A Synergic Approach to Web Usability for Smartphones

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Abstract. The mobile phones that we have been carrying with us all the time started becoming increasingly sophisticated and, consequently, the term "smartphone" surfaced. Smartphones today are extremely powerful and, in addition to making phone calls, are capable of performing a variety of other functions. One very important function is the ability to access the Internet. Users of these smartphones regularly conduct online banking transactions, partake in e-commerce activities, browse through informative web portals, take advantage of gaming and other leisure sites, etc. An obstacle that these users face is that access to the Internet is through a tiny interface; this is in sharp contrast to a large, flat-screen monitor that would be available on a desktop computer. Unfortunately, many websites are neither designed for nor suitable to be accessed from these small devices. With relatively little effort, however, the developers of the websites can make the web interfaces more suitable for smartphones and hence accessible to a much larger audience. In this paper, we focus on "web usability", a term essentially concerned with the ease of accessing and entering information on websites. We compile and synergize several different guidelines with the intent of increasing the web usability of smartphones.

Keywords: Web Usability, Mobile Devices, Smartphones

1. Introduction

This paper amasses various different heuristics with respect to the web usability of smartphones and is organized as follows:

- A description of the evolution of smartphones is given is section 2. Furthermore, some recent statistics regarding these smartphones are also provided in this section.

- In section 3, the concept of web usability is defined. We go on to explain why web usability is a difficult concept for smartphones because of the limitations of these phones.

- In section 4, we synergize various web usability guidelines for smartphones with the objective of producing strategies that developers can pursue.

- Finally, a conclusion to the paper and plans for our future research is provided in section 5.

2. Smartphones

2.1. Evolution of Smartphones

The first true smartphone was designed by IBM in 1992. It was made available to the public and sold by BellSouth the following year. In addition to its mobile phone capabilities, the device also contained a calendar, address book, world clock, calculator, note pad, email, games, and the ability to send and receive faxes. It was a highly advanced piece of equipment for its time. [9]

Nokia released its first smartphone in 1996, the Nokia 9000. A later version of this model, the Nokia 9210, also included the first colour screen. The 9500 Communicator was Nokia's first cameraphone and WiFi phone. A modified version of the Communicator, the E90, included a built-in GPS system.

In the year 2000, Ericsson released the touchscreen smartphone R380: it was the first device to use the new Symbian operating system [10]. During the following year, Microsoft announced that it would be offering a Windows powered smartphone [11].

In early 2002, Handspring released the Palm OS Treo smartphone. This device utilized a full keyboard and included wireless web browsing, email, a calendar, and a contact organizer [12]. Later that same year, RIM released the first BlackBerry: it was the first smartphone that had been optimized for wireless email use [13].

In 2007, Apple released its first iPhone. This phone was one of the first to be predominately controlled through its touchscreen. The following year saw the release of the Android operating system for smartphones. Android is an open source operating system that is backed by Google. A couple of years later, in January 2010, Google then launched the Nexus One smartphone that was powered by this Android operating system.

2.2. Smartphone Statistics

Smartphones have been experiencing rapid growth in the last few years. According to Gartner [8], smartphone sales now account for almost 20% of total mobile phone sales. Some of the very recent statistics involving smartphones are quite striking:

- Coda Research Consultancy [6] forecasts that worldwide sales of smartphones will total 2.5 billion units in the period from 2010 to 2015. The Asia Pacific region and the Americas are each expected to generate sales of 0.83 billion units. Coda Research Consultancy also expect that mobile Internet use via smartphones will increase 50 fold by the end of that period.

- Juniper Research [4] predicts that the number of subscribers using mobile Internet services will reach a whopping 1.7 billion users by 2013, with the Far East and China region making up the largest market for the mobile web with almost 416 million users.

- According to Forrester Research [5], small business owners seem to setting the pace for smartphone adoption in the US. While only 17% of Americans currently own smartphones, a massive 49% of small business owners are reported to possess these devices. The phones are being used for everyday business needs such as such as making calls, email, scheduling, tweeting on the go, mobile advertising, location-based applications, etc.

- Morgan Stanley Research [7] estimates that sales of smartphones will exceed those of PCs in the year 2012.

The statistics above all lead to one obvious conclusion: SMARTPHONES ARE IN! At the core of this exponentially increasing demand is the need for handset subscribers to access the Internet on the go. To take full advantage of this inevitable growth in the smartphone industry, developers of websites therefore need to ensure that their sites have been designed for smartphone users as well. Web usability for these phones is covered in the next section.

3. Web Usability

3.1. Definition of Usability

According to the Web Communications and New Media Division in the U.S. Department of Health and Human Services [1], usability refers to how well users learn and use a product in order to achieve their goals and how satisfied they are with that progress. It is Jacob Nielsen who many consider to be the world's leading expert in this field and has been even been dubbed by the New York Times as "the guru of Web page usability" [2]. Neilsen pointed out that usability is defined by five quality components [3]:

- **Ease of Learning**: How easy is it for new users of a product to be able to accomplish basic tasks?

- **Efficiency of Use**: How fast can experienced users of the system accomplish basic tasks?

- **Memorability**: When users return to a product after a period of not using it, how easily can they re-establish proficiency?

- **Error Frequency and Severity**: How often do users of the system make errors, how severe are these errors, and how do they recover from these errors?

- **Subjective Satisfaction**: How much does the user like using the system?

In terms of the Internet, usability refers to the ease by which a website can be used. Having a website that is rated high in terms of usability is an absolutely necessary condition for survival. People immediately

leave the site if they find it difficult to use, if they find it hard to read, or if they get lost. Another reason why users often leave a site is if the homepage does not clearly state the site's objective. If the user is not able to obtain the information that he or she is after, the user won't hesitate to move on to another site as there are always plenty of other options available.

3.2. Limitations of Smartphones

When it comes to smartphones, there are some limitations inherent in these phones that make it difficult for developers to create usable websites. Some of these issues are listed below:

- **Small Screen Size**: On desktop and laptop computers, users are able to open more than one window at a time, and this allows for multi-tasking. Because of the small screen size on smartphones, this restricts the amount of information that can be displayed at any one time. It is also often difficult or impossible to read text and view graphics on small screens.

- **Download Delays**: On most mobile devices, speed is definitely a major factor. Often, access to the Internet on these devices is even slower than dial-up.

- **Flash**: Flash content is currently not supported on most smartphones. Thus, if a user attempted to access one of the "All Flash" sites out there, for example, he or she would be left staring at a blank page!

- **Awkward Input**: Most mobile devices do not use a mouselike pointer and this makes it difficult to click on menus, buttons and hyperlinks. Scrolling is also more tedious and error-prone. Furthermore, entering text is generally much slower, even on devices with dedicated mini-keyboards.

These limitations with smartphones means that developers of websites must pay particular attention to ensure that users will still enjoy a rewarding experience when visiting their website.

4. Web Usability Guidelines for Smartphones

The inevitable shift towards smartphones for mobile phone users was described in section 2 of this paper. Next, in section 3, some of the web usability issues with respect to these smartphones were underscored. In this section, we synergize various web usability guidelines for smartphones and generate a list of essential rules that developers of websites will need to follow.

- **Keep it Simple** [14, 15, 16, 17, 18, 20, 23, 24]

    Make sure that actions are uncomplicated and user-friendly. Remember that most mobile users will not be willing to fill out long, time-consuming forms. They will also not want to go through a difficult and complicated process for ordering items.

    Because of the lack of space on the screen and because Internet connections are often slower, websites for smartphones should be designed without large images and flash content. It is also important that visitors to the site should have immediate access to the most crucial and essential information.

- **Simplify User Input** [17, 19, 24]

    Because of the lack of a proper keyboard, allow users to make selections instead of keying in input. Entering text on a smartphone is painstakingly slow and error-prone; having appropriate links can be much more effective.

    Furthermore, giving users the option of browsing through a website is often easier than forcing them to search the site for some particular information or item. When presented with a search box, visitors of the website often make typos and this leads to inappropriate search results.

- **Scroll Vertically Only** [15, 18, 21, 22, 23]

    Remember that smartphones have a limited width and design the website so that the users will not have to scroll horizontally. Scrolling vertically on one of these mobile devices is challenging enough; scrolling in two dimensions is even more difficult and very frustrating.

- **Multiple Versions of the Website** [14, 15, 16, 17, 19, 21, 22, 23, 24, 25, 26]

Having a website that has been designed for both desktop computer and smartphone users is unfeasible because website layouts for large landscape PC screens usually do not come across very well on small mobile phones. Therefore, it is important to create multiple versions of the site that are compatible with most smartphones.

One can also automatically detect whether the website visitor is accessing your site using a mobile device or a standard desktop computer. The visitor can then be redirected to the appropriate site depending on the platform that has been detected. Although there are a variety of different mobile devices on the market and it is almost impossible and inefficient for your website to attempt to detect all of them, there are only a few popular brands that dominate. Typically, the different models of a mobile brand have a specific screen resolution and similar capabilities. So, it is usually sufficient to consider just the most popular models. For example, the following piece of PHP code at the top of your PHP page can detect whether the user is accessing the website using an iPhone, iPad, Android, Blackberry, Palm or OperaMini browser and whether the device employs Windows mobile or not:

```
require_once('mobile_device_detect.php');

$mobile = mobile_device_detect();
```

Another option would be to use JavaScript in your site; for instance, the following code will determine if the device is Android operating system based (for identifying Google smartphones):

```
var deviceAndroid = "android";

function DetectAndroid()

{

    if (uagent.search(deviceAndroid) > -1)

        return true;

    else

        return false;

}
```

Furthermore, it might be useful to keep a link (possibly in the page footer) to the desktop version of the website. Giving your visitors the option of skipping to the standard site is also handy for users with a desktop computer that accidentally stumble across the mobile version of the site.

- **Avoid Repeating the Navigation** [14, 17, 20, 22, 23, 24]

Screen space is precious on smartphones and navigation components can consume a large chunk of this area. It is thus advisable that the navigation should only be displayed on the homepage. On other pages, having a link back to the homepage would be it convenient for visitors. A breadcrumb trail is an effective substitute for repeating the navigation on every page.

5. Conclusion and Future Work

Without a doubt, smartphones are the way of the future. Developers of websites need to take note and consider the web usability of smartphones when designing their sites; otherwise, they risk losing a large portion of potential visitors. In this paper, we compiled and synergized various web usability strategies for these developers to consider. For future work, we plan to use the web usability guidelines that we have established to evaluate the effectiveness of a range of prominent websites.

6. Acknowledgements

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