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Analysis of the Change in Position of the Countries' Sets of Leading Universities and Research Centers in the World Webometrics Ranking (with the Mediterranean and the Black Sea Region Taken as an Example)

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Abstract

The article describes the study into the change in position of the countries' sets comprising equal quantity of leading universities and research centers in the world Webometrics Ranking, representation of the countries' sets in the lists of wider scope in these rankings as well as distribution of the universities and research centers by countries and cities, with the Mediterranean and the Black Sea region taken as an example.

Keywords: Webometrics Ranking, universities, research centers Mediterranean and Black Sea region.

Introduction

Out of all the university rankings, Webometrics Ranking has become the most popular because, in comparison to the others, it ranks not only elite universities but all the universities in the world with autonomous web domains. This statement is proved by our Google Scholar search for the names of all the world university rankings. The largest quantity of search results was received for the search query “Webometrics Ranking” [1]. That quantity will be even larger if we add results for the search queries “Webometric Ranking”, “Webometric Rankings”, “Webometrics Rankings”.

Webometrics Ranking covers all the countries in the world hosting considerably broad network of universities. It enables a comparative study into the change in position of the countries' sets comprising equal quantity of leading universities and research centers in the world Webometrics Ranking. Besides, it allows us to analyze their representation in the lists of wider scope in these rankings as well as to study academic institutions distribution by countries and cities.

From the list of the most relevant articles we received for four Google Scholar search queries mentioned above as well as for the queries “university ranking” and “university rankings” we selected a number of articles which study the entry of university sets into various rankings by country and by continent.

Thus, the article by M. Rajesh and S.P. Nair considers representation of the leading countries' universities in the TOP-200 Webometrics Rankings as well as representation of the universities of the USA and Canada, Europe, Oceania, Asia, Africa and Latin America in the TOP-200 and TOP-500 in this ranking [2].

The article by M. Kaya, E. Cetin and A. Sözeri studies quantitative distribution of the universities in the TOP-100, 200, 500, 1000 according to continents and countries in July 2009 in Webometrics Rankings [3].

The article by M. Khosrowjerdi and Z.S. Kashani analyzes the similar distribution of the leading universities of Japan, Australia, China, Hong Kong, Korea, Israel and Taiwan in the TOP-200 QS, Shanghai, Webometrics, Leiden, THE, and HEEACT Rankings in 2010 [4].

In their article, V.M. Moskovkin, J.K. Fraser and M.V. Moskovkina analyze the representation of the TOP-45 Webometrics Rankings (July 2010) of the leading Czech and German universities in the TOP-1000 Webometrics, the TOP-200 THE, the TOP-500 ARWU, and the TOP-500 HEEACT Rankings [1].

In the article by V.M. Moskovkin et al. there is similar analysis of the representation of the TOP-20 country university Webometrics Rankings in 8 World University Rankings (Webometrics, THE, QS, ARWU, HEEACT, Leiden, URAP, SIR) for the Mediterranean and Black Sea region countries [5].

The article by H. Jöns and M. Hoyler presents and analyzes percentage distribution of the countries' sets of universities in the TOP-200 and the TOP-500 Shanghai and THE-QS Rankings for 2006 and 2009 as well as representation of doctorate-granting universities from 15 leading countries of the world in the TOP-100, 200, 300, 400, 500 Shanghai and THE-QS Rankings in 2009 (share of the world-class universities in percent of doctorate-granting universities). It also presents the TOP-10 cities in the TOP-500 Shanghai and THE-QS Rankings in 2009. According to the authors this kind of research refers to an emerging research field called geographies of higher education [6]. This research field also includes the work by S.L. Holloway and H. Jöns (2012) [7].

Methodology

Out of all the universities or research centers (n) ranked at some time t we select several orders (3 orders) lower quantity of universities and research centers ($N \ll n$) represented in the TOP-N Webometrics Ranking of countries in the quantity of m (m – number of countries). The aim is to examine the change in ranking of the universities or research centers represented in the country TOP-N over the time Δt (min Δt = 0.5 year) in the world Webometrics Ranking.

For each of the countries out of m we find world rank interval for the TOP-N universities and research centers at the time of t and $t+\Delta t$. Due to high dynamism of the ranking in question the TOP-N at the time of t may not be the same as the TOP-N at the time of $t+\Delta t$.

If the quantity of universities and research centers at the time of t is smaller than N, the universities and research centers below them in the ranking are added to the list for the time of $t+\Delta t$.

This procedure allows us to compile the table of World Rank change intervals for universities and research centers of m quantity of countries at the time of t and $t+\Delta t$.

There are rare cases when the quantity of the universities or research centers at the time $t+\Delta t$ is smaller, which is connected with their move from the original set.

Analyzing Webometrics Rankings of the universities and research centers as exemplified by comparable sets (comparing cases with equal quantities N) at different moments of time we can draw up a matrix showing change in position of the countries' sets as a whole in terms of improving or worsening position of the universities and research centers or in terms of their position remaining unchanged.

We consider the position of the countries' set of universities or research centers improving as a whole if the number of cases showing improvement in the set exceeds the number of cases with worsening position.

We consider the position of the countries' set of universities or research centers worsening as a whole if the number of cases with worsening position in the set exceeds the number of cases showing improvement in the position.

We consider the position of the countries' set of universities or research centers remaining unchanged as a whole if the number of cases with improvement in the position in the set equals the number of cases with worsening position ($N / 2$).

The issue of how far particular universities improved or worsened their position is disregarded here. For example, let us assume that $N = 20$, 11 universities out of this quantity demonstrated improvement in their position in the world Webometrics Ranking whereas 9 universities worsened their position. In this case we consider the position of the countries' set of universities improving as a whole.

Additionally, we draw up a matrix showing representation of the countries' TOP-N universities and research centers in the lists of broader scope for the world Webometrics Ranking.

Finally, we study quantitative distribution of universities and research centers in the country TOP-N by country and city identifying the cities with high concentration of the universities and research centers. For this purpose we introduce vector variable (a, b), where $a \leq N$ is quantity of the universities, $b \leq N$ is quantity of the research centers. The cities with high concentration of the

universities and research centers are identified according to the following criterion: $a + b \geq N_{cr}$, where N_{cr} is a critical value of the total number of universities and research centers smaller than $2N$. The universities' and research centers' relation to the city is determined on the basis of their web sites.

The selected countries of the Mediterranean and Black Sea Region are 29 countries with direct access to the Mediterranean Sea and the Black Sea except Jordan. These countries include European countries on the north Mediterranean Sea coast and the Black Sea coast and the countries of North Africa and Western Asia within the Mediterranean basin.

Results and Discussion

The country's TOP-20 universities and research centers according to the world Webometrics Ranking in July 2011 are selected. For the same universities and research centers their updated ranks in January 2012 are recorded. Due to high dynamism of the ranking in question the TOP-20 in July 2011 may not be the same as the TOP- 20 in January 2012. If the quantity of universities and / or research centers in July 2011 is smaller than 20, the universities and research centers below them in the ranking are added to the list in January 2012. This procedure allows us to compile the Table 1 of World Rank change intervals for universities and research centers of the Mediterranean and Black Sea region.

Table 1. World Rank change intervals for universities and research centers of the Mediterranean and Black Sea region (TOP-20).

	Universities				Research Centers			
	July 2011		January 2012		July 2011		January 2012	
	Q[1]	WRI[2]	Q[1]	WRI[2]	Q[1]	WRI[2]	Q[1]	WRI[2]
France	20	189-744	20	390-1062	20	7-200	18	9-313
Italy	20	88-536	20	61-547	20	18-734	19	17-4131
Spain	20	116-383	20	41-619	20	13-526	20	14-1438
Russian Federation	20	304-1632	20	147-1851	20	54-956	20	48-3747
Turkey	20	493-1442	20	342-1203	3	105-1869	8	77-3831
Israel	20	169-6211	20	133-7801	12	746-2489	20	643-2377
Greece	20	344-2912	20	158-3237	20	217-2160	20	262-5863
Ukraine	20	1321-4632	20	957-13832	10	426-2379	19	602-4681
Egypt	20	1219-8601	20	770-8086	1	1947	17	1937-7296
Romania	0	–	20	538-2658	0	–	20	817-3799
Croatia	20	1027-7504	20	446-8749	9	133-2400	20	34-3787
Slovenia	14	207-11999	20	80-16265	5	114-2300	20	90-4629
Bulgaria	20	754-6268	20	681-14539	8	131-2394	20	102-6527
Tunisia	12	3326-11829	20	10125-19877	1	234	9	122-7364
Morocco	20	2364-10544	20	2324-11226	1	1942	8	822-6998
Algeria	20	2142-9345	20	1837-10816	2	1679-2073	8	992-6263
Serbia	19	995-11803	20	716-19470	4	669-2386	14	531-7212
Jordan	19	1385-11630	18	1310-14783	0	–	10	3171-7277
Lebanon	14	1138-11749	20	1080-15079	0	–	8	2217-7083
Cyprus	11	1135-11622	18	1066-19218	0	–	4	2078-5596
Georgia	0	–	20	2464-12656	0	–	5	1930-6757
Macedonia	9	1468-11456	20	1163-19707	1	2075	1	1798
Syrian Arab Republic	7	4475-10696	20	5627-16011	1	1147	1	979
Bosnia and Herzegovina	19	2322-11957	19	1245-11755	0	–	0	–
Libyan Arab Jamahiriya	1	7037	11	12726-19215	0	–	0	–
Palestine	16	1193-11557	16	1542-14042	2	944-1336	4	688-2615
Malta	0	–	4	1125-13424	0	–	1	2128
Albania	4	8621-10665	20	8012-15102	0	–	1	5187
Montenegro	0	–	6	9947-19190	0	–	1	5020

Q[1] – quantity;

WRI[2] – World rank interval.

There are rare cases when the quantity of the universities or research centers in January 2012 is smaller than in July 2011, which is connected with their move from the original set. The lack of data on the Romanian and Georgian universities for July 2011 is due to our oversight in the conditions when Webometrics Rankings archive is not saved. Analyzing Webometrics Rankings of the universities and research centers as exemplified by comparable sets (comparing their equal quantities) we draw up a matrix showing change in the countries' sets positions (Table 2) as a whole based on Table 1.

Table 2. Matrix showing change in the countries' sets of the universities and research centers positions as a whole.

	Higher position	Lower position	Stable position
Universities	Italy, Greece, Serbia, Croatia, Russia, Bosnia and Herzegovina, Macedonia, Jordan, Lebanon, Palestine, Algeria, Egypt, Turkey	Israel, Syria, Morocco, Tunisia, France	Cyprus, Spain, Ukraine, Albania, Bulgaria, Slovenia
Research centers	Israel, Turkey, Syria, Croatia, France, Macedonia	Bulgaria, Greece, Italy	Palestine, Russia

Table 2 shows that considerably large quantity of the countries improved positions of their universities and research centers. Among the countries' sets of universities the position of the universities of Turkey and Egypt is predominantly improving, the position of the universities of France and Tunisia is predominantly worsening. We consider the position of the universities and research centers predominantly improving (worsening) if almost all the universities and research centers in the country's set demonstrated improvement (worsening) in their position in half a year. As for the research centers the position of Croatia is predominantly improving in this respect.

Table 1 shows that variability of ranks among TOP-20 universities of the Mediterranean and Black Sea region countries is no more than one order (except Slovenia), variability among research centers is no more than two orders.

Matrix showing representation of the countries' TOP-20 in the world TOP-1000, TOP-2000 and TOP-3000 Webometrics Rankings of the universities and research centers in January 2012 is drawn up (table 3).

Table 3. Matrix for representation of the countries' TOP-20 in the world TOP-1000, TOP-2000 and TOP-3000 Webometrics Rankings of the universities and research centers (January 2012).

	TOP-1000	TOP-2000	TOP-3000
Universities	Italy, Spain	Italy, Spain, France, Russia, Turkey	Italy, Spain, France, Russia, Turkey, Romania
Research centers	France	France, Spain	France, Spain, Israel

It is evident that Romania demonstrates the most impressive results. All its TOP-20 universities are represented in the TOP-3000 as of January 2012. It means that the Romanian universities are well-represented on the web.

We also study representation of the universities and research centers in country's TOP-20 Webometrics Ranking (based on the data for July 2011 and January 2012) by country and city (Table 4).

Table 4. Representation of the universities and research centers in the countries' TOP-20 Webometrics Ranking by countries and cities of the Mediterranean and Black Sea region, January 2012.

African countries	**Cities**
Algeria	Algeria (7, 5); Orán (3, 2); Biskra (1, 0); Batna (1, 0); Blida (1, 0); Constantine (1, 0); Tlemcen (1, 0); Guelma Province (1, 0); Laghouat Province (1, 0); Bejaia Province (1, 0); Boumerdès (1, 0); Mostaganem (1, 0); Baba Hassen (0, 1)
Egypt	Cairo (9, 14); Mansoura (1, 0); Zagazig (1, 0); Tanta (1, 0); Al Fayyum (1, 0); Ismaïlia (1, 0); Asyut Governorate (1, 0); Helwan (1, 0); Qena Governorate (1, 0); Minya Governorate (1, 0); Minufiya Governorate (1, 0); Alexandria (1, 1) Giza (0, 2)
Tunis	Tunis (13, 5); Sousse (2, 0); Sfax (2, 2); Monastir (1, 1); Salammbo (0, 1); Manouba (2, 0)
Libya	Tripolii (5, 0); Sabha (1, 0); Benghazi (1, 0); Sirte (1, 0); Al-Bayda (1, 0); Misurata (1, 0); Zawiya (1, 0)
Morocco	Morocco (2, 4); Casablanca (3, 0); Marrakesh (2, 0); Rabat (2, 4); Souissi (1, 0); city of Ifrane (1, 0); Settat (2, 0); Tangier (2, 0); Oujda (1, 0); Kenitra (1, 0); Agadir (2, 0); Fez (1, 0)
Asian countries	
Israel	Jerusalem (4, 6); Tel Aviv (3, 2); Ramat hashron (0, 1); Haifa (2, 4); Central District Rehovot (1, 0); Beersheba (1, 0); Herzliya (1, 1); Ariel Israeli settlement (1, 1); Rishon LeZion (1, 0); Beit Berl (1, 0); Southern District Sderot (1, 0); Kiryat Tiv'on (1, 0); Holon (1, 0); Tel Hai (1, 0); Kinneret (1, 0); Netanya (0, 1); Beit Dagan (0, 1); Ramat Gan (0, 1); D.N Hevel Eilot (0, 1); Petach Tikvah (0, 1)
Jordan	Amman (11, 10); Irbid (1, 0); Al-Ramtha (1, 0); Zarqa City (1, 0); Arabella (1, 0); Mafraq city (1, 0); Salt (1, 0); Ma'an (1, 0); Kerak Governorate (1, 0); Tafila Governorate (1, 0)

Asian countries	
Palestianian Territories	Nablus (1, 0); Gaza (5, 0); Birzeit (1, 0); Jerusalem (1, 1); Bethlehem (1, 1); Hebron (2, 0); Gaza Strip (2, 0); Jenin (1, 0); Deir El-Balah (1, 0); Al-Zahra (1, 0); Ramallah (0, 2)
Syrian Arab Republic	Damascus (10, 0); Homs (1, 0); Latakia (1, 0); Al Qadmus (1, 0); Deratiah (1, 0); Wadi al-Nasara (1, 0); Deir ez Zor (2, 0); Jbab (2, 0); Aleppo (2, 1)
Turkey	Ankara (5, 3); Istanbul (7, 3); district of Izmir, Bornova (1, 0); Anatolia (1, 1); İzmir (1, 0); province of Konya (1, 0); Malatya (1, 0); Adana (1, 0); Kayseri (1, 0); Bursa (1, 0); Gebze (0, 1)
Lebanon	Beirut (13, 7); Al-Kurah ((1, 0)); Zouk Mosbeh (1, 0); Bekaa (1, 0); Tripoli (1, 1); Hadath-Baabda (1, 0); Matn District (1, 0); Meshref (1, 0)

European countries	
Albania	Tirana (13, 1); Vlorë District (2, 0); Durres (1, 0); Shkoder (1, 0); Elbasan (1, 0); Gjirokastër (1, 0); Korçë (1, 0)
Ukraine	Kiev (6, 11); Kharkov (3, 3); Lviv (2, 1); Donetsk (2, 2); Sumy (1, 0); Odessa (1, 2); Dnipropetrovsk (1, 0); Lugansk (2, 0); Chernivtsy (1, 0); Simferopol (0, 1)
Slovenia	Ljubljana (5, 18); Jesenice (1, 0); Gradec (1, 0); Velenje (1, 0); Maribor (2, 1); Nova Gorica (2, 0); Koper (2, 1); Piran (2, 0); Bled (1, 0); Celje (2, 0); Novo Mesto (1, 0)
Spain	Seville (1, 13); Madrid (5, 0); Barcelona (3, 4); Granada (1, 0); Valencia (2, 0); Leioa (1, 0); Alicante (1, 0); Murcia (1, 0); Salamanca (1, 0); Saragossa (1, 0); Vigo (1, 0); Santiago de Compostela (1, 1); Castellón de la Plana (1, 0); San cristobal de la Laguna (0, 1); Pamplona (0,1)
Serbia	Belgrade (14, 13); Novi Sad (1, 0); Niš (1, 0); Kragujevac (1, 0); Sremska Kamenica (1, 0); Kosovo (2, 0)
Russia	Moscow (7, 10); Kazan (1, 0); Saint Petersburg (3, 3); Tomsk (2, 0); Novosibirsk (2, 3); Chelyabinsk (1, 0); Rostov (1, 0); Saratov (1, 0); Voronezh (1, 0); Dubna (1, 0); Yekaterinburg (0, 1); Protvino (0, 1); Perm (0, 1)
Bosnia and Herzegonia	Sarajevo (7, 0); city of Tuzla (1, 0); Zenica (1, 0); Banja Luka (5, 0); Mostar (1, 0); Istočno Sarajevo (3, 0); Slobomir (1, 0); Bihać (1, 0); Travnik (1, 0)
Bulgaria	Sofia (9, 19); Plovdiv (2, 0); Blagoevgrad (2, 0); City of Stara Zagora (1, 0);Varna (1, 0); Svishtov (1, 0); Shoumen (1, 0); Ruse (1, 0); Veliko Tarnovo (1, 0); Pleven (1, 0); Kostinbrod (0, 1)
Croatia	Zagreb (2, 17); Rijeka (2, 0); Zadar (1, 0); Split (2, 2); Osijek (11, 0); Dubrovnik (1, 1); Posega (1, 0)
Italy	Bologna (1, 0); Pisa (1, 0); Rome (2, 7); Milan (3, 2); Padua (1, 1); Florence (1, 2); Turin (2, 1); Naples (1, 0); Genoa (1, 0); Trento (1, 1); Palermo (1, 0); Pavia (1, 0); Siena (1, 0); Catania (1, 2); Parma (1, 0); Bari (1, 0); Venezia (0, 1); Cagliari (0, 1); Pula CA (0, 1); Prato (0, 1)
France	Paris (10, 12); Lyon (1, 1); Nizza (1, 0); Rennes (1, 1); Grenoble (1, 1); Caen (1, 0); Nantes (1, 0); Dijon (1, 0); Villeneuve-d'Ascq (1, 0); Montpellier (1, 0); Versailles (1, 0); Vandoeuvre-les-Nancy (0, 1); Villerbanne (0, 1); Bordeaux (0, 1)

Macedonia	Skopje (12, 1); Bitola (1, 0); Ohrid (1, 0); Kumanovo (1, 0); Struga (1, 0); Tetovo (1, 0); Stip (1, 0)
Greece	Athens (5, 9); Thessalonica (3, 2); Rethymno, Heraclion (1, 4); Patras (1, 1); Mytilene (1, 0); Ioannina(Jannena) (1, 0); Thrace (1, 0); Piraeus (2, 0); Karditsa (1, 0); Chaniá (1, 0); Peloponnese (1, 0); Larissa (1, 0); Corfu (1, 0); Agia paraskevi (0, 1); Marousi (0, 1); Pikermi (0, 1); Chania (0, 1)
Cyprus	Nicosia (15, 4); Limassol (3, 0)
Georgia	Tbilisi (17,5); Batumi (1, 0); Gori (1, 0); Kutaisi (1, 0)
Romania	Bucharest (4, 17); Lasi (2, 2) Brasov (1, 0); Cluj-Napoca (3, 1); Timisoara (3, 0); Craiova (1, 0); Suceava (1, 0); Oradea (1, 0); Galati (1,0); Constanta (1, 0); Sibiu (1, 0); Pitesti (1, 0)
Montenegro	Podgorica (5, 0); Igalo (1, 0); Kotor (0, 1)
Malta	Msida (1, 0); Paola (1, 0); San Gwann (1, 0); San Giljan (1, 0); Valletta (0, 1)

On the basis of this table we select the cities with high concentration of the universities and research centers. The cities are selected with the use of vector variable (a, b) and according to the criterion $a + b \geq N_{cr}=10$ (Table 5).

Table 5. Cities of the Mediterranean and Black Sea region countries with the largest quantity of the universities and research centers from the countries' TOP-20 Webometrics Ranking ($a + b \geq 10$). January 2012.

Countries	**Cities**	**Countries**	**Cities**
Albania	Tirana (13,1)	Cyprus	Nicosia (15,4)
Ukraine	Kiev (6,11)	Georgia	Tbilisi (17,5)
Slovenia	Ljubljana (5,18)	Romania	Bucharest (4,17)
Spain	Seville (1,13)	Algeria	Algiers (7,5)
Serbia	Belgrade (14,13)	Egypt	Cairo (9,14)
Russia	Moscow (7,10)	Tunisia	Tunis (13,5)
Bulgaria	Sofia (9,19)	Israel	Jerusalem (4,6)
Croatia	Zagreb (2,17), Osijek (11,0)	Jordan	Amman (11,10)
France	Paris (10,12)	Syrian Arab Republic	Damascus (10,0)
Macedonia	Skopje (12,1)	Lebanon	Beirut (13,7)
Greece	Athens (5,9)	Turkey	Istanbul (7,3)

Table 5 shows that the highest concentration of the universities and research centers is characteristic mostly of capitals of Slovenia, Serbia, Bulgaria, France, Georgia, Romania, Egypt, Jordan and Lebanon. The countries are selected according to the criterion $a + b \geq 20$. It should be

pointed out that among the developed European countries of the Mediterranean and Black Sea region Italy's research infrastructure is scattered most of all ($a + b < 10$).

Conclusion

The TOP-20 Webometrics World Ranks change intervals for the second half of 2011 are identified for the universities and research centers of 29 countries of the Mediterranean and Black Sea region. It allows us to draw up a matrix showing change in the countries' sets of universities and research centers. The matrix shows that considerably large quantity of the countries improved positions of their universities and research centers. Among the countries' sets of universities the position of the universities of Turkey and Egypt is predominantly improving, the position of the universities of France and Tunisia is predominantly worsening. The position of Croatia is predominantly improving concerning research centers.

For January 2012 the matrix showing representation of the countries' TOP-20 in the world TOP-1000, TOP-2000 and TOP-3000 Webometrics Rankings of the universities and research centers is drawn up. The top positions are taken by the universities and research centers of Italy, Spain and France.

On the basis of the representation of the universities and research centers from the TOP-20 Webometrics Ranking by countries and cities it is shown that the highest concentration of the universities and research centers is characteristic mostly of capitals of Slovenia, Serbia, Bulgaria, France, Georgia, Romania, Egypt, Jordan and Lebanon (the quantity of the universities and research centers is larger than 20). Among the developed European countries of the Mediterranean and Black Sea region Italy's research infrastructure is scattered most of all (the quantity of the universities and research centers in its cities is smaller than 10).

Similar analysis of the universities' and research centers positioning in the world Webometrics Ranking can be performed for other large regions of the world.

We consider this research to be our contribution to the emerging area of knowledge called Geography (Geographies) of Higher Education that is part of the broader research field of Geography (Geographies) of Science. The study of Webometrics Ranking as empirical bases and analytical tool is justified because it covers all the universities in the world.

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