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User experience with web browsing on small screens: Experimental investigations of mobile-page interface design and homepage design for news websites

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ABSTRACT

The efficiency of web surfing with a smartphone depends heavily on how well a website is structured. With the goal of understanding the effects of mobile-page and homepage designs on small-screen devices, we conducted two experimental studies to examine how users evaluated interface designs that are widely used on mobile news websites. We found that the designs for mobile news pages and the structures for website homepages can have a significant impact on perceived ease of use, reading time, and the overall reading experience. Based on the evaluation results and the analysis of the current interface design for popular mobile news websites, we developed two important guidelines for mobile news websites: (1) the single-page design is favored over the multi-page and zooming designs for displaying text-based information, and (2) a homepage with a thumbnail design facilitates information processing better than the progressive and list-view designs. Our research provides valuable empirical evaluations that help interface designers understand the potential impact of various interface designs on user experience. We also identified several directions related to interface design for future investigation.

1. Introduction

With the increasing popularity of smartphones, such as the iPhone, Android, and Windows Phone, mobile web browsing has been growing remarkably fast. According to the latest study from Pew Research [12], 90% of American adults have cell phones or smartphones. The increasing number of cell-phone users makes media content that has traditionally been disseminated through newspapers, TV, or desktop computers more accessible to people. A national survey indicated that about 60% of cell-phone owners have browsed the Internet on a smartphone [12]. Most prestigious news organizations, including CNN, FOX, ABC, NBC, *The New York Times*, *USA Today*, and *The Washington Post*, have all developed their own mobile applications and websites for tablets and smartphones. Smartphones and tablets are predicted to replace the functions provided by personal computers because they are able to handle almost all major tasks at home or work [1].

The widespread use of smartphones poses new challenges for designers who create mobile web content for users: how to make mobile web browsing easier, more efficient, and more interactive? To answer this question, we conducted two

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separate studies that examined various mobile-page interface designs (Study 1) and homepage designs (Study 2) for mobile news websites to understand how they influence users' browsing experience.

We based our research on prior scholarly investigations into the standards and principles of mobile web design (e.g., [10,4]. We found that most of the research either primarily used non-touch-screen mobile devices (e.g., [10]) or simulated the mobile web content on regular computers [14]. However, there is a critical need to understand the reading experience on the most current version of smartphones. This research is one of the first studies to compare the conventional designs for mobile news websites and investigate their potential impact on the users' experience. We also analyzed some of the most popular mobile e-commerce sites to gain an understanding of the adoption of the design features we evaluated. Through the empirical results we obtained, we hope we can offer useful suggestions for smartphone interface designers that will improve the users' experience with mobile news web browsing.

2. Literature review

2.1. Mobile-page interface design

Depending on the mobile-page interface design, people can use their fingers to slide, tap on certain hyperlinks, flip pages, or zoom the content in or out to view web-based content on a smartphone. In Study 1, we identified three basic types of interface designs for mobile news websites. The first one was the *single-page* design. In this design type, a full news story was presented vertically in a single column. For example, mobile.nytimes.com implements this type of design. Readers slide their fingers downward in order to read the story. The second type was the *zooming* design where readers could zoom in when they felt uncomfortable reading the content on a small screen. On real mobile sites (such as www.usatoday.com), a user can zoom in on the content while reading. The third type was the *multi-page* design where a long article is divided into a few pages. At the bottom of each page, users can tap on navigation links to complete the reading (e.g., www.cnn.com). In Study 1, we examined these three types of interface designs to determine whether the design differences can affect the usability of mobile news websites. Our primary purpose, however, was not to set one mobile-page interface design apart or disqualify others. We aimed at understanding the advantages of each design type and examining how the designs enhance people's web-browsing experience in general.

2.2. Homepage design

The homepage of a news website is the gateway through which readers can locate a particular topic or article to read. The homepage design is crucial because it determines how quickly information can be located. A user-friendly homepage usually contains a vast amount of information with a clear organization for different news sections. For example, a reader who is interested in sports can get to the sports section by tapping on the appropriate link on the homepage and selecting an article to read.

In Study 2, we identified three types of homepage designs that have been used by news agencies for their mobile web displays. The first type was the *list-view* design in which the homepage contained news section names and article headlines. Sometimes, each story headline might be accompanied by a brief summary of that story. The list-view design presented a lot of information simultaneously on the homepage. Readers could make a decision about whether they wanted to read an article by looking at the section name, the story title, and a brief introduction about the news. Homepages utilizing this design type were usually very long in length, so readers needed to navigate vertically to locate the information of interest. An example of the list-view design is m.foxnews.com.

The second type was the *progressive* design where a homepage on a smartphone contains only the news section names. After tapping on a section name, readers saw a dozen news headlines for that section. Another tap on one of the headlines led to a preview of the article's summary. Then, by tapping on the article summary, people could read the news story. We described this design as "progressive" because information is presented progressively through a few levels; users progressively obtained more information through several taps. However, we found that news organizations rarely used this type of design. Indeed, the only example we found was abcnews.go.com/m.

The third type of homepage design was the *thumbnail* design in which the homepage usually contained the news section names with relatively large thumbnails or images. By tapping on the image for a section, readers entered another page that listed article headlines for that news section. On this page, each headline might be accompanied by a small picture and a summary of each article. By tapping on the article title, people could read the full news article. Compared with the list-view and progressive designs, the major difference offered by the thumbnail design was that it provided visual presentations. When choosing news sections, users were offered both graphic and text-based information to choose an area of interest. An example of the thumbnail design is m.huffpost.com.

In Study 2, our major purpose was to test whether various routes of information seeking through different homepage designs for mobile news websites have an impact on the users' browsing experience. Again, our major goal was not to set any design style apart but to understand how users evaluate these designs based on their natural interactions with a smartphone.