Web Structure and Influence of the Arab Universities of the MENA Zone (*Middle East and North Africa*): Visualization and Analysis

Benjamín Vargas-Quesada*

University Professor, Information and Communication Department,

University of Granada, Campus Cartuja, Colegio Máximo, 18071 Granada, Spain.

(CSIC), Associate unit SCImago Group, Madrid, Spain.

E-mail: benjamin@ugr.es

Tel.: + 34 958 240923; Fax: + 34 958 243490

Cristina Faba-Pérez

University Professor, Information and Communication Department,

University of Extremadura, Plaza Ibn Marwan, La Alcazaba, 06071, Badajoz, Spain.

Khaldoon Mohammad Oglah AL_Dwairi

University Professor. Al-Balqa Applied University

Al-Salt 19117, Jordan.

Félix Moya-Anegón

Research Professor, Institute of Policies and Public Property, Superior Council for Scientific

Investigation, C/Albasanz, 26-28, 28037, Madrid. Spain.

(CSIC), Associate unit SCImago Group, Madrid, Spain.

1.- Introduction

The geopolitical zone known as MENA (Middle East and North Africa), occupying so many newspaper front pages last year owing to the "Arab spring" in Tunisia, Egypt, Libya and Syria, is at the same time largely ignored by the realm of webometrics, scientometrics, and information visualization. The MENA zone would include all 22 countries whose official language is Arabic, and which also belong to the League of Arab States (*http://www.arableagueonline.org*): Saudi Arabia, Algeria, Bahrain, Comoro Islands, Djibouti, Egypt, United Arab Emirates, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Mauritania, Oman, Palestine, Qatar, Syria, Somalia, Sudan, Tunisia and Yemen. The MENA zone takes in countries of two geographic areas –the Middle East and northeastern Africa– that are often studied separately, despite their many cultural, social, economic, political and religious points in common. Precisely these aspects, plus the relations or interactions among the respective countries, governments, organizations and institutions, and their degree of development, become determinant factors in the overall influence of a country, the intellectual weight of its institutions in the regional context, and the predominance of certain universities. Studies of interaction among universities are usually approached through their web links, which serve to gauge the comparative influence of each academic institution.

The World Wide Web (3W) has come to be a foremost source of information about a wide array of areas, as well as a vital channel of communication for persons, companies and societies (Al-Dwairi, Faba-Perez and Vargas-Quesada, 2010). Webometrics, based on these information sources, aspires to generate new knowledge that helps explain phenomena of the 3W arena. Indeed, aspects such as web activity or output are used to evaluate the educational and scientific activity of a country and its grid of institutions. We presently dispose of web indicators with academic results (Thelwall, 2002a; Thelwall, 2002b; Thelwall, Harries and Wilkinson, 2003; Ortega and Aguillo, 2008a), or trackings of a bibliometric nature (Aguillo and Granadino, 2006).

As far as we can see, however, there is no panoramic study of the web structure of the Arab countries that assesses their collective or relative influence. Some authors have explored the development and representation of the web at a national level within the Arab world; output from Spain includes works by Thelwall and Aguillo (2003) and Ortega and Aguillo (2007). Canadian universities have been explored by Vaughan and Thelwall (2005) and Vaughan (2006). There are respective studies of Scandinavia by Ortega and Aguillo (2008b) and of Finland by Holmberg and Thelwall (2009). Supranational analyses carried out by Thelwall (2002c) and Tang and Thelwall (2004) discovered that European universities were grouped into national or local sub-networks, connected to others on the basis of linguistic or geographical criteria. Somewhat later, Heimeriks and van den Besselaar (2006) and Ortega et al. (2008) identified four geographic zones in the web space of the European Union: Scandinavia, United Kingdom, Germany and southern Europe. Finally, Thelwall and Zuccala (2008) looked into the relationship between university links and European web space, describing these relations at the country level.

Moving over to the Ibero-American world, deserving mention are the characterizations of Spain´s and Chile´s web connections brought out by Baeza-Yates, Castillo and López (2005); the overview of South America published by Bordignon and Tolosa (2006); and virtual descriptions of Paraguay (Bordignon, Lavallén and Tolosa, 2006) and Argentina (Tolosa et al., 2007). Authors Aguillo, Granadino and Llamas (2005) first approached the Ibero-American academic web using criteria of design and position, to later on establish content indicators (Aguillo et al., 2007) for evaluating this web space. Authors Caraballo-Pérez et al. (2008) described the Cuban academic web in similar terms.

Still, very few have ventured into virtual studies of the Arab world, and even fewer have reflected its webometrics. One such study is that of Farrag, published in 2006, focusing on the Web Impact Factor (WIF) and the production of the eight universities of Saudi Arabia he considered most important. This landmark study was published in Arabic, a considerable hindrance for its diffusion, yet as the same time it underlines the need for a large-scale study of the associations among Arab universities to identify their underlying structure.

Another noteworthy study is the one by Al-Dwairi and Herrero-Solana, in 2007. It presents the problems encountered for the implantation and evolution of new technologies in the countries of the MENA zone, and the appreciable differences in their position regarding internet potential. Elgohary (2008) presented a study of the webs of 99 Arab universities belonging to the MENA zone; its main contribution is a university ranking based on their web links, finding that Saudi Arabia consistently took first place. Yet it also stresses the language factor as determinant for a good web position, an

element often overlooked in university-based studies. A further study along these lines (Al-Dwairi, Faba-Pérez and Vargas-Quesada, 2010) proposes the application of structural quality indicators for the objective elaboration of a ranking of 245 MENA zone universities. This study demonstrates that the universities that are highly linked also secure a better position in the Quality Indicator ranking, making manifest the direct association of the two indicators. In contrast to previous findings, here Saudi Arabian universities were not at the top of the ranking; rather, the outstanding ones corresponded to the wealthiest Arab countries, with their more or less European social trends. A very recent study (Faba-Pérez, et al., in press) analyzes the web presence of Arab countries and their universities through technological indicators.

In sum, the aim of our study was to elaborate a webometric study of the MENA zone, bringing to light the true structure and influence of each country (country field) and its major academic entities (universities) in the broader context of the MENA zone. Drawing this virtual map led us through a series of pertinent research questions:

- Is there a relationship between the number of university web sites of a country and its in-links?
- Can some pattern of linkage among countries be detected? If so, of what type?
- Is it possible to depict the web structure on the national level, using social network techniques?
- How might we generate a ranking of the web influence of Arab countries using network indicators?
- Can the academic structure of the MENA zone be represented by means of the web links of its universities?
- How could social network indicators be used to generate a ranking of web influence?
- Do the links of the universities in the MENA zone obey or reflect any sort of pattern?

In our mind, achieving the main objective of the study and some response to the adjacent research questions would provide ample information about the poorly understood web structure, functions and influence in the MENA setting, and most specifically in the universities of MENA countries.

2.- Materials and Methods

2.1. Source Data

We considered as universities in the MENA zone all those centers located in one of its twenty-one countries where undergraduate or graduate degree studies were imparted, either in a public or a private higher academic institution. The main and most complete source we used to begin with was *Association of Arab Universities of Jordan* (*http://www.aaru.edu.jo*), from Amman (Jordan). A total of 145 universities were selected from it. As a complementary international source we used the list of *Universities Worldwide* (*http://univ.cc/world.php*). *The Federation of the Universities of the Islamic World* (*http://www.fuiw.org*) offered no additional relevant data, and finally, from the *Association of African Universities* (*http://www.aau.org*) we obtained a list of

universities, but no links to them. All the sources were consulted periodically until July 1, 2010; our objective was to finalize and update the list of MENA zone universities by that date.

Having obtained the names of all the universities, we proceeded to search out the respective missing URLs. To this end, search tools such as Google and Altavista were used. The information obtained gave a total of 203 universities with their corresponding URLs, the concrete basis of our research. To complete the list, a corroborator of links (*Linkbot*) was used to examine each of the 203 URLs, extracting its external links. After manual checking, we added to the original list those directed to universities in the MENA zone that had not been gathered previously. Thus, the final list amounted to 267 websites of the MENA zone (Annex). A special case to be underlined here is that of the Comoro Islands, for which no university URLs could be found; it was therefore excluded from our data analysis.

2.2. Data Treatment

It has been shown that the relational data obtained from academic websites reflects real phenomena and relations that take place between or among these institutions (Holmber and Thelwall, 2009). There are essentially three distinct methods for obtaining information about website links. The first consists of visiting each one and manually extracting the information needed about its links and contents. This method is very laborious and time-consuming, and is recommended only when dealing with a limited number of sites. In our case, 267 universities were to be analyzed, however, making it fully impractical. The second method consists of consulting the level of linkage among universities on the basis of queries made through commercial search engines such as Google, Yahoo and Bing. Bearing in mind that authors such as Lawrence and Giles (1999) demonstrated that the coverage of these engines is very low, in some cases just 16% of the total network, and that there is a strong bias toward the United States (Thelwall and Vaughan, 2004), the second method was likewise deemed inappropriate for our purposes. A third possibility was to use a webcrawler (robot), which automatically and independently carries out the necessary queries in order to obtain pertinent information regarding the number of links connecting one university with another, and the contents thereof. This sort of robot, unlike commercial search engines, is not capable of indexing pages that are not HTML or in a dynamic format. Notwithstanding, we chose this latter option, as it allowed us to exercise greater control of the results, and was preferable to the search engine option.

In order to obtain the links existing among the 267 Arabic universities studied, *Lexiurl* (*http://lexiurl.wlv.ac.uk*) was applied. This free software enables one to carry out such tasks automatically, by means of APIs and wizards.

2.2.1. Inlinks

These make reference to the number of links received by a university that come from another university of the MENA zone. They may be considered as a way of quantifying recognition or influence. The greater the number of inlinks, the greater the

acknowledgement made and therefore the vaster the influence of these institutions upon linked academic arenas. In order to determine the inlinks of each one of the 267 universities of our study, during the month of August, 2010, and by means of *Lexiurl* – and specifically the APIs of *Yahoo! search,* the search engine with the highest coverage allowing the combined use of operators– we launched 71,022 consultations of the following type: *linkdomain: universidad x site: universidad y*, so as to determine the number of links pointing to university *x* proceeding from university web pages *y*.

2.2.2 Co-inlinks

The term co-inlinks in turn refers to the number of times that two universities are linked in conjunction by a third. Co-inlinkage shows the groupings produced among universities, as derived from a consensual opinion of each theoretically reflected by linkage patterns. To arrive at the number of co-inlinks we likewise used *Lexiurl* and the *API*s of Y*ahoo! search* on the same date as indicated above. In this case, a total of 35,511 queries of the following type were launched: *linkdomain: universidad x linkdomain: universidad y –site: universidad x –site: universidad y*. The objective was to verify the number of co-inlinks received by MENA universities *x* and *y*, proceeding from the web pages of MENA universities *x* and *y*.

2.3. Visualization

One widely used software application for social network visualization and analysis is *Pajek* (Batagelj and Mrvar, 2012). *Lexiurl* provides different types of formats for data output, such as *.net* or lists of neighbors, easily read by *Pajek*. For this reason, in addition to its power, it was our choice. Two types of maps are generated by means of *Pajek*, logically corresponding to the data gathered.

2.3.1. Maps of Inlinks

These maps allow the web structure of the MENA zone to be visualized through the links of their pages, showing who initiates the link and whom is the object of the link. To represent the spatial distribution of the nodes and links we used the Kamada and Kawai (1989) algorithm, broadly applied within the scientific community for network displays (Vargas-Quesada et al., 2010), and integrated into *Pajek*.

There are also two types of inlink maps generated. First, by grouping the domains of the URLs of the universities, a geographic map of inlinks with the countries constituting the MENA zone was created. It made visible, as we will see later on, the structure, influence and groupings among the countries of the zone. Then, a map with the inlinks of the universities was generated, also clearly reflecting the structure, influence and groupings of these institutions.

2.3.2. Maps of Co-inlinks

Generating this type of map called for using the co-inlink information previously given by *Lexiurl*, and easily importable by *Vosviewer* (van Eck and Walkman, 2010). *Vosviewer* is free software for the representation and analysis of relational information, arising as an alternative to the traditional techniques for multidimensional or network displays. This software fuses visualization techniques and clustering, favoring analysis and bypassing unnecessary complications. It moreover offers the welcome possibility of normalizing data according to the strength of their association; in our case: $AS_{ij} = \dfrac{C_{ij}}{C_i C_j}$

This similarity measure was compared by Van Eck and Waltman (2009) with other typical measures such as the Cosine, Jaccard or raw data, and selected as the most appropriate for normalizing co-occurrence in the framework of our study, and therefore standardizing the co-inlinks.

3. Results and Discussion

3.1. Relationship between Number of Universities and Inlinks by Country

Table I, first of all, shows the name of each country, the number of its universities, and the percentage with respect to the total countries of the MENA zone. Secondly, it indicates the total number of inlinks received by the bulk of the universities of each country and the respective percentages.

Country	N. of Universities	%	*Inlinks* per Country	%
Saudi Arabia	24	8,96	928,918	60,78
Palestine	11	4,1	122,647	8,02
Jordan	21	7,84	83,212	5,44
Egypt	31	11,57	67,164	4,39
Lebanon	19	7,09	63,598	4,16
Algeria	25	9,33	59,472	3,89
UAE	15	5,6	40,623	2,66
Qatar	4	1,49	39,591	2,59
Morocco	14	5,22	29,590	1,94
Sudan	15	5,6	22,706	1,49
Syria	12	4,48	21,617	1,41
Oman	4	1,49	13,889	0,91
Tunisia	20	7,46	9,367	0,61
Yemen	13	4,85	7,340	0,48
Bahrain	8	2,99	6,724	0,44
Libya	8	2,99	5,389	0,35
Kuwait	4	1,49	2,950	0,19
Iraq	10	3,73	1,932	0,13
Mauritania	2	0,75	1,072	0,07
Somalia	6	2,24	454	0,03
Dijbouti	1	0,37	176	0,01
Total	**267**	**100**	**1,528,431**	**100**

Table I. Distribution of the *inlinks* of the 267 universities of the MENA zone grouped by country

The country with the most inlinks, and third regarding the number of universities, is Saudi Arabia, with 928,918 links and 24 websites. This means that it receives 60.78% of the inlinks of the MENA zone, and that the contents of the web pages of its

universities are of great interest for the other universities, since it has a great capacity for attracting links. It is followed by Palestine, with 8.02% of the total inlinks. Despite its relatively small number of universities –11, that is, 4.1% of the total– it is the second country in terms of the inlink/university ratio, after Saudi Arabia. This would suggest that the number of universities of a country is not determinant for the number of links that it receives. If we look at Egypt, the MENA country with the most universities (31), we see that it comes fourth in the number of links received. The case of Qatar is even more remarkable: with just four universities, and none of outstanding prestige, it has a high number of inlinks, many more than Morocco, above it on the list with 14 universities. In contrast, we have the case of Tunisia: despite being the first Arab country connected to the Internet, and having a high number of universities (20, or 7.46% of the total), its ratio of inlinks is less than 1%. Specifically, it is 0.61%, suggesting its contents spark little interest in the academic arenas of MENA. Similarly, Iraq and Somalia have a fair number of universities (respectively, 10 and 6), yet they are at the end of the list in the number of inlinks. Also deserving special mention is Djibouti: it has just one university (website), and the 176 inlinks it receives (0.01% of the total), are self-links. In other words, no other university in the MENA zone expresses any interest in the contents of its web page.

These findings lead us to conclude that there is no direct relationship between the number of universities and the number of inlinks of a given country. If we correlate both variables, we arrive at a value of $r = 0.15$, a low positive correlation; thus, it is not possible to affirm that countries having more university websites are also the ones receiving more inlinks.

3.2. Relation between Inlinks and Geographic Proximity

If there is no clear relationship between inlinks and university websites involving countries, we are left wondering just what reason lies behind the link. It may be that the geographic proximity plays some role, as put forth by Holmberg and Thelwall (2009) and Ortega and Aguillo (2009). A good look at the maps of inlinks and co-inlinks in Figures 1, 2 and 3 would support this hypothesis. However, it is necessary to corroborate and demonstrate this deduction empirically. To this end, we created a binary matrix based on the borders of each country, to simply compare inlinks and geographic vecinity. Accordingly, Jordan, which shares a border with Palestine, gets a 1 in the cell of the matrix that relates the two countries, and has a 0 with Morocco since they are not geographic neighbors. If Jordan borders on Palestine, Palestine likewise borders on Jordan, and in both cases the matrix has a 1, meaning that the geographic matrixes are symmetric. Yet this does not happen with inlink matrixes, which in theory would be asymmetric –the fact that Jordan links with Palestine does not imply that, vice versa, Palestine also links to Jordan. To statistically test our hypothesis, we resorted to the Quadratic Assignment Procedure, or QAP (Krackhardt, 1992). It serves to test the degree of relationship existing between two matrixes, and calculates the probablility of obtaining an identical result in one same cell of the different matrixes in an accidental manner, by means of random permutations. The QAP was performed using Ucinet (Borgatti, Everett and Freeman, 2002). The algorithm is executed in two steps. In the first, the Pearson correlation coefficient between the cells of the two data matrixes is calculated. The second step entails random permutation of the rows and columns in both matrixes, and the correlation is calculated again. This second step is carried out

thousands of times in order to calculate to what extent a random correlation is greater than or equal to the correlation actually observed and calculated in step 1. A low proportion (<0.05) suggests a strong relationship between the two matrixes, which is not likely to be accidental.

	Correlation
Observed value	0.250
Average	0.001
Standard desviation	0.056
Proportion as large	0.012
Proportion as small	0.999
Number of permutations	2,500

Table II. Quadratic Assignment Procedure (QAP)

The column of values shown in Table II indicates that the correlation observed between the two matrixes is 0.250. The mean value of the random correlation produced between the two is practically 0 (0.001), with a standard deviation of 0.056. The percentage of random correlation corresponding to a value as great as 0.250 is 1.2% (0.012). With a typical threshold of 0.05, this correlation is considered significant, as 0.012 is less than 0.05. We can therefore affirm that from a statistical standpoint the links produced in the university setting of the MENA zone follow a pattern of proximity, involving geographic groupings.

3.3. Geographic Maps

In this section we approach the visualization of the networks formed by the inlinks of the universities and countries of the MENA zone from two standpoints: one offers a general panorama, grouping the universities by countries on the basis of their domains, while a second, more specific vantage point is based on the representation of their websites.

3.3.1. Map of inlinks by country

By aggregating the domains of the universities of each country and eliminating the *loops* or links produced among universities from a single country, it is possible to visualize the web structure of the countries of the MENA zone, revealing their linking or influence (Figure 1). To better comprehend the network, the node of each country is situated in the place occupied by its capital city, and the thickness of the links is shown in proportion to the number of inlinks.
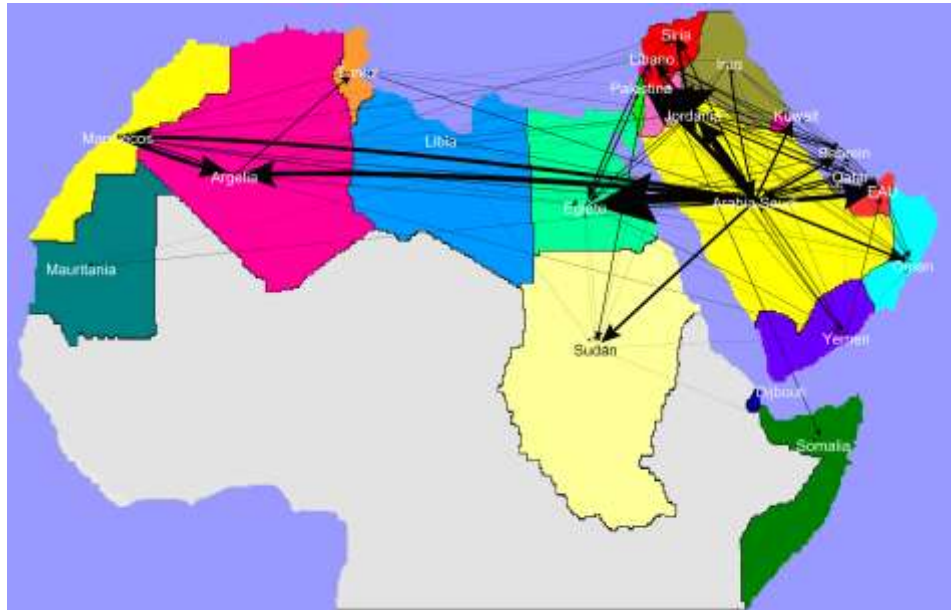
Figure 1. Map of inlinks of MENA-zone universities.

There are 20 countries receiving links from neighbours in the MENA zone. Only Djibouti, having just one university and no links to another country, is left completely disconnected in the depiction.

At first glance, Saudi Arabia would be the best acknowledged country in view of the inlinks it receives. Yet this is actually not true. Social network analysis, based on this recognition, gives us quite a different ranking than the one appearing in Table I. We must recall that the new distribution is the result of taking the country as the unit of analysis, not the university, then eliminating the self-links among institutions within a single country. This explains the apparent discrepancies with Table I.

3.3.1.1. Network analysis

The network of countries in the MENA zone has a density of 0.32, a value indicating that its countries are tightly linked together. Its diameter, or the maximum number of links that one has to retrace to connect two countries, is 3: between Algeria and Somalia. This is high cohesion. The mean clustering coefficiant is 0.57, implying that is is also a homogeneous network. Table III shows the network indicators based on centrality degree of the MENA countries.

Country	Inlinks	Grade	Closeness	Betweenness
Egypt	15	0.750	0.762	0.0972
Jordan	14	0.700	0.720	0.1497
Lebanon	11	0.550	0.617	0.0515
UAE	11	0.550	0.617	0.0296
Saudi Arabia	10	0.500	0.589	0.1233
Palestine	8	0.400	0.540	0.0232
Bahrain	8	0.400	0.540	0.0135
Syria	8	0.400	0.540	0.0032

Oman	7	0.350	0.518	0.0138
Sudan	6	0.300	0.498	0.0115
Yemen	6	0.300	0.498	0.0104
Qatar	6	0.300	0.498	0.0054
Tunisia	6	0.300	0.463	0
Morocco	5	0.250	0.463	0.0060
Algeria	5	0.250	0.418	0.0032
Kuwait	5	0.250	0.486	0
Libya	2	0.100	0.381	0.0033
Mauritania	2	0.100	0.442	0
Somalia	2	0.100	0.416	0
Iraq	1	0.050	0.350	0
Djibouti	0	0	0	0

Table III. *Inlinks* and centrality degree measures according to country in the MENA zone

Egypt stands out once again, as the country most acknowledged. Its degree is 0.75, meaning it receives links from 15 of the 21 countries (71.4%) configuring the MENA zone: Sudan, Palestine, Syria, Libya, Iraq, Qatar, Bahrain, Oman, Morocco, Algeria, Yemen, Jordan, UAE, Lebanon and Saudi Arabia. In short, Egypt is the country exercising the greatest academic or intellectual influence over its peers, thanks to the links it receives from their university webs. Its degree of closeness is also the highest, signaling it as the country with the greatest capacity of interaction. However, its betweenness degree of 0.0972 is not the highest, ranking below Jordan and Saudi Arabia. All this comes to highlight Egypt as the most influential MENA country, as well as the one interacting the most with other Arab nations, but it is *not* the best point of intermediation or confluence through which to gain access or communicate with the rest.

Jordan takes second place in terms of degree (0.700) and closeness (0.720), but is first in power of intermediation (0.1497). Its ranking shows it to be a country of very substantial recognition and influence, interaction and, above all, intermediation. This allows it to rival Egypt insofar as the situation of privilege in the network, despite being the third country in terms of the number of inlinks (Table I).

Lebanon and the United Arab Emirates (UAE) respectively take third and fourth places regarding degree. They have the same degree (influence) and closeness (capacity of interaction), but the former has a higher power of intermediation (0.0515) than the latter (0.0296), therefore attaining better levels of communication with the other countries.

The fifth country is Saudi Arabia, with only average values of degree and closeness, despite being the country with the most inlinks (Table I). This is due to the fact that many of these inlinks are self-links, from universities within the country. Notwithstanding, its degree of intermediation is quite high (0.1233), just after Jordan and well above Egypt, UAE and Lebanon. Not outstanding in terms of recognition by its neighbours, it does not exert great influence. Its capacity for interaction lies in the intermediate range. However, it wields a great power of confluence, and therefore facilitates communication with the rest. Together with Jordan, it can be considered a key point of access and interaction for the MENA zone.

Palestine, Bahrain and Syria occupy positions six, seven and eight in this ranking. Their values of degree and closeness are the same. The only (slight) difference is in between-

ness, which determines their order in the table. That is, they have the same capacity of influence and interaction, yet Palestine is more "confluential".

Oman is ninth in the ranking, just above a few other countries that are practically tied. Its capacity of influence, interaction and confluence lie in the mid-range, and can be considered acceptable in the context of the whole network.

Sudan, Yemen, Qatar and Tunisia occupy positions ten through thirteen in the ranking. Their centrality degrees are comparatively low, indicating little recognition by their peers, hence limited influence, the same as their power of interaction. The case of Tunisia is interesting in that it is a very "pro-internet" country and has a high number of universities, some of considerable prestige; yet its capacity for interacting is inferior to the other three, and its power of intermediation is null. This might be due to its high degree of western influence in the cultural realm, with less geopolitical affinity in the MENA zone, making its capacity to attract links and therefore wield intellectual influence in the area very limited.

The fourteenth, fifteenth and sixteenth positions respectively go to Morocco, Algeria and Kuwait. Their values of centrality of degree (influence) are identical, and the capacity of interaction (betweenness) is nearly the same. Of these three countries, Morocco holds a slight advantage as a point of communication with other countries (Algeria and Kuwait having none at all).

Libya, Mauritania and Somalia are ranked 17, 18 and 19, respectively. As we saw with the three countries above, their values of degree or influence are the same, yet closeness is slightly different. Only Libya has a capacity of intermediation, albeit very low.

Iraq, in 20th place, has the least recognition of all the countries with values over zero in degree; and it is also the country with the least capacity for interaction. It fully lacks betweenness.

Djibouti is at the bottom of the ranking. It has no relations with the universities of other MENA countries, and therefore lacks influence, interaction and intermediation.

3.3.2. Map of inlinks of universities

This type of map and the analysis derived from it, *site inlink analysis*, is highly recommended and utilized for the study of academic webs (Thelwall and Zuccala, 2008). Its objective is none other than to identify the most linked universities, that is, the ones whose contents prove most attractive to the rest.

Of the 267 universities comprising the MENA zone, only 218 send and/or receive at least one link from beyond (not a self-link). In other words, 49 are disconnected and do not constitute part of the network, for which reason they are not represented in the map. The Annex offers a complete list, ordered from 1 to 218.

Figure 2 shows the map of the web structure of the 218 universities of the MENA zone that have at least one link. Note that the ones with a greater number of links (influence) tend to occupy the central area of the map, whereas the rest are spread around peripheral

areas, depending on their level of linkage or influence. This central/peripheral structure is recurrent in other types of maps, establishing a clear relationship between centrality and influence (Vargas-Quesada et al., 2008).
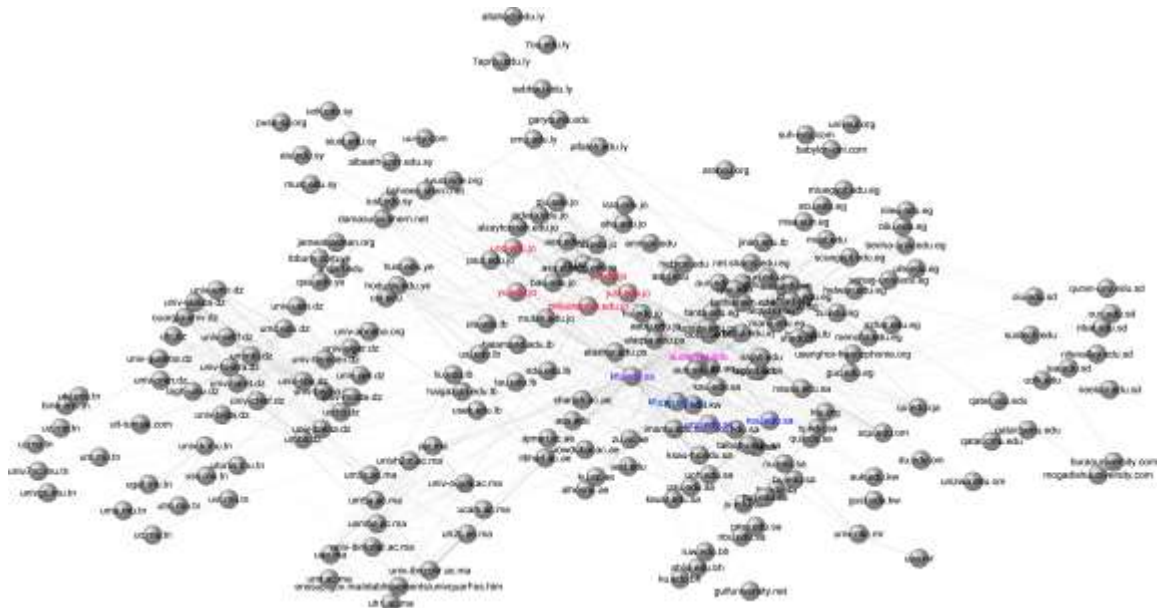
Figure 2 . Map of *inlinks* of the MENA zone universities.

The use of network indicators based on degree lends us the possibility of carrying out a fine-tuned analysis of the way that universities inter-relate. Moreover, it enables us to establish a ranking based on those indicators (see Annex). Of course the 49 universities that are not represented on the map, neither sending or receiving links, have no values in terms of network indicators.

3.3.2.1. Network analysis

The network of universities of the MENA zone has a density of 0.019 and an average degree of 10.11. This indicates that, altogether, their connectivity is quite low. Their diameter, that is, the maximum number of links that need to be retraced to connect two universities, is eight: from the *American University in Dubai* (EAU) to the *Ibb University* (Yemen), indicative of low network cohesion. Finally, their clustering coefficient is 0.27, pointing to a low degree of network homogeneity. We could say that the university network of the Arab countries does not constitute an integrated entity; rather, it is a disperse conglomeration, with little inner coherence or common substance.

As seen clearly in Figure 2, the universities with the greatest number of inlinks, and also the highest values for degree (influence), closeness (connectivity) and betweenness (confluence), are situated in the central area. Thus for example, *University of Jordania* (*ju.edu.jo*) –in red– is probably the most central of all. In turn, this university is the one with the highest values for influence and connectivity, overtaken in confluence only by the *King Faisal University* of Saudi Arabia –in blue– which has the highest value of all

the network for this indicator (0.167). Second, third and fourth in the network indicators we find, respectively: *Fahd University of Petroleum and Minerals* (*kfupm.edu.sa*), *King Saud University* (*ksu.edu.sa*) and *Umm Al-Qura University* (*uqu.edu.sa*). All three are from Saudi Arabia and occupy very central positions on the map, in blue. The fifth, sixth and seventh positions are taken by universities in Jordan, shown in red: *Yarmouk University* (*yu.edu.jo*), *Jordan University of Science and Technology* (*just.edu.jo*) and *Philadelphia University* (*philadelphia.edu.jo*). They occupy very central positions, close to the first in ranking, which likewise pertains to Jordan. In eighth place we find *King Faisal University* (*kfu.edu.sa*) of Saudi Arabia –in blue; as we mentioned earlier, it is the university with the greatest capacity for confluence or intermediation in the network, while it also maintains very good levels of influence (degree) and connectivity (betweenness), reflected by its central position on the map, halfway between the universities of Jordan, Egypt and Saudi Arabia. Ninth in the ranking is the first Egyptian university: *American University in Cairo* (*aucegypt.edu*) –in pink. It also occupies central positions with high values of influence and interactive capacity, though interestingly enough, lacking any confluential power. The tenth position is held by *Petra University* (*uop.edu.jo*) –in red– very near the center, close to the other institutions of Jordan. For the sake of brevity, we only comment on the positions of the top ten universities in the ranking. Again, the Annex shows all the rest, ordered by degree (influence), closeness (connectivity) and betweenness (confluence).

3.3.3. Map of co-inlinks of the universities

The map of co-inlinks is based on the number of times that two Arab universities are linked together by a third university. Its objective is to detect and identify the groupings of universities in view of the consensual opinion derived from their co-inlinks. As we explained in section 2.3.2., we used *Vosviewer* for their representation.

Again, there are 218 universities co-inlinked in the MENA zone, each represented by its URL. The size of the source and the representative circle are proportional to the institution´s weight in the network, calculated by its force of association. The universities are clusterized automatically by means of an algorithm from *Vosviewer* (Waltman, Van Eck and Noyons, 2010). To enhance visualization, each cluster is displayed in a different color, only the universities wielding the most weight are shown within each cluster, and we avoid the overlapping of their names.
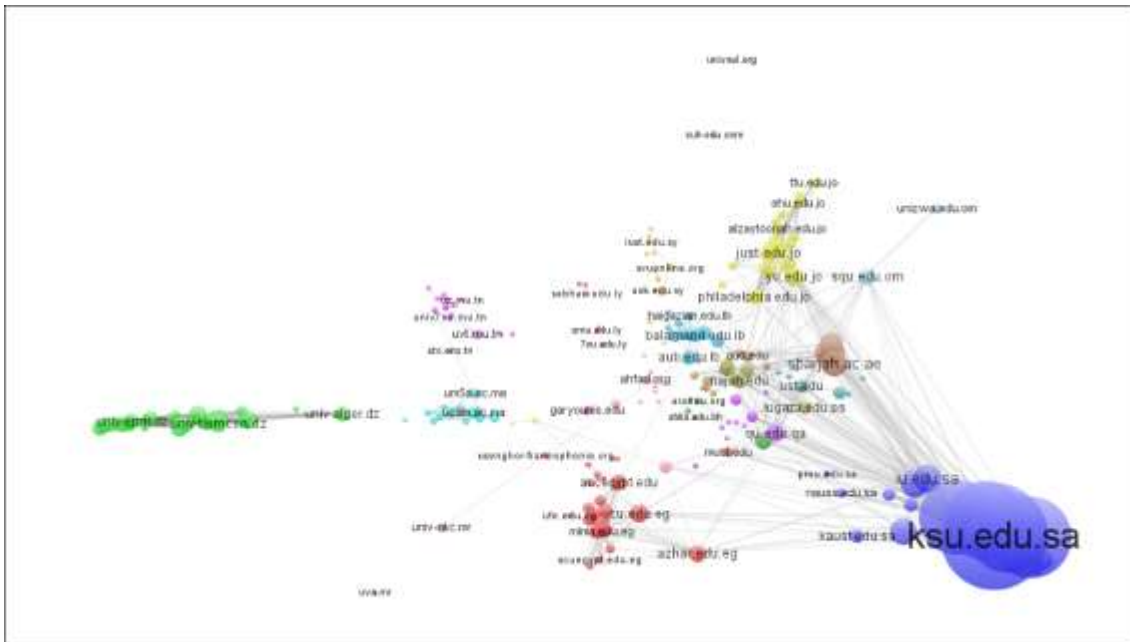
Figure 3. Map of co-inlinks of universities of the MENA zone

The map of Figure 3 shows how the universities of the MENA zone are grouped amongst themselves by national affinity in the first place, and then by geographic proximity. Furthermore, it allows one to distinguish the most relevant institutions within each cluster (country) by depicting only the ones of very substantial weight. Curiously enough, the spatial distribution of the clusters resembles the geographic map of the MENA zone, profiling the countries of the African continent and those of the Middle East. A more detailed analysis allows us to identify the most relevant groupings.

The universities of Saudi Arabia, displayed in blue in the lower right area, are the ones with the most weight or capacity for inter-relating of all the network. Foremost is *King Saud University* (ksu.edu.sa), followed by *Islamic University of Al Madinah (iu.edu.sa)*, *King Abdullah University of Science and Technology (kaust.edu.sa)*, and *Prince Mohammad University (pmu.edu.sa)*. The size and number of links are remarkable, as is their clear polarization; this is due to the high level of co-inlinking of Saudi Arabian universities with their peers, but also, or especially, among themselves. We could call this endogamic co-inlinking. In the display, it is seen to push this grouping away from the rest, and determines its comparatively small weight (size), as there are limited co-inlinks with the universities of other countries.

In brown, above Saudi Arabia, we find the universities of the UAE. This country has a characteristic, strongly atomized university system. The most relevant nucleus is seen to be *University of Sharjah (sharjah.ac.ae)*.

Similarly concentrated are the universities of Jordan, shown in yellow toward the top right, with a core made up of *Philadelphia University (philadelphia.edu.jo)*, *Yarmouk University (yu.edu.jo)* and *Jordan University of Science and Technology (just.edu.jo)*.

Palestine, represented by means of a group of brownish green circles, to the left of *University of Sharjah*, has as its nucleus *An-Najah National University (najah.edu)*.

Qatar, reflected in the figure as a purple cluster, is best represented by *Qatar University (qu.edu.qa)*.

Lebanon is represented by a group of universities led by the *University of Balamand (balamand.edu.lb), Haigazian University (haigazian.edu.lb)* and *American University of Beirut (aub.edu.lb)*, in order of relevance.

As for Egypt, seen in the lower central part in red, the grouping is very dense, with a high number of universities and intermediate weight. Outstanding among them are: *Cairo University (cu.edu.eg), American University in Cairo (aucegypt.edu)* and *AL-Azhar University (azhar.edu.eg)*.

The university system of Algeria is also particularly concentrated, seen here in green on the left side of the map. At the core of this grouping we have, in order of significance, *Université Abou Bekr Belkaid (univ-tlemcen.dz), Université des Sciences Islamiques Emir Abdelkader (univ-emir.dz)* and *Université d'Alger (univ-alger.dz)*.

The cluster comprising the university websites of Sudan, in the center of the map in light pink, includes *Ahfad University for Women (ahfad.org)*. Indeed, this university appears as the cornerstone of Sudan´s university system.

Oman, represented in light blue in the upper right section of the map, has two noteworthy universities, namely *Sultan Qaboos University (squ.edu.om),* and *Nizwa University (unizwa.edu.om)*.

In the case of Bahrain, shown in purple in the central area of the map, *Ahlia University (ahlia.edu.bh)* stands out as the nucleus of the cluster reflecting the country´s higher academic institutions.

The universities of Morocco, in blue and slightly toward the left of the map, are largely represented by *Cadi Ayyad (ucam.ac.ma)* and *Mohammed V-Agdal (um5a.ac.ma)*.

Mauritania, situated in the lower left section of the display, and set off in light pink, has two universities practically unconnected to each other –*Université de Nouakchott (univ-nkc.mr)* and *Université Virtuelle Africaine (uva.mr)*– the first one appearing more connected with Egyptian institutions than with other Mauritanian ones.

Tunisia has a disperse cluster of universities. They are found in pink around the left-center of the map. Four of them stand out from the rest: *Université Virtuelle de Tunis (uvt.rnu.tn), Université du 7 Novembre à Carthage (univ7nc.rnu.tn), Université Ezzitouna (uz.rnu.tn)* and *Université Tunis Carthage (utc.ens.tn)*.

To the right of Tunisia we have Libya, also depicted in pink. In view of their respective weight, we would underline *Sebha University* (*sebhau.edu.ly*), as well as *Omar Al-Mukhtar University* (*omu.edu.ly*) and *University of Seventh April* (*7aprilu.edu.ly*); the latter two appear separated from the rest of the Libyan universities, however.

In between Libya and Jordan we find Syria, just as it would be on a geographic map of the MENA zone. Syria has three noteworthy universities: *Syrian International University for Science & Technology* (*siust.edu.sy*), *Syrian Virtual University*

(*svuonline.org*) and *University of Kalamoon* (*uok.edu.sy*). The three are nearly equal in weight, and are seen to be very closely linked together.

Finally, completely off on their own in the upper central part of the map, above Libya and Jordan, we spot the two universities of Iraq: *Salahaddin University (suh-edu.com)* and *University of Sulaimani (univsul.org)*.

This close look at Figure 3 leads us to confirm what we had stated earlier, based on observation of the other maps: Saudi Arabia and its higher academic institutions are remarkably polarized with respect to the rest of the MENA zone universities. This phenomenon can be contemplated as both the cause and effect of endogamic or self-referential practices made manifest by the representation of its university website co-inlinks.

Conclusions

We attained our main objective of reflecting the structure and influence of the World Wide Web in the MENA zone, at the geographic level (country) and the academic level (universities). Studies of this type are no longer possible, at least from the website approach used here, since *Yahoo!*, *Google* and *Bing* now block the webcrawlers that attempt to make searches of links or co-links between sites. Hence, this study stands alone in the rink of webometric literature, at the same time a pioneer and the last of its kind. We do not know when optimal operability will be reestablished; at present, it is only possible to consult URL citations in the webs and, on occasion, in the titles.

While this research was underway, or eventually through our findings, we found responses to the research questions expounded earlier:

1. Contrary to what might be surmised, there is no direct relation between the number of university websites and the number of inlinks per country, at least in the case of the MENA zone countries studied here. We arrived at a low positive correlation of $r = 0.15$ which does not suffice to affirm that countries with more university websites are better linked than countries with fewer websites. Therefore, other factors must be explored for clues as to what makes some university web pages more "attractive" than others. We address this point just below.

2. We have demonstrated, statistically, that greater geographic proximity acts as a linking force between countries: the closer the neighbor, the greater the linkage. However, in light of the network maps of Figures 1, 2 and 3, we deduce that this underlying pattern is of a geopolitical nature. Linking between countries tends to obey political, cultural economic and even religious affinities. The opposite trend of comparative estrangement could be illustrated by Egypt and Tunisia, for example.

3. Using visualization and network techniques, we were able to represent the web links of the universities comprising the academic or intellectual realm of the MENA zone. To the best of our knowledge, this has not been documented through a similar approach to date. On the basis of our map and rankings, and by

means of degree-based indicators, it is possible to conduct a deep and detailed analysis of each country´s respective influence upon its peers in the area.

4. The use of degree-based techniques likewise allowed us to establish a ranking of influence of the countries/universities in the MENA zone. From our European standpoint, such an order would logically reflect the mental framework of comparative levels of relevance corresponding to the Arab countries and their higher academic institutions. Yet the ranking differs substantially from the listing obtained when the number of inlinks per country is studied, as shown in Table I. The reason behind this is the practice of self-linking, when universities link only to themselves or other institutions within the country. Such is the case of Saudi Arabia, found to be number one in total inlinks, but just fifth when the self-links are eliminated. Thus, Egypt arises as the country exerting more influence over its peers in terms of website quality and academic and geopolitical weight. The interesting case of highly westernized Tunisia moreover reveals that the prestige of a university system is no guarantee of influence, because geopolitical affinity with one´s neighbors may prove decisive.

5. As far as our sources are concerned, this is the first study where the network of universities in the MENA zone is represented on the basis of inlinks. The most influential institutions (having more inlinks) are situated in the center of the display, and the rest are spread around the peripheral areas, depending on the degree of linkage. Our map reveals a poorly cohesive university structure overall, with a definite tendency to establish links domestically or as close to home as possible.

6. We generated a ranking of influence of the Arab universities in the MENA zone. This is significant not only because it is the first of its kind, based on inlinks as network indicators, but also because the ranking largely supports listings such as *Ranking Web of World Universities (Arab World*, based on web indicators: *http://www.webometrics.info/en/Arab_world*, the *Scimago Journal et Country Rank (SCImago,   2007): http://www.scimagojr.com/countrysearch.php?region=NorthernAfrica,* constructed using bibliometric indicators, as well as *Webometrics Formal Quality Indicators* (Al-Dwairi, Faba-Pérez and Vargas-Quesada, 2010). These listings, and the ranking we present, are not necessarily mutually exclusive. Rather, they could and should be consulted in complementary fashion, as each one affords a distinctive means of assessing Arab universities.

7. To a great extent, groupings of the universities of the MENA zone are conditioned by national affinities, giving rise to congregations that represent countries. When the links go beyond the national borders, geopolitical criteria still play an important role.

8. There is a strong and reproachable endogamic tendency among the universities of the MENA zone; that is, a preference to link to other universities within one´s own country. This could reflect an overriding policy of self-linking. It may be that experts in Arab countries recommend this practice as a way of improving the relative position of their universities in certain international web rankings.

References

Aguillo, I., Granadino, B. and Llamas, G. (2005). "Posicionamiento en el web del sector académico iberoamericano", *Interciencia*, Vol. 30 No 12, pp. 735-738.

Aguillo, I. and Granadino, B. (2006). "Indicadores web para medir la presencia de las universidades en la Red". *Revista de Universidad y Sociedad del Conocimiento*. Vol. 3 No 1, pp. 68-75.

Aguillo, I., Ortega. J.L., Prieto, J.A. and Granadino, B. (2007). "Indicadores web de actividad científica formal e informal en Latinoamérica", *Revista española de Documentación Científica,* Vol. 30 No 1, pp 49-60.

Al-Dwairi, K. and Herrero-Solana, V. (2007). "La sociedad de la información en los países: una aproximación al análisis de indicadores socioeconómicos", *Investigación Bibliotecológica: archivonomía, bibliotecología e información*, Vol. 21 No 43, pp. 185-208.

Al-Dwairi, K., Faba-Pérez, C. and Vargas-Quesada, B. (2010). "Indicadores Webmétricos de carácter Formal para Evaluar el Posicionamiento de las Universidades: el caso de los Países Árabes", *Investigación Bibliotecológica: archivonomía, bibliotecología e información*. Vol. 24 No 52, pp. 145-171.

Baeza-Yates, R., Castillo, C. and López, V. (2005). "Characteristics of the Web of Spain", *Cybermetrics*, Vol. 9; No 1, pp. 1-41.

Bordignon, F., Lavallén, P.J. and Tolosa, G. (2006). "El Estado de la Web de Paraguay y la Sociedad de la Información", *I Congreso Internacional y VI Congreso Nacional de Bibliotecarios, Documentalistas y Archivistas del Paraguay*, Asunción, Paraguay.

Bordignon, F. and Tolosa, G. (2006). "Characterization of South American Educational Web Domains", *Congreso Argentino de Ciencias de la Computación*, Potrero de los Funes, Argentina.

Borgatti, S.P., Everett, M.G. and Freeman, L.C. (2002). "Ucinet 6 for Windows: Software for Social Network Analysis", Harvard: Analytic Technologies.

Batagelj, V. and Mrvar, A. (2012). "Package for large network analysis", *Pajek 3.04*.

Caraballo-Pérez, Y., Torres-Cárdenas, V., Noda-Amorós, A-C. and Herrera-Toscano, J-A. (2008). "Medidas de popularidad de la educación superior cubana: un análisis webmétrico", *El profesional de la información*, Vol. 17 No 4, pp. 443-447.

Elgohary, A. (2008). "The Arab universities on the web: a webometric study", *Electronic Library*, Vol. 26 Nº 3, pp. 374-386.

Faba-Pérez, C., Al-Dwairi, K., Vargas-Quesada, B. and Moya-Anegón, F. de. (In press). "The Presence of Arab Countries on the Internet: An Analysis through their Technological Indicators and their universities", *Libri.*

Farrag, A.R. (2006). "[The electronic presence of Saudi universities in internet: a study الحضور الإلكتروني للجامعات السعودية على الشبكة العنكبوتية: دراسة [about the Web Impact Factor استكشافية لمعامل التأثير العنكبوتي", *Arab Journal of Library & Information Science*, Vol. 26 No 3, pp. 151-174.

Heimeriks, G. and Besselaar, P. van den. (2006). "Hyperlink networks and hyperlink analysis", *Cybermetrics*, Vol.10 No 1, pp 8-26.

Holmberg, K. and Thelwall, M. (2009). "Local government websites in Finland: A geographic and webometric analysis", *Scientometrics*, Vol. 79 No 1, pp. 157-171.

Kamada, T. and Kawai, S. (1989). "An algorithm for drawing general undirected graphs", *Information Processing Letters*, Vol. 31 No 1, pp. 7-15.

Krackhardt, D. (1992). "A caveat on the use of the Quadratic Assignment Procedure", *Journal of Quantitative Anthropology*, Vol 3, pp. 279-296.

Lawrence, S. and Giles, C.L. (1999). "Accessibility of information on the web", *Nature*, 400, pp. 107-109.

Ortega, J.L. and Aguillo, I. (2007). "La web académica española en el contexto del Espacio Europeo de Educación Superior: estudio exploratorio", *El Profesional de la Información,* Vol. 16 No 5, pp. 417-425.

Ortega, J.L., Aguillo, I., Cothey, V. and Sharnhorst, A. (2008). "Maps of the academic web in the European Higher Education Area – an exploration of visual web indicators", *Scientometrics*, Vol. 74 No 2, pp. 295-308.

Ortega, J.L. and Aguillo, I. (2008a). "Linking patterns in the European Union's Countries: geographical maps of the European academic web space", *Journal of Information Science*, Vol. 34 No 5, pp. 705-714.

Ortega, J.L. and Aguillo, I. (2008b). "Visualization of the Nordic academic web: Link analysis using social network tools", *Information Processing and Management*, Vol. 44 No 4, pp. 1624-1633.

Ortega, J.L and Aguillo, I. (2009). "Análisis estructural de la web académica iberoamericana", *Revista española de Documentación Científica*, Vol. 32 No 3, pp. 51-64.

Tang, R. and Thelwall, M. (2004). "Patterns of national and international Web inlinks to US academic departments: an analysis of disciplinary variations", *Scientometrics*, Vol. 60 No 3, pp. 475-485.

Thelwall, M. (2002a). "Conceptualizing documentation on the Web: an evaluation of different heuristic-based models for counting links between university web sites", *Journal of the American Society for Information Science and Technology,* Vol. 53 No 12, pp. 995-1005.

Thelwall, M. (2002b). "A research and institutional size based model for national university web site interlinking", *Journal of Documentation.* Vol. 58 Nº 6, pp. 683-694.

Thelwall, M. (2002c). "Evidence for the existence of geographic trends in university Web site interlinking", *Journal of Documentation*, Vol. 58 No 5, pp. 63-74.

Thelwall, M., Harries, G. and Wilkinson, D. (2003). "Why do web sites from different academic subjects interlink?", *Journal of Information Science*. Vol. 29 No 6, pp. 445-463.

Thelwall, M. and Aguillo, I. (2003). "La salud de las web universitarias españolas", *Revista española de Documentación Científica*. Vol. 26 No 3, pp. 291-305.

Thelwall, M. and Vaughan, L. (2004). "New versions of PageRank employing alternative Web document models", *Aslib Proceedings*, Vol. 56 No 1, pp 24-33.

Thelwall, M. and Zuccala, A. (2008). "A university-centred European Union link analysis", *Scientometrics*, Vol. 75 No 3, pp. 407-420.

Tolosa, G., Bordignon, F., Baeza-Yates, R. and Castillo, C. (2007). "Characterization of the Argentinian Web", *Cybermetrics*, Vol. 11 No 1, pp 1-26.

Waltman, L., Van Eck, N.J., and Noyons, E.C.M. (2010). "A unified approach to mapping and clustering of bibliometric networks", *Journal of Informetrics*, Vol. 4 No 4, pp. 629-635.

Van Eck, N.J. and Waltman, L. (2009). "How to normalize cooccurrence data? An analysis of some well-known similarity measures", *Journal of the American Society for Information Science and Technology*, Vol. 60 No 8, pp. 1635-1651.

Van Eck, N.J. and Waltman, L. (2010). "Software survey: VOSviewer, a computer program for bibliometric mapping", *Scientometrics*, Vol. 84 No 2, pp. 523-538.

Vargas-Quesada, B. Moya-Anegón, F. de. Chinchilla-Rodríguez, Z. Corera-Álvarez, E. Guerrero-Bote, V. Development of the Spanish Scientific Landscape: ISI Web of Science 1990-2005. *El Profesional de la Información*, Vol. 7, 1, 2008, pp. 22-37.

Vargas-Quesada, B., Chinchilla-Rodríguez, Z., González-Molina, A. and Moya-Anegón, F de. (2010). "Showing the Essential Science Structure of a Scientific Domain and its Evolution", *Information Visualization,* Vol. 9 No 4, pp. 288-300.

Vaughan, L. and Thelwall, M. (2005). "A modeling approach to uncover hyperlink patterns: The case of Canadian universities", *Information Processing & Management*, Vol. 41 No 2, pp. 347-359.

Vaughan, L. (2006). "Visualizing linguistic and cultural differences using Web co-link data", *Journal of the American Society for Information Science and Technology*, Vol. 57 No 9, pp. 1178-1193.

Annex

Arab Universities of the MENA Zone (2010)

Nº	Country	University	URL	Links	Grade	Closeness	Betweenness
1	Jordan	University of Jordan	ju.edu.jo	28	0.128	0.23	0.033
2	Saudi Arabia	King Fahd University	kfupm.edu.sa	25	0.115	0.221	0.037
3	Saudi Arabia	King Saud University	ksu.edu.sa	22	0.101	0.2	0.025
4	Saudi Arabia	Umm Al-Qura University	uqu.edu.sa	20	0.092	0.199	0.014
5	Jordan	Yarmouk University	yu.edu.jo	19	0.087	0.207	0.015
6	Jordan	Jordan University of S&T Technology	just.edu.jo	18	0.083	0.205	0.008
7	Jordan	Philadelphia University	philadelphia.edu.jo	18	0.083	0.201	0.041
8	Saudi Arabia	King Faisal University	kfu.edu.sa	17	0.078	0.196	0.167
9	Egypt	American University in Cairo	aucegypt.edu	16	0.073	0.227	0
10	Jordan	Petra University	uop.edu.jo	16	0.073	0.191	0.012
11	UAE	University of Sharjah	sharjah.ac.ae	15	0.069	0.218	0.025
12	UAE	Zayed University	zu.ac.ae	15	0.069	0.204	0.006
13	Saudi Arabia	King Abdullah Bin Abdulaziz	kau.edu.sa	15	0.069	0.192	0.033
14	Algeria	Université Abou Bekr Belkaid	univ-tlemcen.dz	15	0.069	0.175	0.001
15	Lebanon	American University of Beirut	aub.edu.lb	14	0.064	0.212	0.014
16	Jordan	Al al-Bayt University	aabu.edu.jo	14	0.064	0.195	0.04
17	Jordan	Hashemite University	hu.edu.jo	14	0.064	0.193	0.02
18	Saudi Arabia	Imam Muhammad ibn Saud Islamic	imamu.edu.sa	14	0.064	0.183	0.016
19	Jordan	Al-Balqa Applied University	bau.edu.jo	13	0.06	0.195	0.002
20	Qatar	Qatar University	qu.edu.qa	13	0.06	0.189	0.025
21	Morocco	Université Mohammed V-Souissi	um5s.ac.ma	13	0.06	0.188	0
22	Jordan	AL-Isra Private University	isra.edu.jo	13	0.06	0.187	0
23	Jordan	Al-Hussein Bin Talal University	ahu.edu.jo	13	0.06	0.186	0.005
24	Saudi Arabia	King Khalid University	kku.edu.sa	13	0.06	0.181	0.004
25	Algeria	Université d'Alger	univ-alger.dz	13	0.06	0.179	0
26	Algeria	Université des Sciences et de la Technologie	usthb.dz	13	0.06	0.177	0.011
27	Algeria	Université Hadj Lakhdar Batna	univ-batna.dz	13	0.06	0.174	0.05
28	Jordan	Mu'tah University	mutah.edu.jo	12	0.055	0.201	0.009
29	Palestine	An-Najah National University	najah.edu	12	0.055	0.196	0.027
30	UAE	UAE University	uaeu.ac.ae	12	0.055	0.196	0.001
31	Oman	Sultan Qaboos University	squ.edu.om	12	0.055	0.192	0.011
32	Egypt	Alexandria University	alex.edu.eg	12	0.055	0.179	0
33	Algeria	Université d'Oran	univ-oran.dz	12	0.055	0.145	0
34	Algeria	Université Badji Mokhtar	univ-annaba.org	12	0.055	0.14	0.007
35	Algeria	Université 08 Mai 1945	univ-guelma.dz	12	0.055	0.139	0.002
36	Morocco	Université Mohammed Premier Oujda	univ-oujda.ac.ma	11	0.05	0.195	0
37	Egypt	Cairo University	cu.edu.eg	11	0.05	0.185	0.024
38	Jordan	Zarqa Private University	zpu.edu.jo	11	0.05	0.185	0
39	Jordan	Al-Zaytoonah University of Jordan	alzaytoonah.edu.jo	11	0.05	0.183	0
40	Saudi Arabia	Islamic University of Al Madinah	iu.edu.sa	11	0.05	0.18	0
41	Algeria	Université de Mostaganem	univ-mosta.dz	11	0.05	0.172	0.001
42	Algeria	Université de Boumerdès	umbb.dz	11	0.05	0.17	0.012
43	Algeria	Univ. Sciences Islamiques Emir Abdelkader	univ-emir.dz	11	0.05	0.144	0
44	Algeria	Université Ferhat Abbas Sétif	univ-setif.dz	11	0.05	0.142	0
45	Syria	Damascus University	damasuniv.shern.net	10	0.046	0.206	0.003
46	Bahrain	Arabian Gulf University	agu.edu.bh	10	0.046	0.192	0
47	Egypt	Mansoura University	mans.edu.eg	10	0.046	0.185	0.017

48	Morocco	Université Mohammed V-Agdal	um5a.ac.ma	10	0.046	0.181	0.007
49	Jordan	Irbid National University	inu.edu.jo	10	0.046	0.18	0
50	Egypt	Assiut University	aun.edu.eg	10	0.046	0.179	0.021
51	Morocco	Université Cadi Ayyad	ucam.ac.ma	10	0.046	0.179	0.014
52	Jordan	German-Jordann University	gju.edu.jo	10	0.046	0.179	0
53	Jordan	Jadara University	jadara.edu.jo	10	0.046	0.179	0
54	Jordan	Tafila Technical University	ttu.edu.jo	10	0.046	0.178	0.001
55	Jordan	Amman Arab University for Higher Studies	aau.edu.jo	10	0.046	0.177	0
56	Algeria	Université Mohamed Boudiaf	univ-usto.dz	10	0.046	0.172	0.006
57	Algeria	Université Djillali Liabès	univ-sba.dz	10	0.046	0.172	0.005
58	Algeria	Université Mentouri Constantine	umc.edu.dz	10	0.046	0.169	0.009
59	Algeria	Université de Bejaia	univ-bejaia.dz	10	0.046	0.169	0
60	Algeria	Université Mouloud Mammeri de Tizi Ouzou	ummto.dz	10	0.046	0.142	0.007
61	Algeria	Université du 20 Août 1955	univ-skikda.dz	10	0.046	0.141	0
62	Algeria	Université de Jijel	univ-jijel.dz	10	0.046	0.139	0.018
63	Bahrain	University of Bahrain	uob.edu.bh	9	0.041	0.187	0.012
64	Palestine	Birzeit University	birzeit.edu	9	0.041	0.183	0.019
65	Morocco	Université Hassan II-Mohammedia	univh2m.ac.ma	9	0.041	0.177	0.001
66	Egypt	Helwan University	helwan.edu.eg	9	0.041	0.174	0
67	Morocco	Université Hassan II Casablanca	uh2c.ac.ma	9	0.041	0.172	0.001
68	Morocco	Université Ibn Zohr	univ-ibnzohr.ac.ma	9	0.041	0.169	0
69	Algeria	Université Hassiba Benbouali de Chlef	univ-chlef.dz	9	0.041	0.15	0.006
70	Algeria	Université Amar Telidji Laghouat	lagh-univ.dz	9	0.041	0.141	0
71	Algeria	Université Ibn Khaldoun	univ-tiaret.dz	9	0.041	0.141	0
72	Algeria	Université Kasdi Merbah Ouargla	ouargla-univ.dz	9	0.041	0.138	0
73	Kuwait	Kuwait University	kuniv.edu.kw	8	0.037	0.184	0
74	Jordan	AL-Ahliyya Amman University	amman.edu	8	0.037	0.183	0
75	Saudi Arabia	King Abdullah University of S&T	kaust.edu.sa	8	0.037	0.178	0
76	Palestine	Bethlehem University	bethlehem.edu	8	0.037	0.174	0.004
77	Egypt	South Valley University	svu.edu.eg	8	0.037	0.173	0.025
78	Saudi Arabia	Taibah University	taibahu.edu.sa	8	0.037	0.168	0.001
79	Saudi Arabia	University of Ha'il	uoh.edu.sa	8	0.037	0.162	0
80	Algeria	Université Saad Dahlab Blida	univ-blida.dz	8	0.037	0.139	0
81	Lebanon	Lebanese American University	lau.edu.lb	7	0.032	0.193	0.014
82	Egypt	Tanta University	tanta.edu.eg	7	0.032	0.189	0.031
83	Palestine	Islamic University of Gaza	iugaza.edu.ps	7	0.032	0.176	0.009
84	Tunisia	Université Virtuelle de Tunis	uvt.rnu.tn	7	0.032	0.175	0.002
85	Palestine	Al-Quds University	alquds.edu	7	0.032	0.165	0
86	Saudi Arabia	Qassim University	qu.edu.sa	7	0.032	0.158	0.001
87	Morocco	Université Hassan 1er	uh1.ac.ma	7	0.032	0.147	0
88	Morocco	Université Ibn Tofaïl	univ-ibntofail.ac.ma	7	0.032	0.142	0.007
89	Algeria	Université de la Formation Continue	ufc.dz	7	0.032	0.138	0
90	Algeria	Université de Biskra	univ-biskra.dz	7	0.032	0.137	0.004
91	Jordan	Princess Sumaya University for Technology	psut.edu.jo	6	0.028	0.181	0
92	Palestine	Palestine Polytechnic University	ppu.edu	6	0.028	0.174	0
93	Yemen	Yemeni University of S&T	ust.edu	6	0.028	0.164	0
94	Saudi Arabia	Prince Mohammad University	pmu.edu.sa	6	0.028	0.159	0.002
95	Saudi Arabia	Taif University	tu.edu.sa	6	0.028	0.159	0
96	Saudi Arabia	Aljouf University	ju.edu.sa	6	0.028	0.159	0
97	Saudi Arabia	Girls University In Riyadh	rug.edu.sa	6	0.028	0.159	0
98	Saudi Arabia	Prince Sultan University	psu.edu.sa	6	0.028	0.158	0.003

99	UAE	American University of Sharjah	aus.edu	5	0.023	0.189	0.025
100	UAE	Ajman University of Science and Technology	ajman.ac.ae	5	0.023	0.18	0
101	Lebanon	Notre Dame University	ndu.edu.lb	5	0.023	0.179	0.008
102	Lebanon	Université Libanaisee	ul.edu.lb	5	0.023	0.173	0
103	Sudan	Ahfad University for Women	ahfad.org	5	0.023	0.169	0
104	UAE	American University in Dubai	aud.edu	5	0.023	0.166	0.001
105	Saudi Arabia	Naif Arab University for Security Sciences	nauss.edu.sa	5	0.023	0.162	0.013
106	Egypt	Zagazig University	zu.edu.eg	5	0.023	0.162	0.001
107	Egypt	Menofia University	menofia.edu.eg	5	0.023	0.16	0
108	Morocco	Université Sidi Mohamed Ben Abdellah	usmba.ac.ma	5	0.023	0.159	0.021
109	Egypt	Minia University	minia.edu.eg	5	0.023	0.159	0.007
110	Tunisia	Université de Sfax	uss.rnu.tn	5	0.023	0.159	0.001
111	Jordan	Applied Science Private University	asu.edu.jo	5	0.023	0.157	0.001
112	Egypt	Suez Canal University	scuegypt.edu.eg	5	0.023	0.157	0
113	Saudi Arabia	Tabouk University	ut.edu.sa	5	0.023	0.157	0
114	Lebanon	University of Balamand	balamand.edu.lb	4	0.018	0.179	0.006
115	Syria	Syrian Virtual University	svuonline.org	4	0.018	0.174	0
116	UAE	University of Wollongong in Dubai	uowdubai.ac.ae	4	0.018	0.171	0
117	Syria	Tishreen University	tishreen.shern.net	4	0.018	0.17	0.022
118	Morocco	Al Akhawayn University	aui.ma	4	0.018	0.167	0.023
119	Egypt	Ain Shams University	net.shams.edu.eg	4	0.018	0.164	0
120	Lebanon	Beirut Arab University	bau.edu.lb	4	0.018	0.164	0
121	Palestine	Arab American University	aauj.edu	4	0.018	0.162	0
122	Saudi Arabia	Northern Borders University	nbu.edu.sa	4	0.018	0.158	0
123	Egypt	AL-Azhar University	azhar.edu.eg	4	0.018	0.158	0
124	Saudi Arabia	Najran University	nu.edu.sa	4	0.018	0.156	0
125	Saudi Arabia	Al-Baha university	bu.edu.sa	4	0.018	0.155	0
126	Palestine	El-Azhr University Gaza	alazhar.edu.ps	4	0.018	0.154	0.003
127	Egypt	Sohag University	sohag-univ.edu.eg	4	0.018	0.149	0
128	Morocco	Université Abdelmalek SEADI	uae.ma	4	0.018	0.148	0.005
129	Egypt	Benha University	benha-univ.edu.eg	4	0.018	0.145	0
130	Tunisia	University of Kairouan	univ-k.rnu.tn	3	0.014	0.175	0.02
131	Sudan	University of Khartoum	uofk.edu	3	0.014	0.171	0
132	Lebanon	Université Saint-Joseph	usj.edu.lb	3	0.014	0.17	0
133	Egypt	Misr University for Science and Technology	must.edu	3	0.014	0.161	0
134	Mauritania	Université de Nouakchott	univ-nkc.mr	3	0.014	0.16	0.002
135	Libya	University of Garyounis	garyounis.edu	3	0.014	0.16	0
136	Saudi Arabia	King Saud bin Abdullaziz University	ksau-hs.edu.sa	3	0.014	0.154	0
137	Egypt	Université Française d'Egypte	ufe.edu.eg	3	0.014	0.148	0
138	Sudan	Sudan University of Science & Technology	sustech.edu	3	0.014	0.147	0.01
139	Tunisia	University of Sousse	uc.rnu.tn	3	0.014	0.146	0
140	Palestine	Al-Aqsa University	alaqsa.edu.ps	3	0.014	0.145	0.001
141	Tunisia	Université du Centre	ugaf.rnu.tn	3	0.014	0.143	0
142	Tunisia	Université de Tunis	utunis.rnu.tn	3	0.014	0.143	0
143	Syria	University of Calamón	uok.edu.sy	3	0.014	0.141	0
144	Sudan	Omdurman Islamic University	oiu.edu.sd	3	0.014	0.13	0
145	Libya	Sebha University	sebhau.edu.ly	3	0.014	0.018	0
146	Kuwait	American University of Kuwait	auk.edu.kw	2	0.009	0.157	0
147	Lebanon	Haigazian University	haigazian.edu.lb	2	0.009	0.155	0
148	Egypt	German University in Cairo	guc.edu.eg	2	0.009	0.154	0
149	Egypt	Université Senghor d'Alexandrie	usenghor-franc.org	2	0.009	0.154	0

150	Syria	Arab International University	aiu.edu.sy	2	0.009	0.152	0.005
151	Lebanon	Université Saint-Esprit de Kaslik	usek.edu.lb	2	0.009	0.151	0.001
152	Tunisia	Université de Tunis El Manar	utm.rnu.tn	2	0.009	0.151	0
153	UAE	Ittihad University	ittihad.ac.ae	2	0.009	0.149	0
154	Palestine	Al-Quds Open University	qou.edu	2	0.009	0.149	0
155	Yemen	Alahgaff University	ahgaff.edu	2	0.009	0.149	0
156	Sudan	International University of Africa	iua.edu.sd	2	0.009	0.146	0
157	Syria	Al-Baath University	albaath-univ.edu.sy	2	0.009	0.145	0.011
158	Yemen	Hadramout University of S&T	hust.edu.ye	2	0.009	0.144	0
159	Tunisia	Université de Monastir	um.rnu.tn	2	0.009	0.142	0
160	Qatar	Texas A&M University at Qatar	qatar.tamu.edu	2	0.009	0.142	0
161	Egypt	Modern Sciences and Arts University	msa.eun.eg	2	0.009	0.141	0
162	Syria	Ittihad Private University	uu-sy.com	2	0.009	0.138	0
163	Tunisia	Université du 7 Novembre à Carthage	univ7nc.rnu.tn	2	0.009	0.137	0
164	Tunisia	Université Ezzitouna	uz.rnu.tn	2	0.009	0.137	0
165	Palestine	Hebron University	hebron.edu	2	0.009	0.133	0
166	Morocco	Université Moulay Ismaïl	umi.ac.ma	2	0.009	0.13	0
167	Sudan	University of the Holly Quran	quran-unv.edu.sd	2	0.009	0.128	0
168	Sudan	The National Ribat University	ribat.edu.sd	2	0.009	0.128	0
169	Iraq	Babylon University	babylon-uni.com	2	0.009	0.126	0
170	Sudan	Open University of Sudan	ous.edu.sd	2	0.009	0.117	0
171	Libya	Al-Fateh University	alfateh.edu.ly	2	0.009	0.014	0.006
172	Libya	7th October University	7ou.edu.ly	2	0.009	0.013	0
173	Yemen	Al-iman University	jameataleman.org	1	0.005	0.147	0
174	Kuwait	Gulf University for Science and Technology	gust.edu.kw	1	0.005	0.145	0
175	Iraq	University of Mosul	uomosul.edu.iq	1	0.005	0.144	0.001
176	Egypt	British University in Egypt	bue.edu.eg	1	0.005	0.144	0
177	Saudi Arabia	Knowledge International University	kiu.org	1	0.005	0.142	0
178	Egypt	Nile University	nileu.edu.eg	1	0.005	0.141	0
179	Qatar	Virginia Commonwealth University in Qatar	qatar.vcu.edu	1	0.005	0.141	0
180	Qatar	Carnegie Mellon University in Qatar	qatar.cmu.edu	1	0.005	0.14	0
181	Egypt	Misr International University	miuegypt.edu.eg	1	0.005	0.139	0
182	Egypt	October 6 University	o6u.edu.eg	1	0.005	0.139	0
183	Yemen	Hodeidah University	hoduniv.edu.ye	1	0.005	0.138	0.005
184	Tunisia	University of Gabes	univgb.rnu.tn	1	0.005	0.135	0
185	Tunisia	Université de Jendouba	uj.rnu.tn	1	0.005	0.135	0
186	Morocco	Université Quaraouiyine	enssup.gov.ma	1	0.005	0.135	0
187	Tunisia	Université de la Manouba	uma.rnu.tn	1	0.005	0.134	0
188	Lebanon	Lebanese International University	liu.edu.lb	1	0.005	0.129	0
189	Sudan	Nile Valley University	nilevalley.edu.sd	1	0.005	0.126	0
190	Mauritania	Université Virtuelle Africaine	uva.mr	1	0.005	0.124	0
191	Bahrain	Royal University for Women	ruw.edu.bh	1	0.005	0.124	0
192	Bahrain	Gulf University	gulfuniversity.net	1	0.005	0.124	0
193	Lebanon	Jinan University	jinan.edu.lb	1	0.005	0.123	0.003
194	Lebanon	Université Sájese	uls.edu.lb	1	0.005	0.117	0
195	Somalia	Burao University	buraouniversity.com	1	0.005	0.117	0
196	Syria	Private University of Science & Arts	pusa-sy.org	1	0.005	0.116	0
197	Syria	Syrian International University for S&T	siust.edu.sy	1	0.005	0.116	0
198	Syria	International University for S&T	iust.edu.sy	1	0.005	0.115	0.005
199	Yemen	Ibb University	ibbunv.com.ye	1	0.005	0.111	0
200	Somalia	Mogadishu University	Mogadishuuniv.com	1	0.005	0.101	0

201	Libya	Omar Al-Mukhtar University	omu.edu.ly	1	0.005	0.009	0.002
202	Iraq	University of Sulaimani	univsul.org	1	0.005	0.009	0
203	Tunisia	Université Tunis Carthage	utc.ens.tn	1	0.005	0.009	0
204	Tunisia	Time Université	time.ens.tn	1	0.005	0.009	0
205	Iraq	Salahaddin University	suh-edu.com	1	0.005	0.009	0
206	Libya	Al-Tahadi University	altahadi.edu.ly	1	0.005	0.009	0
207	Syria	Ma'moun Private University for S&T	must.edu.sy	0	-	-	-
208	Sudan	Al-Neelain University	neelain.edu.sd	0	-	-	-
209	Tunisia	Université Libre de Tunis	ult-tunisie.com	0	-	-	-
210	UAE	Alhosn University	alhosnu.ae	0	-	-	-
211	Libya	University of Seventh April	7aprilu.edu.ly	0	-	-	-
212	Bahrain	Ahlia University	ahlia.edu.bh	0	-	-	-
213	Egypt	Ahram Canadian University	acu.edu.eg	0	-	-	-
214	Yemen	Queen Arwa University	qau.edu.ye	0	-	-	-
215	Oman	Dhofar University	du.edu.om	0	-	-	-
216	Oman	Nizwa University	unizwa.edu.om	0	-	-	-
217	Bahrain	Kingdom University	ku.edu.bh	0	-	-	-
218	UAE	Khalifa University of S&T&R	ku.ac.ae	0	-	-	-
219	UAE	Abu Dhabi University	adu.ac.ae	0	-	-	-
220	UAE	Al Ghurair University	agu.ae	0	-	-	-
221	UAE	Al-Ain University of Science and Technology	alainuniversity.ac.ae	0	-	-	-
222	UAE	British University in Dubai	buid.ac.ae	0	-	-	-
223	UAE	University Of Dubai	ud.ac.ae	0	-	-	-
224	Bahrain	Medical University in Bahrain	rcsi-mub.com	0	-	-	-
225	Bahrain	Bahrain International University	amaiu.edu.bh	0	-	-	-
226	Djibouti	Université de Djibouti	univ.edu.dj	0	-	-	-
227	Egypt	Future University	futureuniversity.info	0	-	-	-
228	Egypt	Modern University for Technology and Information	mti.edu.eg	0	-	-	-
229	Egypt	Pharos University in Alexandria	pua.edu.eg	0	-	-	-
230	Egypt	Sinai University	su.edu.eg	0	-	-	-
231	Egypt	Nahda University	nahdauniversity.org	0	-	-	-
232	Iraq	University of Dohuk	dohukuni.net	0	-	-	-
233	Iraq	Baghdad University	uobaghdad.com	0	-	-	-
234	Iraq	Wassit University	uowasit.edu.iq	0	-	-	-
235	Iraq	Kerbala University	uokerbala.edu.iq	0	-	-	-
236	Iraq	University of Anbar	univ-anbar.org	0	-	-	-
237	Iraq	University of Mustansiriyah	uomustansiriyah.edu.iq	0	-	-	-
238	Kuwait	American University of The Middle East	aum.edu.kw	0	-	-	-
239	Lebanon	Al Manar University of Tripoli	mut.edu.lb	0	-	-	-
240	Lebanon	Beirut University Online	buonline.edu.lb	0	-	-	-
241	Lebanon	Global University	gu.edu.lb	0	-	-	-
242	Lebanon	Islamic University	iul.edu.lb	0	-	-	-
243	Lebanon	Matn University	matnu.edu.lb	0	-	-	-
244	Lebanon	Middle East University	meu.edu.lb	0	-	-	-
245	Lebanon	Université Antonine	upa.edu.lb	0	-	-	-
246	Libya	Open University	libopenuniv-edu.org	0	-	-	-
247	Oman	Sohar University	soharuni.edu.om	0	-	-	-
248	Sudan	Gezira University	uofg.edu.sd	0	-	-	-
249	Sudan	University of Juba	juba.edu.sd	0	-	-	-
250	Sudan	Dalanj University	dalanjuniversity.edu.sd	0	-	-	-

251	Sudan	Shendi University	ush.sd	0	-	-	-
252	Sudan	University El Mahdi	elmahdi.edu.sd	0	-	-	-
253	Somalia	Amoud University	amouduniversity.org	0	-	-	-
254	Somalia	University of Hargeisa	hargeisauniversity.net	0	-	-	-
255	Somalia	Nugaal University	nugaaluniversity.com	0	-	-	-
256	Somalia	Puntland State University	puntlandstateuniversity.com	0	-	-	-
257	Syria	Wadi International Private	wgsu.biz	0	-	-	-
258	Tunisia	Université Centrale	universitecentrale.net	0	-	-	-
259	Tunisia	Université Internationale de Tunis	uit.ens.tn	0	-	-	-
260	Tunisia	Université Aeronautique et des Technologies	unat.ens.tn	0	-	-	-
261	Tunisia	Université de Technologie Privée	utech-tn.net	0	-	-	-
262	Yemen	Aden University	aden-univ.net	0	-	-	-
263	Yemen	Saba University	sabauni.net	0	-	-	-
264	Yemen	Sana'a University	suye.ac	0	-	-	-
265	Yemen	Taiz University	taizun.net	0	-	-	-
266	Yemen	National University	nationaluni.net	0	-	-	-
267	Yemen	Yemen University	yemenuniversity.com	0	-	-	-