User interface design pattern modeling for designing mobile-based scheduling activity application for senior citizen

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Abstract. Design patterns are explanations or templates that show how to solve problems that can then be used in different discussions. Design patterns are also a good solution for repetitive design problems, such as those given in activity scheduling applications for the elderly. Based on the results of literature studies conducted, related to the problem of compiling the elderly to scheduling activities on applications designed for the community because the elderly have special characteristics. From this recurring debate, a Design Pattern is required to request applications for the elderly. In this research, there is a modeling flow consisting of four processes, namely creating new design solutions that produce design patterns, user research using the User-Centered Design method that results in user needs analysis, creating new design solutions that produce prototypes, and finally from this research Testing design solutions are. From this modeling flow, the User Interface Design Pattern and Activity Scheduling application prototype for the senior citizen can be produced that can help to achieve the objectives of carrying out daily activities.

1. Introduction

In line with the increasing age of individuals, especially the elderly will experience a decrease in body organ function and an increase in the loss of active body tissue, in this case, the body's muscles [1]. People who are classified as elderly are called elderly people (elderly) or commonly also called the elderly. According to the World Health Organization (WHO), an elderly person is someone who has entered the age of 60 years and over. The retired have a set of activities consisting of daily habits such as eating schedules, sports, telephone calls, or activities such as therapy to seeing a doctor [2]. Therefore, seniors need to schedule activities for themselves.

In this digital era, there are already activity scheduling applications that have been developed in Indonesia but most are designed for the public and not for the elderly. As said by Masako Wakamiya from Japan who is an 80-year-old programmer that the majority of applications on many smartphones are only available for young people, while applications intended and can be enjoyed by the elderly are almost non-existent [3] so there is no activity scheduling application that is specific to elderly If the elderly use the activity scheduling application for the public, the elderly do not understand how to use it because the elderly have a special characteristic that is not being able to read writings smaller than...
16 pixels (equivalent to 12 points [4]), and the elderly are also sensitive to contrast ratios with text on the application display [2]. However, because of the special characteristics of the elderly do not match the design of the existing activity scheduling application to the public, there are recurring design problems.

To make the senior citizen achieve success in using the activity scheduling application, the UI design of activity scheduling for seniors must meet the characteristic requirements that are suitable for the elderly. Therefore, a User Interface Design (UID) pattern is needed to deal with the problem. UID pattern is a way to organize user knowledge, which is elderly and this is not a method for finding new solutions to problems [5]. Organize user knowledge by finding out user experience on the use of existing applications regarding perceived shortcomings, and unmet needs on applications that have been used previously by the user. The unmet needs will be analyzed to produce a new design solution in the form of a UID pattern that functions as a design solution. To design a UID pattern, it is necessary to know the needs and habits of the user when using an application on a smartphone by conducting research using the principles or steps that exist at several stages in the User-Centered Design (UCD) method to deal with repetitive design problems where the designer focuses on the needs users in each phase of the design process. This method was chosen because UCD involves users throughout the design process through various research and design techniques to create products that are very useful and accessible for the elderly. The resulting UID pattern will be used as a provision in designing an application mockup. The results of the mockup that have been made will be measured by usability using the USE Questionnaire evaluation method which includes three measurement parameters namely Usefulness, Ease of use, and Satisfaction. These three dimensions are the parameters that are most easily observed [6]. The results of several observations also show a correlation and interplay between the ease of use and usefulness parameters. An increase in the Ease of use parameter will be followed by an increase in usefulness, and vice versa [6]. Both of these parameters will contribute greatly to satisfaction.

2. Method
At this stage, the steps taken are adopted from the existing stages in the user-centered design (UCD) method in user research. In figure 1 can be seen modeling flow from this study.

![Figure 1. Modeling flow of the research [5].](image-url)
2.1. Collecting previous design solution
At this stage interviews were conducted with users, experts, and literature studies were also conducted from the journal. At this stage, there are several processes, namely: defining the problem one of the problems is the elderly who have forgetful nature and must be solved then a reminder feature is needed to overcome the problem, designing the design solution, collecting the design solution from the existing activity scheduling application, and finally designing the draft design pattern as can be seen in table 1.

| Reminder |
|----------------|
| **Pattern Category** | Content Pattern |
| **Problem** | Based on the results of literature studies and expert interviews in scheduling activities, the senior citizen must be reminded regularly because they are vulnerable to forget. Therefore, there is a problem, namely "How can the elderly carry out their activities so that no activities are missed?" |
| **Context** | Interface elements that help users to remember every activity they have to do. |
| **Forces** | Users want to do every activity promptly. |
| **Solution** | Apply reminder information related to activities that must be carried out by the user at a specified time. |
| **Rationale** | If the reminder is not applied, it is difficult for the user to reach his goal of carrying out activities on time. |
| **Example** | ![Image](image_url) The interface page above is a view of the Any.do, an application that displays the page for setting the reminder |

2.2. User research
Designs that are designed using UCD are adapted to user behavior in using the product so that the product developed does not force users to change their behavior when using the product. One of the useful tools for communicating extensive user research with design teams is User-centered design (UCD) methods [7]. The process at this stage is user interview, analysis of user context, the user needs analysis, and analysis of the task.
2.3. Creating a new design solution
Create a new design solution using data collected in the previous step and produce a user interface. This stage produces a prototype. Below is a picture of the user interface created based on the draft design pattern that has been defined, in Figure 2 shows the user interface page for setting a reminder.

![Setting reminder UI](image)

**Figure 2.** Setting reminder UI.

2.4. Testing design solution
The evaluation in this study uses the USE Questionnaire evaluation method. USE Questionnaire is a questionnaire that can be used to measure usability, there are several aspects of usability measurement, namely usefulness, ease of use, and satisfaction [8]. The ease of use parameter can be divided into 2 namely ease of learning and ease of use [9]. In the usability test, a questionnaire that is measured based on the measurement scale is used, namely using a Likert scale which has four criteria [10] which can be seen in Table 2.

| Criteria                  | Strongly Disagree | Disagree | Agree | Strongly Agree |
|---------------------------|-------------------|----------|-------|----------------|
| Grade                     | 1                 | 2        | 3     | 4              |

In this evaluation, each user is given a smartphone contained a prototype of the activity scheduling application that is tested. They will use the application. After that they fill out the statements from the questionnaire, the statements available are aspects that are in the USE Questionnaire.

3. Result and discussion
After testing the prototype, the result of the research are obtained. The results showed the greatest value is on easy of use factor which was 75%, then the easy of learn factor showed the smallest value of 40.6%. That is, prototypes are easy to use but must be learned until the user understands. The results of the questionnaire were processed and the data obtained range values. The results of the test can be seen in Figure 4.
Figure 3. Result of testing.

Figure 3 shows the results of the test, the lowest average is easy to learn 40% because the users are still difficult to learn and remember the tasks that exist in the prototype. When creating reminders, senior citizens consider some tasks that are too complicated and long-winded and reminder information lacking in detail so that it needs to be simplified and made clearer to make it easier to make reminders. This also affects the usefulness and satisfaction factors, although some parts are still considered helpful in supporting the activities of senior citizens, including text and buttons with a large size so it is easy to read.

4. Conclusion
From the results of the User-Centered Design method that were adapted in the User Interface Design Pattern modeling research to design mobile-based activity scheduling applications for senior citizen, conclusions can be drawn, namely (1) The UID Pattern model for activity scheduling applications has obtained that provides solutions to recurring problems encountered by users (2) The user interface model for scheduling activities has established driven from the pattern of the user interface design that provides a solution to the needs of users in carrying out their daily activities so that the senior citizen can schedule activities using a smartphone.

Further research will be carried out specifically related to several problems that still arise including the reminder manufacturing process that is considered to be wordy and lacking information so that it still does not adjust the characteristics of senior citizens. Therefore, iterations will be carried out further in making UI design patterns so that more appropriate patterns can be produced as a reference for making user interfaces that match the characteristics of senior citizens.

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