



A Webometric Analysis of Some Universities in Lebanon

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Abstract

One way to rank universities nowadays is through running Webometrics on a university's website. Webometrics measure the overall web presence of websites using various indicators. One way of improving the ranking of a university is to keep measuring its web presence and taking corrective actions based on an analysis of the results. In this paper, an analytical study of twenty-four university websites in Lebanon is conducted. Ranking the universities web sites based on two webometric ranking methods (Web Impact Factor (WIF) and Web Indicators of Science, Innovation and Research (WISER)) is presented. WIF and WISER are based on different webometric indicators such as visibility (external links), size (webpages), rich files and scholar (academic papers). The study was conducted over three years 2011, 2012 and 2013 using several search engines. Based on the collected data and its analysis, an automated ranking and recommendation system was designed and implemented. The main goal of this system was to reduce the time needed for each university webmaster to rank the website. Another goal was to generate automated recommendations to help a university improve its rank and fix problems that it faces in its website. In the paper, it is shown that the correlation between WIF and WISER is negative and it is recommended not to use WIF because of its limitations; whereas WISER is more flexible and promotes research and publications.

Key Words: Webometric, WIF, WISER, Ranking Universities Websites.

INTRODUCTION

The World Wide Web is an important method by which information can be published across the globe. Academic websites are the main showcase for universities. They are used to introduce the world to the universities' programs, faculties, facilities, achievements, etc... They constitute a very important tool that helps students in choosing their future university.

Ranking has always attracted the attention of people, companies and institutions. It focuses on the aspects which are important in achieving the first place. Ranking universities' websites gained more importance in recent years due to the increase in the competition among universities to attract top students who are searching for a suitable university. Thus, achieving advantageous visibility on the web will improve their website ranking.

There are no studies in the literature that provide a webometric analysis for Lebanese Universities' websites. In this paper an analysis for these websites is done according to two different ranking approaches. One of these approaches is the web impact factor (WIF) which is the web version of the impact factor that reflects the total size of a website as well as the quality of information provided by the site, it was developed by Ingwersen (1998). It focuses on two indicators: number of Web Pages in a website and the number of External Links it receives. The second approach is the Web Indicators for Science, Innovation and Research (WISER) (Ranking Web of Universities, 2011, 2012 & 2013). WISER has more indicators than WIF: number of Web Pages in a website, number of External Links it receives (this indicator was adjusted in years 2012 and 2013 to include the number of referring domains originating those links), the total number of academic files (rich files) and the total number of highly cited research papers (scholars) published on the website. The web presence can be measured with the help of search engine's advanced facilities. The webometric data used in this study have been collected using Yahoo, Google, AltaVista, Ahrefs and Majestic SEO search engines using special query syntax.

In section 2, we review existing literature where the authors ranked institutions' websites in various countries. In section 3, we present the objectives of our work followed by the methodology in section 4. Section 5 describes the ranking methods (WIF and WISER) used and the evolution of the WISER formula and the definition of its indicators over three years 2011 to 2013. Section 6 shows the ranking of the Lebanese universities over the three years; section 7 computes the correlation between WIF and WISER for the data collected; and section 8 presents the results extracted from the data collected on Lebanese universities. In section 9, we describe the automated ranking and recommendation system that we built and we conclude the paper in section 10.

LITERATURE REVIEW

Jeyshankar, and Babu (2009), ranked the universities websites in Tamil Nadu in India according to the WIF method. The study showed that some of the universities websites had a large number of web pages, however; their few inlinks kept them with a very low WIF ranking. Samir et al. (2010) analyzed the web presence and visibility of the Asian Countries websites. This research shed some light on hyperlinks studies that reflect the present status of the countries and their relative positions. Another study done by Vijayakumar, Kannappanavar, and Santosh Kumar (2012) focused on the identification of web presence and links among South Asian Countries. Islam and Alam (2011) analyzed the websites of private universities in Bangladesh according to webometric indicators, the study revealed that some universities had high numbers of web pages but their very few numbers of links lowered their ranking. Jalal, Biswas, and Mukhopadhyay (2009) made an

analytical study for the Central Universities in India and ranked their website according to the webometric indicators. The results showed that Indian universities in general had a good web presence; however there were many universities that had a very low number of web pages and thus were not qualified for comparative webometric studies. Also Jalal, Biswas, and Mukhopadhyay (2010a & 2010b) investigated the effectiveness and relevance of web impact factor for Indian Universities' websites. The study noted that even though WIF had been used as webometric indicator, it reflected unreliable results. A webometric analysis of Iranian Universities of Medical Sciences done by Aminpour, Kabiri, Otroj, and Keshtkar (2009) showed that universities websites with high numbers of webpages and external links ranked in last places while other universities with only a few web pages and external links ranked in top places for WIF ranking. Elgohary (2008) analyzed the websites of Arab universities by applying a webometric study; the results showed that Jordanian universities represented 40% of the top ten universities with external WIF while that was not the case in terms of web presence; the results also showed a strong correlation between external links and web presence. Noruzi (2006) made a critical review of WIF and its associated indicators. In his work, he suggested using the WIF as a way of comparing the attractiveness of web sites or domains on the web. Shekofteh, Shahbodaghi, Sajjadi, and Jambarsang (2010) investigated the WIF of Medical Universities in Iran. The results of this study implied that the universities had to pay more attention to the webometric issues and must also allocate more funding to enhance their web pages. Thanuskodi (2013) worked on the websites of some Institutes, which is of national importance in India. The study showed that only a few websites were up to date and that webometric techniques are in their early phases.

OBJECTIVES

The objectives of this paper were to identify websites of some Lebanese universities, collect data about these websites and analyze the collected data according to webometric indicators. Suitable rankings of these websites according to different ranking approaches (WIF and WISER) were found. The correlation between WIF and WISER ranking approaches for the case of the Lebanese universities websites was studied and an automated ranking and recommendation system was designed and implemented. The main goal of this system was to reduce the time needed for each university webmaster to rank the website. Another goal was to generate automated recommendations to help a university improve its rank and fix problems that it faces on its website.

METHODOLOGY

Selection of Universities

The universities included in this analysis were selected in 2010 from the list of universities posted on the Lebanese Higher Education website (Lebanese Higher Education website, 2010). Those universities with non-static websites were chosen.

Data Collection

The data were collected on three different occasions. The first one was on June 25th 2011 and the second was on February 25th 2012 while the third date was on November 2 and 3rd 2013. In the first collection Yahoo, AltaVista and Google search engines were used to collect data. The first two search engines were used to collect the number of web pages and the external links; while Google

was used to find the number of rich files and Google Scholar was used to find the number of scholars. In 2012, we used Google to collect the number of web pages and the rich files and Google Scholar for the scholars while Majestic SEO was used to collect the referring domains and external links. In 2013, we used the same search engines as 2012 in addition to Ahrefs that is also used to find the referring domains and external links. The syntax used to collect data is shown in Table 1.

Table 1 Search engines queries

Search Command	Results	Supported by
domain:abc	Total number of webpages	Google, AltaVista, Yahoo!
site:abc	Total number of webpages	Google, AltaVista, Yahoo
linkdomain:abc – domain:abc	Total number of inlinks	AltaVista, Yahoo!
Linkdomain:abc	Total number of links	Yahoo, AltaVista
Filetype:.x	Total number of files of type x in the web	Google

CLASSIFICATION METHODS

Web impact factor (WIF)

Several studies showed that websites can be compared and ranked in different domains based on their web impact factor which reflects the website's global frame as well as the quality of information resources it provides. Almind and Ingwersen (1997) proposed the first Web indicator, Web Impact Factor (WIF), based on link analysis that combines the number of external inlinks received by a website and the number of pages of the website, a ratio of 1:1 between visibility and size.

An inlink is a link that a web page receives from other web pages. It can be internal or external. The external inlink is a link received from an outsider website, while internal inlink is received from pages in the same website.

$$WIF_{external} = \frac{\text{Number of external inlinks the website receives}}{\text{Number of webpages indexed from the same website}}$$

Web Indicators for Science, Innovation and Research (WISER)

University activity is multi-dimensional and this is reflected in its web presence. For calculating its ranking a group of indicators must be combined to produce the most accurate result. In addition to the indicators already used by WIF, which are the number of external inlinks received by a website and the number of pages in it, WISER uses two new indicators: The number of academically useful documents, measured as the number of rich files in a web domain and the number of highly cited publications. The four indicators were obtained from the quantitative results provided by the main search engines as follows. Each indicator for each university was computed by one, two or three search engines depending on the indicator and on the year studied. Then for each engine, these numbers were log normalized to the highest value. If only one search engine is used, then there is one log normalized value found for this indicator for each university. If two search engines are used, then the highest log normalized value for each university is used. If three search engines are used, then the median log normalized value for each university is used. Those normalized values are sorted and a rank for this indicator is given to the web site of the corresponding university.

Size (S): The number of webpages of each university was computed by AltaVista, Yahoo and Google. For each engine, results are log-normalised to 1 for the highest value. Then for each domain, the median log-normalised value is used to give each institution a rank according to this value. For example, let $W_{A,i}$, $W_{Y,i}$ and $W_{G,i}$ be the number of webpages of university i collected by AltaVista, Yahoo and Google respectively. Let $W_{A,MAX}$ ($W_{Y,MAX}$, $W_{G,MAX}$) be the maximum number of webpages found by Alta Vista (Yahoo, Google) for all universities.

$$W_{A,MAX} = \text{maximum}(W_{A,i}), i = 1 \text{ to } 24$$

Let $NW_{A,i}$ be the number of webpages of university i collected by AltaVista log normalized to $W_{A,MAX}$.

$$NW_{A,i} = \frac{\log(W_{A,i} + 1)}{\log(W_{A,MAX} + 1)}; \quad NW_{Y,i} = \frac{\log(W_{Y,i} + 1)}{\log(W_{Y,MAX} + 1)}; \quad NW_{G,i} = \frac{\log(W_{G,i} + 1)}{\log(W_{G,MAX} + 1)}$$

For each university, the highest and lowest log values were excluded. The remaining log values NW_i ($i = 1$ to 24) are sorted in decreasing order and ranks are assigned to each website (rank 1 to the highest log value). This rank is used in the WISER formula.

Visibility (V): The total number of unique external links received (inlinks) by a site can be obtained from Yahoo Search, and AltaVista. For each engine, results are log-normalized to 1 for the highest value and then combined to generate the rank in the same way described before.

Rich Files (R): After evaluation of their relevance to academic and publication activities and considering the volume of the different file formats, the following were selected: Adobe Acrobat (.pdf), Adobe PostScript (.ps, .eps), Microsoft Word (.doc, .docx) and Microsoft Powerpoint (.ppt, .pptx). These data were extracted using Google. The results for each file type were merged after log normalisation.

Scholar (Sc): Google Scholar provides the number of papers, reports and citations for each academic domain.

For year 2011, the four ranks were combined according to the following formula, where each one has a different weight:

$$WISER \text{ formula} = 0.5 * Rank(V) + 0.2 * Rank(S) + 0.15 * Rank(R) + 0.15 * Rank(Sc)$$

In 2012, changes in the methodology were made concerning the sources of collecting data and the weights of indicators. The Size and Rich Files data were collected from Google and the weight of each indicator in WISER formula was 10%. Scholar data were collected from Google Scholar, and the corresponding weight in WISER formula was 30%. The Visibility data were collected from Majestic SEO and the corresponding weight in WISER formula was 50%. The Visibility indicator's definition changed from being the number of external links in 2011 to the product of the external links and referring domains originating those links. The WISER formula for year 2012 was:

$$WISER \text{ Formula} = 0.5 * Rank(V) + 0.1 * Rank(S) + 0.1 * Rank(R) + 0.3 * Rank(Sc)$$

For 2013, the data was collected in the same way as in 2012, but for Visibility indicator the values were collected from two search engines, and the highest log-normalized value for each university was considered for ranking the visibility indicator. The weight of the Size, Rich Files and Scholar indicators were equal and represent 50% of the overall rank. The WISER method for year 2013 was:

$$WISER Formula = 0.5 * Rank(V) + 0.5 * ((1/3 * Rank(S)) + (1/3 * Rank(R)) + (1/3 * Rank(Sc)))$$

Table 2 lists the indicators of the WISER formula and the corresponding source, weight and definition over the years 2011, 2012 and 2013.

Table 2 Changes in the WISER formula over three years

Year	Indicator	Source	Weight	Meaning
2011	Visibility	AltaVista, Yahoo	50%	External links (inlinks received by the site)
	Size	Google, AltaVista, Yahoo	20%	Webpages
	Rich Files	Google	15%	Number of files (pdf, doc, ppt and ps)
	Scholar	Google Scholar	15%	Publications
2012	Visibility	Majestic SEO	50%	External links × Referring domains
	Size	Google	10%	Webpages
	Rich Files	Google	10%	Number of files (pdf, docx, doc, pptx, ppt, ps and eps)
	Scholar	Google Scholar	30%	Publications
2013	Visibility	Majestic SEO, Ahrefs	50%	$\sqrt{\text{External links} \times \text{Referring domains}}$
	Size	Google	1/6	Webpages
	Rich Files	Google	1/6	Number of files (pdf, docx, doc, pptx, ppt, ps and eps)
	Scholar	Google Scholar	1/6	Publications (the university output being part of the 10% most cited papers in their fields)

RANKING OF LEBANESE UNIVERSITIES

The study was applied on 24 Lebanese universities, 23 private and 1 public. The data was collected for three consecutive years. The first time on June 2011 using 3 search engines. The final ranking results for the Lebanese universities using WIF and WISER are shown in Table 3. The results showed that the American University of Beirut (AUB) ranked 1st in WISER while it ranked 22nd according to WIF. Saint Joseph University (USJ) came in second place in WISER while it ranked in 23rd position in WIF. On the other hand, the Lebanese German University (LGU) with only 105 webpages and 547 external links ranked 1st in WIF while it ranked in 18th position according to WISER.

Table 3 Ranking of Lebanese universities according to WIF and WISER in June 2011

University Name	Webpages	External links	Rich Files				scholar	WISER Ranking	WIF Ranking
			pdf	doc+ docx	ppt+ pptx	ps+ eps			
American University of Beirut	65,719	25,544	15,900	1,380	258	60	2,120	1	22
Saint Joseph University	52,807	15,378	6,400	533	26	0	39	2	23
Lebanese American University	15,342	7,195	2,090	545	4	0	128	3	20
University of Balamand	5,568	9,697	701	9	3	0	3	4	8
Notre Dame University	3,236	2,581	1,260	14	0	0	29	5	17
Lebanese University	2,288	2,343	410	194	2	0	3	6	14
Beirut Arab University	24,087	2,175	257	4	0	0	1	7	24
Holy Spirit University	1,617	1,639	345	8	13	0	1	8	15
Haigazian University	984	1,547	196	4	0	0	0	9	11
Antonine University	1,940	782	74	2	0	0	0	10	21
Jinan University	940	683	158	57	0	0	3	11	18
Lebanese International University	489	836	92	0	0	0	0	12	9
American University of Science and Technology	216	693	190	3	2	0	0	13	3
Global University	309	428	411	4	1	0	0	14	12
The Islamic University of Lebanon	306	509	72	6	0	0	0	15	10
Modern University of Business and Science	273	541	7	0	0	0	0	16	5
Hariri Canadian University xxx	524	352	176	22	0	0	1	17	19
Lebanese German University	105	545	3	0	0	0	0	18	1
University of Sagesse	237	476	57	1	0	0	0	19	4
Middle East University	275	366	0	0	0	0	0	20	13
Arab Open University	157	292	587	6	2	0	16	21	7
Almanar University	194	354	0	0	0	0	0	22	6
Arts, Sciences & Technology University of Lebanon	253	246	5	0	0	0	0	23	16
Lebanese Canadian University	66	266	1	0	0	0	0	24	2

According to the data collected on February 2012, the values of the indicators and the source used to collect these indicators were changed based on the new methodology. The final ranking results for the Lebanese universities in February 2012 using WIF and WISER are shown in Table 4.

Table 4: Ranking of Lebanese Universities Websites according to WIF and the new WISER ranking in Feb. 2012

University Name	Webpages	Referring domains	External links	Rich Files				Scholars	WISER Rank	WIF Rank
				pdf	doc, docx	ppt, pptx	ps, eps			
American University of Beirut	205,000	22,770	310,814	25,700	2,182	1,539	64	2,340	1	17
Saint Joseph University	337,000	11,548	4,023,668	6,650	568	30	0	52	2	5
Lebanese American University	80,500	22,030	267,226	2,540	347	8	0	560	3	14
University of Balamand	35,600	7,348	61,335	2100	23	5	0	3	4	16
Lebanese University	200,000	5,846	30,580	852	336	2	0	3	5	22
Notre Dame University	5,710	5,652	36,951	1,200	23	0	0	37	6	10
Beirut Arab University	5,740	6,287	27,726	312	6	0	0	1	7	12
Holy Spirit University	7,990	2,631	23,614	603	15	16	0	2	8	15
Haigazian University	1,710	4,763	21,440	292	6	0	0	3	9	4
Lebanese International University	17,700	2,980	13,785	96	0	0	0	1	10	21
Jinan University	1,410	1,750	15,762	185	46	0	0	3	11	6
Modern University for Business and Science	522	3,274	19,418	12	1	0	0	0	12	2
Hariri Canadian University	7,610	1,627	7,326	265	26	0	0	3	13	19
American University of Science and Technology	7,530	1,851	8,896	207	3	1	0	0	14	18
Global University	1,200	1,431	8,805	439	4	0	0	0	15	9
Antonine University	7,890	1,398	6,432	103	7	0	0	0	16	20
The Islamic University of Lebanon	342	772	11,275	75	6	0	0	0	17	3
Arab Open University	633	278	2,582	576	3	0	0	20	18	13
Middle East University	1,150	1,109	6,762	0	0	0	0	0	19	11
Arts, Sciences & Technology University in Lebanon	78,200	237	863	7	0	0	0	0	20	24
University of Sagesse	2	259	6,272	0	0	0	0	1	21	1
Almanar University	591	326	4,858	3	1	0	0	0	22	8
Lebanese German University	25,300	151	875	7	1	0	0	0	23	23
Lebanese Canadian University	58	60	576	1	0	0	0	0	24	7



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The results showed that AUB ranked 1st in WISER ranking while it ranked 17th according to WIF ranking. USJ came second in WISER while ranked 5th according to WIF ranking. On the other hand, the University of Sagesse ranked first with respect to WIF with only 2 webpages and 6,272 external links, and ranked 21st according to WISER.

For year 2013, after applying the WISER method, AUB ranked 1st with 116,187 external links and 990,000 webpages and the Lebanese Canadian University (LCU) ranked last with 111 external links and 865 webpages. According to WIF, the Lebanese International University (LIU) ranked 1st with 53,901 external links and only 647 webpages, while the Lebanese University ranked last with 67,740 external links and 975,000 webpages. Table 5 shows the analyzed websites of the universities in Lebanon, their indicators values and their WIF and WISER rankings.

CORRELATION BETWEEN RANKINGS OF WIF AND WISER

The results in the previous section showed that there is a huge difference between the WIF and WISER rankings for the same university. In this section, we will try to study the correlation between the WIF and WISER ranking based on the data collected on June 2011, February 2012 and November 2013.

It is known that the correlation coefficient relates the strength and direction of linear relationship between two variables. The correlation is calculated according to the following formula:

$$r = \frac{\sum XY - \frac{\sum X \sum Y}{N}}{\left(\sqrt{\sum X^2 - \frac{(\sum X)^2}{N}} \right) \left(\sqrt{\sum Y^2 - \frac{(\sum Y)^2}{N}} \right)}$$

Assume that the variable X represents the WISER ranking of the universities, variable Y represents the WIF ranking and variable r represents the correlation coefficient. The following is the calculation of the correlation coefficient between X and Y based on the data collected in June 2011:

$$\begin{aligned} \sum XY &= 3041, \sum X = \sum Y = 300, N = 24, \\ r &= \frac{3041 - \frac{300 \times 300}{24}}{\left(\sqrt{4900 - \frac{90000}{24}} \right) \left(\sqrt{4900 - \frac{90000}{24}} \right)} \end{aligned}$$

Therefore the calculated r is -0.616. The calculated correlation between WISER and WIF methods for data collected in 2011 was negative, which means that the relation between two methods is inverse.

For data collected in February 2012, the correlation coefficient was found to be $r = -0.07$. The value of the calculated correlation coefficient shows that there is a very low correlation between the WIF and WISER ranking according to the February 2012 ranking for the Lebanese universities websites.

For year 2013, the correlation value was $r = -0.174$. Therefore, there was a negative correlation between WIF and WISER; the two methods are inversely related.

Table 5: Ranking of Lebanese universities according to WIF and the new WISER ranking in Nov. 2013

University Name	Webpages	External Links	Referring Domains	Rich Files				Scholar	WISER	WIF
				pdf	doc, docx	ppt, pptx	ps, eps			
American University of Beirut	990,000	116,187	5,233	27,500	1,276	235	63	2,510	1	23
Saint Joseph University	264,000	4,196,551	12,540	9,300	724	71	0	86	2	6
Lebanese American University	64,700	317,389	21,961	3,660	214	18	0	616	3	16
Lebanese University	975,000	67,740	5,894	2,290	564	10	0	45	4	24
University of Balamand	54,500	140,576	6,944	1,330	10	2	0	3	5	20
Holy Spirit University	44,900	34,091	711	1,520	18	15	0	3	6	19
Notre Dame University	7,350	61,427	5,741	2,050	26	0	0	37	7	11
Beirut Arab University	2,670	113,447	6,029	594	7	0	0	1	8	15
Haigazian University	7,090	50,721	4,543	475	13	0	0	3	9	14
Antonine University	13,400	50,100	1,331	143	8	0	0	0	10	17
Jinan University	1,950	25,989	1,550	303	56	0	0	3	11	9
Lebanese International University	647	53,901	3,086	294	0	0	0	1	12	1
Modern University for Business and Science	1,220	21,788	3,497	29	1	0	0	0	13	5
American University of Science and Technology	1,990	18,735	1,890	142	3	1	0	0	14	10
Global University	1330	27,352	1,145	469	2	0	0	0	15	3
Arab Open University	644	9,006	96	572	4	3	0	20	16	8
University of Sagesse	2,030	31,832	407	164	5	1	0	1	17	7
The Islamic University of Lebanon	394	22,959	878	89	13	0	0	0	18	2
Lebanese German University	23,700	9,103	59	33	1	0	0	0	19	21
Middle East University	2050	14,910	898	1	0	0	0	0	20	13
Rafik Hariri University	1,570	539	26	412	223	0	0	4	21	22
Almanar University	1020	19,303	492	76	0	0	0	0	22	4
Arts, Sciences & Technology University in Lebanon	826	1,949	378	36	0	0	0	0	23	18
Lebanese Canadian University	111	865	71	26	0	0	0	0	24	12

RESULTS

After analyzing the indicators of all university websites, we remark that the universities in Lebanon have good web presence in general. The study showed a remarkable progress in web presence between June 2011 and November 2013.

Some Lebanese Universities such as: Almanar University, American University of Science and Technology (AUST), Antonine University, Arts, Sciences & Technology University in Lebanon (AUL), Global University (GL), LCU, LGU, Middle East University (MEU), Modern University for Business and Science (MUBS) and the Islamic University of Lebanon have no Scholar during the ranking dates. Other universities like Beirut Arab University (BAU), Al Jinan University and University of Balamand have Scholars but these Scholars, are low and didn't improve during the three years. AUB, Lebanese American University (LAU), Lebanese University, Notre Dame University (NDU) and USJ Scholars had great improvement over the three years. The remaining universities like Arab Open University, Haigazian, Holy Spirit University (USEK), LIU, Rafic Hariri University (RHU) and University of Sagesse also improved their Scholars but not with high values.

Most universities have a good number of Rich Files and this indicator increased over the three years for all universities except for University of Sagesse that had a decrease in most of its indicators in 2012. This may be due to the change to the website that was taking place at that time. Even with great increase in Rich Files values for most of the universities, there are some universities like MEU, AL Manar University, AUL, LCU and LIU that had only PDF type.

The Rich Files indicator improved for most of the universities as well as the number of webpages. On the other hand, the external links to these webpages also increased. This means that the content of these webpages was also improved. The Scholar indicator increased over the three years, but this increase is less than that of the other indicators.

It is important to note here that in WIF ranks for year 2012 University of Sagesse ranked 1st with only 2 webpages. USJ has the highest external links for year 2012 and 2013. AUB has the highest number of Rich Files and Scholars over the three years. For webpages values, AUB and USJ were always above the mean over the three years. For external links values, AUB, LAU and USJ were above the mean in 2011 and 2012, while in 2013, only LAU and USJ were above the mean. For Scholar values, AUB and LAU were always above the mean over the three years. For Rich Files values, AUB, LAU and USJ were always above the mean over the three years. AUB, LAU and USJ were the only universities above the means of the indicators over the three years and they ranked in the top three over the three years.

The correlation between the WIF and WISER ranking in 2011 and 2013 remained negative. This means that there is an inverse relation between them. In 2012 the correlation was slightly negative this means that there is no relation between them in that year. In some studies, the WISER and WIF methods were not related to each other. In this study the correlation was always negative which means that the data collected from universities websites led to this value rather than the difference in the two methods. The correlation between years 2011 and 2013 remained negative and decreased from -0.616 to -0.174. We can conclude here that the universities are now improving their indicators values as well as the content of their websites. This explains the decrease in the negative correlation value between WIF and WISER, and verifies that the correlation value is due to the data more than the methods. WISER and WIF rank for a university could be improved together if the number of external links of this university increased. If the number of webpages increased this will increase the WISER rank and may affect the WIF rank negatively.

AUTOMATED RANKING AND RECOMMENDATION SYSTEM

The main goals of the automated ranking system that we developed is to rank automatically all the universities websites in Lebanon and to generate automated recommendations that would help improving every university's rank. It is implemented using ASP.net and SQL database.

This system allows each university's web-master to rank the universities websites whenever any changes take place. Then recommendations will be given to help the webmaster improve some indicators value of his university's website which should help in improving its rank. The recommendations are given after comparing the rank of each indicator of the requested university with the above-ranked university's indicator. It then suggests a minimum value of this indicator to reach that of the above ranked university in addition to a list of suggested changes that can help the webmaster achieve the desired indicator's value.

Figures 1 and 2 below are snapshots of the system developed taken in April 2014. They show the WISER ranking of the twenty four universities and the recommendations given to Beirut Arab University to improve its WISER rank.

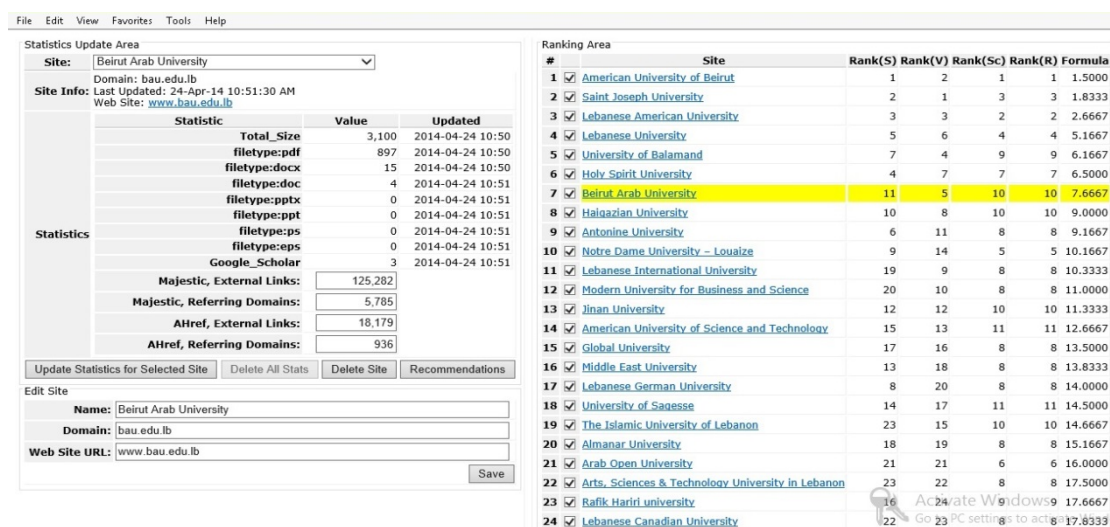


Figure 1: Final WISER ranks

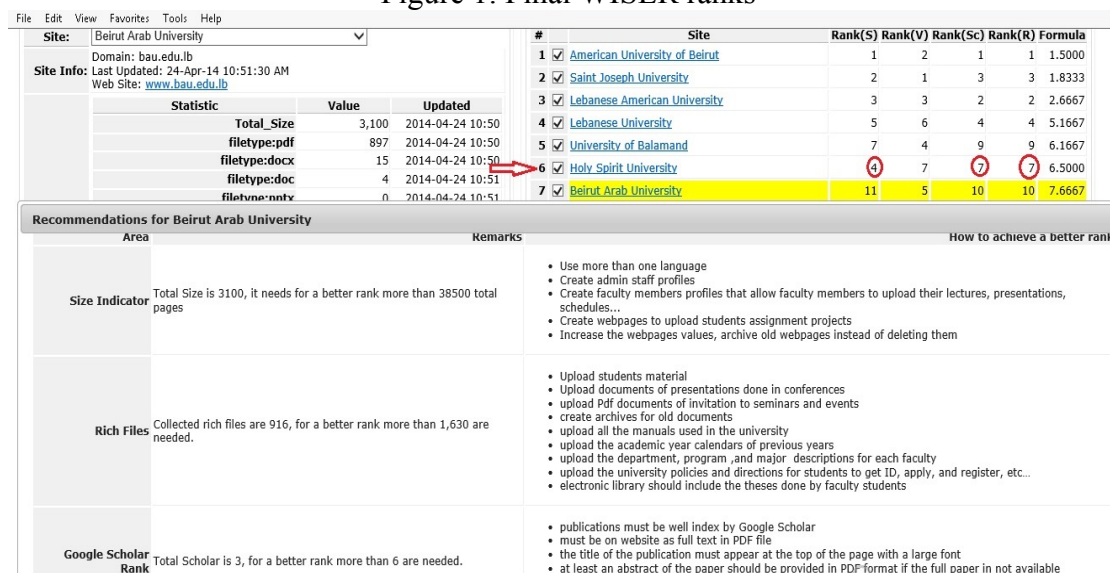


Figure 2: Recommendations for BAU to improve values of its indicators

The system consists of five components shown in Figure 3. These are the User Interface, the Search Engines, the Ranking module, the Database and the Recommendations module.

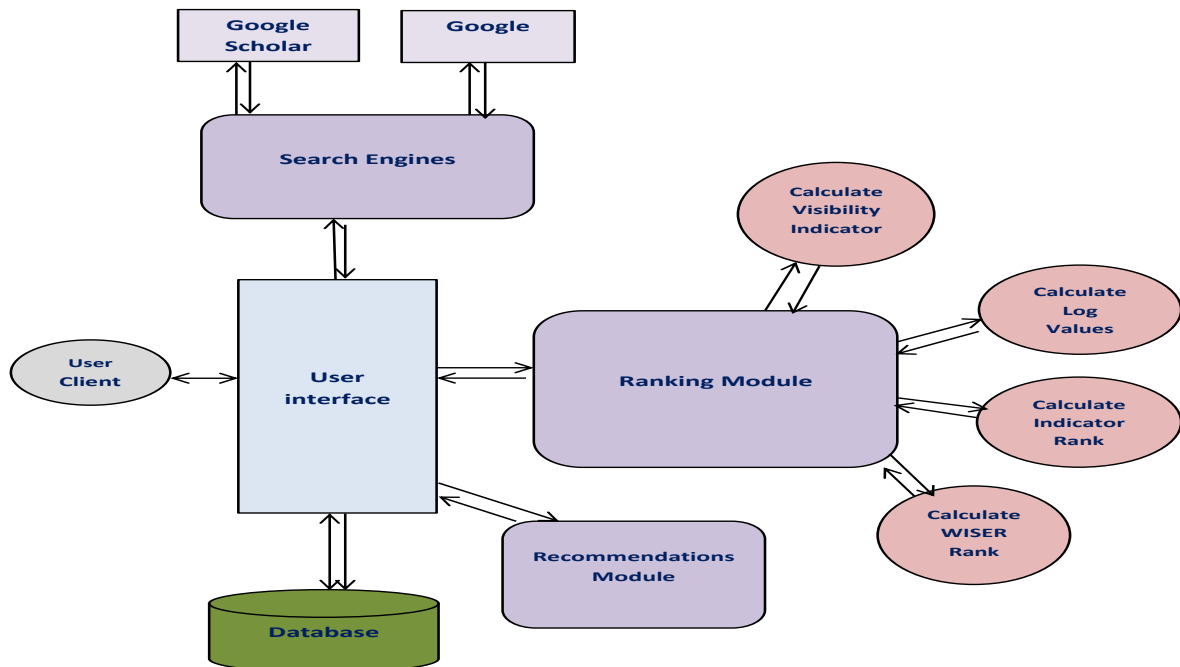


Figure 3: The five components of the Automated Ranking and Recommendation System

The user interface component is responsible for adding a new university and updating or deleting an existing one. It is used to enter the external links and referring domains collected manually using Majestic SEO and Ahrefs Search Engines. It can send an HTTP request to the Search Engine component to get the values of each indicator; it can also send a request to the Ranking module to apply the ranking method on the retrieved data. The rank of each indicator as well as the final WISER rank will be displayed on the user interface. The recommendations to improve each indicator are also displayed by this component.

The search engines component gets the values of Size, Rich Files and Scholar indicators from the Google and Google Scholar search engines after sending query containing the domain. These values are sent to the User interface and saved in the database.

The ranking module calculates the rank of each indicator as well as the final rank of the university. It consists of four subcomponents:

- Calculate Visibility Indicator: multiplies the external links entered by the user with the referring domains.
- Calculate Log Values: calculates the log normalized value of each indicator and chooses the highest log value for visibility.
- Calculate Indicator Rank: ranks each indicator for the universities.

- Calculate WISER Rank: calculates the final rank for each university by applying the WISER formula.

The database module saves the data entered by the user which include the university's name, domain and URL in addition to Majestic SEO and Ahrefs External Links and Referring Domains. It also stores the data retrieved from the search engines that include the number of webpages, the number of scholars and the number of rich files of each type.

The recommendations module allows the user to get some recommendations for a certain university according to its indicators' values, which can be used to improve its rank. The recommendations are given after comparing the rank of each indicator of the requested university with the above ranked university indicators. It recommends that the university should increase the values of certain indicators to reach those of the above ranked university.

CONCLUSION

In this paper, an analytical study of twenty-four university websites in Lebanon was presented. The study was conducted over three years 2011, 2012 and 2013 using several search engines. Based on the collected data and its analysis, the universities' websites were ranked based on two webometric ranking methods Web Impact Factor (WIF) and Web Indicators of Science, Innovation and Research (WISER). Furthermore, an automated ranking and recommendation system was designed and implemented. The main goal of this system was to reduce the time needed for each university webmaster to rank the website. Another goal was to generate automated recommendations to help a university improve its rank and fix problems that it faces in its website.

Lebanese universities made remarkable progress in developing their websites between June 2011 and November 2013. The study shed some lights on the effective indicators used in ranking the websites. The results of the study could be a guide for universities to work on their weak indicators in order to improve their ranking.

According to the ranking made over three years, the calculated correlation between the two methods WIF and WISER was negative and thus they were inverse to each other. The WIF ranking approach, which was calculated by dividing the external links of a website by the number of web pages, could be falsely high for universities with few web pages such as university of Sagesse in year 2012. It is recommended not to use WIF because of its limitations; whereas WISER is more flexible and promotes research and publications.

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