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Website performance analysis in relation to the Visibility indicator of the Webometrics ranking: case study TOP 5 universities from the Republic of Moldova & Romania

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***Abstract*—The Webometrics Ranking of World Universities periodically brings to the attention of mass media, but also to the society of the Republic of Moldova, information relevant for future students regarding the positions of higher education institutions in the country. A website is simply a prerequisite of online existence for a university. Most of the time, the university's webpage is the place where one can present detailed information about institution's activity, educational services provided, research activity, etc., this being the official source of information for future students, future graduates, but also university partners. The purpose of this paper is to analyze the webpages of the TOP 5 universities ranked by Webometrics from the Republic of Moldova and Romania, in terms of the visibility indicator of this university ranking. The paper has the task to make a comparative evaluation of the universities' webpages so that the conclusions formulated later could contribute to the improvement of the Moldovan universities' positions in the Impact Rank section of the Webometrics Ranking of World's Universities.**

***Keywords*—Webometrics, university ranking, visibility.**

I. INTRODUCTION

University rankings provide future students and their families with information based on which they can make a better choice of the university they want. Therefore, the presence of the higher education institutions of the Republic of Moldova in the international rankings can become one of the factors that will allow them to continue to attract a sufficient number of students, including from abroad, thus helping the universities to survive financially in the conditions of decreased number of students, for demographic, but also for migration reasons.

Also, the university rankings allow better visibility at the international level, in order to attract international projects for the university, but also to establish viable partnerships with other educational or research institutions. And last but not least, the positioning of the university in the various international rankings, which reflect its performance, can also represent an indicator based on which the authorities will first be able to evaluate the efficiency of spending public funds allocated to state universities, and second, they will also be able to take measures aimed at increasing the quality of these universities, related to the pursuit of national interest.

Within some university rankings there are parameters that make these rankings seem extremely objective, but still the latter hide various subjective elements. Subjectivism comes from: the definition of indicators, which may not accurately reflect the missions of different universities and may not be adapted to all fields; the share given to various indicators when being added up or the inclusive errors resulting from the automatic collection and processing of an extremely large amount of data.

For example, the number of teaching staff of a higher education institution must be collected from various sources that do not, in most cases, provide this information accurately, completely or appropriately; the number of university students, in most cases it is not present in digital statistical reports on the web, or may be indicated with errors; gathering the number of publications of a university is sometimes subject to an erroneous process, because the name of a higher education institution can appear in various forms, etc.

The analysis of some methodologies of the university rankings can generate the misinterpretation made by their

authors who choose those indicators depending on data accessibility. For example, considering that the primary mission of a university is education, from an economic point of view, this can be measured in the quantity and quality of graduates' preparation for labor market, and the most suitable indicator for ranking would be based on the average salary of this graduate, in the first years after the bachelor's degree graduation. Since these data practically present a complex problem of collection, in most cases, the authors of the university rankings, use specific tools, among which, for the education segment: employee opinions, the number of graduates with scientific awards, the number of graduates who have become administrators of top companies, development and positioning of a segment of the national economy compared to the university's field of study, the number of teaching staff per student, the number of international students, the number of academic mobilities, etc.

Currently, research represents another important mission of the university. The information used in the university rankings, regarding research results, is collected more simply, compared to those related to the education process, as a result of the existence of bibliometric databases and aggregated collections of scientific publications.

In this context, we can state that even if some university rankings use the academic collegiate evaluation in order to measure the quality of education, with a share of about 20-30% in the final result, the latter is mostly carried out still focusing on the research results. In other words, a professor from a university outside the country can find out information about a higher education institution from the Republic of Moldova, especially as a result of reading a scientific publication produced in that university, of attending a presentation at scientific conferences made by a representative of that university, of partnership relations with an academic or researcher from the university, the latter often results from the scientific collaborations, of discussions with Moldovan university graduates, in case they follow post-graduate studies, often focused on research.

In most cases, the international results of the research activity, but also the generation of the prestige of these activities, represent the most important component of the performance measured by rankings. However, performance in the field of research must not affect university performance in the teaching process, both objectives requiring the successful achievement of the other.

The hierarchization methodologies of higher education institutions cause controversial discussions and are evolving continuously. The latter are caused by the fact that it is very difficult to measure the level of performance of a complex higher education institution, and it is even more difficult, subsequently, to reflect it by a one-dimensional figure.

Since Webometrics is the only international ranking that includes most of universities from the Republic of Moldova, this paper will provide a comparative analysis of the web pages of the TOP 5 ranked higher education institutions from the Republic of Moldova and Romania, related to the Visibility parameter within the Webometrics ranking, while making some conclusions followed by recommendations aimed at improving the positions of Moldovan universities.

II. ANALYSIS OF VISIBILITY INDICATORS OF THE WEBOMETRICS RANKING OF THE TOP 5 UNIVERSITIES (REPUBLIC OF MOLDOVA & ROMANIA)

The Ranking Web or Webometrics is the largest academic ranking of Higher Education Institutions offering every six months an independent, objective, free, open scientific exercise for providing reliable, multidimensional, updated and useful information about the performance of universities from all over the world [1]. The Webometrics Ranking is not a ranking of the websites of Universities, it is a Ranking of Universities. It uses both webometric (all missions) and bibliometric (research mission) indicators. The primary objective of the Webometrics Ranking is to promote Open Access to the knowledge generated by the university. Established in 2004 by the Cybermetrics Lab from Spain (Spanish National Research Council, CSIC), Webometrics Ranking (current is the 18th year of publication) with the aim of offering full coverage of Higher Education Institutes whatever the country or discipline involved. Currently, 31000 HEIs from more than 200 countries are ranked according to a series of indicators.

Starting from January 2021, the ranking introduced new rules regarding the indicators used in the calculation. Thus, the web presence indicator was excluded (with a share of 5% representing online presence, directly proportional to the size of the institution's main web domain), and the current indicators taken into account by Webometrics are the following:

50% – Visibility – Number of external networks (subnets) linking to the institution's webpages (normalized and then the maximum value is chosen). Source: Ahrefs & Majestic;

10% – Transparency – Number of citations from Top 210 authors (excluding the top 20 outliers). Source: Google Scholar.

40% – Excellence – Number of papers amongst the top 10% most cited in each one of the all 27 disciplines of the full database. Data for the five year period: 2017-2021. Source: Scimago.

The methodology for calculating the transparency parameter is based on the collection of citations from the

first top 210 public profiles of each university, in order to allow independent comparisons of the number of employees of the institution, with the subsequent exclusion of the first 20 top profiles of the list to improve representativeness. For the other 190 profiles per university, the number of citations is added up, and the institutions are listed in descending order.

The latest Webometrics ranking (July 2022) included 24 universities from the Republic of Moldova [2]. The best positioned university – the State University of Medicine and Pharmacy "Nicolae Testemitanu" (USMF), is on the 3875th place, followed by the Technical University of Moldova - UTM (the 3927th place), Moldova State University - USM (the 4026th), the Academy of Economic Studies of Moldova (ASEM) is ranked the 4th nationally and 7960 globally, and the 5th nationally and the 8456th globally out of over 31000 higher education institutions included in the ranking is the State University "Alecu Russo" from Balti (USARB).

Similarly, the July 2022 Webometrics ranking included 102 educational institutions from Romania [3], so the following universities are in the TOP 5 of this ranking: the 1st at the national level and the 823th at the global level - Babes-Bolyai University (UBB); position 2 nationally and 980 globally – "Alexandru Ioan Cuza" University from Iasi (UAIC); position 3 at national level and 1147 at global level - Polytechnic University of Bucharest (UPB); position 4 nationally and 1231 globally - Bucharest Academy of Economic Studies (ASE); position 5 nationally and 1451 globally - Transilvania University of Brasov (UNITBV).

Since both the transparency and excellence indicators in the ranking are tangential to the research activity within the university, we will analyze the values of the impact indicator (with a share of 50% in the final score of the ranking) for the universities mentioned above, but also the correlation of these values with the institutional webpages.

If we analyze the values of the impact indicator for the TOP 5 universities from the Republic of Moldova in the Webometrics ranking presented in fig.1 versus the values of this indicator for the Romanian universities ranked in the first 5 positions in Webometrics (fig.2), we will find out since this parameter has a share of 50% of the final score, none of the Moldovan university will be able to improve its position in the ranking if, in addition to research activity, it does not also improve the value of this indicator. It should be noted that the minimum value of the indices presented in the table indicates a higher position in the ranking.

Moldova, Republic of

ranking	World Rank	University	Det.	Impact Rank*	Openness Rank*	Excellence Rank*
1	3875	Nicolae Testemitanu State University of Medicine and Pharmacy / Universitatea de Stat de Medicina si Farmacie		8592	2386	4078
2	3927	Technical University of Moldova / Universitatea Tehnica a Moldovei		6741	2616	4558
3	4026	State University of Moldova / Universitatea de Stat din Moldova		3587	2785	5413
4	7960	Academy of Economic Studies from Moldova / Academia de Studii Economice din Moldova		8833	5015	7217
5	8456	Balti State University Alecu Russo / Universitatea de Stat Alecu Russo din Bălți		10599	4463	7217

Figure 1. TOP 5 universities from the Republic of Moldova, ranked in Webometrics. July 2022 edition, source: Webometrics Ranking of World's Universities [2].

Romania

ranking	World Rank	University	Det.	Impact Rank*	Openness Rank*	Excellence Rank*
1	823	University Babes Bolyai		1066	864	1009
2	980	Alexandru Ioan Cuza University		995	1095	1379
3	1147	University Politehnica of Bucharest / Universitatea Politehnica din Bucuresti		2633	1137	1043
4	1231	Bucharest Academy of Economic Studies		899	1294	2098
5	1451	Transilvania University of Brasov		3619	1454	1258

Figure 2. TOP 5 universities from Romania, ranked in Webometrics. July 2022 edition, source: Webometrics Ranking of World's Universities [3].

Based on the public information provided by Webometrics, figure 3 presents the variation of the values of the impact indicator both for Moldova's and Romania's universities for the period January 2013 - July 2022. Although the value difference of the Impact parameter between the first university ranked in the TOP of the Republic of Moldova (USMF, with a value of 8592) and UBB, from Romania with a value of 1066 is quite high (about 8 times), the latter is not a value that could not be reached or at least reduced by the USMF within a reasonable period of time, which would allow to improve its position in the international ranking.

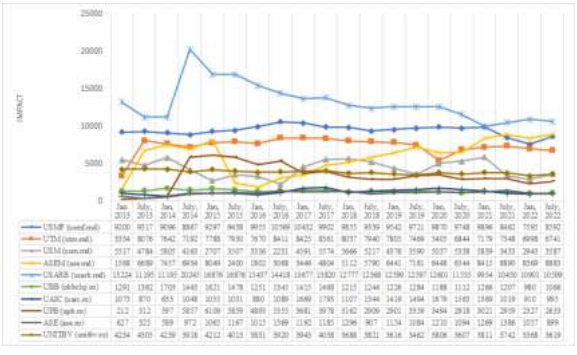

Figure 3. Value variation of the Impact indicator of the TOP 5 positioned universities both in the Republic of Moldova and Romania. Source: Webometrics Ranking of World's Universities.

III. CORRELATION OF THE IMPACT INDICATOR WITH DATA COLLECTED BY THE WEB ANALYZER OF THE TOP 5 UNIVERSITIES RANKED IN WEBOMETRICS (REPUBLIC OF MOLDOVA & ROMANIA)

Maintaining the performance of a website, especially for a higher education institution, is not a simple task at all. Improving the performance of an institution's website must be the result of serious decisions based on relevant and accurate data. In this regard, in addition to daily online activities, it is recommended to use reliable tools to check website traffic versus online pages of the competitor. Thus, monitoring your own university website and comparing the statistics of similar portals (national and international higher education institutions) has numerous benefits.

Currently, in the online environment, there are many website traffic checking tools available both for free and paid, but the purpose of this paper is not to compare the functionalities of these tools.

For the purpose of comparing the impact indicator values versus the information collected by the web analyzer for the webpages of the above-mentioned universities, we will use the tool SimilarWeb [4], which provides efficient information such as traffic sources, audience values, geolocation profiles and keyword performance. According to some tests [5], SimilarWeb ranks among the most accurate web analyzers, this being a free tool, but also having a paid version. With the help of the SimilarWeb tool, it is possible to collect information about the number of visitors, and it also enables us to see the traffic to the university website per country. Using this tool, it can significantly improve SEO (Search Engine Optimization) to bring more traffic to the university's webpage. The premium version of SimilarWeb offers various tools and complex options for comparing webpages against competing websites.

Analyzing the webpages of the universities selected in the research, with the help of the SimilarWeb tool, we obtained the following results, presented in Table I:

TABLE I. DATA COLLECTED BY THE WEB ANALYZER ON 14.09.2022 FOR THE UNIVERSITIES SELECTED IN THE RESEARCH. SOURCE: SIMILARWEB.

HEI	***Impact Rank***	***Total visits,***	***Bounce rate, %***	***Ave-rage pages per visit***	***Average duration of time spent on the site***
Republic of Moldova					
USMF	8592	234.5	47.17	4.43	00:02:22
UTM	6741	130.0	42.24	5.13	00:05:01
USM	3587	120.6	40.51	5.52	00:03:56
ASEM	8833	31.4	43.74	4.57	00:04:12
USARB	10599	23.0	59.36	2.78	00:02:17
Romania					
UBB	1066	462.8	41.81	4.92	00:03:11
UAIC	995	376.8	42.87	4.21	00:05:12
UPB	2633	487.1	33.45	5.88	00:05:31
ASE	899	282.7	47.52	6.37	00:04:37
UNITBV	3619	342.6	28.25	7.28	00:04:30

The indicators measured by the web analyzer and listed in Table I indicate the following parameters: Total visits - sum of all visits on desktop and mobile from the last month, expressed in thousands of users; Bounce rate - average percentage of visitors who view only one page before leaving the website, expressed in percentage. Total visited pages represent the total number of webpages that the user accesses on the site. The duration of the visit is the time spent by the user on the university website. Bounce rate is the ratio between the time the user opens the webpage and closes the page immediately. The results of the analysis of data collected highlight that the average time the user focuses on the webpages of the 5 universities included in the research in Romania exceeds the one spent on the webpages of the Moldovan universities. In this context, we can conclude that if the university's website shows a higher average visit duration than other competing institutions, this proves that the website has many interesting contents that attract various users (prospective students, current students, partners, etc.). Both the total number of pages visited by users in the case of Romanian universities and the bounce rate percentage (the percentage of visitors who enter the website and then leave the web domain, without continuing to view other pages from the same website) record values that allow them to be positioned ahead of the universities from the Republic of Moldova in the final score of the Impact Ranking. In the context in which Moldovan educational websites show a high percentage of bounce rate, they must take into account their websites content, language versions, but also the relevance of presented information for visitors both nationally and internationally.

Summing up the information presented in Table I, we can conclude that it is a priority in the next period „to fill"

the webpages of Moldovan universities with accessible content that would be of interest to several service beneficiaries, not only to the internal academic community of the university or its potential students, thus increasing the number of reference subnets collected within the Ahrefs and Majestic ranking, and subsequently contribute to the improvement of the Impact Rank positions.

Regarding the increase in the impact rating for the TOP 5 Moldovan universities, it is recommended:

• to implement tools that will increase the social media presence of the university;

• to implement a greater number of academic mobility programs in the university, including internships, continuous training, professional retraining, partnerships with the business environment, development of joint research projects and programs, participation in international scientific conferences, other events of academic interest;

• to expand cooperation and interaction with international institutions, universities and research institutes;

• to increase the number of foreign students enrolled at university study programmes;

• to participate in international research, but also technology transfer, cross-border projects, etc.

In order to diversify, but also to increase the web domains, which refer to the webpages of Moldovan universities, in the next period, for each ongoing project, whether it is national, regional, international, or research, one should analyze and check if partners' website not only presents university's logo or mentions about it in the text, but also inserts a hyperlink to the university's webpage.

If the faculty or any university subdivision has any direct partnership with some institutions / companies, then partner's website can refer to the name of the faculty and the university's webpage, which will finally be counted in the Majestic and Ahrefs reports for the purpose of achieving Impact Rank.

An important role in the process of establishing the university's visibility on the web is played by language tags, which are extremely effective in SEO optimization. It is important to ensure that each language version is easily visible. It is advisable to keep content for each language on separate URLs, but also to place links on university pages to switch from one language to another. In such a way, an English surfer who opens the French version of the higher education institution's page could access the English version with a single click. It is recommended to use several languages in the organization of the website, but the translations must be of a high quality, professionally executed.

IV. CONCLUSIONS

With the purpose of improving the values of the Impact indicator and as a result of the analysis of the Moldovan universities' webpages, we propose the following short-term action-conclusions:

1. Deans of faculties, heads of departments, services and other university subdivisions should present truthful and up-to-date information that will later be professionally translated into English, French, and/or other languages of international communication and placed on the university website, with the aim of increasing its degree of visibility and attractiveness.
2. Completing the list of external links that the university domain receives from third parties with new links to various collaboration projects existing within the university.
3. The universities should join business directory listings, for example: http://www.umultirank.org, https://www.dnb.com/, https://www.google.com/business/, etc.
4. Increasing the total number of webpages hosted by the university websites.
5. Increasing the total number of *.pdf, *.ppt, *.doc, etc. type of files (didactic-scientific publications, regulations and instructions in force) of major interest to those who interact with the university, placed on the institution's webpage.

Medium term actions:

1. Boosting the promotion measures of the university image in the online environment.
2. Disseminating university events and activities within social networks and online media.
3. Centralizing and updating the webpages that currently use the web domains of the institution.
4. Don't focus on the number of backlinks in a particular domain. Focus on the number of different organizations referencing university web domains. Each independent organization (even with a single backlink to you) will add +1 to the number of referral subnets used in the calculation of the impact value.
5. Use the power of social media: motivate your academic staff and undergraduate / master's / PhD students to share the content of the higher education institution's website on all social networks: Facebook, LinkedIn, Twitter, Vimeo, YouTube, Reddit, etc. [6]
6. Motivate your academic staff and undergraduate / master's / PhD students to share university website content online: Wikipedia, SlideShare, GitHub / GitLab, Q&A websites, etc. [6]
7. Motivate your staff and undergraduate / master's / PhD students to share your website content (e.g. from an institutional repository) to all social networks: Mendeley, CiteULike, etc. [6]

8. Use the power of bibliometric catalogs – library staff to integrate the institutional repository with the variety of bibliometric catalogs. Register and be present in every online university database and catalog.

9. Increase the volume of english language content of the webpage - this will bring you immediate benefits by increasing the audience to the university website, including internationally.

10. Track the impact indicators of university departments and subdivisions: give certain bonuses or monthly increments to those who complete the above actions by counting them.

11. Motivate your staff to create valuable online projects for local and even international society (high-quality reviews, interviews with top graduates, your own internal rankings or other unique content that will increase your web citations).

12. When university partners write articles about a visit to you, or about a particular partnership, ask them to mention the university website or any other relevant sub-site of university subdivisions.

13. Develop reporting forms where university staff could indicate evidence or results of a business trip, internship or joint project, and in these forms, you can ask them to specify where the university field is mentioned on the hosting website, in the context of their activity.

As a result of implementing the above-mentioned recommendations, there is a strong possibility of reaching a critical mass for the purpose of general efficiency and increased competition, which could help propel Moldovan universities in the rankings. Universities should promote internal policies that support innovation, the application of research results and the development of start-ups. Also, universities must periodically ask for the opinion of students regarding the education they receive and other services provided by the higher education institution, in a way that ensures the sincerity of the answers, and take these opinions into account to improve the offered services.

Possible effects of the attempt to improve some complex indicators, for some university rankings, can have an effect only after time intervals between 3 - 5 years, period during which the indicators used by the most popular rankings can change. Therefore, the actions presented in the paper do not aim at measures that try to manipulate precisely defined parameters, such as the indicators of the current versions of the Webometrics ranking, but indicators that correspond to various results expected by the society following the development of the university activity and that can be collected quantitatively, under one form or another, so that they can be used in possible rankings. For example, universities that have focused on real growth in research performance will benefit from various subsequent evaluations, compared to higher education institutions that have focused only on indexing their own journals or only on encouraging publications in local journals. In other words, universities must not pursue artificial optimization of performance, but publish scientific articles that will be cited by other researchers, in international scientific journals; to prepare graduates that companies will hire and pay good salaries; to be visible nationally and internationally as educational institutions of academic excellence; to become more and more attractive for foreign students; to create real market value and applicability inventions both nationally and internationally; to recruit staff recording unbeatable results in research, recognized worldwide; to publish information of major interest on the webpages, not only in Romanian.

The universities that take seriously the improvement in international rankings, should proceed to a restructuring of human resources, and this action, depending on the university's budgets (which would allow it to make attractive offers to internationally recognized people), would allow a recruitment of some didactic staff from outside the country, with excellent results in research. In this context, the university management should be open to these competitive actions, even if this would overshadow or show a superiority over the current university's staff.

And last but not least, the candidates who apply for the occupation of vacant teaching and scientific-didactic positions must benefit from a real competition, in the context where, currently, there is often only one candidate per position, more precisely - the candidate for whom the position is being created. Without an imperative attitude towards these approaches, it will be impossible to talk about the entry of Moldovan universities into the top positions of the international rankings.

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