Responsive web design – Are we ready for the new age?

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Abstract

Due to the rapid development of the IT industry, there are many different devices for accessing the web: desktop computers with a wide range of screen dimensions, tablets, mobile phones, TV-s. Hence there is a need for adapting the web content layout for different screen dimensions and resolutions. Responsive web design is a modern technique for that purpose. This paper considers the implementation of responsive web design in practice. We conducted a survey and analysed 470 websites of various categories and countries and give an analysis on the obtained results.

Keywords: responsive web design, adaptive web content layout, fluid responsive, semi-responsive.

Introduction

Due to the evolution of techniques and communication devices in the past decade, anyone can easily surf around the web using a PC, mobile phone, tablet, television, game console, etc. All these devices have the ability to access to the internet, and have their own screen dimensions and use different resolutions. Hence web designers should take care that the content of their website is readable and functional on all these resolutions.

That was a motivation for the development of Responsive Web Design (RWD). The term RWD was first mentioned by Ethan Marcotte in his report published in May 2010 on the portal "A list apart". Therein (Responsive Web Design, 2013) he described theories and the applications of RWD. One year later, the term RWD was ranged on the second position on Top Web Design Trends in the British e-magazine .net.

The year 2013 was announced in Mashable Inc., the British-American news website, technology and social media, as a year of RWD, (Mashable, 2013). Hence the idea of the authors of this paper to investigate the extent to which RWD is implemented in practice. For that purpose, we checked 470 websites in four different countries: Serbia, Canada, UK and USA.

The authors came to the conclusion that it is necessary to educate web designers and constantly affect to the good organization of the HTML page, so that they could easily adapt to different resolutions and devices.

Responsive Web Design (RWD)

The main idea of the basic principles of RWD and Rich Internet Applications (RIA) is *Web for All and Web on Everything,* see (Karolić, 2013.). The essence of this idea is to enable access to the web content for all existing media. As already stated in the Introduction, nowadays, there are various types of devices for accessing the Internet that have different screen dimensions. But users have similar needs when surfing around the web, regardless of the device they are using. For, example, getting information from websites created for wide screen computers, accessing the web by mobile phone can be quite uncomfortable. Hence the need for adapting the layout of the web content for different screen dimensions and resolutions. On the other hand, creating different web pages for various devices is a hard work for web designers, and should also be avoided. Together with the development of the media industry (mobile phones, ePads, screens), techniques for adapting web content for different media are developing too. In this context, RWD appears to be a good solution.

In the last four years, there is an increase for more than 45% of the use of mobile phones for accessing the web. The estimated number of people accessing the web per mobile phone is about 1.1 billion (Musti, Kashyap, 2013.). According to a prediction of the Ericsson company, (Vanguardngr, 2014), the number of mobile phone users will reach 9 billion in 2018. It is expected that smart phones keep the leader position among other mobile devices.

Overall, the content layout should be well adapted to the users' media. As we can conclude from Fig. 1, there is a wide range of screen dimensions and devices.
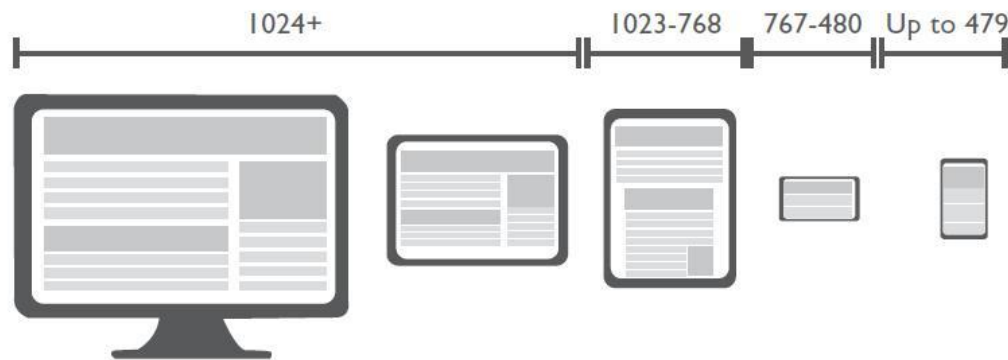

Fig. 1. Content layout on different media (Musti, Kashyap, 2013.)

It is not flexible and not profitable to conduct surveys about what devices users use for accessing your website and adapting the website according to the results. The right solution for different user devices is creating a flexible, smart and adaptive website. In order to do so, one has to take into account different screen dimensions and resolutions and to adapt the content layout accordingly. This is a relatively new concept and requires a well organized HTML structure, as such a structure can be flexible to different devices. Therefore, it is advisable to pay attention to (Developing responsive, 2013; Images Guide, 2013):

- The number of columns of the web page should be adaptive to the screen/window dimensions

- The menus and the content have to be displayed according to the interest of the users

- Images and videos should dynamically be resized in order to fit the screen width

- 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

- The font size and line spacing should be determined to enable easy reading. The number of columns should also be carefully chosen in that manner.

- Using CSS3 rules for visual effects instead of images

RWD is a client-server technology. It is mainly realized through Cascading Style Sheets (CSS). The main idea of RWD is that adapting the content layout is realized with minimum server requests. RWD works the best when the content renders according to the device.

Fig. 2: Adaptive web content layout (Musti, Kashyap, 2013.)

Generally, the content should not be reduced so extremely, that it becomes hardly readable. It rather should be adapted to the screen dimensions (Fig. 2). In other words, it should intelligently re-shape itself for maximum usability and impact.

Creating a responsive website requires using a proportion-based grid, flexible images and CSS3 media queries. The proportion-based grid is often called „Fluid grid". Its basic idea is that the dimensions of all elements should be given in relative units, i.e. in percents (%), whereas fixed units like pixels should be avoided. One should also give flexible dimensions for images which are proportional to various screen resolutions. CSS media queries allow us to create different styles for various screen dimensions and devices. On that way, the web page is displayed using the style which is best adapted to the users screen dimensions.

RWD limitations

Besides all above mentioned advantages, there are also some limitations of RWD. First of all, there is no universal screen resolution, which fits all devices. In other words, the so called „one-size-fits-all" resolution does not exist. Usually, it is not possible to stretch the web content from the smallest smart phone to the resolution of the biggest 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.

Besides RWD, there are some rules which can help adapting the content layout without changing the elements: After determining the optimal content width just add margins to fit the rest of the screen. This is what we called semi-responsive web pages.

One of the limitations of RWD is that some older web browsers do not support CSS3 media queries. In Table 1 the browser support of some CSS3 rules regarding to properties *transform* and *transition* are presented.

Table 1 – Browser support for CSS3 properties *transform* and *transition* (Browser support, 2013)

transform		10		16	-webkit-		-webkit- 3.1		
transform-origin		10		16	-webkit-		-webkit- 3.1		
transform-style				16	-webkit- 12		-webkit- 5		
transition		10		16		26	-webkit- 3		
transition-property		10		16		26	-webkit-		
transition-duration		10		16		26	-webkit- 3		
transition-timing-function		10		16		26	-webkit-		
transition-delay		10		16		26	-webkit- 3		

A solution for some of these limitations are prefixes for the CSS3 properties which make those features working well in various browsers. As shown in the Table 1, for example the browser Mozzila is using prefix *-webkit-* . Overall, in spite of all limitations, the benefit of using RWD is significant.

Statistics and tools for RWD

According to (Browser support, 2013), the most commonly used screen resolutions are 1366x768px (mostly for laptops) - 25% and 1900x1200px (desktop computers) - over 30%, mobile phones with resolution 800x480px - 0.5%. Searching the web by using mobile devices is constantly increasing since 2011. The number of computers around the world reaches 2 billion, while the number of mobile phone owners is up to 5 billion. The need for creating responsive web content which can easily be accessed by using various devices is obvious.

Data presented in Fig. 3 were taken from references (Canadian Internet Usage, 2013; Mobile Access Serbia, 2013; Mobile Marketing, 2014; Mobile Statistic, 2013; Statcopunter, 2014). Fig. 3 shows that, among the countries from the survey, desktop computers are the most used in Serbia, and are used at least in the UK. Also, we can see that mobile phones are mostly used in UK for accessing the web.
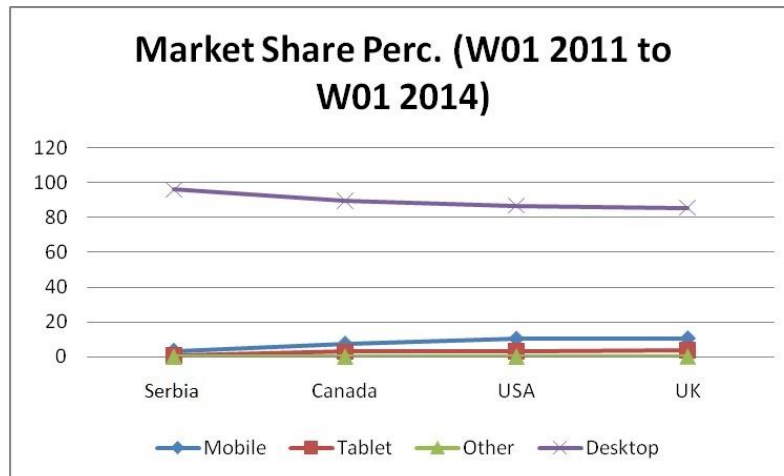
Fig. 3. Usage of various devices for accessing the web in the period 01.2011. to 01.2014.

A tool for responsive design testing http://responsive.victorcoulon.fr enables a tool bar on its web page which gives options to check the layouts of different resolutions and devices.

Fig. 4 Preview of tool for RWD

This toolbar can be connected with any accessed web page a check the layout of the following resolutions: Auto (1366x677), 1024x768, 768x1024, 480x320, 320x480

The survey

The task of this paper will be

- To examine the presence of responsive web design in Serbia, Canada, UK and USA

- To comment on usability, representation and legitimacy of using RWD within web pages.

Methods used in the survey for collecting data were: descriptive and comparative methods.

In this survey, we used two criteria for assessing the implementation of RWD:

- Behaviour of the web content during View port reducing

- The content layout on various screens and devices using the aforementioned tool

In our survey, we will classify the observed websites in three categories:

- Fluid responsive websites,
- Semi-responsive websites,
- Not responsive websites.

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Fluid responsive websites are complete adaptive to different screen dimensions and the content is visible on all devices and resolutions (mobile phones, tablets, laptops and PCs). This can be achieved in two ways: by including CSS3 media screen queries which give us an opportunity to implement different CSS rules for different resolutions or one can use JavaScript or jQuery scripts for dynamic calculating the dimensions and positions of elements according to the screen dimensions.

As we can see on the Fig. 5a, 5b and 5c, the same web site is shown RWD in all of screen resolution on mobile, tablet and desktop devices.
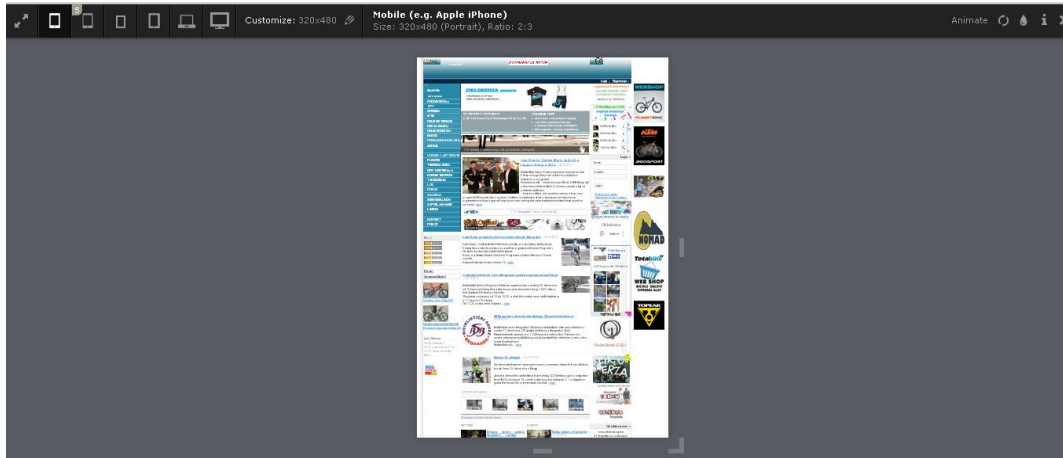
Fig. 5a Preview of fluid responsive site in Mobile (Size of the screen:320x480px, Portrait, Ratio 2:3)

Fig. 5b Preview of fluid responsive site in Tablet (Size of the screen: 760x1024px, Portrait, Ratio 3:4)
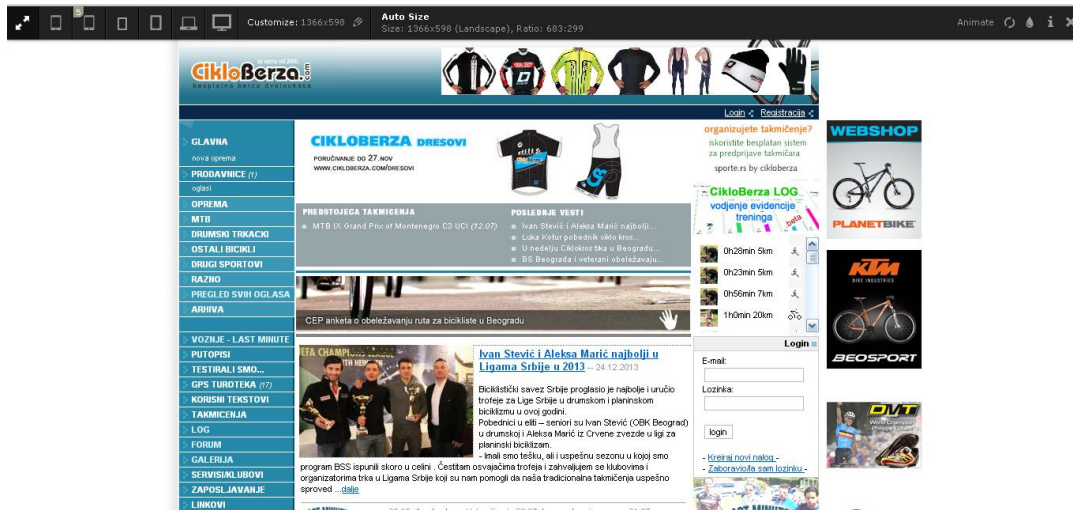
Fig. 5c Preview of fluid responsive site in Auto Size (Size of the screen:1366x598px, Landscape, Ratio 683:)

Semi-responsive websites contain a grid of certain dimensions, and their content is adaptive up to a fixed screen dimension, but the content is no more adaptive on lower screen dimensions. The grid is mainly centered horizontally, and has such dimensions to fit a wide range of screen dimensions. In many cases it is the grid of 960px or 980px width. We call websites semi-responsive:

- If the width of the main content divider is smaller than the majority of screen widths and the rest of the page fits as a background, as shown on the Fig.6a and Fig.6b,

- If they have some elements which are adaptive to all screens, like menus or link buttons,

- If the horizontal navigation bar is moving into a new line without changing the font size

Fig. 6a Preview of semi-responsive site when is shown in Auto Size

Fig. 6a Preview of semi-responsive site when is shown in a smaller resolution

Not responsive websites have elements with fixed dimensions and do not change according to the different devices and screen resolutions. They always keep the same layout as shown in Fig.7.
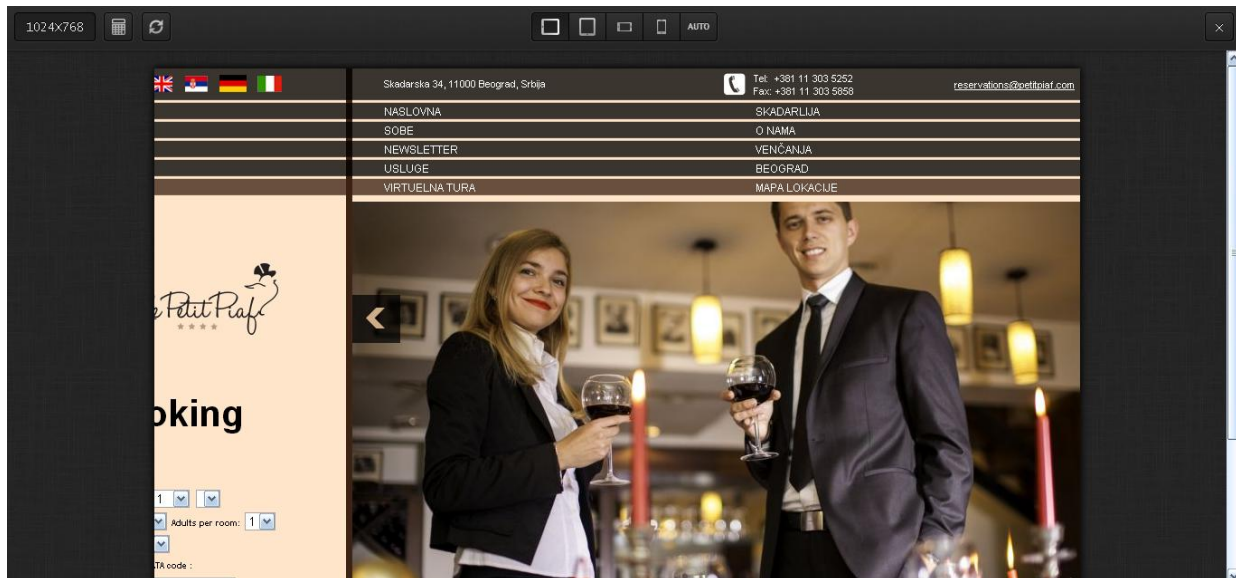
Fig. 7 Preview of not responsive site when is shown in a smaller resolution

In our survey, we checked the use of RWD of websites of various categories like real estates, hotels, book stores, bike stores, music instruments, doctors, dentists, restaurants, foreign language schools, flower shops, home appliances, etc. We tested 470 websites in total from four different countries: Serbia, Canada, USA and UK. The obtained results are given in Table 2 and Fig. 8 to 11.

Table 2 - The results of the RWD survey

	Fluid -responsive	**Semi-responsive**	**Not responsive**	**Total**
Serbia	20	65	32	117
Canada	39	83	17	139
UK	28	32	35	95
USA	28	54	37	119
Total	115	234	121	470

In our survey, we checked 117 websites of the above listed categories from Serbia and obtained the following results: RWD is found on only 17% websites. The majority of websites are semi-responsive (56%), and 27% of the checked websites are not responsive. From the obtained results we can conclude that RWD is not present in general in Serbia. However, the majority of the checked websites is semi-responsive, so we can conclude that there exist an idea about the need of the use of RWD and that there is probably a lack of knowledge how to create fluid responsive websites since RWD is relatively new technique.

Fig. 8 RWD in Serbia

Fig. 9 RWD in Canada

In Canada, there are about 60% semi-responsive websites, and 12% not responsive ones. The percentage of fluid responsive websites is 28%.
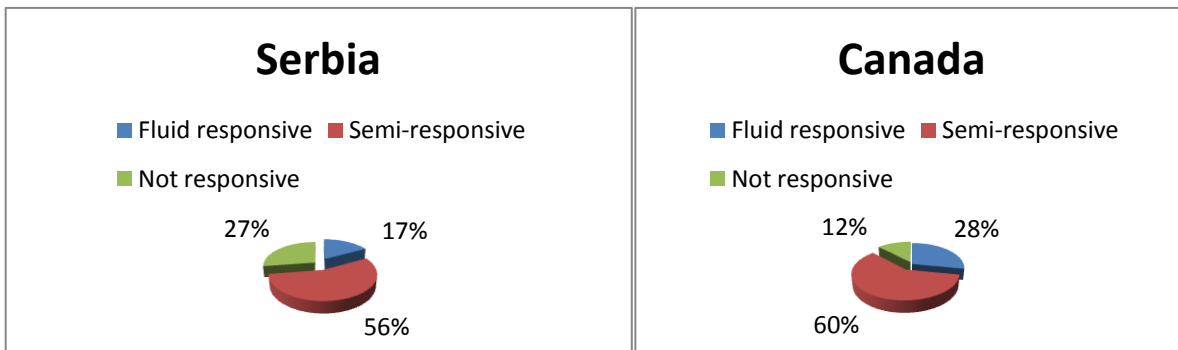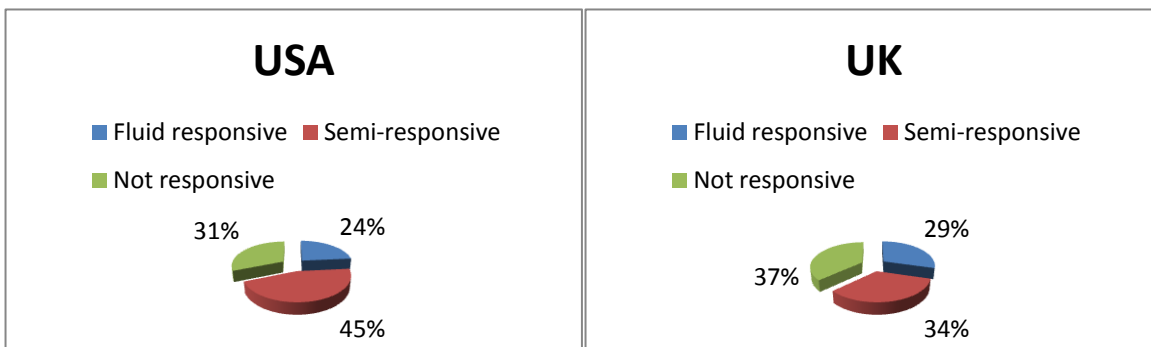

Fig. 10 RWD in USA

Fig. 11 RWD in UK

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As we can see from Fig. 11, there are 37% not responsive websites in the UK. The authors realized that among the countries from our survey, UK holds the biggest percentage of not responsive websites.

Conclusions

The results of our RWD survey indicate that the majority of analysed websites are not created using the latest technologies like CSS3 and HTML5 and are not adaptive to various resolutions and devices. The commonly used technologies are HTML4, CSS2, JavaScript, Flash and PHP.

Taking into account the results of our analyses, RWD and new web technologies are taking big steps to the future, since the need of adapting web sites to various devices is growing continuously. The majority of web sites created before 2012 are optimized for resolutions of 1024x768 and 1280x1024, with a body width of 800px to 960px.

Social network link buttons and email forms are mostly fluid responsive. Also, the most popular social networks are fluid responsive. This could be one of the reasons for their big popularity. Fluid websites are somewhat under represented today, but they are definitely the future of web design. In fact, creating a responsive website is a complex process, and costs certainly more than a common website. One of the problems in implementing RWD is also the lack of knowledge in this area. In other words, this technology is slowly being introduced into the curriculum of IT schools. In The Higher Technical school of professional studies, there are several IT study programs (Web design, Information Technology, Electronic Business and Multimedia) including web design courses. The first two authors of this paper are teaching a subject called *Internet Languages and Tools* which covers topics RWD techniques.

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