Usability studies on Google Applications

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ABSTRACT
To identify the potential usability problems of Google applications, a multi-step task was given to 20 users. On completion of the task, the users were asked to fill a survey with five questions. In all, several usability problems were identified and a qualitative description of the problems is provided. We suggested some solutions for the problems and closed the paper with a discussion of what we plan to do in the upcoming months.

Keywords
Usability studies, google maps, google search, web maps.

1. INTRODUCTION
In everyday life, people are becoming more dependent on computer applications to do any task. As the tasks are becoming complex day by day, applications which help to support those tasks are becoming available. This has made usability more critical. Now companies are focused not only on the technology aspect of the application but also on user experience.

In the past decade, there has been a significant increase in the number of mobile apps users due to the benefits provided by the smartphones in terms of portability, location awareness, and accessibility [16]. The lower price of the hardware and the increase of software capabilities accelerated the growth of the number of mobile users. This has led to a huge number of applications being developed for this community.

With the increasing number of applications in the market, it is important for an application to be of superior quality in order to compete. One of the important aspect in an application is its usability; applications which are easy to install, takes less time to learn and get results, and has a simple interface, are usually preferred by the users. For an example according to netmarketshare.com 2015 [1], Google search is the world's most popular search engine with a market share of 67.49 percent as of September 2015. Google, as a contrast to its competitors, Bing and Yahoo! has kept a minimalistic interface and shows results which are more relevant to the users. Another Google application, "Google Maps" is a web mapping service which shows satellite imagery, street maps, 360 ° panoramic views of streets, real-time traffic conditions is widely used for route planning by millions of users [2]. Compared with other maps such as Bing Map and MapQuest, Google Maps has better performance on finding a given place. Additionally it can design the route according to users' preference and provide other useful functionalities and better visualizations.

In our survey, we have focused on the usability aspects of Google applications. Google applications like Search, Maps, Gmail, Google Drive, and others are used by millions of people in their daily life. A survey was conducted on 20 people who were given a multi-step task and were asked to use the google applications if possible. Our team was responsible for monitoring their progress and after their completion, a simple survey with 5 questions was presented and their response was collected.

This paper is structured as follows. Section 2 presents some of the related works in this field. Section 3 presents the methodologies for identifying the usability problems. Section 4 provides the results of the survey and section 5 presents some of the major usability issues and their possible solutions. Finally section 6 and section 7 presents the conclusion and future works respectively.

2. RELATED WORK
Research on usability evaluation targeting on google applications seems to be scanty. However, several previous usability researches in relation to other web mapping sites

have been carried out. Beverley (1997) studied the benefit of a dynamic display of spatial data-reliability from the user's point of view with a test using map data for decision-making [7]. Harrower et al. (1997) evaluated the design elements and communication quality of Internet maps for tourism and travel in a user survey [8]. MacEachren et al. (1998) have conducted some studies with the help of map animation and interactive tools [15]. Andrienko et al. (2002) tested the learnability, memorability and user satisfaction of users with specific geo-visualisation tools [5]. Hornbaek et al. (2002) have also evaluated the usability of zoomable maps with and without an overview map [10].

Arleth (1999) studied the problems of screen map design and listed them; the map area was too small and both the legend and instructions too dominating on the screen [6]. According to the study, the design process would be more manageable if it were divided into two phases concerning the map interior, including the map elements, symbolisation etc, and the map exterior, including the tools and functions for using the map. Leitner and Buttenfield (2000) investigated the effect of embedding attribute certainty information in map displays for spatial decision support systems by having test users perform specific tasks with test maps [14]. Harrower et al. (2000) used a focus group method and structured user testing to find out how novice users understood and used the geo-visualisation tool designed to support learning about global weather [9]. Ahonen-Rainio and Kraak (2005) described a study including an iterative design with improved map prototypes and testing for visualising geospatial metadata [4].

With the intention to improve usability, Agrawala and Stolte (2001) studied how route maps are used analysing the generalisations commonly found in hand-drawn route maps [3]. Ishikawa et al. (2005) evaluated climate forecast maps by designing an empirical study with test users and observed their behaviours in the experiment. They concluded that in many cases qualified and motivated test users failed to interpret the maps in the way that the map designer had intended [11]. Richmond and Keller (2003) carried out an online user survey to assess whether maps on tourism Websites met the expectations of users [17]. Jahn and Frank (2004) proposed an additional factor for usability attributes: information quality (IQ), which is used to describe the importance of the data needed by the user and it can help to enable data quality to be adapted in an optimal way to meet user needs [12]. Van Elzakker (2004) carried out user tests in order to investigate the selection and use of maps when users are exploring geographic data online. In their method, users carried out six to seven tasks with the sites. Qualitative data was gathered through the 'thinking aloud protocol' and questionnaires and quantitative data by measuring the total time each user was performing each task, as well as the total number of clicks [18]. Similarly, Koua et al. (2006) studied test subjects' ability to perform visual tasks in the data-exploration domain and emphasised that use and usability assessment is an important part of understanding visual methods and tools for data exploration and knowledge construction [13].

3. METHODOLOGY

The study was designed to identify the potential usability problems with Google applications and gather the qualitative information to find solutions for the problems in the near future. Two of the google applications had been chosen in the evaluation process: Google Maps and Google Search. These well-known sites are selected because most people are familiar with these applications. Additionally, most of the users were able to complete the tasks using these applications.

3.1 Procedure

Several experiments were carried out in order to identify as many potential usability problems with the chosen google applications as possible. First, a typical scenario for using these types of sites was formulated: 'A friend of yours has a layover at Raleigh for 8 hours and you need to plan an itinerary and accompany with her'. Part of the evaluation was conducted as a series of user tests, with the other part consisting of the evaluation of the the applications involved in the user tests in the form of questionnaire. Altogether, 20 participants were involved and 11 evaluations (6 tasks in the first part and 5 questions in the second part) were carried out. The experiments were run in a Windows/ Linux/ Mac OS environment using either desktop, laptops or phone according to the preference of the user. Evaluations were carried out in January 2016 and the results presented here are based on the content of the applications at that time.

3.2 User Tests

The experiment can be divided into two parts. In the first part, a scenario was described to the users at the beginning of the test. Following this, the test instructor gave the users one pre-defined task at a time, which they would try to complete by using any google application. There are 6 tasks they need to complete while planning the itinerary and some important points had to be considered. For example, Cara arrives at 1 pm and leaves at 9 pm, so you need to pay much attention to time schedule because there are a couple of places to visit in the tasks. And as Cara is an art student, it is better to take her to an art museum. Then, it mentions that you have a budget of only 50$, so you should carefully consider food price, museum ticket price, parking price before zeroing on any decision. In order to achieve these tasks, participants need to take everything into consideration and it can maximally test the functions of applications they use. During the user test, we provide them with some intro notes and encourage them to "think aloud" as they do their work. On an average, the users took 30 to 40 minutes to complete this part of the survey. After finishing all the tasks in the first part, a questionnaire was presented to the participants. This helped us to get some feedback about the problems they faced during the first part. The questionnaire allowed the users to select from some of the common problems that we previously prepared and allowed the participants to write additional problems which were not mentioned. The users took less than 10 minutes to complete this part of the survey.

4. RESULT

We did a survey for 20 people about Google Apps and google Maps. Here is the result:

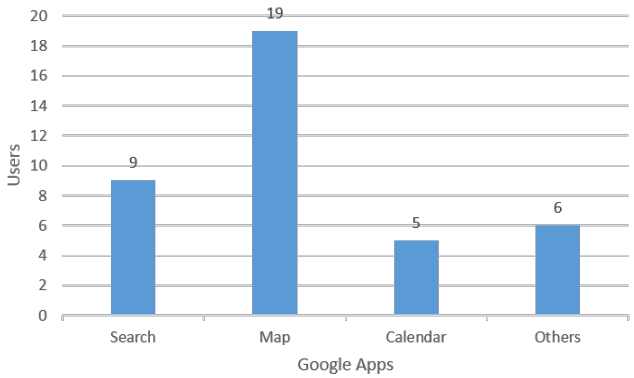

Figure 1: Google Apps survey result

One important thing we wanted to find out is which applications the users will use to complete this task. Among 20 people, there are 9 people select Google Search, 19 people select Google Maps, 5 people select Google Calendar and 6 people select others such as Keep, Flightstats. Percentage for each Apps is: 23%, 49%, 13%, and 15%. Apparently, almost every user in the survey (19/20) used Google Maps.

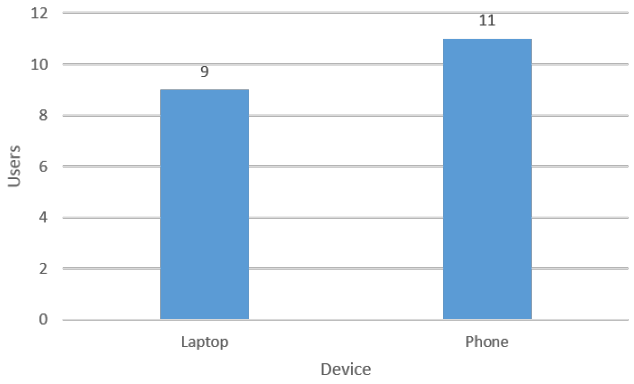

Figure 2: Device priority survey result

One of our question focused on which device would a user prefer while doing this sort of task. About only 45% of users chose laptop while 55% of people thinks theyâĂŹd rather use a smartphone. One of the users who prefered smartphones over laptop stated that smartphones are better for this kind of task as it is handy and easy to use. Another user who chose laptop over phone said that he prefers laptop when using more than one application at the same time. Also multiple tabs in a browser can be better handled on a larger screen.

Before we started the user tests, we conducted the survey on our teammates. Further we studied some papers on the usability studies on google applications and then we listed several of the problems, which were later put in the questionnaire. Some of them are as follows:

1. Parking places availability and price not available.
2. Closing times for museums and other locations.
3. No results for search nearby.
4. Price for restaurants missing.
5. Entry fee for museums missing.

While the users did the survey tasks, we observed their actions and recorded the problems they encountered. Besides the problems that had been provided in the questionnaire, participants also encountered other usability problems. We enlisted few of the problems which were pointed by multiple users. Firstly Maps show no information about local school bus, which had been mentioned by two users. Five users complained that they cannot save the route. Five users mentioned they cannot mark location on the maps. Another two users pointed that it would be a good feature if integration calendar and maps can be done. Few of the user suggestions were tourist information can be shown for free outdoor places (like what would be the best time of the day and of the year to visit a lake/mountain), adding opening hours and distances in the nearby menu. One of the user pointed out that on adding more than 2 places using Maps, one has to enter the exact name of the place as it no longer provided with a results list. For an extensive results one can visit this link. (https://goo.gl/e4j6W7)

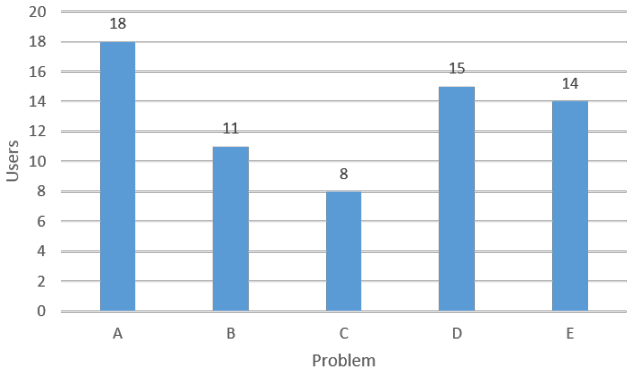

Figure 3: Device priority survey result

This chart shows the number of users who faced with the corresponding problems (the problems are mentioned in the previous paragraph). Clearly majority of the users (18/20) faced problems regarding parking information (problem A).

Further we asked the users to order the 5 problems in terms of severity in descending order. And here is the order.

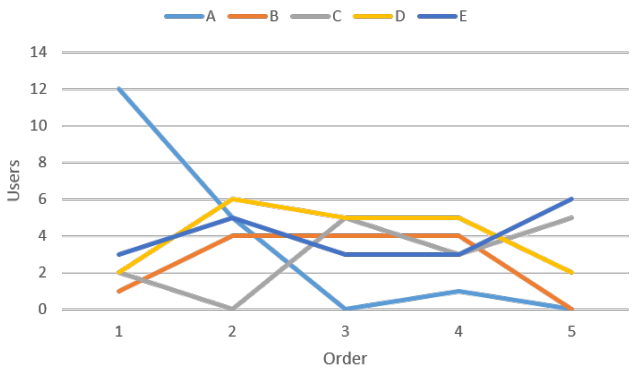

Figure 4: Order Result

According to the result, most of the users put problem A as the first order and problem D is the second important problem. It can lead to a conclusion from this survey, parking places availability and price is not easily available.

5. USABILITY PROBLEMS

Although the tasks appeared pretty simple, the users faced a lot of problems. In the questionnaire that we gave to the users, they had to select the problems which he had faced during the activity. We have found that many of the users faced similar problems. In this part we will try to briefly describe five typical problems which appeared multiple times during the survey.

5.1 Parking places availability and price not available

As we have assumed that the user has a car, it is also the responsibility of the user to find a car parking spot and estimate a price for parking but as it turns out that this information is usually unavailable. Most of the users (18/20) had selected this option. Some users even tried to access the website of the restaurants to find if they mentioned anything about parking but usually they were unable to find any. Failing to find any parking information, many set aside money for parking and some assumed that parking will be free. An easy solution would be if Google Maps provided parking details such as closest parking spaces and their associated rates when a place is searched.

5.2 Closing times for museums and other locations not available

Google Search has an interesting feature of listing out opening and closing times of places whenever a person searches for a place. However this information was missing for a few museums and restaurants. More than half of the users (11/20) reported to have this issue. Few users took the initiative to visit the official websites of their destination to get this information. Google Maps can easily fix this issue as the information is generally available at their websites and show a consistent view.

5.3 No results for search nearby

Whenever a user searches a place in Google Maps, one can click on nearby to get access of the closest restaurants, hotels, pubs or bars. On selecting any of the above options, the user can also customize according to his needs. For example if the user selects Restaurants nearby, he can further select the price, rating, cuisine and timings. Often selecting this button resulted in no results. The problem with this feature is there is no option of selecting how far or close you are considering "Nearby" to fetch you results. 40 percent of the users reported having this problem not taking into account that most of the users didn't use the "Nearby" feature as they didn't know this feature existed. To solve this problem, Google Maps can make the "Nearby" button more visible to the user and can give more customization like "Distance".

5.4 Price for restaurants missing

Google search uses dollar symbol ($) to represent the price of the food in a restaurant. A single dollar ($) on a restaurant means the restaurant is inexpensive, a double dollar ($$) means it's more expensive and so on. As the users had a budget of 50 dollars, most of them tried to get a single dollar restaurant. Several of the restaurants had this information missing. Also this information popped up only when you searched several restaurants and disappeared once you clicked on a restaurant to get more details. 15 users out of 20 had this problem. Some of the users visited the official website of the restaurant to get an estimate of the price. As the food menu is usually available on the website, Google Maps can generate a consistent estimate of all the restaurants.

5.5 Entry fee for museums missing

Google search doesn't list the entry fee of museums therefore the users had to visit the official websites of the museums to find this information. 14 users out of 20 reported having this issue. Most of the users suggested that this is an important piece of information and should be displayed on the right side of the page along with the other details.

6. CONCLUSION

During the past month, we read several research papers on usability tests on different applications. Then we decided to do the survey on Google applications as it is used by millions of users throughout the world and several of its applications provide an API to develop over their applications. Subsequently we prepared a multi-step task and an accompanied survey where the users can provide their feedback. The survey proved to be really helpful as we found several usability issues with Google search and maps. We managed to collect several important ideas that we can work on in the upcoming months.

7. ACKNOWLEDGEMENT

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8. FUTURE WORK

After collecting the problems, our next step is to figure out how to fix these problems and provide some solutions. As one problem may have more than one solution, we will have

to study the feasibility of each solution. Each solution contains two parts: one is tool environment and the other is programming implementation. In February, we plan to do a research on the tool environments we can use such as google API or IOS SDK and then we can implement it. We may analyze several solutions and compare whose performance is better and implement it as our final fix solution.

9. CONCLUSION

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