

Online Mobile Application Development using Ionic Framework for Educational Institutions

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Abstract—We often see education institutions using conventional method to manage school and student related affairs and activities. Events are still managed by sticking news in notice boards and by issuing memos. This at times creates confusion and lot of inconvenience to students, teachers and school management. Thus it becomes difficult to follow-up proceedings. Using technology in the easiest manner is the best solution to manage this effectively. The aim of the project is to develop an Online Build Tool for creating Mobile Application for Educational Institutions. Using the application created events can be managed efficiently. Managing activities of teachers is also one among many functionalities application provides. The online build tools involve options to select functionalities required from a pool of common services usually used by educational Institutions. On proceeding further, templates for the mobile application will be shown. After selecting desired template, by using online build tool apk,ipa files can be generated. The apk,ipa files is of hybrid in nature and works according to Responsive Web Design pattern. Generated apk, ipa files will be uploaded to a portal with download option.

Keywords—Ionic framework, Angular JS, Hybrid mobile application

I. INTRODUCTION

A digital enterprise is an organization that uses technology as a competitive advantage in its internal and external operations. As Information Technology (IT) has reshaped the infrastructure and operations of enterprises, digital enterprise has taken on different meaning. Mobility which includes Mobile Application Development is an application of Digital Enterprise.

Mobile application development is a term used to denote the act or process by which application software is developed for mobile devices, such as personal digital assistants, enterprise digital assistants or mobile phones. These applications can be pre-installed on phones during manufacturing platforms, or delivered as web applications using server-side or client-side processing (e.g., JavaScript) to provide an "application-like" experience within a Web browser. Application software developers also must consider a long array of screen sizes, hardware specifications, and configurations because of intense competition in mobile software and changes within each of the platforms. Mobile

app development has been steadily growing, in revenues and jobs created.

II. CURRENT STATE OF MOBLE APPLICATION DEVELOPMENT

There are various platforms, Operating systems and supporting tools available for Mobile devices. Few of them are given.

A. Android

Based on the Linux kernel, Android started life as a proposed advanced operating system for digital cameras until the company realized that the market was limited compared to that for mobile phones. The Open Handset Alliance unveiled the Android operating system in 2007, nearly two years after Google's acquisition of Android. Advantages of using Android are: i) Android had the dominant share of the mobile market i.e. 81% of all devices shipped in Q3 2013 were Android, ii) we can develop on any platform, iii) The environment is more open: call history is available to all apps; notifications between apps are possible as well as the sharing of content; apps can be installed from any source, iv) We can publish to Google play.

B. iOS

Apple's iPhone set the standard for the new generation of smart phones when it was first released in June 2007 with its touch screen and direct manipulation interface. The iOS lineage started with NeXTSTEP, an object oriented multitasking OS from the late eighties developed by NeXT computer. The world's first web browser was developed on NeXTSTEP and proved hugely influential in the formative years of HTML. The main programming language for iOS is Objective C. Development is done through XCode IDE which has an inbuilt iOS simulator. Advantages of using iOS are: i) New features are available quickly, ii) The OpenGL API is standard for graphics across the platform, iii) Navigation is non-prescriptive – users can decide how they will navigate within their app.

C. Windows Phone 8

The second generation of the Windows Phone operating system uses the same Metro interface but has an updated

architecture based on the Windows NT kernel rather than Windows CE. We can develop for Windows Phone 8 only on a system running Windows 8 using Visual Studio 2012 as an IDE.

D. BlackBerry 10

Originally named BBX, BlackBerry 10 is based on the QNX microkernel operating system whose parent company RIM acquired in 2010. BlackBerry 10 uses a system of gestures and touches which is supposed to make physical buttons unnecessary for core functions. The OS also has an Android runtime layer so that Android apps can be packaged and distributed on the BlackBerry platform.

E. Titanium Mobile

iOS, Android, Blackberry and Windows Phone apps can be created using Appcelerator's Titanium framework. Application source code is interpreted on the mobile device using a JavaScript engine. Titanium provides fast results, making it a popular prototyping tool but performance issues abound and code forking is often required.

III. FUTURE OF MOBILE APPLICATION DEVELOPMENT

There are various related and growing technologies for mobile applications. Few of them are given here.

A. Wearable Technology

Wearable technology is not a new term. Miniaturization has made wearable what once would have been unthinkable cumbersome – sophisticated computers and communication devices can now be incorporated into wristbands, glasses or even clothes themselves. The market of wearable technologies is estimated to exceed 12 billion \$ by 2018.

B. Google Glass

Google Glass is released in 2013, which is an augmented reality device. It can record images and video and can almost be entirely controlled by voice alone when in operation. Most of the third party apps available are centered around taking and sharing pictures or displaying feeds to the user though there are more interesting applications like driving assistants and fitness coaches.



Fig. 1. Sample picture for Google Glass

C. Galaxy Gear

Galaxy Gear operates with a Samsung smartphone or tablet running Android 4.3 or above. Galaxy gear is a line of wearable computing devices produced by Samsung electronics.

D. FuelBand

The FuelBand is worn on the wrist and tracks physical activity, allowing users to share and compare stats via the Nike+ online community. FuelBand is highly proprietary and it worked with iOS 5.0+ and any attempts to hack the technology were met with legal action. Hence third-party development was therefore non-existent. Problems with the FuelBand included the poor monitoring of activities involving the lower half of your body and the possibility of gaming our stats with vigorous arm shaking. It did prove the viability of fitness related wearable tech though and offers up lots of



possibilities for the future of sportswear.

Fig. 2. Sample picture for FuelBand

E. The Connected Car

Computers have been an essential part of car technology for many years. But now automobiles are becoming part of the Internet of Things and the market for connected cars is predicted to treble over the next five years.

The race is also on to develop viable driverless car technology and Google seems to be in the leading pack.

F. Second Screens

The rise of the second screen continues as people increasingly seek an enriched experience while watching television. The ability to interact with content, or unlock new content, by interacting with a smart phone or tablet app is becoming a focus area for content providers.



Fig. 3. Sample picture for second screen

IV. HYBRID MOBILE APPLICATION DEVELOPMENT

Hybrid mobile application development combines the best of both the native and HTML worlds. We define hybrid as a web app, primarily built using HTML5 and JavaScript, that is then wrapped inside a thin native container that provides access to native platform features.

The hybrid mobile app has become a major factor in mobile app development. By enabling developers to use web technologies to target multiple mobile platforms from a single code base, rather than writing native code for each platform separately, hybrid mobile apps can significantly reduce the time and cost of mobile app development.

Hybrid apps have several key limitations that leave native as the sole option in many cases. The limitations are: i) Animation – hybrid apps handle animations with less fluidity than native apps, ii) App fluidity – hybrid apps often appear sluggish during page and state transitions, iii) Memory usage – since mobile apps run on a small physical device, memory usage is a very real concern.

Going hybrid can be a great approach to mobile app development. Before deciding to go hybrid, we need to fully understand the associated limitations and risks.

V. NEED FOR ONLINE BUILD TOOL

Single code and multiplatform support is the main advantage of hybrid mobile applications. It could do any operations normally a native application does. For creating such hybrid mobile applications good knowledge in HTML5, CSS3, JavaScript, Java Web Services, Cordova is required. Nowadays it is possible to access internal sensors like camera, microphone or positioning sensors from within mobile web browsers and developers as well as researchers are not limited to native applications to exploit the potential of modern mobile devices.

In the current era of digitalization we always see technology integration in our day to day life. Consider event management application as an example. The application could really help to resolve the complexities which arise when we manage an event manually. But the main concern is the affordability to get the desired mobile application done from mobile application developers or from service oriented software companies.

VI. OBJECTIVES OF CREATING ONLINE BUILD TOOL

There are some objectives for creating online build tool. They are given below.

A. Building unique platform for creating online hybrid app development

Native application development requires specialization in each technology. This incurs more cost and time for the projects. Small entrepreneurs often find difficult to manage the same. Hybrid applications using frameworks like ionic could be used as solution. But even for this strong technical knowledge is required. Online tool to build platform independent applications by just selecting functionalities required will increase the outreach of mobile application development.

B. Using latest technologies

Many tools and researches are available over Internet which uses various technologies to create online build tools. Angular JS is the latest technology which is very likely to change the way we code. Besides efficient data binding overall efficiency is very high such that it reduces the lag that often comes in hybrid mobile applications. Ionic framework uses angular JS and helps in efficiently building hybrid mobile applications.

C. Offline data syncing

Data sync is the key functionality of any mobile application. There are methods to use it efficiently in native applications. Experimentations are still undergoing for creating efficient data syncing applications. Integration of the functionality in online build tool will really help to increase the usability of applications generated via the tool.

VII. LITERATURE BACKGROUND

The efforts carried out related to the design and development of a web-based framework that allows designing, deploying and executing mobile data collecting applications is discussed [1]. It also allows analyzing and presenting the data that is generated during the same process. The framework is completely web-based provides a platform independent execution of the mobile application on any mobile device with a web browser. This framework was introduced to teachers in an activity to follow up an initial study. An explorative study is conducted regarding the technology acceptance and usability of two components of the proposed framework. Limitations in this work are: i) framework is built on normal JavaScript and not using latest JavaScript frameworks like Ionic framework which uses angular JS, ii) functionalities like managing offline data is not mentioned.

Developing applications for mobile platforms is challenging because of multiple proprietary environments. Abundant material has been published discussing three kinds of mobile app development – native, web and hybrid where hybrid apps are preferred due to their usability. A strategy and approach for developing and delivering existing web and desktop applications as mobile apps is discussed [2]. The

proposal is a variant of hybrid development model that utilizes code translators to translate existing web or desktop applications for the target mobile platforms. The goal is to validate if investments made by an enterprise in developing web or desktop applications are still relevant when the same are to be re-deployed as mobile apps.

Main problems that arise in development process of mobile applications are concerned with creating cross-platform solutions that will work on different mobile operating systems like Android, Windows Phone and iOS. For such development needs PhoneGap framework can be used. To identify common development issues for creating cross-platform applications with PhoneGap and offer solutions is the main aim [3]. Analysis is based on case study of insurance mobile application development process and comparison of its working version on two different mobile platforms. Difference in performance of different scripting language to native code is not mentioned.

Modern companies, institutions, organizations, individuals, etc have websites in order to extend their reach to audience or customers. However, it is not sufficient anymore just to have an appearance on web and to be recognized through various web search engines. People are increasingly using smart phones and tablets for accessing the Internet, not just desktop, personal computers and notebooks, therefore websites need to be optimized for all these devices in order to provide the best user experience. Responsive web design provides a website with a flexibility to adapt to any of these devices. The work [4] presents statistics and predictions of market trends regarding the devices and user experiences in web browsing and m-commerce. Responsive web design is researched along with its benefits and potential problems.

Responsive web design have receive a popular attention in recent years because of they can meet a variety of internet terminals resolution. How to use media queries, bootstrap responsive navigation, and layout of streaming technology to achieve responsive web design is discussed [5]. A rational analysis about responsive web development at the present stage is made.

New mobile networks and new devices like smartphones and tablets are rapidly changing opportunities for public sector units delivering smart, mobile e-services to their citizens. Moreover, the upcoming HTML5 standard allows for cross-device and cross-browser support making service development and deployment much more easier than before at lower costs. [6] analyzes the most important features of HTML5, CSS3, and WebGL and their applicability for mobile e-services in the public sector. Also presented a novel architecture for mobile e-services using HTML5, mashups, and RESTful web APIs as important building blocks. But there is no comparison between services using JSON and XML.

One of the challenges in mobile apps development is its fragmentation with respect to mobile platforms. Large companies like IBM, Adobe and a growing community of developers advocate hybrid mobile apps development as a possible solution to mobile platforms fragmentation. Hybrid mobile apps are consistent across platforms and built on web

standards. A realistic investigation into mobile hybrid apps through a solid empirical strategy is presented [7]. the goal is exploratory and aimed at identifying, analyzing and understanding the traits and distinctions of publicly available hybrid mobile apps within their real-life context. The study has been conducted by mining 11,917 free apps and 3,041,315 reviews from the Google play store and analyzing them from both a technical and end users perception perspective.

VIII. PROPOSED SYSTEM DESIGN

Native applications are build which requires specialization in each technology. This incurs more cost and time for the projects. Small entrepreneurs often find difficult to manage this situation. Frameworks on Angular JS and Ionic could be used as solution. But features like offline data sync is not implemented in these frameworks.

The proposed system is build tool for hybrid application built using Ionic framework and Angular JS. Library for offline data sync will be made and to be added in the existing framework.

The aim of the work is to develop an online build tool for creating mobile application for educational institutions. Using the applications, events can be managed efficiently. Managing activities of teachers is also one among the many functionalities the application provides. The online build tool involve options to select functionalities required from a pool of common services usually used by educational institutions. First templates are shown. After selecting desired template, using online build tool apk and ipa files are generated. The apk, ipa files is of hybrid in nature and works according to responsive web design pattern. Generated apk, ipa files will be uploaded to a portal with download option. The following modules were developed.

A. *User interface for online build tool*

This includes creating user interface of the online build tool to create mobile application. The UI includes most common functionalities used by educational institutions. After this a new page to select template for mobile application will be shown. The template is also designed.

B. *Web service integration using Spring MVC4*

Web services needed for the work are written in Java Spring MVC4. Restful web service using JSON is used here. Service libraries to integrate web service is also part of this module.

C. *Offline data sync in mobile application*

The application generated supports offline data synchronization. The application is designed in such a way that normal operations can be done offline and once network connection is identified it will be synced to the server. Separate libraries to enable offline data sync is made and will be added to mobile application generated.

D. Application building using Java and Node environment

An environment for building the application online is setup on the server. For this node environment is to be setup using Ionic framework. In Java, where the web services are written, triggers are made to the shell script to build hybrid mobile application.

E. Portal to download mobile applications

The application which is built as mentioned in the previous module, is uploaded to a Google play store like portal, where authorized people could download the applications.

IX. CONCLUSION

There are a number of mobile application development tools available and most of them are making use of recent web technologies also. Every work has its own merits and demerits. This paper proposed a new work that make use of Angular JS and Ionic framework to build smart and better mobile based applications soon. Further the work has to be completed and tested using various ways of creating different mobile based applications.

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