


# Mobile-First Usability Guideline for Responsive E-Commerce Websites

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## ABSTRACT

Handheld devices such as smartphones, tablets, and PDAs are commonly used for online shopping. In order to satisfy web page requests on these devices, web developers are using a responsive web design approach, where websites dynamically adapt to different screen sizes and orientations. One of the challenges faced by web developers is to provide a usable experience across different devices. Motivated by this, a mobile-first usability guideline was established by extracting good usability practices from five popular responsive e-commerce websites. Validation of the usability guideline was conducted, and results indicate that it will have a positive impact on the overall user experience.

## KEYWORDS

Electronic Commerce, Heuristics, Responsive Web, Usability Guideline

## INTRODUCTION

Online shopping (e-commerce) has been around for a while, and it is used by many for their everyday shopping (Lissitsa & Kol, 2016; Zhou & Wang, 2014). Nowadays, it is possible to buy everything online. Thousands of e-commerce websites are available that offer a variety of products. With the advent of smartphones, tablets, and PDA's, many online shoppers are using these devices for accessing e-commerce websites (Lim, Osman, Salahuddin, Romle, & Abdullah, 2016; Mosteller, Donthu, & Eroglu, 2014). Different devices have different characteristics, such as screen size, resolution, input capability, and processing power. In order to satisfy web page requests on different devices, many developers started using responsive web design approach that allows the website to dynamically adjust to different screen dimensions. Responsive web design is now commonly used to design and develop e-commerce websites (Majid, Kamaruddin, & Mansor, 2015; Varon & Karlins, 2020). Since different devices have different characteristics, it is a challenging task to design e-commerce websites that provide usable experiences across different devices.

Motivated by this, a mobile-first usability guideline was established to support the design of responsive e-commerce websites. Mobile-first is a design philosophy where the design process starts from the smallest screen, and then the features are expanded to create a tablet and desktop version (Mullins, 2015; Van Goethem, Le Pochat, & Joosen, 2019). Usability has been identified as one of the key factors that determine the success of e-commerce websites. Hassan and Morris (2017) analyzed different attributes of twelve e-commerce websites and concluded that online customers would not return to a website if it has usability issues. Therefore in order to increase customers buying intention, providing a usable experience is mandatory. Bevan (2001) defined usability "as the ease at which

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specified users can use the product to achieve the specified goal with effectiveness, efficiency, and satisfaction.” In the literature, there are usability guidelines available to support the design of responsive web applications. However, they are very generic and may not be very effective for designing domain-specific applications such as e-commerce. A domain-specific guideline will address issues affecting the domain (Kumar & Mohite, 2016; Kumar & Mohite, 2017; Kumar, Goundar, & Chand, 2019).

The mobile-first usability guideline was established by extracting good usability practices from five popular responsive e-commerce websites. A questionnaire was designed to guide the data extraction process. Ten usability experts used the questionnaire to assess selected e-commerce websites. Card sorting, a knowledge elicitation technique, was used to group the responses. Twenty-six usability guidelines were developed. Heuristic evaluation was conducted to validate the guideline, and the results indicate it will have a positive impact on the overall user experience. This paper is organized as follows; the background section provides information on the responsive web and prior work done in the area. The methodology section describes how the research was designed and executed. Different parts of the methodology, information extraction, guideline development, and guideline validation are described in detail. Finally, the paper concludes by discussing the work done and setting the direction for further investigation in the field.

## **BACKGROUND**

The background section describes responsive web and prior work done in this area.

### **Responsive Web**

World Wide Web has revolutionized the society, having a huge impact on how various sectors of the economy operate today, such as education, medical, business, and many more (Aghaei, Nematbakhsh, & Farsani, 2012; Jacksi & Abass, 2019). It has been at the forefront of the digital world. The world wide web is composed of websites that consist of multiple web pages. A web page is a hypertext document that is displayed using a web browser. Over the years, we have seen some notable technological improvements in website design and development, such as HTML, CSS, JavaScript, etc. (Duckett, 2011). Initially, the websites were viewed using desktop computers that had large screens but with the advent of handheld devices such as smartphones, tablets, and PDA's enabled with the internet, many are using these devices to assess websites. These devices have different characteristics such as screen size, input capability, etc. In order to serve websites request on devices with different screen devices, a responsive web design technique was introduced (Hussain & Mkpojiogu, 2015).

The term responsive web design was coined by Ethan Marcotte, a freelance web designer, in May 2010. It is a development paradigm that optimizes a website that easily adapts to different screen dimensions (Krzewińska et al., 2018; Nogueira, Ferreira, Carvalho, & Berreta, 2017). It provides a smooth viewing experience, navigation, and content reading. The goal of responsive web design was to use a single code base to deliver websites on multiple devices (Cosgrove, 2018; Peterson, 2014). There are many advantages of responsive web design, i) makes development faster by reducing the need to create multiple web pages for devices with different screen dimensions, ii) provides the option to degrade content if required, e.g., images may be displayed on desktop but removed from the display of smartphones, iii) provides easier navigation through panning, scrolling across different devices. There are also a few challenges of responsive web design; i) responsive web design is dependent on CSS3, and this is not supported by all browsers, ii) responsive web design works on resizing the image at times, the full image is downloaded and resized, which takes time, and space iii) making responsive websites usable across different screen sizes and resolutions.

### **Prior Work**

In literature, there are few guidelines to support the design of responsive web applications. Aryal (2014) studied the responsive web design paradigm and development approaches and further analyzed

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