



## Usability testing of two Libyan banks' websites using the Dareboost tool (Bank of Commerce & Development, Wahda Bank)

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### Keywords:

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### ABSTRACT

Internet banking is constantly expanding in terms of content and functionality, and it has a significant impact on society. One goal of the Digital Agenda for Libya is to make Internet banking services available to all, reducing cash handling. Internet banking is a critical service that financial institutions provide to their customers in order to facilitate easier and faster access to financial services and transactions. Banks currently spend vast sums of money on the development and maintenance of websites and backend systems that provide clients with Internet banking services. Given the low accessibility of bank websites, evaluation and monitoring of the efficiency of those banking sites that offer the service are needed. The effect of moderating factors on online banking usability assessment in Libya is discussed here. As the Internet grows in popularity, banks are adopting technologies to create their own Web sites. The design of the website is an important factor in determining whether or not visitors will return to the site. Thus, the purpose of this study is to investigate the usability of the Internet banking Web sites of two main banks in Libya. The evaluation procedure is used in the World Wide Web environment to measure real data and obtain response time. To get results on the performance of a Web site, some data from the calculation of page size, composition, structure, and download time has been measured. In this study, a website performance evaluation tool, Dareboost, was used to evaluate the Bank of Commerce & Development website and Wahda Bank website. Dareboost has a modern graphical user interface that is very easy and intuitive to use and gives a recommendations on how to improve the performance as the result. Based on the observation results, the Bank of Commerce & Development website received the highest score in most metrics. Therefore, the Bank of Commerce & Development website is the best in terms of usability.

اختبار قابلية الاستخدام لمواقع مصرفيين ليبيين باستخدام أداة Dareboost (مصرف التجارة والتنمية ، مصرف الوحدة)

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### الكلمات المفتاحية:

Dareboost  
مواقع البنوك  
ليبيا  
القياسات  
الاختبار  
سهولة الاستخدام

### الملخص

تتوسع الخدمات المصرفية عبر الإنترنت باستمرار من حيث المحتوى والوظائف، ولها تأثير كبير على المجتمع. يتمثل أحد أهداف الأجندة الرقمية لليبيا في إتاحة الخدمات المصرفية عبر الإنترنت للجميع، وتقليل التعامل النقدي. الخدمات المصرفية عبر الإنترنت هي خدمة مهمة تقدمها المؤسسات المالية لعملائها من أجل تسهيل الوصول الأسهل والأسرع إلى الخدمات والمعاملات المالية. تنفق البنوك حالياً مبالغ طائلة من المال على تطوير وصيانة المواقع الإلكترونية والأنظمة الخلفية التي تزود العملاء بالخدمات المصرفية عبر الإنترنت. مع تزايد شعبية الإنترنت، تعتمد البنوك تقنيات لإنشاء مواقع الويب الخاصة بها. يعد تصميم الموقع عاملاً مهماً في تحديد ما إذا كان الزوار سيعودون إلى الموقع أم لا. ناقش هنا تأثير العوامل المعتدلة على تقييم قابلية استخدام الخدمات المصرفية عبر الإنترنت في ليبيا. وبالتالي، فإن الغرض من هذه الدراسة هو التحقق من قابلية استخدام مواقع الويب المصرفية عبر الإنترنت لمصرفين رئيسيين في ليبيا. يتم استخدام إجراء التقييم في بيئة شبكة الويب

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العالمية لقياس البيانات الحقيقية والحصول على وقت الاستجابة. للحصول على نتائج حول أداء موقع ويب ، البيانات المقاسة هي حساب حجم الصفحة وتكوينها وهيكلها ووقت التنزيل. الأداء التي تم استخدامها في تقييم الموقع الإلكتروني لمصرف التجارة والتنمية ومصرف الوحدة هي Dareboost ، حيث تمتاز هذه الأداء باحتوائها على واجهة مستخدم رسومية وسهولة الاستخدام وتقديمها للتوصيات واقتراحات حول كيفية تحسين الأداء. بناء على نتيجة التقييم، حصل موقع مصرف التجارة والتنمية على الويب على أعلى الدرجات في معظم المقاييس. لذلك فإن موقع مصرف التجارة والتنمية هو الأفضل من حيث سهولة الاستخدام.

## 1. Introduction

The proliferation of the internet has resulted in the adoption of technology solutions by banks to develop websites so that customers can easily conduct transactions. Apparently, every viable bank wants to do exceptionally well in the market, so bank management must ensure that their banking websites are accessible and usable [1]. In today's business world, website usage knows no bounds, which can be beneficial in improving productivity and streamlining processes. However, if customers do not find the website easy to use, they will not carry out the transaction. Over the years, the proliferation of the internet has led to the adoption of technologies by banks to develop websites so that customers can easily carry out transactions. In today's business world, website usage knows no bounds, which can be beneficial in improving productivity and streamlining processes. However, if customers do not find the website easy to use, they will not complete the expected transaction, resulting in a loss of money and a negative impact on the business [2]. Therefore, banks must have easily accessible and usable websites in order to provide high-quality service. Usability and accessibility have been identified as critical factors in website development. Users of the internet are on the increase, and organizations are moving towards the online delivery of products or services that are normally carried out on a website. Hence, for effective online product or service delivery, website users must find them usable and accessible at all times. This will lead to increased customer satisfaction and, consequently, an increase in market sales [3]. Hence, a bank is inoperable without a functional website; hence the need arises to have a website that is both accessible and usable. The speed with which web pages are downloaded and displayed on the user's web browser is referred to as "web performance." Website optimization is the study of how to improve the performance of a website. Faster website download speeds have been shown to increase visitor retention and loyalty, as well as user satisfaction, particularly among users with slow internet connections and those using mobile devices. Web performance also results in less data traveling across the web, lowering a website's power consumption and environmental impact. Browser/server cache, image optimization, and encryption (for example, SSL) are all factors that can affect the time it takes for pages to load [4, 5]. Overall load time: the amount of time it takes for a file that is required to render the website to download. Latency, file size, and the number of HTTP requests made by the file are typically the influencing factors. The availability of file preloading can reduce load time. The time it takes for a site to be usable is the amount of time it takes for a user to use it while other assets are still being loaded in the background. Smoothness and interactivity: This refers to how customers feel when using the site, as well as whether the buttons and pop-ups are clickable and open. Perceived performance refers to how quickly a website responds to a user request and what websites can do to prevent users from thinking the website is broken or that there is no response when loading a large file. In particular, in comparison, each website performance evaluation tool may display a different set of evaluation criteria when it performs. These evaluations can show us how a site performs across different platforms or devices and reveal potential factors that cause it to slow down by monitoring website uptime, performance, and interactions and identifying optimization opportunities [6]. Common criteria were used in the evaluation tools mentioned in this paper. On the other hand, usability is defined by the International Standards Organization's ISO 9241 standard as "the extent to which a product can be used by specified users to achieve

specified goals with effectiveness, efficiency, and satisfaction in a specified context of use" [7]. Website usability is a prerequisite for a firm's strategic success; because users of a website cannot be attracted to a site unless they can easily navigate the website [8]. As a consequence, there's also a lot of pressure on website developers to improve usability because users are presented with an abundance of service options and the ability to leave a website with a single click. In this paper, banking websites are evaluated based on accessibility and usability since most financial transactions are done through online banking nowadays. The evaluation focused on two main commercial banks' websites in Libya, one is government-owned bank, and the other is a private bank.

## 2. RELATED WORK

**2.1 Website Content Accessibility of Banks Websites in Pakistan Using WCAG 2.0.** Technology has become increasingly important to us over time. It is possible that technology and the Internet now dominate human life. Many people nowadays can't imagine their lives without the Internet. The internet provides access to social networking, news, email, e-commerce business, and entertainment, among other things. According to the survey, there are nearly 650 million people worldwide with various disabilities. Only with a little more effort on the part of developers can the majority of a website's content be made accessible to people with disabilities as well as everyone else. According to this study, most websites in Pakistan currently have an accessibility barrier that makes it difficult for people with disabilities to use the websites. Despite the fact that a variety of software is available to assist special people in their daily web usage, a lack of developer concern frequently appears to limit the use of this software. This paper investigates and investigates the accessibility issues of various financial websites in Pakistan. The study is based on the Web Content Accessibility Guidelines version 2.0 and employs a variety of web accessibility tools. It identifies the major barrier to website content access for those with hearing, listening, or other physical disabilities. The purpose of this study is to highlight the government's and the general public's ignorance of people with disabilities. A slight concern on the part of developers during website development can greatly assist these people in their website usage [9].

## 2.2 Banking Websites in Turkey: an Accessibility, Usability and Security Evaluation.

Banks are using technology to build their own websites. Websites have evolved into an excellent means of disseminating and promoting information. As a result, banks and organizations all over the world use websites as their primary mode of communication. The information on bank websites, which is widely assumed in many countries, must be accessible to everyone, simple to use, precise, and secure. Because the internet is a valuable source of information for millions of people at all levels, achieving accessible e-banking services that allow customers to benefit from them and execute a variety of customer requirements, regardless of time or location constraints, has become a global goal. The main purpose of the research is to investigate the accessibility, usability, and vulnerability of Turkish banking websites. A total of thirty-two banking websites in Turkey were analyzed using the WCAG 2.0 guidelines, and all of them were chosen for further examination based on usability and vulnerability criteria. According to the findings, the evaluated websites had a significant number of accessibility, usability, and vulnerability issues [10].

### 3. METHODOLOGY

The evaluation focused on two main commercial banks' websites, one is a government-owned bank, and the other is a private bank. Data was collected from selected internet banking websites in Libya using the Dareboost usability testing tool based on their usability scores, in order to ensure the consistency of the results and analysis. The tool analyzes the site in accordance with the WCAG 2.0 criteria, using metrics that indicate the level of the website's load time, size and structure. The Dareboost usability testing tool is described below.

#### 4. E-commerce

Two Libyan bank websites in particular, which are the subject of this paper's researcher investigation, must serve a diverse range of users. Every website must provide essential information to current customers. It must attract and inform users by providing relevant, timely, and engaging content that is tailored to a variety of users, which is difficult. Banks' websites give online services, and their websites' usability metrics are below.

##### 4.1 Wahda bank

Wahda Bank offers a wide range of banking products and services through its branches and agencies located throughout the country and equipped with modern technology. To facilitate and distinguish its foreign trade operations, Wahda Bank's swift system is linked to a large network of correspondent banks. The executive management of the bank is seeking to take confident steps towards applying the latest modern automated systems to improve wahda banking services in all aspects of the banking industry [11]. The Wahda Bank website portal on the Internet is <https://www.wahdabank.com.ly/en/>.

##### 4.2 BCD (Bank of Commerce and Development)

The Bank of Commerce and Development has been a pioneer in introducing the latest banking technologies to the Libyan banking market. Since then, the bank has implemented the most recent and advanced basic banking systems and support, as well as the operating systems and technical equipment used by the world's largest and most prestigious financial institutions [12]. The Bank of Commerce & Development website portal on the Internet is <https://www.bcd.ly/bcd/en/>.

#### 5. Testing tools

A web application testing tool is a software testing method that focuses on web applications. Issues may include the security of the web application, the basic functionality of the site, accessibility to users, its ability to adapt to a wide range of desktops, devices, and operating systems, as well as readiness for expected traffic and number of users, both of which are related to load testing. The emphasis was on selecting one of the measuring instruments for page size, load time, and performance. The tool is described in detail below. The total amount of time from the start of the request to the first byte of the response is referred to as the Time to First Byte (TTFB). It is calculated by adding "Redirect Duration" + "Connection Duration" + "Backend Duration." This is a key indicator of web performance. Websites should aim for a Time to First Byte (TTFB) of less than 200 milliseconds. The First Contentful Paint (FCP) metric measures how quickly visitors can view actual content (text, images, videos, etc.) on a destination page. FCP is the time required from the start of destination page load to the point at which any content is rendered on the screen. A low FCP time contributes to a positive user experience because visitors perceive the page to load quickly if the content is delivered sooner. Websites should aim for a First Contentful Paint time of 1.8 seconds or less. Largest Contentful Paint (LCP) The length of time it takes for the largest "content element" on the page to become visible within the visitor's viewport is measured by LCP. Sites should strive for a largest Contentful Paint time of less than 2.5 seconds. Fully Loaded Time is the maximum time after FCP and Onload have been triggered, and there has been network and CPU idle (5.25 s each) after the last request has been captured. Time to Interactive is a performance metric that measures a page's load responsiveness and assists in identifying situations where a page appears to be interactive. TTI determines the earliest point after First Contentful Paint (FCP) at which the page is reliably ready for user interaction. TTI contributes to the usability of the page. Sites should aim for a time to interactive of less than 3.8 seconds. The

Total Page Size is the total of all the elements required to render the destination page. This includes the HTML file, CSS files, images, scripts, multimedia, and so on. Sites should aim for a total page size of no more than 1.80 MB. The structure score describes how well the page is constructed for enhanced efficiency [13, 14].

##### 5.1 Dareboost tool

Dareboost is one of the online evaluation tools functioning to measure the accessibility of a website. The application must be connected to the internet network and the result is in the form of the number of scores criteria of a website according to WCAG 2.0. Dareboost is a newer addition to the website monitoring scene that provides straightforward information about your website. Dareboost has a modern graphical user interface that is very easy and intuitive to use. It looks very promising, and it could also give a recommendation on how to improve the performance based on the feedback result. It also allows users to perform the test using different browsers. It can be set on different devices. When users run the test, the first thing they see is a grade with a score, followed by the test details, which include the page weight with all of its details, request details, Dom details, bottlenecks, CSS details, and server configuration details. Overall, it is a useful platform. DareBoost is a web-based tool for testing, analyzing, and monitoring your website's speed, SEO, quality, and security [15].

Optimal evaluation criteria based on the DareBoost tool are: TTFB metric has less than 200 ms, FCP metric has less than 1.8 seconds, LCP metric has less than 2.5 seconds, Fully Loaded Time metric has less than 5.25 seconds, Time to Interactive metric has less than 200 ms, total page size metric has less than Size of 1.80 MB.

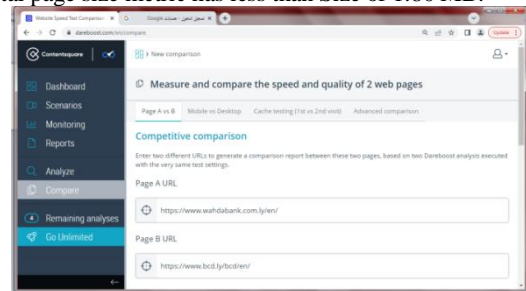


Figure 1: main web page of Dareboost tool [16].

Figure 1 shows the Dareboost tool as well as a comparison of the Bank of Commerce & Development website with the Wahda Bank website discussed in this paper. The evaluation was based on customer interactions in Libya on both internet banking websites. After analysing the internet banking websites in the Usability testing tools, the results and the highest score in the usability testing tool were generated to ease data presentation. The website with the highest score, which is the best website, was concluded based on the analysis from the Dareboost usability testing tool.

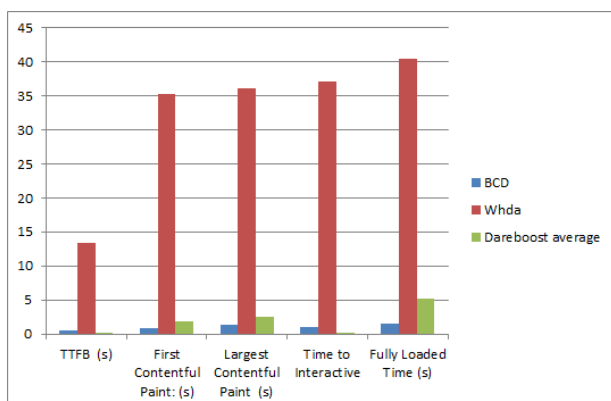
#### 6. Results and discussion

The paper has focused on one web usability tool to calculate internet banking platforms' website usability. The evaluation results are shown below. The Dareboost tool evaluated the Wahda Bank website and the Bank of Commerce & Development websites. The data obtained was taken on Feb. 27-28, 2022) and the results were as follows: Wahda bank's website has a TTFB metric of 13.39 sec, an FCP metric of 35.22 sec, an LCP metric of 36.19 sec, a Fully Loaded Time metric of 40.38 sec, and a Time to Interactive metric of 37.17 sec, and the results are shown in Figure 2. The total page size metric of 2.4 MB, separated into HTML is 79.24 KB, CSS is 377.49 KB, JS is 885.1 KB, IMG is 557.72 KB, OTHERS is 496.42 KB, and the results are shown in Figure 3. The structure metric has a 57% score, and the results are shown in Figure 4. The Bank of Commerce & Development website has a TTFB metric of 510 msec, an FCP metric of 837 msec, an LCP metric of 1.37 sec, a Fully Loaded Time metric of 1.49 sec, and a Time to Interactive metric of 1.01 sec, and the results are shown in Figure 2. Total Page Size metric with 443 KB, separated into HTML is 2.41 KB, CSS is 26.9 KB, JS is 52.16 KB, IMG is 361.25 KB, OTHERS is zero KB, and the results are shown in Figure 3. The structure metric has an 80% score, and the results are shown in Figure 4.

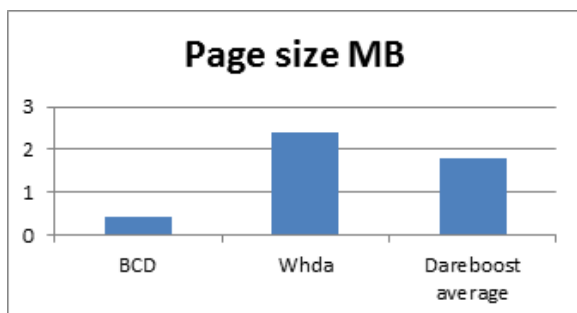
The result shows that the Bank of Commerce & Development bank website has the highest score in most metrics except TTFB metric and Time to Interactive metric. So the bank gets a structure percentage of 80%, which is a good percentage as it is very close to the percentage set by DareBoost tool scale. This is due to the frequent use of unnecessary high-resolution images in start-up page. Wahda bank's website has failed to fulfil all metrics. This is due to the frequent use of unnecessary high-resolution images in most website pages and the frequent loading of different pages that can be included in one page. The long page load time is due to the delay in response time from the main server.

**Table 1: Dareboost Tool evaluation of bank websites**

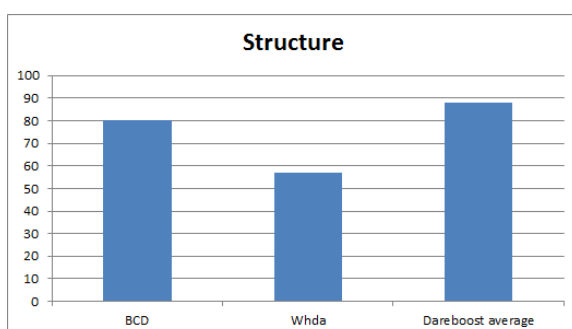
Banks	TTFB (s)	First Contentful Paint: (s)	Largest Contentful Paint (s)	Time to Interactive	Fully Loaded Time (s)	Page size MB	Structure % 100
BCD	0.510	0.837	1.37	1.01	1.49	0.443	80
Whda	13.39	35.22	36.19	37.17	40.38	2.40	57
Dareboost average	0.20	1.80	2.50	0.20	5.25	1.80	90



**Figure 2:** banks' websites Timings graph by Dareboost tools



**Figure 3:** Banks' Websites Dareboost tools' weight by resource graph



**Figure 4:** banks' websites' structure graph by Dareboost tools

## 7. CONCLUSION

Based on the evaluation usability criteria through the Dareboost automated tool, the Bank of Commerce & Development has the highest score for most metrics. Hence, this Bank of Commerce & Development website can be concluded as the best website based on usability.

The worst internet banking website is Wahda bank. As for the Bank of Commerce & Development website, it has good appraisal rates which are better than the recommended rates, but the Wahda Bank has very bad appraisal rates and is much higher than the recommended ones.

Through the evaluation conducted in this paper, the researcher has recommended improving the Bank of Commerce & Development website by giving lighter image formats and providing real-time transformations for responsive images. The researcher has also recommended developing the Wahda Bank website in order to obtain customer satisfaction, giving lighter image formats by compressing images, provide real-time transformations for responsive images, caching images and improving delivery time, eliminate render-blocking resources, Download the relevant data in a simple way, staying away from many colours and on the same page as much as possible instead of dividing it on several pages.

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