



**THE DIFERENT BETWEEN HYBRID, WEB
AND NATIVE MOBILE APPLICATION**


By
Muneerah Q. Alqahtnai
Robert Morris University

Doi: 10.33850/ejev.2021.198975

قبول النشر: ٢٠٢١/٩/١٤

استلام البحث: ٢٠٢١/٩/١٠

Alqahtnai , Muneerah Q. (2021). THE DIFERENT BETWEEN HYBRID, WEB AND NATIVE MOBILE APPLICATION, Vol.5, No. 20, October, *The Arab Journal of Specific Education*, The Arab Foundation for Education, Science and Arts, Egypt, pp. 321-334.



**THE DIFERENT BETWEEN HYBRID, WEB AND NATIVE
MOBILE APPLICATION****Abstract:**

There are serious grow in the number of mobile devices industry, where each year large companies such as apple and Galaxy introduce new mobile devices and tablets (McGuirk et al). Recently, in September 2015, apple just releases a new version of its iPhon's series called iPhone 6 (Apple, 2014). Such growth cause large, medium and even small companies to think about developing applications for those mobile devices. Clearly, companies should know the different between developing a native mobile application that is install from big online market such as Apple Store or Google Play, web application which should be render in the mobile device browser or hybrid mobile application which is a gather some characteristics from both previous ones. Enlighten the organizations with available options would certainly help them to pursue the right choice.

Key word: Native, Web, hybrid application

Brief History

Long time before mobile applications had started; progeammers were more interested in desktop application or what is known as software appliactions (smith). Software applications are the applications that are developed to run in desktop computers. After that, people become more interested in web mobile applications. Web mobile application overcomes the drawbacks of installing the software in each individual computer (Smith). "The history of mobile application begins with the history of the mobile devices" (Bates, 2014). The first cell phone produced in 1973 by Motorola with cost of around \$4000. It had been used for basic calling software (Bates, 2014). According to Paul Lin in his article that in 80s and 90s the application manufacturing development kept as secrets. Later, companies deployed the Wireless Application

Protocol, Which solved some issues with that days' mobile problems. On the other side, such evolvement enlightened the user to the drawback of single manufacturing application. The first attempt of Touchscreen devices has developed in 1993 by IBM with built-in application such as clock, email, calendar and notepad. By 2008, Apple released the first iPhone and its apple store. Accessing and installing application was easy, however the application varieties were limited, which open the door the development of application for other companies. By 2011, millions of application has been developed and become available for the user. Billions of downloaded applications took place in the marketplace for Apple store and Google play Such as Angry Birds with one billion download, Draw Something and Instagram with 50 million downloads (Lin, 2014).

IS IT IMPORTANT TO KNOW THE DIFFERENT BETWEEN THE CURRENT APPROACHES OF MOBILE DEVELOPMENTS?

The answer is yes. Some interested statistics approve that the world is going to use mobile. Therefore, companies and organizations become more interested in creating mobile applications. In a survey conducted 2012 done by Meeker, business expert shows that a around half of American kids in ages between 6 and 12 want mobile devices as gift, specifically iPhone, iPad, iPod and iPad mini. Also, Pew Research Center asserts that the percentage of American adults who own tablets grows from 2 percent in 2009 to 29% in 2012 and there is room for growing. Moreover, 24 percent of all Christmas purchases took place online using mobile devices (Olson).

Introduction

When some organizations or companies want to develop a mobile application, they face a challenging question what type of mobile application Native, web or hybrid application should be selected? Defining each of these concepts, clarifying the fundamental

features and showing the main drawback will help to address this crucial question.

WHAT IS NATIVE MOBILE APPLICATION?

Native application that is the one build for specified platform or mobile device (Rouse). For a particular platform all application is coded using a particular language (Janssen). For example: developers use an Objective-C to develop an application for any of Apple's Products such as iPhone. Also, developer use Java, which is an Object-Oriented Language frequently to build applications that work with Google's Andriod (Smith, 2013). Native application has the full capabilities to use the built-in mobile devices (Rouse).

WHAT IS WEB OR HTML5 MOBILE APPLICATION?

Web application is a well-designed HTML file that is rendered in any mobile device and built with server-side technology (Korf and Oksman). It helps to give alternative display similar to those website accessed via personal computer (Janssen). Mobile web applications build with three important components HTML, CSS and JavaScript. They are not requiring specific platform, operating system or special device (Mobile Web).

WHAT IS A HYBRID MIBILE APPLICATION?

Hybrid mobile application combines some feature from mobile web application and mobile native application (Rouse). Hybrid application is work like a web application but it has to be installed like the native application. There are two ways to implement the code:

- 1- Local: packages the HTML code inside the mobile application binary file.
- 2- Server: stores the HTML file in the server and use container as shell (Korf et al).

NATIVE, WEB AND HYBRID APPLICATION FEATURES

Each type has its own features that make it different and special. Here are some differences:

Speed: Literally speed plays an important role especially for application with large data. Native applications provide the fastest graphics presentation. (Korf et al). As a live example, Facebook's company decides to change its Facebook's application and convert it to native one for iPhone and iPad and as result this changes significantly increases the speeds of those versions and gives the users the best experience (Arthur). Companies competes to develop a highly speed performance application.

On the other hand, the hybrid application has equivalent achievement as native application, but in the case of graphic-oriented application hybrid is not the right option (Medium 2019).

Application development: “*Software Developmet Life Cycle*” is the phases that are needed to develop an application by teamwork. Each native application is developed uniquely for each platform has it own development process environment. As mentioned before that each native application developed for particular device or platform uses different languages and it has its own unique SDK tools and unique interface controls. In fact, there are several tools and frameworks to build the native application (Viswanathan). In native application, devoted programming language for each platform for example, Java for Andriod and Swift for iOS (Tdkteck.com, 2019). As result, native application's developer uses different tools for different plastform such as Xcode IDE for developing iOS applications and Java IDE for Andriod appications (Tdkteck.com, 2019).

However, hybrid application uses different development frameworks such as Cordova and Ionic (Medium, 2019). Cordova is a mobile development framework, which is an opened source provided by Adobe. The main feature of Cordova it gives the

programmers to use CSS3, HTML and JavaScript. It does not depend on a particular development platform (Quasar Framework 2019). Similarly, Ionic is a free framework that uses CSS, HTML and JavaScript to build mobile application (Iconic Docs, 2019).

Accessibility: Using the approach of native development gives the developers the opportunity to fully integrate the device capabilities such as the camera, gesture, barometer, gyroscope and accelerometer (McGuirk et al). Therefore, the native application gives the user the best experience in term of taking full advantage of the device-feature.

Also, the hybrid application gives the user the same experience as the native application does. It enables the user to access built in featur (Medium 2019)

Offline/Online Feature: Advance feature of developing native application is the ability to directly access the local device storage. This feature gives the developer the freedom to customize database or storage (McGuirk et al). Genuinely, native application does not require connectivity to work (Budiu, 2013).

In the same way, the hybrid application is to following the same fashion (Tdkteck.com, 2019). But, if the application's designer does not deploy a good caching and HTML5' local device storage that can be used when the user cannot connect to the Internet then, the hybrid application is almost look like as regular web application that needs an Intrenet connectivity (Tdkteck.com, 2019).

Push Notification: Push notification is a feature that comes with the mobile application to advertise the companies' latest update, to notify the customers about transactions and to provide the users with urgent announcement (Selvarajan et al, 2019). Native application support push notification, which is a technique used to tell the user about updates, messages or alerts. Such feature is added after the user install the application and it can be turned on or off (Costello). What is good about push notification is that it saves the devise battery and helps to reduce network usage (McGuirk et al).

Application Distribution: Native applications are distributed, found and downloaded via the online market stores such as Apple Store and Google Play (Matzner). It is good to indicate that it is hard to reach the users with tremendous number of applications in such stores (Serrano).

Correspondingly, hybrid application has both distribution methods, thus it can be distributed via application's store and/or via web browsing (Tdkteck.com, 2019). Therefore, the hybrid win when its come to the ease of distribution (Tdkteck.com, 2019).

Web application is distributed online (Viswanathan, 2019). The only one problem associated with the online distribution is that there is no application's store (Viswanathan, 2019).

Update: When the time comes to update a native application, which is not an automatic feature then the user need download the upgraded version after a notification pushed to the user (Summerfield).

Cost: Building a native application is definitely expensive. Furthermore, the maintenance process would not be easy for both the developer and the user (Budiu, 2013).

Both hybrid and web application support varieties of browsers, thus costs can be high because of development and maintenance (Craig, 2019).

The following table summarize the main characteristics of Native application, web application and hybrid application:

Feature	Native	Web	Hybrid
Speed	Fastest		Fast
Development Process	Built for each platform	HTML	Both
Accessibility	Full	None	Partial
Connectivity	Offline	Online	Off/Online
Push notification	YES	NO	NO
Distribution	Market store	Web browsing	Both

Update	Not automatic	Automatic	Automatic
Cost	Expensive	Cheap	Reasonable

Mobile Web Application:

Web application depends on the browser that will render the HTML, CSS and the JavaScript code. For instance, Safari is mobile browser used to display websites or web application. The speed of mobile browser has increased significantly after the existence of 4G. However, relying on mobile web is not efficient enough until the 4G become popular (software). According to a survey published by the web performance division of Compuware Corporation states that 39 percent of people prefers quick response from website in favor of functionality. Moreover, about 32 percent of people will close the website if it takes 1-5 second to load the contents (Compuware). We can say that slow network latency in a thumb of any mobile web application (McGuirk et al).

Web application uses the popular languages; HTML, CSS and JavaScript across all platforms and they do not have SDK tools. It runs on different mobile devices and uses their browsers (Viswanathan). In simple word, single website can be render in a different platform and different devices (Summerfield).

In point of fact, it is impossible for mobile web application to access on-board hardware on a mobile device (Budiu, 2013).

Mobile web application automatically updated. In reality it is easy for the developer to edit the content or the design of the website and the changes will be visible to the user whenever they load the website. Obviously, Web application requires Internet connectivity in order for the pages to be display and for the updates to take place (Summerfield).

Web application reach the users effectively because the user will search for some information in the search engine and a web application will be display automatically (Budiu, 2013). Even though mobile web application is easier than the other approaches when

distributed, still user may find difficulties finding them since there is no specific market place to market such applications (Serrano).

In compare with native application, web application development cost is much less. Also, maintaining web application can be accomplished as much as needed and it is relatively easy (Buidu, 2013).

Mobile Hybrid Application

Hybrid mobile application is a web application written with HTML, CSS and JavaScript packed with native application, which works as container. PhoneGap is used to build such container (Korf et..al.). Such approach gives the HTML code the abilities to use the device-specific feature, which enhances the user experience (Serrano). Generally, hybrid application takes all advantages of native application such as offline access, push notification and the use of market place. On the other hand, since the hybrid application is browser-based, the application performance will be slower than it would be build natively (McGuirk et al).

Discussion

Obviously, each of native application, web application and hybrid application has magnificent features, which partially or fully would satisfy any organization or company if they decided to develop a mobile application.

HTML web application seems to be the easiest one to develop and it is also the widest one to reach all platforms and different devices. However, companies and organizations should take into consideration that developing with web application approach will not let the user interact with device feature and this is not an ideal solution. For example, the user will not be able to experience the multi-touch input (korf et al). Also, it is difficult for some users to locate the web application since there is no central application store (Craig, 2019). As matter of fact, web application is the least secure approach between the others because there is no security control

system that checks the web application; so the security of the application is not approved (Viswanathan, 2019)

Native application considers the most secured application because it must take the application's store approval (Viswanathan, 2019) .It is most efficient among all other development approaches and the user would have the fastest responses and best interaction with device, nevertheless it is the hardest in many aspects. Native application development requires very knowledgeable developers. Also, what make it further complicated is there are different tools, operating systems, APIs and devices with various capabilities for each platform (Charland et al). Moreover, various codes for various platforms would consequently affect the cost of maintainance, development and update. In addition, native applications goes through approval procedures, which may postpone the predictable launching date (Craig, 2019).

Hybrid can be use to build an application for existing web sites that can be install and download in the user's device and use an embedded browser to render the content. As a matter of fact, it is a great solution to have across-platform with out huge development costs and time (Buidu, 2013).

In Conclusion

A decision to build web applications, native applications or hybrid applications depends on some relevant and tangled factors such as the importance of the application speed and performance. Also, companies and organizations should check the developers' availability and knowledge. They must answer the question whether their companies and organization need to develop for all devices and platform or just a particular type. Further more, cost and the time to build the application should be take into consideration. Some companies choose to develop in both hybrid and web applications to take the advantages of those approaches.

Reference

- Arthur, C. (n.d.). Facebook doubles iPhone app speed by dumping HTML5 for native code. <http://www.theguardian.com>. Retrieved October 10, 2014, from <http://www.theguardian.com/technology/appsblog/2012/aug/24/facebook-iphone-app>
- Apple - Press Info - Apple Announces iPhone 6 & iPhone 6 Plus-The Biggest Advancements in iPhone History. (2014, September 4). *Apple - Press Info - Apple Announces iPhone 6 & iPhone 6 Plus-The Biggest Advancements in iPhone History*. Retrieved October 15, 2014, from <http://www.apple.com/pr/library/2014/09/09Apple-Announces-iPhone-6-iPhone-6-Plus-The-Biggest-Advancements-in-iPhone-History.html>
- Bates, S. (2014, January 14). A History of Mobile Application Development - Manifesto. Retrieved October 7, 2014, from <http://manifesto.co.uk/history-mobile-application-development/>
- Budiu, R. (2013, September 13). Nielsen Norman Group. *Mobile: Native Apps, Web Apps, and Hybrid Apps*. Retrieved October 15, 2014, from <http://www.nngroup.com/articles/mobile-native-apps/>
- Charland, Andre; Leroux, Brian. *Communications of the ACM*. May2011, Vol. 54 Issue 5, p49-53. 5p. 2 Color Photographs, 1 Chart, 1 Graph. DOI: 10.1145/1941487.1941504. , Database: Business Source Premie
- Compuware. (n.d.). New Survey From Compuware Gomez Reveals Consumers Will Quickly Abandon Slow Websites . *globenewswire*. Retrieved October 11, 2014, from <http://globenewswire.com/news-release/2010/09/07/429014/200875/en/New-Survey-From-Compuware-Gomez-Reveals-Consumers-Will-Quickly-Abandon-Slow-Websites.html>

- Costello, S. (n.d.). What Are Push Notifications on My iPhone?. *About*. Retrieved October 12, 2014, from <http://ipod.about.com/od/iphonesoftwareterms/g/iphone-push-notifications.htm>
- Craig, W. (2019). Native App vs. Mobile Web App: A Quick Comparison. Retrieved 21 October 2019, from <https://www.webfx.com/blog/web-design/native-app-vs-mobile-web-app-comparison/>
- Ionic Docs. (2019). *What is Ionic Framework? - Ionic Documentation*. [online] Available at: <https://ionicframework.com/docs/intro> [Accessed 18 Oct. 2019].
- Korf, M., & Oksman, E. (n.d.). Native, HTML5, or Hybrid: Understanding Your Mobile Application Development Options - *developer.force.com*. *Native, HTML5, or Hybrid: Understanding Your Mobile Application Development Options - developer.force.com*. Retrieved October 8, 2014, from https://developer.salesforce.com/page/Native,_HTML5,_or_Hybrid:_Understanding_Your_Mobile_Application_Development_Options
- Janssen, C. (n.d.). What is a Native Mobile App? - Definition from Techopedia. *Techopedias*. Retrieved October 8, 2014, from <http://www.techopedia.com/definition/27568/native-mobile-app>
- Janssen, C. (n.d.). What is a Mobile Application? - Definition from Techopedia. *Techopedias*. Retrieved October 6, 2014, from <http://www.techopedia.com/definition/2953/mobile-application-mobile-app>
- Lin, P. (2014, February 6). The History Of App Development And What It Means For The Future. Retrieved October 8, 2014, from <http://www.buuna.com/blog/app-development/>
- Matzner, R. (2012, September 12). Why Web Apps Will Crush Native Apps. *Mashable*. Retrieved October 10, 2014, from <http://mashable.com/2012/09/12/web-vs-native-apps/>

- Medium. (2019). *Choose the best — Native App vs Hybrid App*. [online] Available at: <https://codeburst.io/native-app-or-hybrid-app-ca08e460df9> [Accessed 16 Oct. 2019].
- Mobile Web Apps Vs Mobile Native Apps How to Make the right choice. (n.d.). *www.lionbridge.com*. Retrieved October 9, 2014, from
- Rouse, M. (n.d.). Native app. Retrieved October 7, 2014.
- Rouse, M., & Gillis, A. (n.d.). What is native app? - Definition from WhatIs.com. Retrieved from <https://searchsoftwarequality.techtarget.com/definition/native-application-native-app>.
- Olson, P. (2012, December 4). 5 Eye-Opening Stats That Show The World Is Going Mobile. *Forbes*. Retrieved October 15, 2014, from http://www.forbes.com/sites/parmyolson/2012/12/04/5-eye-opening-stats-that-show-the-world-is-going-mobile/?utm_campaign=forbestwittersf&utm_source=t
- Quasar Framework. (2019). *What is Cordova | Quasar Framework*. [online] Available at: <https://quasar.dev/quasar-cli/developing-cordova-apps/introduction> [Accessed 18 Oct. 2019].
- Rouse, M. (n.d.). hybrid application (hybrid app). *What is ?*. Retrieved October 8, 2014, from <http://searchsoftwarequality.techtarget.com/d>
- Selvarajan, D. and Kadambi, B. (2019). *Push notifications for hybrid mobile apps*. [online] IBM Developer. Available at: <https://developer.ibm.com/patterns/tag-based-push-notifications-for-hybrid-mobile-applications/> [Accessed 19 Oct. 2019].
- Serrano, N., Hernantes, J., & Gallardo, G. (2013). Mobile Web Apps. *EEE Software*, 30(5), 22-27.
- Smith, C. (n.d.). Top 5 Programming Languages for App Developers. *StartApp*. Retrieved October 8, 2014, from <http://blog.startapp.com/top-5-programming-languages/>

Smith, J. (n.d.). Desktop Applications Vs. Web Applications. Retrieved from https://www.streetdirectory.com/travel_guide/114448/programming/desktop_applications_vs_web_applications.html.

Software Development For The Mobile Market. (n.d.). *Mobile Technology*. Retrieved October 10, 2014, from <http://www.bbconsult.co.uk/Mobile-Web-Software-Development.aspx>

Summerfield, J. (n.d.). Mobile Website vs. Mobile App (Application): Which is Best for Your Organization?. *Mobile Website vs. Mobile App (Application) – Which is Best for Your Organization?*. Retrieved October 12, 2014, from <http://hswsolutions.com/services/mobile-web-development/mobile-website-vs-apps/>

Tdktech.com. (2019). *Mobile Development - Web, Hybrid, or Native? | TDK Technologies*. [online] Available at: <https://www.tdktech.com/tech-talks/mobile-development-web-vs-hybrid-vs-native> [Accessed 18 Oct. 2019].

Viswanathan, P. (n.d.). Should You Develop a Native App or a Web App?. *About*. Retrieved October 11, 2014, from <http://mobiledevices.about.com/od/additionalresources/a/Native-Apps-Vs-Web-Apps-Which-Is-The-Better-Choice.htm>

Viswanathan, Priya. "The Pros And Cons Of Native Apps And Mobile Web Apps". *Lifewire*, 2019, <https://www.lifewire.com/pros-and-cons-of-native-apps-and-mobile-web-apps-2373173>.