Improving Web user Experience by Adapting RWD

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Abstract: Responsive Web Design (RWD) is a design which focuses on responsively fitting in whatever device the website is accessed from. It involves writing code for all possible screen sizes and bundling them together. Hence when the website is accessed, the whole bundle alongside the code for all screen sizes are downloaded to the user's device and acts responsively when the browser window is resized, or the mobile device is rotated to portrait or landscape orientation. RWD can provide a far better user experience than the other designs because it primarily focuses on the user experience. Despite the bundle size being large, this method has proved to be robust in providing a better user experience and has evolved with evolution of web technologies. Latest CSS Media Queries make it possible to even target devices with limited accuracy. CSS Media Queries form the fundamentals of RWD because it is the most used way of targeting devices with various screen sizes.

Keywords: Responsive Web Designing, Web Experience, Web Design, Mobile-Friendly Design.

I. INTRODUCTION

The field of web design has been continuously evolving since the introduction of smartphones. As the global smartphone usage continues to increase, mobile-friendly design has become the prime focus in the web design field. There are a number of factors to consider when choosing the right web design for a site or application. In the past decades, websites used to be built with fixed dimensions. They were originally meant to be viewed on a large screen. And when viewed on a small screen, they didn't provide a good user experience. But these days, users mostly rely on their smartphones and tablets to access the information quickly. And the idea of providing a good user experience in smartphone and tablets has led us to three new web design options: Adaptive, Responsive and Fluid web design. Each of these designs has its own pros and cons. But irrespective of the cons, RWD (Responsive Web Design) continues to prove effective and better when it comes to providing better user experience. For comparing the three designs, microsoft.com, gmail.com and amazon.com are considered for case studies as they are most used RWD, AWD and FWD web sites respectively.

II. TERMINOLOGIES

A. Breakpoint

The widths at which a website changes its layout to fit better in the device and increase the user experience are called breakpoints. Breakpoints can be specified using CSS Media Queries.

B. Responsive Web Design (RWD)

The RWD uses CSS Media Queries to target breakpoints and adjust the layout to scale images, wrap text so that the website would 'shrink / scale to fit' on any screen size.

C. Adaptive Web Design (AWD)

AWD uses the CSS Media Queries to identify the screen size and load the version of the website designed specifically for that screen size.

D. Fluid Web Design (FWD)

FWD sites use percentages for width so that the layout looks same on different screen sizes.

E. Fixed Design (FD)

Fixed Design (traditional) websites use fixed widths making them less user-friendly and do not fit inside different screen sizes.

F. CSS Vendor Prefix

CSS vendor prefixes are a string of characters relating to specific browser engines that we place before a CSS property name.

III. TOOLS USED

A. Google Lighthouse

Google lighthouse is an online open-source tool for auditing performance, accessibility, SEO, etc… of any web page. It can be automated to perform the analysis. Developed and maintained by Google, this tool serves as an industry-standard to analyse the performance and accessibility of web pages and sites. The analysis result contains scores for each category scored by the website and provides suggestions on how to improve the scores for providing a better user experience. Google lighthouse works with chromium-based browsers.

B. Google Mobile-Friendly Test

Google Search Console's Mobile-Friendly Test Tool is an online open-source to check the mobile-friendliness of a webpage. It runs the webpage on a variety of different screen sizes to detect any user experience flaws and reports where the page is mobile-friendly or not for it.

IV. RESPONSIVE WEB DESIGN

If Responsive web design (RWD) changes its layout to fit better inside the device. The codes required to make the site run on any device irrespective of the screen size are bundled together and executed separate using CSS Media Queries. It is recommended by Google. It is like **write once and run everywhere[11]**.

Google frequently changes its search and ranking algorithms to provide better results for the users and take mobile-friendly design into consideration when determining search engine rankings. If a website isn't built with RWD, it may end up at the bottom of the google search results. Other than rankings, responsive web design provides a good user experience that helps the user to navigate the site easily and get information quickly. It is recommended to use CSS vendor prefixes in the web pages to make them responsive across multiple platforms, operating systems and browsers which may lead to additional page size. However, since all the codes for different screen sizes are bundled together, the web page's download size increases, leading to increased loading time. The unused codes in the page decreases the rendering speed of the browser.

Case study - Microsoft uses RWD in its websites to provide a better user experience for the users. It has over 8 breakpoints to detect the screen size and uses CSS Media Queries to adjust the layout to that particular size. The following chart shows the time split-up taken for the browser to display the microsoft.com webpage.
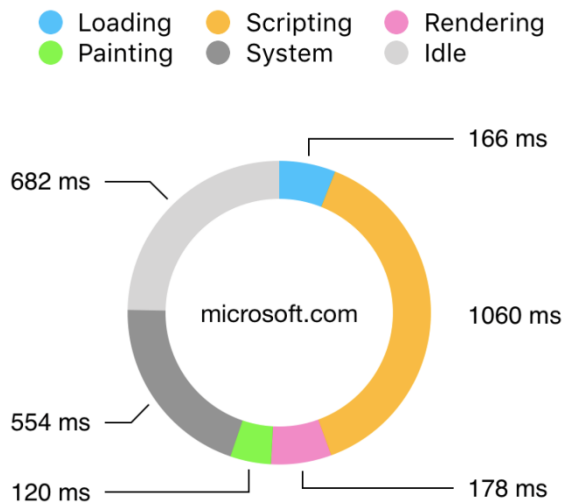

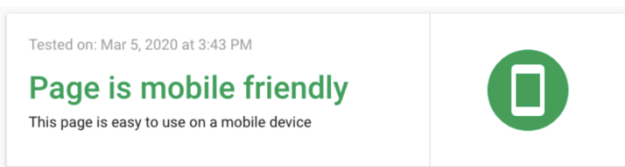**Fig 4.1: Time split-up taken for the Browser to display microsoft.com webpage**

**Fig 4.2: Google Mobile Friendly Test results for microsoft.com**

Fig 4.3: Google Lighthouse Analysis results of microsoft.com for both Mobile and Desktop

Despite all these pros, AWD is actually a better option than RWD in some cases, especially for older sites that already have a strong domain and user traffic. Instead of having to completely redesign the site, which can frustrate consumers who are used to the usual look and feel, AWD allows for a more mobile-friendly site.

V. ADAPTIVE WEB DESIGN

AWD detects the screen size using CSS Media Queries and user agents to pull the appropriate layout from the available options. There are over six common screen sizes that cover most of the ways that a user might view a website, so all AWD websites should have at least these six options. Although creating multiple versions of the site for multiple screen sizes looks like extra work, it can provide better performance when compared to RWD due to the low bundle size. AWD bundle sizes are usually less when compared to RWD as they only contain the code required for the functionality in one particular browser and screen size. This decreases the download time and increases the rendering speed of the browser. For sites already with a desktop version, AWD would most likely be a better option than others.
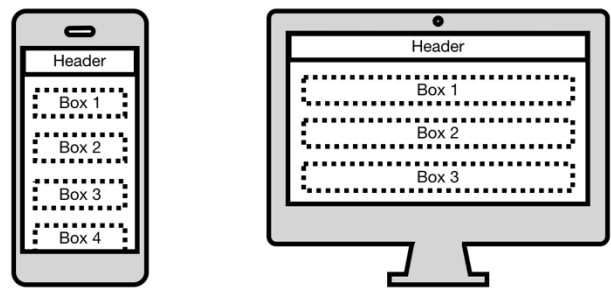

However, whenever a new device with a new specification is released, the code has to be updated to make the site work properly on the new device. Another major drawback is that, the moment the user tries resizing the browser window, the layout begins to change. So, whenever the user resizes, new layout must be pulled from the server to fit into the new screen size which may lead to unnecessary wait time for the user until the page has been loaded.

Case Study - Gmail uses AWD in its webpages. The strategy is that downloading only the code needed to render the page on that particular device and browser may save time and result in faster download. This also makes the rendering fast and gives the first meaningful picture to the browser in a very little time compared to RWD. The following chart shows the time split-up taken for the browser to display the gmail.com webpage.
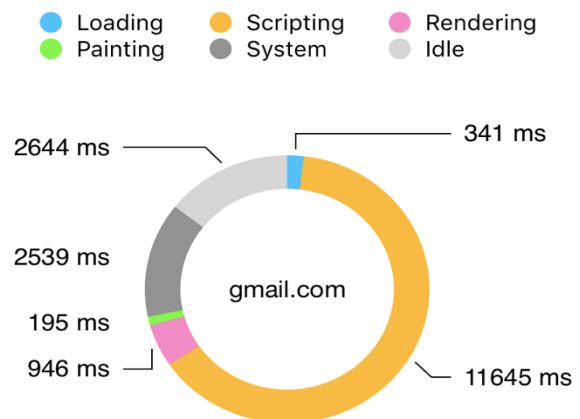
Fig 5.1: Time split-up taken for the Browser to display gmail.com webpage
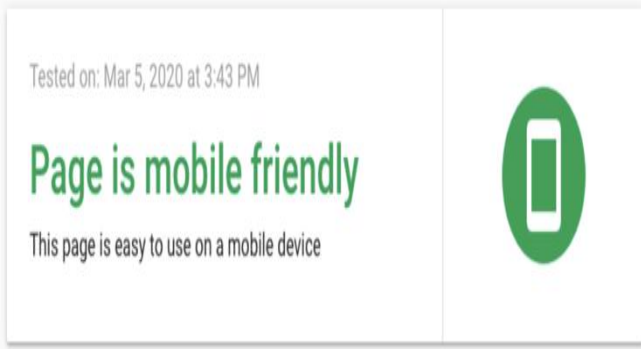

Fig 5.2: Google Mobile Friendly Test results for gmail.com

Fig 5.3: Google Lighthouse Analysis results of gmail.com for both Desktop and Mobile

VI. FLUID WEB DESIGN

Fluid design has the same adaptability as RWD and AWD sites, but unlike RWD and AWD[7], Fluid design uses percentage for widths. This makes the page to fit in almost all screen sizes. Using the same code on all screen sizes make it more reliable in terms of speed and execution. But unlike RWD and AWD, the design remains constant on all screen sizes. This leads to poor user experience. But separate design values for targeted devices would solve this problem. Google does this by detecting the screen size by using CSS Media Queries and user agents. Since google has a large database of device details, it can correctly identify the device and provide better user experience. This design cannot be recommended unless a huge amount of device details required to identify the devices are available.
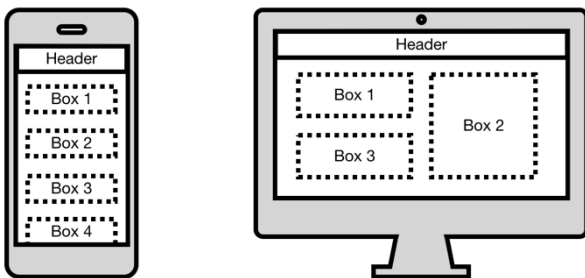

Case study - Amazon uses Fluid Design in amazon.com to deliver blazingly email service. Here, the strategy is using percentage for widths to make the content fill the screen. By this design, amazon is able to provide a unified design on all devices irrespective of the screen size This also eliminates useless code, thus making the webpage to render in no time.

The following chart shows the time split-up taken for the browser to display the amazon.com webpage.
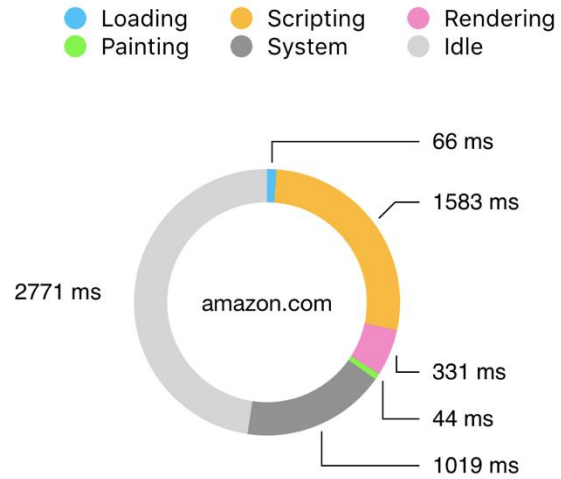
Fig 6.1: Time split-up taken for the Browser to display amazon.com webpage
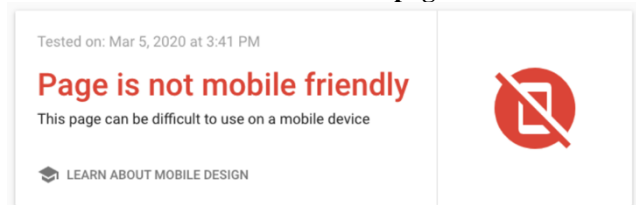

Fig 6.2: Google Mobile Friendly Test results for amazon.com

Fig 6.3: Google Lighthouse Analysis results of amazon.com for both Desktop and Mobile

VII. COMPARISON

On comparing the three designs, it is clear that RWD scores better than the others in terms of both performance and accessibility. And once the webpage has been loaded, RWD can render the styles in almost any screen size without additional downloads.
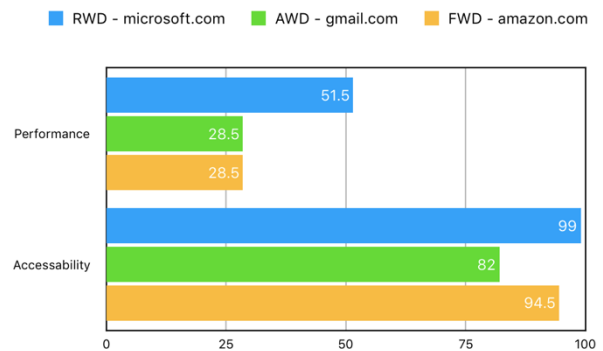
Fig 7.1: Comparison of Page Load Time split-ups for RWD, AWD and FWD

It is also mobile friendly and provides the same user experience across multiple screen sizes.

And when used with HTTPS[10] (Hypertext Transfer Protocol Secure), browsers would cache some resources like fonts,

CSS files, images, etc… Hence the resources need not be download again once downloaded. This pretty much solves the high bundle size issue. Once a page is accessed, the resources used by that page are cached and reused across the entire site. This technique works for all designs but provides better results in case of RWD.
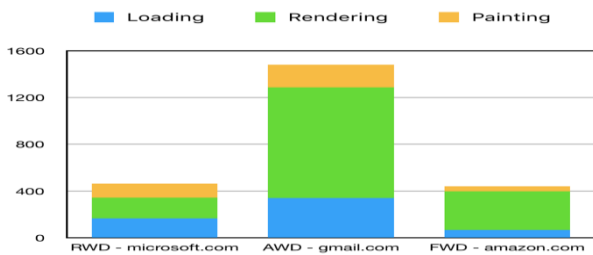

Fig 7.2: Comparison of Google Lighthouse Analysis results for RWD, AWD and FWD

VIII. CONCLUSION

On comparing all the three designs, we can conclude that the better design selection actually relies on the business type. But since RWD is the one with fewest cons, it can be considered a go-to solution in most cases. The large bundle size in RWD is less of a considerable issue since we have better internet speeds like 4G and 5G (expected to conquer the internet in the near future). Performance issues are neglect-able since the smart devices in people's hands have more processing power than it was required to send man to the moon. With these details one can conclude that RWD is currently the only web design that is preferable in all conditions.

IX. RESULT

Hence, with the results of all the comparisons, it is proved that Responsive Web Design (RWD) is the best for all kind of business irrespective of the server hardware resources and it is the only design that is rewarded with better ranking by Google in their search results. It also provides the best user experience when compared to the other designs. Hence it is proved that Responsive Web Design (RWD) is the best web design that can improve the user experience.

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