

5.2. Influence Of WCAG Rules On Academic Websites Rankings: A Correlation Study Between Accessibility And Quantitative Webometrics

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Abstract

This paper focuses on finding out if the strict use of WCAG rules helps universities to improve positions in the Ranking Web of World Universities. For this purpose, top 25 European universities are selected and analyzed. On one hand, an accessibility analysis is performed through TAW test, retrieving automatic errors and warnings for the URL of each homepage's university. On the other hand, a cybermetric analysis is carried out, obtaining size, external inlinks, domain authority, and domain MozRank values. Results confirm the lack of correlation among accessibility and cybermetric figures, at least in the population under study.

Keywords

WCAG, Accessibility, Cybermetrics, Webometrics, University Rankings, Europe. TAW.

Introduction

Nowadays, Content Management Systems (CMS) are mainly used to maintaining and upgrading large websites, due to their functionality: content creation, management, publishing, and presentation [1].

The CMS must be considered as an application used to create, edit, manage, and publish digital content in a variety of formats. The content manager generates dynamic pages, interacting with the server in order to generate a web page at the request of a user, with the content extracted from a database server, and a default style format. This style is determined using templates performed by Cascading Style Sheets (CSS). This separation of instructions, content, and style is useful for web administration, but provides some concerns about accessibility issues. Should a CMS rely on a specific CSS in order to comply with accessibility standards, such as W3C WCAG standards?

Many academic websites, such as Universities and Higher Education Institutions (HEIs) rely on a CMS in order to create, publish, disseminate, and preserve their contents and services. Web content is such important nowadays that even some university rankings, (the most influential is the Ranking Web of World Universities [2] [3]) takes into account these quantitative data to rank universities, through some diverse webometric indicators, such as visibility (number of external inlinks of the site), or size (number of files within a web domain), among others [4] [5]. If it is assumed that universities utilize a CMS, and these applications are prone to present accessibility problems due to their excessive influence of the applied template (although these mistakes could be fixed by redesigning), the following question could be raised: are accessibility mistakes influencing in the position of universities in the



Ranking Web of World Universities? In order to answer this question, the main goals of this paper are shown below:

- To analyze a possible correlation between applied cybermetric indicators and accessibility problems in academic websites.
- To identify a possible relation of accessibility problems with the use of a specific CMS in academic websites.

Methodology

Ranking Web of World Universities [7] (January 2011 edition) is used to select the first 25 European universities (see next table). The URLs of each university conforms to the population under study. For each URL is performed an accessibility and cybermetric analysis. Both analyses were performed on the first week of July 2011.

Accessibility analysis

The T.A.W [8] automatic web accessibility test (WCAG 2.0 standard; AA level) is applied to the 25 URLs, obtaining an extensive report about WCAG compliance of each web page, where mistakes are divided into errors and warnings. From each report, the following quantitative data is extracted:

- Number of perceptible errors/warnings (PER): the information and the components of the user interface must be presented to users so that they can perceive.
- Number of operable errors/warnings (OPE): the components of the user interface and navigation must be operable.
- Number of compressible errors/warnings (COM): the information and managing the user interface should be understandable.
- Number of robustness errors/warnings (ROB): content must be robust enough to be interpreted reliably by a wide variety of user agents, including assistive technologies.
- Total errors/warnings: The sum of the above categories.

The process to identify the CMS used in each URL was performed by two methods: automatically, and by a personal letter sent to web administrators. The automatic method has been realized with the help of software Wappalyzer [9] v1.13.2, that running both on Mozilla and Chrome browsers shows in the address bar some of the various elements which the page was built with. Among the elements that distinguish shows the web server used, different Java's frameworks employed. Various types of embedded code used to get accurate usage statistics, and if it's possible the CMS, is also between these elements.

Webometric analysis

Each URL is measured by four webometric indicators:

- Domain Authority (DomA)
- Domain MozRank (DmR)
- Size (S)
- Visibility (V)



DomA and Dmr are retrieved directly from Open site explorer [6], while S and V are extracted from Yahoo Site Explorer- Spain mirror [10]. For V, only external links targeted to the homepage (not the entire site) are considered, in order to make this value comparable with those obtained by T.A.W test.

Finally, the data obtained from the two analyses was exported into a spreadsheet in order to be statistically treated. Spearman's correlation was calculated between each indicator, due to the non-normality distribution in web indicators.

EURO RANK	WORLD RANK	UNIVERSITY	URL	COUNTRY
1	19	University of Cambridge	cam.ac.uk	UK
2	31	University College London	ucl.ac.uk	UK
3	32	University of Southampton	soton.ac.uk	UK
4	41	University of Oxford	ox.ac.uk	UK
5	43	Swiss Federal Institute of Technology	ethz.ch	Switzerland
6	54	University of Oslo	uio.no	Norway
7	62	University of Helsinki	helsinki.fi	Finland
8	67	University of Edinburgh	ed.ac.uk	UK
9	74	University of Glasgow	gla.ac.uk	UK
10	82	Universität Wien	univie.ac.at	Austria
11	85	Utrecht University	uu.nl	Netherlands
12	87	Università di Bologna	unibo.it	Italy
13	93	Durham University	dur.ac.uk	UK
14	98	Freie Universität Berlin	fu-berlin.de	Germany
15	100	Uppsala University	uu.se	Sweden
16	101	University of Warwick	warwick.ac.uk	UK
17	103	University of Leeds	leeds.ac.uk	UK
18	105	Ludwig Maximilians Universität ...	uni-muenchen.de	Germany
19	106	Humboldt Universität zu Berlin	hu-berlin.de	Germany
20	109	Università di Pisa	unipi.it	Italy

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EURO RANK	WORLD RANK	UNIVERSITY	URL	COUNTRY
21	110	Universidad Complutense de Madrid	ucm.es	Spain
22	112	Universität Münster	uni-muenster.de	Germany
23	113	University of Copenhagen	ku.dk	Denmark
24	116	Norwegian University of Science ...	ntnu.no	Norway
25	124	University of Amsterdam	uva.nl	Netherlands

25 top European universities (source: webometrics.info)

Results

Accessibility analysis

The following Table shows the errors and warnings detected by T.A.W test, for each type of fault (perceptible, operative, compressible, and robustness). Universidad Complutense of Madrid is the only university within the top 25 European institutions without any accessibility problems (automatically detected, obviously). Up to nine universities present more than twenty errors, which are considered excessive if we consider that is websites representing to higher-education institutions. Other aspects that should be mentioned are the rate of perceptible errors in some centres. For example, Oxford University shows seven problems, all of them perceptible, or Ludwig Maximilians Universität München, with 26 problems, 23 of them perceptible.

As expected, the number of warnings is higher than errors. Any university shows ought warnings, and only four (Durham University, Cambridge University, University of Wien, and Universidad Complutense of Madrid) show zero warnings in a single category. Moreover, the correlation between errors and warnings is very low ($R=0,33$).

URL	PER	OPE	COM	ROB	T
ucm.es	0;54	0;24	0;0	0;67	0;106
cam.ac.uk	0;28	1;27	0;6	0;1	1;61
dur.ac.uk	1;11	0;10	0;6	1;0	2;27
gla.ac.uk	2;7	0;21	1;6	0;1	3;35
uio.no	3;38	0;37	0;18	0;37	3;130
leeds.ac.uk	3;71	0;44	1;13	1;6	5;134
soton.ac.uk	2;22	0;15	1;6	2;35	5;78
fu-berlin.de	5;68	1;68	0;6	0;12	6;154
ox.ac.uk	7;59	0;55	0;12	0;13	7;139
ucl.ac.uk	6;25	2;25	1;6	1;8	10;64
ed.ac.uk	7;45	0;32	2;6	2;89	11;91
uu.se	7;12	2;9	1;6	2;6	12;61
uni-muenster.de	9;12	0;3	3;6	3;25	15;46



URL	PER	OPE	COM	ROB	T
hu-berlin.de	2;23	1;47	0;6	13;20	16;96
ntnu.no	10;26	0;36	0;12	7;100	17;174
univie.ac.at	13;41	4;17	1;6	1;0	19;64
warwick.ac.uk	18;73	3;35	1;12	1;28	23;148
unibo.it	14;79	7;57	2;6	2;6	25;148
uni-muenchen.de	23;49	0;28	2;6	1;17	26;100
uu.nl	22;77	4;29	1;6	0;43	27;155
ku.dk	7;56	17;42	6;6	2;2	32;106
uva.nl	24;41	3;32	2;6	5;265	34;344
unipi.it	23;46	13;35	7;6	7;2	50;89
helsinki.fi	40;36	4;12	5;12	20;15	69;75
ethz.ch	61;54	6;30	10;37	10;20	87;141

WCAG Compliance: errors;warnings

The following Table illustrates the CMS applications used in the homepage of universities considered under study, and which we have information. This information is unknown in nineteen universities (personal e-mail was only answered by only two webmasters, which give us with some information about its systems), and there is no information in the public source code of the homepage.

UNIVERSITY	CMS
ucl.ac.uk	Silva CMS
hu-berlin.de	Plone
unipi.it	Joomla
uio.no	Vortex (self-developed)
univie.ac.at	TYPO3
uu.nl	Microsoft SharePoint

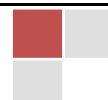
CMS used by universities

Webometric analysis

Finally, the next Table shows webometric performance obtained for each indicator:

URL	DomA	DmR	S	V
cam.ac.uk	85	7,23	2.740.000	174
dur.ac.uk	79	6,48	489.000	56
ed.ac.uk	82	6,98	787.000	82
ethz.ch	77	7,01	1.340.000	136
fu-berlin.de	80	6,85	815.000	171
gla.ac.uk	80	6,8	944.000	87
helsinki.fi	76	6,76	1.600.000	78
hu-berlin.de	77	6,72	1.140.000	69
ku.dk	74	6,64	647.000	173
leeds.ac.uk	82	6,86	377.000	95
ntnu.no	74	6,54	1.210.000	168
ox.ac.uk	85	7,23	1.360.000	218
soton.ac.uk	82	6,8	603.000	78
ucl.ac.uk	81	6,97	886.000	292
uclm.es	84	6,45	1.160.000	91

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URL	DomA	DmR	S	V
uio.no	73	6,81	1.580.000	130
unibo.it	75	6,56	906.000	77
uni-muenchen.de	80	6,68	562.000	45
uni-muenster.de	79	6,62	608.000	62
unipi.it	74	6,35	526.000	29
univie.ac.at	83	6,8	1.690.000	187
uu.nl	75	6,72	1.040.000	71
uu.se	73	6,65	981.000	67
uva.nl	76	6,72	902.000	97
warwick.ac.uk	83	6,64	1.020.000	141
ucl.ac.uk	81	6,97	886.000	292

Webometric performance

Webometric indicators show as Cambridge University performs really high in almost all indicators (DomA, DmR, and size), while University College London is the University whose homepage with more external inlinks (292), followed by Oxford (218), Wien University (187), and Cambridge (174).

Correlation analysis

With data compiled in 3.1 and 3.2, table 5 is performed, showing Spearman correlation between webometric and accessibility indicators, in this case total errors/warnings, and perceptible errors/warnings.

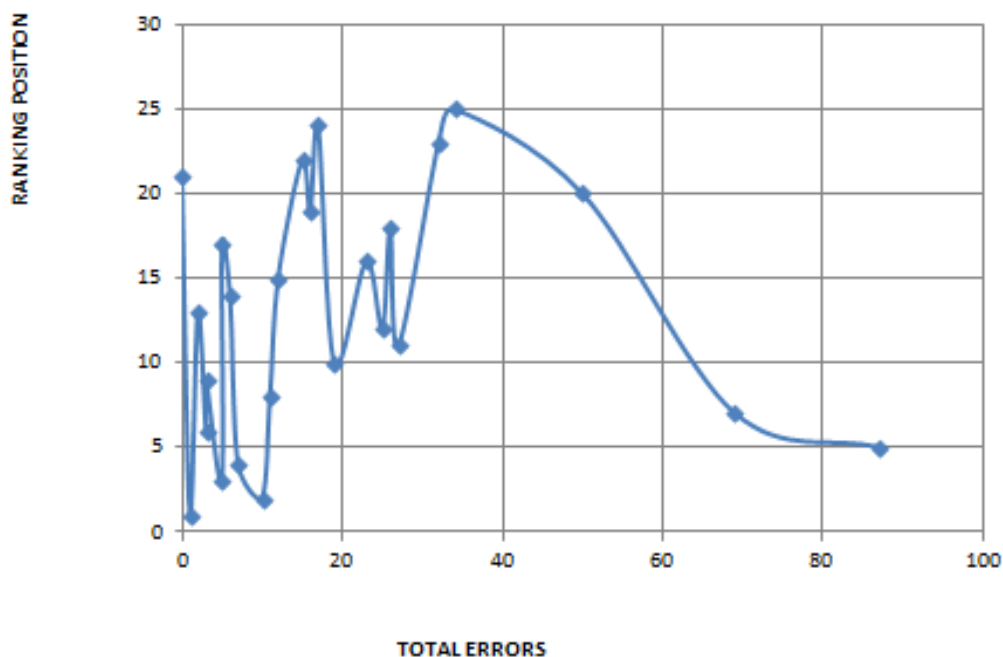
INDICATOR	TOTAL ERRORS	TOTAL WARNINGS	PERCEPTIBLE ERRORS	PERCEPTIBLE WARNINGS
DomA	0,49	-0,19	0,44	-0,10
DmR	0,23	-0,13	0,21	-0,02
Size	-0,02	0,23	-0,02	-0,01
External inlinks	0,16	-0,25	0,15	-0,22
EWR	0,30	0,36	0,25	0,11

Correlation between accessibility and web performance

The higher value identified corresponds with the correlation between DomA and Total errors ($R=0,49$), what reflects the lack of correlation between webometrics and accessibility problems. External inlinks, which is considered the indicator that could be more influenced by a poor accessible website, does not present any correlation with errors and warnings ($R=0,16$ and $R=-0,25$, respectively). Finally, the relation between size and errors/warnings seems to be practically random.

In addition, the correlation between the position of each university in the European web ranking and the accessibility problems detected is shown. Results confirm the low level of correlation. Next Figure shows the performance of each university in both indicators (ranking position and total errors detected).





Ranking position and total accessibility errors per each university.

Conclusions

Results confirm the lack of correlation among webometric indicators, and accessibility errors/warnings (measured by TAW automatic test) for 25 top European universities.

Complete correlation with specific CMS has been impossible to assess due to lack of information about the applications used by all universities. This raises questions about why the secrecy about which CMS is been used by each university, in case any was used. One possible cause why our automatic system does not find the CMS used by the institution might be that the home page was maintained manually edited with software like Macromedia Dreamweaver or Microsoft FrontPage.

We make a special appeal to point out the lack of interest that webmasters put in making cascading style sheets (CSS) grammatically correct, without errors to be transferred to all pages of the universities (as they are used as templates for the rest of pages). We believe that a large percentage of all types of errors appeared in the accessibility analysis are due to bugs in the CSS of each university. Although this should be confirmed by further analysis of them.

Some webometric indicators, as external inlinks, seem to be independent of accessibility problems automatically detected in the homepages, what could mean that universities are linked by users who do not detect these problems? Other reasons could be that universities are linked due to other academic or meritocratic reasons, and accessibility is not influencing the decision of linking. Other indicators, such as size and Domain MozRank, is completely random with accessibility.

These results confirm the shortage correlation found with the position of universities in the Ranking Web of World Universities, because the combined indicator used (Webometric

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Rank, WR), is composed by, among others, size and external inlinks. Measuring other webometric indicators based on usage (e.g. total visits, unique visits, downloads) may arise from other results. In any case, due to the importance of accessibility parameters, and their poor correlation with WR, this ranking should evaluate the possibility of include some of these indicators in their final formula.

Perceptible errors perform lower correlation rates with webometrics as total errors. This situation repeats with warnings. This could indicate that the correlation is increased adding more problems, and not one specific (in this case, perceptible). In any case, this study should be completed with another population and webometric indicators in order to assess the results obtained.

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