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Dept. Of ECE, Stanley college of Engineering & Technology for Women, Hyderabad, India

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EDITORIAL

It is my proud privilege to welcome you all to the Academics World International Conference at Los Angeles, USA. I am happy to see the papers from all part of the world and some of the best paper published in this proceedings. This proceeding brings out the various Research papers from diverse areas of Science, Engineering, Technology and Management. This platform is intended to provide a platform for researchers, educators and professionals to present their discoveries and innovative practice and to explore future trends and applications in the field Science and Engineering. However, this conference will also provide a forum for dissemination of knowledge on both theoretical and applied research on the above said area with an ultimate aim to bridge the gap between these coherent disciplines of knowledge. Thus the forum accelerates the trend of development of technology for next generation. Our goal is to make the Conference proceedings useful and interesting to audiences involved in research in these areas, as well as to those involved in design, implementation and operation, to achieve the goal.

I once again give thanks to the Academics World, Institute of Research and Journals & The IIER for organizing this event in Los Angeles, USA. I am sure the contributions by the authors shall add value to the research community. I also thank all the International Advisory members and Reviewers for making this event a Successful one.

Editor-In-Chief

Dr. P. Suresh

M.E, Ph.D. Professor and Controller of Examinations,
Karpagam College of Engineering.,
Coimbatore, India.



HYBRID FRAMEWORK AS A CROSS PLATFORM TOOL FOR DESIGNING AND DEVELOPING A MOBILE APPLICATION SERVING THE INTERNSHIP PROGRAM MANAGEMENT

SHUTCHAPOL CHOPVITAYAKUN

¹Faculty of Science and Technology, Suan Sunandha Rajabhat University, Bangkok, Thailand
Email: Shutchapol.ch@ssru.ac.th

Abstract: The number of mobile users surpassed the number of computer users since the cost of mobile phone production has been declined and the performance of mobile device hardware has been improved increasingly. Moreover, the versatility and utility of wireless communication are very essential for users in their daily lives. These trends are still moving on and there is no sign to slow down. However, mobile phone operating system has been divided into 2 major platforms: Android and iOS and a very small percentage for other operating systems. Each application has to run on its platform and it must be created discretely by a few native designing and developing tools. Nevertheless, there are some hybrid tools compatible with almost every operating systems in term of designing user interface and user experience. Moreover, they have capability of creating programming codes and packaged them as a native-like mobile application regardless of mobile platform. This study deployed 3 hybrid frameworks: Apache Cordova, Ionic and AngularJS which are very suitable for designing and developing a mobile application focusing on iOS. This mobile application was designated to help and manage the internship program of senior students from Information Technology program, Faculty of Science and Technology. Business processes and logics of this application are based on the criteria and requirements regarding the internship program.

Keywords: Mobile Phone Application, Hybrid Framework Tool, Internship Program, Mobile Operating System

I. INTRODUCTION

Smart mobile devices have been more utilized and demanded by various kinds of users. Smart devices such as smart phones and tablets have been used as an essential part of many people lives every day. Thus, the development of smart device application to serve various types of user's needs and complement their daily activities has been increased drastically as well.

Users are currently provided with 2 main dominant mobile platforms: iOS and Android. Each mobile platform has its own developing tool called SDK (Software Development Tool), IDE (Integrated Development Environment) and its own programming language. The development of application to run on each platform requires its own specific software development tools. In order to do this, it takes time, experienced developers, and production cost. Then, cross-platform development has been proposed to solve these previous limitations. There are some frameworks such as jQuery Mobile, Sencha Touch, The-M-Project and Google Web with capabilities of developing applications for iOS and Android platform or even other platforms such as Windows Phone and Black Berry. These frameworks come with license, cost, documentation, and support.

It is an interesting question for companies and organizations in order to develop their mobile application for users. [1] Which platform it should serve all needs of those users: iOS or Android. Each platform has its own unique environments such as hardware specifications, Software Development Kit (SDK), programming language which are very

specialized for each platform. Apple offers a free license for students in universities to develop iOS application but it must make the Memorandum of Understanding (MOU) or agreement between Apple and university. Moreover, Apple devices such as iMac or MacBook is strictly required in order to run SDK and APIs for iOS. Android is an open source platform and free to develop but it requires its own tools and native programming language as well. Other platforms such as Windows and Blackberry also have the same limitations as iOS and Android. For example, iOS application is developed by using Xcode as the Software Development Kit (SDK) and Object-C or Swift as the programming language. This application cannot run across platform and it must be installed and run solely within its own operating system.

In India [2], there is a study that categorized cross or hybrid frameworks for mobile application development by using four approaches: web, hybrid, interpreted, and cross compiled. This study reveals each framework strengths and weaknesses for cross-platform development. Each framework deployment depends on what features of the application must have, each framework has its own interesting features for developing the mobile application.

Then, application development must be consistent with the business rules of each organization and complied with each interesting feature that each framework has.

Cross or hybrid platform framework for mobile application development enables software developers to develop only 1 application and implement it on various mobile platforms at the same time. This

framework helps developer avoid repeating some stages of software development life cycle and increase software productivity. It has been categorized in to 4 approaches for developing cross platform mobile application: web approach, hybrid approach, interpreted approach, cross-compiled approach, and model driven approach. These approaches vary on their technology and the mobile operating platform they are taken to implement with. Web and hybrid approaches are based on web technologies as HTML5, CSS and JavaScript. Interpreted approach provides a runtime environment. Cross-compiled approach consists of compiling the source code to create platform-specific native binaries.

There are some frameworks that support cross-platform mobile application. The development is based on HTML/CSS, such as Sencha Touch, PhoneGap, DOJO, Kendo UI, and jQuery Mobile. Most of them are able to generate mobile applications for major platforms such as iOS and Android. It is flexible for developer to use these platforms to develop a web-based application compatibly run on each target platform. Nevertheless, these frameworks cannot deploy native features of each specific platform such as low-level image processing or different kinds of sensor.

Xamarin is another framework and not running on HTML/CSS base but it follows the native cross-platform approach. It is an open-source infrastructure based on ECMACLI standard [3]. In order to run a developed application on each platform, the application must be compiled into either intermediate language code (for Windows Phone or Android) or native code (for iOS). Developers can reuse their source codes on Xamarin and also merge abstract elements to native APIs for iOS at the compile time or Windows Phone and Android at the runtime.

There is a study that analyzed and compared 4 frameworks: MoSync, Titanium, jQuery Mobile, and Phonegap in many aspects[4]. Their study collected data from developers who actually know how to write programming language used by each framework. All of them have to learn only how to use the framework tools such as Software Development Kit (SDK) or Application Program Interface (API). These following aspects were studied and compared in this work: licenses, API, community, tutorial, complexity, IDE, devices, GUI, and knowledge. For more details, the variety and quality of APIs that are available to developers was answered by the developers who know each framework APIs. Next, the resources of tutorials and the community size of developers who using these frameworks were studied and compared as same as the complexity of the code necessary to implement the case study application. Moreover, the usability of each framework IDE and the list of

mobile devices that supporting those frameworks were studied in this work as well. Finally, the support to create applications with a native user interface and the basic knowledge in term of programming skills and technologies required by each framework.

Department of Electrical and Computer Engineering, University of Auckland developed a mobile application for patient self-reporting on mobile device. [5] This work studied 6 hybrid platform frameworks before developing the patient self-reporting mobile application. These are 6 studied frameworks: RhoMobile Suite, PhoneGap, DragonRad, MoSync, Titanium, and Illumination. This study concluded that PhoneGap is the most suitable hybrid framework for developing a mobile application. PhoneGap can create applications with look and feeling as similar as native developed applications.

However, memory usage and application startup time are not efficient as same as a native application. Moreover, there are some necessary functionalities for telehealth applications were not developed due to PhoneGap does not provide them.

Chopvitayakun, [6] developed a mobile application to help the Faculty of Science and Technology of Suan Sunandha Rajabhat University, Thailand to manage its internship program focuses on students who major in Information Technology program. This application runs on Android platform, developed by Eclipse Lunar version in 2015. This application has 3 main functions for 3 main stakeholders: student, teacher, and trainer. It keeps working records of all interns with capability of using cell phone's camera and GPS and accessing faculty's database through web server.

This application is beneficial for students to communicate with their teachers or advisors while they are off the campus and practicing real work tasks at many different locations. Moreover, students can make real time questions regarding their problem and receive the answers through this application. Teachers can monitor their students closely while they are at the workspaces and getting trainings. Trainers can evaluate each intern working performance towards the rubric designed by faculty. This application has been implemented and run on Android devices. However, there are still many users who do not have Android device and using iOS devices. These users such as trainers and interns are not involved with this application. Then, the step of his work is to develop an application that runs on iOS platform with the same features that the Android application has and runs.

DETAILS EXPERIMENTAL

This research is aimed to deploy a hybrid framework or cross-platform framework to generate an

application that runs on iOS platform in order to help and organize the internship program of the Faculty of Science and Technology of SuanSunandhaRajabhat University, Thailand. This research is not focusing on the use of native tools such as Xcode or native programming language such as Objective C or Swift. However, it deployed cross-platform framework. This framework can overcome the limitations of native tools in many aspects. Despite native code and framework, this application integrated some hybrid frameworks to implement a mobile application that looks like the original native iOS application. Here are all frameworks that were implemented in this study: Apache Cordova, Ionic framework, and AngularJS.

2.1. Apache Cordova

Apache Cordova, previously known as PhoneGap is a mobile application development framework initially created and distributed by Nitobi. In 2011, Adobe Systems purchased Nitobi and rebranded it as PhoneGap. Later Adobe released it as an open source software called Apache Cordova. Apache Cordova provides the means for software programmers to create applications for mobile devices deploying HTML5, CSS3, and JavaScript unlike native tools and languages that depend of each platform SDK and APIs such as Android, iOS, and Windows Phone. It works like a native application wrapper with components that offer the appropriate modifications. Cordova can integrate and interpret HTML5, CSS3, and JavaScript codes without modification of additional coding or changes in a native application.

This framework helps developers to build a rapid mobile application regardless of the knowledge and skills of the target native platform. Moreover, mobile application developers can attain native application installation file such APK for Android and IPA for iOS to distribute and sale via online stores of each platform.

2.2. Ionic Framework

Ionic framework provides web-based SDK that helps developer to build a native-like mobile application using web technologies: HTML5, CSS3, and Javascript. Ionic is focused on the appearance such as user experience (UX) and user interface (UI) of application. Ionic relies on AngularJS as a front-end designer as Model-View-View-Model (MVVM) like a stack of components working together. It offers powerful UI interactions, gestures, animations, and web view. Ionic package has to run on Apache Cordova to expand the capabilities of mobile applications. Its codes written by CSS, HTML, and JavaScript are wrapped up with the target native platform of the device. Applications developed by Ionic framework are hybrid, they are neither actually native mobile application, its layout rendering is

compiled via Web views not the platform's native UI framework) nor purely Web-based application because it cannot run through web server and it must be packaged as an installation file distributed via online store.

2.3. AngularJS

It is also known as "Angular", a framework that deploys Javascript to develop UI and UX of web application front-end. It was released in 2012 for AngularJS version 1.0 and now 2016, AngularJS version 2.0. This framework with the extents of Javascript complements Apache Cordova by encapsulating the web interface developed by AngularJS and Ionic with the native mobile application interface. It provides rich models to develop an application such as Model-View-Controller (MVC) and Model-View-View-Model (MVVM) architectures. It also comes with useful components pervasively used in rich Internet applications. AngularJS framework requires HTML tag and extends it by embedding its syntax into the HTML tags with its predefined custom attribute tags called directives. Here is an example of its tag and attribute `<body ng-app>` -- `<body>` is an HTML tag and `ng-app` is an attribute which is based on AngularJS syntax bundled in HTML tag. Then, Angular binds input and output of each page by interpreting its attributes to a model which are represented by standard JavaScript variables. JavaScript variables' values can be manually assigned within the attribute of tag, or retrieved JSON resources both statically and dynamically.

RESULTS AND DISCUSSION

3.1. Main functions

According to the literature review, this study applied a hybrid or cross-platform framework by deploying Apache Cordova, Ionic framework, and AngularJS framework to create a mobile application called Internship Program Management or IPM. IPM complements the maximum use of technology in term of integrating mobile application and working protocols for internship program. It also enhances the efficacy and productivity of the internship program a lot of ways. This application runs on iOS platform with 3 main functions for 3 types of users: students as interns, teachers as advisors, and trainers as supervisors as shown in figure 1. Each user type can communicate with web server through IPM application in order to insert, update, and delete data records regarding performance of the internship program. First, each user type can log in to IPM application by unique username and password. Then, all relevant data will be shown and wait for manipulation.

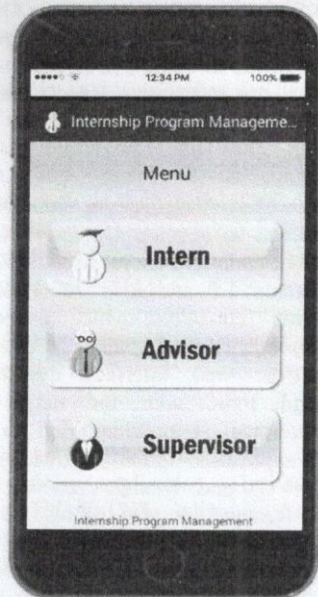


Fig. 1. Main menu for main users

3.2. Data security

Each menu requires authenticated users to verify themselves with a log in process as shown in fig. 2. Once the user provides correct usernames and passwords to the server, the application will retrieve the relevant screens of each type of user and welcome them to initiate the system. In case of providing wrong authentication for 5 trials, the application will be suspended for 120 seconds for the next log in process will begin again. For users who are students and faculty members, their usernames are their staff and student IDs. For passwords, they were derived from their birth date in a format of DD/MM/YYYY. For users who are not students or faculty members, they will be assigned a set of username and password to access this application and it will be delivered officially by registered postal mail to each organization along with a user manual.



Fig. 2. Log in screen for user to access IPM application

3.3. Application features

The authentication must be preceded in a form of log in, the main menu will be displayed and prompt for users to select what functions they anticipate to access. Fig. 3 shows the main menu for advisors to monitor their advisees who are doing the internship program at a particular organization or company. Advisor can see all of their interns' working records and their working details such as images or videos of their works taken by iOS device's camera. Moreover, advisors can see problems regarding the internship program posted by their advisees. These questions come from each intern's daily work and they cannot solve them on their own such how to deal with a bad temper staff at their organizations? or what are they supposed to do if they want to extend their internship program for 1 month? and what time should they come back and meet their advisors on campus or meet them on their work space. Sometimes, some questions require high attention and really demand proactive answer instantly. The longer interns wait, the worse outcome it may be.

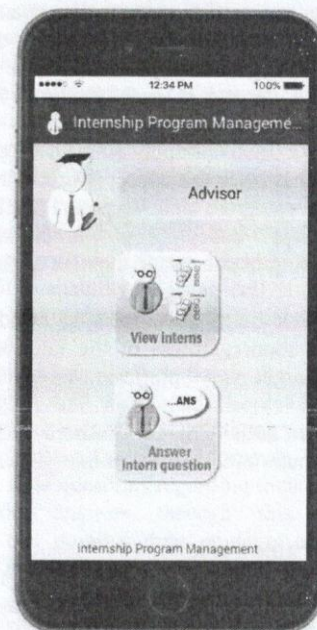


Fig. 3. The main screen for advisors

Advisors can search their advisees in overview or in particular. Data of all interns or desired one can be retrieved by using web technology. A web server and database server store all data on the internet. IPM deploys a web view to exchange information over the cellular network or internet. Besides, data of each intern such as working logs, working details, questions sent from each advisees will be notified and ready to answer in this menu. Once advisors submit their answers, the owner of that question will be notified as well.

Each question will be stored on the web server with Mysql database server. Advisors are able to see each one of them real time since it is posted by their advisee. Advisors are capable of answering these questions by using on screen keyboard or writing their answers in a paper and upload it to the web server. Interns do not need to make a phone call or text messages to their advisors because their questions will be notified real time to let their advisors know.

CONCLUSIONS

This study was aimed to develop a mobile application runs on iOS platform by using a hybrid or cross platform frameworks as tools to deploy this development. The result of this study is a mobile application call IPM (Internship Program Management). This work is a collaboration of 3 hybrid frameworks: Apache Cordova, Ionic and AngularJs. This study could save a lot of cost and time compared to the native software development kit or SDK from Apple such as Xcode with Objective-C or Swift. For cost saving can be fined by the number of mobile application developer are less than the native application. For time saving, it is defined as the time period that is much shorter than the native one as well. IPM developed by hybrid frameworks can function almost every main task as same as the native application. For time saving, it is defined as the time period that is much shorter than the native one as well. IPM developed by hybrid frameworks can function almost every main task as same as the native application are capable of. There are some limitations of using hybrid frameworks that it cannot provide unlike the native one such as camera function, GPS deployment and other built-in sensors. However, there are some third party organizations provide these features for hybrid frameworks but they must be purchased and installed like an extra module or add-on feature. Then, this study avoided these features by

applying web technology such as using built in camera and upload taken pictures and videos via web service. For the further study, it is potential to try to deploy other hybrid frameworks such as Sencha and JQuery Mobile because these frameworks are very well known and also provide many interesting features for mobile application development.

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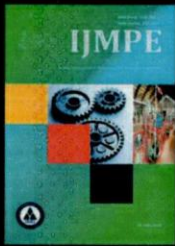
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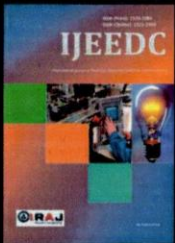


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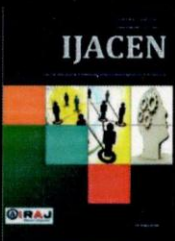


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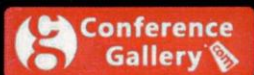
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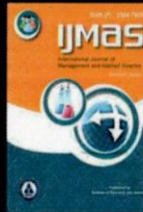
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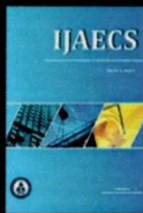
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