DEVELOPMENT OF E-COMMERCE USER INTERFACE WITH RESPONSIVE WEB DESIGN METHOD

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ABSTRACT: In today's lifestyle, e-commerce have become a trending platform as everything turned online now-a-days. Mostly purchases are taking place online in every type of business areas. Customers are majorly showing interest to buy any product or service on different sites. There are different platforms for users to browse e-commerce website. But, designing an e-commerce site or application is not a simple target. Many guidelines need to be provided to a developer for designing a user friendly interface. This study presents development of e-commerce user interface with responsive web design method. The main goal of this paper is to discuss various conventional methods in practice now-a-days discussing about its drawbacks. The guidelines for development of user friendly e-commerce interface are also discussed in this paper. Due to this reason, Responsive Web Design method is employed that has the ability of self redesigning basing on the resolution and size of the screen i.e., from large size screens to mobile phones that supports and enhances the user experience to access different web pages. The result analysis shows the new version of responsive web page and presents the screen shorts of a prototype e-commerce website with this new version responsive web page by applying guidelines for good user interface development.

KEYWORDS: e-commerce website, user interfaces, Responsive Web Design, Java Server Page, JavaBeans model.

I. INTRODUCTION

In present days the e-commerce has improved drastically, it became a part of daily activities in human life. These lead to development of online transactions that ultimately lead to digital era. Usage of e-commerce sites is beneficial to the business firms and also the end user. By using these e-commerce sites, the process of online purchasing is not difficult instead it is accurate [1]. Hence, different companies are now building e-business sites for the enhancing business environment.

As the word e-commerce does not strictly rely upon commercial industries, they can be classified in wide application areas. Development of e-commerce strategy [2] is linked with theoretical and practical implications for developing the effective virtual stores. The key factors for developing the e-commerce sites need to be understood clearly. Content present on the website is observed to be a main cause for repeated visits. The web content includes graphical layouts, pictures, sound and text. The latest trends are emerging that drags the user attention of visitors of website. Converting the internet web surfers as repeated visitors of site is a complex phenomenon [3].

Faced with the increasing e-commerce and the increasingly fierce competition, more and more e-commerce businesses pay attention to the details to stimulate consumers' purchase desire [4]. It pays attention to the design of website interface with consumers, along with the interaction and its experience, for their own in e-commerce to occupy more market share. It is also accompanied by the increasingly high requirements for the interface design of e-commerce websites, the level of the design of the website interface, to a certain extent, which reflects the background, foundation and culture of the e-commerce website. As of now, various domestic companies dealing

184

with e-commerce sectors have identified the importance of data utilization and integration on various e-commerce objectives [5]. By making use of product information E-commerce platforms can recognize the behavioral patterns of products online.

The responsive web designing techniques are adopted by the interface due to latest trends developed by the sites. The responsive web design technique has become very popular as it provides user friendly interface to the browser. Such dynamic responsive technique is build at the time of deployment of the layout level in a project [6]. Such that these techniques make the website compatible to any type of device irrespective of the resolution and size of the screen [7]. Therefore, the examination of other factors to find out the appropriate measures which are required to be deployed in web interface in responsive web design are analyzed in this paper. Most related and appropriate features for web development of responsive web design is discussed in this paper by utilizing new trend of business development [8]. Various principles of web design theories are established earlier. However, such principles are not applicable to responsive web design. Therefore, this study is made on investigation of various usability principles with main focus on e-commerce website designing for responsive web design.

II. LITERATURE SURVEY

S Bhuvaneswaran, A K Subramani and M. Prabhu [9], researched about the reviews from customers in Chennai. The survey was conducted and customer data was collected from scheduled questions. This study is conducted on a class of intellectual people who can understand the economic value and quality standards of the product or service. The feedback from physically challenged people or mentally retarded persons was not taken into consideration. The famous online store like Flipkart also extends its support for blind people with the operation of mobile applications, but there was no technology for incorporation of the same on a desktop.

Md Abdullah Al Imran [10], conducted a study on Amazon which is a trending online platform. The business strategy and information system were studied. The observation was that, the information system of such giant online platform was not focusing on visually impaired users. Amazon made efforts for designing a mobile application that supports the mobile version to access its website, it also supports some other devices of Amazon such as Fire tablet, Fire TV, and Kindle e-reader. Still proper efforts are not initiated by amazon for incorporation of Braille or keyboard for designing a simple navigation for visually impaired persons.

The term responsive web page means concept of designing a website that can change its layout basing on the device on which the website is reviewed [11]. Device used to open the website may be a smart phone, tablet, laptop or a desktop computer and even smart LED TV screens [12]. Responsive architecture design is the origin of Responsive Web Design (RWD) which is similar to the concept of a room gets automatically adjusted to the flow of people in it. This idea is transformed into the web design concept as it is similar to that.

According to [13], RWD approach means the website design has to get adjusted and be suitable basing on user requirement environment of screen size, type of device, resolution and orientation. This responsive web design deals with dynamic layouts and grids, pictures and smart application of CSS

185

queries. For instance, when a user switches to iPad from a laptop, the website must be compatible for the resolution of device, scripting ability and image size.

Lazar, Kleinman, Allen and Malarkey [14] have made research about the inconvenience occurred to the visually impaired persons at the time of using digital screens. Screen readers are comfortable and the layout related issues lead to drawbacks on web development. The layout must be very simple to the user for convenience.

Farnandes, Almeida, Carvalho, Simoes et al. [15] conducted a research to recognize the screen reading techniques that supports easy access. From the research, it was suggested that the layout must be transcoded prior to start screen reading. For multicasting the screen layout, semantics must be fetched from the website structure such that the system is capable of receiving information within the website.

III. E-COMMERCE USER INTERFACE WITH RESPONSIVE WEB DESIGN

3.1 Guidelines for designing Better E-Commerce User Interface

Online business is trending and opted by most of the users because of its convenience of shopping from anywhere and variant options at the finger tips. For assuring the positive online shopping experience of customers, an effective interface has to be designed. In order to obtain an effective e-commerce interface, the appropriate guidelines are made for designing the home page, product information, shopping cart, categorization, navigation bars, registration and checkout for delivery all these tabs need to be designed accurately and understandable by the user.

Guidelines are discussed in this paper. Each tab of the website and functionalities are explained as follows:

Home page: Home page needs to be designed very carefully as it attracts the users and it is a main landing page of the website. The important guidelines to design a home page are like few colors have to be used, italic font must not be used, there must not be many adverts on the site. The web page must not be cluttered with extra graphics and unwanted text. The width of browser window must be must be greater than the width of home page in order to overcome horizontal scrolling.

Navigation Tab: An effective navigation tab will be user friendly, as it helps to easily switch from one tab to another on the site. Therefore, the design of navigation should be clear and insightful. The controls of navigation must be in every page. Usually, a navigation tab helps the user to locate the place where they are on website especially to the users who browsed the website through reference links and hyperlink.

Product Catalog: Product catalog of an e-commerce website is very crucial as it is a major feature of e-commerce websites. The user finds new products in product catalog which they intent to buy. The users must be given direct access to this step. Product specifications such as such as reviews and add-on items must be specified in a hidden page tabs. The reviews and tags like "bestseller" product will improve the sales of product as no one wants to be the first person to buy something.

Search Function: Search option helps a user to search any product on the website. The search function is the main barrier for prospective customers for finding the products that they are willing to buy on the virtual store. Search function should be visible. The search keywords of products must be kept default on the site to find

products easily. The search function must be visible and easy to find.

Shopping Cart: the shopping cart option is used to add the favorite items or products in the list. It is like a bag to drop the interested products of the customer. The best place to locate the shopping cart is top right corner of the web page as the user first looks at the option easily once after browsing. The product information, costs, date of expected delivery, current status of product and checkout for delivery are all options available in shopping cart option. It helps the users either to continue shopping or exit the application.

3.2 Responsive Web Design (RWD):

The main concept of this study is to design a technique called Responsive web design (RWD). It is a dynamic technique for building a website that makes the website suitable to be accessed on various kinds of devices like notebook, tablet, iPad, iPhone, laptop or even a simple java enabled keypad mobile which differs in size of the screen. An intuitive and gratifying experience is offered by the Responsive web design. This technique provides a dynamic layout and advanced functionalities like being adoptable to any kind of device irrespective of their screens and resolution. This is an advanced technique when compared with the traditional liquid designs. CSS3 media query is used in responsive sites to regulate the screen size and some other set of rules to change the layout design to enhance the usage of website. The responsive website design consists of the features that are given as follows:

Custom Layout Structure: In the technological point of view, a custom layout framework is the combination of flexible layouts and grids for designing a website. Customized layouts can be designed by adding layouts, pictures and smart usage of

CSS media queries. When a user switches from desktop to an iPhone, then the websites by default adopts the screen resolution, scripting ability and size of the image. It avoids the drawbacks such as scrolling the website for overview of website on a new device.

Adjusting Screen Resolution: latest devices like iPhone, iPad, Smartphone, windows phone have the ability to switch to landscape mode from a portrait mode basing on the preference of the user. Therefore, a latest technique RWD is deployed to switch the screen size of laptops, tablets and mobile phones. New layout rules are determined and applied at these breakpoints. For an instance, the sites must be designed differently for different screens having resolution of 320 pixels vary from sites may be laid out very differently for devices pixels.

Common	Breakpoints in Device Resolution
320 px :	Portrait mode in Mobile devices.
480 px :	Landscape mode in Mobile devices.
600 px :	Portrait mode in Tablets.
768 px :	Landscape mode in Tablets.
1024px :	Landscape mode of desktop and iPad 1 and 2 versions. (iPad 3 resolution is 2048 x 1080)
1200 px :	Large displays of desktop computers.

Website Flexibility: Only flexibility of text and layout is not enough for a website to be flexible. The entire content within the website must be flexible. Techniques such as Fluid grids, fluid images and layouts are used for making a flexible website that is compatible for all platforms.

187

Responsive Images: Responsive Image is the process of image shrinking in the proportionate devices. This process ensures that the space on small screen is not wasted due to large images. The major difference between specification and the snippets is for excluding scr fallback attribute which was removed intentionally from avoiding the same image to download twice. Selections basing on Device- pixel ratio, Art direction, Image format and Viewports help in implementation of responsive images.

Perfection in SEO: Companies building the 'mobile sites' for devices which are usually not compatible leads to burden on developers and they also throws a challenge for Search Engine Optimization (SEO) persons to enhance both mobile & desktop site links. Responsive designs of the website enhance the functions of SEO and reduce the work burden on developers. Optimization of URL is a simple task that improves the consistency of URL structure over all other devices. Eventually, this leads to high performance standards of the website which makes it popular when compared with other search results.

IV. RESULTS

The result analysis is performed on an e-commerce website named etao.com which is a desktop version of eye tracking task and it is classified five Areas Of Interest (AOIs) as Logo, Search box, Navigation tab, recommended products and promotions which are displayed in Fig 1. The high frequency groups and Novice average fixation duration are calculated in each AOI as shown in Table 1. The high frequency groups have high average fixation durations when compared with novice group's in AOI in logos, search box and navigation tabs. Apart from this, the product recommendation area has more fixation duration than that of themes and promotions.

The group participants of two teams designed a consistent layout when they are challenged to design a page in smart phone by using puzzle components. Idea was that space of display screen can be managed by scrolling the screen and image shrinking by some adjustments. The logo, search box and navigation tabs are placed on the top right of the page that are consistent to the layout of PC. Below these tabs the top part of the page and cards of promotion area are combined together and designed on website.

Table 1: Fixation duration averages in each AOI in seconds

	Novice Group	High Frequency Group
Logo	1.78	0.59
Search Box	1.33	0.68
Navigation	2.71	0.96
Products recommendation	14.31	15.77
Products recommendation	5.54	4.43

Fig. 1: AOIs on etao.com (desktop version)

Basing on results obtained from information sorting task and eye tracking task, the new

188

version of webpage is designed for smart phones which is responsive in nature. Such responsive webpage is depicted in Fig.2 shown below. A new page is designed with logo, search box, Navigation at the top of the page as it is consistent for the desktop version. The body of website is contained with common objects like Recommendations of Product and Themes or Promotion area.

Anyways, the components of the web page are placed according to the requirements of the virtual store. The drawbacks from old techniques are over ruled by using the latest techniques like RWD. Usually promotion area and themes are placed adjacent. The size of webpage is limited on mobile phones, whereas Desktop consists of large area. So that, the recommended products and promotions are placed basing on the space or screen size which differ from one device to another. According to the requirements the content of web pages is designed basing on the information sorting task results.

The following fig. 2 represents the design of new version of responsive webpage for mobile phones with five Areas of Interest basing on the trending latest designs of the e-commerce sites.

Fig. 2: The New Version of the Responsive Webpage for Mobile Phones

A prototype of e-commerce website has been developed with applying rules revised in this paper and using new version of responsive web page in this study. Basing on the earlier studies, the new version of web pages is designed for analysis with the responsive web design method. Number of web development languages such as PHP, CSS, JavaScript and MySQL database are deployed in the website design. Fig. 3, Fig. 4, and Fig. 5 illustrate the screen shots of prototype e-commerce website.

189

Fig. 3: Homepage of e-commerce website

Fig. 4: Product Page of e-commerce website

Fig. 5: Shopping Cart Page of prototype e-commerce website

For an instance, once users enter the homepage, they will directly see the product catalog. Users must be allowed to browse the product catalog without registering. In information page, products details were hidden behind individual's tabs to prevent page clutter and improve organization to prevent website cluttered with so many text. Furthermore, shopping cart page contains details of products that users are intent to buy and total prices. Users are allowed to

update the shopping cart, go back to the product catalog or proceed to checkout process that users are intent to buy and total prices. Users are allowed to update the shopping cart, go back to the product catalog or proceed to checkout process.

V. CONCLUSION

An e-commerce website is required to be designed in a user friendly manner that allows easy access of website in order to become effective in these competitive marketing strategies. Substantial efforts have to be made in order to achieve the goals of an accurate website with no bugs. The detailed description of services is performed to improve the usability. Therefore development of e-commerce user interface with responsive web design method was discussed in this paper. The main objective of this paper is to draft the guidelines for designing an error free e-commerce interface and website for its implementation.

Responsive Web Design involves designing of website with maximum number of views from different devices having dissimilar screen size by using same code base. Search Engine Operation can be enhanced by the advantages of Responsive Web Design that involves single code base. The responsive web page can be designed by thoroughly understanding the user requirements and compatibility of each kind of device. Therefore, the approach for designing an effective e-commerce company can be achieved by the Responsive Web Design technique. This will help the new companies to emerge basing on current requirements and resist future proof, digital trends and ever changing requirements of the customer.

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190

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191