The Role of Participatory Design in Mobile Application Development

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Abstract. Mobile devices are used by people worldwide. It becomes a common equipment to complete a day-to-day activity. Inside the devices, there are numerous mobile applications that have been built for various needs. Some of these are quite successful while the other are not. The development of successful mobile application faces several challenges. In this research, we want to explore the use of participatory design method in mobile application development. Particularly, the aim of the study is to answer the question whether participatory design method has a place in the realm of mobile application development. We established two sessions of workshop to accommodate the participant to take part in the development process of mobile application. The result shows that participatory design method can determine how the user will deal with the limitations of mobile devices. It helps user to create a particular form of interaction that meets mobile devices characteristics.

Keywords: participatory design, mobile application, exploratory study

1. Introduction
Mobile applications are flourishing along with the increase of mobile devices user itself. Recently, there are about 2 billion mobile devices being deployed [1]. With the device, people are able to download and use various mobile applications which currently reach more than two million different applications [2]. This number is far more than the number of application available five years ago which only around 200 thousand applications [3].

However, the development of mobile applications face several challenges such as information architecture, data management and application context, and user interface [4]. This challenges are mostly stemmed from technical limitations of mobile devices [5]. To some extent, the challenges will affect the usability of mobile applications. In some cases, the user even unable to solve their problem with the applications that supposed to help them in that problem because of lack usability.

Participatory design is somewhat a new approach to the development of mobile application paradigm. This method is actually the mechanism of involving the user since the beginning until the end of the development of the mobile application. The user has a freedom to explore and do experiment with various applications’ features. Nonetheless, the user still need accompaniment from the designer of application so that the development process is appropriately running.

This research aims to explore the role of participatory design method in the development of mobile applications. However, the biggest challenges in using this method is how to encourage user, as a partner of design, to be able to actively express their idea to the designer of application [6], [7] and then manifest
the idea into sketch, prototype, or storyboard. In addition, the lesson learnt is important for the other designer whom build the same application in similar context [8], [9].

The next section will describe another study with similar topic. It then followed with the explanation of methodology that have been used in this study. After that, the result will be presented followed by discussion section. The conclusion section will end this paper.

2. Related Works
It seems that participatory design has been considered as useful approach in producing highly usable application that match users’ needs in a better way. For instance, there is a report about a work that combining participatory design approach in agile development [10]. The use of method makes for better balance of user’s involvement and a tight schedule that innate in the development process.

However, participatory design is highly dependent on the context where it is implemented [8]. To some extent, it is not interchangeable. This is due to the heterogeneity of user themselves which mostly differ from one to another background. For instance, people coming from medical background is somehow different with those who coming from academic background in terms of how they do thinking and or doing something which in turn will affecting the design process and the application itself. Some researchers have been studied the use of participatory design in healthcare context. It helps them to find unique requirements and limitation of design [9] that was strongly correlated to the condition in which the system was implemented [8]. Moreover, it can be used to take advantage of user existing knowledge [11].

In the same manner, mobile application development is also a context-dependent activity as stated by Harpe [8] that it is affected by the context where the application would be deployed. Therefore, the research that related to the development of mobile application in various context is important in order to take part in the future research or development that met the similar context.

3. Method
This study is explorative and cross-sectional in nature. The research route begins with literature review to find out the way to explore participatory design approach in mobile application development. Then, it was followed by two workshop sessions and ended up with analysis. There are n=100 participants joining this research. They work in a group consisting of 4 to 5 people. They work in the following steps.

Firstly, they were interviewed about the application they want to build. As a case study, we choose to build mobile-based learning management system as a big theme in this research. It was perfectly match with the day-to-day activity of participants since all of them are students.

After that, we held two workshop sessions to accommodate the development process with the participant.

1. Workshop 1: storyboarding. The participants would explore their idea in a group and create some storyboard.
2. Workshop 2: prototyping. The participants would develop high-fidelity prototype based on the idea that have been stored in storyboards.

Each workshop sessions were followed by discussion with another group to retrieve feedback.

After the prototype was formed and fixed, we hire professional programmer to build the applications based on participants’ prototype. We built the first version of application for Android platform. This is merely due to the popularity of this platform among participants.

4. Results
Most of literature have been reviewed stated that their research is important to other researcher or designer in terms of giving an example of either the implementation of participatory design or the development of mobile solution. It can be concluded that there are still a lot of work to be done in this
area so that there is enough example in various context. Therefore, this research proposes the context in academic nature.

In the first workshop session, participants were brainstorming their idea about the features and appearance of their forthcoming applications. In this workshop, they work as a group consist of 5 participants. Along with that, we give them a slight review of some well-known similar application, such as Moodle, Classroom (Google), and Edmodo. In addition, we explain to the participant how to build a low-fidelity prototype by sketching and storyboarding. The goal is to collect user requirements as much as possible. Participants are free to explore their idea and put it in the storyboard.

After the participant had finished their storyboard then we held presentation and feedback session. In this session, each group were presenting their storyboard to the other groups and taking feedback from them and this is the end of the first workshop session. Through the workshop, we had identified 20 most preferable features of mobile application that participants want to build. Table 1 below depicts the features together with the number of groups who brings the idea and the percentage of that groups comparing to the whole groups of participants.

From the list in Table 1, we do not build all the features. Instead, we choose to highlight (bold printed) and finally built only several features due to the limitation of resources (personnel and time). The selection is based on the observation during the workshop. The selected features are the features that discussed intensely by the participants and deeply attracted them.

| Table 1 Preferable features |
|-----------------------------|
| Features                  | Number of Groups | Percentage |
| Assignments               | 17              | 89,47       |
| Discussion/Forum           | 11              | 57,89       |
| Course Material Sharing    | 11              | 57,89       |
| Login / Authentication     | 10              | 52,63       |
| Schedule                  | 9               | 47,37       |
| Grade                     | 7               | 36,84       |
| Notification               | 6               | 31,58       |
| Message                   | 6               | 31,58       |
| Pair View                 | 5               | 26,32       |
| Announcements             | 5               | 26,32       |
| Timeline                  | 5               | 26,32       |
| Quiz                      | 4               | 21,05       |
| Profile                   | 4               | 21,05       |
| Lecturer’s Profile        | 2               | 10,53       |
| Join Course               | 2               | 10,53       |
| Chatting                  | 1               | 5,26        |
| Feedback Form             | 1               | 5,26        |
| Live Video Conference     | 1               | 5,26        |
| Attendance List/Sheet     | 1               | 5,26        |
| Online Storage            | 1               | 5,26        |
Of these features, participants once again being involved in the second workshop in which they start to design the high-fidelity prototype. In this session, they can decide how a certain feature will be displayed and behaved on the screen.

Here we had developed mobile-based learning management system that covers the features. The homepage of the application was figured out in figure 1. During the development process, we hired professional programmer to build our prototype on mobile platform. In this phase, we intensively communicate with the programmer to ensure that the application is match with the design that has been created by participants during workshops.

![Figure 1. Screenshot of the application’s homepage.](image)

5. Discussion

After going through the workshops, this study accentuated three prominent points about participatory design in mobile application development.

Initially, regarding to the design process, there are two incompatibly characteristics of participants. One, participants are able to follow well the instruction given to them. They can do the task that requested by designer, such as, draw storyboard, making discussion and taking feedback, and build prototype. However, due to their background and experience in using the same application that will be built in this study, they are inclined to design an application that mimic well-known application in the field. In this part, participants are unable to explore and exploit their idea even further. This makes them lost their opportunity to obtain the most preferable application.

Moreover, mobile devices where the mobile application is running within has limited resources, especially in screen size, battery life, and storage size. Comparing to bigger devices such as laptop and PC, mobile devices has certain usage pattern either in positive and negative way. On the one hand, user can bring it anywhere anytime. On the other hand, user need to deal with the limitations. Participatory design has taken its part in this matter. With this approach, user or participant had an opportunity to determine their own usage pattern. For example, they can pick only important features in application’s homepage as figured out in Table 1. The features that came out and listed in Table 1 was emerge from the user knowledge about the limitation of mobile devices and how to deal with it.

6. Concluding Remarks

Participatory design is a means for user to obtain preferable application. The main purpose of its usage is acquiring user requirements as match as possible with user needs. It is an opportunity for the user to determine how their application will behave. The goal of this approach is making a highly usable application. However, there are still challenges of making participant become actively express their idea so that the features of the application can perfectly match with their needs. Many research has been done to implement participatory design in various context. This research is among of them.
In this research, participatory design is being used in the context of mobile application development. The method helps user to explore their notion about the appearance, behavior, and features of mobile application based on their knowledge and experience. It can be done because their ideas are accommodated in several workshop sessions. In spite of that, there are still challenges gaining attention from participants during the whole process.

To sum up, this study has shown that participatory design could be an alternative approach in developing mobile application. It can accommodate the behavior of user in dealing with mobile device characteristics.

Further study can be done in developing and implementing working application that came from participatory design process in various context. Moreover, there are an opportunity also to do an evaluation study or user acceptance test regarding to applications generated from participatory design process.

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