International Association of Scientific Innovation and Research (IASIR)
(An Association Unifying the Sciences, Engineering, and Applied Research)

ISSN (Print): 2279-0063
ISSN (Online): 2279-0071

International Journal of Software and Web Sciences (IJSWS)
www.iasir.net

Cross-Platform Mobile Web Applications Using HTML5

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Abstract*: In recent years the use of smart mobile devices has become an integral part of everyday life leading to the expansion of applications development for the various mobile platforms, requiring separate software development process, which subsequently increases the corresponding effort for app development. The market of smartphones has a variety and there is no single dominant mobile platform or OS. Developing a particular application for a particular OS is time consuming. With the emergence of HTML5 these issues can be addressed efficiently since application development is allowed in a cross-platform manner. The apps which are developed using HTML5 are also reliable, efficient and portable. HTML5 also allows to develop webOS which can be used in TV's, Smart watches, etc.*

Keywords*: Cordova API's, HTML5, webOS, Feature Detection, Cross-platform*

I. Introduction

What is a cross-platform web application? It is an application that is available to the customers through whatever device they use, wherever they are using a Windows PC, an Apple iPad or an Android phone.Why should we use HTML5? Because we can take advantage of cross-platform nature of HTML5 language, APIs, and tools. As the code of app is written using HTML5, the app works on approximately all the new devices as they come into the market.

Currently, the market of web applications is very high. The number of smartphone users are very large and also the number of mobile platforms are increasing, hence developing mobile applications becomes very difficult for the developers because they need to develop the same application for each mobile platform or operating system. Native apps are generally more difficult to develop and it requires a high level of technical knowledge and experience.

The primary goal of cross-platform mobile app development is to achieve native app performance and run on any mobile platform. Today's cross-platform app development has both opportunities and challenges for the generation. Since these apps can run on any platform, hence the apps need to adapt to various screen sizes, resolutions, aspect ratios and orientations. The mobile devices today also provide the facilities, such as accelerometer and GPS, etc. and the app should be compatible with these services. Cross-platform apps should be developed in the way such that it can take advantage and use accordingly of these functionalities in an appropriate and portable manner and provide a good service and experience to the users across a variety of range of mobile phones.

HTML5 apps do not have a constraint i.e. it is not limited to the web pages which are opened and displayed in any web browser. The HTML5 code can be packaged and deployed as a locally installed (on any user device) hybrid web application. It enables the users to use the same distribution and monetization channels like native apps, and the same procedure to install the app and same launch experience.

II. Literature Review

A mobile app is a computer program which is designed to run on smartphones, tablet, computers and other mobile devices. We can download the apps usually through the application distribution platform, which started appearing in the year 2008 and are generally managed by the owner of the mobile operating systems, such as the App Store from Apple, Google Play from Google, Windows Phone Store from Microsoft, and BlackBerry App World from Blackberry.The term "App" is a short form of the term "Application Software". This word became very popular among the people and in the year 2010, and it was declared as "Word of the Year" by the American Dialect Society. **[1]**

A. Need of the Mobile Apps

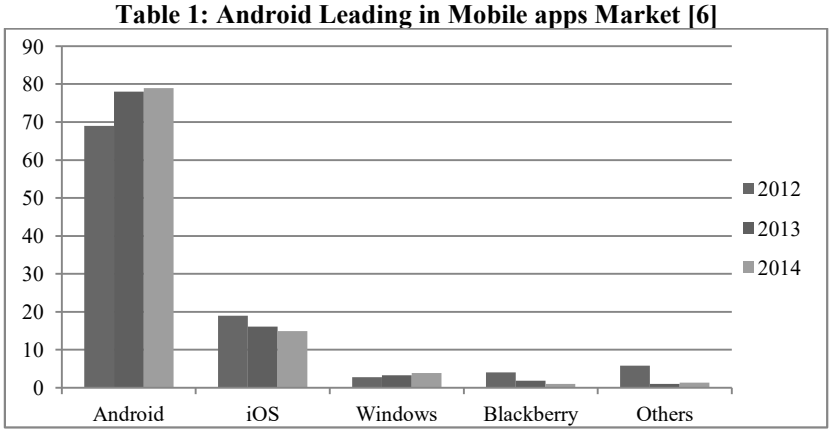
In modern era, the growth of the mobile and Internet has taken a large step. With the rapid development of mobile and Internet and increasing use of Internet, most of the companies transfer their business to M-Commerce (Mobile Commerce), and more and more users make their payment through their mobile devices. Meanwhile, the diverse range of mobile devices and the secure transaction are the main factors that put some restriction on the M-Commerce advancement. There is a possibility that the app which is designed for some platforms may not work on some different platforms. Here comes the need of a cross-platform app which may run on all the platforms without running on only some specific platforms. The cross-platform issues are solved

by using Web technology such as HTML5, CSS and JavaScript. For providing the secure transaction, such that no one can track your ID's and passwords, "CUPMobile", mobile payment standard of China can be applied. Currently, this solution has been successfully used for the payment through the mobile apps in China. **[2]**
The new mobile network companies and new electronic devices like smartphones and tablets are changing opportunities rapidly for public sector departments in delivering smart, easy and fast mobile e-services to their citizens. They want to provide the services at more ease day by day. HTML5 language standard enables cross-device and cross-browser support, making the development and deployment of these services much easier than before and the costs are also low. This paper carries the analysis of the important features and applications of HTML5 web language and its applications in developing cross platform web apps, a web OS from Firefox. **[3]**
To develop an interactive TV Commercial or in short iTVC for Internet connected TVs is complicated because of the number of different platforms, each of which has its own operating system and application programming interface (API). For achieving the cross-platform compatibility for the ads, we should use standard web technologies, instead of native APIs for each individual device. By using these standard web languages like HTML5, JavaScript and CSS, only one iTVC needs to be developed, which contains commonly used features of these kinds of advertisements. The iTVC was developed on a desktop computer and after development, it was tested on three different smart TV platforms for testing the feature compatibility. After achieving compatibility, a user study which included 36 participants, evaluated how platform-related differences affected the user experience (UX) and effectiveness of the interactive ad. The measured User Experience, effectiveness aspects and usability were consistent and satisfiable. This experiment shows the power and potential of web technologies to provide a uniform and user interactive Ad across a variety of heterogeneous devices. **[4]**

B. Smart Phone market: A glimpse

In PC market, there is a single dominant platform i.e. Microsoft [5], which provides Operating Systems, Document editor such as MS office and many more things to the users. However, the market of smartphones is very much heterogeneous, fragmented and distributed among various OS providing companies or organization. The market of smartphone apps is divided among Android (From Google), Symbian (From Nokia), iOS (From Apple Inc.), Blackberry Operating Systems (From Research In Motion or RIM) and now windows (From Microsoft). According to the data released in 2012 (table 1), Android is the leading in mobile apps has the majority of the market shares with 78.9%, Windows has 3.9%, Blackberry has 1.0%, Apple's iOS has a 14.9% shares and others 1.3% share of total app market.

Table 1: Android Leading in Mobile apps Market [6]



C. What is HTML5

HTML5 is a core technology markup language of the Internet which is used for structuring and presenting content for the World Wide Web or simply, it is used for web designing. As of October 2014, HTML5 is the final and complete fifth revision of the HTML standard of the World Wide Web Consortium (W3C). **[7]** HTML 4, the older version of HTML5, was finally revised and standardised in the year 1997. HTML5 improves and support better markup for the documents, and introduces application programming interfaces (APIs) for complex web applications. Hence, HTML5 has a potential for cross-platform mobile applications development. Many of the features of HTML5 are designed such that it can run on the devices which are low-powered such as tabs and smartphones. Analysing the scope of HTML5, the research firm "Strategy Analytics", forecasted in December 2011 about the sales of HTML5 compatible phones that it would be more than 1 billion in the year 2013**[8]**. A very interesting new element in HTML5 is <canvas> which provides an area of the screen which can be drawn upon programmatically **[9]**. It has widespread support and is available in the most recent versions of Chrome, Firefox, Internet Explorer, Opera, and Safari and also on Mobile Safari.

D. Features of HTML5

- Improved design rules accommodating screen size and potential interface limitations.

- Improved support of digital media, such as video and voice, and reducing the need of extensions or plug-ins.
- Improved support of common hardware accessories, such as GPS.
- Improved interaction with hardware for better response time.
- Improved support of caching for simpler application usage while offline.
- Improved support of native graphics (SVG and Canvas).
- Support for the open-source SQLite database and independent threaded processes ("web workers") to enable more sophisticated applications and better offline capabilities.
- Better substitution of markup language rather than scripting.

a) New APIs

HTML5 specifies scripting application programming interfaces (APIs) that can be used with JavaScript. Existing document object model (DOM) interfaces are extended. The new APIs, are as follows:

- ✓ The canvas element for immediate mode 2D drawing.
- ✓ Timed media playback
- ✓ Offline Web Applications
- ✓ Document editing
- ✓ Drag-and-drop
- ✓ Cross-document messaging
- ✓ Browser history management
- ✓ MIME type and protocol handler registration
- ✓ Microdata
- ✓ Geolocation
- ✓ Web SQL Database, a local SQL Database (no longer maintained).

b) Popularity

Popularity of HTML5 can be seen as according to a report released on 30 September 2011, 34 of the world's top 100 Web sites were using HTML5 web language, led by search engines and social networks **[10]**. In August 2013, a report has shown that 153 of the Fortune 500 U.S. companies implemented HTML5 to design their corporate websites. **[11]** HTML 5 is at least partially supported by most of the popular layout engines.

E. Using Feature Detection technology to build Cross-Platform HTML5 Packaged Web Apps

HTML5 enables cross-platform apps, which means you can write one app that runs on multiple platforms using only a single source code **[12]**. The HTML5 web apps are mostly cross-platform and sometimes require conditional code to deal with platform-specific minute or large differences. Not all HTML5 web app platforms are Apache Cordova platforms that use Cordova APIs. We can use feature detection technology in the apps, hence it is possible to build a cross-platform web app that runs on Cordova platforms and also on those platforms that support other JavaScript APIs rather than Cordova APIs.

a) Building Packaged Web Apps

HTML5 web apps are packaged in a single bundle so that they can be downloaded from the internet, installed and executed on a portable or mobile platform. Some examples of the platforms that support packaged web apps

- ➢ Chrome OS
- ➢ Firefox OS
- ➢ Ubuntu Mobile
- ➢ Cordova on Android, iOS, and Windows 8 platforms

An HTML5 packaged web app is a ZIP file containing a platform-specific manifest file that describes the application's name, icon, system requirements, permissions and any other attributes related to the platform. This is important to say that this ZIP file contains the HTML5 source files such as JavaScript, CSS and HTML and assets such as images, fonts, etc. that are ingredients to that web application.

b) Platform Detection and Feature Detection in the app

There are two methods to detect the platform API differences that might affect the execution and functionality of the cross-platform web app-

1. Feature detection
2. Platform detection

The feature detection is very useful for identifying at runtime the lack or unavailability of an HTML5 functionality, which is usually JavaScript APIs. This technique can be used to conditionally implement the backup features or eliminate some optional app features, when the necessary HTML5 APIs are not available

with the zip file you have downloaded. Platform or browser detection is an easy way to deal with the Cordova API differences.

c) Using Feature Detection and Platform Detection with Cordova API's

Apache Cordova is an open-source mobile development framework which allows the developers to use standard web technologies such as HTML5, CSS3, and JavaScript for cross-platform development of mobile apps, avoiding each mobile platforms' native development language. [13]

Table 2: Decision Drivers [14]

Drivers	Native Apps	Mobile Web/HTML5	Cross-platform Tool
Quality of user experience	Excellent	Very Good	Excellent
Application Sophistication	High	Moderate	High
Addressable Audience	Limited to Smartphones	Large, supported by Smartphones and featured Phones	Large
Cost per User	Typically Medium to High	Typically Low	Low to Medium Development, Medium to High Licensing
Agility	Medium to Low	High	Medium to High
Technical Risk	High	Medium	High
OS/Platform vendor Risk	High	Medium to Low	High
Operational Issues	Operationally More Flexible	Requires Network Connectivity but with HTML5 Can Operate Offline to Some Degree	Operationally More Flexible
Security	More Flexible	Inflexible, Expected to Improve	More Flexible
Supportability	Complex	Simple	Medium to Complex

III. Conclusion and Future Work

The major goal of this paper is to throw light on the potentials of HTML5. We can conclude that HTML5 has helped the developers a lot as it reduces the cost, effort and time while developing a web app. The cross-platform nature of the app makes its universal deployment on any mobile platform. HTML5 features such as canvas, audio, video support and improved design tools, etc. elaborates it's usability at a larger scale. Also HTML5 has helped in developing webOS, which can be used to operate TV's and Smartwatches. The apps should have Functionality, Usability, Efficiency, Maintainability, Portability and Reliability. These all features are available in web apps developed using HTML5. Functionality is present there as there are available different features in HTML5 applications. Usability and efficiency can be evaluated on the basis of user feedbacks in using HTML5 based Smartphone apps. These apps also support maintainability as editing the code is easier. At last, Portability and Reliability must be there as these apps are cross-platform. There is a large work to be done using HTML5.WebOS for personal computers is a great work. Also the mobile apps should be developed which are cross-platform not native.

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Acknowledgements

It is our proud privilege and duty to acknowledge the kind of help and guidance received from several people in preparation of this report. It would not have been possible to prepare this report in this form without their valuable help, cooperation and guidance. First and foremost,

we wish to record our sincere gratitude to Management of this college. Our sincere thanks to Dr.Pankaj Agarwal, Head, Department of Computer Science and Engineering, IMS Engineering College, Ghaziabad. We express our sincere gratitude to our mentor, Mr.Vijai Singh, Asst. Professor, Department of Computer Science and Engineering, IMSEC, Ghaziabad for guiding us in investigations for this seminar and for his constant support and encouragement. Our discussions with him were extremely helpful. We hold his in esteem for guidance, encouragement and inspiration received from his.The seminar on "CROSS PLATFORM MOBILE WEB APPLICATIONS USING HTML5" was very helpful to us in giving the necessary background information and inspiration in choosing this topic for the seminar.Last but not the least, we wish to thank our parents for financing our studies in this college as well as for constantly encouraging us to learn engineering. Their personal sacrifice in providing this opportunity to learn engineering is gratefully acknowledged.