# *Software Requirement Specification of Intelligent System for Monitoring and Preventing Smartphone Addiction*

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*Abstract*—**Internet usage in Indonesia is 72.7 million or 28% of Indonesia population. At least 80% of Internet subscriber use smartphone. From previous reasearch, several treatment can be applied to cure smarphone addicts, but prevention is more important. Smartphone overuse and social-media relationship are two dominant factors that cause smartphone addiction. Therefore, it is important to monitor smartphone usage so that it can be known if smartphone user become addicted. In education setting, this is not only a responsible of the teachers but also parents. It is difficult to find a comprehensive system that can accomodate teachers, parents, and institution in preventing smartphone addiction. This research proposes a model of intelligent system software to monitor smartphone usage and give recommendation for its users to prevent addiction.**

*Keywords—smartphones; addiction; intelligent system*

## I. INTRODUCTION

Internet usage in Indonesia is 72.7 million or 28% of Indonesia population. At least 80% of Internet subscriber use smartphone. Smartphone user has same portion by range of age, and use smartphone mostly for social-media, chatting, music, and game [1]. Based on this data, smartphone has potential impact on people live. As technology in general, it has positive and negative impact on their live of technology user.

Prior research found that smartphone usage can (1) decrease academic achievement of student [2]; (2) cause depression, shying, and sleep disturbance [3]; (3) impact on physical health because of decreasing muscle mass related to decreasing in body activities like walking and other sport activities [4][5]. On the other hand, smartphone has also benefit to increase critical thinking of student [6] and improve academic achievement of student [7]. Reaseacher also agree that smartphone has positive impact on academic achievement if student use smartphone in tolerable limit that not enter into addiction condition.

Several factors can influent smartphone user to be addicts, such as overuse, maintaining social-media relationship,

withdrawal from community [8]. In children, when their parents' education/income/age is higher, dual-income family, the longer parents themselves use smart phones, permissive parenting style, and positive attitudes towards smart phone, children tend to have higher possibility to be addicted to smart phones [9].

One of solution to prevent smartphone addiction is creating parental software that can monitor and interupt application usage by parent, for example Norton Family Primier PhoneSheriff, and ESET [10]; and several applications are dedicated for preventing smartphone addiction, for example Offtime, Moment, BreakFree, FlipD, and AppDetox. [11]. These applications are private domain and not records historical behaviours and treatments for preventing smartphone addiction. On this condition, there is no public information that can figure the general behaviour of smartphone user. The bahaviour of smartphone user, in individual user, group of users, or overall smartphone users basis, is important to provide a data and information support in creating institutional or public policy in term of preventing smartphone addiction. Therefore, this paper proposes software requirement spesification of intelligent system for monitoring and preventing smartphone addiction. This software requirement consist of data aquisition, data visualisation, data intelligence, and monitoring and suggestion by parent and teacher.

## II. RELATED WORK

One of solution to prevent smartphone addiction is creating parental software that can monitor and interupt application usage by parent, for example Norton Family Primier that can track location, web-filtering and block application; PhoneSheriff that have time limit control, extensif browsing and texting logs, and location features; ESET that can filter website, manage application, and track location faster. This application is only in family scope and the prevention is based on rule that can be broken if new application environment change. Moreover, it is not record the

history of behaviour in using smartphone that can be implemented for dynamics treatment [10]. Several applications are dedicated for preventing smartphone addiction, for example Offtime, Moment, BreakFree, FlipD, and AppDetox. These application is used dan configured individualy by smartphone owner. The kind of configuration consist of limiting application time usage, filtering website and communication, and family tracking. BreakFree can provide score of addiction. [11]

## III. METHODOLOGY

Software requirement engineering methodology is an organized, documented set of rules and practices for gathering requirement. This paper uses Use Case methodology in gathering software requirement (IEC 62559-2:2015), that consist of description of the use case, diagrams of use case, technical details, step by step analysis of use case, information exchanged, requirements, common terms and definitions, and custom information. [12]. In this paper, only three major representation will be described, namely description of use case, diagram of use case, and step by step analyasis of use case.

## IV. USER REQUIREMENT

To overcome smartphone addiction in student environment, parent and teacher and also institution should collaborate to do it through direct treatments or policies. To support them in making accurate treatments or policies, they need tool having capabilities:

- provide data and information about smartphone usage behaviour of child/student
- benchmark among student or group of student or institution or areas of outhority.
- provide recommendation

This tool should be realized using computer software that can be used easily and friendly.

## V. DESCRIPTION OF SYSTEM

To realise the goal of system that can give treatment recommendation to parent or teacher for preventing smartphone addiction, the system should has capability to:

- recording behaviour of student in using smartphone such as location and mobility tracking, student gesture, application usage, and smartphone resource used by application.

- collecting and saving smartphone usage behaviour in one place.

- visualizing behaviour of smartphone usage so that parent and teacher can be easily to interpret and manipulate it in order to give suggestion in preventing smartphone addiction.

- monitoring and interupting individualy or grouply of students in order to take proactive action in preventing smartphone addiction

- learning based on historical data and teacher's or parent's suggestion recorded and giving better treatment recommendation for preventing smastphone addiction.

- giving public information related to general behaviour in using smartphone.

These functionalities can be realized by six packages such as (1) student mobile data aquisition; (2) data collector; (3) data vizualisation; (4) data intelligence system; (5) parent application; and (6) teacher application. The architecture of system is depicted in Figure 1.
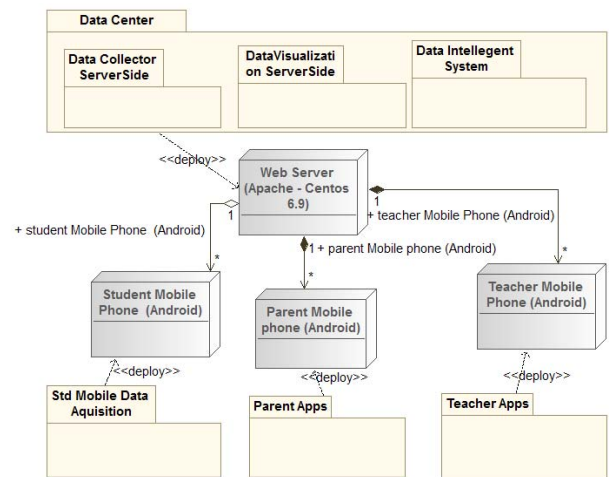


Figure 1. Enteprise Architecture of intelligent system for monitoring and preventing smartphone addiction.

## VI. SYSTEM FEATURES

### A. Student Data Aquisition

Student Data Aquisition package is descatibed using Use Case Diagram in Fig 2.
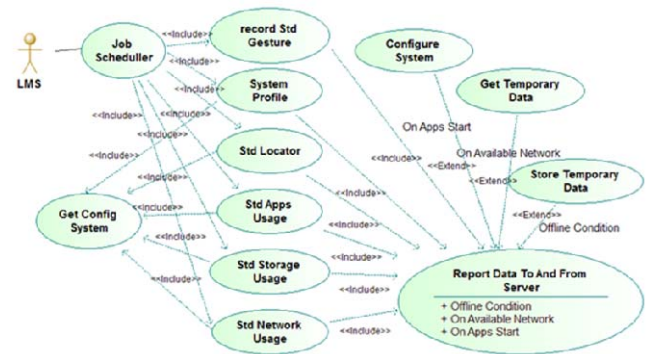


Figure 2. Use Case Diagram of Student Data Aquisition

This package records the behaviour of smartphone usage such as application usage actifities, location and mobility tracking, student gesture in using application, and smartphone storage and network usage. This package is run by following sequences:

1) On Learning Management System (LMS) started, LMS starts Job Scheduler Service.

2) On planned time, Job Scheduler executes Record Student Gesture, System Profile, Student Locator, Student Application Usage, Student Storage Usage, and Network Usage services, one by one.

3) Each service will get statistic usage of its taks domain, for example Student Locator service will get location and mobility of student and Network Usage service will get size of data download and upload.

4) Each service will invoke Report Data To and From Server (RDTFS) service to deliver its data to Server in Data Center.

5) In case of no available network, RDTFS will try to save statistic data to smartphone storage. In case of no available space in smartphone storage, statistic data will be ignored and will be recovered for next cycle.

6) All services, except Job Scheduler, is destroyed by itself.

7) Back to #2 step.

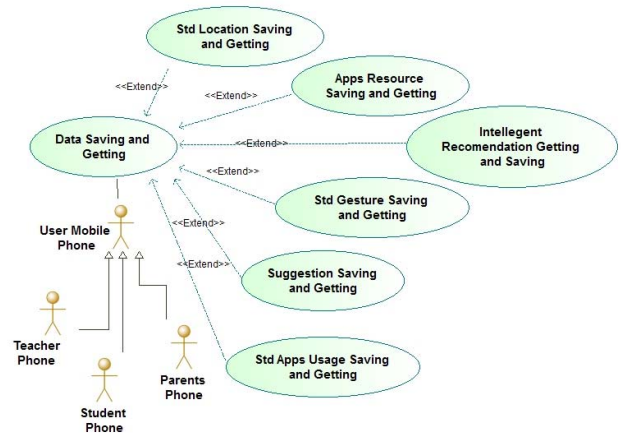### B. Data Collector

Data Collector package is simplest package in this system. This package has function to parse URL request from mobile devices and manage saving and getting data from database system. Use Case for this package is figured in Figure 3. This package is excecuted in following sequences:

1) Data Saving and Getting is waiting for URL request from Student Data Aquisition package.

2) Data Saving and Getting parse URL string to know what kind of command that should be excecuted.

3) Data Saving dan Getting will execute command with options:

   a) *Data Lokasi*: call Std Location Saving and Getting function that save to or get from table of location and mobility in database.

   b) *Apps Resource*: call Apps Resources Saving and Getting function that save toor get from table of smartphone resources in database.

   c) *Intelligent Recommendation*: call Intelligent Recommendation Saving and Getting function that save to or get from table of recommendation and send to requester.

   d) *Student Gesture*: call Std Gesture Saving and Getting function that save to or get from table of student gesture.

   e) *Suggestion*: call Suggestion Saving and Getting function that save to or get from table of suggestion and related supporting data.

   f) *Apps Usage:* call Std Apps Usage Saving and Getting that save to or get from table of application usage.



Figure 3. Use Case Data Collector

### C. Data Visualization

Data Visualization package visualizes the behaviour of smartphone usage either for individual student or a group of students, so that stakeholders easily intepret and make a corresponding action from friendly visual presentation. Use Case of Data Visualization is as in Fig.4.

Data Visualization package is executed by following sequences:

1) Stakeholder (parent or teacher) login into system first, if they want to see the characteristics of smartphone usage behaviour either in individual or group of students.

2) If login is succeed, stakeholder can explore presentation of application usage map and its trajectory, and list of application favourite.

3) Stakeholder can choose one application in a favourite list to be explored in detail; for example when and where the application was used or how much smartphone resources used.

4) Stakeholder can explore the historical application usage in daily, weekly, or monthly activity.

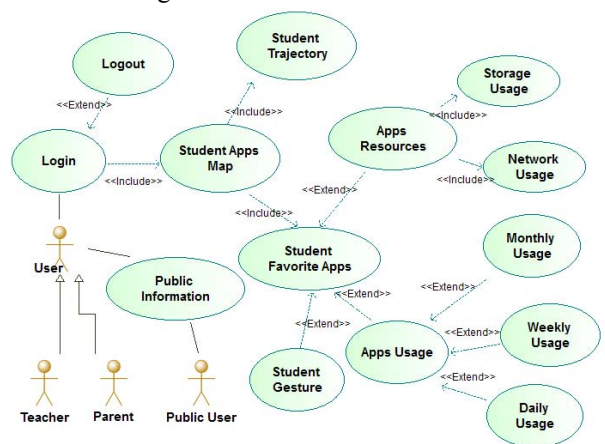5) Stakeholder can explore behaviour of storage and network usage.



Figure 4. Use Case of Data Visualization

## D. Intelligent System

Intelligent System should give recommendation properly, therefore it should be able to:
1) select meaningful data from any data type, in this case data that was collected from smartphone usage behaviour such as student location and mobility, application usage, student gesture, resources used, suggestion from their teacher and parent, and data that retrieved from their enviroment like current issues in open medias.
2) build new information from collected data.
3) learn to find new information that is more accurate and meaningful based on prior information and result of interaction with its environment.
4) autonomous in making interaction with its environment

## E. Parent Apps

Parent Apps provides data and information to parent about smartphone usage behaviour of his children. Parent can make a benchmark between his child and his child's friends or groups. Use Case of Parent Apps is presented in Figure 5. Parent Apps is executed by Parent as follow:
1) Parent can see public information in using smartphone, so that he has the big picture of smartphone usage behaviour.
2) Parent can explore list of his child's favourite application and its location and mobility in a map.
3) Parent is able to select and reveal the history of selected application and its gesture.
   a) If Parent select application usage, he can view his child's application behaviour either in daily, weekly, or monthly basis.
   b) If Parent select gesture, he can view his child's gesture behaviour for certain application usage.
4) Parent can see his child's smartphone resource history.
5) Parent can give suggestion to his child or aks for system to give recommendation that will be used as a supporting information in making a treatment for his child.



Figure 5. Use Case of Parent Apps

## F. Teacher Apps

Teacher Apps package provides data and information of smartphone usage behaviour of his students. Teacher can monitor to and interact with his sudents and benchmark his student behaviour to intitution, distric, province, or country scope. Teacher can give suggestion to his student or aks for system to give recommendation. Use Case of Teacher Apps is figured in Figure 6.

Teacher Apps is executed by teacher as follow:
1) Teacher can see public information in smartphone usage, so that he has the big picture of smartphone usage behaviour.
2) Teacher can explore list of favourite application and its location and mobility based on either individual or group of his student, in a map
3) Teacher is able to select and reveal the history of selected application and its gesture.
   a) If teacher select application usage, he can view application behaviour either in daily, weekly, or monthly basis.
   b) If teacher select gesture, he can view gesture behaviour for certain application usage.
4) Teacher can see his student's smartphone resource history.
5) Teacher can give suggestion to his student either individually or in group.
6) Teacher can aks for system to give recommendation that will be used as a supporting information in making a treatment for his student.



Figure 6. Use Case of Teacher Apps

## VII. VERIFCATION

Stakeholder has capability to collaborate to make suggestion or direct treatment in overcoming smartphone addicts, if they are equiped by tool that can provide single data and information about smartphone usage behaviour of child/student. Single data can be realized using Data Center that collect smartphone usage behaviour from student periodically. Collecting smartphone usage behaviour will be conducted by Data Collector (Fig. 3) in collaboration with Student Data Aquisition (Fig.2) that will work in background process managed by Job Scheduler periodically.

In making judgement, stakeholder need not only a level of addicts but also trend and comparison among student or group of students. To make it easier for stakeholder in making judgement, system provides user friendly data visualization in Data Visualization (Fig 4.) that stakeholder can explore level, trend, and comparison of smartphone usage in web-base platform. Moreover, for mobility, stakeholder can access the same interface by their smartphone and make a suggestion for their student or group of student (Fig. 5 and 6).

For advance level, stakeholder can ask the system to give recommendation to stakeholder, or alternatively the system gives recommendation automatically (section IV.D). This recommendation is generated from intelligent system learning process based on data collected by Data Collector, data suggestion from stakeholder, and external data ingested by the system itself.

## VIII. CONCLUSION AND FUTURE WORKS

This paper propose software requirement specification for intelligent system of monitoring and preventing smartphone addicts. This spesification is written based on three user requirements, and then realized into six software packages: Student Data Aquisition, Data Collector, Data Visualization, Intelligent System, Parent Application, and Teacher Application.

Futher stage in this research is system analysis for software design spesification that will consist of at least class diagram, sequence diagram, and deployment diagram.

## REFERENCES

[1] eMarketer, Breaking down Indonesians Smartphone Habits by Age. July 2016. https://www.emarketer.com/Article/Breaking-Down-Indonesian-Smartphone-Habits-by-Age/1014225.

[2] Manumpil Beauty, Ismanto Yudi, Onibala Franly. Hubungan penggunaan gadget dengan tingkat prestasi siswa di SMANegeri 9 Manado. ejoural Keperawatan (e-Kep) Volume 3. Nomor 2. 2015

[3] Demirci Kadir, Agonul Mehmed, Akpinar Abdullah. Relationship of smartphone use severity with sleep quality, depression, and anxiety in university students. Journal of Behavioral Addictions 4(2), pp. 85–92. 2015.

[4] Kibona Lusekelo and Mgaya Gervas. Smartphones' Effects on Academic Performance of Higher Learning Students. Journal of Multidisciplinary Engineering Science and Technology (JMEST). 2015

[5] Sung-eun, Jin-woo, and Yong-seok. Relationship between smartphone addiction and physical activity in Chinese international students in Korea. Journal of Behavioral Addictions 4(3), pp. 200–20. 2015

[6] Rambitan V.MM. The Effect of Smartphone on Students' Critical Thinking Skill in Relation to the Concept of Biodiversity. American Journal of Educational Research, Vol. 3, No. 2, 243-249. 2015

[7] Higgins Steven, Xiao ZhiMin, and Katsipataki Maria. The Impact of Digital Technology on Learning: A Summary for the Education Endowment Foundation. School of Education, Durham University. 2012

[8] Min Kwon, etc, The Smartphone Addiction Scale: Development and Validation of a Short Version for Adolescents. 2013 http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0083558 retrieved in August 2017

[9] Park, Cheol and Park, Ye Rang, International Journal of Social Science and Humanity, Vol. 4, No. 2, March 2014

[10] Bryan Hall, Best Parental-Control Apps 2017, https://www.tomsguide.com/us/best-parental-control-apps,review-2258.html. Retrieved in August 2017

[11] Jeremy Goldman, 6 Apps to Stop Your Smartphone Addiction, https://www.inc.com/jeremy-goldman/6-apps-to-stop-your-smartphone-addiction.html. Retrieved in August 2017.

[12] Gottschalk, M, Ulsar, M, and Delts, C., Use case and Smartgrid Architecture Model Approach The IEC 62559-2 Use Case Template and SGAM applied in various domain. 2017