Responsive Web Design in Online-CADCOM platform

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Abstract – **In this paper the software development of Responsive Web Design layout in Online-CADCOM platform is presented. The approach for "responsive" design of pages layout in Online-CADCOM is presented, as well as approach for "responsive" design in Content Management System pages' layout. Challenges and benefits of Responsive Web Design in Online-CADCOM are described.**

Keywords – **Software development, Responsive Web Design, Layout, Responsive Elements, Styles.**

I. INTRODUCTION

Online-CADCOM platform with included Content Management System (CMS) is an online assisted platform for computer-aided design in communications that is designed to work not only with standard computer devices with unified resolutions. Furthermore, the platform is designed to work with different devices and Operating Systems (OS) and large scale of resolutions. This approach gives a reliable method to manage all materials and resources that Online-CADCOM stores and it is frequently called "responsive" design, which becomes more important in World Wide Web because the amount of traffic from non-standard devices (desktop computers and notebooks) is half of total internet traffic [1]. Responsive Web Design is an approach for making web designs provide an optimal viewing and user interaction experience – easy reading and navigation with a minimum of resizing, panning and scrolling which is very important for Online-CADCOM due to the platform complexity and large number of online content. The platform is designed to adapt the layout to the viewing environment by using fluid, proportion-based grids, flexible images and CSS3 (Cascading Style Sheets) media queries and media rules that are dynamically adapted according to the used device. Fluid grid concept is a method for resizing and adapting the layout to the viewing environment in relative units like percentages, rather than the traditional method that uses pixels and points [1] which cannot be applied in the platform due to the large amount of different type of content. Also flexible images in Online-CADCOM are resized in relative units, so as to prevent them from displaying outside their containing element. Online-CADCOM also uses media queries that allow the platform to use different CSS style rules based on characteristics of the devices that the platform is displayed.

First challenges and benefits of using Responsive Web Design are presented, and then responsive build of both Online-CADCOM platform and Content Management System is presented.

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II. RESPONSIVE WEB DESIGN DEVELOPMENT IN ONLINE-CADCOM

Responsive Web Design in Online-CADCOM platform was developed with the rule "keep it simple" and it fits literally all screen sizes no matter if it is desktop, laptop, tablet, smartphone or wearable in landscape or portrait mode. With this kind of design, there is need to maintain only one website because while the layout changes, the content stays the same across different devices and platforms. In standard approach, different variations of one platform are created for different layouts, which cost development time and money. That's why this approach is not used in developing the Responsive Web Design in the platform.

One of the biggest challenges related with creating Online-CADCOM Responsive Web Design is to be highly user friendly and in the same time to provide as much information as the full layout provide. The platform uses consistent style and consistent content because users don't expect it to be different just because they use a different device and operating system and this method solves the problem that a lot of web platform has – limited functionalities, lack of information and missing content in "responsive" designs.

Redirects in the platform do not exist in fact that for all devices same page URLs (Uniform Resource Locator) deliver content to all users that use the platform. This method eliminates the problem with redirections to different pages and incompatibilities between different devices and ensures that a link can be certain access directly, no matter from where or what kind of device. This solves the problem with possible email sending from mobile device when a link is open and the need of device switching for this operation.

Load times in Online-CADCOM, when the platform is loaded through a mobile device are significantly decreased because of Responsive Web Design methods for layout, media and media-queries adaptations to the browsing devices. This approach saves the time needed for the platform pages to be loaded and also the 3G and 4G traffic bytes of mobile users.

Another challenge of developing the Responsive Web Design is that older browsers do not recognize media-queries, especially Internet Explorer version 8 and older. Currently about 14% of web users worldwide still use IE8 in accordance with [2]. These 14% are potential users portion of Online-CADCOM audience, which is a reason to solve the problem. Online-CADCOM has additional CSS source code for proper displaying in IE8 and older versions, which makes the platform completely multi usable not only with new trends in web browsing, but also with old methods and versions.

It is not a secret that when a flexible image is resized and scaled in relative units, it quickly loses details and thus its

meaning. This challenge in creating Responsive Web Design in Online-CADCOM was solved with using both for normal and "responsive" layout – vector pictures with low pixel size and in the same time with high dots detail. This gives to the "responsive" design a quality near to the ordinary layout.

III. SOFTWARE DEVELOPMENT OF ONLINE-CADCOM FRONT VIEW RESPONSIVE LAYOUT

Online-CADCOM platform has managed the CAD tools based on Daniel-Gajsky Y model of design levels and has two main panels – Panel 1 and Panel 2 equipped with buttons related to two design areas from the Y model and interconnections between them [4]. Also each tool is characterized and a tool passport is created. Besides the two panels, Online-CADCOM develops and supports a lot of different content [6]. This large amount of different type of content should be properly described and scaled for responsive view in different devices. Even more, this content should be presented properly to the users with all specifications and functions which offer and user should be able to use their full functions. In Online-CADCOM this approach is achieved as exporting all code rules and adjustments in a file in the "front_end" folder with name – "style.css". This file contains all colors, element specifications and placement and also "responsive" rules for different devices.

First and most difficult part of developing a "responsive" layout for Online-CADCOM is adjusting the screen resolution of the platform, when a request is placed. Most of the smart devices offer a function for switching from portrait to landscape orientation when the device is rotated. This changes the parameters of the screen and visible part and often can break the layout of the platform. In Online-CADCOM the method used for this situation is to define all rules for displaying platform elements in according to specific resolution. Code bellow shows how to properly define rules for different device categorization based on resolution using media queries. Media queries are simple filters that are applied to Online-CADCOM CSS styles. They make it easy to change platform styles based on the characteristics of the device rendering the content, including the display type, width, height, orientation and even resolution. They enabled the platform to create a responsive experience, where specific styles are applied to small screens, large screens and anywhere in between. Online-CADCOM styles uses `min-width` tags instead of old and deprecated `min-device-width`. The first tag is based on the size of the browser window, whereas min-device-width is based on the size of the screen. Unfortunately, some browsers, including the legacy Android browser may not report the device width properly and instead report the screen size in device pixels instead of the expected viewport width. Sample code is shown below:

```
/* Small devices (tablets, 768px and up) */
@media (min-width:768px) {
        .fixed-header-on.boxed .header.fixed {
                width: 750px;
```

```
        }
}
/* Medium devices (desktops, tablets, 992px and up) */
@media (min-width:992px) {
        .fixed-header-on .header .logo {
                display: block;
        }
        .fixed-header-on.boxed .header.fixed {
                width: 970px;
        }
}
/* Large devices (Large desktops 1200px and up) */
@media (min-width:1200px) {
        .fixed-header-on.boxed .header.fixed {
                width: 1170px;
        }
}
/* Small devices (tablets, phones less than 767px) */
@media (max-width:767px) {
        /* Fixed header position */
        .header.fixed {
                position: relative !important;
                top: auto !important;
        }
}
```

Device categorization and properly adjusting screen resolution of the platform is not the single step to properly develop Responsive Web Page. Online-CADCOM is optimized for a variety of devices and include a meta viewport element in the head of the "style.css" document. A meta viewport tag gives the browser instructions on how to control the page's dimensions and scaling. The problem is that to attempt to provide the best experience, mobile browsers will render the platform page at a desktop screen width (usually about 980px, though this varies across devices), and then try to make the content look better by increasing font sizes and scaling the content to fit the screen [3]. This is strictly true as regards to Apple devices. For users of the platform, this means that font sizes may appear inconsistently and they have to double-tap or pinch-to-zoom in order to see and interact with the navigation panels and content. Additional rule must be provided for the described case. The code bellow shows, how this malfunction is solved in the platform:

```
<meta name="viewport" content="width=device-width, initial-scale=1">
```

Using the meta viewport value `width=device-width` instructs the platform pages to match the screen's width in device-independent pixels. This allows the page to reflow content to match different screen sizes, whether rendered on a small mobile phone or a large desktop monitor. Some browsers will keep the page's width constant when rotating to landscape mode, and zoom rather than reflow to fill the screen. Adding the attribute `initial-scale=1` instructs browsers to establish a 1:1 relationship between CSS pixels and device-independent pixels regardless of device

orientation, and allows the platform pages to take advantage of the full landscape width.

Part of the responsive layout of Online-CADCOM first page is presented on Figure 1.

Fig. 1. Responsive layout of Online-CADCOM first page.

IV. SOFTWARE DEVELOPMENT OF CONTENT MANAGEMENT SYSTEM FRONT VIEW RESPONSIVE LAYOUT

Content Management System is part of Online-CADCOM which enables dynamically adding content without using any programming skills [5, 6]. This requires the development of Responsive Web Design of Content Management System also. Like the above-described method for Online-CADCOM loading styles method, also CMS platform has its own folder with name "front_end" that stores the file with all styling rules – "style.css". Furthermore, in CMS platform we have two more additional style files that take care about the breakpoints. CMS uses breakpoints to define a point to which content will respond to provide the users with the best possible layout to consume the information in the platform. The approach used for creating the Content Management System is – "mobile first" [3]. Approaching the design "mobile first" is the best approach for a responsive design [3]. It allows CMS to layout the content that is most important to users in a clear and logical way on the smallest screen real-estate. This helps to identify what is the most important information on the platform and how to be properly displayed [7]. CMS content was designed to fit on a small screen size first, and then the screen was expanding until a breakpoint becomes necessary. This optimizes breakpoints based on content and maintains the fewest number of breakpoints possible. The first step of designing the layout is to fit good on small screen with size of 320x480 pixels [8]. Next the browser is resized until there is too much white space between the elements and they do not look good. The decision is somewhat subjective, but above 600px is certainly too wide for the platform instruments for content management. This requires the creation of two additional files for breakpoints like described above. Index page html contains the following code for inserting the style files:

```
<link rel="stylesheet" href="style.css">
<link rel="stylesheet" media="(max-width:600px)" href="style-2-small.css">
<link rel="stylesheet" media="(min-width:601px)" href="style-2-large.css">
```

Common platform styles such as fonts, icons, basic positioning and colors are placed in style.css. Specific layouts for the small screen are then placed in style-2-small.css and large screen styles are placed in style-2-large.css. CMS platform has good responsive layout because between the major breakpoints, it has adjustments for margins, paddings and font size which make feel the platform more natural in the layout.

Screen size of devices is not a definitive of what a user may want to see or use [9]. That's why CMS platform does not hide content from the standard layout just because it can't fit on screen. Instead, each element layout is strictly designed for responsive view, even text. Optimize text for reading is another "responsive" task that is completely done with creating a CMS platform with "responsive" design. Classic readability theory suggests that an ideal column should contain 70 to 80 characters per line (about 8 to 10 words in English) [3]. Thus each time the width of a text block grows past about 10 words, a breakpoint should be considered. This means that the font of CMS will work perfectly on smaller screens giving 10 words per line, but larger screens will require a breakpoint. In this case, if the browser width is greater than 575px, the ideal content width is 550px. Code fragment showed below is for extra small devices layout:

```
@media (max-width: 575px) {
```

```
article {
  width: 550px;
  margin-left: auto;
  margin-right: auto;
  }
}
```

Figure 2 shows how the "Dashboard" of CMS looks. It is part of the screen dynamically generated on screen with size 560x640 pixels:
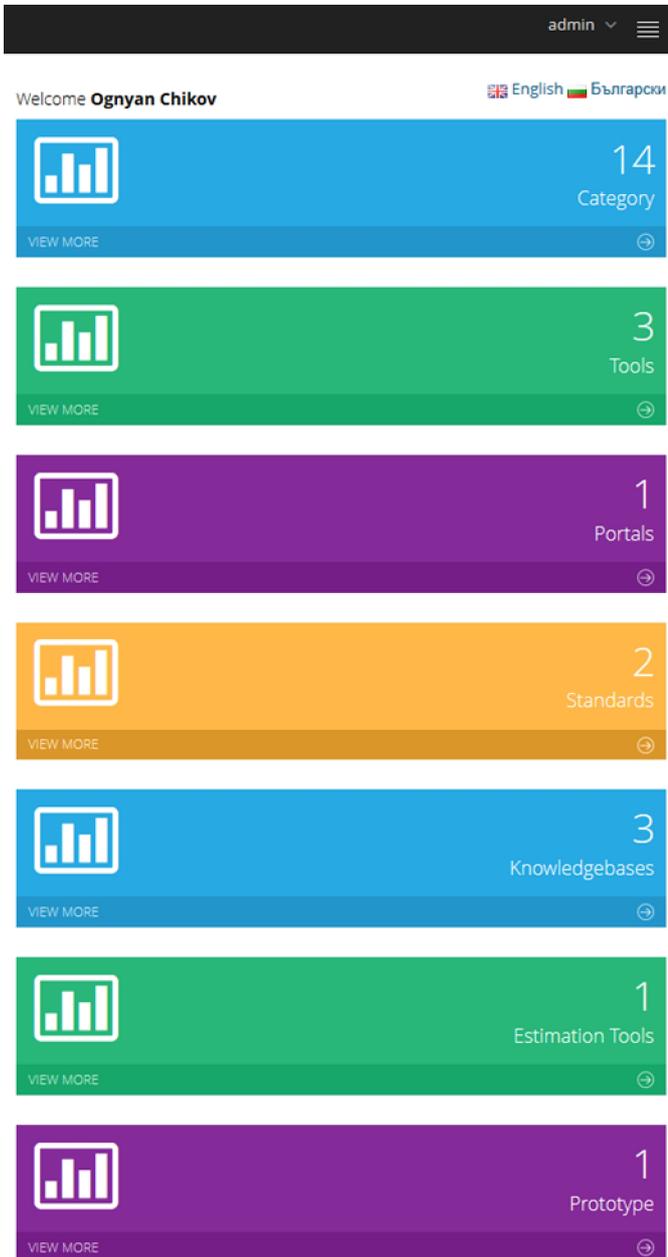

Fig. 2. Responsive layout of Content Management System Dashboard.

V. Conclusion

Online-CADCOM platform with included Content Management System offers to users a completely "responsive" layout for perfect user experience when using the platform. The solution consists of a mix of flexible grids and layouts, images and an intelligent use of CSS media queries which dynamically change the content according to user device specifications. The approach and methods used ensure proper content visualization, easy content management and provides highly effective usability for the platform itself.

Acknowledgement

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