Design and Development of Smartphone Application Control

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Abstract. Smartphone Application Control is a project designed to block other phone applications that have excessive use by users. Excessive phone use is often experienced by children aged 7-18 years old. At the same time, many parents nowadays do not have time all day long to monitor and limit the use of their children’s phone due to work. The efforts of the mass media to advise on the use of phone do not give much positive impact on these children. Therefore, a robust alternative such as Smartphone Application Control is essential to curb these issues. To develop this application, a methodological approach has been used namely the Evolutionary Prototyping model. Android Studio version 3.6.2 is used to develop this application while SQLite Database acts as a database for storing all application usage statistics and Google-Cloud Firebase is used to store user-related information for user authentication purposes. To create an attractive user interface, Adobe Photoshop CS6 is used to design background and interface buttons. This app is able to track usage hours of other apps and block them if they exceed their daily usage limits. The time limit for such use can only be set by parents. Additionally, notification of excess usage will be sent to parents via email as a notification. A pop-up alert notification will be issued when user has reached his or her application limit. Smartphone Application Control is very important in helping user to control their phone usage behaviour.

1. Introduction

Mobile phones have become a very useful technology in our modern life. However, many reports state that adolescents and children have problems controlling the use of the phone. It is clearly stated in most newspaper clippings that teenagers 18 and under often surf the internet 6 hours a day [1]. Therefore, adolescents and children aged between 7 to 18 years old need to be constantly monitored so that the use of their phones is controlled. Now, the mass media and parents are acting as blocking agents of this addiction. Parents are certainly responsible for controlling their children but not all parents have the ability to control their children all the time due to the business of work. Furthermore, the mass media cannot provide a good guarantee to teenagers to limit their phone usage. This is due to the ego and stubborn nature that is often experienced by adolescents and children. Most of them do not care about community service order ads. Adults are smarter when using the phone while children are easily distracted and need guidance from parents [2]. Therefore, an application should be developed to allow this group to have a daily limit for each phone application usage [3]. It aims to educate and prevent children from becoming one of the victims of telephone addiction. The application should also be able to track every use of the phone apps so that parents can control and monitor the usage limit of their phone apps. With this, parents do not have to worry if they cannot be with the child for 24 hours. In
addition, the application must also have a function where parents will be notified or emailed when their child has reached the usage limit of an application.

2. Related Work

Nowadays, in modern age almost both parents have their own career and busy to monitor their children especially in gadget usage for instance smartphone. Most parent will not have time to monitor their children 24 hours and if they think that children misuse the phone or using certain apps for quite a long time, usually, they will advise their children or confiscate the smartphone and keep it for a while. However, this manual method is not effective as the parents don’t have time to monitor and observe their children frequently. In this case, a smartphone application control can help parents in controlling the usage of children apps in one time.

Parental control application is a parental monitoring and application blocker for child’s phone [2]. Parents choose to download this app because they are worried about their children being potentially exposed to internet access that could display inappropriate advertisements, cyber bullying, sharing of personal information and fraud [3]. One of the existing parental control apps is Stay Focused. It functions as a phone application usage supervision and able to give warning message on excessive application usage [4]. However, it does not contain user login feature for parent so, Smartphone Application Control is designed with user login feature to allow only parent able to modify the phone application setting. Plus, Time’s Up app is also built to monitor and block excessive used application [5]. But it does not alert or notify the parent when any excessive apps use occurs. Thus, parent alert notification feature is added to be designed within Smartphone Application Control.

3. Methodology

Evolutionary Prototyping model has been selected as a suitable model for the Smartphone Application Control project. The workflow process for the development was adapted from Evolutionary Prototyping model [6]. Table 1 shows the methodological phases and activities involved in the model.

| Phase       | Activity                                      | Tools & Technique | Result                      |
|-------------|-----------------------------------------------|-------------------|-----------------------------|
| Planning    | Task scheduling                               | Microsoft Project | Gantt chart Proposal        |
|             | Earnings proposal                             | Microsoft Office  |                             |
| Analysis    | Asking important individuals to elaborate     | Microsoft Office  | Use Case diagram            |
|             | on project needs                              | Draw.io           | Class diagram               |
|             | Organize project requirements                 |                   | Requirement diagram         |
|             |                                               |                   | Traceability Matrix         |
| Design      | Design the interface                          | Photoshop CS6     | User Interface              |
|             | Design a database structure                  | Android Studio    | Application database        |
|             |                                               | Google Cloud      |                             |
|             |                                               | Firebase          |                             |
| Implementation | Creating encoding                           | Android Studio    | Android Application         |
|             | Build a database                              | Google Cloud      | Report Draft                |
|             | Connecting a database with the               | Firebase          |                             |
|             | application                                   | User Smartphone   |                             |
|             | Download the application on the phone         | Application APK   |                             |
| Testing     | Alpha testing                                 |                   | Application testing         |
|             | Beta testing                                  |                   | Test case                   |
| Completion  | Report completion                             | Microsoft Office  | Final report                |

Table 1. Phases of methodology and activities.
4. Results and Discussions

Smartphone Application Control is made for parent user and phone user. This app will start with the module of user information registration which requires information like username, email address, password, and child’s name. They are required to enable only parent user can sign in the apps using registered email and password. This app contains of four main menus namely Limit Apps Usage, Apps Usage Stats, Apps Usage Report and User Profile. Limit Apps Usage menu acts to allow user modify the list of apps restriction setting by desired types of restriction; number of launches limit, usage time limit, and specific time restriction. The restriction setting of number of launches limit can be seen in Figure 1 which requires user to insert hourly and daily launches limit while Figure 2 shows the restriction setting by time limit which requires specific time per hour and per day. If the user wants to restrict the apps by specific time (i.e., sleep hour, study hour), user can choose the start and end time for the apps to be restricted like Figure 3. Apps Usage Stats menu acts to display the time usage statistic for each apps as shown in Figure 4. When an application has reached its usage limit, a pop-up alert notification will appear on user’s phone like Figure 5 while parent user will receive an email notification regarding the event as shown in Figure 6.

![Figure 1. Restriction setting by launches limit.](image1)

![Figure 2. Restriction setting by time limit.](image2)
Figure 3. Restriction setting by specific time.

Figure 4. Usage statistic of an Apps.

Figure 5. Pop-up alert notification on user’s phone.
In order to validate the performance of the proposed system, functionality testing has been carried out and recorded in a test case. Functional testing help validates the software system of their functional requirements or specifications. Table 2 shown partial test case for the Smartphone Application Control Module. This test case shown that requirement and functionality of the apps and successfully function.

Table 2. Test cases.

| No. | Functionality                                                                 | Expected Result                                                                 | Test Result |
|-----|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------|-------------|
| 1   | Application restriction according to set limits module                         |                                                                                 | SUCCEED     |
|     | - The user selects the application they want to block                          | - The application detects and displays the list of applications available in the phone | SUCCEED     |
|     | - The user presses the Select button on the selected application               | - The Select button is displayed on the screen                                   | SUCCEED     |
|     | - The user selects the desired type of restriction                             | - A checkbox is displayed for the selection of restrictions by launches, total time limit, and certain time interval | SUCCEED     |
|     | - The user selects the restriction options for number of launch limit and enters the desired limit number | - The text edit of the application launch limit of one hour and one day is displayed | SUCCEED     |
|     | - The user selects the restriction option for total time limit and enters the desired amount of time limit | - The text edit hours and minutes of time usage limits are displayed for hourly and daily use | SUCCEED     |
|     | - The user selects the restriction option for specific time range and enters the application time limit | - The timePickerDialog class displays an object in the form of a clock to allow users to easily select a time limit | SUCCEED     |
|     | - User confirms application restriction created                                | - An Alert Dialog displays the Yes or No options to get user confirmation and record the restriction information if Yes selected | SUCCEED     |
|     | - Users open a list of applications that have been subject to restrictions      | - A list of applications that are subject to restrictions is listed in the listViewHolder on the Application With Restrictions page | SUCCEED     |
(Continued…).

|   |   |
|---|---|
| **2** | Pop-up warning notification module |
|   | - Notifications appear when the application exceeds the opening limit |
|   | - A warning notification pop-up on screen with the message “application closed due to opening limit” SUCCEED |
|   | - Notifications appear when the application exceeds the usage time limit |
|   | - A warning notification pop-up on screen with the message “application closed due to time limit usage” SUCCEED |
|   | - Notifications appear when applications are used at the time of the ban |
|   | - A warning notification pop-up on screen with the message “application closed due to time limit usage” SUCCEED |

|   |   |
|---|---|
| **3** | Module of sending notifications to parents by email |
|   | - User entered wrong email or password 3 times when login |
|   | - A warning notification is sent to the parent email regarding login attempt failure SUCCEED |
|   | - Users reach app’s launch limit |
|   | - Notification is sent to parents SUCCEED |
|   | - User reaches the time limit of an application |
|   | - Notification is sent to parents if the user has reached the usage limit of an application SUCCEED |
|   | - Users open an application at forbidden time |
|   | - Notification is sent to parents if the user has reached the usage limit of an application SUCCEED |

5. Conclusions
In general, Smartphone Application Control can help parent to control their children’s phone usage more efficiently and effectively. By implementing this application, a full supervision can be done without the need of parental supervision. This app also helps parent to find out the total usage of their child's phone app throughout the day. Thus, it could educate and prevent children from becoming a phone addiction victim. It is absolutely justified that Smartphone Application Control should be practiced among children's phones nowadays.

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