JSCIRES PERSPECTIVE PAPER

Analysis of Iranian and British university websites by world wide web consortium

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ABSTRACT

The primary goal of this paper is to investigate various elements of websites and compare the quality of two groups of university website designs. The procedure for the quality assessment of website design involves various modules: Extracting components of websites, validating web pages, and identifying broken links. It continues with collecting the compared data of the existing statement of Iranian and British universities websites. The 5-point scale has been chosen as evaluator tool. Different kinds of tools are used to examine above components. These tools include: World Wide Web Consortium (W3C) Link Checker, W3C markup validation service, web page analyzer, and website extractor. The W3C statistics findings show that Iranians university websites have high rate of errors compared with British university websites. These errors had been occurred in various levels of the websites: For example, HTML errors, broken links, server connectivity, image load error, and so on. It is clear that some of the websites donot followthe explicit website designing standards like W3Cs standards, and use nonprofessional designers whichcauseescalating the rate of website's errors.

Keywords: HTML errors, online measurement tools, websites, websites analysis, broken web-links

INTRODUCTION

A website has different information in various formats such as text, image, audio, and video. We acknowledge that each format has some special features and therefore requiresspecific design. A website contains objects and information which arealso related to each other, even with its outside. These objects have to follow certain guidelines to have a qualified web design.

Different audiences surf universities websites for different purposes. A student may look forcourse information, changes in lecture times, account access, or teacher contact information. It is very importantwhatever the user is searching for be in hierarchical and logical relationship as well as easily understandable.[1]

Different tools have been developed to help web designers to achieve this matter. Along with web designers, various evaluation applications have been introduced to the evaluators of websites. For instance, World Wide Web Consortium (W3C) is a web tool which showsthe status of websites accessibility, usability, and visibility interface.

Designing a qualified website, despite of many recommendations, ideas, and guidelines, is still a burning problem;[2] taking in to account that web designing is a continuous process. We always should improve our website design in such a way that it should not be too much crowded (with link), vacuous, or broken link and so on. This paper attempts to find various qualitative measured data for two groups of university websitesand compares their status.

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Access this article online	
Quick Response Code:	Website: www.jscires.org
	DOI: 10.4103/2320-0057.115870

LITERATURE REVIEW

W3C defines a set of guidelines forthe quality of web designs. These guidelines provide a series of techniques for assessing the contents of a website.[a] The qualitative measures are used to achieve functional quality of websites. An effective web design is one that makes it easier for users to navigate through its different pages. As a result, a site should be a network of active links. A website structure might be represented by directed graph where each node and edges represents a webpage and a link to the corresponding web.[3] It is already accepted that web link structure can also be used for page ranking[4] and web page classification.[5]

Another method for evaluatingwebsites design qualification is the use of 10-points scale where the value suggests improvement of web design throughextracting PowerMapper which is used to establish the sitemap for a website and path length metricthat is used to evaluate average number of clicks to get a desired web page. Additionally, a website structural complexity is determined with cyclamate complexity.[2]

Attempt by, Maswera *et al.*,[6] seek to establish the nature and extents of errors in e-commerce websites diagnosed by two automated evaluation tools and showthe websites of tourist organizations from South Africa, Kenya, Zimbabwe, and Ugandaare comparedwith those of European websites. Almost 318 websites were rated for content accessibility and usability through the application of automated tools developed by Bobby and Lift. Results show that although the detected errors didnot affect most e-commerce users, they hinder the usability and accessibility of people with disabilities. Sreedhar *et al.*,[7] asserted 30 Indian university websites by W3C where authors traced errors of the websites (major and minor errors), and deliveredthe status of the websites designs by 5-point scale. In a research by Sreedhar and Chari,[8] authors asserted five Indian university websites to identify qualitative measures of website design. They showedthe rate of minor and major errors and used W3C web tools for information extraction. Yen considers website design as a mathematical optimization. Specifically, he proposes a framework which classifies real-world design problems in a generic website design categories and maps each resulting category into a graph model which can be analyzed or solved by using appropriate analytical techniques. His framework consists of generic design and graph modelsto gather the necessary mapping.[9] The other case was May and Zhu's[10] work that analyses the Taxes public school websites using the Bobby software against section 508 guidelines and web content accessibility guidelines. In this work, each errorwas analyzed and the corresponding solution was given.

a. Techniques for Web Content Accessibility Guidelines by W3C, http://w3.org.

METHODOLOGY

This study follows the quality assessment of website design which involves various modules such as extracting components of websites, validating web pages, and identifying broken links. The existing status of Iranian and British universities websites were chosen to be compared. This process showsfunctional and operational status of mentioned websitesand some considerations were suggestedon the evaluation of websites. All these modules are included in a web program. The structure of web programs is shown in Figure 1.

In order to extract components of websites, the corresponding components were found and extracted using an appropriate web tools like websites extractor.[b]

By the use of W3C Markup Validation Service,[c] the web page errors in HTML tags, web page characters, and standards of W3C organization, errors and their details were stored in a file for further analysis.

To identify the broken links, W3C Link Checker[d] which finds all the broken and incorrect links of a website, the broken link errors were extracted and stored in a file to

b. http://www.Websiteoptimization.com/services/analyze
c. W3C Markup Validation Service, http://validator.w3.org/
d. W3C Link Checker, http://w3.org/checklink/

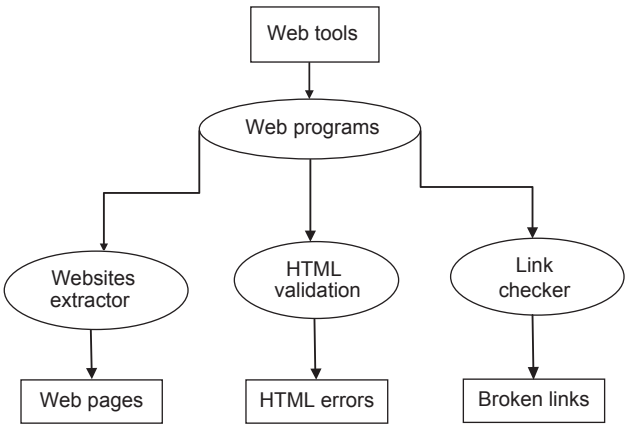

Figure 1: Structure of web programs

find out the status code of each link to be alternated. The broken error indices are calculated using equation (1).

$$\text{Percentage of broken links (PBL)} = \left(\frac{\text{number of broken links}}{\text{number of web pages}}\right)100 \quad (1)$$

An example map is shown in Figure 2.

Following data collection, the 5-point scale was used to explore the status of the target websites as this tool uses both minor and major errors for final conclusion.

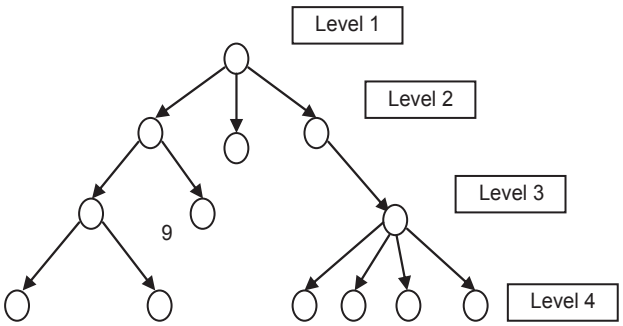

Figure 2: An example site map

RESULTS

The websites of 10 Iranian universities and 10 British universities have 1437 web pages. All pagesincluded in the evaluation process. The web tools were used to study each university's website and all components of universities websites are shown in Tables 1 and 2. The web page errors that were generated using web program are considered to identify the measures of quality of website design. These errors are further divided into major and minor errors.

The detail of Iranian and British university websites broken link figure is presented in Figure 3.

Major Errors

These categories of errors are very important in website design. Major errors affect the download time of a web page. The major errors include: Broken links, document type declaration errors, applet usage errors, server connectivity errors, image load errors, frames tag usage errors, and title tag with no keyword errors. The major

Table 1: Iranianuniversities' website report

University name	Websites address	No. of web page	Total web page size (bytes)	Total no. of web page errors in web site	Percent of broken links in each page	Average no. of errors in each page	Download time at 28kps
University of Khaje Nasir Toosi	www.kntu.ac.ir/	62	580900	1079	8	17.4	234.71
University of Shahid Beheshti	www.sbu.ac.ir/	74	366179	329	4	4.43	153.50
Tehran University of Medical Science	www.tums.ac.ir/	82	410668	84	1.2	1.02	168.74
University of Amirkabir	www.aut.ac.ir/	58	347118	41	10.3	0.7	144.52
Sharif University	www.sharif.ir/	210	852763	73	7.6	0.34	372.07
University of Tarbiat Modares	www.modares.ac.ir/	22	159643	81	4.5	3.68	65.07
University of Tabriz	www.tabrizu.ac.ir	89	1216014	77	5	0.86	484.44
University of Ferdowsi	www.um.ac.ir/	108	613049	101	3	0.93	249.17
University of Shiraz	www.shirazu.ac.ir/	50	265042	131	0	2.62	82.00
University of Isfahan	www.ui.ac.ir/	68	141155	327	7	4.8	62.30

Table 2: British universities' website report

University name	Websites address	No. of web page	Total web page size (bytes)	Total no. of web page errors in web site	Percent of broken links in each page	Average no. of errors in each page	Download time at 28kps
University of Manchester	www.manchester.ac.uk/	52	465909	10	0	0.19	189.95
University of Bristol	www.bris.ac.uk/	76	428971	5	0	0.06	179.24
University of Newcastle	www.ncl.ac.uk/	29	386120	13	0	0.44	155.03
University of Oxford	www.ox.ac.uk/	76	282838	20	2.6	0.26	120.21
University of York	www.york.ac.uk/	42	493683	14	2.3	0.33	198.31
University of Bedfordshire	www.beds.ac.uk	32	588700	16	3.1	0.5	233.74
University of Cambridge	www.cam.ac.uk/	62	155420	10	1.6	0.16	71.03
University of Liverpool	www.liv.ac.uk/	57	573745	22	1.7	0.38	233.14
University of Nottingham	www.nottingham.ac.uk/	102	424259	56	6.8	0.54	182.41
University of Southampton	www.soton.ac.uk/	86	575621	2	0	0.02	236.07

errors dependon the download time of the web pages. If major errors are minimized, then download time will be automatically reduced and hence leads to the better quality.[7]

Minor Errors

The minor errors are related to HTML tag orders. These errors affectwebsites' visual quality. The minor errors include: Table Tag Errors (TTE), Body Tag Errors (BTE), Image Tag Errors (ITE), Head Tag Errors (HTE), Font Tag Errors (FoTE), Script Tag Errors (STE), Style Tag Errors (STE), Form Tag Errors (FmTE), Link Tag Errors (LTE), and Frame Tag Errors (FTE). The developers must be attentive so that web pages can be properly designed with appropriate HTML tags.[7]

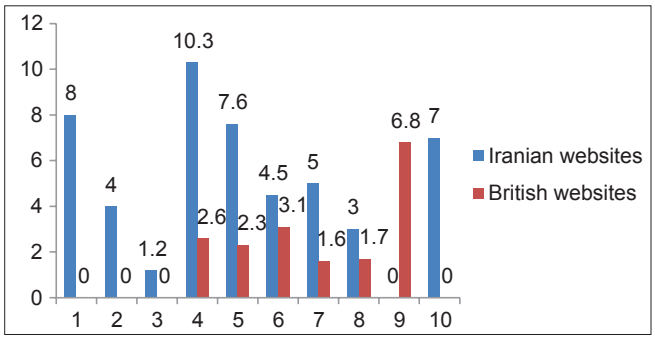

Figure 3: The percent of Iranian and British universities website broken links

Evaluating Qualitative Measures of Improved Website Designs

Each qualitative measure is evaluated based on 5-point scale. Formula for each measure is determined based on consideration of minor and major errors which has shown in the following equations:

$$\left.\begin{aligned} m1 &= (BTE + FTE + HTE)/n \\ m2 &= (LTE/nn) \\ m3 &= (TTE + FTE + StTE + FoTE)/n \\ m4 &= (ITE + BTE)/n \\ m5 &= (FmTE + STE)/n \\ m6 &= (STE)/n \end{aligned}\right\} \quad (2)$$

$$\left.\begin{aligned} k1 &= (\text{Broken links}/n) * 100 \\ k2 &= (\text{Frame tag usage errors} + \text{DTD errors})/n \\ k3 &= (\text{Image load errors})/n \\ k4 &= (\text{Title tag with no key word errors})/n \\ k5 &= (\text{Applet usage errors} + \text{server connectivity errors})/n \end{aligned}\right\} \quad (3)$$

Where *n* is then number of web pages in a website.

Each qualitative measure is evaluated using equations (2) and (3) in a 5-point scale. The value 0 indicates lowest value and value 5 indicates the highest value. Table 3

Table 3: 5-point scale values for various universities' websites Iran and British

University	Text formatting measure	Link formatting measure	Page formatting measure	Graphics element measure	Page performance measure	Site architecture measure
University of Khajeh Nasir Toosi	4	2	1	1	4	2
University of Shahid Beheshti	3	4	2	0	2	3
Tehran University of Medical Science	3	4	0	3	3	3
University of Amirkabir	4	1	0	2	3	2
Sharif University	5	2	1	1	3	1
University of Tarbiat Modares	5	1	2	3	4	0
University of Tabriz	3	1	3	2	2	0
University of Ferdowsi	4	1	3	2	1	1
University of Shiraz	5	4	4	3	5	3
University of Isfahan	5	1	1	0	2	0
University of Manchester	5	4	5	3	4	2
University of Bristol	4	1	4	3	4	3
University of Newcastle	5	2	4	4	5	4
University of Oxford	5	3	4	4	3	5
University of York	4	4	3	5	4	2
University of Bedfordshire	4	2	2	5	5	3
University of Cambridge	5	3	3	5	5	3
University of Liverpool	5	3	4	5	1	3
University of Nottingham	5	1	5	5	2	4
University of Southampton	5	1	5	5	3	4

shows the values of various qualitative measures of Iranian and British universities' websites [Table 4].

The average number of errors rate between Iranian and British university websites is shown in the [Figure 4].

CONCLUSION

This paper aims to evaluate and compare elements required for designing thewebsites ofmajor Iranian and British university websites. The findings show that Iranian university websites have much more broken link than British university websites which make users to be bored. As a result, such error may disappoint user for future refers. The detail has been presented in Figure 3.

Based on findings, British university websites have much better statuscompared withIranian university websites which could be seen in the websites page loading, accessing to various formats of files, andachievingto pages of selected links.

Since there are many programming languages of HTML and a few of them are accepted as a standard programming language in W3C consortium, some errors could be originatedin the selection of programming languages of websites. Often nonprofessional designers search their required HTML codes with various standards from the Internet and use them in their websites without appropriate considerations. As a result, the number of HTML errors increases or decreasesbased on platform that an evaluator uses. The same problem was mentioned by Sierkowski who stated that nonprofessional designers use multistandard regulations in a website's design, while a unique standard should be followed throughout of a website.[11] On clicking on a link in a website all items may be seen without error; but a platform such as W3C reports it as an error. In other word, different evaluator tools may result different reports.

Some designers are nonprofessionals which affect thewebsites' error decreases or increases. Anamateur designer is not able to insert some advanced contents such as audiovisual stuffs. Inclusion of such advanced materials by nonprofessional designers always bring high rate of website's errors as Regan indicates they are a source of many inaccessibility cases.

Regan[12] believes that among web designers there is notion that claims "taking into account high accessibility concerns" may affect creativity and individual inspirations.

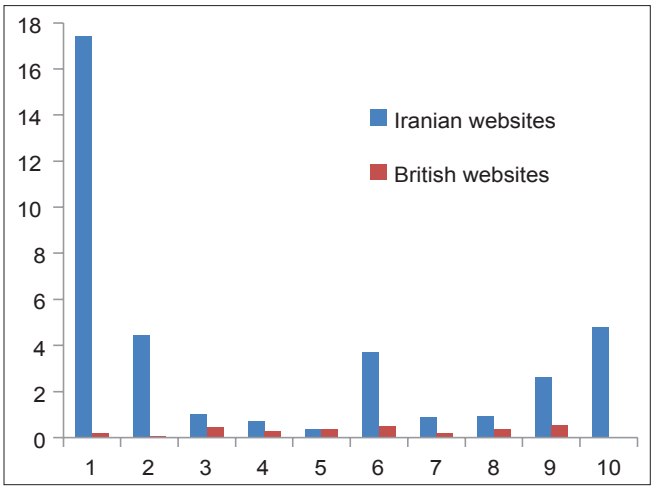

Figure 4: Average number of errors in each page

Table 4: The 5-point scale formula components for various qualitative measures

Qualitative measure	5-point scale value
Text formatting measure	if mL<5 then value=5 else if mL<10 then value=4 else if mL<15 then value=3 else if mL<20 then value=2 else if mL<25 then value=1 else value=0
Link formatting measure	if (m2<5 and k1<10%) then value=5 else if (m2<10 and k1<20%) then value=4 else if (m2<15 and k1<30%) then value=3 else if (m2<20 and k1<40%) then value=2 else if (m2<25 and k1<50%) then value=1 else value=0
Page formatting measure	if (m3<5 and k2<2) then value=5 else if (m3<10 and k2<4) then value=4 else if (m3<15 and k2<6) then value=3 else if (m3<20 and k2<8) then value=2 else if (m3<25 and k2<10) then value=1 else value=0
Graphics element measure	if (m4<5 and k3<0.5) then value=5 else if (m4<10 and k3<1) then value=4 else if (m4<15 and k3<1.5) then value=3 else if (m4<20 and k3<2) then value=2 else if (m4<25 and k3<2.5) then value=1 else value=0
Page performance measure	if (m5<5 and k4<0.5) then value=5 else if (m5<10 and k4<1) then value=4 else if (m5<15 and k4<1.5) then value=3 else if (m5<20 and k4<2) then value=2 else if (m5<25 and k4<2.5) then value=1 else value=0
Site architecture measure	if (m6<5 and k5<0.5) then value=5 else if (m6<10 and k5<1) then value=4 else if (m6<15 and k5<1.5) then value=3 else if (m6<20 and k5<2) then value=2 else if (m6<25 and k5<2.5) then value=1 else value=0

As Brajnik[13] noted, at the Proceedings of the 6th Human Factors and the Web Conference, the usability and accessibility of a websitein the first place depends on human factors (knowledge, expertness, and etc.,).

Usability or accessibility is among concerns that web designers take into account. Evaluators such as "Lift"[e] accentuate on accessibility of a website rather than usability.[14] Whereas, Bobby emphasis on usability instead of accessibility. Each of them has some special guidelines. Therefore, the initial purpose of a web designer should be considered on the evaluation of a website. Clearly, a continuous revision and amendments must be followed to achieve both usability and accessibility of a website over the time.

e. For more information please refer to: http://www.usablenet.com/

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How to cite this article: Doulani A, Hariri N, Rashidi A. Analysis of Iranian and British university websites by world wide web consortium. J Sci Res 2013;2:74-9.

Source of Support: Nil, **Conflict of Interest:** None declared