Comparative Study of Native and Web-Based Mobile Application

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Abstract

In today’s world, Smartphones are gaining popularity day by day, which is making mobile application development more popular among aspiring developers. There is a Rapid growth in the number of aspiring software developers working on mobile application development. The question, which platform is best for development continues to pop up. The aim of this study is to present a comparison between Native and Web-based application from a beginner App Developer’s perspective. We compare key characteristics of both approaches, their advantages, and disadvantages. To compare App development on both the platform, we develop a mobile application called Patient-tracker in both Android and Web platform and evaluate the development process focusing on the experience of a beginner level developer. Our study presents a platform to compare the Web and Android-based application. It also reviews the similarity and differences between them.

Keywords: Web Application, Android Application, App Development.

I. INTRODUCTION

The increasing popularity of smartphones have paved the way for mobile application, and the demand for mobile application developers is increasing day by day. Currently, the two largest App distribution platforms are Google Play Store for Android users and Apple App Store for iOS users. As per the data recorded in March 2017, there are 2.8 million apps on Google Play store; Apple users were able to choose from 2.2 million applications, Windows Store had 669,000 application.

Mobile applications are those that run on any mobile operating system. There is a large number of the operating system available in the market; an app is developed and operated according to their operating system. Depending on the platform chosen to develop the app, mobile apps can be categorized into two categories, Native application, and Web application.

A Native app is designed and operated on a particular operating system. Special Development Kit (SDK) tools and languages provided by the platform vendor are used, by the developer. Android applications are developed in the Android Studio using Java and XML; the iOS app is developed on Xcode using Swift. The application is directly installed on the mobile. All the data associated with the app is also generally stored on the mobile hardware. The Native app runs on device’s operating system and has access to device-specific hardware and software, i.e., it can make full utilization of mobile technology like GPS, various sensors, and camera. Internet connection may not be required depending on the type of application. An app developed for one OS cannot operate on any other OS. This is the biggest drawback of Native apps; we have to develop the same app differently for different platforms.

A web application is platform independent. It can be operated on any mobile operating system. It is developed using HTML, CSS, and Javascript. Web app runs on external servers; they are accessed through mobile’s web browser, so internet connection is required.

For comparison between them, we are developing an app on both platforms. Each step of the development procedure is compared, beginning from the installation of the toolkit for development on our laptop to the final user interface of the application.

The remainder of the paper is structured as follows, Section 2 consist of literary review, Section 3 talks about the UI design and Development of the application, Section 4 describes its performance evaluation and comparison of the Apps. Section 5 gives the result of the study and Section 6 concludes this paper.

II. LITERATURE REVIEW

Research for the successful completion of the study was done by examining a lot of literature written on the topic. Seung(2015) compared native and hybrid method in terms of performance cost, development cost, user interface design, and the efficiency with which both the platforms utilize device capabilities such as various sensors, cameras, network interfaces. Maryam Ahmed, Rosziati Ibrahim (2014) reviews the similarity and difference in the testing mechanism for Web application and mobile application. Also, it discusses the quality assurance provided by the web application and mobile application. Ali Mesbah et al. (2015) discuss a qualitative study fo the various issues that developer face while developing and different versions of an app for different devices. a semi-structured survey was conducted in which 12 senior mobile developers from 9 different companies, were interviewed and the information gained from the mobile development community was presented. Arunima Jaiswal et al. (2014) focused on security issues and the main aim of the study unique challenges and problems in preventing data leakage and maintain the confidentiality of data.
developers and software tester develop better testing tools for their related projects. Chaitanya Ekhatpurkar et al. (2016) developed an application aims to provide a solution for the lack of interaction between the voter and the candidate. It gives voters a convenient and safe way to vote it also presents a profitable way for conducting an election and attracts voters to participate by providing the platform to interact with the candidates. Dayanand Patil (2014) discusses the Challenges & Problems in Security Testing of Web-based Applications and also about Security testing for web-based applications which is different from functional testing and usability testing in a number of ways.

III. DEVELOPMENT OF PATIENT TRACKING APPLICATION

A. Patient Tracking Application

The application is developed to compared the strength and weakness of both the development methods so it is designed to keep the functionality simple. Patient tracker simply keeps the database of the clinic. A doctor using the app and can perform the following function

1. Registration/Inserting Information: information of a new patient can be inserted in the database
2. Monitoring/Viewing information: details of an existing patient can be seen by querying the database
3. Updating information: details of an existing patient can be updated

B. UI Components

The UI of the application developed on both the platform is presented below. The Web application is built on Notepad++, using HTML5 and CSS, and Bootstrap libraries.

The Android application is developed on Android Studio using Java and XML.
IV. COMPARATIVE WEB AND NATIVE APP

A. Architecture

1) Web Architecture

Web apps are platform independent, they are not operated on any particular system or kernel, the generic Web application architecture is client-server architecture.

B. Development Stack

The developer of both applications has a beginner level experience in App development on both the platform. From developers point of view developing the Web App and working with HTML was easier, faster and, it was much less complex to build many UI elements with HTML rather than JAVA, but the learning curve of Android was much more, and a lot of the hardware resources were very easy to access on Android platform. Time taken to build Web app was just half of the time required to build Android app. The Android platform had the infrastructure for event-driven behavior. The system on which both the apps are developed is Dell Inspiron 3443, with Intel(R) Core(TM) i5-5200U CPU, 4.00GB installed RAM, and 64-bit operating system, The resources, and tools used to develop the application were installed on the system. Fig. 7 shows how they used the system memory. Installation of Android Studio was more complex as compared to the Notepad++ editor.
After completion of the development phase of the apps, we found that development cost of Native app is more than that of Web app.

C. Functionality

The performance of any application is measured by how responsive it is, how quickly it starts up, how well it uses device memory and device power. The experimental device that we used to run the apps is an Android smartphone, nexus5. Web app had a very responsive design, but the user experience, user interaction, and personalization was much better in a native app. Native app also worked offline and had local storage capabilities whereas, Web app was entirely dependent on the server, its performance was affected by the type of connection (2G, 3G, 4G, Wi-Fi) but search engine optimization worked better in the Web app. In terms of computational power native app was found to be better as Java is faster than JavaScript but Java uses more memory than JavaScript. Application maintenance and the update were found to be very easy in the Web app.

V. RESULT AND ANALYSIS WITH DISCUSSION

With the developed Native and Web application, we have evaluated and compared the development procedure and functionality. The results and finding of the comparison are formulated in the Table I. The apps are rated out of 5 in terms of their functionality, 5 being the highest and 1 being the lowest.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Functionality</th>
<th>Native App</th>
<th>Web App</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Accessibility capability</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Computational Power</td>
<td>5</td>
<td>3</td>
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<tr>
<td>3</td>
<td>Local Storage, Offline Capability</td>
<td>5</td>
<td>3</td>
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<tr>
<td>4</td>
<td>User Experience</td>
<td>5</td>
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VI. CONCLUSION

From this paper, we conclude that when we talk about the best solution, the answer depends on the purpose for which the App is built, the device on which it will run the user’s requirements and the budget.

If the application design is complex, frequently used, then the aim of the developer is to guarantee the best experience for the users, which can be best achieved by a Native application. If on the other hand, our application design is simple and not very frequently used by the user then it is much more suitable build a web app which is easier to maintain because we are standardizing the application on a single code base.

As an aspiring developer or someone who is starting with App development, Web App is best to start with. the development environment is relatively easy to install and the languages used are easier to learn. with the experience...
of Web App development, the developer should proceed with Android or any other Native App development as it will allow the developer to explore a lot of new functionality which was not possible with Web App development. Even though both Native and Web App continues to evolve and both will coexist for the foreseeable future, Native apps will remain the choice of users because of its richest experiences that take advantage of the latest onboard functionality.

REFERENCES

[2] Adrian Holzer and Jan Ondrus, “MOBILE APP DEVELOPMENT: NATIVE OR WEB?,” University of Lausanne
[7] Ivano Malavolta, “Beyond Native Apps: Web Technologies to the Rescue! (Keynote),” Vrije Universiteit Amsterdam, The Netherlands
[17] Tor-Morten Gronli, Jarle Hansen, Gheorghita Ghinea and Mohammad Younas, “Mobile application platform heterogeneity: Android vs. Windows Phone vs. IOS vs. Firefox OS,” Norwegian School of IT.