

AUTOMATED CHECKING OF ANDROID BASED EXAMINATION SCHEDULING OF IT FACULTY

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ABSTRACT

Exam scheduling is one of the key tasks in any educational institute. The implementation of technology in educational organizations can make such task much easier. The division of Final Task, at Faculty of Information and Technology Satya Wacana Christian University, determines the schedule of final exam. The division analyzes the same schedule between the reviewer, adviser, room, and the schedule of backup reviewer. The purpose of this research is to develop a mobile and web application-based solution for the schedule of final exam using the Phonegap framework and GCM service as a notification. The output of this research is a mobile application that helps lecturers and students to resolve scheduling issues.

Keywords: scheduling; phonegap; android platform; automation; google cloud messaging;

1. INTRODUCTION

The development of increasingly advanced technology has an impact on the development of technology used by the community. The rapid development of technology is also felt in the world of education in Indonesia. One obvious form of technological development is the increasingly sophisticated mobile phone operating system currently in use [1]. Popular smartphones in today's society are Android and iPhone [2]. The flexibility of mobile technology that is easily accessible from anywhere becomes one of the answers to every problem including administrative issues [3].

Faculty of Information Technology, Satya Wacana Christian University (FTI-UKSW) Salatiga is one of the faculties with the highest number of students with 600-650 students for each generation. Consisting of nine study programs i.e. diploma programs consisting of two programs namely Informatics Engineering and Computerized Accounting; undergraduate program consisting seven courses namely Informatics Engineering, Information Systems, Visual Communication Design, Informatics and Computer Engineering Education, Public Relation, Tourism Destination, and Science Library. There are 60 lecturers according to data taken from the FTI-UKSW secretary. The Final Task division of FTI-UKSW Salatiga has many business processes related to the Final Project of each study program. One important process is in determining the exam schedule performed by the Final Task division. In this process, the Final Task division should match the schedule of two testing lecturers, two supervisors, the available exam room schedule, and the schedule of lecturers as a backup. In one year there are three times of the graduation period conducted by UKSW which on every graduation period consisting two examination processes with the number of student applicants ranging from 80 to 100 students for each test period. Final section division performs this scheduling process by collecting data on the schedule of each lecturer's activities. The Final Task division of FTI-UKSW has encountered many obstacles in the scheduling process such as the outdated schedule of each lecturer because many lecturers have so many activities such as seminars, teaching, taking tasks out of town, involving in community services, etc. The diversity of each lecturer schedule has caused the Final Task division must work hard in the process of scheduling which it takes a long time to process it. The Final Task division must confirm each lecturer about their exam schedule, and if there is a mistake the exam schedule must be revised before the exam schedule is announced to the student.

Mobile phone is a device that is used for making and receiving a phone calls, sending and receiving a message, video and audio capturing, and basic editing. In addition, it is used as a personal organizer, and for accessing mobile application that provide a myriad of service healthcare, education, agriculture, finance, hospitality, governance and environmental services among other [4]. In education sector, 90% of online time is spent using mobile apps [5]. With that percentage of mobile device using, the final task division decided to change the business process of student final task from manually to systematic. The other reason for mobile device using is because the rise of 3G/4G networks, handheld device such as smartphone and tablets are quickly becoming the primary way people accessing information

especially on university campus [6]. With the popularity of mobile device, as well as sustained and rapid development of mobile internet industry, hot cross platform mobile application development based on web technology. Compared to native application, cross platform mobile web application with the development of simple, low cost, cross platform adaption [7]. There are two kinds of application on different mobile operation systems, they are native application and web application. To create native application, the developer must write the source code and create additional resources such images, audio segments, and various OS specific declaration files [8].

Table. 1 Requirements for development environment (for various mobile platforms) [9]

Mobile OS	Operating System	Software/IDEs	Programming Language
IOs	Mac Only	XCode	Objective C
Android	Windows/Mac/Linux	Eclipse/Java/ADT	Java
Blackberry	Windows Mainly	Eclipse/JDE,Java	Java
Symbian	Windows/Mac/Linux	Carbide.c++	C++
WebOS	Windows/Mac/Linux	Eclipse/WebOS Plugin	HTML/JavaScript/C++
Windows 7 Phone	Windows Mainly	Visual Studio	C#/.NET/Silverlight or WPF

Phonegap is an HTML5 platform that allows us to create a native mobile application using web application code [10]. Phonegap allows all developers to implement HTML5 code built into various mobile platforms like android, iOS, Windows Phone, and so on [11]. Phonegap is a framework that uses JSON as a medium for exchanging data that occurs on an HTML page. Phonegap also enabling software programmers to build applications for mobile devices using JavaScript, Hypertext Mark-up Language (HTML), Cascading Style Sheets (CSS) or similar language, rather than less known languages such as Objective-C [12]. The working theory of Phonegap is not complex, the application's user interface consists of essentially a unique screen that contains a unique web view that consumes all of the available space on the device screen [13].

Based on the background that has been elaborated, the author conducted a study titled Automation Checking Of Android Mobile-Based Final Task Examination Schedule of Information Technology Faculty. The purpose of this research is to build a mobile and web-based application that can automate the schedule provided using Phonegap framework by utilizing technology from GCM as a notification. The results of this study in a form of a mobile-based application that will be used by lecturers and students and applied in a web application used by the TA officers to conduct the overall managerial process related to the scheduling process

2. RESEARCH PROCESS

Research process conducted in this research consists of 4 stages of research namely:

1. Identification of Problems
2. System Design
3. Application Creation
4. Implementation and Testing System
5. Analysis of Test Results

The research stages in Figure 1 can be explained as follows: 1) The first stage: Problem Identification which at this stage, the research and observing the work system is done on the Final Task division of Faculty of Information Technology of Satya Wacana Christian University Salatiga 2) The second stage: System Design which the system planning is made by using Unified Modeling Language (UML) diagram. System design is in the form of diagrams consisting of use case diagrams, class diagrams, sequence diagrams and deployment diagrams. 3) The third stage: Making Applications which at this stage the application is made in accordance with the design system that has been made. The making of the application consists of two applications namely mobile application and web application. Mobile app is created using Phonegap by applying technology from GCM. Web application is created using PHP language and framework of the bootstrap. 4) The fourth stage: Implementation and Testing System and Test Result Analysis which at this stage both applications will be implemented on android and desktop devices, then they are tested to determine whether the applications have been in accordance with the design and no error/bug found on them.

Testing the application is done on the object of research i.e. at the Final Task division of the Faculty of Information Technology of Satya Wacana Christian University Salatiga.

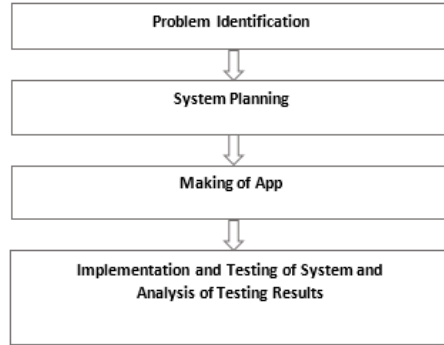


Figure. 1 Research stages

2.1 Problem identification

In the phase of problem identification, the research process of car sales work system is studied by conducting an interview with the Coordinator of Final Task of FTI-UKSW. From that interview, we obtained the following business processes as shown in Figure 2.



Figure. 2 Business Process of Exam Schedule Checking by the Final Task Division of FTI-UKSW

Judging from the current business process, there are several processes that must be done, so it takes a lot of time to check the exam schedule. Therefore, we propose a new business process using the help of the device, which is useful to accelerate and facilitate the process of checking the exam schedule. The new business process as shown in Figure 3.

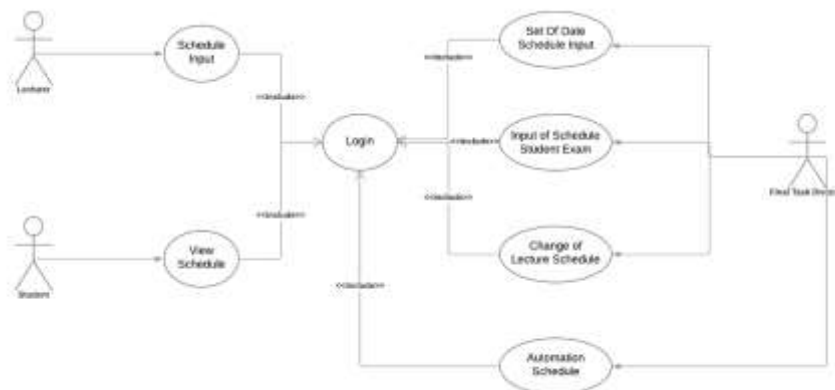


Figure. 3 Use case system diagram

2.2 System planning

The design of this automation system is done by referring to the used literature review i.e. Phonegap. Phonegap is an HTML5 platform that allows creating a native mobile application using web application code [10]. Phonegap is a hybrid platform which means that an application built using Phonegap is not only from HTML or native mobile language but a combination of both [2]. Phonegap will convert the code written into a code that can be understood by a mobile operating system. Figure 4 shows the hybrid platform of Phonegap.

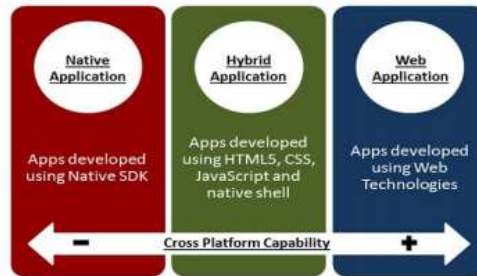


Figure. 4 Phonegap as Hybrid Platform [14]

UI section, application logic in Phonegap and communication with the server are done using HTML and JavaScript language. While the other parts that connect between server communication and the device used is part of the native mobile language. Figure 5 shows the architecture of the Phonegap.

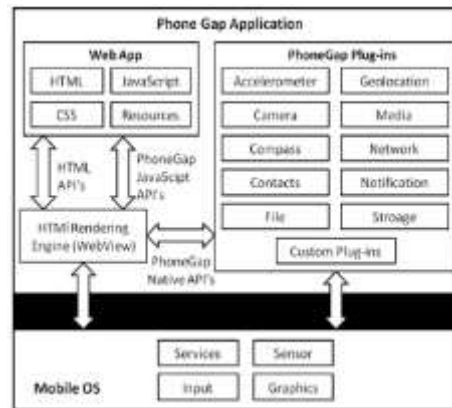


Figure. 5 Phonegap architecture [15]

The design of the system using UML diagram serves to describe the procedures and work processes of the application. UML diagrams include Use case diagram, Class diagram, Activity diagram and Deployment diagram. Use case diagram is a graphical image of some or all of the actors, use case and interactions among those components that introduce a system to be built [11]. There are 3 actors involved in use case that is Final Task division, Lecturer, and Student. The lecturer actor can only input the schedule. The student actor can only observe the fixed schedule. While Final Task division actor can do some activities such as determining the date of input schedule, making input data of examinees, editing the lecturer schedule, and performing the automation process as shown in Figure 3.

Activity diagram describes the flow of activities in the system that being designed; how each flow begins; the decisions that may occur and how they end [14]. Activity diagram to login can be seen in Figure 6.

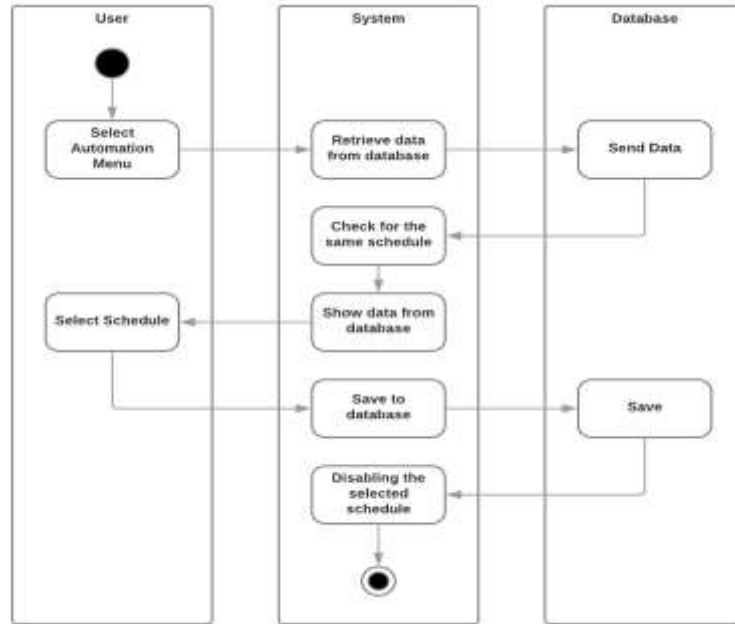


Figure. 6 Activity diagram of automation process.

Figure 6 describes the processes that occur when the system is automated. First, Final Task division will select the available automation menu. The system will retrieve all the data stored in the database and it will be checked for the same schedule and then displayed by the system. After the checking is successful, the final task division will choose one of the successful schedules of automation. The selected schedule data will be stored in the database and the schedule data selected on that date will not be re-selected on the date and name of the same tester.

Class diagram describes the structure and description of classes, packages and objects along with relationships to each other such as containment, inheritance, associations and others [15]. Class diagram in this application can be seen in Figure 7.

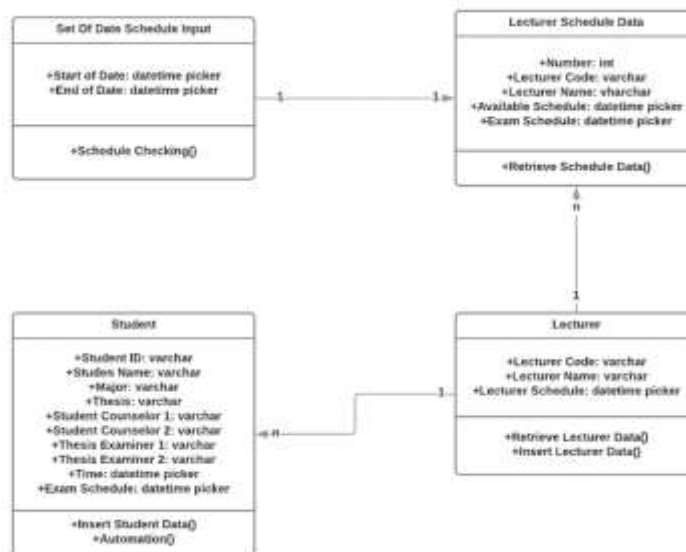


Figure. 7 Automation class diagram

Figure 7 describes a class diagram for the system class of the sales application system. It describes the class contained in the application system along with the attributes and functions in it.

Deployment diagram is a physical arrangement of a system showing the layout parts of the software that runs on the hardware parts. Deployment diagram in this application can be seen in Figure 8.

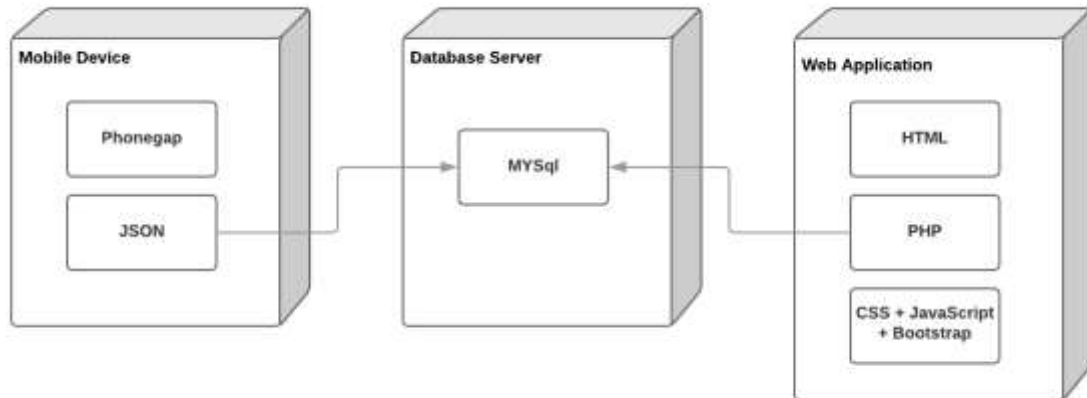


Figure. 8 Deployment diagram

In the deployment diagram there are two kinds of software namely mobile application and web application. Mobile application uses JSON data exchange language for data access to mobile app. Mobile app is also connected to the database on the server. While web application can connect directly with the database server.

3. RESULTS FROM SECONDARY STUDIES

This research produces two applications namely mobile and web applications. Mobile app is implemented on android platform. Mobile application is directed towards lecturers and students of FTI-UKSW, while web application is directed towards final task division to manage existing data and automate the exam schedule.



Figure. 9 Main menu display of mobile app

Figure 9 describes the main view of the mobile app after the login page. On the main page, the lecturers only need to choose on the date of the schedule to be entered in accordance with the date of the lecturer exam schedule. On this main page there are 2 options i.e. “input schedule” and “view schedule”. On the schedule view menu, it will display the exam schedule page that has been automated.

In mobile application, data exchange is done using JSON (JavaScript Object Notation). JSON is used to exchange data between mobile devices and servers. One of the usages of JSON in the application can be seen in Program Code 1.

Program Code 1. Data exchange using JSON

```
01 $.ajax({
02   url: "http://tauksw.esy.es/Project_TA/www/server/server.php",
03   type: "GET",
04   dataType: "json",
05   data: {type: "cekAksesTanggal"},
06   contentType: "application/json",
07   success: function (response)
08   {
09     obj = JSON.parse(JSON.stringify(response));
10     if (obj.Users.Success == true) {
11       document.getElementById("halamanAksesTanggal").style.display =
12         "block";
13       document.getElementById("belumAksesTanggal").style.display =
14         "none";
15     } else if (obj.Users.Success == false){
16       document.getElementById("halamanAksesTanggal").style.display =
17         "none";
18       document.getElementById("belumAksesTanggal").style.display =
19         "block";
20     }
21   }
22 });
```

The automation process takes place on web pages managed by final task division. The automation process is done by comparing two schedules of testers and choosing the same schedule. The system will perform data retrieval of 2 timetable testers, and then the system will compare the data that successfully retrieved and choose the same schedule between the two testers concerned. Code performed for the automation process can be seen in Code Program 2.

Program Code 2. Automation process

```
01 if ($data['jam_1'] == 1 & $data2['jam_1'] == 1)
02   echo "<input type='checkbox' name='waktu1' value = '08.00 - 09.30'
03     onChange='myFunction1();'> 08.00 - 09.30<br>";
04 if ($data['jam_2'] == 1 & $data2['jam_2'] == 1)
05   echo "<input type='checkbox' name='waktu2' value = '09.30 - 11.00'
06     onChange='myFunction2();'> 09.30 - 11.00<br>";
07 if ($data['jam_3'] == 1 & $data2['jam_3'] == 1)
08   echo "<input type='checkbox' name='waktu3' value = '11.00 - 12.30'
09     onChange='myFunction3();'> 11.00 - 12.30<br>";
10 if ($data['jam_4'] == 1 & $data2['jam_4'] == 1)
11   echo "<input type='checkbox' name='waktu4' value = '12.30 - 14.00'
12     onChange='myFunction4();'> 12.30 - 14.00<br>";
13 if ($data['jam_5'] == 1 & $data2['jam_5'] == 1)
14   echo "<input type='checkbox' name='waktu5' value = '14.00 - 15.30'
15     onChange='myFunction5();'> 14.00 - 15.30<br>";
16 if ($data['jam_6'] == 1 & $data2['jam_6'] == 1)
17   echo "<input type='checkbox' name='waktu6' value = '15.30 - 17.00'
18     onChange='myFunction6();'> 15.30 - 17.00<br>";
```

The result of the automation process itself is a schedule of both testers who have the same schedules. The results of the automation process can be seen in Figure 10.

NIM	Judul Skripsi	Pembimbing 1	Pembimbing 2	Waktu	Penguji 1	Penguji 2
672010002	Framework CI Pada E-Commerce	Ramos Sonya	-	09.30 - 11.00 11.00 - 12.30	Christine Dewi	Radius Tanone

Figure. 10 Result of automation process

Testing of the application is done by testing functions of the application that have been made to look for errors/bugs in the system. Application testing is done to make the system that runs in accordance with the expected outcome and can meet the needs of users. Testing of the application of transportation information system uses two testing techniques namely alpha testing and beta testing.

Alpha testing is an application test performed by the app builder and the people who help him in the creation. Alpha testing using black-box method is testing the functions of the application directly regardless of the flow of program execution. This test has been done and it results an outcome as expected. Here are the test results from web app and mobile app.

Table. 1 Web application testing result

Tested Function	Condition	Expected Output	Output Resulted from System	Status of Testing
Login	Username and password are correct	Success to enter the app	Success to enter the app	Valid
	Username and password are incorrect or empty	Failure to enter the app	Failure to enter the app	Valid
Set of Date Schedule Input	Form is filled up correctly	Success to add data	Success to add data	Valid
	Form is filled partially or empty	Failure to add data	Failure to add data	Valid
Input of Schedule Student Exam	Form is filled up correctly	Success to add data	Success to add data	Valid
Change of Data of Lecturer Schedule Data	Form is filled out correctly	Success to change data	Success to change data	Valid
Automated Schedule	Checking the same schedule	Success in getting the same schedule	Success in getting the same schedule	Valid

Based on testing done on the web application can be seen the test status of each valid function, it is concluded that the application is running well and as expected.

Table.2 Result of mobile application testing

Tested Function	Condition	Expected Output	Output resulted from system	Status of testing
Login	Username and password are correct	Success to enter the app	Success to enter the app	Valid
	Username and password are incorrect or empty	Failure to enter the app	Failure to enter the app	Valid
Schedule Input	Form is filled out correctly	Success to add data	Success to add data	Valid
	Form is filled out partially or empty	Failure to add data	Failure to add data	Valid
Schedule View	Schedule has been automated	Success to display data	Success to display data	Valid
Display of notification by GCM service	All schedule has been automated	Success to display notification	Success to display notification	Valid

Based on testing conducted on the mobile application, it can be seen that the test status of each function is valid. Thus, it can be concluded that the application is running well and it is as expected. Beta testing is a test performed by people who do not participate in the making of the app. Beta testing is done by using questionnaires, by distributing questionnaires to user samples. The sample users consist of 10 FTI-UKSW lecturers and two final task division executives who are assigned to determine the exam schedule. Based on beta testing that has been done, we obtain the results that this automation application has a very helpful role in the process of determining the exam schedule. This application simplifies and accelerates the performance of final task division in conducting student exam scheduling.

4. CONCLUSION

Based on the above discussion, it can be concluded that the process of automation applied to the scheduling of the exam is very helpful for final task division in determining student exam schedules. Automation application results 2 applications: 1 mobile-based application and 1 web-based application. Mobile app is built using the framework from Phonegap that uses JSON as a data exchange process, and web app is built using the PHP language. Both applications have a server and database. Automation process itself occurs on the web application which is performed by taking all the lecturer's schedule stored in the database, then checking is done towards the same schedule data. Next, the system will display the same schedule data and users only need to choose 1 among the already automated schedules.

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REFERENCES

1. Hoehle, H. and V. Venkatesh, *Mobile Application Usability: Conceptualization and Instrument Development*. Mis Quarterly, 2015. 39(2).
2. Pierre, N.J., et al., *Cross-platform mobile geolocation applications based on PhoneGap*. Lecture Notes on Software Engineering, 2015. 3(2): p. 78.
3. Kim, P., et al., *Socioeconomic strata, mobile technology, and education: A comparative analysis*. Educational Technology Research and Development, 2011. 59(4): p. 465-486.
4. Ojino, R. and L. Mich, *Mobile Applications in University Education: the case of Kenya*. Journal of e-Learning and Knowledge Society, 2018. 14(1).

5. Smartinsights. *Smartinsights, Mobile Marketing Analytics, 2016*. . 2016; Available from: www.smartinsights.com/mobilemarketing/mobile-marketing-analytics/mobile-marketing-statistics/attachment/.
6. Whitfield, S., *Introduction to phonegap: Developing native applications for libraries*. The Reference Librarian, 2012. 53(4): p. 441-447.
7. Sun, S. and S. Cao, *The Web development technology research of Cross platform mobile application*. Applied Mechanics & Materials, 2014.
8. Bo, C., Z. Shuai, and T. Haina, *Wireless machine to machine monitoring using cross-platform smart phone for district heating*. Wireless Personal Communications, 2015. 83(2): p. 1229-1250.
9. Pierre, N.J. and M. Octavien, *Review of PhoneGap APIs Accessing the Native Mobile Platform APIs*. Lecture Notes on Software Engineering, 2016. 4(1): p. 12.
10. Ahti, V., S. Hyrynsalmi, and O. Nevalainen. *An evaluation framework for Cross-Platform mobile app development tools: A case analysis of adobe PhoneGap framework*. in *Proceedings of the 17th International Conference on Computer Systems and Technologies 2016*. 2016: ACM.
11. Heitkötter, H., S. Hanschke, and T.A. Majchrzak. *Evaluating cross-platform development approaches for mobile applications*. in *International Conference on Web Information Systems and Technologies*. 2012: Springer.
12. Redpath, R., *Mobile web app infrastructure*. 2015, Google Patents.
13. Wargo, J.M., *PhoneGap essentials*. Building cross-platform mobile apps, Boston, 2012.
14. De Andrade, P.R., et al., *Cross platform app: a comparative study*. arXiv preprint arXiv:1503.03511, 2015.
15. Palmieri, M., I. Singh, and A. Cicchetti. *Comparison of cross-platform mobile development tools*. in *Intelligence in Next Generation Networks (ICIN), 2012 16th International Conference on*. 2012: IEEE.

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