Responsive Web Development Optimization Using CSS Front end Framework "Bootstrap"

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Abstract

In modern digital era, the internet is a crucial part of our lives. Our capability to achieve it through multiple different devices anywhere and anytime makes more omni-present. Responsive web design and web development that is focused to provide design and development should acknowledge to the user's environment based on media's screen size, platform and orientation. A web design implementation consists of a mix of grids and layouts and an efficient usage of HTML5 and CSS3 media queries. The responsive website changes based on size of media. As the user shifts from their desktop or laptops to smart-phone or any other devices like iPad, tablets etc. Responsive web design (RWD) is a design approach to creating websites that are automatically adjustable to any screen size of device type such assmartphones, desktop, laptops or any other smart devices.

In this paper, we discuss about open-source CSS framework that is Bootstrap which is an integral toolkit for responsive web development.

Keywords: Responsive, Web Design, Web Development,CSS Framework

1. INTRODUCTION

Now days, more than half of the world population is connected to the internet. In 2018, statistics reports that about 61.27% of internet users are using small smart devices such as mobiles and tablets etc to access the internet.From above statistics, McKinney & company explored that 60% are not mobile friendly or difficult to access.[3]

During 1900 century, web designers had to separate web page for small devices such as mobiles and tablets. Now days, it is possible to develop one website for both computer and mobile devices. A responsive web page means suitable to all the media

devices.Responsive web development is a viewpoint that resizes and re-arranges that web pages on the size of browser. With a responsive website, solves the problem of building the same code across multiple screen sizes. If a website is responsive, changes of items can be seen in real time execution. If you rescaleyour browser window or move on different devices like mobiles, you will see the screen elements resizes accordingly to the browser. [2]
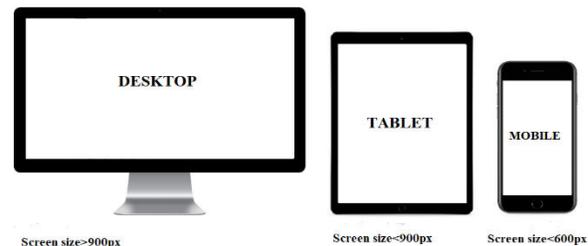

Figure 1. Various devices' screen sizes and resolutions

Behind this execution, this includes three principles: Fluid grids, Images and Texts and Media queries.Above these principles that come together to form that is responsive design. [4]

2. LITERATURE REVIEW

2.1 The evolution of Web paradigm

Internet has seen a tremendous growth in terms of coverage and awareness. So, giving the business an online presence has become very crucial and important. A number of significant changes have arisen, from basic paradigm of Web 1.0 to Web 4.0. [5]

Web 1.0

TheWeb 1.0is also a first version that is also referred as real only web is the era 1990-2000) where the role of a user is limited to reading information by content

producers. Example of Web 1.0 are static web sites and personal sites. [1],[5]

Web 2.0

It is also referred as social web or read-write web is the era (2000-2010) which facilities interaction between web users and web sites. Some of the famous Web 2.0 applications are Facebook, YouTube, Flicker, Twitter etc. [1],[5]

Web 3.0

The web 3.0 also referred as read-write execute is the era (2010 and above) which refers to the future of web. Some famous Web 3.0 applications are Artificial Intelligence and Machine Learning. [1],[5]

Web 4.0

The web 4.0 emerges currently as a new paradigm arising from the technological advances of mobile devices, Internet of things and ad-hoc network. [1]

2.2 The concept of responsive design

Website design is a crucial part in a website development. The web design process uses techniques to acceptable structuring of information, using convenient resources to give on a site, in a manner that the user can attain his aim in direct and cheerful way.Responsive web design is to automatically hide, resize, shrink, or broaden a website to make it look good on all devices such as (desktops, tablets and phones). In simple words, a web page should look good on any device.[6]

A responsive website changes the layout to offer an experience based on device being used such as desktops, mobiles etc. A responsive website includes design elements such as

- ➢ Adequate space
- ➢ Readable text without requiring zoom
- ➢ No horizontal scrolling

Figure 2. Responsive design of a website with various devices' screen sizes and resolutions

Creating responsive design includes: tailoring the page layout to the resolution of the device, resize the images automatically to fit on the screen, hide unnecessary elements in smaller devices and use intelligently features in smart devices, such as changing the orientation of the content view.The importance of responsive web design is that it offers an optimized browsing experience. Basically, your website will look great well on a desktop(or laptop), a tablet, and a mobile phone's browser. [1]

3. PROBLEM STATEMENT

Creating web page design run it on desktop, it looks nice, but when it runs on tablet and other small devices, it doesn't seem good. In earlier days, web development implemented in various and different version of the one website for various user.So, to make html page design perfect for all the devices and for all various device's browser, using Responsive Web Design (RWD) is really necessary. [2]

4.RESPONSIVE WEBSITEDEVELOP-MENT OPTIMIZATION

A website must be accessed by different devices. Each and every website has different needs and thus requires different features. If a website is not accessed by a user through certain devices, it risks losing out on visitors from those devices based on resolution, screen size and orientation. These devices include smartphones, tables, desktop and so on. You can look how the web pages change their layouts to fit on the different various devices. Responsive design is a way to compose a site so that it naturally scales its goods and data to test the screen size and its resolution on which it is viewed by different media's users. The essential goal of responsive design is to avoid the irrelevant zooming,

resizing and scrolling that occurs with web sites that is not accessed through different devices. It can even more cost your viewers who become frustrated with figuring out how to fetch information from your web sites.[2],[7]

The most important benefits of a responsive web sites are that any viewer on any media will have the best experience. A responsive web design increases visibility on various search engines- because it is mobile friendly. Mobiles/smartphones are slowly taking over the primary user experience the web. This means that having a responsive web sites is more important and consistent.

Major benefits of making responsive your web sites include:

- Optimization
- Improved viewer experience
- Flexibility
- Cost effectiveness
- More Search Engine Optimization (SEO) benefits

Figure 3.Adaptive web content layout

There are a number of things to think about when creating a responsive website design. Web properties built using this framework will automatically scale from phones to tablets to a full desktop experience without any manual intention from the content editor. The three main components of a responsive web design include:

- A fluid grid system
- Flexible text and images
- Media queries

Above terms are explained below:
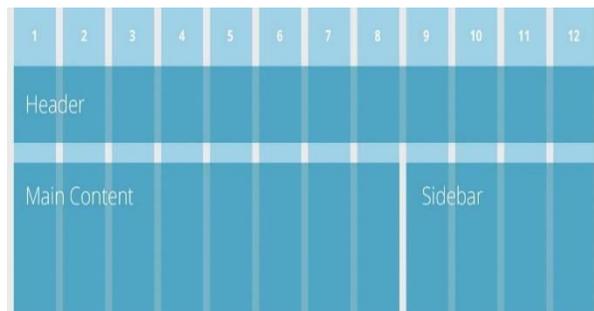
A. Fluid grid

The grid is a crucial element a responsive layout. Fluid website are built using percentage for widths. As a

result, columns are relative to one another and the browser allowing it to scale up and down fluidly. A fluid grid used to for responsive sites will ensure that the design is flexible and scalable. Elements will have persistent space; proportion and it can adapt to a specific screen-width based on percentages. [2]

The most common screen's sizes and resolution are:

- Large desktop (1220px and more)
- Desktop (960px - 1219px)
- Tablet (768 px - 959px)
- Mobile (479px and less)

With a fluid grid, users will have the best experience on whatever screen they view your responsive website

on. [4]

Fig 4. Fluid Grid Representation

B. Flexible Images and Text:

The usage of fluid images causes the adjust most of size to the parent block. The image will scale out according to the media's device screen size and resolution. The way to advertise text varies depending on what device a user is viewing you publish on, but it should be readable. Extensible text and images adapt with a website structure width, according to the contenthierarchy set with CSS.[2],[4]

```
img{max-width: auto;height: 100%;}
```

Fig 5. Basic CSS Query

C. Media Queries (@media):

A new feature in HTML5 and CSS3 known as "media queries" allows capable browsers to detect the size of

the user's screen. This is code that powers the flexible of a layout on responsive website. Media queries defines the CSS to beapplied accordingly, depending on different devices (i.e. desktop orientation or smartphone orientation etc.).Media queries allow for multiple layout of a design, which use the same HTML coded page. Media queries are used to write CSS for specific situations, which allows you to apply styles based on the information about device resolution. We have to specify some breakpoints in the CSS. [2],[4]

```
/* Big tablet to 1200px (widths smaller than
the 1140px row) */

@media only screen and (max-width:
1200px) {}

/* Small tablets to big tablets: from 768px to
1023px */

@media only screen and (max-width:
1023px) {}

/* Small phones to small tablets: from 481px
to 767px */

@media only screen and (max-width:767px)
{}

/* Small phones: from 0 to 480px */

@media only screen and (max-width:480px)
{}
```

Fig 6. A Website's Media Queries

4.1 Importance of Responsive Web Develop-ment

- ➢ Increased sales
- ➢ Easier website management
- ➢ Improved SEO and ranking on SERPs
- ➢ Easier web tracking
- ➢ Renders across any screen size
- ➢ Provides control and flexibility
- ➢ Give better user experience
- ➢ Time, performance, speed and cost effectiveness
- ➢ Lower bounce rates
- ➢ More mobile traffic
- ➢ Future scalability

- ➢ Increases accessibility

4.2 Challenges of Responsive Web Develop-ment

- ➢ Bad content adaption
- ➢ Difficulties optimizing user experience
- ➢ Higher loading time
- ➢ Not suitable for complex projects
- ➢ Time consumption
- ➢ Navigation menus
- ➢ Hiding and Removing contents

4.3 Working with a Responsive Bootstrap Framework

Bootstrap is the most popular framework for creating responsive layouts which support all devices. Bootstrap is a framework to help you design websites faster and easier. Bootstrap is a authoritative toolkit which is a collection of HTML, CSS, and JavaScript tools for making and constructing responsive, mobile-first web pages, web sites and web applications.

It is a free and open source front-end web framework, hosted on GitHub, and originally created by (and for) Twitter. Almost all latest web browsers support Bootstrap. It was developed by Mark Otto and Jacob Thornton at Twitter. Bootstrap was initially released August 19,2011 and licensed under MIT. Major benefits are mobile first approach, browsers support, easy to start.

Some of its interesting features are listed below:

- ➢ **Easy to start**: Basic knowledge of HTML5 and CSS3 can start using Bootstrap.
- ➢ **Browsers support**: Bootstrap version 3 and 4 are compatible with all web browsers such as Google Chrome, Internet Explorer, Safari and Firefox etc.
- ➢ **Mobile first approach**: Small smart devices layout is first approach of Bootstrap methodology.
- ➢ **Responsive design**: Bootstrap's responsive website are optimized to smart device, tablets, laptops and desktops.

Bootstrap gives responsive CSS classes, CSS components and JavaScript components. Bootstrap uses mobile first approach to make responsive

websites. As per mobile first access, bootstrap indicates to first create the web pages for mobile devices and later enlarge and enriching the website render it on other large devices as well.Bootstrap includes HTML and CSS based design templates for forms, buttons, typography, navigation, tables, modals, image carousels, and many other, as well as optional JavaScript plugins. It also provides you support for JavaScript plugins. Bootstrap is adaptable with all modern browsers (Chrome, Firefox, Safari, Internet Explorer and Opera).

4.3.1 Visual breakpoints

Breakpoints are screen sizes you can use to define different layouts. Basically, these breakpoints are t-shirt sizes. Bootstrap has four categories according to various media devices' width such as large devices, small devices, small devices and extra small devices. [8]

NAME	SYM-BOL	VIEWPORT	EXAMPLES
Extra small	Xs	<768px	Mobile devices
Small	Sm	>=768px and <992px	Smart phones &tablet devices
Medium	Md	>=992px and <1200px	Laptops
Large	Lg	>=1200px	Large desktop devices

Some predefined criteria:

➢ Those devices with width size <768px are put in the categories of extra small devices and it is denoted as "xs" in Bootstrap methodology.
➢ Those media devices with width size between >=768px and <992px are put in the categories of small devices and it is denoted as "sm" in Bootstrap methodology.
➢ Those media devices with width size between >=992px and <1200px are put in the categories of small devices and it is denoted as "md" in Bootstrap methodology.

➢ Those media devices with width size between >=1200px are put in the categories of large devices and denoted as "lg" in Bootstrap methodology.

Table 1: Sizes and categories of media devices
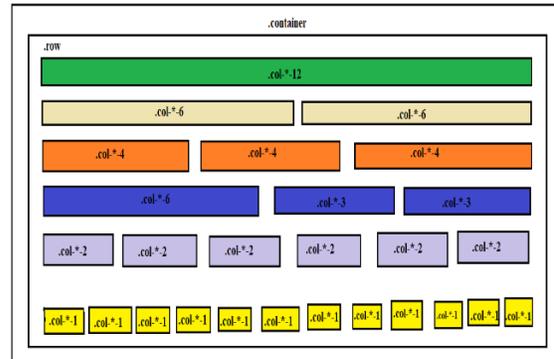
4.3.2 12 Column Grid Layout

Fig 7. Bootstrap's 12 column grid layout structure

Bootstrap'scolumn grid structure system provides 12 columns across the webpage. Bootstrap divides the complete device width into 12 columns. A number specified with the class represents the element having that class will take the specified number of column space of total 12 column. [8]

4.3.3 How to add Bootstrap:

Building a Responsive Web Design with bootstrap, follow the following steps:

1. Download Bootstrap and inline text editor
2. Install text editor
3. Extract the bootstrap files in to your project folder
4. Create html file and save it as index.html in the project folder

Three files are included in this:

➢ bootstap.css
➢ bootstrap.js
➢ jqyery.js

Mainly, there are two ways to use Bootstrap in webpage:

1. use a CDN (Content Delivery Network)
2. Download and store a copy of Bootstrap file in our web server or local server.
(downloading link: http://getbootstrap.com/getting-started/#download)

Include Bootstrap CSS:

- Use CDN link

Fig 8. CDN link in a web page

- Use copy of Bootstrap file

Fig 9. Copying link of Bootstrap file in a web page

5. CONCLUSION

Responsive Web Design has grown to become one of the most important part of website development and it is rising trend in developing websites for optimized user's experience across various media's devices with respect to screen sizes and resolution. Responsive web designs are not low maintenance, but also provide versality and a smooth experience user experience. Major benefit of responsive web development that improves SEO and rises in SERPs. Hence, Bootstrap is an effective that is easy to maintain and provides responsive web design and it is an effective and powerful open-source tool that has become one of the popular front-end responsive frameworks in the internet world.

REFERENCES

[1] Almeida Fernando,& Monteiro José (2017), "The Role of Responsive Design in Web Development", Volume No. 14, Issue No. 2, Page No. 48

[2] Panchal Priyanka. (2017). "Responsive Web Design and Web Development Using Bootstrap Front-End Framework", Volume No. 6, Issue No. 7, Page No. 1

[3] Loggie Nick. (2020). "Optimizing Bootstrap Responsive Web Design to Boost Conversions". Retrieved 25 January, 2020, from https:// www .adlibweb.com/optimizing-bootstrap-responsive -web-design-to-boost-conversions/amp/

[4] Gregory Sonia. (2019). "Why Responsive Design is important"? Retrieved 27 January, 2020, from https://freshsparks.com/why-respon sive-design-is-important/

[5]Madurai Vivek. (2018). "Web Evolution from 1.0 to 3.0". Retrieved from 2 February,2020, from https://medium.com/@vivekmadurai/web-evolution-from-1-0-to-3-0-e84f2c06739

[6]"HTML Web Responsive Design". Retrieved from 5 February,2020. From https://www.w3 schools.com/html/htmlresponsive.asp

[7]"Why is Responsive Design so important"? Retrieved15 February,2020. Fromhttps://www.webfx.com/web-design/why-responsive-design-important.html

[8]Shukla Ashish. (2016). "Creating Responsive Website using Bootstrap". Retrieved 20 February,2020. From https://www.codeproject.com/Articles/1113048/Creating-Responsive-Website-using-Bootstrap