Responsive Web Design

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Abstract

Tablets, desktops, and smartphones, and laptops, minis: we live in a world of screens, all of different sizes. Web designers have to create websites for keeping in mind today's users and tomorrow's technology. Hence it is really an important problem for web developers to create websites, which are compatible with various devices in the market. In this paper we discuss and survey about the responsive web design aspects and how it can be implemented in order to provide optimal viewing experience to the users.

Introduction

In the current world, websites are often not designed with the crucial mobile user as the foremost priority. The use of mobile devices to browse the websites is increasing at an astronomical pace, but unfortunately most of the websites aren't optimized for all the devices (Example: Mobile Devices). For many of the web designers and developers, ensuring they create a high-quality visual experience, and deliver the website to the customers and users. Responsive web design should be widely adapted to maintain usage across a various devices, like desktop computers with a wide range of screen dimensions, tablets, mobile phones, TV's. Smartphone and tablet friendly websites are equally important when compared to the normal websites, with the rapid increase in use of mobile friendly users**.** In this Paper we discuss through why the responsive web design method needs to followed by the web designers and how can it be done. Right now every second industry-related article mentions this topic and every good execution of it is admired and bandwagon around the web [1].

Earlier the web designers had just one challenge to deal with keeping the same look and feel of their websites and across different browsers. However with the onset of rapidly increasing mobile usage for browsing websites, factors such as touch vs click, screen size, pixel resolution, and optimized performance with minimal loading time are the main things to the considered by the Web designer. Therefore it is the primary job of the web designer to take care, that the content of the designed website is readable, accessible and functional on the various resolutions.

The term '**Responsive Web Design'** was first mentioned by Ethan Marcotte in his report published in May 2010 on the portal "A List Apart" [2], he described theories and the applications of RWD.

Responsive Web Design

Responsive web design adapts to the size of the screen no matter what the target device screen size is. The layout that is 'fluid' and uses CSS media to change styles, this 'fluid' grid enables the pages to resize its width and height to adapt to different screen sizes and show correctly [3].

Responsive web design, originally responds to the needs of the users and the devices they are using. The layout changes based on the size and capabilities of the device. For example, when a user uses a phone to open a website, he would see content shown in a single column view, whereas in a tablet it might show the same content in two columns. Hence we to aim to provide optimal viewing experience. [4].

Responsive web design is distinct from adaptive web design. Adaptive web design uses distinct layouts for multiple screen sizes, the layout largely depends on the screen size being used so with each of these sizes in mind a layout would have to be designed for it, whereas a truly responsive web design is "fluid", it uses CSS, Bootstrap among others to change styles and resize to match the needs of any device. This would result in a more flexible webpage, and for future technologies—considering the introduction of new devices, such as wearable and IoT technologies. For adaptive we have to design for each of the different screen sizes, whereas responsive design we would design one page for all the screen sizes. This concept can be also called 'One for all' or 'Web for All and Web for Everything' [5] approach.

Figure 1: Comparison between Responsive Web Design and Adaptive Web Design [3]

Many of the user would not ever maximize their windows while using websites on desktop. [6] Says that only 50.04% of users maximize their windows while viewing a website. This is also considered a major concern for creating different screen sized based websites.

There are various methods proposed for implementing the responsive web design. One of the most important would to make everything flexible.

Make Everything Flexible:

With the advancement of HTML5 and CSS, the designs can be made flexible. With the help of Flexible/Fluid Grid concept, where the pages can adjust itself, according the screen size. The main idea of flexible grids is to create a layout where all elements are based on the calculated percentage width and so all elements in the

layout are resizable in relation to one another. [7]. In Ethan Marcotte's article [2] , he mentions that created a sample Web design [8] that features this better flexible layout:

In this, the mode switches from landscape to portrait mode, when shifted from desktop to mobile version. This entire design is a wonderful mixing of fluid grids, fluid images and using smart code of HTML. There are few ways

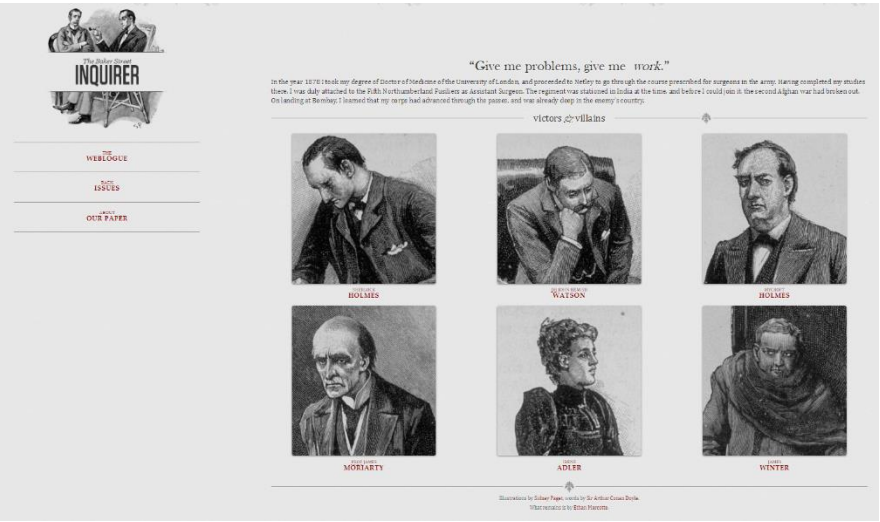

Figure 2: Desktop Version [8]

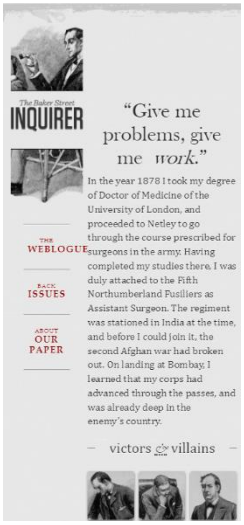

Figure 3: Mobile Version (IPhone X) [8]

to make the website flexible, some of them are:

- **Hiding and Revealing portions of images**: Here when we resize the images, the image is either cropped or pixels are lost creating a major problem. In the above figure, Ethan illustrates, how the image is cropped and the text is resized to fit the phone screen yet, not losing the original look and feel. If resized too small, the image would appear to be of low quality, but keeping the name of the website visible and not cropping it off was important. So, the image is divided into two: one (of the illustration) set as a background, to be cropped and to maintain its size, and the other (of the name) resized proportionally.

```
<h1 id="logo"><a href="#"><img src="site/logo.png" alt="The Baker Street Inquirer" /></a></h1>
```

- **Flexible images**: The **maximum width** of the image is set to 100% of the screen or browser width, so when that 100% becomes narrower, so does the image. Essentially, as Jason Grigsby noted, "The idea behind fluid images is that you deliver images at the maximum size they will be used at. You don't declare the height and width in your code, but instead let the browser resize the images as needed while using CSS to guide their relative size". It's a great and simple technique to resize images beautifully.

/*code img {max-width: 100 %;} */

- **Creating sliding composite images:** Create the appearance of a single image by layering multiple images on top of each other. The pieces can slide around the page as its width is changed, making it a perfect technique for liquid layouts. [9]

```
<div id="outer"><div id="inner"></div></div>
#outer {background: url (skyline.jpg) no-repeat;

        }
#inner {
        background: url (ufo.png) no-repeat;
}
```

- **Preprocessing pages via the webserver before serving them to the devices:** As per research conducted by [10] Image, font and layout resizing along with completing image optimization process before serving, would ensure a similar experience across all the devices.
- **Media Queries Technique** - Media queries allow the page to use different CSS style rules based on characteristics of the device the site is being displayed on, most commonly the width of the browser. With the help of media queries, designers can build multiple layouts using single HTML documents and selectively provide style-sheets based on different features such as browser size, orientation, resolution or color [7]. Here is an example used in Ethan's website [2].

  Media queries one of the, main requirement in responsive web design, websites will automatically adjust to different styles according to the different screen resolution. With the help of media queries, we can not only test certain types of equipment, but also tests on the current physical properties which are used

```
<link rel="stylesheet" type="text/css media="screen and (max-device-width: 480px)"
        href="shetland.css" />
```

  for displaying the content on the screen [2]. When the terminal screen is so small that cannot display 4 lines, then it will be showed in 3 lines or 2 lines according to the need. It will automatically detect the screen width, then the corresponding CSS style sheets would be loaded. Such as: The meaning of the above code is that if the category of the medium is screen, and the width parameter of equipment is not more than 400px, then screen.css style sheets would be loaded, otherwise it will be ignored. In addition, the method of '@media' that can be used as way to media query also could achieve the same effect:

  @media screen and (max-device-width: 400px) {.column {float: none ;}}

- **Responsive Typography Technology** – Usage of the fonts adapts to different resolutions so they are still viewable, with the overall layout still intact. Unlike using a simple fonts for a separate mobile site, you are using a fonts which are complex as you like, hence stretch or shrink according to the screen's need [11].
- Menus, links and buttons have to be bigger on touch screen devices, so it could enable a user friendly environment. The space between interactive links has to be sufficiently high in order to avoid an occasional press on small devices like smart phones or tablets

- Using Bootstrap for effective and usage of screen sizes, layout and table design. Bootstrap is the wonderful language, when used alongside of HTML and CSS. This has some inbuilt simple tags to make the layout, images and tables fit according to the container (screen) size.
- **Prioritization of the content:** We need to decide on which content to be shown to the user, based on the devices and has to be ordered accordingly. Multiple columns for larger screen sizes and single column for smaller sizes would be apt. showing the headlines in the smaller sized screens, whereas showing the content along with headlines in larger screens.
- **Making Buttons Bigger:** In smaller devices, most of them are touch enabled, compared to using of cursor/touch to click on the larger screens. In order to accommodate, and make user experience better we have to make the button look bigger and accessible by the user.
- **Keep the navigation together:** Navigation is the lifeline of the majority of your content, the single block that has become uniform across the web is a vital part of many users browsing habits and moving it to the bottom or getting rid of it all together can through many a user and make website bit harder to use [12]. They should be simple (easier to use with fewer clicks), clarity (easier to understand what each navigation option does) and consistency (it should be same, for all the devices)
- **Using of Analysis and testing tools:** Before deploying the project the website has to be tested using a few testing tools and websites to analyze the performance of the website, page load time across devices.

Limitations for Responsive Web design:

It is not possible to stretch images and content from a smaller device to larger screen size (smart TV). The pictures might be of low resolution and the text might be of low readability. Therefore, it is important to optimize content to the needs of the business. Some older web browsers do not support CSS3 media queries which makes it hard to create responsive web for everyone. The responsive web may not suitable for all types of websites, thus various kinds of new technologies are needed to improve it continuously.

Recommendations and Future Scope:

The website needs to be designed in such a way that, the most important objects are shown at first depending on the screen sizes. They may also prioritize to develop with respect to the local culture based or target based user specific. Some content can be omitted from showing at first if it is not important for that user. Web designers have to use the latest technologies such as, bootstrap, HTML5, CSS3. Extensive usage of Social network link buttons and email forms which are mostly fluid responsive. This could be one of the reasons for their big popularity. Fluid websites are definitely the future of web design. In fact, creating a responsive website is a difficult process, and expenses involved are certainly more than a common website. Introducing the technologies in the curriculum of IT schools. Creation of advanced tools to check how the screen looks in different devices in the market and different browsers, show errors or problems if any. More research needs to done towards, how to accommodate new modes of input, such as virtual and augmented reality, will fundamentally change how people navigate the web.

Conclusion:

Responsive web design, with the advantages of providing a good user experience for all kinds of devices, is picking up with changing needs of a user and the technologies. In previous years, papers about the responsive web are very rare, but gradually increased in recent years. Liu et al.'s [13] and Yang et al.'s [14], studies combine responsive web design with education online or off-line. They applied responsive web design to develop education resources for different kinds of mobile learning devices automatically. All over the world there is a lot of attention is given towards responsive web design, papers about this theme are extremely abundant such as Baturay and Birtane [15], Kim [16], and Rowan [17]. More research needs to done towards, how to accommodate new modes

of input, such as virtual and augmented reality, will fundamentally change how people navigate the web. It's Web Designers job to make sure users don't leave disappointed. With responsive Web design, we can create custom solutions for a wider range of users, on a wider range of devices. A website can be tailored as well for someone on an old laptop or device as it can for the vast majority of people on the trendiest gadgets around, and likewise as much for the few users who own the most advanced gadgets now and in the years to come. Responsive Web design creates a great custom experience for everyone.

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