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### Webometrics: Institutional Consciousness and National Development

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#### Abstract

*The growth of Web technologies opens new avenues for Web researchers for measurement and analysis of the phenomenon. Webometrics is traditionally used for quantifying Web data related to footprints of researchers or institutions on the Web measured in terms of research publications and other parameters. The growth of new Web technologies has posed new challenges for traditional citation databases which have been used so far for measuring research impact of universities, institutions or individual researchers. Institutions are also conscious of the effects of webometrics to their rankings. The paper looks at the current trends of the concept and its applications, in line with the methods to be adopted in research, examining its impact on institutions and national development.*

**Keywords:** *Webometrics, Websites, Visibility, Universities, Institutions, National development*

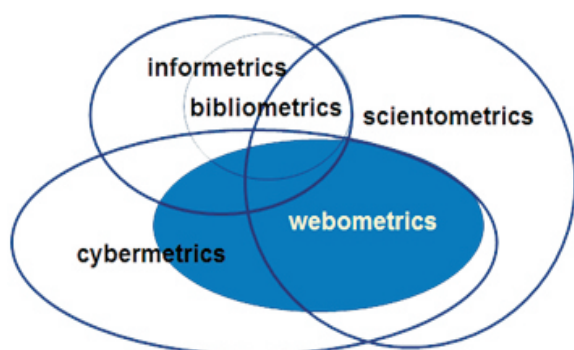
#### 1.0 Introduction

Webometrics is the quantitative analysis of Web phenomena. The science of *webometrics* or *cybermetrics* tries to measure the World Wide Web, its structure, the number and types of hyperlinks and usage patterns. According to Björneborn and Ingwersen (2004), *webometrics* is the study of the quantitative aspects of the construction and use of information resources, structures and technologies on the Web drawing on *bibliometric* and *informetric* approaches. Webometrics is concerned with measuring aspects of the web: web sites, web pages, and parts of web pages, words in web pages, hyperlinks, and web search engine results. The significance of the web itself as a contact and for hosting a progressively wider array of documents, from periodicals to vacation brochures, desires no introduction. Given this

huge and easily accessible source of information, there are limitless possibilities for measuring or counting on a huge scale (e.g., the number of web sites, the number of web pages, the number of blogs) or on a smaller scale (e.g., the number of web sites in Nigeria, the number of web pages in the Nigerian Library Association website, the number of blogs mentioning Muhammadu Buhari before the 2015 presidential campaign).

#### 2.1 Review of Related Literature

Webometrics is a scientific discipline that examines the quantitative aspects of information sources and their utilization. In other words, webometrics tries to measure the World Wide Web, examines technology usage and allows us to have a simple content



analysis. As Figure 1 shows, webometrics is affected by many scientific disciplines:

Figure 1: The interrelation of webometrics and bibliometrics, cybermetrics, informetrics and scientometrics (Malinsky, 2012).

**Bibliometrics** – is the quantitative study of documents in scientific dispatch; the documents reveal the condition of scientific knowledge.

**Cybermetrics** – is the quantitative investigation of information sources, structures and technologies on the Internet; a study of chat groups, electronic messaging, communication, etc.

**Informetrics** – is focused on the information stream in networks and demonstrates on the basis of mathematical and statistical methods a variety of relations between them.

**Scientometrics** – is focused on the evaluation of the efficiency of scientific-research or individual researchers by citation counts.

Nevertheless, webometrics is principally rooted in informetric and bibliometric approaches. The data sources that are analysed by webometrics are web files. According to Thelwall (2012), webometrics is a set of quantitative approaches for trailing and appraising the impact of web sites and online ideas and, the data research field that

developed these ideas. Webometrics approaches comprise of link analysis, web mention analysis, blog analysis and search engine appraisal, but from the standpoint of digital library evaluation, the major approach is link analysis.

How can studying web hyperlinks help appraise digital depositories? The explanation is that the links to a web site can disclose useful information concerning how popular it is, which pages or resources are the most admired, reason for the popularity and where it is popular. Although all this information can also be augmented from web server log file analysis, the server log file analysis can normally only be conducted with the permission of a site's webmaster. In contrast, link analysis can be applied to any website. This means that link analysis can be used to evaluate a website by comparing it to its competitors or to similar websites and can also be used to identify missed audiences for a site.

Links can divulge information concerning web sites since each link to a web site may be created to direct visitors to it. The link author believes that the end site is important or useful. For example, the course pages for a degree in history may get in touch with links to the origin of African trade for its images of ancient Malian artefacts of Timbuktu. Contradictorily, discovering all the links to the Timbuktu web site would give helpful discernment into who was using it and why. Of course, most people using a web site will not construct a link to it but a link analysis can still give pointers to probable users and uses.

Links can divulge information about where a web site is accessed for the reason that many links originate from web sites with a top-level domain that pinpoints their geographic origin (e.g., .uk for UK, .ng for Nigeria, .es for Spain, etc). Links can also disclose reasons for accessing a web site through reading the web pages housing the

links.

## 2.2 Webometrics Ranking of Nigerian Universities

The web has a significant benefit over other systems as it is simpler to discover the institutional units even if their names or locations are very alike. Habitually, each organization has an unlike web domain that can be used for retrieving data from search engines. Unfortunately, this is not generally the case, as few universities have more than one main domain, use by names or give autonomous domains for some of their sub-units or services. Randomly, there is no independent, sovereign or exceptional domain one might refer to as only a faculty or department. Most domains do not change over long periods, but occasionally institutions amalgamate or divide or adopt a new domain. These changes have a deep impact on the rankings as the number of external inlinks decreases abruptly. There are three key aspects to be measured in the academic web: Size, that is, the volume of information published. Visibility, the number of 'situations' (site citations & external inlinks) the domain receives; and popularity as the number of visits or visitors of the web pages (Aguillo, Ortega and Fernandez, 2008).

The original aim of the ranking is to promote web publication. Supporting Open Access initiatives, electronic access to scientific publications and to other academic material are primary targets. However, web indexes are valuable for ranking purposes too as they are not grounded on the number of visits or page blueprint but on the international rendition and visibility of the universities. As most other rankings capitalized only on few pertinent aspects, especially study results; web indicator based ranking mirrors better the whole picture, as many other activities of professors and researchers are exposed by their web

presence. The Web treats not only formal (e-journals, repositories) but also informal scholarly communication. Web publication is cheaper, asserting the high standards of quality of peer review processes. It could also get in touch with much larger possible audiences, presenting access to scientific knowledge to researchers and institutions located in developing countries and also to third parties (economic, industrial, political or cultural stakeholders) in their own community (Kaya, Certin, and Sözeri, 2010).

In creating the webometrics ranking of institutions, series of criteria are observed, but only size (S) and visibility (V) are incorporated in the final ranking. The foremost Web indicator, Web Impact Factor (WIF), was grounded on link analysis which sums the number of external inlinks and the number of pages of the website, a ratio of 1:1 between visibility and size. This quotient is adopted for the ranking, summing two new indicators to the size element; i.e. a number of documents, calculated from the number of rich files in a web domain, and a number of publications being collected by Google Scholar database. On the other hand, webometrics ranking of world universities, also recognized as Ranking Web of World Universities, is firmly linked to the volume and quality of the contents it publishes on the web ("Ranking Web", 2017). Such contents should be originated by the faculty and other members or by special agreement with external authors. This ranking is usually published twice a year. An example of a current web ranking of Nigerian universities using four web indicators, presence rank, impact rank, openness rank and excellence rank, illustrating the top ten Nigerian Universities is as follows (January, 2018 edition):

Ranking	World Rank	University	Presence Rank	Impact Rank	Openness Rank	Excellence Rank
1.	1099	University of Ibadan	2654	627	1684	1725
2.	2140	Covenant University, Ota	1300	2720	2501	2600
3.	2267	Obafemi Awolowo University	3847	3993	2476	2283
4.	2463	University of Nigeria, Nsukka	2024	4291	1492	2805
5.	2654	University of Lagos	3051	5478	2662	2635
6.	2783	Ahmadu Bello University	2001	7272	2844	
7.	2821	Federal University of Technology, Minna	3862	4585	2844	3090
8.	3118	University of Ilorin	4441	6650	1855	3300
9.	3176	Federal University Technolgy, Akure	2429	8984	2643	2912
10.	3512	University of Benin	9626	7633	2972	3480

Table 1: Webometrics 2018 Ranking top ten Nigerian Universities (<http://www.webometrics.info/en/africa/nigeria>).

Also according to the Kaya, Certin, and Sözeri (2010), the four indicators obtained from the quantitative results provided by the main search engines are:

**Size (S):** Amount of pages retrieved from four engines: Google, Yahoo, Live Search and Exalead. For every engine, results are normalized to a random variable of 1 for the highest value. Then for each domain, highest and lowest results are disqualified and every institution is assigned a rank according to the collective sum. The insertion of the total number of pages is based on the acknowledgment of a new global market for academic information, so the web is the sufficient platform for the globalization of the institutions. A strong and comprehensive web presence providing exact drawings of the structure and activities of the university can attract new students and scholars worldwide.

**Visibility (V):** The total number of unique external links received (inlinks) by a site can be only assertively obtained from Yahoo Search. Results are normalized to a random variable of 1 for the highest value and then combined to generate the rank. The number of external inlinks received by a domain is the quantity that represents visibility and impact of the published material, and although there are a great variety of motivations for linking, a considerable fraction works in a similar way as a bibliographic citation.

**Rich Files (R):** After an appraisal of their relevance to academic and publication activities and taking into account the volume of the different file formats, Adobe Acrobat (.pdf), Adobe PostScript (.ps), Microsoft Word (.doc) and Microsoft PowerPoint (.ppt) were seen as rich files. These data were extracted using Google and merging the

results for each file type after normalizing to a random variable in the same way as described before. The accomplishment of personal archiving and other depository's related initiatives can be roughly represented by rich file and Scholar data. The huge numbers involved with the pdf and doc formats mean that not only administrative reports and bureaucratic forms are involved. PostScript and PowerPoint files are clearly related to academic activities.

**Scholar (Sc):** Worthy of note is that Google Scholar provides the number of papers and citations for each academic domain. These results from the Scholar database represent papers, reports and other academic items. For the sake of concentrating on the scope of this paper, the researcher directs the reader to the above summary of the methods involved in webometrics and how the citations are analyzed.

### 2.3 Webometrics and Institutional Consciousness

Institutions in Nigeria vary from all works of life but we shall take a look at the prominent ones for clear and precise emphasis. Though most are of educational affiliations, others like agriculture and tourism are glittering institutions in Nigeria. Effects of webometrics on these institutions are highlighted as follows:

**Coverage:** Promotion of agriculture is a core agenda in President Buhari's regime since inception in 2015. Webometrics has made it possible for the birth of agricultural innovations created through research and published on the internet, creating, educating the public on ways to create wealth and food sufficiency. E-agriculture has been described as an emerging field focusing on the enhancement of agricultural and rural development through improved information and communication processes. According to

Adeyemo (2013), e-Agriculture involves the conceptualization, design, development, evaluation and application of innovative ways to use information and communication technologies in the rural domain where the farms and human resources are in abundance. This trend is also experienced in other sectors in Nigeria including tourism, librarianship, medicals, and many other socio-economic institutions.

Tourism in Nigeria, for example, is now being promoted easily through web-related activities as social media and use of hash tags and links create a wider coverage. This shoots the Nigerian tourist sites and culture into the global stage, for example; the Yankari Game Reserve of Bauchi State, Obudu Maintain Resort of Cross River state, Ikogosi Warm and Cold Spring of Ekiti State, or the Igbo, Hausa and Yoruba cultures, to mention but a few. In order to beat the competition, research is conducted to source more information on special interests. Forums and bulletin boards are created in the process. Summarily, as applies in other major institutions in Nigeria, dissemination of information relating to advanced technology, application of advanced scientific knowledge and overall improvement of the quality of life of the people within the framework of the national economic and social policies as a whole culminate into a growing economy for Nigeria.

**University missions and visions:** The web is the key to the future of all the university missions, as it is already the most important academic communication tool, the prospective channel for the off-campus distance learning, the open medium for community engagement and the universal platform for alluring talent, funding and resources. The direct evaluation of teaching mission is almost unachievable and those evaluations based on observations

(subjective), ratios of students/scholars (data undependable and results not separating) or employment results (with many variables drawn in other than the quality of teaching) should be ducked. Webometrics ranks circuitously this mission using web presence as an indicator of the commitment of the scholars with their students. It is not faultless but the future of this assignment is clearly in the web arena and any institution or individual not realizing that is losing ground very fast.

**Bad naming practices:** Institution managers are still fighting to encourage their authors to assign the correct affiliations in the scientific publications. The circumstance is not much different in the Web with numerous institutions possessing more than one central web domain, maintaining active old domains while having another, or using alternative domains for international (English) contents or sharing domains with third parties. Even among those institutions with only one domain, many of them change the domain frequently, sometimes without any apparent good reason for doing that. A strange relatively common situation is when those changes are for transferring a national top level domain to a “.edu” domain (that usually refers to a USA university!) even when the nation has a distinct academic subdomain (edu.pl, edu.ua, ac.kr). According to Ranking Web Universities (2017a), a lot of universities maintain two or more main web domains that clearly come down like a ton of bricks on not only their Webometrics Ranking. Shockingly Abia State University, in Abia State, Nigeria, maintains two web domains that clearly penalizes, not only their Webometrics Ranking but even more importantly their position in the search engines and their global internet visibility.

Since the creation of their original domain, <http://www.absuu.net/> in 2008, to the new and current domain, <http://abiastateuniversity.edu.ng> in 2016. Many visitors to

their institutional domain may have been misled severally since the two domains are open for them same time. Imperial College London also changed its domain a number of years ago from *ic.ac.uk* to *imperial.ac.uk*, a welcomed development as the new domain encompasses the name of the institution. Regrettably, the university still maintains a lot of servers that are not independent of the old domain. These servers are even more popular and visible than the fresh domain. This partly explains their poor performance in webometric ranking. These modifications and, especially the conservation along the time of several domains, penalizes very sternly in webometrics ranking. But of course, it is also a very disingenuous practice that decreases the web visibility of the institutions. Probably it has not so strong effect on local populations, but it is really puzzling to global audiences.

**Motivation:** Efficiency at doing certain tasks at the workplace or otherwise, is strongly influenced by how motivated individuals are. Inquiring new ways to encourage employees is often paramount to any company's agenda. Whether in our private or professional life, every day we finish a certain amount of tasks, some of which are more or less delightful to do. Of course, when encouraged or inspired to do certain tasks, we often complete them faster, better and without delaying them, even when the tasks themselves are not very enjoyable. Institutions always look for ways to motivate their staff by, for example, providing opportunities for professional development that it is mutually beneficial, i.e. employees get to feel more proficient, and employers get to have more competent employees. Employers are encouraged to take advantage of this arrangement by offering ways for employees to sharpen their skills and knowledge, such as conferences, mentoring programs, online courses access to the

internet, or even tuition reimbursement. Comprehensively, our jobs have a big impact on our daily cheerfulness. In other words, unhappiness from our jobs creates room for thought of abandoning the jobs and looking for one better (Klongerbo, 2015). Thelwall (2009), observes webometrics as "the study of web-based content with primarily quantitative methods for social science research goals using techniques that are not specific to one field of study", therefore finds expression in the institutional motivation of staff which leads directly to an increase in the study. This emphasizes the development of applied methods for use in the wider social sciences. The institutional motivation of staff directly leads to an increase of web-based scientific content from different fields of study. This increases the web visibility of the institutions and also puts the institution on the webometric map during rankings.

#### **2.4 Webometrics and National Development**

According to Lawal and Oluwatoyin (2011), national development can be seen as the overall development or a collective socio-economic, political as well as religious advancement of a country or nation. This is best achieved through development planning, which can be described as the country's collection of strategies mapped out by the government. Below are ways in which webometrics enhance these developmental plans:

*Economic Growth:* The Minister of Budget and National Planning, Senator Udoma Udo Udoma, in his address at the opening ceremony of the Nigeria Institute of Social and Economic Research (NISER) strategy retreat, acknowledged NISER's role in economic development but emphasized governments aim as being a major player in the world economy as recognized in government's Economic Recovery and

Growth Plan (ERGP). This aim is not achievable without proper leverage on science, technology, innovation to build a knowledge based economy (Akinfenwa, 2017). Leveraging on science and technology creates the needed innovation as knowledge will be made available to the people through the activities of different institution's employees on web-related activities. Web content will consist of ideas for innovation, creating more employment, wealth and generally growing the economy. Webometrics only provides a platform for the evaluation of these web-related activities and the web content put out by these professionals after a thorough scientific research. The ranking provided by webometrics makes the healthy competition between the professionals of different institutions an impetus for national development.

In an article by Adegbulu (2017), the national Economic Recovery and Growth Plan (ERGP), comprises of three broad objectives: restore growth, invest in human capital and build a globally competitive economy. Webometrics, as seen above, impacts positively on the restoration of national growth. It also creates employment for the unemployed that will be hired to execute the ideas scientifically created by the professionals, i.e. human capital/job creation. The healthy competition among these professionals stirs the Nigerian economy into the global stage where it competes with the rest of the world, fostering national development.

*Fake Institutions:* Webometrics makes it possible to easily fish out the underperforming institutions. Many institutions may have their activities being sponsored by the federal government account with no result produced in terms of scientifically oriented output for which they were instituted. Some might have a fake identity and still be operating under dubious

circumstances. This means that the tax payers' money might be wasted in funding of these institutions. According to Fa-ed and Mangaco (2016), webometrics tries to do the best for not including fake institutions, checking especially online, international and foreign branches if they have independent web domain or subdomain. Webometrics, went further in the 2017 updated report, to make stipulations about such institutions. It was noticed that in few years past, that most of the unethical practices were done by individuals or groups not really representing the institution where they work.

Until now a flagrant violation of ethical code was penalized with the exclusion of the institution, but this was misleading as external visitors could assume the absence was due to a mistake from the ranking body. For avoiding this problem and pointing academic authorities to a serious misbehaviour by somebody in charge of the websites, the body decided to maintain the entry, but marking with a 99999th rank those indicators grossly manipulated. The raw value of this indicator is set to zero (Ranking Web Universities, 2017b). This tantamount to whistle blowing on the institutions concerned, which is also part of the current regime's policy against corruption in Nigeria.

## **2.5 Observations and Recommendations**

Webometric ranking is meant to encourage both institutions and scholars to have a web presence that reflects accurately their activities. If the web performance of an institution is beneath the anticipated position according to their academic excellence, managers of the institution should redefine their web policy, encouraging a significant boost in the volume and quality of their electronic publications. Webometric Ranking correlates well with the quality of education delivered and academic prestige, but other non-academic variables also need to be taken into account.

Webometrics influences on both institutional consciousness and national development can barely be achieved without first of all creating an online open access to information in these institutions. Open access will widen the horizon of the employees to their counterparts around the world, establishing collaborations and giving birth to the emergence of ambitious professionals who strive to excel in the competitive arena so created by the institution. Emphasis should be placed on creating computer-aided research techniques. According to Qui et al (2017), computer-assisted information measurement research based on theoretical analysis has highlighted software design and development work to achieve a reestablished library which covers recorded data and statistical analysis of multiple data. More so, students can learn about the institutions, companies can find suitable partners for industrial projects, and organizations can easily access contact data for experts. These and other reasons should be taken into consideration (Kaya, Certin, and Sözeri, 2010).

The Federal Government of Nigeria presently runs a whistle blowing policy of which comes at a cost to the government. This comes into effect when you consider the cost of running the investigation into each report made in order to validate the report with evidence, the percentage of the loot that is accrued to the whistle blower after a report has been successfully validated and loots recovered. Webometrics can serve as a whistle blower for the government on all fake and underperforming institutions in the country, at no cost. Webometrics makes the government also aware of how excellent some other institutions have performed. This should help in national planning.

Webometrics should be used by the government as a valuable asset towards the attainment of the much needed diversification of the economy. Findings in different sectors



of the economy, made possible through research, culminated in online publishing and web presence of these professionals, aid in attracting Foreign Direct Investment (FDI) into these areas of interest. Emphasis will now shift from oil to other areas formerly not explored. Buttressing the above, the World Bank president, Mr Jim Yong Kim, stated that Nigeria currently needs an accelerated growth in human capital, especially in education and health care, to secure economic future because economic growth will surely be driven by a digitized economy. He made this known during the bank's 2017 Annual meeting in Washington DC, United States (Anaeto and Komolafe, 2017). He debunked this to counter the notion of an increase in oil prices as a panacea for economic growth.

### Conclusion

Today the worldwide web (www) is one of the main sources of information and the main showcase for everyone (institutions, business enterprises, individuals, etc.) who want to be recognized as a performer in the global stage. This established body glorifies the output of performers globally, attracting attention to the prowess of the concerned institutions. As an academic institution, universities have a very significant role communicate scientific and cultural accomplishments. Web publication by scholars is not only an instrument for scholarly communication but it is also a means to get in touch with larger audiences and in general a reflection of the performance of the institutions. There have been several efforts to develop web indicators that can ultimately lead to and build university's rankings. This kind of ranking using web indicator greatly measure universities' performance in conjunction with more traditional academic indicators.

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