Development of Film Production Mobile Learning Application for Android Platform

Kuhaneshwaran Vijayan, Mohd Norasri Ismail and Suriawati Suparjoh

Applications & Research on Multimedia Focus Group, Faculty of Computer Science and Information Technology, Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Batu Pahat, Johor, Malaysia.
norasri@uthm.edu.my

Abstract. Over the years, the film has changed as well as the pattern of how audiences watch movies. Youngsters nowadays are very fond of shooting videos and uploading them online. However, mobile learning applications for filmmaking are limited. Therefore, this paper presents the development of a mobile learning application named Film Geek for the Android platform. The objective of this project is to design and develop three main learning modules for filmmaking which are screenwriting, cinematography and directing. The methodology of this project consists of three phases which are requirement identification, system design and development and testing and evaluation which is adapted from the prototyping model. This mobile learning application has been developed using Microsoft Xamarin, a native cross-platform mobile application development framework. Furthermore, Firebase Real-Time cloud database was chosen for storing the application and user's data. Functional and usability testing has been performed to evaluate the developed mobile learning application. The result of the testing shows that the functionality of the mobile learning application completely works (100%) as expected. Also, the usability test result of this application using SUS instrument achieved 86.3% which is within the acceptability ranges.

1. Introduction

In recent years, the mobile application has gained popularity due to its functionality and versatility. A mobile application can assist its user and has been widely used in teaching and learning in the form of mobile learning [1][2]. Previous research shows that mobile learning facilitates students and teachers in the learning process since it encloses comprehensive information and the ability to be accessed anytime and anywhere [3],[4]. The information is effectively accessed by the students when they study and help them connect with other people [1][9]. The students give a positive response to this matter [2][9]. The use of mobile learning in the classroom provides an effect on group works, projects, active learning process, confusion and stress relief, communication enhancement, students' concentration, quickly delivered topics, and practical use [3][4][9]. Mobile learning has also influenced the teaching and learning process and students' achievement [5][6]. Future studies can also focus on research and development of mobile learning and its application in a more diverse field of science [7][8][10].

Applications that teach complete filmmaking through mobile learning applications are limited. Some applications help users to shoot or add filters but do not teach users the basics of filmmaking. Furthermore, most of the filmmaking courses are on websites. This creates a mobility problem because nowadays people are more hooked on smartphones which are easy to be carried everywhere and they prefer any applications on the go. Most filmmaking learning platforms cover only one particular topic. So, users only can learn part of the whole filmmaking topic.
This paper presents the development of a mobile learning application named "Film Geek". This application covers the learning of important elements in film making, which are screenwriting, cinematography and directing.

2. Related works
Several applications are related to the developed application based on its architecture and its functionality which are Filmmaking Free Books Application, Film Maker Pro – Free Movie Maker and Video Editor, and Filmmaking Guide application.

Filmmaking Free Books [11] application is an application distributed by Nxtech App Distribution. This application provides information on the history of filmmaking. This application also incorporates information such as film theory, film meaning and symbols that are normally used and sound design. This application is developed for the Android platform. This application presents its information in the form of paragraphed texts. This application is an application that is incorporated with e-books where users can choose a topic and read. This application does not integrate a register and login system. The application also lacks images and infographics which would have increased the look and feel factor of the application.

Film Maker Pro [12] is an android application which is developed for editing videos. This application incorporates various features to enhance the quality of a video. Film Maker Pro application is a free application but there are certain features which are the in-app product that cost from RM 3.99 to RM 49.99 per item. This application offers features such as video adjustment where users can manually customize the exposure, contrast, saturation, brightness, white balance, temperature and shadow. Furthermore, users will be able to use the professional blending mode provided within the app features to generate good double exposure, multiply, darken and lighten the videos. When users upgrade their plan to premium, users will never have to face problems such as pop-up ads and watermark.

Filmmaking Guide [13] application was developed on the android platform by Beginner's Dance Tips. This application consists of a video series integrated into the application where users can choose and watch videos from related topics. This application provides knowledge from getting good audio to choosing good costumes, this application video covers all the bases of filmmaking for beginners. This application has no other extra feature. This application does not support user management. It is a static application that only provides video tutorials. This application lacks features such as including text and instruction for the application.

3. Methodology
This mobile learning application was developed in three phases: requirement identification, system design and development and system functionality and usability testing. The phases of development are illustrated in Figure 1. We adopt the methodology in [14] for the development of the mobile application.

![Figure 1. Methodology](image-url)
3.1. Phase 1: Requirement identification
The requirement identification phase focuses on identifying the problem that needs to be solved, the objective, the scope and the user requirement of the proposed application. There are two sub-phases in this phase; requirement gathering and requirement analysis. In requirement gathering sub-phase, the requirement was collected by conducting interviews with the targeted users. The respondents for this project are students from Faculty of Computer Science and Information Technology, Universiti Tun Hussein Onn Malaysia. In the second sub-phase, the gathered requirement is translated into diagrams and informative tables that will assist the developer in the next phase.

3.2. Phase 2: Design and development
The design and development phase emphasizes the development of the architecture of the application and the interfaces of the mobile application. There are two sub-phases in this phase; system design and system development. In the system design sub-phase, the activities include user interface design, user experience design, and database design. Then in the system development sub-phase, the development of the application based on the design will take place. For this sub-phase, we use Microsoft Xamarin as the development framework which uses XAML and C# language. Microsoft Xamarin was chosen because of its features and ability for developing cross-platform native mobile applications [15]. As for the database, we use Google Firebase because of its strength in cloud database services [16]. The real-time database has been chosen to store the data of users, tutors, exercise and as well as firebase authentication is used in the login function. The features and functionality that was drafted previously are implemented to become an actual functioning application prototype.

3.3. Phase 3: Testing and evaluation
The testing and evaluation phase focuses on all activity to ensure the developed application meets all requirements and works as planned. In this phase, the application is tested to find out if there is an error or bug. Functional testing is carried out on the developed application to test whether the application is working the way it was planned before. In this testing phase, the functionality of the proposed application, its database and interface are carried out to ensure the application meets all the requirements and it is working smoothly. Usability testing also was carried out to evaluate the proposed application.

4. Result and discussion
From the interview, we found that the targeted users highly prefer mobile learning platforms. We analyse the result of the interviews and determine all functional and non-functional requirements. The following Table 1 shows the functional requirements while Table 2 shows the non-functional requirements of the proposed application. The requirements are divided into categories based on these priorities:
   i. M – Mandatory requirements (something the system must do)
   ii. D – Desirable requirements (something the system preferably should do)
   iii. O – Optional requirements (something the system may do)

| Modules                      | Requirement Description                                                                 | Priority |
|------------------------------|----------------------------------------------------------------------------------------|----------|
| User management module       | New user registers as a user by providing necessary information.                         | M        |
|                              | Users must enter email and password to log in.                                           | M        |
|                              | Users can edit their information.                                                        | M        |
|                              | Users information should be displayed on the user’s profile page.                        | M        |
|                              | Users can change their password                                                         | M        |
|                              | An error message will alert the user when logged in using invalid email or password or both. | D        |
|                              | Invalid email format message appears when registered with the wrong format.           | D        |
|                              | Users will be redirected to the user’s profile after successfully logged in or registered.| D        |

Table 1. Functional Requirements
Learning module  
Students should be able to choose learning content from the main menu.
Students should be able to view learning content in full-screen mode.
There are navigation buttons in the learning content.
D

Practice and evaluation module  
Students should be able to take exercises right after they finish the learning module.
Students should be able to review their answered questions before submitting it to the tutor.
Students should not be able to swipe back and exercise can only be answered once.
Students cannot redo the exercise after submitting the exercise.
The tutor should be able to give marks to the students' answers.
The tutor should be able to give comments on students' answers.
Tutors must be able to see a list of students who answered questions based on chapters.
Users should be able to keep track of their evaluation performance.

| Setting   | Requirement Description                                                                 | Priority |
|-----------|----------------------------------------------------------------------------------------|----------|
| Implementation | This application can display its module or function that is required by the user      | M        |
| Operational | This application can withstand more than one operation simultaneously without any problem | D        |
| Security   | This application can keep personal user’s data privacy such as name, username and password in a secured database | M        |

These requirements are then analysed and translated into Unified Modelling Language (UML) diagrams. Two types of users are student and tutor. The following Figure 2 is the Use Case Diagram for this application.

![Use Case Diagram](https://example.com/image.png)

**Figure 2.** Use Case Diagram
Figure 3. Student Registration Sequence Diagram

Figure 3 shows the sequence diagram for student registration. Students need to provide their personal information such as username and password to register.

Figure 4. Student Activity Diagram
Figure 5. Tutor Activity Diagram

Figure 4 and 5 shows the activity diagram of both student and tutor for the application. As for the student activity, students need to log in with their username and password. If they don't have an account, they need to register a new account. As they register, they will be directed to their profile. They can view the notes provided and attend the exercises that are provided for every topic that they have learnt. They can then be evaluated by a tutor. They can either log out of the application or continue learning. As for the tutor, the tutor can choose which chapter to mark, and see the list of students who submitted the exercises based on the chapters.

In the system design sub-phase, user interface design is made up of a few rough sketches of the system interface design. Then the sketches are transformed into a user interface using XAML. Figure 6 to 11 shows some of the interfaces of this application.

Figure 6. Splash screen  Figure 7. Login page  Figure 8. Main menu
Testing activities in aspects of functional and non-functional were performed to make sure the application meets all the requirements stated in the first phase. In this phase, the application is tested to find out if there is an error or bug. Functional testing is carried out on the developed application to test whether the application is working the way it was planned before. In this testing phase, the functionality of Film Geek application, its database and interface are carried out to ensure the application meets all the requirements and it is working smoothly. Table 3 to Table 7 shows the functional test plan and the result of each test case.

### Table 3. Test plan for Login Module

| No | Test Case                        | Expected Output                                      | Result |
|----|----------------------------------|------------------------------------------------------|--------|
| 1. | Input fields empty               | Snack bar message pops up with a message "Please fill in data" | ✓      |
| 2. | Enter unregistered user          | Snack bar message pops up with message “Username not found” | ✓      |
| 3. | Type wrong password              | Snack bar message pops up with a message "Wrong password" | ✓      |
| 4. | Successful login                 | Direct tutor/student to profile page                 | ✓      |
| 5. | Authenticate user who login      | If it’s a tutor, direct the tutor to tutor profile page. If it’s a student, direct the student to the student profile page. | ✓      |

### Table 4. Test plan for Logout Module

| No | Test Case       | Expected Output                                      | Result |
|----|-----------------|------------------------------------------------------|--------|
| 1. | Student log out | Kill the application and start over when logging in. | ✓      |
| 2. | Tutor log out   | On back press to log out.                            | ✓      |
Table 5. Test plan for Exercise Module

| No | Test Case                  | Expected Output                                                                 | Result |
|----|----------------------------|---------------------------------------------------------------------------------|--------|
| 1  | Student answering exercise | Students should not be to swipe back and exercise can only be answered once      | ✓      |
| 2  | Exercise button disabled   | After answering the exercise questions, the student cannot redo the exercise.   | ✓      |

Table 6. Test plan for Tutor Marking Module

| No | Test Case                  | Expected Output                                                                 | Result |
|----|----------------------------|---------------------------------------------------------------------------------|--------|
| 1  | Tutor access student list  | Tutors must be able to see a list of students who answered questions based on chapters. | ✓      |
| 2  | Tutor marking exercise     | Tutors must be able to mark right or wrong the answers of the students.         | ✓      |

Table 7. Test plan for Result Module

| No | Test Case                  | Expected Output                                                                 | Result |
|----|----------------------------|---------------------------------------------------------------------------------|--------|
| 1  | Display students results   | After marking exercise, the tutor should be able to see the result of the students. | ✓      |
| 2  | Student viewing marks      | Students should be able to view the marks after the tutor has marked exercises on the exercise button. | ✓      |

The result of the functional test plan shown in Table 3 until Table 7 shows that all the Film Geek mobile learning applications are given the expected output, therefore pass the functional testing.

The usability test for the proposed application employs the System Usability Scale (SUS) measuring instruments [17]. The test is conducted by distributing the questionnaire to the selected 10 respondents with 7 questions. The score is shown in Table 8.

Table 8. Respondents’ scores

| No | Question | Respondents’ Score (R) | Score |
|----|----------|------------------------|-------|
|    | R1 | R2 | R3 | R4 | R5 | R6 | R7 | R8 | R9 | R10 |       |
| 1  | P1   | 5  | 4  | 5  | 5  | 5  | 4  | 4  | 5  | 4   | 3  | 44  |
| 2  | P2   | 4  | 4  | 5  | 5  | 4  | 4  | 5  | 4  | 5   | 4  | 44  |
| 3  | P3   | 4  | 5  | 5  | 4  | 4  | 4  | 5  | 5  | 4   | 4  | 45  |
| 4  | P4   | 4  | 4  | 4  | 5  | 4  | 4  | 5  | 4  | 4   | 4  | 42  |
| 5  | P5   | 5  | 5  | 4  | 5  | 4  | 4  | 5  | 4  | 4   | 3  | 43  |
| 6  | P6   | 4  | 4  | 4  | 5  | 4  | 4  | 3  | 4  | 4   | 3  | 39  |
| 7  | P7   | 5  | 5  | 4  | 5  | 4  | 4  | 5  | 5  | 4   |    | 45  |
|    | Total |               |       | 302 |

The formula used to get the usability result based on SUS is:

\[ Y = \frac{P}{Q} \times 100\% \]

Where:

- \( P \) = Total scores of respondents for each question.
- \( Q \) = Total maximum of respondents scores.
- \( Y \) = Percentage score.
Therefore:

\[
Y = \frac{302}{350} \times 100\% = 86.29\%
\]

Based on the scale of the SUS score shown in Figure 12, the proposed application SUS score is Acceptable.

5. Conclusion

Based on the results, it can be concluded that the proposed Film Geek application has been successfully developed which cover screenwriting, cinematography and directing learning modules. Results from the functional test show that 100% of this application functionality works as expected. Also, the result of the usability testing using SUS got 86.29% which is in the acceptability ranges.

The advantage of this application is it can be used in filmmaking courses where it enables tutor and student roles. Students are provided with notes, videos and examples for three main topics in filmmaking which are screenwriting, cinematography and directing. Once students have learned they can answer the question provided in the question section. Students may answer the question to have their understanding tested. On the other hand, the tutor can see the list of students who have answered the exercises based on the filmmaking topics. Tutors also can mark the student’s exercises and display the marks.

The limitation of this application is the application is fixed learning content. Therefore, new content cannot be included easily. Another limitation is there is no communication module provided for students and tutor to communicate with each other through this application. Therefore, an external communication medium is needed.

Future works of this project are to include dynamic learning content so that new learning content can be added easier. A forum like a platform also planned to be developed to facilitate communication between students and tutor. An improved user interface and functionalities such as connectivity to a camera for practical sessions also recommended in the future works to enhance the user experience. Last but not least is to develop the application on the iOS device platform.

In conclusion, the application aims to provide a great learning platform for anyone who would like to learn filmmaking is achieved. This application will be a kickstart to anyone who would like to expand their interest in filmmaking and setting their foot in the film industry.

Acknowledgements

The authors would like to thank Universiti Tun Hussein Onn Malaysia (UTHM) and Ministry of Education Malaysia for supporting this research under the Tier 1 Grant, Vot No. H093.
References

[1] Pedro L F M G, Barbosa C M M d and Santos C M d 2018 A critical review of mobile learning integration in formal educational contexts \textit{Int. J. of Educational Technology in Higher Education} 15(10)

[2] Nikolopoulou K 2018 Mobile learning usage and acceptance: perceptions of secondary school students \textit{J. of Computers in Education} 5 pp 499–519

[3] Purnawansyah and Salim Y 2018 Mobile-flipped learning for an information systems course World Trans. on Engineering and Technology Education 16(2) pp 193-197

[4] Kartikadarma E, Listyorini T, and Rahim R 2018 An Android mobile RC4 simulation for education World Trans. on Engineering and Technology Education 16(1) pp 75-79

[5] Puyada D, Ganefri G, Ambiyar A, Wulansari R E and Hayadi B H 2018 Effectiveness of interactive instructional media on Electrical Circuits \textit{Int. J. of Engineering and Technology} 7(2.14) pp 220-228

[6] Hayadi B H, Bastian A, Rukun K, Jalinus N, Lizar Y and Gucci A 2018 Expert system in the application of learning models with forward chaining method \textit{Int. J. of Engineering \\& Technology} 7(2.29) pp 845–848

[7] Hwang G J and Wu P H 2014 Applications, impacts and trends of mobile technology-enhanced learning: A review of 2008-2012 publications in selected SSCI journals \textit{Int. J. of Mobile Learning and Organisation} 8(2) pp 83 – 95

[8] Al-Hunaiyyan A, Alhajri R A and Al-Sharhan S 2018 Perceptions and challenges of mobile learning in Kuwait \textit{J. of King Saud University - Computer and Information Sciences} 30(2) pp 279-289

[9] Tabor S W 2016 Making mobile learning work: Student perceptions and implementation factors \textit{J. of Information Technology Education: Innovations in Practice} 15 pp 75-98

[10] Baran E 2014 A review of research on mobile learning in teacher education \textit{J. of Educational Technology \\& Society} 17(4) pp 17–32

[11] Filmmaking Free Books https://play.google.com/store/apps/details?id=com.wTeachingsoccerto_kids_ (retrieved June. 20, 2017).

[12] Filmmaker Pro https://play.google.com/store/apps/details?id=com.cerdillac.filmmaker (retrieved Oct. 21, 2018).

[13] Filmmaking Guide https://play.google.com/store/apps/details?id= com.Filmmaking.Lessons. Techniques.Tips&showAllReviews=true (retrieved Oct. 21, 2018).

[14] Sherrell L 2013 Waterfall Model \textit{Encyclopedia of Sciences and Religions}. Springer, Dordrecht

[15] Ebene A, Tan Y and Jia X 2018 A Performance Evaluation of Cross-Platform Mobile Application Development Approaches 2018 IEEE/ACM 5th Int. Conf. on Mobile Software Engineering and Systems (MOBILESoft) Gothenburg pp 92-93

[16] Mokar M A, Fageeri S O and Fattoh S E 2019 Using Firebase Cloud Messaging to Control Mobile Applications 2019 International Conference on Computer, Control, Electrical, and Electronics Engineering (ICCCEEE) Khartoum Sudan pp 1-5

[17] Lewis J R 2018 The System Usability Scale: Past, Present, and Future \textit{International Journal of Human–Computer Interaction} 34(7) pp 577-590