics. Of course, the usefulness of this measure needs to be validated by other universities as well.

Discussion

The goal of the present paper was to determine the factors that best explain Webometrics' academic ranking. This study pointed to the strong effect of university's RG score and the number of RG members in predicting the academic ranking. Around 72% of the variance in the Webometrics scores could be explained in terms of two RG measures, namely the university's RG score and the number of RG members affiliated with the particular university. RG score is available for both individual researchers and an institution. Much more research has been devoted to an individual researcher's RG score which is calculated by taking into account the four dimensions: publications, questions, answers, and followers (Orduna-Malea, Martín-Martín, Thelwall & Delgado López-Cózar, 2017). Research has shown that an individual RG score is not a reliable academic reputation indicator (Copiello & Bonifaci, 2018). The individual's RG score depends on the level of activity and less interaction with other researchers concerning lower RG scores (Deng, Tong, Lin, Li & Liu, 2019). But what about institutional RG score? Although previous studies have warned that the RG score should not be used for comparing institutions by research quality (Lepori et al., 2018), our study has found that the RG score is strongly correlated with Webometrics ranking in a way that higher the RG score, the better is the Webometrics ranking of a university. As for the RG members affiliated with the certain university, it is important to note that an institutional email is required to sign for RG, and in that way many potential misuses are reduced although not entirely eliminated. The more RG members a university has, the better its Webometrics ranking. Our study indicates usefulness of RG for measuring universities ranking. Similar results were found in other studies as well. For example, in a study by Onyancha (2015) the author found that RG scores and WOS indicators are both equally good predictors of the research impact of the universities in South Africa. As for the indicator of which university will be ranked in the top 1000 according to Webometrics, our study has shown that the number of Scopus publications was the best single predictor. Earlier research has shown that the scholarly output of a university is one of the major factors in university academic ranking (Sheeja, Mathew & Cherukodan, 2018). However, it seems to matter which publications are important for which university ranking. For example, for a more prestigious university ranking such as ARWU, the best predictors were: the number of members who won Nobel Prizes and Fields medals, the number of papers published in Nature and Science, and the number of papers published in Web of Science's Science Citation Index

and Social Science Citation Index (Hou & Jacob, 2017).

It should be noted that ranking systems should not dictate university policy but should provide information to various stakeholders. Ranking systems can provide information on an individual, institutional, and national level (Taylor & Braddock, 2007). At the national level, they provide information to state governments and other stakeholders about the effectiveness of state higher education policies. Additionally, university rankings have a significant role in reshaping the national higher education system and establishing criteria for competitive processes (Goglio, 2016).

Despite their many controversies, university rankings will most likely be used in the future. Governments and university leaders especially in developing countries need to be aware of them and use strategies to position their universities on the map of "top 1000 universities".

It is important to note several limitations of this study. First, in this study, we did not include universities ranked above 7000th position, so it would be inappropriate to generalize these findings to those universities as well. Additionally, the sample of universities is relatively small and future studies should include a larger sample of universities. Next, we could not determine whether there are some country-specific factors in these relationships. For example, the pattern of correlations might differ in the UK, Germany, BIH, and Romania. Future studies should attempt to answer these questions.

Conclusion

This study has shown that ResearchGate scores are strongly related to the *Webometrics* ranking of the universities. In addition, the presence of the academic staff on ResearchGate is also related to the *Webometrics* ranking. These two factors explained 72% of the variance in the Webometric scores. Thus, it would be of utmost importance that universities proactively motivate researchers to create their ResearchGate profiles as it can affect the rating of their universities. Future studies should be directed to examine whether this model of predicting the Webometric ranking applies to all universities regardless of their ranking. In addition, future studies should also examine the effects of other indicators, such as the Altmetric scores in predicting the universities' ranking.

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