

Computing Metrics for Measuring User Experience on Libyan Food Industry Websites

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Abstract – Different quality attributes are assigned to assess web user experiences such as; websites usability, design and performance. Measurement of these qualities is a vital issue. Computing metrics play a major role towards user acceptance of websites. The aim of this paper is to evaluate Libyan Food industry websites in terms of the attributes mentioned above. The authors applied a set of criteria that will be used for measuring the websites. Moreover, a common way of measuring the usability and web design of any web application is by asking users to give their feedback on a particular application. In order to achieve valuable user feedback, a questionnaire will be designed to measure the usability and Design. The results obtained, indicated clearly that websites usability is quite reasonable. Figures show that most sites included in this study exhibited very limited use of site design particularly for content. On the other hand, performance tests showed that other Arabic websites samples have a better performance under pressure comparing to the Libyan ones.

Index Terms—Computing Metrics, Food Industry, Web Application, Usability, Web Design.

I. INTRODUCTION

Nowadays, most people tend to prefer to use the internet and web-based applications more than before and therefore there is a higher demand for the use of online services [1]. This fact makes the internet one of the main source of information and news in Libya too. Since the rise of the number and size of the web applications worldwide, web quality assurance has become a critical issue for the users of internet websites. The need to assess characteristics with website quality and success increases as well [2]. Hence, it gets more important to have a set of evaluation metrics and criteria that should be able to measure the quality of websites. In fact, there is a wide range of potential software quality criteria that can be considered during the evaluation of web applications. A main quality criteria for the success of web applications are; usability, web design, reliability, and security. In addition to availability, scalability, maintainability, and performance [3].

In this paper, the quality of some Libyan food industry

websites will be measured according to usability, web design, and performance attributes. Measuring these quality attributes, especially in the field of commercial websites, is vital for many reasons; users no longer tolerate websites that are not easy to use, or difficult to navigate, or slow to load. Poor design or usability can lead to lose productivity and revenue. Hence, commercial websites should be used to satisfy the needs of its customers. To reach this, the criteria for measuring these attributes should be applicable to different websites.

A. Usability Metric

Usability means that the software must be usable, without undue effort by the type of user for whom it is designed, which means it should have an appropriate user interface [4]. The ISO 9241-11 (1998) standard, defines usability in aspects of efficiency, effectiveness, user satisfaction, and whether specific goals can be achieved in a specified context of use [5]. According to Jakob Nielsen [6], the definition of usability can be defined by explaining the following five qualitative elements, learnability, efficiency, memorability, errors and satisfaction. Usability in the McCall's model is decomposed into three criteria; operability, training, and effectiveness [7]. On other words, usability relates to how the system interacts with the user, and it includes five basic attributes; Learnability, efficiency, user retention over time, error rate and satisfaction [8]. Additionally, the user-friendly interfaces, fast and accurate search capability and interactive features were considered as the most important three key attributes of website usability [9]. On the other hand, the quality of website design is vital to attract customers. According to Kim and Lee [10] content, structure, interaction, and presentation are the four components of web design. Content represents the information that is put up on the web page. The Structure represents the way in which the information is arranged. Interaction represents the way the user can surf the web pages with maximum ease.

B. Design Metric

Some researchers addressed other website design factors such as; information design, which deals with the information that is placed on the site; navigation design, that concerned with the navigation of the website, and visual design that concerned with the graphical aspects of the website. This includes the use of graphics, colors, photographs, and various font types to improve the look and feel of the site [10]. Other researchers showed that the main characteristics of website design analysis include three major categories; interactivity, navigation, and functionality [11].

C. Performance Metric

Website performance is usually measured by the response time – that represents the time elapses between the issue of a request and the return of the requested data. When the server is processing a large number of requests, requests may take longer to complete. Therefore, as a business website, it is important to keep track of the site and its traffic, as its visitors are the key factor [12]. An open tool JMeter is used to measure the sample web applications.

This paper is organized as follows: After the introductory Section 1, in Section 2 it presents the methodology that was used to carry out the criteria for evaluating some Libyan food industry websites, and defines the Metrics used in this study. Section 3, illustrates the description of the chosen web sites. Section 4, presents the analysis of the results and discussion. Finally, Section 5 concludes this paper.

II. METRICS USED FOR WEBSITES USABILITY, DESIGN, AND PERFORMANCE

As mentioned above, the term “usability” have been defined in different ways in the literature. Consequently, the usability attributes which have been adopted in this study include learnability, satisfaction, accessibility to help, and interactive features. The metrics for measuring usability attributes were adapted from Ben Lilburne [13], Ying-Hueih [9], and Ahmed Seffah [14]. On the other hand, web design also has been defined in different aspects by various authors as well. In this study, design attributes were identified to include: Content; Navigation; Gravitationally; and Interactivity. Web design was measured by the metrics used by Baloglu [11], Layla [2], and Jonathan [15]. Whereas, in order to determine whether the selected web applications for this study could satisfy high load requirements, JMeter Performance Testing is used to analyse overall server performance under heavy load. "Table 1" describes the criteria used in this study.

III. SELECTION OF WEB SITES

It was clear through research, the limitation of the official web sites of the Libyan food companies. As most of them have a Facebook account instead, while others are under construction. Therefore, this study was

restricted to the websites of most widespread Libyan food industry products, as well as two other Arabic Food industry websites. "Table 2" shows some information about them.

TABLE 1. WEB METRICS

Attributes	Description	Measure
USABILITY		
Learnability	How easy it is to learn the main system functionality.	Easy to use a functionality. Easy to find information
Accessibility to help	Whether the user interface provides context-sensitive help and meaningful feedback when errors occur	Online help available. Error message to help users
Interactive features	The website has clear instructions to use different parts of it. Effective internal search tool.	Search tool Menu bar and Clear instructions
WEB DESIGN		
Content	The currency of websites' information and updated of site, different languages are available	Corporate identity Detailed and Variety of information. Date Last Updated
Navigation	Enables moving through the information space presented by the web application.	Navigation menu, Mapping
Consistency	The interface should be consistent in that wherever possible,	General layout Consistent navigation
Attractiveness	The design of the website is innovative. This concerns with the effective use of background and text colors	Quality of Text: Scrolling text, color & font., Background Color
Interactivity	It includes information about the organization. Communication channel and feedback exist between user and website.	Phone Number Listed Address Listed, email Listed Location Map of the Company
PERFORMANCE		
Normal Load	Modeling the expected usage by simulating multiple user access the Web services concurrently.	Load Testing
Heavy Load	Finding the maximum load the web server can handle.	Stress Testing

TABLE 2. WEBSITES DESCRIPTION

Website Name	Website Description	Website URL
Almazraa	Dairy & juices company-Libya	www.almazraa.com.ly
Alnaseem	Dairy & ice cream industry – Libya	www.alnaseemdairy.com
Elrayhan	Dairy and juice company – Libya	www.el-rayhan.com
Almarai	Food & beverages company - Saudi Arabia	www.almarai.com
Johanna	Food Industry – Egypt	www.juhayna.com

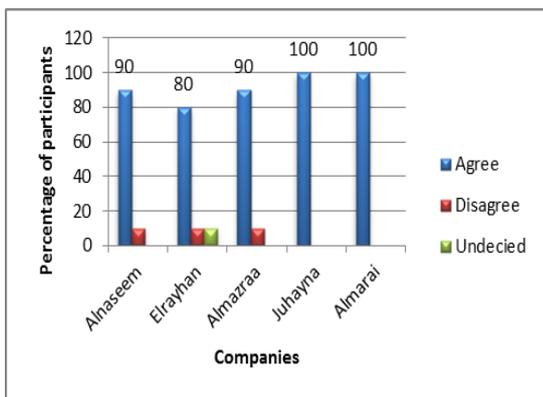
IV. FINDINGS AND DISCUSSIONS

A questionnaire of five samples was designed to measure Usability and web design of the selected web sites (a sample for each website). The participants were required to answer 21 questions in each sample of the questionnaire. Although, this survey was applied to 20 students, academicians and employees; three of these

participants did not comply to the survey instructions of answering the 5 samples. Furthermore, 5 questionnaires are missing. As a result, a total of 8 questionnaires have been excluded. The data have been collected in short period of two weeks.

A. Usability Findings

The three main criteria which were chosen and used to identify the usability of websites were learnability, accessibility to help, and interactive features. The analysis of data shows that most of the websites performed well in Learnability, ~~which is ease of use functions~~, and provide clear and concise icons, and ease of navigation. For instance, "figure 1" shows that most users agreed that they can move through the information space presented by the websites. The largest percentage of positive response was 100% for Juhayna and Almarai sites.



1. Easy navigation

On the other hand, it seems that over 90% of the websites do not have accessibility to online help, error messages that help the users are not applicable either. More than 80% had lacked features such as search tool. Based on the information provided in "figure 2", it can be observed that there is no active search tool in both Elrayhan and Almazraa websites with 100% and 90% of participants agreed respectively. Whereas, the same tool is not applicable to the Alnaseem site. However, 90% of the participants found that the search tool on Juhayna site works effectively. As a result, it is clear that the search feature is not available on the whole sample of Libyan websites, which would affect the usability of these sites.

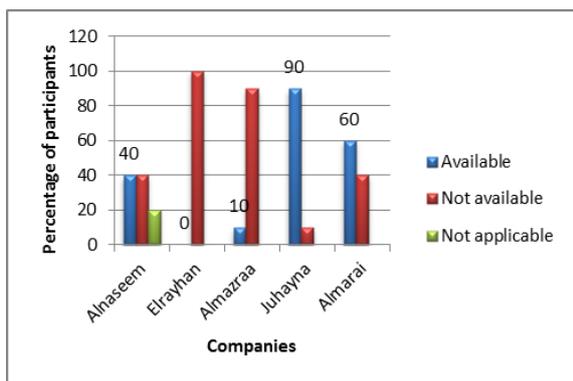


Figure 2. Search capabilities

B. Design Findings

In order to determine the evaluation for the target websites design attributes; metrics such as websites Content, Navigation, Consistency, Attractiveness, and Interactivity were chosen for design measurement. Due to the analysis of questionnaire, the results indicated that all websites were relatively performed well in terms of defining the company, describing the purpose of the site, as well as providing Multi-Languages content. Additionally, in terms of rich information and news, the other Arabic sites have clearly defined a variety of information of the company and new updates (what's new). However, Libyan sites performed poorly in terms of rich content. However, the most distinguished characteristic of the Almazraa website was presenting product's ingredients comparing to the rest of Libyan sites.

On the other hand, about 60% of companies had lacked features such as date last updated. As shown in "figure 3", Juhayna and Almarai sites are up to date, Alnaseem was last updated in 2015, while 2014 was the last update date of Elrayhan site. Lastly, Almazraa comes last.

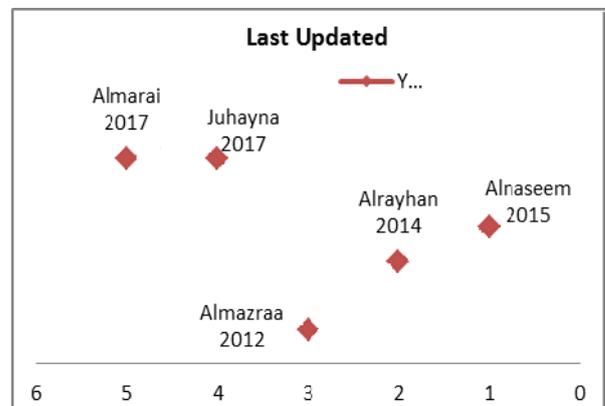


Figure 3. Sites last updated date

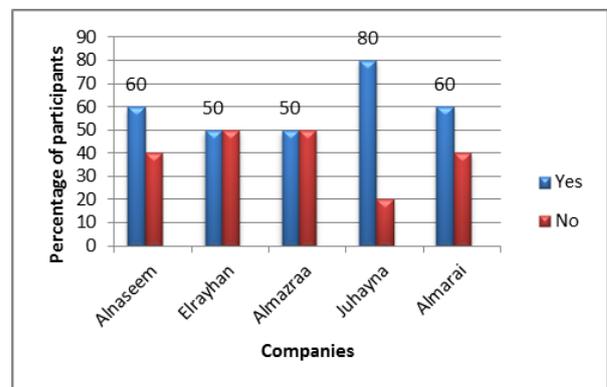


Figure 4. Attractiveness of the interface background

Although all of the sample sites do not provide a site map, most of them provide a consistent navigation for users. Participants did not find any difficulty of moving from page to another. The Main menu is clearly provided on every page. Furthermore, the interface layouts are probably consistent on all pages of the websites, except in Alnaseem and Almarai sites where only 60% agreed

that the interface layout is consistent. 100% of websites have clearly defined the contact information, phone number, an email, and the address have been given. Moreover, the largest percentage of response, that is, 90% of users liked the colors used in Juhayna site. Approximately 80% of the participants satisfied with the colors in both Almazraa and Almarai websites. They think that the combination of the colors is appropriate. Whereas, Alnaseem and Elrayhan sites were attained admiration of about 70% of users. However, as shown in "figure 4", it can be noted that not all participants agreed with the attraction of interface background. About 50% of the analyzed websites performed poorly in terms of the attractively screen background, while in Juhayna site, the majority of users feel that the screen background was attractive.

To sum up, again, most of the websites performed well in factors of consistency, ease of navigation, learnability, and Interactivity. However, they had lacked features such as search capabilities and accessibility to online help. Comparing with the Arabic sites, having the Libyan sites a rich content was questionable, they do not have new updates on their websites. In general, the Libyan websites focused only on introducing their companies, and presenting some of their products, but without mentioning any details information such as prices, product's ingredients, and the way of marketing. Hence, from the marketing standpoint, most Libyan websites were focusing on tangibilizing their marketing offerings, suggesting that the sites were focusing on the basic and simple features of the Internet.

C. Performance Findings

Performance testing using JMeter offers load testing and stress testing. In this study, a performance analysis is done on the selected websites simulating multiple user access the Web services concurrently (Load testing). To analyze a load of web servers under test, two parameters (Throughput) and (Deviation) should be focused on. Respectively, the first parameter represents the ability of the server to handle the heavy load. In other words, it is the amount of capacity that a website can handle (the higher the better). Whereas the second parameter shows how many exceptional cases were found which were deviating from the average value of the receiving time (the smaller the better) [16].

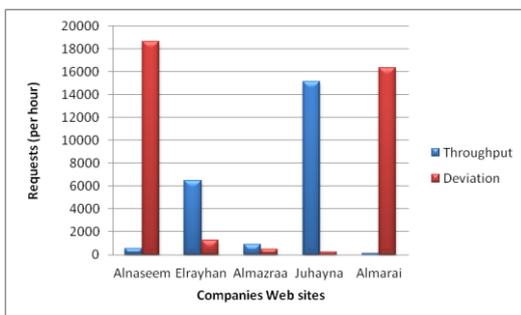


Figure 5. Load testing

In the load testing, 10 users were simulated connecting to the target websites at once. It is obvious, as "figure 5" illustrates, that Juhayna server has the highest throughput and the lower deviation. In other words, Juhayna server can handle the highest number of requests per hour comparing to other websites of the same study with the lower deviation from average. As a result, it can be concluded that Juhayna server has proven satisfactory performance. Whereas Alnaseem server seems to be able to handle only few requests per hour along with the highest deviation among all.

On the other hand, for measuring the stress of web servers under this study, the parameter (Error%) which indicates the failed requests per 100 requests, was analyzed [16]. Testing the selected web servers with different samples of users (1, 10, 50, 100, 200, 500) respectively, the web servers start responding slowly and produce errors when the user sample reached 200 users. Therefore, that means web servers have reached their maximum load capacity.

"Figure 6" shows the Error percentage of each website when implementing the JMeter testing using a sample of 200 users accessing concurrently. Surprisingly, results indicate that Elrayhan web server could handle 200 users with the lower percentage of Errors (52%), whereas Alnaseem and Almazraa web servers produce 100% Error rate with the same sample. Juhayna, on the other hand, made a hit in the load testing failed here. As a result, experiencing a high load, or reliability under high load is an issue among all the sample websites including the Arabic ones which show reasonable performance at the first glance.

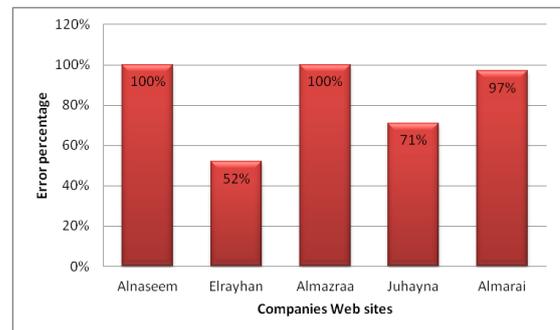


Figure 6. Stress testing

V. CONCLUSIONS

The purpose of this paper was to evaluate selected websites of five Food Industry companies, according to usability with respect to users point of view and to find out prospective problems in the design of the web pages, as well as the website server performance. The work presented here attempted to investigate some of the criteria that could measure web usability, design, and performance. Different computing metrics were utilized to measure website qualities like usability, web design, and performance factors. In conclusion, the findings showed that the other Arabic sites are more efficient than

the Libyan ones. Libyan companies included in this study are not utilizing the internet to its full potential. Consequently, not attracting internet users not effectively marketing their products. The Libyan websites could be more improved by value added features such as; improving servers' performance, availability of products and prices information. Attention should be given to add search capabilities as well. They should also take advantage of full range of features of website design.

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