

THE USABILITY ANALYSIS OF MOBILE INTERFACES

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ABSTRACT: *The mobile market is expanding quickly with the rapid growth of technology. Although the usability is a major factor to determine the success of any interactive software application but the focus of the mobile producing companies is on the features of the application, not on the usability of these applications. It is difficult for the developers to produce an application which satisfy the needs of all type of users because the user has different expectations with different applications. Therefore, one should give equal importance to the usability testing and functionality of these applications. In this research paper the focus lands on the usability issues of mobile interfaces. Furthermore, we evaluate and measure the usability performances by using the two common mobile brands namely MeeGo phone and Blackberry 10.*

Key-words: Usability Analysis; Mobile Application; Mobile Interface; Graphical User Interface (GUI); MeeGo ; Blackberry 10; Human Computer Interaction (HCI)

1. INTRODUCTION

Every day market is introducing a variety of mobiles, tablets, systems, devices and many more. The devices manufactured by different companies have different features from one another. The features of some device are easily understandable by users; some devices have difficult features which are somehow difficult for the users to understand. Therefore, the usability test is performed at different features and different applications of devices with the help of users' feedback for the improvement and to check the usability rate of applications, software and devices. The usability is the capability of things which we are using in our daily life, it makes different systems easier to use and make them according to the user's requirement. Any device is considered as useable if it is pleasant, good, easy to use and user expected interface.

The users should be considered for usability testing rather than professionals. Professionals already knows the details and working of the product, here professionals uses their "knowledge in the head" that means the knowledge which is gained from the professional studies or from the experience. By conducting tests with the professionals it is not possible to get the usability defects in the product. End users doesn't knows the details and working of the product, the end users uses their "knowledge in the world" that means the knowledge which is gained from the surroundings without learning it. By conducting tests with the end users we get the usability defects in the product, "knowledge in the world" are used for the designing of different systems.

Different companies are introducing different operating systems with different and new features. Those features are sometimes easy for the user and sometimes difficult. If user is satisfied by the product one will use it and if dissatisfied will move to the other product. Here the situation becomes challenging for the companies and developers to create user friendly applications for users. A lot of quality matters when we talk about user's satisfaction.

A user-centered design is a philosophy of how things should be designed with the needs and interests of the user and making of the products that are easy to use and understandable by the users. We should make it easy to determine that what actions are possible at what moment, and should make things visible for the ease of the user including the conceptual model of the system, it is all

alternative actions, and the results of the all alternative actions should be kept in mind. Make it easy to evaluate the current state of the system. System should try to follow the natural mappings between intents and the required activities; between different activities and the resulting outcome; between the information that is visible and the clarification of the system state. Basically we should be able to figure out what to do and tell what is going on. When software is useful it increases the user satisfaction and it is not useful confuses the user, the result in loss for the company. Continuously working and improving usability is a good way to give a support to the users to use the software.

The main objective of this paper is to check the behavior of mobile users having less or no technical knowledge, to evaluate user satisfaction with mobile application and to collect the feedback of the user about GUI of the application on which the tests are performed. Moreover, we perform different usability tests at MeeGo and Blackberry 10 based applications. Finally we draw a comparison of the applications of both of the devices with respect to their interfaces. The rest of the paper is organized as follows: section 2 is about Literature Review, section 3 is about Methodology in section 4 different Usability Tests are conducted in section 5 the results are discussed and finally the conclusion is drawn in section 6.

2. Literature Review

Mobile devices are becoming extremely popular during past few years. These devices are widely used in business, education and almost every field of life by every age of group. Different companies such as Apple, Samsung, Nokia, Blackberry and many more are producing new mobile devices that have modernized the way we are using these devices which allow these companies to change their systems according to the users' requirements both in hardware and software, consequently, this leads to increase the number of devices and each company attempts to cover a variety of clients.

In ISO 9241 the usability is the effectiveness, efficiency and satisfaction with which satisfied users achieve specified goals in particular environment [2]. Now a day we are using a variety of mobiles devices manufactured by different companies and having different features from one another, some of the features are easily understandable by users; some devices have difficult features which are somehow

difficult for the native users. For this purpose the usability test is performed on different features and different applications of mobile devices. Here the key goal is the usability engineering which is often measured as extensive work with little benefits. The fact “joy of use” is important when it comes to everyday use of system. The system should be interactive and should fulfill user’s requirements. The usability has unlocked the doors of better-quality, faster, better looking and probably yet never seen applications to be developed.

Human Computer Interaction (HCI) can be defined as the interaction between human and computers, and involves the planning, designing, and execution of collaboration between human and computers. The point of HCI is to make this communication accessible and more widespread in everyday life, a task which is majorly motivated towards inspiring growth and development in computer science. The tasks faced in HCI include usability, user preference, varying design interfaces, analyzing evaluation methods, and increasing human dependency on computers; HCI’s ultimate purpose is to allow interaction between humans and computers to operate successfully and actually aid humans in our current technologically run world. The main techniques of HCI testing are Usability Testing which is frequently done by industry usability experts to discover usability problems in specific UIs and User Testing is frequently done by academic researchers to categorize users or tasks and improve HCI theory.

Usability testing is a technique to evaluate any product, software or device by the help of user’s with the testing. The companies used to conduct usability test carefully construct a scenario and a user has to perform a list of different tasks. The person on which testing is conducted is observed during all the tasks given to him/her. The usability is strongly based on Learnability, Efficiency, Memorability, Satisfaction and Errors [6,16]. There are different techniques to test the usability on the basis of the requirements. These are Hallway testing, Remote Visibility testing, Expert Review, Paper Prototype testing, Questionnaires and Interviews and Controlled Experiments [2,3].

According to Jacob Nielsen’s theory of usability testing says, extravagant usability tests are a waste of resources. The best results come from testing not more than 5 users and running as many small tests, as the tests are affordable by the team. If we want to get 100% of results then we can test fifteen users in three phases. The first phase with five users will give us 85% usability problems and testing with five users in second phase we can get 13% of usability problems and 2% of usability problems are left which can be finding out by the third phase with five users [4].

We just need to test with five users. When we do testing with first user the user find out different problems and when we do testing with second user. The user will find different problems. Some of them are the same problems and definitely find some new problems. When we do testing

with third user the user will find some of the same problems and some new different problems. When we move on with the fourth user the problems will overlap with the same problems of first, second, third and fourth will find some new problem and when we do testing, with fifth user the results are overlapping, with no new problem found. So by testing with five users we can get 85% of results. “A Heuristic evaluation or Usability Review is an evaluation of an interface by one or more Human Factors experts. Evaluators measure the usability, efficiency, and effectiveness of the interface based on usability principles, such as the 10 usability heuristics originally defined by Jakob Nielsen in 1994” [4,13].

A user-centered design which is a philosophy of how things should be designed with the needs and Interests of the user and what is in the mind of user, and the making of the products that are easy to use and understandable by the users. We should make it easy to determine that what actions are possible at what moment, and should make things visible for the ease of the user. Including the conceptual model of the system, it’s all alternative actions, and the results of the all alternative actions should be kept in mind. Make it easy to evaluate the current state of the system. System should try to follow the natural mappings between intents and the required activities; between different activities and the resulting outcome; between the information that is visible and the clarification of the system state. Basically we should be able to figure out what to do and tell what is going on. The important UCD principles are affordance, visibility, mapping, feedback, constraint and consistency [30].

3. MATERIAL AND METHODS

There are different methods of usability testing. The users on which usability testing is performed are given tasks to perform using the device. They are fully observed while they are performing the given tasks. The moderator is a person who conducts the usability test sessions with its team. When the test session starts, the moderator give the list of tasks to the users then those tasks are performed by the users on the given application or software. When user is performing the different tasks the user is fully observed by their facial expressions that how they are using the application and how they are reacting while using the product. I conduct session with users. Cameras are fixed on the front of the user to observe him/her. Other camera is set on the screen of the device through which user is observed on which moment what expression was given by the user. Overall session is observed by the help of the videos. With the help of these observations, the solutions are designed. In [30] the steps to conduct the usability test are mentioned which are: Test Plan, Testing Environment, Participant Selection and Test Material. Fig. 1 depicts the life cycle of the usability testing.

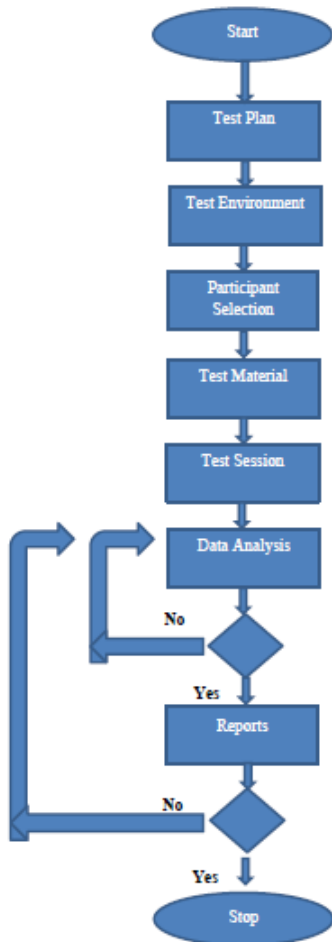


Fig.1 Life Cycle of the Usability Testing

The explanation of Fig. 1 is: in first step a test is planned, second step is about the environment in which the test is conducted, the participants are selected in third step. The testing material is distributed among the selected participants is conducted in step four. In step five, the test sessions are conducted with participants and the data are collected and data are analyzed in step six. If the results are satisfactory then a report is prepared otherwise go to step five and again conduct the test session.

After thoroughly investigating all applications of MeeGo and Blackberry 10 based applications, some applications are selected. Before going through the actual test session. Everything is checked properly, focusing of each camera, its position and sitting arrangement of the user. Test session is conducted and schedule for every participant is prepared. After the completion of test session, all videos are reviewed to observe the behavior and to find out where the participant get into trouble and then check whether the test session is completed or not due to any problem.

On the basis of the above discussion, a sample of the test is discussed as: the orientation script is given to the participants at a time of test session for reading. The script describes about the test that what will happen during the session, to make their mind and put the user to ease. The sample questionnaire is: Gender (Male, Female), Education (BS, MS, PhD), What is your background of education? (Computer science, Engineering, Other), What are you

studying right now? (Fresh man, sophomore, Junior, Senior, Graduate 1st year, Graduate 2nd year), What is your age? (Below 25, 25-34, 35-44, Above 45), Which type of phone you are using right now? (Android, iPhone, Blackberry, Other smart phone, Not a smart phone), From how much time you are using smart phone? (6 months, 1 year, 2 years, 5 years), How many applications you have down loaded? and How many years you have been using computer? (1 year, 5 years, 10 years, 15 years). We select three applications namely, web browser, calendar and gallery applications and conduct the usability test on MeeGo and Blackberry 10.

4. RESULTS AND DISCUSSION

The information the users is: User 1(has an experience with smart phone), User 2(is using iPhone), User 3(is using blackberry), User 4(has little experience with smart phone) and User 5(is using Samsung S4). Furthermore, ‘P’ is for PASS, ‘F’ is for FAIL and ‘U’ represents unable to solve because of missing features.

4.1. Results of MeeGo

i. Gallery Application: Table 1 shows the results of Gallery application and these results are further illustrated in Fig. 2.

Table 1. The Gallery Application using MeeGo

| Tasks/Users | User 1 | User 2 | User 3 | User 4 | User 5 |
|--------------------------------------|--------|--------|--------|--------|--------|
| 1. Take a photo in full zoom | P | P | P | P | P |
| 2. Take a picture from front camera | U | U | U | U | U |
| 3. Put all the pictures at slideshow | F | P | F | F | P |
| 4. Save contact picture | F | F | P | F | F |
| 5. Apply wallpaper | U | U | U | U | U |
| 6. Apply wallpaper to lock screen | P | P | P | P | P |

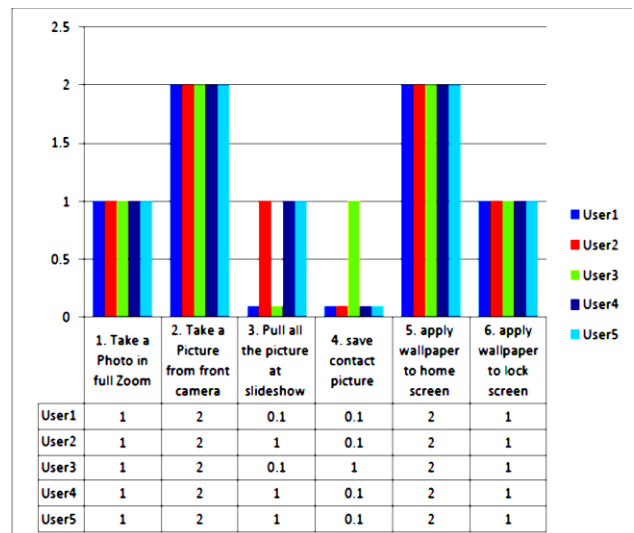


Fig. 2 A Graph for Gallery Application using MeeGo

Fig. 2 is a graphically representation of Gallery application. Five users perform six different tasks using MeeGo, X-axis represents tasks and Y-axis represents users. 0 means fail, 1

shows pass and 2 represents that the user is unable to perform the task because of missing features. All five users are able to complete Tasks 1 and 6, on the other hand Tasks 2 and 5 are not completed by any one because of missing features. Three users are able to complete Tasks 3 and 4 and users are not able to complete Task 4.

ii. Web Browser Application: Table 2 shows the results of Web Browser application and these results are further illustrated in Fig. 3.

Table 2. The Web Browser Application using MeeGo

| Tasks/Users | User 1 | User 2 | User 3 | User 4 | User 5 |
|---|--------|--------|--------|--------|--------|
| 1. Open yahoo and save password of your yahoo account | P | P | P | P | P |
| 2. Open Google find moon images and then save them to the gallery | P | F | P | F | P |
| 3. Add Google page to home screen | P | P | P | P | P |
| 4. Delete history | U | U | U | U | U |
| 5. Delete cookies | U | U | U | U | U |
| 6. Delete passwords | U | U | U | U | U |

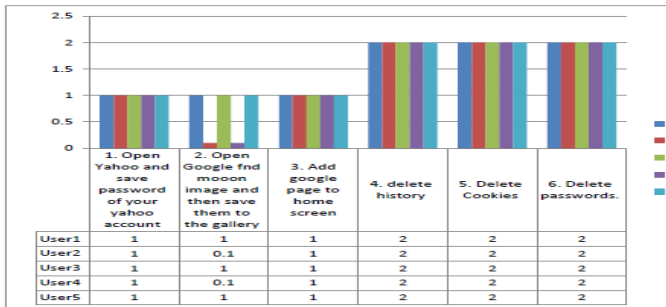


Fig. 3 A Graph for Web Browser Application using MeeGo
 Fig. 3 is a graphically representation of Web Browser application. Five users perform six different tasks using MeeGo, X-axis represents tasks and Y-axis represents users. 0 means fail, 1 shows pass and 2 represents that the user is unable to perform the task because of missing features. All five users are able to complete Tasks 1 and 3, on the other hand Tasks 4, 5 and 6 are not completed by any one because of missing features. Three users are able to complete Task 2.

iii. Calendar Application: Table 3 shows the results of Calendar application and these results are further illustrated in Fig. 4.

Table 3. The Calendar Application using MeeGo

| Tasks/Users | User 1 | User 2 | User 3 | User 4 | User 5 |
|--------------------------|--------|--------|--------|--------|--------|
| 1. Add an event | P | P | P | P | P |
| 2. Add a reminder | P | F | F | F | P |
| 3. Check month view | P | P | P | P | P |
| 4. Check week view | U | U | U | U | U |
| 5. Check day view | U | U | U | U | U |
| 6. Checkup coming events | F | P | P | P | F |

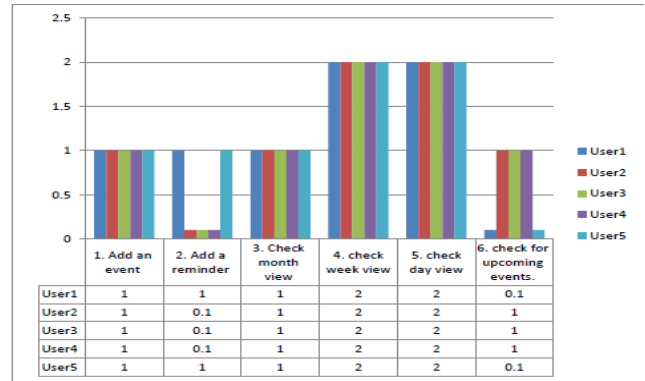


Fig. 4 A Graph for Calendar Application using MeeGo
 Fig. 4 is a graphically representation of Calendar application. Five users perform six different tasks using MeeGo, X-axis represents tasks and Y-axis represents users. 0 means fail, 1 shows pass and 2 represents that the user is unable to perform the task because of missing features. All five users are able to complete Tasks 1 and 3, on the other hand Tasks 4 and 5 are not completed by any one because of missing features. Three users are not able to complete Task 2 and two users are not able to Task 6.

4.2. Results of Blackberry 10

i. Gallery Application: Table 4 shows the results of Gallery application and these results are further illustrated in Fig. 5.

Table 4. The Gallery Application using Blackberry 10

| Tasks/Users | User 1 | User 2 | User 3 | User 4 | User 5 |
|--------------------------------------|--------|--------|--------|--------|--------|
| 1. Take a photo in full zoom | P | P | P | P | P |
| 2. Take a picture from front camera | P | P | P | P | P |
| 3. Put all the pictures at slideshow | P | P | P | P | P |
| 4. Save contact picture | P | P | P | P | P |
| 5. Apply wallpaper | P | P | P | P | P |
| 6. Apply wallpaper to lock screen | P | P | P | P | P |

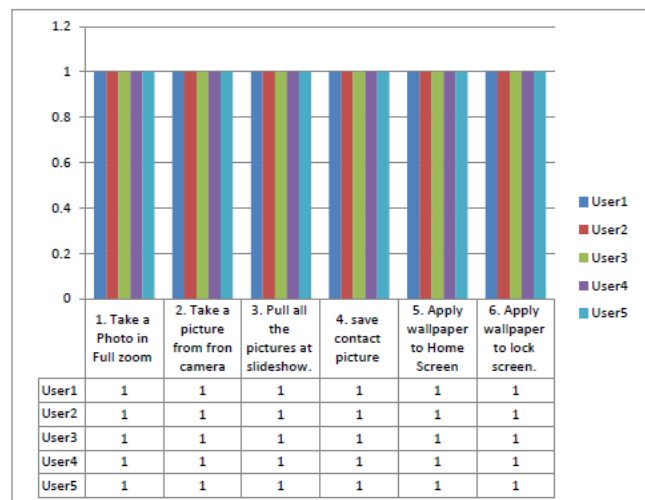


Fig. 5 A Graph for Gallery Application using Blackberry 10

Fig. 5 is a graphically representation of Gallery application. Five users perform six different tasks using Blackberry 10, X-axis represents tasks and Y-axis represents users. 0 means fail, 1 shows pass and 2 represents that the user is unable to perform the task because of missing features. All five users are able to complete all six Tasks which shows that the usability of Blackberry 10 is 100% as compared to MeeGo for this application.

ii. Web Browser Application: Table 5 shows the results of Web Browser application and these results are further illustrated in Fig. 6.

Table 5. The Web Browser Application using Blackberry 10

| Tasks/Users | User 1 | User 2 | User 3 | User 4 | User 5 |
|---|--------|--------|--------|--------|--------|
| 1. Open yahoo and save password of your yahoo account | P | P | P | P | P |
| 2. Open Google find moon images and then save them to the gallery | P | F | P | F | P |
| 3. Add Google page to home screen | P | P | P | P | P |
| 4. Delete history | P | P | P | P | P |
| 5. Delete cookies | P | P | P | P | P |
| 6. Delete passwords | P | P | P | P | P |

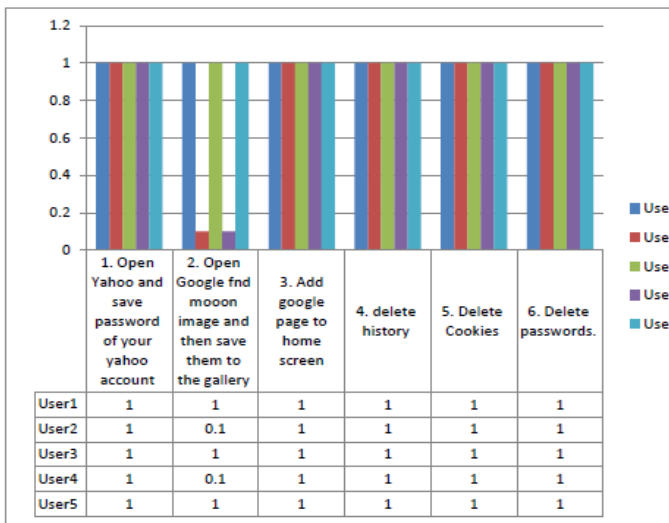


Fig. 6 A Graph for Web Browser Application using Blackberry 10

Fig. 6 is a graphically representation of Web Browser application. Five users perform six different tasks using Blackberry 10, X-axis represents tasks and Y-axis represents users. 0 means fail, 1 shows pass and 2 represents that the user is unable to perform the task because of missing features. Only two users are failed to perform Task 2 and the rest of the Tasks are successfully performed by the users which shows that the usability of Blackberry 10 is almost 100% as compared to MeeGo for this application.

iii. Calendar Application: Table 6 shows the results of Calendar application and these results are further illustrated in Fig. 7.

Table 6. The Gallery Application using Blackberry 10

| Tasks/Users | User 1 | User 2 | User 3 | User 4 | User 5 |
|--------------------------|--------|--------|--------|--------|--------|
| 1. Add an event | P | P | P | P | P |
| 2. Add as reminder | F | P | P | P | F |
| 3. Check month view | P | P | P | P | P |
| 4. Check week view | P | P | P | P | P |
| 5. Check day view | P | P | P | P | P |
| 6. Checkup coming events | P | P | P | P | P |

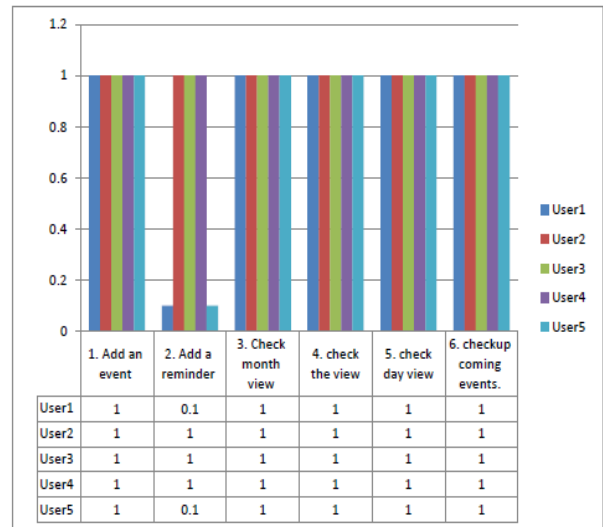


Fig. 7 A Graph for Web Browser Application using Blackberry 10

Fig. 7 is a graphically representation of Gallery application. Five users perform six different tasks using Blackberry 10, X-axis represents tasks and Y-axis represents users. 0 means fail, 1 shows pass and 2 represents that the user is unable to perform the task because of missing features. Only two users are failed to perform Task 2 and the rest of the Tasks are successfully performed by the users which shows that the usability of Blackberry 10 is almost 100% as compared to MeeGo for this application.

4.3. A Comparison of MeeGo and Blackberry 10 for all Applications: Table 7 shows the comparison of all applications using MeeGo and Blackberry 10. The result from Table 7 reveal that there is no usability problem in Blackberry 10 as compared to MeeGo for the selected applications. We conclude that the ease of use in interactive software is the most important factor that influence user to continue use of that software. The behavior of the user vary according to their age, locality, and nature of use and satisfaction level. Therefore, it is very difficult to predict some standard rules for designing UI that meets customer satisfaction. In case of mobile applications different users want the applications to behave in a particular way according to the nature of use and their satisfaction level.

Table 7 A Comparison of all Applications using a MeeGo and Blackberry 10.

| Application/Mobile | MeeGo | Blackberry |
|--------------------|---|---|
| Gallery | <ul style="list-style-type: none"> Lack of affordance while saving contact picture. Simple Vocabulary should be used to provide affordability. No visibility for front camera. The front camera is available on the screen but there is no option for the front camera in the camera settings. We have to install separate software for the use of front camera. Wallpaper is not conveying the appropriate message. Instead of wallpaper the word home screen and lock screen should be used. The options should be appropriate so user can easily find them out. No feedback is given on saving a picture No feedback is given on saving a contact picture. Terms should be according to their functionality refers to mapping | <ul style="list-style-type: none"> No usability problem found. |
| Web Browser | <ul style="list-style-type: none"> No visibility for deleting history, deleting Cookies, deleting passwords. There is no option for delete history, deleting Cookies, deleting passwords we have to move to settings on the home page and there is a complete procedure through which we can delete it. This is difficult for the users to recall again and again. No feedback is given on saving image in web browser. In web browser, no feedback is given on deleting history, cookies and passwords. | <ul style="list-style-type: none"> No usability problem found. |
| Calendar | <ul style="list-style-type: none"> Visibility issues. Signs and symbols should convey appropriate meaning and should be easily understandable. Placing the features appropriately so user can easily find them out should be visible. Feedback should be given after work has been completed. In calendar, no visibility for adding reminder. In calendar the icon is showing week view and when we open it is showing us day view. Terms should be according to their functionality refers to mapping In calendar, no feedback is given on adding an event. | <ul style="list-style-type: none"> In calendar, no visibility for adding reminder. The words "add task" is used instead of reminder. |

The users who are satisfied with using applications feel some inconvenience in operating mobile applications because of less options are visible on a single screen. The user satisfaction is the only factor that decides the success of any interactive software particularly considering mobile applications. The user friendly and familiar interactive interfaces are required by smart phone users who do not have much technical knowledge. The factors of user centered designs are very important to consider while designing GUI so that user can take maximum advantage of an application and can completely utilize it.

5. CONCLUSION

The main objective of the paper is to evaluate, analyze and measure the comparative usability performances of interfaces of mobile devices namely MeeGo phone and Blackberry 10. For this purpose, first we find out the issues of usability using different mobile phones, second we compare both of the devices with respect to their interfaces. Every user has different expectations related to the different applications. The users perform all tasks easily with good mood and we achieve better results. Blackberry 10 provides 95% better results than MeeGo. We conclude after conducting usability testing on MeeGo phone and Blackberry 10 phone. MeeGo phone is having a lot of usability issues which are lacking affordance, visibility, mapping and even issues of feedback. Due to these issues MeeGo phone is giving poor results and users are confused and frustrated. On the other hand there are no such usability issues in Blackberry 10 phone.

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