Designing Responsive Websites Using HTML And CSS

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Abstract: Responsive web design is a web design approach aimed at designing sites to provide an optimal viewing experience. The basic idea of designing a responsive website is to fit in the content, based on the size of the device without hiding any content and changing the view of layout. Since the visitors of different websites through handheld devices in increasing day by day, it has become necessity to design the websites with responsive layout. Responsive website designing have reduced the problem of resizing, panning, and scrolling and accessing them from any device. People can now access information easily with responsive websites because they respond to need of users and the devices they are using. The layout of site changes based on the size and capabilities of the device. Responsive designing have reduced lot of efforts of organizations in developing and maintaining the websites for different devices. This can be achieved by using CSS3 and HTML5 for designing. Different classes are designed in CSS which are used at multiple location in code, these classes' helps reducing number of line of code of the project and prevents from inline styling, which helps in maintaining symmetry throughout the design and layout. This paper will elaborately discuss the need of these websites today, how they benefit the users, how to design these websites, what are the challenges faced while designing such websites and how to resolve them and what are its future implications.

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I.   Introduction

A modern website is a tool for any company to increase its visibility towards potential customers. It is common for companies, institutions, organizations and individuals to have websites to reach audience or customers. However, it is not enough just to be present on web and available through web search engines anymore. People are spending most of their time online and most of them are using handheld devices to access the Internet, so now websites need to be optimized for all these devices in order to provide the best user experience. Besides multiple resolutions and screen sizes, different web browsers and platforms, some differences also exist in the ways users input data in devices: using a mouse, touching the screen or making movements. Internet is accessible to anyone and anywhere. However, many websites are still not responsive; they are not optimized for different devices, mainly because of the technology used for website creation. Converting an existing website require lots of effort, money and time. While some web technologies are outdated (e.g. Flash) due to their incompatibility with different versions of the browser, new technologies, and www standards are in, the need of HTML5 and CSS3 for responsive designing of website is increasing rapidly.

II.   Need of responsive designing

Smartphone and tablets have changed the approach toward design and user experience. Before the rise in use of mobile devices with advanced web-browsing capability, web designers had only one primary challenge to deal with – keeping the same look and feel of their websites in various browsers and their versions.

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However, interacting with websites on Smartphones and tablets is not the same as doing that on a desktop computer monitors. Factors such as Click versus Touch, Screen-size, Pixel-resolution, and availability of space, support for Adobe's Flash technology, optimized markup and many more have become crucial while creating websites with Responsive Design
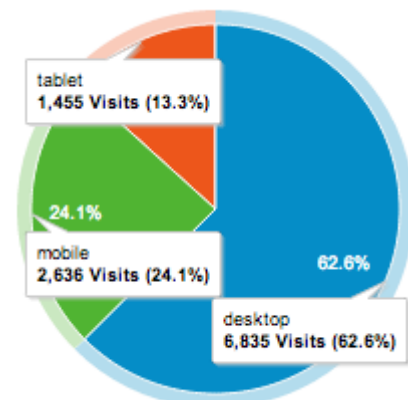

Figure 1. PERCENTAGES for visitors for a website

This pie chart shows the percentages for visitors for a particular website coming using mobile, tablet, and desktop devices for the past 12 months. The number of users using mobile to access internet is increasing day by day. So, to increase the user accessibility, readability, ease to input and fetch data from the websites. The websites needs to be responsive which is being implemented by many organizations but it will still take time.

III.   Ease of Use

Responsive design means maintaining the same look and feel of website for different devices without any major difference. This helps the user to easily access the data from different devices without any complexity to understand the flow of input and output of the information. Users need not opt for a particular device to access the information from the site.

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IV.   Architecture For Designing

Since, responsive designing is major task and we have to design a single code for all the devices, which is a problem faced, due to this we need to generalize the things. Approach for designing responsive website can be in two ways, we can start designing for desktop and make it responsive for mobile or it can be done other way i.e. start designing for mobile and make it responsive for mobile. Since Responsive Design requires you only have one website that is coded to adapt to all screen size no matter what the device it's being displayed on, we need to identify the things to be generalized so that there no repetition of code as same html will serve all the devices, using CSS (which determines the layout of webpage) to change the appearance of the page. Rather than creating a separate site and corresponding codebase for wide-screen monitors, desktops, laptops, tablets and phones of all sizes, a single codebase can support users with differently sized viewports.In this, page elements reshuffle as the screen grows or shrinks. A three-column desktop design may reshuffle to two columns for a tablet and a single column for a Smartphone. Responsive design relies on proportion-based grids to rearrange content and design elements. **E**nsuring that elements fit within a page is not enough. For a responsive design to be successful, the design must also be usable at all screen resolutions and sizes. Responsive website designing include three main principles that will form the whole responsive design:

- Fluid Grid
- Fluid Images
- Media Queries

Detailed explanation of above principles:

a) Fluid Grid

Traditionally, websites layouts were defined in terms of pixels. This is like a magazine or a newspaper which was always going to be the same fixed size. For better or worse, this is not how websites are displayed. Rather, a website might appear in a large format like on a television, or on a very small screen like a Smartphone (or even a smart watch). For this reason, responsive websites are built and designed with relative units like percentages, rather than fixed units like pixels. If you're used to designing in pixels, there's a simple math formula that can help you transition to using percentages. It looks like this:

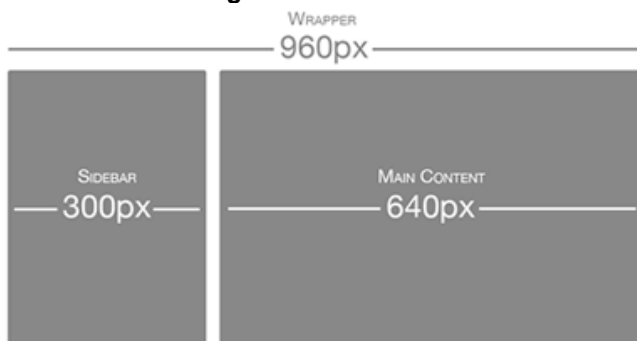**target / context = result**

Figure 2. GRIDS for website.

Example: let's say that you have a website that has a wrapper containing the site to a width of 960 pixels, and you're looking at this site in a maximized browser window on a screen that's 1920 pixels wide. In this case, the width of the browser window is the context and the wrapper is the target. In order for the site to look exactly the same, you can divide the target by the context to get a percentage value.

960px / 1920px = 50%

Similarly as above example, we can divide main layout of our webpage in two or three basic sections. This can be achieved by defining different CSS classes defining length, width, etc in percentage, which can also be used for further division of the sections into sub-sections to fit the content as per required. e.g. CSS Classes

```
.one-half
    {
          width: 50%;
    }
.whole
    {
          width: 100%;
    }
```

The above mentioned classes can be used as follows.

```
<div class="whole">
<div class="one-half">
<p>…..</p>
</div>
<div class="one-half">
<p>…..</p>
</div>
```

The whole class will be the total width of the body tag, defined in your CSS and the one-half class will divide the page into 2 halves horizontally. Similarly as per our requirement different class are designed in CSS which can be used at different point in the code.

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b) FLUID IMAGES

The images should be able to shrink within the confines of a fluid grid. This can be done with a line of CSS code. e.g.

```
img, .img
 {
        max-width: 100%;
 }
```

This code will set the maximum width of the image 100% of its parent container. This code will be implemented on the img tag and img class used in HTML file, the original image size will not affected. If the container is small the clarity of image will not be affected, but if the container size is greater than image's original size and image is displayed in it the images may pixilated. Say an image is of 800px width which has to be displayed in the parent grid of 600px and we have a CSS code defining maximum width of the image, the image will reduce its size to 600px and will display in smaller screen.

c) Media Queries

A media query are CSS technology, consists of a syntax and at least one expression that limits the style sheets' scope by using media features, such as width, height, and color. Media queries allow CSS to only be applied when specific conditions are met. Media queries, added in CSS3, helps in presentation of content be fitted to a specific range of output devices without having to change the content itself. Even more complex media queries can be composed using logical operators, including not, and, and only. The and operator is used for combining multiple media features together into a single media query, requiring each combined feature to return true in order for the query to be executed. The not operator is used to negate an entire media query. The only operator is used to apply a style only if the entire query matches, useful for preventing older browsers from applying selected styles. While using not or only operators, we must specify an explicit media type. We can combine multiple media queries in a comma-separated list; if any of the media queries in the list is true, the entire media statement returns true. This is equivalent to or operator. We could write a media query that will only execute CSS, if the browser reaches a specific width. That means when a design is too large or too small, a media query can be used to detect the site width and serve CSS that appropriately rearranges the site's content.
e.g.
@media screen and (min-width: 600px)
{
......//CSS classes for particular screen size
}

V.   Benefits of Responsive Design

Responsive Design had many benefits, it reduces lots of effort required in designing different website for different screens. Benefits are,

a) One Website, One URL

One URL means we do not need to design different website for different screens. A different website for mobile view means starting from scratch. This will require lots of effort as well as cost. For a responsive website, we can build social shares for just one URL, and when the site does get shared, wherever the link is viewed – whether on a mobile, tablet, or on desktop – all of the content will be clear and easy to navigate.

b) Multi-Screen Adaption

The site content adjusts according to the screen size, simplifying the optimization process for every device variation.

c) Easy To Maintain

Responsive website is all the same i.e., an easier time maintaining content because they only need to make changes to content once. If the majority of your content changes frequently, having a responsive site can help cut down on site maintenance.

d) Improves Search

If website is optimized for several devices, it will rank higher in Google, which means can be easily found on internet. The duplicity of content will be reduced as, there will be one website and hence the value of content won't reduce.

e) Enhanced user experience

60% of people use mobile devices to access internet, having responsive website offer a good mobile experience. This positive experience also has impacts on website performance, SEO and how Google ranks you.

f) Save Time And Cost

Many people have the notion that responsive website is expensive. However, this is not the case, the expenses to duplicate this website for tablets, mobile and other devices are completely eliminated. Therefore, this cut the overall costs of development of this website significantly. Responsive design also cuts the costs that you incur when you maintain different version of websites such as mobile version and desktop version. SO, in the long term, investing in the responsive website is the best decision.

VI. Drawbacks Of Responsive Design

a) Responsive Web Designing is not "one-size-fits-all" in some devices. For instance, some webpage's look perfect in PC, but it looks not so good in Mobile after being resized.

b) The navigation part in mobile devices, the responsive web design also makes the navigation difficult to set out in an instinctual and comprehensive manner.

c) People visiting website in different devices might have different needs, they want something new rather than the same contents in different devices.

d) The average development time of building a responsive website is usually 20% more than the time of building a standard site.

e) These include a longer loading time. Most of the time, users browsers are obliged to download HTML/CSS codes.

VII. Conclusion

Responsive Designing is great idea for those who want to that their website is easily accessible to users. It is difficult to keep up with the different devices and resolutions on the market. Responsive web design adapts the web page to different screen sizes and it is also prepared for the future-devices that haven't been released yet. Along with greater number of mobile devices, the importance of responsive web design is also increased. It is important for a business or a commerce website to be optimized for optimal user experience without major change in the flow, navigation and content. Implementation of responsive web design can result with greater number of visitors, increased sales and customer's satisfaction. More work should be done in defining standards, reducing load time, costs and including best practices of responsive web design and finding the ways for improvements. There are many live examples of successful implementation of responsive web design. Responsive web design is becoming the standard of present web design. It can be concluded that responsive web design has a promising future, and will continue to develop.

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