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Characterization of web browser usage on smartphones

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ABSTRACT

The increased use of smartphones has established a trend of web browsing through smartphone browsers. On one hand many of the smartphone web browsers are available and on the other hand many of the websites are customized for mobile browsing. This paper presents the results of a study conducted to reveal the usage patterns of smartphones web browsers. Mix methods of research are used in this study. It is initiated with a qualitative part to lay down the basis for further investigations and concluded with a quantitative part. The results revealed about some of the insights on smartphone web browser usage patterns, which are equally helpful for the industry and academia. The findings are presented in following categories: number of usage sessions per day, duration of sessions, common tasks performed, and frequently used browser features. Furthermore, usage patterns associated to these categories are identified and analyzed in context of age and experience groups. The findings suggest that respondents from 35 to 44 years of age tend to use smartphone web browsers for less number of times in a day but have longer sessions. However, there is no significant difference in use of browser feature among different age groups.

1. Introduction

The advancement in communication technologies has reshaped the idea of mobile phone. Mobile phones are transformed into smart phones and their capabilities are enhanced far beyond the level of a phone (Reynolds, 2008). The number of smart phone users can be estimated from the number of smart phone shipments in 2012. According to Canalyse, 694.8 million units of smart phones were produced in 2012 (Canalyse, 2013). Another figure of smart phone shipments in 2012 quoted by IDC, is 722.4 million units (IDC, 2013). Smart Phone market is continuously progressing. These figures are representative of the popularity and acceptance of smart phones in the masses. There is no doubt that this popularity and acceptance is due to the unique features provided by smart phones.

Among others, one of the unique features of smart phone is web browser with fairly improved capabilities (Reynolds, 2008). Its usefulness and popularity can be estimated from the statistics presented by comScore (2011), that in Japan, US and Europe people spend 55.4%, 36.4% and 28.8% of time (out of total phone usage time) by using mobile browsers. The growing trend of browsing through smart phone browsers attracted the interest of software developer community, and now dozens of commercial and open source browsers are available in market.

Web browsing using smartphones has become one of the most common use among the use of other applications. Figures show that web browsing using mobiles phones has increased from 9.58% to 25% in last two years (StatCounter, 2013). This increasing trend can be credited to several factors such as better supporting infrastructure and services e.g. Wi-Fi, 3G, 4G, etc. and availability of sophisticated smartphones and web browsers with fairly improved capabilities (Reynolds, 2008). Different companies shipped around 1 billion mobile phones in 2013 and 55.1% of them were smartphones (IDC, 2014). Experts forecasted that the growth of smartphone market will progress and would reach 1095 million in 2016 (Portio, 2013). Smartphone has revolutionized the idea of web browsing with its web browsers. Smartphone browsers are not only used for information seeking tasks but for other purposes also such as shopping. It is reported in "Smartphones Leading to Greater Transparency in the Shopping Experience" (2011), that over 70% of iPhone owners use applications or web browsers while shopping in store and 41% make purchases directly from their phone. These trends compelled many researchers to work on smartphone related issues. Several studies have been conducted on usability and usage of smartphone. In this paper, the usage pattern related to smartphone web browsers are identified with respect to different age and experience groups. The results of this study will help to better understand the usage of smartphone browsers and will help the practitioners to improve browsers for better usability.

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The paper is organized as follows: related works are discussed in Section 2. Research methods and information about the respondents are presented in Section 3. Findings of the study are presented in Section 4 and discussed in Section 5.

2. Related works

The usage of smartphone has been discussed in many studies. These studies include those where the usage of smartphone is discussed including its entire features and in some studies specific applications were focused. A few of notable works are presented here. A survey was conducted in Bomhold (2013), with undergraduate students to know use of smartphone applications. The results of this study show that using search engine is the most frequent task performed by the users. Another study (Lin, Zhang, Jung, & Kim, 2013), was conducted to know the extent wireless communication has affected the traditional wired means. A survey was conducted; involving youth between 12 to 17 years of age in five East Asian cities. The authors have identified three main categories of mobile internet usage namely; task based activities, information seeking and communication activities, and recreational activities. The study concluded that teens tend to use their mobile internet for recreational and entertainment purposes. The social media practices of smartphone users were outlined in Malinen and Ojala (2012). Qualitative research method; interview was used and 30 owners of smartphone were interviewed. The results of this study suggest that users of mobile social networking applications mostly check the news and latest updates while on the move. Secondly, it was observed that there were more browsing activities on mobile phones than content creation.

The security of smartphone browsers is discussed in Mylonas, Tsalis, and Gritzalis (2013), from the view point of availability and manageability of security controls. Analysis of security control is conducted and recommendations are provided. A study on the trends of smartphone usage was conducted in Osman, Zawawi Talib, Sanusi, Yen, and Alwi (2011) focusing Malaysian market for mobile content and applications. The results were based on a survey conducted in different cities. The results show that 23.26% of the population used smartphones daily to brows web pages, 18.38% used a few times weekly and 11.10% used weekly to brows web pages. The lessons learned from a four month field study are presented in Rahmati and Lin (2013), which include application usage and usage characteristics of 14 participants (novice teenage users). The results show that the participants used the smartphones in highly mobile fashion and usage was location dependent. Other results include session length, usage length, and number of sessions per hour. It took five to six weeks for participants' usage to stabilize.

A study (Shirazi, Henze, Dingler, Kunze, & Schmidt, 2013) was conducted to investigate that how smartphone applications, in particular web browsers are used. The data about the posture of device show that phones were moved more while messaging and using navigation applications. In case of browser and other applications less movements were observed. Regarding the use of multiple browsers, 31% of the participants used more than one browser. The participants tend to use browser for a longer period of time when open it through system launcher rather opening it through other applications. High rate of switching between applications and browser is observed during the study. The average length of session was 2.36 min and when started through another application it was 1.52 min.

A Delphi method study was conducted in Dunn, Galletta, Hypolite, Puri, and Raghuwanshi (2013) by engaging the Smartphone users and potential users. Three task lists are presented as the result of the study; one for smart phone users, all users, and non-users of smart phones. Following four tasks were part of the task list of smart phone users; check email, send email, internet search, browse internet. These tasks are related to the use of browsers. Although the research presented in this paper is similar into this study as both of the studies aim to identify user task. However, the methodology and scope differs, in this paper qualitative method; interview is used to identify the tasks. Furthermore, the scope of our study is limited to the smart phone users and particularly the users of smart phone browsers.

A study (Oulasvirta, Rattenbury, Ma, & Raita, 2012) on smartphone users habits concluded that brief usage sessions comprise a large part of smartphone usage. While comparing smartphone and laptop it was found that smartphone use is significantly short in duration. It was also found that the smartphone use habits are tightly associated with particular context.

In one of our previous work (Fazal-e-Amin and Alghamdi, 2014), a usability evaluation model is presented to evaluate the usability of web browser. This model presents the attributes and sub attributes of usability in three layers. Usability tests were conducted with participants on four android web browsers. The results show consistency in case of three browsers.

The empirical patterns associated with the mobile internet usage were identified in Tossell, Kortum, Rahmati, Shepard, and Zhong (2012). There were 24 participants of 19.2 years average age in this study. The average number of browsing sessions per day was 3.86% and 50% of the users used browser for less than three times a day. Most of the browsing sessions (85%) were for searching and google.com was used for this purpose. Our research work is more close to (Dunn et al., 2013; Shirazi et al., 2013; Tossell et al., 2012), and the results are comparable and complement these studies. Details are presented in discussions section.

3. Research methodology

This research was deemed to outline the characterization of web browser usage on smartphones. Mixed methods of research are applied in this research; both qualitative and quantitative methods were used. A through literature review was conducted that revealed that this phenomenon was not discussed earlier, so limited knowledge was available regarding the usage patterns of smartphone web browser usage. The study was commenced with qualitative method i.e. interviews to explore the phenomenon and to form the basis of the qualitative method i.e. survey. In first phase of the study seven in-depth interviews were conducted with expert smartphone web users. The results were produced using content analysis approach (Krippendorff, 2004), details are presented in next sections. Here, the experts are defined as, those users who are using smart phone browsers almost every day for more than a year's time. They were engaged for a structured interview and were asked open ended questions about their web browser usage.

Frequently used browser feature, common tasks, number of sessions, and session duration were identified. This information was analyzed and survey instrument was prepared. After furnishing the task list, tasks were categorized as basic and advanced tasks. These tasks and other information such as number of browser's sessions per day and duration of session, common tasks performed were used to prepare a survey. The survey population was 630 respondents, contacted through social media, online survey and in-person meetings. Although, five age groups were created but significant number of respondents were from 3 age groups i.e. 18 to 24, 25 to 34, and 35 to 44. Rest of the age groups were discarded and not discussed further in this paper. Majority of respondents (more than 60%) were from 25 to 34 years. Similarly, six experience categories were created and majority of respondents were

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