Ranking Web of Universities: Is Webometrics a Reliable Academic Ranking?

Ibrahim Shehatta
Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia
Email: isshehata@iau.edu.sa

Abdullah M. Al-Rubaish
Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia
Email: arubaish@iau.edu.sa

Khalid Mahmood
University of the Punjab, Lahore, Pakistan
Email: khalid.im@pu.edu.pk

Global university rankings continue to gain growing interest and have high visibility from all stakeholders. Of these, Webometrics Ranking (WR) faces many criticisms about its function. Some people believe WR evaluates only the universities' websites but not their global performance and impact, as WR authors mentioned. This stimulates us to examine the idea of using WR as a reliable academic ranking for world universities. We apply the WR results with two widely accepted indexes to test this hypothesis, i.e., the global university rankings and the bibliometrics. Therefore, the WR ranking of the Top 100 institutions is correlated with the corresponding values of six world ranking systems' 2015 edition (ARWU, USNWR, QS, THE, NTU, and URAP) that commonly accepted to evaluate the academic performance of the university, as well as with the objectively bibliometric indicators gathered from the Web of Science (WOS) In Cites ™ - Thomson Reuters. The findings revealed that the WR results provide a good correlation with both ranking systems' results and with 12 bibliometric variables, namely: WOS Documents, Times Cited, Citation Impact (CI), Citation Impact: Category Normalized (CNCI), Citation Impact: Journal Normalized (JNCI), Impact Relative to World, Percent of Top 1% Documents, Percent of Top 10% Documents, Highly Cited Papers, h-index, International Collaborations, and Percent Industry Collaborations. WR and the studied six rankings' consistency increases with increasing the weight percent of the research or bibliometric indicators in these

https://doi.org/10.47657/2631

six global rankings. Moreover, the consistency between WR and survey-based rankings (USNWR, THE, and QS) increases with decreasing the weight of subjective reputation survey indicators. The extremely high visibility characterizes the North American, especially USA universities in WR and the studied seven global rankings. Thus, web-based indicators ranking (WR) offers comparable and similar quality to those of the six major global university rankings. Accordingly, they can rank institutional academic performance. Moreover, the reliability could be enhanced if each university has only one web-domain that accurately reflects its actual performance and activity.We recommend all institutions apply all ranking systems together since their criteria and indicators complement each other and form a comprehensive index for covering various HEIs activities or functions worldwide.

Keywords: Academic Rankings; Web Indicators; Bibliometrics; Correlation; WR; ARWU; QS; THE; NUT; URAP; USNWR.

INTRODUCTION

University Rankings is a global phenomenon that has gained interests from all stakeholders such as students, parents, academics, political leaders, funding bodies, governments, employers, and all universities around the world (Marginson & van der Wende 2007; Marginson 2007; Rauhvargers 2011& 2013; Hazelkorn 2014 & 2015; Shehatta & Mahmood 2016a). Higher education institutions (HEIs)' efficiency, concerning their contribution to the world scientific & education space, is evaluated and rated by various ranking systems. These rankings use many indicators related to three academic missions: teaching, research, and community involvement. These indicators are related to and cover all aspects of scientific and educational activities.

All worldwide universities strive and seek to become one of the world-class universities. Such global ranking can be used as a transparency & learning tool and a marketing & strategic tool to enhance the performance & ranking positions of universities. Therefore, careful investigation and understanding of ranking indicators and results are of utmost importance and are necessary to apply suitable strategies, mechanisms, and actions to improve global competitiveness and thereby enhance universities' ranking positions in various global rankings.

Higher education nowadays is characterized by a massive competition for talented students, faculty, funding, rapid expansion (178 million students in 2010 and is forecasted to around 263 million by 2025, greater internationalization (4.1

https://doi.org/10.47657/2631

million international students in 2010), and rapid advancement of new communications and educational technologies (Tremblay et al. 2012). All of these greatly influence the emergence of global rankings and explain why rankings gain more interest. Furthermore, HEIs exist in two forms: the real off-line life and the virtual world based on the Internet. All stakeholders prefer to visit the virtual world using the HEI website because it is the easiest, rapid, cheapest, and comprehensive way to know and evaluate the university's performance and activities. Therefore, the university's website is of utmost importance because it is the preferred medium, showcase and forum for distance learning, community engagement, and talent attraction such as international students, faculty, and researchers (Aguillo et al. 2006 & 2008).

Moreover, it is the most powerful and useful means of communication that is providing information to various users: students, staff, prospective students, employees, sponsors, etc., to ensure communication means towards the public community and promote the university's educational programs, research programs, e-learning programs, social responsibility programs, and alumni, etc.In this context, Internet-based online academic services are of utmost importance in this constantly changing world, which has become a global village. This phenomenon puts more pressure on the HEIs to let their activities open and accessible on their websites. Therefore, the evaluation of universities' global performance using web indicators is very important in this rapid transformation of Higher Education worldwide.

Since 2004, Aguillo and his colleagues (Aguillo et al. 2006 & 2008) adopt the composite indicator model introduced in 2003 by ARWU (Liu & Cheng 2005; Liu et al. 2005) to measure the volume, visibility, and impact of a university website. Thus, the appearance of ARWU as the first global ranking and its developed composite indicator has provided a model for emerging Webometrics Ranking (WR) (Aguillo & Labajos 2010).

The WR, first published in 2004, usesfourquantitative web variables to rank all the world universities from various countries, regions, and continents.The WR 2015 edition is based on four web indicators, i.e., visibility or impact (50%), presence or content (20%), openness (15%), and excellence (15%). The visibility is the number of back links using Majestic SEO. Presence means the total number of webpages (information taken from Google). The openness is the pdf, doc, ppt, PostScript (ps) documents number using Google Scholar, and excellence is the Top 10% most cited papers using SCImago. These four web variables are combined to obtain a composite indicator that gives a clear picture of the global performance

https://doi.org/10.47657/2631

and impact of the university and reflects the excellence of various university units or activities and the impact of its outcomes. The main aim of WR is enhancing web presence and public dissemination of scientific knowledge as well as promoting open access initiatives and improving the quality and quantity of online scientific research publications (Aguillo et al. 2005, 2006, 2008, 2010a, 2010b, & 2013; Aguillo & Orduna-Malea 2013). The WR publishes five rankings for universities, repositories, hospitals, business schools, and research centers twice a year, January and July (WR official website – see links after references). WR ranks all the universities globally - that have web domain – not only elite universities but, i.e., WR is also covering more than 20,000 HEIs. WR is the most popular and has the most extensive coverage among various global rankings.

Problem Statement

As global university rankings vary in indicators and their weights used, data sources, etc., it is not surprising to see that they generate different rankingresults. Hence, it is of utmost importance to study and analyze the correlation among the global rankings' methodologies and results. Therefore, this article attempts to add some knowledge to the on-going healthy debate and dialogue among authors for more understanding of the global university ranking phenomena. Moreover, Webometrics ranking (WR) faced many criticisms focusing on some views that WR only evaluates the websites and not the university's global performance and impact. In addition, some universities do not take the website seriously and perform less than their outstanding academic performance. Thus, the present work tries to explore how well WR can measure the academic performance of higher education institutions, as well as to suggest a set of recommendations to enhance their web performance and thereby improve their ranking positions.

LITERATURE REVIEW

After launching the first global university ranking (ARWU, 2003), comparative studies of ranking methodologies and results attracted many scientists' interest and became a hot topic for research and studies. These comparative ranking studies fall into two main categories, i.e., qualitative and quantitative analyses. The qualitative studies focused on the classification of ranking indicators into various HE missions (teaching, research, and community services) and dimensions covering all inputs, processes, and outputs such as beginning characteristics, infrastructures, resources (staff, finance, materials), quality and reputation etc. (Bowden 2000; Dill and Soo, 2005; Usher and Savino 2007; Buela-Casal et al. 2007), whereas the quantitative

https://doi.org/10.47657/2631

studies are mainly based on overlapping universities and ranking correlation coefficients (Aguillo et al. 2010a; Hou et al. 2011; Huang 2011; Cheng 2011; Thamm & Mayr 2011; Chen & Liao 2012; Lee & Park 2012; Khosrowjerdi & SeifKashani 2013; Pandey 2014; Liu & Liu 2016; Shehatta and Mahmood 2016a).

Thamm & Mayr (2011) examined the possibility of using hyperlink-based indicators to rank academic websites for German universities. They extend this work to correlate the suggested method with famous official rankings, i.e., Center for Higher Education International Ranking (CHE), ARWU, and WR. They concluded that hyperlinks could not be utilized to rank an academic website.

The correlation of four global university rankings, namely WR, ARWU, THE, and four International Colleges and Universities (4ICU) were investigated by Pandey (2014). He obtained the rank correlation coefficients as 0.5277, 0.0333, and 0.3333 for WR-ARWU, WR-THE, and WR-4ICU ranking pairs.

Lee and Park (2012) studied the connection between both academic and web-based rankings. They used several analytical methods, such as correlations, nonparametric tests, and multidimensional scaling. Also, a positive correlation was found between the ranking of a university and its web visibility, and native English countries featured higher web visibility than non-English speaking ones. Liu and Liu (2016) examined the results of three university rankings (top 100 universities): ARWU, QS, and THE for 2010 to 2015.They found that 56 and 47 universities were covered in the top 100 in these rankings in 2015 and 2010, respectively. They defined world-class universities' common features as the fully comprehensive, public, long history of superior achievement (Salmi, 2009) and expanding the university's size, activities, and capacity. Moreover, they proposed four lessons learned to improve the performance and ranking of the university. These lessons are: the university should strive to conduct innovative research, delivering excellent international-based teaching, continuing government support, and enhancing reputation.

Shehatta and Mahmood (2016a) studied the correlation among 2015 results of six well-known university ranking systems: ARWU, QS, THE, USNWR, NTU, and URAP. They found a moderate to high correlation among these ranking systems, although each ranking applied different indicators and weights. Also, the correlation degree and the common universities increased with the increasing length of the ranking list. The proposed policy implications targeted the university performance and thereby to improve its ranking.

https://doi.org/10.47657/2631

Aguillo et al. (2010a) used the size of overlap, the Spearman's foot rule and the normalized similarity measures to examine the correlation degrees among ARWU, THE, QS, NTU, and CWTS - 2008 results. They found similarities between various rankings, where the highest similarity and the biggest differences were noticed between ARWU and NTUand between THES-QS and WR results, respectively.

In order to define the major indicators influencing various rankings, Hou et al. (2011) analyzed the ARWU, THES-QS, THE & NTU results - 2009 list. The Top 20 and 100 universities noticed that a strong relationship existed between the ARWU overall rankings with its single indicators: over 0.9 and 0.8 for publications in Nature & Science and highly cited papers, respectively. Also, apart from articles number in the last 11 years, there was a strong correlation (0.8) between NTU's total ranking and its single indicators.

Huang (2011) found similarities between ARWU & NTU and between QS & THE ranking results for the Top 20 universities - 2010 and 2012. The 2011 ARWU, QS & THE ranking results of the Top 100 universities were examined by Cheng (2011). He noticed that only 35 universities were overlapped in three studied rankings. A positive and significant correlation coefficient values were found at < 0.05: these rho values were 0.7 for ARWU-THE, 0.54 for ARWU-QS, and 0.42 for QS-THE.

Chen and Liao (2012) have studied correlations among four global ranking results and their indicators over time span (2007 – 2010), as well as longitudinal patterns. The top 200 universities revealed that 55% was the overlapping rate of ARWU, THES-QS, and NTUrankings, and if the WR was also included in the analysis, it decreased to 41%.They noticed that the correlation between ARWU and NTU was the strongest among all ranking pairs because both rankings focused on academic research performance. Moreover, the Spearman's rho values for QS-WR, ARWU-NTU, and QS-THE ranking pairs were 0.78, 0.58, and 0.53, respectively for the top 200 Asian universities in ARWU, WR, QS, THE, NTU & CWTS rankings for the year 2010 (Khosrowjerdi & Seif Kashani, 2013). Global and national university rankings comparison was conducted by Cakir et al. (2015). They found that national rankings were composed of a large number and centered on institution and education, while global rankings' indicators were few and mainly based upon research.

A cross-correlation matrix was constructed for six global rankings, WR, QS, THE, ARWU, Leiden, and URAP, for three years, 2011-2013,by Moskovkin et al. (2015). They found that the Spearman's rho values for correlating WR with ARWU,

https://doi.org/10.47657/2631

QS, THE, URAP, and Leiden were 0.53, 0.50, 0.63, 0.39, and 0.59, respectively, for the year 2012 and were 0.55, 0.50, 0.63, 0.39, and 0.60, respectively for the year 2013 indicating that these values were constant or mainly constant with changing the year from 2012 to 2013.

Aims & Research Questions

There is a need for more researches on correlating global rankings' results to enhance our knowledge, understanding, and learning. Therefore, this study is one of our continued work, and research focuses on global university rankings (Shehatta and Mahmood 2016a, 2016b & 2017). The aim of the present work is fourfold: 1) to understand the connection between ranking results of two different methodological approaches: web-dependent & web-independent indicators, 2) to figure out the feasibility and benefit of using WR to assess universities' academic performance, 3) to define the consistency degree among the 2015 results for Top 100 of the seven world rankings, and 4) to suggest a set of recommendations to improve Webometrics ranking of the institutions. These are in accordance with the on-going debate that can help rankers revise their ranking approach considering different experts and other stakeholders' views.

The present research study is focused on the following questions:

1. Is there any correlation between web-dependent and web-independent rankings? To what extent? What are the reasons?
2. How does the correlation behave at different list lengths?
3. Is there any correlation between WR results and bibliometric indicators? To what extent?
4. Could the webometrics ranking indicators be used as proxies for academic performance for universities?
5. Which are the common top 100 universities in the said seven world rankings?
6. What are the conclusions and implications of the present work?

METHODOLOGY

The present article attempts to examine and compare the ranking of world universities using seven major global ranking systems, i.e., WR, ARWU, QS, THE, USNWR, NTU, and URAP.This study focuses on comparing web-dependent & web-independent ranking methodologies. For that, Webometrics ranking is used as the benchmark for web-based rankings and compared this ranking's results for the Top 100 universities with those for the other six rankings (ARWU, QS, THE, USNWR, NTU, and URAP) that using web-independent indicators such as student-faculty

https://doi.org/10.47657/2631

ratio, Ph.D.awards, Ph.D.academic staff, percent international students, percent international faculty, publications, citations, citation impact, international collaboration, reputation survey, etc.

The global rankings are published annually (e.g., ARWU, QS, THE, etc.) or biannually (e.g., WR) using very different indicators and weights. Each ranking has its own methodology, purposes, data source, and publisher. The indicators could be objective or subjective. The objective indicators include bibliometric and other statistical data such as publications, citations, h-index, international collaboration papers, student-faculty ratio,etc. In contrast, the subjective indicators are derived from surveys among faculty, student, employers, etc.All the studied seven global rankings, 2015 edition, collect bibliometric variables from Web of Science (WOS) - Thomson-Reuters –except THE and QS (SCOPUS - Elsevier) and WR (SCimago). Three of the studied global rankings, THE, QS an USNWR, use survey to collect data. Thus, these three rankings use both subjective and objective indicators of academic performance. Rankings' methodologies of ARWU, NTU, USNWR, and URAP are based on research performance, QS, and THErelied-on reputation measured through surveys.

In contrast, the WR depends upon four web indicators: impact, presence, openness, and excellence. These wide varieties and differences among the studied rankings' methodological approaches provide extra opportunities for deep analysis and interpretation and enrich the study in general. League tables based on global university rankings are only used in this study.

The data, institutions' names and ranking positions for the Top 100 universities in seven global rankings' 2015 results were collected. These gathered data were analyzed using SPSS – 22 to compare WR results, as a benchmark, with the other six ranking systems through Spearman's correlation coefficient (rho), which is widely applied for evaluating the relationship of ordinal variables.WR was compared with the other six global rankings using Spearman's correlation coefficient calculated using ranking orders achieved by each university. Only the overlapping universities were used to calculate the Spearman's coefficient between WR and the other global rankings. Because each ranking system used different indicators and consequently ranked the different number of universities, the correlation analysis simply focused on the common overlapping cases.

Bibliometric indicators such as WOS Documents, Times Cited, Citation Impact (CI), Citation Impact: Category Normalized (CNCI), Citation Impact: Journal Normalized (JNCI), Impact Relative to World, Highly Cited Papers, h-index, Percent

https://doi.org/10.47657/2631

of Top 1% Documents, Percent of Top 10% Documents, International Collaborations, and Percent Industry Collaborations were obtained over the 35 years' period (1980 - 2014) from In Cites [TM] – Web of Science – Thomson Reuters.

RESULTS & DISCUSSION

All the results and discussion are limited to the top 100 universities of the seven ranking indexes unless otherwise mentioned. In the present study, we tested the Webometrics Ranking (WR), whether it can be applied to assess and evaluate the university academic performance by using two indexes, i.e., the global rankings and the bibliometric indicators. For that, the WR results were compared with the corresponding results of widely accepted rankings:ARWU, USNWR, THE, QS, NTU& URAP, as well as with the bibliometric indicators (Incites [TM], WOS – Thomson Reuters) of the Top 100 universities.Thus, WR results' correlation coefficients with the other six global rankings and bibliometric variables (1980-2014) were computed and analyzed.

Part 1: Global University Rankings

In this section, we compare WR results with the corresponding results of the major six global rankings for the Top 100 universities - 2015 edition - to test WR methodology's capacity to evaluate the academic performance. We estimated and analyzed the common universities and the Spearman's coefficients between WR and the other 6 rankings. Also, the length effect of correlating universities list, the weight percent of research, bibliometric indicators, and reputation survey on the consistency between WR and the other studied rankingswere examined.Moreover, the common universities in all studied seven rankings (Top 100) were estimated and analyzed.

Overlapping Universities in the Seven Global Rankings

To compare the WR results with six selected global university rankings, a statistical description method was used to calculate the overlapping universities and ranking correlation coefficients (Spearman's rho) between the results of WR, as a benchmark, and the results of the ARWU, QS, THE, USNWR, NTU and URAP rankings. Spearman's and overlapping universities' calculated results are shown in Table 1, together with the available published data (Aguillo et al. 2010a; Chen & Liao 2012) for comparison.

https://doi.org/10.47657/2631

Table 1.

Correlation for Top 10, 20, 50, 75 and 100 global universities between Webometrics results & sixglobal ranking indexes

	ARWU[a]	USNWR	THE	QS	NTU	URAP
Top 10 universities						
Spearman's rho using Rank order	0.900*	0.886*	-1.000**	NS	NS	NS
Correlating universities	5	6	3	3	7	5
Top 20 universities						
Spearman's rho using Rank order	0.662**	0.729**	NS	NS	0.582*	NS
Correlating universities	14	15	14	9	15	13
Top 50 universities						
Spearman's rho using Rank order	0.558**	0.683**	NS	NS	0.644**	0.622**
Correlating universities	34	38	33	27	35	36
Top 75 universities						
Spearman's rho using Rank order	0.713**	0.725**	0.551**	0.388*	0.675**	0.668**
Correlating universities	51	56	46	42	53	54
Top 100 universities						
Spearman's rho using Rank order	0.658** 0.52[b]	0.708**	0.592**	0.359** 0.31[b]	0.693** 0.48[b]	0.590**
Correlating universities	65 63[b]	72	61	59 53[b]	68 59[b]	68
Top 125 universities						
Spearman's rho using Rank order		0.701**	0.517**	0.399**	0.597**	0.535**
Correlating universities		92	80	74	89	88
Top 150 universities						
Spearman's rho using Rank order		0.710**	0.508**	0.478**	0.644**	0.597**
Correlating universities		111	99	91	106	106
Top 175 universities						
Spearman's rho using Rank order		0.750**	0.620**	0.481**	0.656**	0.634**
Correlating universities		127	116	108	116	122
Top 200 universities						
Spearman's rho using Rank order		0.780**	0.603**	0.548** 0.260[c] 0.626[d]	0.706** 0.556[c] 0.665[d]	0.673**
Correlating universities		146	132	127	134	140

https://doi.org/10.47657/2631

** Correlation is significant at level 0.01 (2-tailed)

* Correlation is significant at level 0.05 (2-tailed)

NS = Not Significant

[a]Ranking data for each institution are not published for top 125-200, these are published only as rank range; [b]Aguillo, et al. (2010) for 2008 results; [c]Chen and Liao (2012) for 2009 ranking results; [d] Chen and Liao (2012) for 2010 ranking results

WR = Webometrics, ARWU = Academic Ranking of World Universities, QS = Quacquarelli Symonds – QS World University Ranking, THE = Times Higher Education (THE) world university ranking, USNWR= US News & World Report - Best Global University Rankings, NTU = National Taiwan University Ranking, and URAP = University Ranking by Academic Performance.

As shown in Table 1, the size of overlap, i.e., the number of overlapping universities, ranges from 59 to 72 universities for the Top 100.It demonstrates a 59-72% overlapping rate among the WR results and the other six rankings. The overlapping universities number in the Top 100 are 72, 68, 68, 65, 61, and 59 for WR with USNWR, NTU, URAP, ARWU, and THE and QS.

Also, there is a fair agreement between the present results and the corresponding values for the Top 100 (Aguillo et al. 2010a for 2008 ranking results) and Top 200 (Chen & Liao 2012 for 2009 and 2010 ranking results) universities.

Correlating Webometrics' Results with Six Global Rankings

To assess the similarities between the WR results and the other six rankings, the Spearman's rho values were estimated and depicted in Table 1.As can be seen, for the top 100, all Spearman's rho coefficients are positive and are between 0.359 and 0.708, confirming the low to high correlation. Moreover, the strongest correlation is between WR and USNWR (rho = 0.708). In contrast, the weakest correlation is between WR and QS (0.359) in parallel with the number of overlapping universities, where the maximum and minimum overlapping rates are (72%) and (59%) for WR with USNWR and QS, respectively.

Moreover, the two lowest overlapping and weakest correlations with WR are THE and QS. This may be because only the QS 2015 results among the studied six global rankings collected critical data from the institution itself and used Elsevier' Scopus database to collect bibliometric indicators. Moreover, both allocateda high percent of the score for gathering peoples' views using questionnaires. QS allocated 50%, whereas THE allocated 33%.The peoples' opinions differed considerably and

https://doi.org/10.47657/2631

were highly affected by the reputation of the university. Thus, these opinion-based indicators are subjective (Cheng 2011; Chen and Liao 2012; Shehatta and Mahmood 2016a). On the other hand, USNWR, ARWU, NTU, and URAP utilized Thomson Reuters – WoS database for collecting bibliometric indicators. For correlating WR results with the non-survey rankings, the overlap size for both NTU (68) and URAP (68) is more than with ARWU (65). This may be due to the fact that both NTU and URAP rankings are based on 100% bibliometric variables, whereas the weight percent of bibliometric indicators in the ARWU ranking is only 50%.

Although the number of overlapping universities is constant (68) for both WR-URAP and WR-NTU pairs, the correlation coefficient values for WR-NTU (0.693) is higher than that of WR-URAP (0.590). This might be attributed to the differences in criteria, indicators used, their weights, and duration coverage can be seen from the following:

Both NTU and URAP rankings are applied 100% bibliometricmetrics.NTU uses eight indicators representing three different criteria for research performance covering all three main research dimensions: productivity (25%), impact (35%), and excellence (40%), whereas URAP utilizes six indicators representing three research criteria, namely research productivity (31%), research impact (54%) and international acceptance (15%).

The quality and excellence indicators account for 75% (NTU) and 54% (URAP) of the total score.NTU utilizes 50% of the university's long-term (11 years) score and short-term (1-2 years) progress in research to consider both on-going and current research performance. In contrast, URAP uses 21% for short-term (1 year) and 79% for medium-term (5 years).

- 90% of URAP score comes from InCites™ that covers only articles, reviews, and notes, and the other 10% of URAP score comes from Web of Science (WoS) core collection, which includes all scientific publication types: paper, review, note, letter, meeting abstract, discussion, correction, editorial material, news item, biographical item, scripts, proceeding paper, and book review. On the other hand, NTU is based on the data obtained from Essential Science Indicators (ESI) and WoS core collection. WoScovers Arts &Humanities (A&H) and science and social sciences, whereas ESI does not include A&H (Thomson Reuters – InCites™ indicators handbook 2014).
- Both total academic and per capita performances are considered by URAP and NTU, where they use both size-dependent and size-independent indicators.

https://doi.org/10.47657/2631

These differences might not influence the involvement of a university in the Top 100, but they affect its position rank in the Top 100 universities. Thus, one can expect two different Spearman's coefficient values for WR-URAP and WR-NTU rankings' pairs, although both have the same overlapping universities (68).

Effect of Length of Correlating Universities List

In order to examine the length effect of correlating universities list, the Spearman's rho and the common universities are estimated for the top 10, 20, 50, 75, 100, 125, 150, 175 & 200 and depicted in Table 1. For most of the pairs of rankings (WR with the six rankings), the percentage of overlapping universities and the correlation coefficients increase by increasing the length of the correlating universities list. These findings are in accordance with our previous work (Shehatta & Mahmood 2016a) and Aguillo et al. 2010a.

Effect of Research on Consistency between WR and Six Global Rankings

In order to understand and reach the possible interpretation of these findings, a simple linear regression analysis was conducted using the following equation: Y = a + b X, where Y the dependent variables are the Spearman's values (rho) or overlapping universities for the Top 100 obtained upon correlating WR results with six global rankings, X the independent variables are the weight percent of reputation survey, research, and bibliometric indicators, a is the intercept (Y values at X = 0), and b is the slope of the line to explain the relationship between dependent and independent variables. The results of the regression analysis are summarized in Table 2.

The studied six global rankings can be classified into two groups: the survey (QS, THE, and USNWR) and the non-survey (ARWU, NTU, and URAP) - based rankings. The correlation of WR results with survey-based rankings is in the order: USNWR > THE > QS. As can be seen from Table 2, there is a strong correlation (R^2 = 0.7859) between a) correlation coefficients of survey-based rankings with WR and b) research weight percent in QS, THE, and USNWR. Such correlation is enhanced to R^2 = 0.9163 when considering only bibliometric indicator weight percent. This means that the correlation coefficient between WR results and the corresponding QS results or THE or USNWR increases with increasing research weight or bibliometric indicators weight in the survey-based rankings (QS, THE & USNWR).

https://doi.org/10.47657/2631

Table 2

Summary of linear regression analysis results: $Y = a + b X$

Dependent Variable (Y)	Independent Variable (X)	Equation	R^2
A) Correlation between WR and Survey-based rankings' (USNWR, THE and QS) Results			
Spearman values	% Research Weight	Y = -0.1759 + 0.0101 X	0.7859
	% Bibliometric indicators weight	Y = 0.2433 + 0.0075 X	0.9163
	% Reputation Survey	Y = 1.0541 – 0.0139 X	0.9998
Overlapping Universities	% Research Weight	Y = 31.748 + 0.4454 X	0.9919
	% Bibliometric indicators weight	Y = 51.749 + 0.2976 X	0.9247
	% Reputation Survey	Y = 80.454 – 0.4571 X	0.6949
B) Correlation between WR and six global rankings'(ARWU, URAP, NTU, USNWR, THE and QS) Results			
Spearman values	% Research Weight	Y = 0.1157 + 0.0057 X	0.5763
	% Bibliometric indicators weight	Y = 0.3912 + 0.003 X	0.4987
Overlapping Universities	% Research Weight	Y = 45.089 + 0.2414 X	0.7138
	% Bibliometric indicators weight	Y = 58.355 + 0.104 X	0.4070

https://doi.org/10.47657/2631

Similarly, there is a constant increase in overlapping universities, between WR results and survey-based rankings (QS, THE, and USNWR), with the research or bibliometric indicators' weight percent. The linear regression analysis shows that the correlations are very strong (R^2 = 0.9919 and 0.9247) for correlating the overlapping universities with research and bibliometric indicators weight percent, respectively. These findings reveal the importance of research in WR. These findings are in good agreement with the fact that research performance may be the governing factor in defining the best institution (Asekun-Olarinmoye, 2015). Moreover, Rauhvarger assured that world rankings reflect the university's research performance more accurately than teaching and learning (Rauhvarger 2011; 2013). The research plays a dominant role in defining a world-class university (WCU), where WCU has high productivity, impact, and excellence, i.e., the highest research reputation (Shehatta & Mahmood 2016a).

On the other hand, for all studied six major global rankings (survey and non-survey – based rankings) there is a good correlation (R^2 = 0.5763) between a) correlation coefficients of the six rankings with WR and b) research weight percent in ARWU, QS, THE, USNWR, NTU, and URAP.In comparison, a strong correlation (R^2 = 0.7138) is obtained between the overlapping universities of WR andsix rankings' pairs and research weight percent.Furthermore, a moderate correlation exists when we use only bibliometric indicators weight percent instead of research weight percent for correlating correlation coefficients of the six rankings with WR and bibliometric indicators weight percent (R^2 =0.4987) or correlating overlapping universities of WR andsix rankings' pairs and bibliometric indicators weight percent (R^2 =0.4070). Again, based on these findings, the research contribution in WR or any global rankings' results is of utmost importance. Moreover, increasing the research or bibliometric indicators' weight percent in the studied six rankings enhances WR results' consistency and the six studied global university rankings' corresponding results.

Effect of Reputation Survey on Consistency between WR and Survey-Based Rankings

The effect of the reputation survey on consistency between WR and survey-based ranking was also examined. For that, a linear regression was conducted between the Spearman's correlation coefficient values (rho) of WR and survey-based rankings' pairs and the reputation survey weight percent (Table 2). There is a constant decrease in the rho values with increasing the weight percent of

https://doi.org/10.47657/2631

reputation survey. Similarly, the overlapping universities between WR and either QS or THE or USNWR results for the Top 100 decrease with increasing the reputation survey weight percent. The linear regression coefficients for these correlations are very high, where we obtain R^2 = 0.9998 and 0.6949 for Spearman's correlation coefficients and overlapping universities, respectively. These findings indicate that the consistency among WR and survey-based rankings (QS, THE, and USNWR) increases with decreasing the weight of subjective indicators like surveys. Thus, the correlation strength and overlapping universities number in the Top 100 of WR results with these rankings that based on survey follow the order: USNWR > THE > QS, where the three survey-based rankings utilize two surveys: USNWR utilizes two research-based surveys (12.5% each for global and regional), whereas THE and QS employ two reputation-based surveys (THE: 18% and 15% for research excellence and teaching, respectively, and QS: academic 40% and employers 10%)

Common Universities in All Seven Rankings

As indicated by our recent publication (Shehatta & Mahmood, 2016a), only 167 universities made the Top 100 of2015 ARWU, USNWR, QS, THE, NTU & URAP. Among these, 49 universities are covered.In the present work, considering Webometrics data 2015, it is easy to notice that 182 universities made the Top 100 ofseven rankings. Only 43 out of 182 universities are covered in all seven global rankings.This reveals that six universities have dropped out of the group (49covered in all six rankings) when considering Webometrics results 2015. These six universities are Imperial College London, Leiden University, University of Groningen, Kings College London, Technical University of Munich, and Penn State University.Therefore, although these sixinstitutions lead most of the academic rankings, their web performance is below their pronounced level of academic excellence. Moreover, the Webometrics' overall and indicators' rankings for these six universities are illustrated in Table 3.

https://doi.org/10.47657/2631

Table 3

Webometrics' data - July 2015- for some universities

University	Country	World Ranking				
		Overall	Impact	Presence	Openness	Excellence
Imperial College London	UK	118	394	393	506	16
Leiden University	Netherlands	145	355	395	208	75
University of Groningen	Netherlands	107	228	291	100	71
Kings College London	UK	121	246	275	636	57
Technical University of Munich	Germany	103	206	193	147	78
Penn State University	USA					
Pennsylvania State University	USA	124	14	96	99999	38

https://doi.org/10.47657/2631

As shown in Table 3, although Imperial College London's excellence rank is 16, the ranks of other indicators are 394, 394, and 511, for impact, presence, and openness, respectively. This may be because Imperial College London changes its domain fromic.ac.uktoimperial.ac.uk (official Webometrics website; http:// www.webometrics.info/en/node/36). It decreased the university visibility in various search engines, global internet impact, and therefore significantly affected their Webometrics ranking. Thus, Imperial College London should take the web seriously in order to gain the web ranking that coincides with their outstanding academic excellence if they want to maintain their ranking positions among the Top 100 in all seven global university rankings. It can be achieved by following the published bestpractices(http://www.webometrics.info/en/Best_Practices) to have a web presence equivalent to their academic excellence. In general, these six universities should update their policy on "Web presence, impact, and open access".

The common universities (43) from the top 100 in the seven rankings were examined to evaluate the ranking results' consistency using the published criteria (Shehatta & Mahmood, 2016a). Out of 43, only 13 (30%) universities were consistent, and thereby the rest 30(70%) universities were inconsistent. It is interesting to note the following:

- 182 universities, from 27 countries, made the Top 100 on the seven world rankings, i.e., universities that were ranked among the top 100 positions in at least one of the studied seven rankings - 2015.
- 43 out of 182 universities are Top 100 on all of them (Table 4). Thus, 139 universities are covered in only 1 or 2 or 3 or 4 or 5 or 6 rankings as "Top 100". These 43 universities are from 10 countries as follows: USA 26, UK 5, Canada 3, Japan 2, Australia 2, Netherlands 1, Germany 1, Switzerland 1, Belgium 1, and Denmark 1.
- Harvard, MIT, and Stanford have remained at their Top 10 positions in the seven rankings.
- University of California Berkeley 3rd, 4th, 5th, 8^{th,} and 10th in USNWR, ARWU, WR, URAP & NTU, respectively, while it was 13thand 38thin THE and QS, respectively. A similar mismatch can be noticed for some institutions such as the University of Toronto, Princeton University, Columbia University, University of Michigan, and Caltech.
- Cambridge, Oxford, Johns Hopkins, University College London, and University of Melbourne have WR positions less than their outstanding academic performances:

https://doi.org/10.47657/2631

- Oxford is rated high as it is among the top 10 in 6 rankings, although it ranked 13th in WR.
- Cambridge is ranked 14 in WR and NTU rankings, although it is in the Top 10 in the other 5 rankings.
- Johns Hopkins University is in the Top 20 in all seven rankings except WR (rank 25th).
- University College London is 6th, 7th, 11th, 14th, 18th, and 22nd in URAP, QS, NTU, THE, ARWU, and USNWR, respectively, whereas it ranked 34 in WR.
- The University of Melbourne is in the Top 50 in all seven rankings except WR (rank 71).

https://doi.org/10.47657/2631

Table 4.

Ranking of the Top 100 universities overlapping in all seven ranking indexes

No	Name	Country	NTU	URAP	ARWU	QS	THE	USNWR	WR
			Highly consistent cases						
1.	Harvard University	USA	1	1	1	2	6	1	1
2.	Stanford University	USA	4	7	2	3	3	4	3
3.	University of Pennsylvania	USA	12	13	17	18	17	15	11
4.	Massachusetts Institute of Technology (MIT)	USA	6	9	3	1	5	2	2
5.	University of Cambridge	UK	14	5	5	4	4	6	14
6.	Yale University	USA	19	21	11	15	12	14	12
			Reasonably consistent cases						
7.	University of Oxford	UK	8	3	10	6	2	5	13
8.	Duke University	USA	18	23	31	28	20	20	19
9.	University of Chicago	USA	21	19	9	10	10	10	23
10.	Columbia University	USA	13	14	8	22	15	9	7
11.	University of California Los Angeles	USA	9	12	12	26	16	8	9
12.	Northwestern University	USA	29	37	27	31	25	25	44
13.	Cornell University	USA	22	24	13	17	18	21	4
			Inconsistent cases						
14.	Johns Hopkins University	USA	2	4	16	16	11	12	25
15.	University of Michigan	USA	7	10	22	29	21	17	6
16.	University College London	UK	11	6	18	7	14	22	34
17.	University of Tokyo	Japan	20	17	21	39	42	31	46
18.	University of Edinburgh	UK	44	47	47	21	24	37	50
19.	Ruprecht Karl University Heidelberg	Germany	52	44	46	65	36	38	65
20.	University of British Columbia	CA	26	20	40	49	33	33	22
21.	University of California San Diego	USA	16	16	14	44	38	19	18

https://doi.org/10.47657/2631

No	Name	Country	NTU	URAP	ARWU	QS	THE	USNWR	WR
				Inconsistent cases					
22	University of Toronto	Canada	3	2	25	33	19	16	16
23	Swiss Federal Institute of Technology Zurich	Switzerland	37	41	20	9	9	27	20
24	University of Queensland	Australia	45	51	77	46	59	52	58
25	University of California Berkeley	USA	10	8	4	38	13	3	5
26	New York University	USA	42	65	28	52	29	34	30
27	McGill University	Canada	34	33	64	24	37	53	64
				Highly inconsistent cases					
28	University of Melbourne	Australia	32	29	44	42	32	40	71
29	University of Wisconsin Madison	USA	28	26	24	53	49	26	10
30	University of Illinois Urbana-Champaign	USA	63	73	29	58	35	43	26
31	California Institute of Technology	USA	38	50	7	5	1	7	40
32	University of North Carolina Chapel Hill	USA	27	40	39	77	62	28	24
33	KU Leuven	Belgium	40	38	90	80	34	44	74
34	University of California Davis	USA	33	36	57	84	44	39	27
35	Boston University	USA	60	71	73	89	63	32	60
36	University of Utrecht	Netherlands	35	35	56	92	61	69	60
37	University of Washington	USA	5	11	15	64	31	11	8
38	University of Texas Austin	USA	64	66	37	75	45	30	15
39	Kyoto University	Japan	49	53	26	37	87	86	75
40	University of Copenhagen	Denmark	25	22	35	68	82	62	86
41	University of Manchester	UK	46	39	41	32	55	56	98
42	Ohio State University	USA	31	32	67	97	90	36	42
43	Princeton University	USA	73	79	6	11	7	13	28

https://doi.org/10.47657/2631

Correlation among Common Universities in the Seven Global Rankings

Table 5 shows Spearman's correlation coefficients when the list is limited only to the common universities covered in all studied seven global rankings, i.e., 43, 53, and 60 universities for the top 100, 125, and 150, respectively. Comparing the results depicted in Table 5 with the corresponding results in Table 1, one can notice that the correlation coefficient values when the datasets are limited to the common universities in the studied seven rankings are higher than the corresponding values for the whole set making up the top 100, 125 and 150 universities.

Table 5.

Correlation for common global universities covered by all seven ranking indexes for the top 100, 125 and 150universities

	ARWU	USNWR	THE	QS	NTU	URAP
Top 100 universities (Correlating universities = 43)						
Spearman's rho using Rank order	0.729**	0.817**	0.590**	0.456**	0.694**	0.608**
Top 125 universities (Correlating universities = 53)						
Spearman's rho using Rank order	0.737**	0.810**	0.598**	0.489**	0.698**	0.609**
Top 150 universities (Correlating universities = 61)						
Spearman's rho using Rank order	0.745**	0.811**	0.619**	0.534**	0.707**	0.632**

** Correlation is significant at level 0.01 (2-tailed)

Part 2: Bibliometric Indicators

Bibliometric indicators are very important to evaluate the quantity, quality, and excellence of research productivity. A feasibility study was carried out to estimate the possible correlation between WR results and the bibliometric indicators. For that, a correlation analysis was conducted to calculate the correlation coefficients between the WR 2015 results for the Top 100 universities and 12 bibliometric indicators over 35 years' period (1980-2014) for these universities. Bibliometric indicators for the Top 100 universities in 2015 WR results were retrieved for 35 years' period (1980-2014) using the relatively new online In Cites TM tool based on Thomson Reuters' Web of Science database. The bibliometric indicators were selected to cover various research criteria, i.e.,

https://doi.org/10.47657/2631

research output or quantity, research impact or quality, research excellence, and collaboration with peers and industry. Among these 12 bibliometric indicators, Web of Science documents measure the research productivity or quantity; times cited and citation impact evaluate the research impact or quality, whereas highly cited paper, h-index, Percent of Top 1% documents, and Percent of Top 10% documents measure the research excellence. The correlation coefficients are presented in Table6.There is a positive and significant correlation between the WR results and the studied 12 bibliometric indicators. The WR results are well correlated with Web of Science Documents(rho = 0.704), Times Cited (rho = 0.705), Highly Cited Papers (rho = 0.690), h-index (rho = 0.683), Category Normalized Citation Impact (rho = 0.546), Percentof Top 1% Documents (rho = 0.536), Percentof Top 10% Documents (rho = 0.537), Citation Impact (rho = 0.518), Impact Relative to World (rho = 0.518), International Collaborations (rho = 0.463), Journal Normalized Citation Impact (rho = 0.451), and Percent Industry Collaborations (rho = 0.404).Therefore, there is a good correlation between the world-class universities using bibliometric and web indicators, confirming that scientific output can be measured using Web visibility and impact.

Table 6.

Correlation of Top 100 universities 2015 Webometrics ranking results with Incites' Web of Science bibliometric variables

Variables		Spearman's rho
1.	Web of Science Documents	0.704**
2.	Times Cited	0.705**
3.	Citation Impact	0.518**
4.	Category Normalized Citation Impact	0.546**
5.	Journal Normalized Citation Impact	0.451**
6.	Impact Relative to World	0.518**
7.	International Collaborations	0.463**
8.	% of Top 1% Documents	0.536**
9.	% of Top 10% Documents	0.537**
10.	Highly Cited Papers	0.690**
11.	% Industry Collaborations	0.404**
12.	h-index	0.683**

** Correlation is significant at level 0.01 (2-tailed)

https://doi.org/10.47657/2631

Dominance of North American and USA Universities

A digital gap between North American & European universities is well proved from examining universities' distribution by countryorregion for the WR results – 2015 edition. In the Top 100 - edition 2015, the number of universities for North America was 65, Europe 19, Asia 10, Oceania 4, and Latin America 1.On a country level, USA had 59, UK 5, Canada 5, China 4, Australia 4, six countries (Japan, Belgium, Germany, Italy, Netherlands & Switzerland) had 2 and 10 countries (Hong Kong, Singapore, South Korea, Taiwan, Denmark, Finland, Norway, Spain, Mexico & Brazil) had only one institution each. It means that the North American or USA institutions in the top 100 represented 65% and 59%, respectively; around 2.5 to 3.0 times as much as from the rest of the world. Thus, it is clear that there is a huge digital gap between North America and other regions' universities, as well as between the USA and other countries' universities.Similar findings are observed for all previous editions, see for examples July 2007 edition (Aguillo et al. 2008), January 2010 edition (Aguillo & Labajos, 2010), and July edition (Aguillo, 2012). Such a digital gap is larger than the expected (Aguillo et al. 2008).

It is not surprising since the USA's institutions are the world'stop in transferring knowledge through the World Wide Web (WWW).They are the first to develop websites to show and archive various materials, projects, activities, etc.They are also supporting open access initiatives, promoting web publications, and understanding the importance of Search EngineOptimization (SEO) as the main platform for widespread information access.Furthermore, these institutions are famous formarketing their wide range of activities via the web.Moreover, the North American universities are the models for a research-intensive focus.

Although many European and Asian universities are rated high in academic rankings as top 100, they under-perform in Webometric rankings. Therefore, European, Asian HEIs as well as other regions and countries, should develop digital policies and initiatives to enhance web presence, open access repositories, and support web publications.

Furthermore, an academic gap between North American & European universities is observed for the distribution of universities in terms of country or region for the studied seven rankings. As indicated before, 182 universities represented the top 100 according to seven world rankings (each university appears in at least one global ranking index).

At a country level, only 27 countries contained the top 100 universities in seven global rankings. The top six countries are USA 68, UK 20, Germany 11,

https://doi.org/10.47657/2631

Netherlands 10, Canada 7, and Australia 7 universities. At a continent level, the ranking related coverage shows that 76, 73, 24, 8, and 1universitiesare from North America, Europe, Asia, Oceania, and Latin America, respectively. These findings confirm the dominance of North American and USA universities in WR alone as well as in the studied seven global rankings altogether.

Correlation at Continent and Country Levels

Correlation among European and UK Universities. Out of 182, only 73 European universities were among the top 100 consideredsevenworld rankings. The Spearman's rho values between WR and the results of the other six rankings and the overlapping universitieswere calculated for these 73 European universities and listed in Table 7.For that, the non-European universities were excluded, and the remaining European universities were re-ranked accordingly to show a continuous ranking of these universities.Comparing Table 7 and Table 1, one can notice that Spearman's correlation coefficients for European universities are higher than that for global universities.Furthermore, Spearman's correlation coefficients for UK universities are higher than the corresponding values for European universities.

Table 7.

Comparison of Correlation coefficients and overlapping universities for the top 100 European, North American, UK and USA universities according to 7 global rankings

	ARWU	USNWR	THE	QS	NTU	URAP
All universities (182)						
Spearman's rho using	0.658**	0.708**	0.592**	0.359**	0.693**	0.590**
Rank order Correlating universities	65	72	61	59	68	68
European universities (73)						
Spearman's rho using	0.662**	0.807**	0.776**	0.591*	0.718**	0.588*
Rank order Correlating universities	14	14	14	14	17	16
North American universities (76)						
Spearman's rho using	0.666**	0.655**	0.587**	0.576**	0.754**	0.769**

https://doi.org/10.47657/2631

	ARWU	USNWR	THE	QS	NTU	URAP
Rank order						
Correlating universities	45	46	34	28	36	36
UK universities (20)						
Spearman's rho using	-	1.000**	1.000**	0.900*	0.900*	0.900*
Rank order						
Correlating universities	-	5	5	5	5	5
USA universities (68)						
Spearman's rho using	0.666**	0.655**	0.587**	0.576**	0.754**	0.769**
Rank order						
Correlating universities	45	46	34	28	36	36

** Correlation is significant at level 0.01 (2-tailed)

* Correlation is significant at level 0.05 (2-tailed)

Correlation among North American and USA Universities. Similarly, the Spearman's correlation coefficients and the overlapping size between WR and the studied six global rankings were calculated for the 76 North American universities in the top 100 universities in these seven rankings and depicted in Table 7.Notably, the Spearman's rho and correlating universities for North American and USA universities are the same. It could be expected because USA universities (68) are representing the most (around 90%) of the North American universities (76) in these rankings (top 100 universities).

Policy Implications

Nowadays, universities and their faculty's strong web presence are of paramount importance. It is a better and cheaper medium for achieving higher global impact, thereby gaining higher ranking positions among world-class universities. The academic websites are the main platforms for describing and communicating the institutions' activities and the most effective tool for scholarly and scientific information accessibility and communication. The visibility of their contents can also be measured using link analysis by estimating the external back links from other websites, citing the institution's web domain. It is based on the fact

https://doi.org/10.47657/2631

that the web allows links among documents. Moreover, it is well-known that if a researcher cites a published article, he or she recognizes the quality of the author and the content of the article. By analogy, the number of back links is a measure of the quality of an institution's website or its contents. Thus, increasing the number of back links is an objective indication of high prestige and good academic performance as well as the value and usefulness of information, data, and services offered by the institution as it appeared on its website. The link analysis has the advantage of capturing huge entries of Internet users (billions), and the composite indicator of WR can account for the institution's overall performance.

Therefore, in the second decade of the 21st century, all higher education institutions (HEIs) should develop policies and strategies to enhance web performance by enhancing their web presence and activity. It should be one of the universities' main priorities. The policies and initiatives for enhancing the web performance can be classified into two main groups: the first group focuses on increasing the WR indicators, i.e., web presence, visibility, openness, and excellence ranks. The second group concentrates on managing a website effectively by developing effective mechanisms for updating content, feedback from stakeholders and archiving old materials, and monitoring, analyzing, and evaluating the website regularly.

The following policies, strategies, initiatives, and programs can be used to enhance the web performance of universities and thus their WR positions:

1. Promote web presence by developing an open access policy to increase webpages and scientific publications' volume and quality.
2. Increase web visibility by having only one web-domain (unique domain) and enriching the website with more valuable information and content in international languages to attract more visibility by acquiring an international view.
3. Increase openness through converting electronic resources to rich files formats (pdf, doc, ppt, ps, etc.), uploading more of these rich files relevant to the academic and publication activities, and create an archive for historical reference.
4. Promote excellence by increasing scientists' capacity to produce quality research in high impact international journals and increase visibility. Also, converting non-electronic journals to pdf and upload them is very important.
5. Enhance website management through setting up an institutional repository to include all scientific and academic activities such as developing reliable

https://doi.org/10.47657/2631

mechanism (effective & in place) for updating the contents of the website (in collaboration with colleges, departments, units, etc.), developing a feedback mechanism for the university community to report errors on the university website, developing a mechanism for archiving & persistence: maintaining a copy of old documents in the site and continuing creation, uploading& updating more contents at the website.

CONCLUSION

This study has applied two well-known and commonly accepted methods: the global ranking and bibliometrics, to test and prove the Webometrics ranking's (WR) ability to produce a reliable academic ranking result. The WR results are well correlated with the corresponding results of six major global rankings, i.e., ARWU, QS, THE, USNWR, NTU, and URAP. The correlation of WR results and the other six global rankings indicate that WR is significantly correlated with all six global rankings (rho = 0.590 – 0.708) except with QS (rho = 0.359) for the top 100.Whereas for the top 200, these correlations are stronger (rho = 0.603 – 0.780) than for the top 100, as well as the WR correlation with QS enhanced significantly from 0.359 (top 100) to 0.548 (top 200). Also, the correlating universities are increased from 59-72% (top 100) to 63.5 – 77% (top 200). It reveals that WR seems like the other six global rankings, even though WR uses web-based indicators. In contrast, the other global rankings apply web-independent indicators as well as different methodological approaches.

Also, the WR results are well correlated with 12bibliometric indicators:Web of Science Documents (rho = 0.704), Times Cited (rho = 0.705), Highly Cited Papers (rho = 0.690), h-index (rho = 0.683), Category Normalized Citation Impact (rho = 0.546), Percent of Top 1% Documents (rho = 0.536), Percent of Top 10% Documents (rho = 0.537), Citation Impact (rho = 0.518), Impact Relative to World (rho = 0.518), International Collaborations (rho = 0.463), Journal Normalized Citation Impact (rho = 0.451), and Percent Industry Collaborations (rho = 0.404).

Therefore, these findings indicate that WR uses a composite indicator that describes the university's global performance and impact, considering all academic missions (Aguillo and Orduna-Malea, 2013).

To sum up, the WR approach is based on institutions' web presence, visibility, and web access, which measures how well an institution is present in the web by its domain, sub-domains, rich files, research excellence, etc. After a careful inspection of WR indicators, it is obvious that WR is a credible ranking due to the

https://doi.org/10.47657/2631

use of scientific methodologies. The WR publisher is the largest public scientific research organization in Spain and has a long-rooted research experience in academia, and the ranking indicators reflect all targeting academic activities. Moreover, WR results' good correlation with both six major global rankings' results and the 12 bibliometric indicators reveals WR results' reliability. Accordingly, WR has a great role in assessing the quality and effectiveness of various activities of the university to define the strengths and weaknesses. Thus one can easily design an improvement plan to enhance the web visibility and activity of the university.

The reliability of WR could be increased if the universities' websites accurately reflect the actual academic performance, i.e., web presence should be a trustworthy actual mirror of the university performance and activity (Aguillo 2006; 2008; 2010a). Also, each university needs to have a unique web domain. The non-English universities (Germany, Italy, France, Japan, China, etc.) should expand the website language and use English content because non-English materials are less likely to be cited. Avoiding bad practices and failed open access policies is the key success factor to produce reliable WR results that are truly representative pictures of the institutions.

The major global university rankings offer various indicators in all academic functions, i.e., teaching, research, and other functions. They can complement each other to give a clear picture of the performance of the universities.WR with the other global rankings can provide useful information and detailed insights to develop an action plan to improve all actions, activities, and KPIs, hence enhancing the institutions' global performance and visibility.

Finally, although WR produces comparable results with various global rankings, it should be used to evaluate HEIs in conjunction with various global rankings that use traditional indicators (Aguillo, et al. 2008).

https://doi.org/10.47657/2631

REFERENCES

Aguillo, I. F., Bar-Ilan, J., Levene, M. & Ortega, J. L. (2010a). Comparing university rankings. *Scientometrics, 85* (1), 243-256.http://dx.doi.org/10.1007/s11192-010-0190-z

Aguillo, I. F., Ortega, J. L., Fernandez, M. & Utrilla, A. M. (2010b).Indicators for a webometric ranking of open access repositories. *Scientometrics, 82*, 477-486.

Aguillo, I. F. & Orduna-Malea, E. (2013). The ranking web and the "world-class" universities – new webometric indicators based on G-Factor, interlinking and web 2.0 tools. In Wang, Q., Cheng, Y. & Liu, N.C. (Eds.), *Building world class universities: different approaches to a shared goal*, (pp 197-217). Sense Publishers, Rotterdam, the Netherlands.

Aguillo, I. F. & Labajos, N. G. (2010). Ranking web of world universities. *Journal of International Higher Education, 3*(4), 153-156.

Aguillo, I.F. (2012).University rankings: the web ranking. *Higher Learning Research Communications, 2*(1), 3-22. http://dx.doi.org/10.18870/hlrc.v2i1.56

Aguillo, I. F., Ortega, J. L. & Fernandez, M. (2008). Webometric ranking of World Universities: Introduction, methodology and future developments. *Higher Education in Europe, 33*(2/3), 233-244. http://dx.doi.org/10.1080/03797720802254031

Aguillo, I. F.; Granadino, B.; Ortega, J. L.; Prieto, J. A. (2006). Scientific research activity and communication measured with cyber metric indicators. *Journal of the American Society for the Information Science and Technology, 57*(10), 1296 - 1302.http://de.doi.org/10.1007/s10734-004-1746-8

Aguillo, I. F., Granadino, B., Ortega, J. L. and Prieto, J. A. (2005). What the internet says about science: Universities can be ranked based on web indicators. *The Scientist, 19* (14), 10-11.

Asekun-Olarinmoye, E. O. (2015).The importance of research in university's webometric ranking: UNIOSUN case study. *Research Journal of Health Sciences, 3*(3), July/September, 184-195.http://www.ajol.info/index.php/rejhs/article/view/143269/133015

Bowden, R.(2000). Fantasy Higher Education: University and college league tables. *Quality in Higher Education, 6*(1), 41-60.

Buela-Casal, G., Gutiérrez-Martínez, O., Bermúdez-Sánchez, M., & Vadillo-Muñoz, O. (2007). Comparative study of international academic rankings of universities. *Scientometrics, 71*(3), 349-365.https://doi.org/10.1007/s11192-007-1653-8

Cakir, M. P., Acarturk, C., Alasehir, O. & Cilingir, C. (2015).A comparative analysis of global and national university ranking systems. *Scientometrics, 103*, 813-848.https://doi.org/10.1007/s11192-015-1586-6

Chen, K. & Liao, P. (2012).A comparative study on world university rankings: a bibliometric survey. *Scientometrics, 92*(1), 89-103.https://doi.org/10.1007/s11192-012-0724-7

Cheng, S.K. (2011). World university rankings: take with a large pinch of salt. *European Journal of Higher Education, 1*(4), 369-381.http://dx.doi.org/10.1080/21568235.2012.662837

Dill, D. &Soo, M., (2005). Academic Quality, League Tables and Public Policy: A Cross-National Analysis of University Ranking Systems. *Higher Education 49*(4), 495–533. http://dx.doi.org/10.1007/s10734-004-1746-8

Hazelkorn, E. (2014), Reflections on a Decade of Global Rankings: What we've learned and outstanding issues. *European Journal of Higher Education, 49*(1), 12-28.http://dx.doi.org/10.1111/ejed.12059

Hazelkorn, E. (2015), Rankings and the Reshaping of Higher Education. *The Battle for World-Class Excellence*, 2nd ed. Palgrave MacMillan: Basingstoke.

Hou, Y. Q., Morse, R., & Jiang, Z. L. (2011). Analyzing the movement of ranking order in world universities' rankings: how to understand and use universities' rankings effectively to draw up a universities' development strategy.*Evaluation Bimonthly, 30*, 43-49.

Huange, M. X. (2011). The comparison of performance ranking of scientific papers for world universities and other ranking systems. *Evaluation Bimonthly, 29*, 53-59.

Khosrowjerdi, M. & SeifKashani, Z. (2013). Asian top universities in 6 world university ranking systems. *Webology, 10*(2), Article 114. Available at: http://www.webology.org/2013/v10n2/a114.pdf.

Lee, M. and Park, H. W. (2012). Exploring the web visibility of world-class universities. *Scientometrics, 90*, 201–218.https://doi.org/10.1007/s11192-011-0515-6

Liu, L. and Liu, Z. (2016). The variation of university acknowledged world class universities (UAWCUs) between 2010 and 2015: An empirical study by ranks of THE, QS and ARWU. *Higher Education Studies, 6*(4), 54-69. http://dx.doi.org/10.5539/hes.v6n4p54

Liu, N. C. and Cheng, Y. (2005). Academic ranking of world universities. *Higher Education in Europe, 30*(2), 127-136. DOI: 10.1080/03797720500260116

Liu, N.C., Cheng, Y. and Liu, L. (2005).Academic ranking of world universities using Scientometrics – A comment to the fatal attraction, *Scientometrics, 64*(1), 101-109. https://doi.org/10.1007/s11192-005-0241-z

Marginson, S. (2007).Global university rankings: Implications in general and for Australia. *Journal of Higher Education Policy and Management, 29*(2), 131-142.http://dx.doi.org/10.1080/13600800701351660

Marginson, S., & Van der Wende, M. (2007). To rank or to be ranked: The impact of global rankings in higher education. *Journal of Studies in International Education, 11*(3/4), 306-329. http://dx.doi.org/10.1177/1028315307303544

Moskovkin, V. M., Golikov, N. A., Peresypkin, A. P. and Serkina, O. V. (2015).Aggregate ranking of the world's leading universities. *Webology 12*(1), Article 133.http://www.webology.org/2015/v12n1/a133.pdf

Pandey, R.K. (2014). Empirical Validation of webometric based ranking of world universities. *International Journal of Computer Science & Information Technology, 5*(1), 580-584. http://ijcsit.com/docs/Volume%205/vol5issue01/ijcsit20140501122.pdf

Rauhvargers, A. (2011), *Global University Rankings and their Impact*, EUA Report 2011, European University Association, Brussels.

Rauhvargers, A. (2013). *Global University Rankings and their Impact* - Report II -, EUA Report 2013, European University Association, Brussels.

Salmi, J. (2009). *The Challenge of Establishing World-Class Universities*.Washington, DC,World Bank.

Shehatta, I. & Mahmood, K. (2016a). Correlation among top 100 universities in the major six global rankings: policy implications. *Scientometrics, 109,* 1231-1254.DOI:10.1007/s11192-016-2065-4

Shehatta, I. &Mahmood, K. (2016b). Research Collaboration in Saudi Arabia 1980-2014: Bibliometric Patterns and National Policy to Foster Research Quantity and Quality. *Libri: International Journal of Libraries & Information Services, 66*(1), 13-29.https://doi.org/10.1515/libri-2015-0095

Shehatta, I. & Mahmood, K. (2017). Bibliometric patterns and indicators of research collaboration of Egyptian health scientists: 1980 – 2014. *Malaysian Journal of Library & Information Science, 22* (2), 45-65. DOI: 10.22452/mjlis. vol22no2.4

Thamm, M. & Mayr, P. (2011). Comparing webometrics with web – independent rankings: a case study with German universities, arXiv:1105.2443v1, research paper, Cornell University Library.http://www.ib.hu-berlin.de/~mayr/arbeiten/thamm-mayr_final.pdf

Tremblay, K., Lalancette, D., & Roseveare, D. (2012). *Assessment of Higher Education Learning Outcomes AHELO Feasibility Study Report* (Vol. 1, pp. 272). OECD, Paris, France.http://www.oecd.org/edu/skills-beyond-school/ AHELOFS Report Volume1.pdf

Usher, A. & Savino, M. (2007).A global survey of university league tables.*Higher Education in Europe, 32*(1), 5-15.http://dx.doi.org/10.1080/03797720701618831

InCites™ Thomson Reuters (2014). *InCites indicator handbook*. Available at: http://researchanalytics.thomsonreuters.com/m/pdfs/indicators-handbook.pdf

Official Websites of Ranking Systems

- WR:http://www.webometrics.info/en/world
- ARWU:http://www.shanghairanking.com/
- NTU:http://nturanking.lis.ntu.edu.tw/
- QS:http://www.topuniversities.com/university-rankings
- THE:https://www.timeshighereducation.com/world-university-rankings
- URAP:http://www.urapcenter.org/
- USNWR:http://www.usnews.com/education/best-global-universities/rankings

https://doi.org/10.47657/2631