## A.

Native applications refer to applications that are specifically written and developed for a specific mobile operating system. The three leading mobile operating systems are Google’s Android, Apple’s iOS, and Windows Phone. In order to create true, native applications, the Java programming language must be used for Android, the Objective C programming language for iOS, and the .NET framework for Windows Phone. Common, key characteristics of native applications are that these applications have unhindered access to device hardware and support all user interface and interactions available in the respective mobile operating environment.

## B.

Dedicated mobile web applications Dedicated mobile web applications refer to web applications that are designed and developed to mimic the native applications of the host operating system as much as possible, but they execute in a web browser on the host platform. Dedicated mobile web applications are developed with a combination of HTML5, JavaScript, and CSS.

1) HTML5, CSS, and JavaScript HTML5 is the latest standard and current candidate recommendation from the W3C (http://www.w3.org), which is the official, non-profit organization that develops and maintains web standards. HTML5 is candidate recommendation from the W3C and the official recommended web language to create web pages [9]. HTML5 is both the official recommendation from the W3C as well as a more informal term used to group the actual HTML5 standard together with the new JavaScript APIs, and CSS3[10]. Key goals of HTML5 are to create a standard with a feature set that can replace proprietary technologies and bring HTML5 into the world of application development [11]. Therefore, all of these technologies modernize the capabilities of these native web languages, so that they offer all the necessary functionality to deliver contemporary web applications to a variety of devices. A short summary of the new functionality and the different levels of approval are listed in Table II below.

*SUMMARY OF NEW FUNCTIONALITIES FOR HTML5 AND RELATED TECHNOLOGIES*

|  |  |  |  |
| --- | --- | --- | --- |
| W3C recommenda tion | Candidate recommend ation | Proposed Recommend ation | Working Draft |
| MathML | Web storage | GeoLocation | Microdata |
| SVG | Web messaging |  | XmlHTTP Request |
| Selectors | Canvas 2D |  | File API |
| Navigation Timing | Web sockets |  | Media Capture |
| Open Web Fonts | Native audio/video tags |  | Indexed Database |
| RDFa and HTML + RDFa | New HTML5 markup tags |  | Contacts API |
|  | Drag and drop |  | Device Orientation |
|  | Web workers |  | Animation Timing |

Dedicated mobile web apps, generic mobile web apps, and hybrid web apps all depend on HTML5 and related technologies along with mobile web browsers for rendering in order to deliver web-based applications on a mobile device. C. Generic mobile web applications (mobile websites) A generic mobile web application is another term for mobile versions of websites. There are a variety of ways to create and develop mobile versions technically, however the usual premise is that the desktop version of a website checks for mobile devices through the user-agent identifier from the web browser. Once a mobile device is detected, the user-agent is redirected either to a dedicated mobile website created for that specific device or to a website that utilizes responsive web design techniques in order to provide the same content to a variety of devices. 1) Responsive web design Responsive web design is the concept of using CSS (Cascading Style Sheets), which is a style sheet language for describing the presentation of web pages, and media queries in order to determine the resolution of the device being used and adjust the delivery and presentation of the website content accordingly [12]. What responsive web design basically implies is that the use of device specific apps or web applications becomes unnecessary because the content is simply manipulated according to the CSS3 directives provided in order to adapt the content for the screen size of each device. Furthermore, responsive web design even expands/shrinks the content to use available space when the web browser window is resized. 2) jQuery mobile jQuery Mobile is a JavaScript library or mobile framework that enables and supports touch events and design elements for a wide variety of tablets and smartphones in order to make them look and function like native apps. jQuery Mobile is developed and maintained by the jQuery project team and is compatible with all major mobile platforms and desktop browsers. It even offers a theming framework that allows web apps to customize aspects of the user interface and CSS in order to imitate the user interface of the host operating system. D. Hybrid apps A hybrid web app is an application that is neither truly a mobile web app nor a native app. It is basically an application written with the aforementioned web techniques of HTML5, JavaScript APIs, and CSS, but it runs inside a 3rd party native app container. The key characteristics of a hybrid app are that they are developed with standard web languages, but typically have access to the native device APIs and hardware. Some of the wellknown and used hybrid mobile frameworks are PhoneGap, Appcelerator, and Appspresso. E. Related research Huy and Thanh [13] developed four different applications; a native app, a HTML5 web app, a widget, and a generic mobile web app, and evaluated them on a variety of criteria to try and determine the optimal paradigm for development. Their conclusions were that native apps were fast and responsive but were complicated to develop and required much effort. Furthermore, jQuery Mobile in combination with HTML5 provided an attractive and adaptive user interface. Finally, Huy and Thanh [13] concluded that native apps and HTML5 mobile apps were still the leading mobile paradigms, though distinctions were made between the two. Hamou et al. [14] performed a study where iPhone web apps were used to collect patient data. Their results showed such web applications were viable replacements for equivalent functionality from websites and were successful in both consuming and creating content by collecting patient data. Additionally, Sin et al. [15] showed that the development of web apps was simple and could be performed by “non-programmers” and offered a user experience comparable to a native app. Juntunen et al. [16] studied drivers and constraints of HTML5 and found that web apps did not currently offer the usability and added value of native apps, but the gap between native and web apps was closing. Additionally, they stated that the lower costs and cross-platform traits of web apps might prove crucial in the future. Finally, Costello and Proshaska [17] pointed out that most of the criticisms regarding HTML5 and web apps stems from game developers not corporate app developers, and that the fate and possible success of HTML5 might depend more on digital rights management and platform specific lockdown than anything else

# 原生应用与Web应用

原生应用程序是指为特定移动操作系统专门编写和开发的应用程序。 三大主流的移动操作系统是Google和Android，苹果的iOS和Windows Phone。 为了创建真正的本机应用程序，Android必须使用Java开发，Objective C只能用于IOS的开发，.NET框架则用于Window Phone的开发。 原生应用程序的常见关键特性是这些应用程序可以不受阻碍地访问设备硬件，并支持相应移动操作环境中可用的所有用户界面和交互。

专用移动Web应用程序专用移动Web应用程序是指设计和开发的Web应用程序，以尽可能多地模仿主机操作系统的本机应用程序，但它们在主机平台上的Web浏览器中执行。专用移动Web应用程序是结合HTML5，JavaScript和CSS开发的。

1）HTML5，CSS和JavaScript HTML5是W3C（http://www.w3.org）的最新标准和当前候选推荐，W3C是开发和维护Web标准的官方非营利组织。 HTML5是来自W3C和官方推荐的网络语言的候选推荐，用于创建网页[9]。 HTML5既是W3C的官方推荐，也是一个更加非正式的术语，用于将实际的HTML5标准与新的JavaScript API和CSS3 [10]分组。 HTML5的主要目标是创建一个标准，其功能集可以取代专有技术，并将HTML5带入应用程序开发的世界[11]。因此，所有这些技术都使这些本地Web语言的功能现代化，以便它们提供所有必要的功能，以便将当代Web应用程序提供给各种设备。下表II列出了新功能和不同批准级别的简短摘要。

## 表格

专用的移动网络应用程序，通用移动网络应用程序和混合网络应用程序都依赖于HTML5和相关技术以及移动Web浏览器进行渲染，以便在移动设备上提供基于Web的应用程序。 C.通用移动Web应用程序（移动网站）通用移动Web应用程序是移动版网站的另一个术语。从技术上讲，有多种方法可以创建和开发移动版本，但通常的前提是网站的桌面版本通过Web浏览器中的用户代理标识符检查移动设备。一旦检测到移动设备，用户代理就被重定向到为该特定设备创建的专用移动网站或者利用响应式网页设计技术的网站，以便向各种设备提供相同的内容。 1）响应式网页设计响应式网页设计是使用CSS（层叠样式表）的概念，CSS是一种样式表语言，用于描述网页的呈现和媒体查询，以确定正在使用的设备的分辨率并进行调整相应地传递和呈现网站内容[12]。响应式网页设计基本上意味着，设备特定应用程序或Web应用程序的使用变得不必要，因为根据提供的CSS3指令简单地操作内容，以使内容适应每个设备的屏幕大小。此外，响应式Web设计甚至可以在调整Web浏览器窗口大小时扩展/缩小内容以使用可用空间。 2）jQuery mobile jQuery Mobile是一个JavaScript库或移动框架，支持和支持各种平板电脑和智能手机的触摸事件和设计元素，以使它们看起来像本机应用程序一样。 jQuery Mobile由jQuery项目团队开发和维护，并与所有主流移动平台和桌面浏览器兼容。它甚至提供了一个主题框架，允许Web应用程序自定义用户界面和CSS的各个方面，以模仿主机操作系统的用户界面。 D.混合应用程序混合Web应用程序既不是真正的移动Web应用程序，也不是本机应用程序。它基本上是用前面提到的HTML5，JavaScript API和CSS的Web技术编写的应用程序，但它在第三方本机应用程序容器中运行。混合应用程序的关键特性是它们是使用标准Web语言开发的，但通常可以访问本机设备API和硬件。一些众所周知和使用的混合移动框架是PhoneGap，Appcelerator和Appspresso。 E.相关研究Huy和Thanh [13]开发了四种不同的应用;本机应用程序，HTML5 Web应用程序，窗口小部件和通用移动Web应用程序，并根据各种标准对其进行评估，以尝试确定最佳的开发范例。他们的结论是原生应用程序快速且响应迅速，但开发起来很复杂，需要付出很多努力。此外，jQuery Mobile与HTML5结合提供了一个有吸引力的自适应用户界面。最后，Huy和Thanh [13]得出的结论是，原生应用程序和HTML5移动应用程序仍然是领先的移动范例，尽管两者之间存在差异。哈穆等人。 [14]进行了一项研究，其中iPhone网络应用程序用于收集患者数据。他们的结果表明，这些Web应用程序是网站等效功能的可行替代品，并且通过收集患者数据成功地消费和创建内容。此外，Sin等人。 [15]表明，网络应用程序的开发很简单，可以由“非程序员”执行，并提供与本机应用程序相媲美的用户体验。 Juntunen等人。 [16]研究了HTML5的驱动程序和约束，发现Web应用程序目前没有提供本机应用程序的可用性和附加值，但本机和Web应用程序之间的差距正在缩小。此外，他们表示，未来Web应用程序的低成本和跨平台特性可能至关重要。最后，Costello和Proshaska [17]指出，大多数关于HTML5和网络应用程序的批评都源于游戏开发者而非企业应用程序开发人员，HTML5的命运和可能的成功可能更多地取决于数字版权管理和平台特定的锁定。