Ascertaining the Presence of Responsiveness in the Websites of Tertiary Institutions

Francis. A. U. Imouokhome[1], Kehinde Desmond Moru[2], Veronica I. Osubor[3]

[1]*Department of Computer Science, University of Benin, Nigeria*
[2]*Robotics and Vision Department, University of Navarra, San Sebastian, Spain.*
[3]*Department of Computer Science, University of Benin, Nigeria*
franc.imo@uniben.edu, dmoru@tecnun.es, viosubor@uniben.edu

Abstract: The use of the concept of responsiveness in designing websites aims at developing applications that respond to the behavior and background of users of the sites. The design procedure involves the use of Cascading Style Sheet (CSS) media queries. This intelligently blends flexible grids with image layouts and appearances. A web page, when viewed in a specific device, (for example, a desktop computer) adjusts to retain its resolution features, image size and scripting abilities on another device (e.g., laptop or mobile device) without any intervention from the device user. Product delivery delays are avoided in responsive approach because repetitions of the different phases of the design and development cycle for every new device are eliminated; thus saving on cost. This study, motivated by the significant benefits accruable from this new technology, investigated the websites of 515 tertiary institutions on the Internet with a view to determining if they were designed using the concept of responsiveness or not. Results show that only 55% of the 515 websites were designed with responsive technique, while 45% were not. It is therefore recommended that other tertiary institutions should adopt responsive technology in the design of their websites in order to avail themselves of its benefits.

Keywords: Website, Responsiveness, Mobile devices, Screen resolution, Page resize

I. INTRODUCTION

The ubiquitous use of mobile devices has brought with it the necessity and desire for mobile versions of websites. It becomes very necessary therefore that web designs are done to meet with the screen resolutions of mobile devices. Screen resolutions vary from one mobile device to another. To design a new website for every new device with its new resolution is practically impossible [1]; hence the need for responsive web-design for mobile devices.

Responsiveness is a new approach in web design that provides a most favourable and interesting viewing of a wide range of screen resolutions for different devices. The use of the technology in designing a website aims at developing applications that respond to the type, features and screen size of the device being used and the orientation of the user. Responsiveness resizes a webpage to fit the host device screen without loss of any details (like texts, titles, images, etc) while scrolling through the pages; thus making navigation and reading through the web pages easy. The user just sees objects on the screen adjust and resize to automatically fit the screen, relocate contents, resize images and fonts, and adjust navigation [2]. This gives the user an exciting experience irrespective of the device being used.

The practice of responsive web design involves the use of Cascading Style Sheet (CSS) media queries. This intelligently blends flexible grids with image layouts and appearances. Classical website design methodology involves different phases of design and development for every new device on the market. With responsive web design approach, repeated efforts and delayed time for product delivery are eliminated, thus saving on cost.

An outstanding feature of responsiveness is flexibility, which enables a website designed with this technology to handle different resolutions of a page by adapting to the user interface of the site; thereby allowing a user to switch between different devices without losing any expected or desired results [3]. As a user moves from one device to another (such as from laptop to hand-held or mobile devices), the web page, in response to the characteristics of the device preferences of the user, adjusts to retain all the features (such as resolution, image size and scripting abilities) on the screen of the host device as it should be on a non-mobile device. This is done without any intervention from the device user. This eliminates the need for a web designer to repeatedly carry out the same process of web design for every new device of a new user. This implies flexibility of web pages that are adaptive to their host media.

II. RELATED WORKS

The concept of responsive web design can be traced to the awareness in responsive architectural design, in which the size of a room automatically changes in response to the flow of people into or out of the room [4]. Responsiveness has also been applied to the technology of "smart glass" production. The technology enables a "smart glass" to become opaque when the population of the occupants of a room reaches a preset number [4]. These responsive designs are based on motion sensor and robotic technologies. Responsiveness of web pages cannot however be accomplished with these technologies. Rather, website design with the technology of responsiveness is a more abstract and new way of formatting web pages using media queries, scripts, etc. [5,6]. This is described by [7] as "a multiple-loop system in which one enters into a conversation; a continual and constructive information exchange". [8] presented a description of some frameworks, web-based tools and libraries necessary for the design of modern websites, which make them to be "mobile-friendly responsive browser-based applications". The author also presented an application (Family Harmony) he used these frameworks and libraries to build. Family Harmony is an interactive and colour-based application that takes age-appropriate need as its input data. It processes the data and outputs a score that enables parents and their children to ascertain the level of harmony that exists between them.

A project undertaken to determine the viability of a responsive website for a small academic Library of an institution revealed that by using responsive design methodology, a small Library can successfully deliver a high quality website [9]. Subić et al [10] undertook a survey to determine the presence of responsive web design in Serbia, Canada, UK and USA. The researchers concluded that most of the websites they analysed were not created with this latest technology and, consequently, are not responsive. [11] presented a responsive web design to illustrate the effectiveness of this technology in e-learning. The authors identified some benefits derivable by students when they access instructional materials hosted on responsive websites to include: more user-friendly learning environment; flexibility of reading instructional materials on any computer device; ease of navigation through web pages. These benefits make learning more enjoyable and effective. Other plus that have been identified with responsive web design include flexibility, excellent user experience, cost effectiveness [12], ease of use and also of maintenance, time and cost saving, multi-screen adaption, increase in visitors to the site, less investment, scalability [13,14]. In response to their students' demand, many universities have developed responsive websites with mobile centric access [15]. According to [16], 37 out of 345 (i.e., 10.72%) Division I colleges and universities have mobile versions of their websites. Responsive website implementation, according to [17], remains the solution to meeting the needs of students of institutions of higher learning, who make use of mobile devices to access the internet for their course materials; as it eliminates the perpetual need to zoom in and out a web page to be able to view its content. [17] further reported a dramatic increase in the number of institutions implementing mobile version of their websites without substantiating this claim with any facts.

This present study therefore aims at ascertaining the presence of responsiveness in the websites of some tertiary institutions in both the developed and under-developed countries of the world.

III. METHODOLOGY

Responsive web design makes use of three functions, namely: (i) Adaptive layout, in which a web design is modified to suit different screen sizes; (ii) Fluid grid, which replaces the use of fixed-width units (like pixels) with relative units such as percentages; and (iii) Flexible media/images and other media (like videos) which are scaled to use relative units in order to limit them to the sizes of the elements that contain them. A web site designed with responsive technology must be tested for precision. This involves watching to see if the page adjusts the screen resolution of the browser and resizes the images to fit within the screen of the device being used [1]. This test option was adopted in this study to determine the use of responsive technology in the design of the websites of some tertiary institutions around the globe. The random survey technique was used to select the sample population of the websites of 1019 tertiary institutions randomly visited from countries around the continents of the world. The sample websites were chosen to investigate what percentage among them were developed with the concept of responsiveness in mind, and those that were not, but designed by the use of the classical technique. An opera mobile emulator, and six web browsers, namely: Google Chrome, Safari, Mozilla Firefox, Internet Explorer, Comet Bird and Opera were used as tools to ascertain whether the websites were responsive or not. The option to use various browsers was taken due to the fact that some web browsers are built to respond to responsive technology, while others are not. The opera mobile emulator was used to verify the responsiveness of the sites as they would be viewed on various mobile devices. The opera mobile emulator a small, native application that is easy to install on the desktop machine and runs exactly the same code as its mobile phone version — that way, the user is assured that what is seen on the test environment is practically identical to the experience the end users will get. The Opera mobile emulator has over 30 brands of mobile devices and with varied dimensions. Random selections were made amongst these brands to test for responsiveness. The Uniform Resource Locators (URLs) of the websites were entered into the address bar of the browsers and emulator. A website was affirmed responsive if it adjusted to the screen resolution of the browser or emulated device,

and automatically resized the images, making no part of the content of the website lost to the view of the user. Results from the survey are shown in Table 1.

IV. RESULTS AND DISCUSSION

Table 1 shows the list of some countries, the number of websites of tertiary institutions visited in each of the countries, and their percent responsiveness in relation to the total number of websites investigated per country during the survey.

Table 1. Percent Responsiveness of Websites of Tertiary Institutions

NAME	RES-PONSIVE	UNRES-PONSIVE	TOTAL	% RES-PONSIVE	% UNRES-PONSIVE
INDIA	10	17	27	37.04	62.96
MALAYSIA	11	15	26	42.31	57.69
CHINA	14	11	25	56.00	44.00
JAPAN	36	11	47	76.60	23.40
SPAIN	21	23	44	47.73	52.27
UK	30	4	34	88.24	11.76
FRANCE	18	25	43	41.86	58.14
GERMANY	20	24	44	45.45	54.55
AUSTRIA	27	13	40	67.50	32.50
AUSTRALIA	37	8	45	82.22	17.78
USA	34	20	54	62.96	37.04
SOUTH AFRICA	10	8	18	55.56	44.44
NIGERIA	28	10	38	73.68	26.32
KENYA	26	11	37	70.27	29.73
EGYPT	25	19	44	56.82	43.18
ARGENTINA	28	18	46	60.87	39.13
BRAZIL	34	12	46	73.91	26.09
VENEZUELA	16	18	34	47.06	52.94
CHILI	34	14	48	70.83	29.17
CANADA	42	7	49	85.71	14.29
GHANA	31	7	38	81.58	18.42
ISRAEL	31	16	47	65.96	34.04
MEXICO	34	13	47	72.34	27.66
PAKISTAN	28	21	49	57.14	42.86
UKRAINE	32	16	48	66.67	33.33
ANTARTICA	0	1	1	0	100
T O T A L	657	362	1019	64.47	35.53

The table shows the number of websites designed with the concept of responsiveness and those that were not. Percentage of each of these, against each total is also shown. The table reveals that tertiary institutions in the developed countries have higher percentage of responsive websites than those in the under-developed ones.

Fig. 1 is a graphical representation of the results of Table 1. The figure shows that of the 657 websites that were investigated, 64.47% were developed with responsive technology for use on mobile devices, while 35.53% were developed with traditional web technique (i.e., non-responsiveness). It is therefore recommended that the websites of institutions in the latter group should be redesigned to become responsive so that the benefits of responsiveness can be enjoyed by users of the sites.
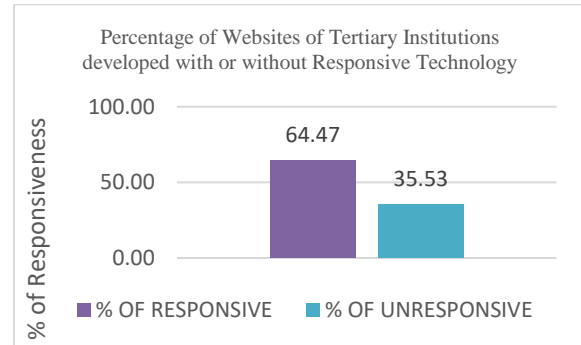

Fig. 1: Level of Responsiveness of Websites of Tertiary Institutions.

The benefits include the following, as presented by Isadora [18].

- Effortless multi-device adaptation: Responsiveness results in flexibility whereby a website can adapt to the screen sizes of different mobile devices without losing any of its features.

- Ease of maintenance: Creating multiple versions of a website using the traditional technique is costly and cumbersome. A website designer would need to triple his efforts to update a websites to be accessed through three desktop computers or mobile devices. With Responsive web design, this extra labour for the design of two extra websites after the first one is completely avoided. A website designed for use on a desktop computer performs very well on other devices. When the need for update arises, multiple versions of the website would not be created; only one platform in the content management system would be affected, thereby saving on effort, time and cost.

- Improvement on Search Engine Optimization (SEO): Responsiveness requires only one link to optimize content. The structure of the Uniform Resource Locator (URL) does not depend on any device being used to access any site on the web. With Responsive design, the URL makes it easy to update and optimize content for all devices and the Google crawlers to index the website pages.

- Higher Conversion: More online commercial businesses or dealings imply more conversion of web transactions. Customers find these businesses and make purchases by the use of mobile devices causing an increase in conversion.

- Increased Mobile Sales: Responsive web design has made online purchases more comfortable for people, thereby increasing mobile sales of goods and services through the use of hand-held communication devices.

- Seamless User Experience: A responsive website handles users experience seamlessly as regards the look and feel of all features of the application. It makes websites to look more attractive and work more

correctly without having any image distortions or content being out of place.

- Longer Website Relevance: Responsiveness adds quality to and makes a business website more relevant for a long period of time because it makes the beauty of websites to become more attractive and users experience more exciting [19].

V. CONCLUSION

With the proliferation of mobile devices, it has become necessary for designers and developers to create web pages that adapt to fit the screen sizes of the devices (whether hand-held, or laptop, or desktop) with which they are accessed. This is the revolution that responsive web design has introduced into web development, making the technology the hub of future web design. Responsive web design is a methodology in which the designer has the end-user's experience in mind. A sterling feature of this approach is the flexibility with which the web pages adapt to different devices and their screen sizes, without losing any features or details, making them more easily accessible on all types of devices.

Although this research reveals that 64.47% of the websites of the tertiary institutions investigated are developed with responsive technology, nevertheless, other tertiary institutions could adopt the technology in the design of their websites in order to avail themselves of its benefits. This is with a view to making websites more relevant and exciting for the ever-increasing number of mobile device users who visit the websites of educational institutions.

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