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Development of iPROJECT Mobile Application for Mini Project Assessment of Engineering Science Courses

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Abstract

In the advancing world of technology, mobile applications represent a large part of the entire country. The field of education is also informed about mobile applications that are developing rapidly. In the area of education, there is a lot of evidence to support the idea that technology is constantly evolving and will have a significant impact on society. This research paper discusses the stages in the development of our mobile application has named as "iPROJECT". This application was developed to help facilitate the Coursework Assessment documents management process for the DBS10012 Engineering Science course. This is due to the Course Work Assessment management process becomes less effective because there are twelve (12) documents that need to be managed by the lecturers which can cause document loss due to hard copy submission, difficult to control the student's work progress and the student also does not get the highest score for the mini project evaluation. Therefore, in this research study, the iPROJECT android application is designed, developed, and tested for lecturers and students. Adaptation of Agile Model serves as a roadmap for the staged development of this application. To ensure the development needs of this application, preliminary interviews were conducted with lecturers and students. The results of the interview proved that the informant voiced the need to develop an application to help manage documents in the evaluation of mini projects. With the application lecturers and students can manage all the documents in an effective way.

Keywords: - Mobile application, assessment documents management, engineering science, technology, android application

1. Introduction

Smartphone users have grown to over two and a half billion people and are predicted to increase year after year (Fook et al. 2021). The introduction of smart phones in recent years has altered how mobile phones are defined. The phone has evolved into more than just a tool for communication, but it is now an integral component of daily life and communication, including in line with today's educational developments (Latif et al. 2019).

Smartphone use is increasingly evolving into an effective educational tool that is utilized to enhance teaching and learning process (Darko-Adjei 2019). In the context of this study, smartphones are used to access the iPROJECT application as a medium to receive documents from lecturers and documents submission from students. Lecturers and students refer to lecturers who teach and students who enroll in the DBS10012 Engineering Science course. The Engineering Science course is a compulsory course for all engineering students at Polytechnic in Malaysia.

One of the evaluated assessments is a mini project, the assessment requires the management of twelve (12) documents by lecturers and students. Lecturers need to provide project instruction, project rubric, example videos, proposal form and proposal status notification. While students need to submit proposals, first to fourth weekly progress report, slide presentation and full report. This shows that an effective document management process is very important for lecturers to prepare and monitor the student's work process from time to time.

According to Khalid et al. (2015), mobile learning services and learning documents management system integration enable anytime, anywhere access to e-learning using communication devices like android mobile application by students and lecturers more easily learning process. Android based mobile applications were created mainly for smartphones and other mobile devices that make it easy for users (Lazareska & Jakimoski, 2017).

Therefore, in this study, iPROJECT was designed and developed with the aim of ensuring the management process of Course Work Evaluation for the DBS10012 Engineering Science course is more organized and facilitates both parties, namely users as lecturers and users as students. Involved institutions that offer the course can use iPROJECT to make it easier for lecturers and students to manage all mini-project documents for various classes and groups anywhere and anytime.

2. Methodology

Methodology is the methodical, theoretical evaluation of the process used to create, develop, and maintain an application (Al-Saqqa, Sawalha, & AbdelNabi, 2020). According to Buladaco and Sabugaa (2022), with the suitable approach in place, application development may be carried out gradually, effectively, and systematically while staying on track.

In this study, Agile methodology is implemented to ensure the development of iPROJECT. Adaptation of Agile Model serves as a roadmap for the staged development of this application. The SCRUM Model (1995) and the Waterfall Model were both improved to develop Agile Model in 2001 by Ken Schwaber and Jeff Sutherland. The use of Agile development methodology can improve quality, flexibility, user involvement, fast cycle time and react immediately to changing requirements (Matharu et al., 2015).

Adaption of the Agile methodology consists of six (6) phases which are brainstorm phase, design phase, develop phase, test phase, release phase, and improve phase as shown in Fig. 1.

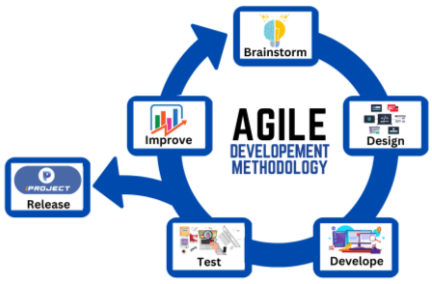

Fig. 1. Agile methodology

2.1 Brainstorm Phase

In this phase, the researcher conducts preliminary interviews with lecturers and students to examine the application development needs. Given that the study's nature is more suitable with informants' experiences, the qualitative case study approach was chosen as the study design. Informant experience refers to lecturers who have taught this course for at least three years and current semester students who are enrolled in this course.

In this research, semi-structured interviews were conducted with 3 lecturers and 3 students. The purposive sampling selection in this study was made by using referral and chain referral techniques. According to Bagheri & Saadati (2015), purposive sampling is used to select informants, ensuring that the data are rich and comprehensive for the phenomenon being studied. Each interview took place individually between 00:20:04 to 00:30:10 hours and was recorded with informants' consent. After the interview data were transcribed, transformed into transcripts and then categorized into themes (Denzin & Lincoln, 2011). A complete description of the interview results is described in the finding and discussion section.

However, the results of this brainstorming phase show that there is a need to develop an application for the management of mini-project documents that is divided into 2 users, namely lecturers and students.

2.2 Design Phase

This stage involves designing the proposed iPROJECT using the requirements gathered in the previous stage where includes results of the preliminary interview. This initial flow design was created to facilitate the development process in subsequent phases. It is to enable the interaction of user and application needs clearly. Also, to show how the iPROJECT flow of process works and how an integrated project was chosen with precise step-by-step planning in accordance with the design.

Fig. 2. shows user's design for lecturer which consists of user registration, sign in, lecturer hall, student's registration, choose class, proposal submission, weekly report submission, slide presentation and full report submission.

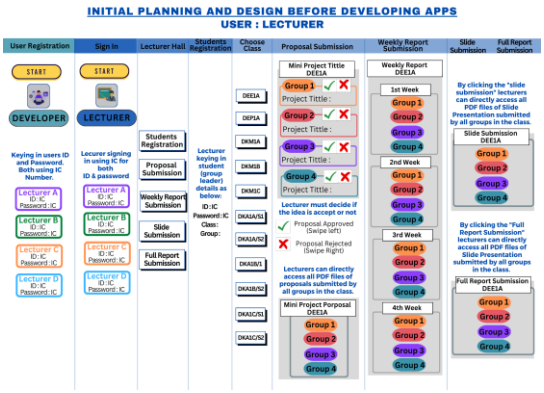

Fig. 2. User initial flow design for lecturer

Fig. 3 shows user's design for student included student's registration, sign in, student hall, mini project submission choose class, mini project submission

menu, proposal submission, proposal status, weekly report submission and slide/full report submission.

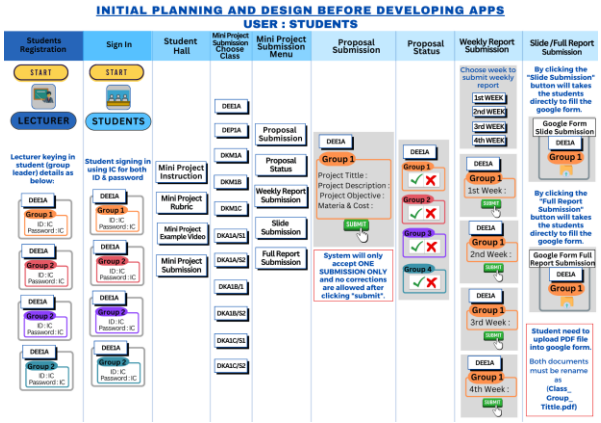

Fig. 3. User initial flow design for student

2.3 Develop Phase

Develop phase is developing the application by referring to the detailed initial flow design that was created in the previous step. This mobile application was developed using Thunkable. In comparison to the other phases, this one is typically thought of as being the longest. This is so because the development phase is so crucial to this phase, which is the foundation of the entire process. However, if the design phase were conducted in a systematic way, the development phase would be successful. Fig. 4 to Fig. 6 shows several interfaces in the iPROJECT mobile application.

Fig. 4 shows the iPROJECT main interface with a combination of several types of blue tones with a login button on the right and a manual (how to use) on the left. The selection of blue color on the main interface is based on the results of research proving blue colour is one of the most important colors in User interface (UI) design and can help students with special needs who have Protanopia and Deuteranopia (Red and green colorblind deficiencies). Rigos, Chatzismatis & Tsekouras (2020) stated that Protanopia and deuteranopia can often remove the ability to see both red and green, showing the world in bright blues and yellows. The log button is placed on the right side because we have a higher percentage of right-handed users than left-handed users, which lefties make up only about 10% of the population.

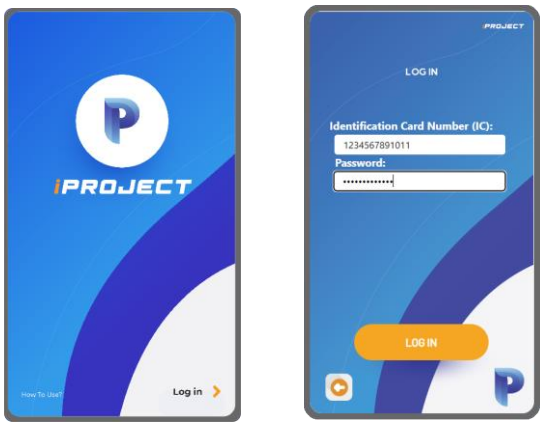

Fig. 4. Main interface of iPROJECT

We chose this arrangement as Fig. 5 because the students must submit a sequence of documents that start with the "Proposal Submission" in the 7th week, then the students must submit the weekly report in the 8th-11th week and finally submit the "Presentation Slide and Final Report" in the 13th week. While the last sequence, the "Student Account Registration", is the least used button that is only used once when registering students or is used only if there is a need.

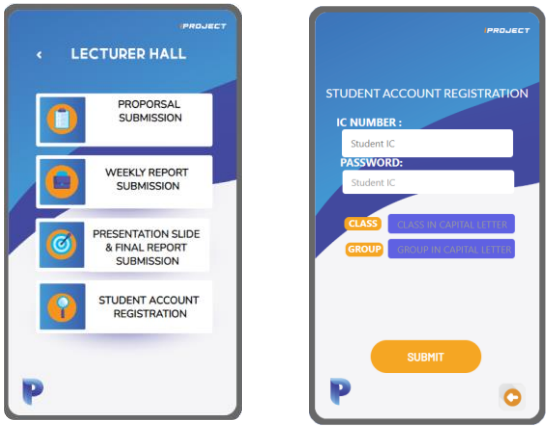

Fig. 5. Lecturer interface

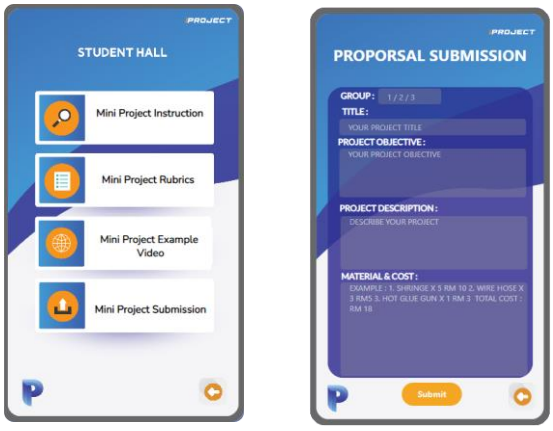

Fig. 6. Student interface

2.4 Test Phase

After iPROJECT is successfully developed, it will be tested on informants who have been selected in the brainstorming phase as application users. In this phase, the developer will try to get comments and suggestions in line with the results of the interviews that have been conducted.

2.5 Release Phase

After iPROJECT is fully developed and tested, the iPROJECT usage manual is given to lecturers and students to see the effectiveness of this mobile application development. Besides, developers find out users' comments and suggestions for improvement for the next phase.

2.6 Improve Phase

The application will go through an improvement phase once it has been completely utilized to pinpoint potential areas for improvement and future work based on the comments and ideas from the prior stage.

3. Result and Discussion

Three (3) themes were proposed as results from the preliminary interview that are cost-saving, time-saving, and one-stop-centre. This interview was conducted to identify the development needs of this application. The following is a complete description of the themes categorized based on the result of the interviews.

3.1 Cost-Saving Application

From the results obtained, all the informants voiced the opinion that the developed application must be able to save money in terms of reducing printing costs and there is no need to use paid applications. Here are some statements from the informants regarding their needs of cost-saving application:

i. Develop a form of online system, which reduces management costs that previously required hardcopy document involving paper and printing at a high capacity (Informant 2).
ii. I prefer not to do any printing because I don't have a printer at the hostel and soft copy submission documents are very economical (Informant 4).
iii. The application developed must be usable by students without having to purchase the application (Informant 6).

All these statements have proved that cost-saving can be one of factors that influence need of this application development. Cost-saving characteristic suggested by the informant of this study is in line with Underwood, Birdsall, and Kay (2015) and Kazhan et al. (2020) where the use of mobile applications has financial advantages over conventional approaches, such as not requiring any costs for printing, storing, distributing, or disposing of applications.

3.2 Time-Saving Application

The results of the study show that the informants stated that they need an online application that saves time such as they do not need to go to the lecturer's office to submit hard copy documents while lecturers also do not need to waste their time looking for student documents that may be lost or misplaced. The following quotes are among the informant's statements about their needs of time-saving application:

i. There is no need for students to waste time travelling to the lecturer's office to deliver “hard copy” documents (Informant 5).
ii. Lecturers do not need to schedule meetings with students to keep track of the progress of mini projects but just get a weekly report in the application submitted by the student (Informant 4).
iii. Every semester I have problems retrieving documents that have been sent by students. I teach several classes, so the documents get mixed up and it wastes my time to organize and save all the hard copy documents (Informant 1).

The findings of this study are in line with (Criollo-C et al., 2018), due to accessibility and mobility, mobile applications can be employed as efficient learning tools. Without requiring students to set aside time to physically interact with the lecturer. Mobile applications are anticipated to be an integral element of all learning activities, both inside and outside of the classroom (Hort et al., 2021).

3.3 One-Stop-Centre Application

Lastly, the results show that informants say they are hoping there is an application that provides all the necessary documents completely without expecting the provision of documents in stages. In the context of this study, it seems that a one-stop-centre application is needed to facilitate the systematic management of documents. Here are some statements from the informants regarding their expected application features:

i. All the information related to the mini project for the DBS10012 Engineering Science course is compact in one application that makes it easier for users (lecturer & student) to get related information. (Informant 1).
ii. Lecturers need to provide students with mini project questions, scoring rubrics, example videos and proposal templates. Meanwhile students need to submit mini project proposal, weekly report for four weeks, slide presentation and full report. Therefore, the developed application must be able to store all those documents (Informant 2).
iii. Lecturers need to get all the documents submitted by each group. One compact application indirectly easier for users to access related documents and submit mini-project requirements through a single application (Informant 3).

This study's findings concur with Zoolkafli (2020) about mobile application that has all the documents completely so that the user will focus on one application only without the need for other references. Besides, based on the results of this study, lecturers seem to need a medium as an organized storage system because lecturers must manage at least more than one class (8 groups) individually. Online document management organized in this compact mobile application is also explained to help users without having to store physical documents (Fook et al. 2021).

4. Conclusion

In overall, findings of the current study demonstrate the development of the mobile application namely iPROJECT can facilitate the Coursework Assessment management process for the DBS10012 Engineering Science course. With the application, lecturers and students only need to focus on one application that stores all the documents related to the Mini Project course work. Indirectly this application saves time and printing costs. For future improvements, this application will be improved in terms of a more detailed and clearer interface related to documentation instructions and requirements.

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