The Effectiveness and Efficiency of a GPS Route and Voice Navigation App

Maslinda Nadzir, Azham Hussain, Emmanuel O.C. Mkpojiogu, Josephine Oluwatosin Faromiki, Eman M. A. Abdusalam

Abstract: The study carried out the usability testing of a GPS route and navigation application (Street View HD app) in Universiti Utara Malaysia (UUM) environments with a total of 10 test users. The usability of the application was captured by observation. The results showed that the application was effective and efficient. However, a close look at the error frequency indicates that there are still issues to be addressed in the application's interface as some users made some errors while accomplishing their tasks on the interface.

Keywords: Effectiveness, efficiency, mobile application, voice navigation

I. INTRODUCTION

Mobile devices have grown to be more advanced, leading users to carry out a wide range of tasks. These devices and their specific apps supply considerable benefits to their users in terms of portability, position consciousness and accessibility. With the rapid increase of mobile apps, developers and designers face challenges in the ascertaining the quality of mobile apps, particularly, the usability quality. Usability of mobile app has become an important quality because several software apps which previously were run using computers (laptop and desktop), are currently being run using smartphone technologies (Harrison et al.,2013; Saleh & Ismail, 2015).According to Diefenbach, Kolb &Hassenzahl, (2014) usability is the user's experience quality when interacting with systems or products such as software, applications, websites or devices. Usability is about the efficiency, satisfaction and effectiveness with which a user can achieve a specified goal when using a system or product (Rusu et al., 2015).

In addition, usability facilitates the suitability and ease of use of a software or system when carrying out specific task which thereby help in the enhancement of user's loyalty (Wani et al., 2017). The study of Harrati et al. (2016) points out that user's performance and satisfaction is affected by ease of use and acceptability which in turn determine whether the product will be used. Usability testing involves the evaluation of applications' accessibility from the user's perspective based on different application functions (Kübler et al., 2014). According to Hussain et al. (2017a) and Georgsson and Staggers (2015), usability testing is important in measuring the satisfaction, efficiency and effectiveness of the interaction of user with mobile application in a particular context (see Hussain et al., 2016a; 2016b, 2017b, 2017c; 2018). Usability testing enables feedbacks from users in order to modify the potential mistakes done during design (Hassan et al., 2017). This study attempts to evaluate the usability of street view live HD: GPS route and voice navigation application. The street view app is a GPS navigation app which provides navigation information and user-submitted travel times and route details. Street view navigation app is a mobile app that enables drivers to build and use live maps checks on a car speedometer, get to know famous places in an environment and turn-by-turn navigation for an optimal commuting. The objectives of this study are to evaluate the effectiveness and efficiency of the street view street view live HD: GPS route and voice navigation app. The purpose of this usability test is to explore the ways in which users interact with the street view live HD: GPS route and voice navigation app. According to Statista (2015) the number of users of navigation apps has increased since 2013 to 68.6million. A well-designed navigation system can prevent driver's wrong turns, reduce travel time and also decrease driver's workload. It is revealed that usability of a mobile app contribute ultimately to the user experience of the app (Lazar et al., 2018). The usability difficulties of the app are related to various events like how to apply the software and hardware, and the ease of the technology usage. Street view live HD: GPS route and voice navigation app have the capacity to help clients find current location, use the GPS compass to find direction, save visited places or locations history with date and time, Send ETA, use voice directions and turn screen off, use user's own voice, clean up map, watch

 Maslinda Nadzir, School of Computing, Universiti Utara Malaysia, 06010 UUM, Sintok, Malaysia
 Azham Hussain, School of Computing, Universiti Utara Malaysia, 06010 UUM, Sintok, Malaysia
 Emmanuel O.C. Mkpojiogu, Department of Computer and Information Technology, Veritas University, Abuja, Nigeria. School of Computing, Universiti Utara Malaysia, 06010 UUM, Sintok, Malaysia
 Josephine Oluwatosin Faromiki, School of Computing, Universiti Utara Malaysia, 06010 UUM, Sintok, Malaysia
 Eman M. A. Abdusalam, School of Computing, Universiti Utara Malaysia, 06010 UUM, Sintok, Malaysia

user's speed, sync calendar and contacts by the medium of wireless networking. Whatever is learned from this test will be considered to identify the main characteristics of this application. This usability test, with its scenarios, and tasks, has been designed to come up with clear picture about the street view live HD: GPS route and voice navigation app performance. The test will apply certain usability measures to the app performance of designated tasksin order to evaluate the overall effectiveness and efficiency of the app.

II. METHODS

This study was conducted using students in Universiti Utara Malaysia (UUM), Sintok. They were selected randomly within inclusive criteria and a total number of 10 drivers were used for this study. The tasks done during the usability testing include: 1) Download the app from Google play store; 2) Find your current location; 3) Use the GPS route navigation; 4) Find favorite places around during driving; 5) Use the voice navigator to find driving routes. The study invited 10 students (8 male and 2 female) from different levels of study at UUM. The age of the participants ranged from 18 to 49. Users were categorized in terms of their years of using the app as either experienced users (3 years and above), moderate users (1 - 2 years), and novice users (less than a year). A facilitator was used to facilitate the test sessions. Table 1 depicts the users' profile.

Table. 1 User Profile

User #	Gender	Age	Study level	Experience
1	Female	18 – 29	Undergraduate	Moderate
2	Male	18 – 29	Undergraduate	Expert
3	Male	30 – 39	PhD	Moderate
4	Male	30 – 39	PhD	Expert
5	Male	18 – 29	Undergraduate	Moderate
6	Male	40 – 49	PhD	Novice
7	Male	40 – 49	PhD	Moderate
8	Male	18 – 29	Undergraduate	Moderate
9	Male	18 – 29	Undergraduate	Moderate
10	Male	30 – 39	PhD	Moderate

With regard to procedure, the research was facilitated in different environments using the field study approach. The field test (driving) was conducted from DPP Maybank to TM, Sport Center to PKU (School clinic), Petronas to Varsity Mall, UUM library to School of Computing, and Tradewinds block D to Proton. These locations are generally known by the students. The users were allowed to perform the tasks while driving. After the task had been agreed between the facilitator and the participants, no constraints was imposed on the user during the test session in order to create a good environment for the participants. The test was conducted individually, one user at a time. Prior to starting the test, the facilitator encouraged participants to use the "think aloud" protocol while they were in the process of executing the tasks. The facilitator also instructed the users to move between tasks as is naturally for them to do, and this was done in order to capture users' behavior at the time of navigating from one part to another.

The procedure of this test was based on the following steps adapted from the work of Lin, 2015: 1: Execution of the 5 tasks by the 10 participations who evaluated the app; 2: The facilitator recorded all test sessions in an audio recorder. The measurement involves counting the number of errors the users made when attempting to complete a task. The task time is the time taken to complete a task. The time to complete each task is recorded with a stopwatch. Task success (whether or not a user successfully completes a task) was also recorded. Participants were given up to one minute to complete each task (pilot testing was done to determine that 1 minute is sufficient for task completion); 3: The numerical data that included the task time, error frequency and success rate were analyzed.

III. FINDINGS

Success Rate and Task Completion Time

There were five tasks involved in this study which included: downloading the app from Google play store, finding your current location, using the GPS route navigation, finding favorite places around while driving, and using the voice navigator for finding driving routes. The ten participants completed all the tasks that were given to them (i.e. a 100% success rate). Table 2 shows the time taken to complete each task. The ten participants completed all the five tasks given to them. The time to complete each task was recorded with a stopwatch. The participants were allocated one minute to finish each task.

Table. 2 Time taken to complete each task

User #	Task1(1 Min)	Task2(1 Min)	Task3(1 Min)	Task4(1 Min)	Task5(1 Min)
1	0.29	0.38	0.28	0.34	0.32
2	0.36	0.35	0.40	0.37	0.27
3	0.45	0.32	0.38	0.30	0.32
4	0.50	0.45	0.42	0.32	0.35
5	0.35	0.34	0.29	0.35	0.38
6	0.40	0.33	0.32	0.31	0.36
7	0.45	0.40	0.36	0.34	0.35
8	0.30	0.35	0.35	0.36	0.38
9	0.37	0.35	0.45	0.37	0.36
10	0.40	0.36	0.42	0.39	0.39

Table 2 shows that all participants were able to complete the tasks successfully. This implies that the app has good effectiveness and high success rate. All the participants completed each task within the allocated the time. The highest time was taken by participant 4 (0:50 seconds) in task 1. The shortest time was taken by participant 7 (0:36 seconds) in task 4. This outcome shows that the app has good efficiency. The result also shows that majority of respondents did not face any problems or have any issues completing the tasks.

Error Frequency

In this study, the facilitator counted the number of wrong actions made by the users when executing a particular task and analyzed each task based on the number of errors. An error according to Nielsen (1993) is described as any incorrect user action that does not reach a desired goal. For task 1, out of the 10 participants, 5 participants had no errors, 3 participants had 3-4 errors and 2 participants had more than 5 errors. For task 2, 8 participants made no errors while 3 participants had 1-2 errors. For task 3, 6 participants had no errors, 3 participants had 1-2 errors and 1 participant had 4 errors. For task 4, 8 participants had no errors while 2 participants produce 1-2 errors. For task 5, 7 participants had no errors, while 3 participants had 1-2 errors. The error frequency indicated that on average, the app has good effectiveness and efficiency, however, it also points to the fact that there are issues to be addressed in the interface.

VI. CONCLUSION

The study carried out the usability testing of a navigation application in UUM environments with a total of 10 test users. In this study, the researchers evaluated the test sessions by utilizing the measurement success rate, task completion time and error rate. These were captured by observation. The results showed that the application was effective and efficient. However, the frequency of errors observed shows that there are issues of concern in the interface that demands attention.

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