INTEGRATING SMARTPHONE WITH STUDY ACTIVITIES OF UNIVERSITAS MUHAMMADIYAH SURAKARTA

Compiled as a condition to complete Bachelor Degree of Informatics Department Faculty of Communication and Information

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UNIVERSITAS MUHAMMADIYAH SURAKARTA

APPROVAL PAGE

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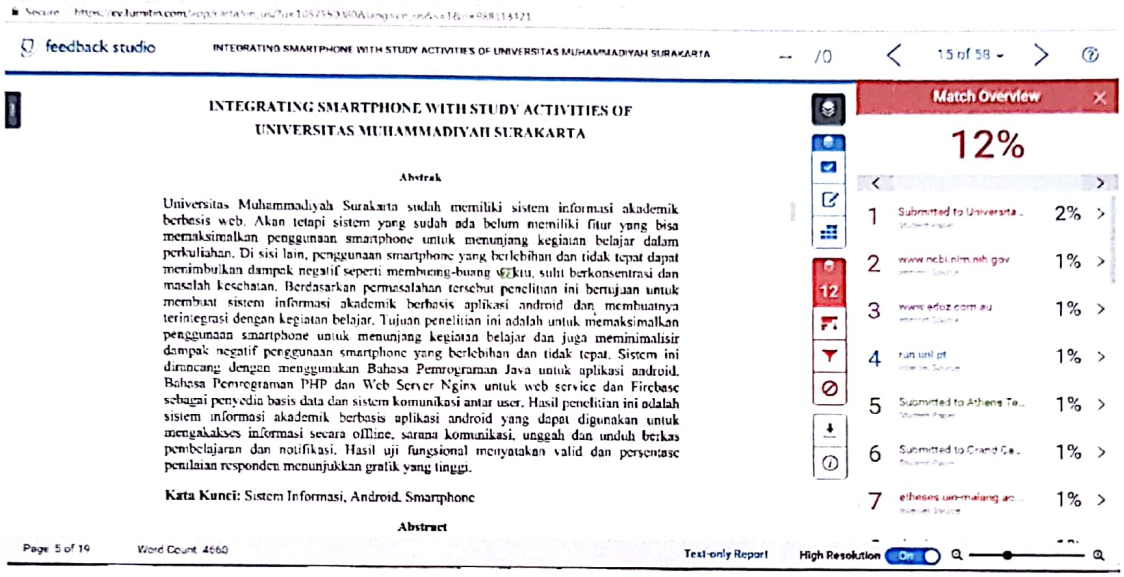

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INTEGRATING SMARTPHONE WITH STUDY ACTIVITIES OF UNIVERSITAS MUHAMMADIYAH SURAKARTA

Abstrak

Universitas Muhammadiyah Surakarta sudah memiliki sistem informasi akademik berbesis web. Akan tetapi sistem yang sudah ada belum memiliki fitur yang bisa memaksimalkan penggunaan smartphone untuk menunjang kegiatan belajar dalam perkuliahan. Di sisi lain, penggunaan smartphone yang berlebihan dan tidak tepat dapat merimbulkan dampak negatif seperti membuang-buang waktu, sulit berkonsentrasi dan masalah kesehatan. Berdasarkan permasalahan tersebut penelitian ini bertujuan untuk membuat sistem informasi akademik berbasis aplikasi android dan membuatnya terintegrasi dengan kegiatan belajar. Tujuan penelitian ini adalah untuk memaksimalkan penggunaan smartphone untuk menunjang kegiatan belajar dan juga meminimalisir dampak negatif penggunaan smartphone yang berlebihan dan tidak tepat. Sistem ini dirancang dengan menggunakan Bahasa Pemrograman Java untuk aplikasi android. Bahasa Pemrograman PHP dan Web Server Nginx untuk web service dan Firebase sebagai penyedia basis data dan sistem komunikasi antar user. Hasil penelitian ini adalah sistem informasi akademik berbasis aplikasi android yang dapat digunakan untuk mengakses informasi secara offline, sarana komunikasi, unggah dan unduh berkas pembelajaran dan notifikasi. Hasil uji fungsional menyatakan valid dan persentase penilaian responden menunjukkan grafik yang tinggi.

Kata Kunci: Sistem Informasi, Android, Smartphone

Abstract

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Kata Kunci: Sistem Informasi, Android, Smartphone

Abstract

Universitas Muhammadiyah Surakarta already has a web-based academic information system. However, the existing system does not have features that can maximize the use of smartphones to support study activities. On the other hand, the excessive and inappropriate use of smartphones can have negative impacts such as wasting time and health problem. Based on these problems, this study aims to create an android based academic information system and make it integrated with study activities. The purpose of this study is to maximize the use of smartphones to support study activities and also minimize the negative impact of excessive and inappropriate smartphone usage. This system developed by using Java Programming Language for the android application, PHP Programming Language and Nginx Web Server for the web service and Firebase for the database and communication system between application users. The results of this research is android based academic information system that provide offline access of information, communication media, upload and download study files, and notification. Functional test results stated were valid and the percentage of the respondents assessment chart shows high value.

Keywords: Information System, Android, Smartphone

1.INTRODUCTION

Universitas Muhammadiyah Surakarta already has web based academic information system. This system provides student and lecturer with many functions for academic purpose. But, this system is still not providing some functions such as communication, notification, manage study files, manage student assignment, and manage university announcement. Because of the system is web based the users is can not access it when there is no internet connection and when there is something new in the system, the users can not get notification about it. Because of that the use of android application will be solve those problems because the android application is still accessible whether if there is no internet connection and android application is also providing notification system.

The next problem is smartphone addiction. Addiction to smartphones is the real form of addiction that can be happened. Some researchers have succeeded to classify distinct subgroups of people who use both smartphones and the internet based on addiction severity levels. The classified groups differed in terms of sex and psychosocial traits. They also conclude that smartphones can be problematic when used excessively. For example, excessive smartphone use can interfere with school or work, decrease real-life social interaction, decrease academic ability, cause relationship problems, and cause physical health-related problems including blurred vision and pain in the wrists or the back of the neck (Choi, et al., 2014).

However, because of the limited findings, which lack a validated standard, nothing about smartphone addiction or the characteristics of problematic users has yet been clearly concluded. The existing solution of this addiction is an exercise rehabilitation. This rehabilitation has form of family camp with the main goal to make someone addicted to smartphone knows that they can live without using an smartphone (Kim, 2013).

In this research area, the two main problems are smartphone addiction and inefficiency of the online leaning because of the lack of standard platform. The main goal of this research is to solve these two problem with one solution which is fully integrated smartphone with student activities and become the standard platform of online learning. Online learning provides the opportunity for teachers to make learning interactive and collaborative by using a social constructivist approach to teaching and learning. This involves creating a student-center approach where the teacher takes the role of the facilitator and the students engage in peer learning (Maor, 2003). The students are become online learner participation which is mean a complex process of taking part and maintaining relations with others in the online network study (Hrastinski, 2009). This research will develop android application by using java programming language as core program and firebase as a provider of the storage and communication system. User will install the android application which will be able to

provides notification of assignment and announcement, real-time chat or discussion and reference sharing with just providing their university ID and password. This study expects that this android application will be able to fully integrated with study activities of Universitas Muhammadiyah Surakarta and maximize the use of smartphones to support study activities and also minimize the negative impact of excessive and inappropriate smartphone usage.

2. METHOD

This research used waterfall model approach as the method of development. First step of this method is requirement analysis which is a step to determine all posible requirements of the system and then the results of the analysis will be used to make database design and system design. The next step is implementing the requirements, database design and system design into real product. After that the developed system will be tested with some scenarios based on the user type. This testing section will determine wheter the system is good enough to be use by university student, staff, and lecturer. If the testing section is fail, then the system need to be developed again in the maintenance section to fix the failure.

2.1 Requirement Analysis

Requirement analysis is the phase to determine all possible requirements of the system to be developed. The analysis started with making a list of available features in Universitas Muhammadiyah Surakarta web based academic information system. The features are view lecture schedules, view exam schedules, view student bills, view student marks, search lecture schedule.

Based on the experience of researcher and his friends as active students of Universitas Muhammadiyah Surakarta, there are some features that have not existed in existing information systems and in certain cases required by students. Those features are offline access of information, uploading and downloading study files, notification of announcement sent by university staff to students and lectures, notification of student assignment sent by lecturer and chat features between university staffs, lecturers and students.

From the list the researcher conducted that there are three actors: staff, lecturer, and student. Each actor have its own functionalities so the application will adjust the interface based on the user type. The adjustment is also done for the web service. It’s because each user have it’s own login scenario. The features of the application are listed as use case diagram in Figure 1. Each feature may have some derivative features but figure 1 will only show the main features of each user type.

Figure 2 shown the activity diagram that represent the workflows of application used by each type of user.

Figure 1. Use case diagram of the application

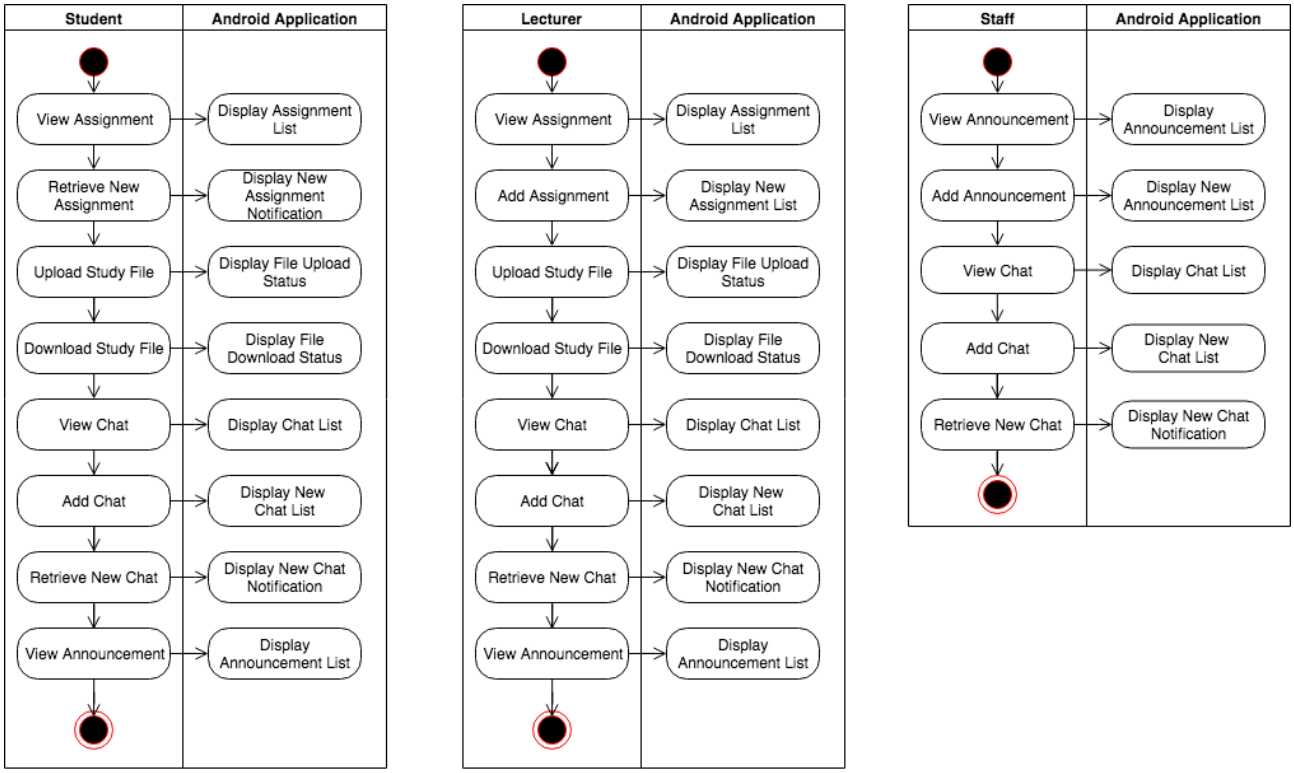

Figure 2. Activity diagram of the application

2.2 Database Design

From the use case diagram based on requirement analysist, the next step is to design the database shown by figure 3. The database is using Firebase Realtime Database which is a cloud non relational database. Firebase is platform which allow to build web and mobile applications without server side programming language ("What is Firebase? - Quora," n.d.). Non relational database means that the tables in the database do not have direct relation of tables. This type of database is suitable to handle big data because of the reliability and speed. Cloud means the data is stored on remote servers accessed from the internet. Firebase is used by this application because of the simplicity, reliability and security. Simplicity means the developer does not need to configure the server from scratch and only need to use the services, tools, libraries, relevant documentation, code samples, processes, and or guides provided by Firebase. Reliability and security mean that the service can operate well and also maintain its security.

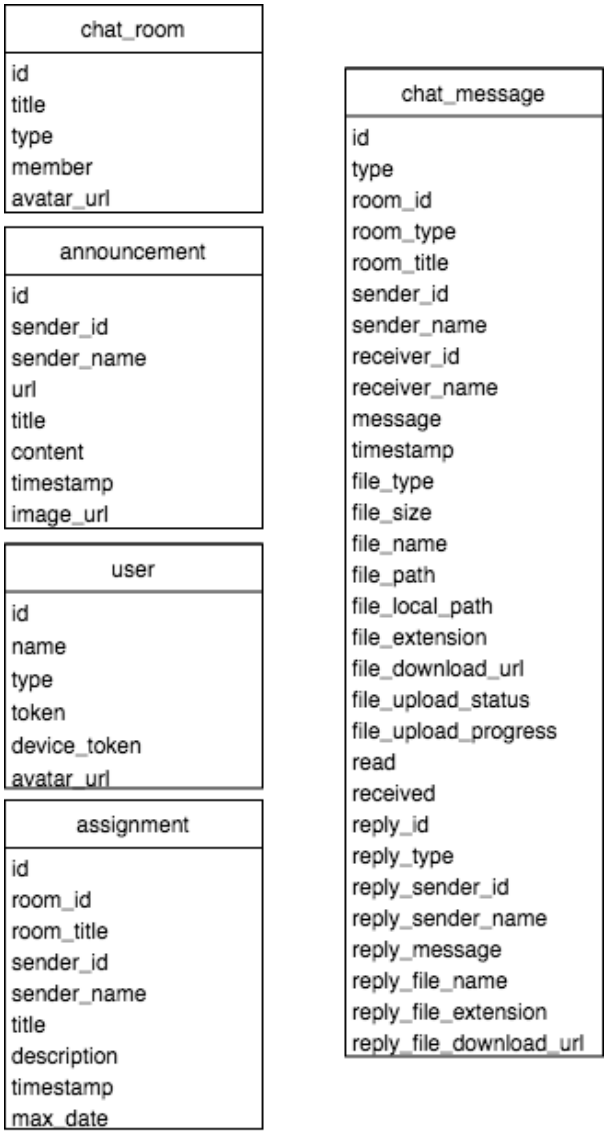

Figure *3*. Database Scheme

There are 5 database tables used by this application which are user, chat_room, chat_message, assignment and announcement. User table is used to store user information. The user will separate by their type which are staff, lecturer and student. Id in user table is the university ID. Chat_room table is used to store chat room information such as title and member. Id in chat_room table is the id of lecture or subject in university academic information database. Chat_message table is used to store chat message between university staff, lecturer, and student. Assignment table is used to store assignment information added by lecturer. Announcement table is used to store announcement added by university staff.

2.3 System Design

The next step is designing the system based on requirement analysis. For the user login, get schedule, get student academic information, the application need a web service to get the information from the university web-based academic information system. Web service reformat the university web-based academic information system to become formatted data that the application can understand.

Firebase real-time database has function to provide real-time chat and storage features. There is no web service needed so the operations such as add and read chat message, upload and download file, assignment and announcement management can be done directly with the real-time database.

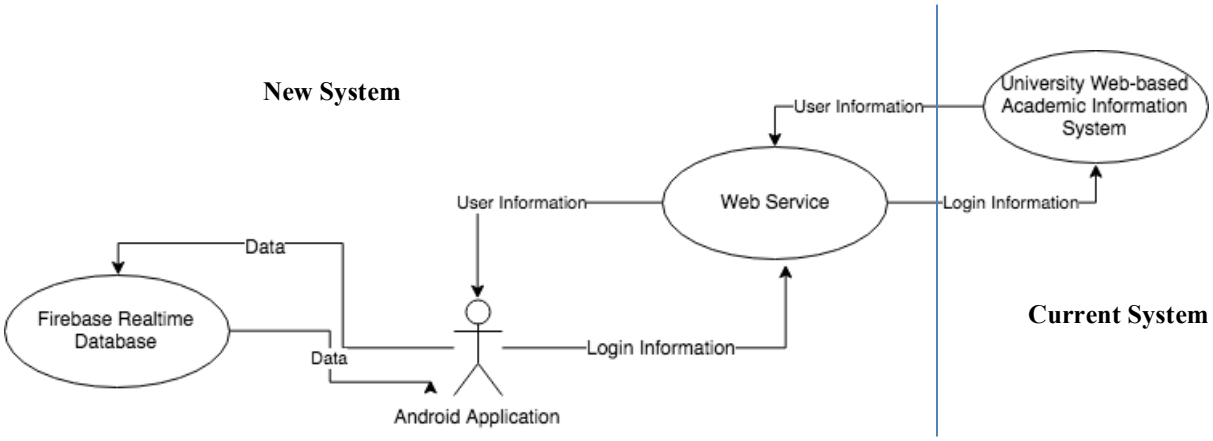

Figure *4*. System Design for Web Service Interaction

Figure 5. System Design for Firebase Real-time Database Interaction

2.4 System Implementation

The implementation of the system is start by making the web service to get the user information from the web-based academic information system. A web service is a function that can be accessed by other programs over the internet and uses a standardized JSON messaging system. JSON (JavaScript Object Notation) is a syntax for storing and exchanging data. JSON is used to encode all communications to a web service. For example, a client invokes a web service by sending an JSON message, then waits for a corresponding JSON response. ("What are Web Services? - Tutorialspoint," n.d.). The web service is using nginx as web server and PHP programming language for the web service program.

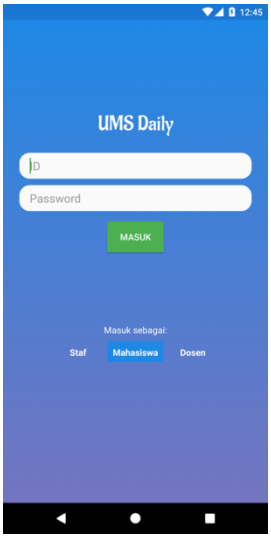

Figure 6. Application Login Screen

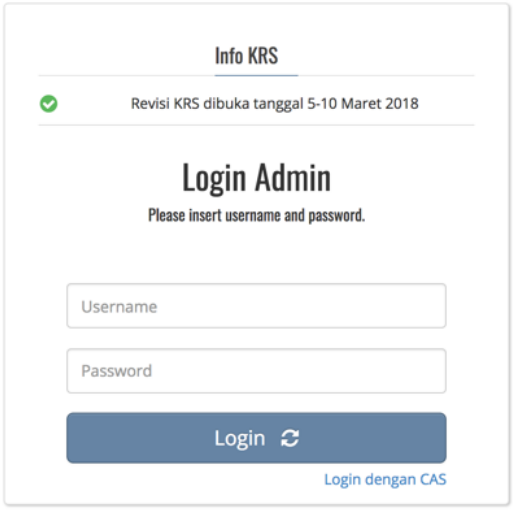

Figure 7. Current System Login Page

Figure 6 and figure 7 shown the different of the new and current system user interface. From the features perspective, the advantages of the new system are the new system's user does not need to always connected to the internet. They only need to load the data once when they connected to the internet. Then, the data is still accessible even though the user is offline. But, the data will automatically updated whenever the user is connected again to the internet. The new system is also have some new features such as real-time chat, upload and download file, assignment and announcement management and notification system.

When the user click on the "Masuk" button, the application send user login information consist of user university ID and password to the web service and then the web service act like a web browser to login and get user information such as user university id, user name, and user schedule from the university web-based academic information system. The user schedule contains lecture or subject id, name, room, semester, and time. To communicate between android application and web

service, the web service need to format the information to become JavaScript Object Notation (JSON) format.

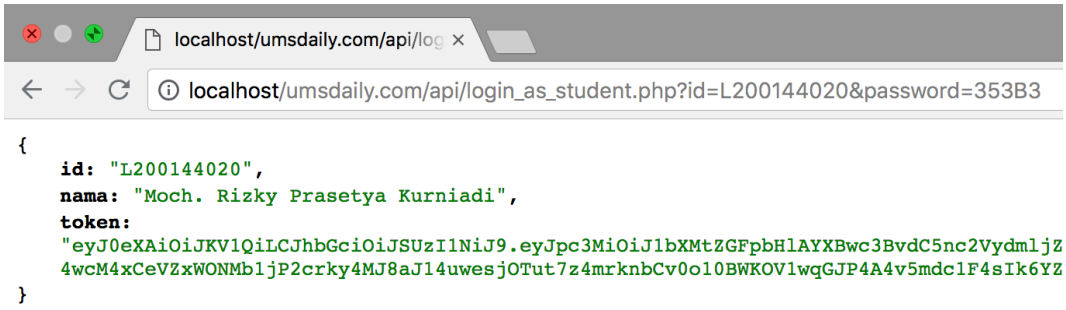

Figure 8. JSON Formatted User Information from Web Service

Figure 9. JSON Formatted User Schedule Information from Web Service

After that, the application reformat the information to become a record of *user* table and *chat_room* table in the database where the *id* in *user* table is user university ID and the *id* in *chat_room* table is the *id* of lecture or subject in university academic information database.

The lecture or subject name will be the *title* of *chat_room* table and then the application also store the user university ID in *member* list of *chat_room* table. The application also store user device token in *user* table for the purpose of push notification. After stored login information to the database, the application display *chat_room* table records as a list of chat room in the application home screen. The *chat_room* table records are filtered based on *member* list. When the user university ID is in the list of *member* inside *chat_room* table then the *chat_room* records will be added to the chat room list in the application home screen.

Figure 10. Database user Table Record

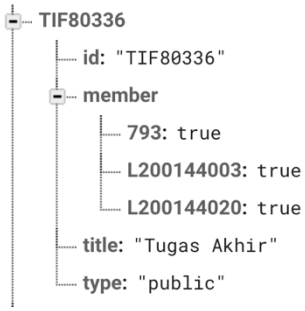

Figure 11. Database chat_room Table Record

The notification system of this application is using Firebase Cloud Function as a listener that triggered whenever new data is added to the database. Then, the cloud function will create push notification and send it to the user based on the user device token.

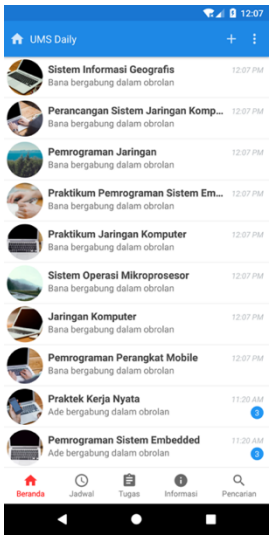

Figure 12. Student Application Home Screen

Figure 13. Staff Application Home Screen

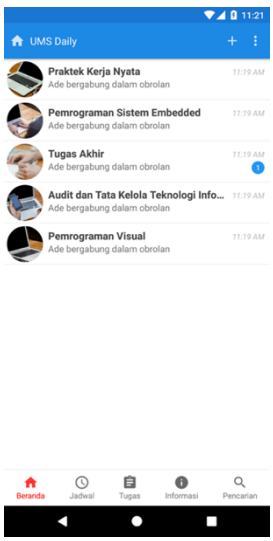

Figure 14. Lecturer Application Home Screen

2.5 Testing

This android application is using User Test approach. At this step, the application tested by the user directly. The application use Firebase Crashlytics service to make the application able to automatically submit the error log to the server so the developer can analyze the log to find the solution. This testing step is consists of three parts based on user types which are student, staff and lecturer. Each part consists of cases, test scenarios and results.

Case is the function of application that will be tested. Test scenario is how the function will be tested. Then, the result is the expected outcome from the tested application function. At this step, the system was tested by students, lecturer and staff of Universitas Muhammadiyah Surakarta who used the application. A survey conducted to obtain the users satisfaction assessment, then to see the response a questionaire is held. Ten peoples consist of students, staff, and lecturer are given the questionaire. They will use the application in their smartphone and answering 5 questions which are can the application maximize the use of smartphones to support study activities, can the application minimize the negative impact of excessive and inappropriate smartphone usage, does the application functionality give more efficient way to use the academic information system, does the application interface is good enough, is the application worth to develop. Each question has point 1 to 10 to describe the satisfaction of user who used the application.

2.6 Maintenance

In this step the error or failure that occured in the testing section is analyzed and fixed. The error that happen outside the testing period is recorded automatically using Firebase Crashlytics Service and the developer can see the error detail is the Firebase Crashytics Dashboard. Figure 15 shown the error recorded that occured outside the testing period.

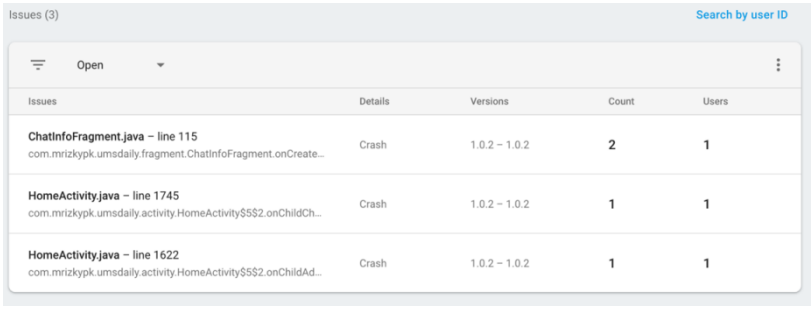

Figure 15. Error Detail in Firebase Crashytics Dashboard

3.RESULT AND DISCUSSION

To ensure that the application is ready for the user then testing is done on the application. The testing is consist of three part based on user types which are student, staff and lecturer. Table 1 is the functional testing for student user type. This testing is contain cases and test scenarios to test wheter

the application functionalities for student can work well without error and produce correct result. The student user type is the user which contain most functionalities of the application.

Table 2 is the functional testing for lecturer user type. This testing is contain cases and test scenarios to test wheter the application functionalities for lecturer can work well without error and produce correct result. The lecturer user type application functionalities is little bit different from the student user type. That is because the lecturer is able to manage the assignment such as add and delete assignment.

Table 1. Functional testing result of application with student user type

No	Case	Test Scenario	Result	Status
1	Login	Input university ID and password, choose student as user type, then click login button	Application showing homepage screen of student with a list of chat room.	Valid
2	View chat room message	Click chat room name	Application showing a screen that contains of list of chat room messages.	Valid
3	Add chat room message	Click chat room name, then type message in the message box in the bottom of the screen and then click send symbol button.	New message is added to the bottom of the chat room messages list.	Valid
4	Upload study file to the chat room	Click chat room name, then click attachment symbol in the bottom of the screen. Choose and click file type.	New message with incidator of uploading status of the file is added to the bottom of the chat room messages list.	Valid
5	Download study file to the chat room	Click chat room name, then click chat room avatar, click “Gambar” or “Berkas” label the choose then file	Application showing download indicator. The indicator will be disappear when the download is commpleted.	Valid
6	View schedule	Click “Jadwal” menu in the bottom of the screen	Application showing the list of student schedules.	Valid
7	View assignment	Click “Tugas” menu in the bottom of the screen	Application showing the list of student assignments.	Valid
8	View announcement	Click “Information” menu in the bottom of the screen then click “Pengumuman” menu.	Application showing the list of announcement.	Valid
9	Search schedule	Click “Pencarian” menu in the bottom of the screen. Type keyword then choose search category.	Application showing the list of lecture schedule based on the search keyword and category.	Valid

Table 3 is the functional testing for staff user type. This testing is contain cases and test scenarios to test wheter the application functionalities for staff can work well without error and produce correct result. The staff user type is the user that have minimal application functionalities. That is because the staff is not able to join in the chat room and the staff is also not able to check user assignment and academic information except the lecture schedule. But, the staff is able to manage announcement such as add and delete the announcement.

Table 2. Functional testing result of application with lecturer user type

No	Case	Test Scenario	Result	Status
1	Login	Input university ID and password, choose lecturer as user type, then click login button	Application showing homepage screen of lecturer with a list of chat room.	Valid
2	View chat room message	Click chat room name	Application showing a screen that contains of list of chat room messages.	Valid
3	Add chat room message	Click chat room name, then type message in the message box in the bottom of the screen and then click send symbol button.	New message is added to the bottom of the chat room messages list.	Valid
4	Upload study file to the chat room	Click chat room name, then click attachment symbol in the bottom of the screen. Choose and click file type.	New message with incidator of uploading status of the file is added to the bottom of the chat room messages list.	Valid
5	Download study file to the chat room	Click chat room name, then click chat room avatar, click “Gambar” or “Berkas” label then choose the file	Application showing download indicator. The indicator will be disappear when the download is commpleted.	Valid
6	View schedule	Click “Jadwal” menu in the bottom of the screen	Application showing the list of student schedules.	Valid
7	View assignment	Click “Tugas” menu in the bottom of the screen	Application showing the list of student assignments.	Valid
8	Add assignment	Click “Tugas” menu in the bottom of the screen then click plus symbol in the top right of the screen then fill all the form.	Application showing the list of student assignments.	Valid
9	View announcement	Click “Information” menu in the bottom of the screen then click “Pengumuman” menu.	Application showing the list of announcement.	Valid
10	Search schedule	Click “Pencarian” menu in the bottom of the screen. Type keyword then choose search category.	Application showing the list of lecture schedule based on the search keyword and category.	Valid

Table 3. Functional testing result of application with staff user type

No	Case	Test Scenario	Result	Status
1	Login	Input university ID and password, choose staff as user type, then click login button	Application showing homepage screen of staff with a list of private chats.	Valid
2	View private chat message	Click chat person name	Application showing a screen that contains of list of private messages.	Valid
3	Add private message	Click chat person name, then type message in the message box in the bottom of the screen and then click send symbol button.	New message is added to the bottom of the private chat messages list.	Valid
4	Add announcement	Click “Information” menu in the bottom of the screen then click “Pengumuman” menu. Click plus symbol button on the top right of the screen and fill all the form.	Application showing the list of announcement.	Valid
5	View announcement	Click “Information” menu in the bottom of the screen then click “Pengumuman” menu.	Application showing the list of announcement.	Valid
6	Search schedule	Click “Pencarian” menu in the bottom of the screen. Type keyword then choose search category.	Application showing the list of lecture schedule based on the search keyword and category.	Valid

3.1 Discussion

Based on testing result of the application which is represent by user satisfaction survey result in table 4, we can conclude that the lowest point is obtained by Question B (Can the application minimize the negative impact of excessive and inappropriate smartphone usage?) which represent the Benefit of the Application, then the second lowest point is obtained by Question D (Does the application Interface is good enough?) which represent the Interface of the Application. Based on the Question B and D results we can conclude that the application benefit and interface are need improvement.

Table 4. Result of the user satisfaction survey

No	Question	Respondens										Total
		A	B	C	D	E	F	G	H	I	J	
1	Question A	10	10	8	10	10	10	10	10	7	8	93/100
2	Question B	9	8	5	10	7	10	9	10	3	9	80/100
3	Question C	9	9	9	10	10	10	7	10	8	9	91/100
4	Question D	9	10	8	10	8	10	7	9	10	8	89/100
5	Question E	10	10	10	10	10	10	9	10	10	9	98/100

The highest point is obtained by Question E (Is the application worth to develop?) which means that the users want the continuity of application development so they can get more benefit from the application. The second highest point is obtained by Question A (Can the application maximize the use of smartphones to support study activities?) and the third highest point is obtained by Question C (Does the application functionality give more efficient way to use the Academic Information System?) which represent the Performance of the Application. Based on the Question A and C results we can conclude that the application is able to maximize the use of smartphone to support study activities and also give the efficient way to use the Academic Information System. Figure 16 shown the chart that represent the testing result of the application.

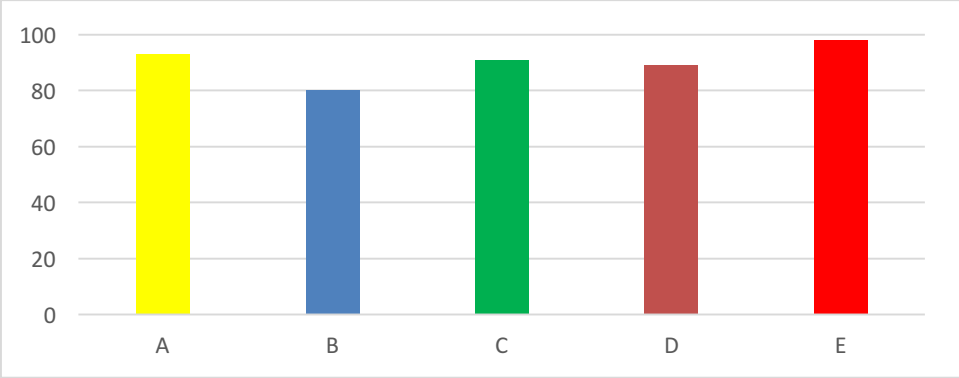

Figure 16. Chart of application testing result

4.CLOSING

Based on the development results, this application is able to running well on many user devices that contain various models of smartphones. The application installer size is also small which is around 6 MB of disk space so the user can easily to download and install the application. The users of this application can get many benefit from it such as more efficient way to use academic information system by using application functionalities such as offline access of information, uploading and downloading study files, notification of announcement sent by university staff to students and lectures, notification of student assignment sent by lecturer and chat features between staffs, lecturers and students.

4.1 Conclusion

Based on result and discussion, it can be conclude some things as follows: a. The application can maximize the use of smartphones to support study activities, b. The application can provide offline access of information, uploading and downloading study files, notification of announcement sent by university staff to students and lectures, notification of student assignment sent by lecturer and chat features between staffs, lecturers and students, c. The application can provide more efficient way to use academic information system.

4.2 Recommendation

This application needs further development such as: a. Interface is not good enough for some user. It's because the application interface does not include user suggestion in the designing process. It's also can be caused by the variety of users devices which mean that the interface may be different for some users, b. It would be even better if we can add more functionality to remind the user about their study such as alarm of study and assignment, c. Performance of the application need to be more tested with big size of users data. It's because the more size of the data has probability to affect the application performance.

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