

Is it Possible to Predict Usability of a University Website from University Ranking Systems?

Layla Hasan and Emad Abuelrub, *Member, IAENG*

Abstract—This research conducts a comparison between the results obtained by one of the major ranking systems called, Eduroute, and the results obtained by the heuristic evaluation method regarding the usability of the top three university websites in Jordan. The results proved that the results of Eduroute regarding the ranking of universities' websites, could provide indication regarding the overall usability of the websites. This research also shed the light on common usability problems that could be found on a university website, which was identified by the heuristic evaluation method.

Index Terms—Educational websites, Eduroute, Jordan, university ranking systems, usability

I. INTRODUCTION

Academic institutions (i.e. universities, colleges) were among the early developers of websites to present themselves on the Internet [2, 12, 14]. Nowadays, higher education websites have many aims, such as: Recruit major stakeholders of academic institutions (i.e. prospective students, prospective faculty, alumni, parents) [2, 3, 13], provide a cost effective and timely communication with their stakeholders [8], and provide a way to present their image on the Internet (i.e. academic offering, programs, services, students resources) [2, 3, 8]. As the importance of academic institution websites increased with the increasing number of academic websites and number of Internet users, the importance of university ranking websites increased.

Earlier research employed usability methods, including heuristic evaluation, to evaluate the usability of educational websites [2, 7, 11, 13, 17]. However, there is a lack of research which investigates the findings obtained from usability evaluation methods (i.e. heuristic evaluation), while evaluating the usability of educational websites and compares them with the results obtained from university ranking systems

This research aims to make a comparison between the results obtained by Eduroute (a university ranking system) and the results obtained by the heuristic evaluation method, to investigate the possibility of predicting the usability of educational websites using Eduroute.

Manuscript received March 31, 2013; revised April 6, 2012.

Layla Hasan (corresponding author) is with the Department of Management Information Systems, Zarqa University, Zarqa, Jordan, email: l.hasan2@yahoo.co.uk

Emad Abuelrub is with the commission for academic accreditation, UAE, email: abuelrub@yahoo.com

This paper is organized as follows. Section two presents earlier research that employed heuristic evaluation in the evaluation of the usability of academic institution websites. Section three provides a summary of the major university ranking systems together with their indicators. Section four presents the methodology used by this research. Section five presents the results and discussions, and finally section six concludes the paper.

II. RELATED WORK

Usability is one of the most important characteristics of any user interface; it measures how easy the interface is to use [10]. It has been defined as "a measure of the quality of a user's experience when interacting with a product or system - whether a web site, a software application, mobile technology, or any user operated device" [1].

Heuristic evaluation is an example of a common usability method related to evaluator-based methods, which include methods that involve evaluators in the process of identifying usability problems. It involves having a number of evaluators assess the user interface and judge whether it conforms to a set of usability principles, namely 'heuristics', [9].

Only a few studies were found in the literature that evaluated the usability of educational websites. For example, Astani and Elhindi [2] employed heuristic evaluation method to evaluate the usability of the top 50 colleges and universities. The authors indicated that the tested websites had usability problems related to old content and inappropriate layout, which make it difficult for users to locate the information of interest. The results showed that the tested websites need to make improvements regarding some issues, including: Navigation, usability, customization, and security.

Noiwan and Norcio [11] also evaluated and compared the usability of two Thai and two US academic websites. The results showed that the sites had several usability problems, including: Lack of a site map, old content, lack of navigational tools or site index that help students to find information on the sites, and inconsistency problems. The results also showed that the Thai websites have additional problems, such as: Ineffective internal search functions and language problems (i.e. misspelling words).

Alternatively, Pierce [13] employed user testing and heuristic evaluation methods to comprehensively evaluate the usability of Harvard University website. The results identified several design problems on the site, related mainly to: Lack of navigational tools, inconsistency in navigation throughout the site, and inappropriate presentation of content on the Home page.

Kostaras and Xenos [7] also employed the heuristic evaluation method to evaluate the usability of the website of the Hellenic Open University. The results showed that the site had several usability problems, including: Lack of navigational support links, inconsistency problems, errors in the internal search function, inappropriate choice of color, and lack of site map.

Furthermore, Toit and Bothma [17] investigated the usability of the website of an academic marketing department in the University of South Africa, using the heuristic evaluation method. They mentioned few examples regarding the usability problems that were identified on the tested website, which related to: Poor navigation, old content, and incomplete information regarding the modules of the department.

These studies proved the usefulness of the heuristic evaluation method regarding its ability to identify various types of usability problems on the educational websites. They provided examples regarding types of usability problems that could be found on educational websites.

III. INTERNATIONAL UNIVERSITY RANKING SYSTEMS

An investigation into university ranking systems using Google search in March 2011 for the phrases ‘university ranking Jordan’ resulted in identifying various systems. The following presents a summary of the major university ranking systems and their indicators:

- *4 International Colleges and Universities (4ICU)*: Universities and colleges worldwide are ranked by 4ICU by the popularity of their websites. The ranking is based upon an algorithm including three unbiased and independent web metrics extracted from three different search engines: Google Page Rank, Yahoo Inbound Links, and Alexa Traffic Rank [19].

- *Webometrics*: It uses four indicators to rank universities, that were obtained from the quantitative results provided by the main search engines, as follows [18]: Size (no. of pages recovered from four engines: Google, Yahoo, Live Search and Exalead), visibility (no. of unique external links obtained from Yahoo Search, rich files (files related to academic and publication activities extracted using Google), and scholar (no. of papers and citations for each academic domain).

- *QS World University Rankings*: The rankings according to QS are determined based on six distinct indicators [16]: Academic reputation (based on an online survey distributed to academics worldwide), employer reputation (based on a global online survey distributed to employers), faculty student ratio; citations per faculty, the percentage of international students, and the percentage of international faculty.

- *Academic Ranking of World Universities (ARWU)*: Universities are ranked by ARWU using several indicators [15]: Quality of education (no. of the alumni of an institution winning Nobel prizes and fields medals), quality of faculty (no. of the staff of an institution winning Nobel prizes), research output (no. of papers published), and per capita performance (the weighted scores of the above indicators divided by the number of full-time equivalent academic staff).

- *Eduroute*: This system focuses on studying and evaluating university websites and not the performance of a university. The indicators that are used in ranking the universities are as follows [4]: Volume (volume of relevant and comprehensive information published on the website of a university), online scientific information (no. of university publications), links quantity (no. of incoming links whether these links are from academic or nonacademic websites), and quality of links and content (quality of links and quality of content published on the website).

IV. METHODOLOGY

Eduroute university ranking system was selected to conduct this research and to make a comparison between its results and the results of the heuristic evaluation method, since it was the only ranking system which evaluates the quality of academic institutions’ websites. They indicated that Eduroute’s indicators measure the quality of both content and navigation of a university website [4]. The issues Eduroute considers are similar to the usability issues included in many heuristic guidelines that are used to evaluate usability of different types of websites including educational websites. These issues are also included in the heuristic guidelines that were used in this research (Table1).

In order to evaluate the usability of the studied educational websites using the heuristic evaluation method, heuristic guidelines document was developed. It includes a set of comprehensive heuristics specific to educational websites that was developed by earlier studies [5, 6]. The developed heuristics were organised into five major categories. Table1 displays the categories and the subcategories of the developed heuristics.

Five evaluators participated in this research; two usability specialist and three web experts. The evaluators were asked to visit all pages related to all the faculties and their corresponding departments on each of the studied universities’ websites.

Analysis of the heuristic evaluators’ comments on the compliance of each site to each heuristic principle generated 14 problem sub-themes, which correspond to four main problem-themes. The list of problem themes and sub-themes is explained in the results.

TABLE 1
THE CATEGORIES AND SUBCATEGORIES OF THE DEVELOPED HEURISTIC GUIDELINES

Category	Subcategories
Navigation: Assesses whether a site includes main tools (i.e. navigation menu, internal search facility), and links which facilitate users' navigation through a site.	Navigation support; effective internal search; working links; no broken links; no orphan pages.
Architecture/organisation: Relates to the structure of a site's information in which it is divided into logical clear groups, and each group includes related information.	Logical structure of a site; not deep architecture; simple navigation menu.
Ease of use and communication: Relates to the existence of basic information which facilitates communications with a university using different ways.	Quick downloading of web pages; easy interaction with a website; contact us information; foreign language support.
Design: Relates to the visual	Aesthetic design; appropriate

attractiveness of a site's design; the appropriate design of a site's pages and the appropriate use of images, fonts and colors in the design of a site.	use of images; appropriate choice of fonts; appropriate choice of colors; appropriate page design; consistency.
Content: Assesses whether a site includes information that users require.	Up-to-date information; relevant information; no under-construction pages; accurate information; information about the university; information about the colleges; information about the departments.

In order to determine the level of usability of the three studied university websites and because of the fact that not all the university pages were investigated, a usability index was identified in this research and calculated for the three websites. The usability index represents the number of usability problems found on a website divided by the average number of pages investigated on the site.

V. RESULTS AND DISCUSSIONS

This research addressed a gap noted in the literature regarding the use of a university ranking system (Eduroute) to predict the potential usability on educational websites. According to Eduroute university ranking for the year 2011, the results indicated that the Hashemite University, the University of Jordan, and Yarmouk University were the top first, second, and third universities, respectively. Based on the indicators used by Eduroute to rank universities, the results could indicate that the website of Hashemite University had the lowest usability problems compared to the other tested websites, while the website of Yarmouk University had the highest usability problems.

The results obtained from Eduroute were consistent with the findings obtained from the analysis of the heuristic evaluation. Table 2 presents the findings of this research which showed that the usability index (as identified in this research) for the website of the Hashemite University was the lowest, indicating that it has the lowest number of usability problems per investigated pages, while the website of Yarmouk University has the highest usability index compared to the other tested websites, indicating that it has the highest number of usability problems per investigated pages.

Therefore, this research proved that the results obtained from Eduroute university ranking system regarding the order of the top three universities in Jordan (for the year 2011) were indicators of the overall number of usability problems identified on the three websites. The results of this research proved that considering usability of educational websites could improve the ranking of a university website at one of the major university ranking systems (Eduroute).

TABLE 2
USABILITY INDEX FOR THE THREE WEBSITES

	Hashemite University	University of Jordan	Yarmouk University
No. of Usability Problems	4176	2926	3399
Average No. of Pages Investigated	1875	1129	1187
Usability Index	2.23	2.59	2.86

An analysis of the qualitative data obtained from the heuristic evaluators provided comprehensive and detailed comments regarding the common areas of usability problems that were found on the three university websites. Tables 3-6 show the four main problem themes, related to navigation, design, content, and ease of use and communication, and their problem sub-themes.

Five common navigational problems were identified on the tested websites, as shown in Table 3. These related to: Weak navigational supports problems (i.e. the websites had pages related to various departments which did not have a navigational menu or links to return back to the corresponding department); misleading links (i.e. the link related to the name of the chairman, for all the departments of the Hashemite University, opened a page that was not expected by the evaluators; a page that displays an introduction to the department instead of information about the chairman of the department); broken links; orphan pages; and problems with the internal search functions related to the different universities' sub sites investigated during this research.

TABLE 3
USABILITY PROBLEMS SUB-THEMES RELATED TO NAVIGATION
PROBLEM THEME

Problem Theme	Problem Sub-Theme
Navigation	Weak navigation support
	Misleading links
	Broken links
	Orphan pages
	Ineffective internal search

Four common usability problems were identified on the tested websites regarding their design, as shown in Table 4. One of the problems related to inconsistency. The large number of inconsistency problems that was found on the sites is related to inconsistency in the language interface (i.e. links at the English language interface, which opened pages that displayed content in the Arabic language and vice versa). Other problems related to inappropriate page design. The common usability problems found on the websites regarding this area consist of: Ineffective text format on the sites' pages (i.e. information, figures, tables were not aligned correctly); the existence of many pages without headings or with inappropriate headings, and having long and cluttered pages on the websites.

Furthermore, the results showed that all the websites had usability problems related to the images that were presented on their websites' pages (i.e. poor quality of images, broken images), and having pages with inappropriate combination of background and font colors.

TABLE 4
USABILITY PROBLEMS SUB-THEMES RELATED TO DESIGN
PROBLEM THEME

Problem Theme	Problem Sub-Theme
Design	Inconsistency
	Inappropriate page design
	Problems with images
	Inappropriate choice of colors

Table 5 presents the common usability problems identified on the websites regarding content. The results show that the websites presented old information on their pages (i.e. news, announcements, events, faculty members committee pages). The results also show that all the websites had large number of usability problems regarding irrelevant content that was presented on their pages (i.e. missing information about the faculty members, empty pages). Furthermore, the results show that the content of the tested websites was not reviewed carefully; many spelling, punctuation, and grammatical errors were found.

TABLE 5
USABILITY PROBLEMS SUB-THEMES RELATED TO CONTENT
PROBLEM THEME

Problem Theme	Problem Sub-Theme
Content	Old content
	Irrelevant content
	Grammatical accuracy problems

The results show that it was not easy to interact with the websites in order to visit some pages, such as course schedule page. The results also show that the websites did not support the Arabic language. Specifically, it was found that the language interface of the Hashemite University, and The University of Jordan websites including their faculties, and their corresponding departments, was written in only English language.

Some of the usability problems obtained from the analysis of the heuristic evaluation method, presented above, were comparable to the results offered from earlier research. Earlier research, which evaluated the usability of educational websites using the heuristic evaluation method (Section II), provided examples of the usability problems that could be found on such websites, such as: Old content, lack of navigational support links/tools, inconsistency problems, ineffective internal search function, some language problems (i.e. misspelling words), inappropriate page design, and incomplete information. These were confirmed by the results of this research, as shown in this section. This research also provides other types of common usability problems that could be found on an educational website, based on the qualitative data obtained from the heuristic evaluators who investigated large number of pages on the three studied universities' websites. These usability problems include: Misleading links, broken links, orphan pages, problems with images, irrelevant information, difficult interaction with a website, and lack of support to the Arabic language.

TABLE 6
USABILITY PROBLEMS SUB-THEMES RELATED TO EASE OF USE
AND COMMUNICATION PROBLEM THEME

Problem Theme	Problem Sub-Theme
Ease of Use and Communication	Difficult interaction with a website
	Not supporting more than one language

These results, together with the results obtained from earlier research, provide useful information to educational institutions regarding common types of usability problems that could be found on their websites. These issues should be taken into consideration and should be investigated and improved in order to improve the overall usability of educational websites and therefore to obtain the advantages of making educational websites usable.

VI. CONCLUSIONS

This research investigated whether the results obtained from a university ranking system called Eduroute regarding the top three universities in Jordan, could be used to predict the usability of the three universities' websites. The usability of the three websites was comprehensively evaluated by the heuristic evaluation method, and a large number of usability problems was identified on the three websites.

The results showed that the ranking of the three websites was an indicator to the overall usability of the sites; the first ranked university at Eduroute had the lowest number of usability problems per investigated pages, while the least ranked university had the largest number of usability problems.

The results also identified common usability problems that could be found on a university website, which related to four problem themes that were identified in this research and related to: Navigation, design, content, and ease of use and communication.

ACKNOWLEDGMENT

The authors would like to thank the web experts who participated in this study: Abla HerzAllah, Amneh Alamleh, and Ayat Damra. Their enthusiasm is greatly appreciated.

REFERENCES

- [1] Anonymous, Step-by-Step Usability Guide, 2006, <http://www.usability.gov> [accessed 20.09.2011].
- [2] Astani M. and Elhindi M., "An Empirical Study of University Websites", *Issues in Information Systems*, Vol. IX, No. 2, 2008.
- [3] Astani M., "An Empirical Study of the Effectiveness of Universities' Web Sites", in *the Proceedings of IACIS*, 2003.
- [4] Eduroute, < http://www.eduroute.inf> [accessed 20.03.2011].
- [5] Hasan, L., "Investigating the Relative Importance of Design Criteria in the Evaluation of the Usability of Educational Websites from the Viewpoint of Students", in *the Proceedings of The World Congress on Engineering 2012*, Vol II, WCE 2012, London, UK, 4-6 July, 2012.
- [6] Hasan, L., "Evaluating the Usability of Nine Jordanian University Websites", in *the Proceedings of The 2nd International Conference on Communications and Information Technology (ICCIT)*, Hammamet, Tunisia, pp. 102-107, 26-28 June, 2012.
- [7] Kostaras N. and Xenos M., "Assessing Educational Web-site Usability using Heuristic Evaluation Rules", in *the Proceedings of 11th Panhellenic Conference in Informatics*, 2006.
- [8] Mentis A. and Turan A., "Assessing the Usability of University Websites: An Empirical Study on Namic Kemal University", *The Turkish Online Journal of Educational Technology*, Vol. 11, No. 3, 2012.
- [9] Nielsen J. and Molich, R., "Heuristic Evaluation of User Interfaces", in *the Proceedings of CHI'9 s*, ACM, pp. 249-256, 1990.
- [10] Nielsen J., *Usability 101: Introduction to usability*. Useit.com, 2003. <http://www.useit.com/alertbox/20030825.html>, [accessed 14.02.2006].
- [11] Noiwan J. and Norcio A., "A Comparison Analysis on Web Heuristic Usability between Thai Academic Web Sites and US Academic Web Sites", in *the Proceedings of SGI, World Multi Conference on Systems, Cybermetrics and Informatics*, Volume X, Concepts and

Applications of Systems, Cybermetrics and Informatics, Orlando,
Florida, USA, 2000.

- [12] Peterson K., "Academic Web Site Design and Academic Templates: Where does the Library Fit in?" *Information Technology and Libraries*, Vol. 25, No.4, pp.217-221, December 2006.
- [13] Pierce K., "Web Site Usability Report for Harvard University", Technical Report, *Capella University*, 2005.
- [14] Sandvig J. and Bajwa D., "Information Seeking on University Web Sites: An Exploratory Study", *Journal of Computer Information Systems*, Vol. 25, No. 1, pp. 13-22, 2004.
- [15] The Academic Ranking of World Universities, <<http://www.shanghairanking.com>> [accessed 20.03.2011].
- [16] The QS World University Rankings, <<http://www.topuniversities.com/>> [accessed 20.03.2011].
- [17] Toit M. and Bothma C., "Evaluating the Usability of an Academic Marketing Department's Website from a Marketing Student's Perspective", *International Retail and Marketing Review*, Vol. 5, No. 1, pp. 15-24, 2010.
- [18] Webometrics Ranking of World Universities, <<http://www.webometrics.info>> [accessed 20.03.2011].
- [19] 4 International Colleges & Universities, <<http://www.4icu.org/>> [accessed 20.03.2011].