The Battle of the Mobile OS: iOS vs Android vs Windows

Technical Report

Yadana Ko Ko - 13117247
James Cook University
Contents

Technical Report
  Introduction 3
  Background 4
  Research 9
  Market Analysis of Mobile OS 11
  Pros and Cons 12
  Conclusion 17
  References 18
Introduction

Twenty first century has been the world of smart gadgets and people can not resist from their daily best needs “smart phones”. Since every people has their distinct life styles and different choices, a lot of choices for their mobile devices has also be needed. Technology and Innovation are leading to produce much more products to meet the users’ requirements.

During the past few years, mobile devices have become very popular. The wide use of mobile devices in business and daily life by both the elderly and young people can be seen obviously.

Since the mobile devices and their respective operating systems have built up, the makers have made it conceivable likewise for regular clients to make their own particular applications utilising particular Software Development Kits. Therefore, it is presently regular that applications are made by outsider organisations as well as by everybody inspired by the matter.

The portable business has gone to a point where there are a couple of huge organisations in charge of building up the working frameworks utilised by most equipment producers. Of all the working frameworks, there are two which have developed their piece of the overall industry amid the previous couple of years: Apple's iOS, Google's Android and Microsoft Windows. The reason for this proposition was to think about the two, discovering that they are so natural to take into utilisation, and to create and distribute applications with.

The study was completed as an exact exploration. The examination was made on both working frameworks and the SDKs. Taking into account that information, applications were made and distributed for both frameworks. The essential framework of the study was introducing and work-ing with both SDKs, creating and distributed applications utilising the SDKs, and assessing the expenses of introducing improvement units in an instructive situation. The targets of this study were accomplished as arranged: both SDKs were effectively introduced, four applications were made out and out, an estimation of expenses was made and general experience of both frameworks was picked up.
Background

History of Android Operating System

Android is a mobile operating system presently created by Google, in view of the Linux part and outlined principally for touchscreen mobile gadgets, for example, tablets and smartphones. The user interface of Android is fundamentally taking into account direct control, utilising touch signals that freely relate to certifiable activities, for example, swiping, tapping and squeezing, to control on-screen objects, alongside a virtual console for content information. Notwithstanding touchscreen gadgets, Google has further created Android TV for TVs, Android Auto for autos, and Android Wear for wrist watches, each with a specific client interface. Variations of Android are additionally utilised on scratch pad, amusement supports, advanced cameras, and different gadgets.

Android’s source code is discharged by Google under open source licenses, albeit most Android gadgets at last ship with a mix of open source and exclusive programming, including restrictive programming required for getting to Google administrations. Android is famous with innovation organisations that require an instant, minimal effort and adaptable working framework for cutting edge gadgets. Its open nature has empowered a substantial group of engineers and lovers to utilise the open-source code as an establishment for group driven ventures, which include new components for cutting edge clients or convey Android to gadgets initially delivered with other working frameworks. (android.com, 2016)
History of iOS Operating System

iOS (once in the past known as iPhone OS) is a UNIX-based working framework worked for Apple's iPhone, iPod touch and iPad cell phones. It is utilised for dealing with the equipment of a gadget and for giving innovations required to actualise both local and web applications. Very few individuals realise that IOS is initially Cisco's centre working system which has been being used for right around 20 years. Cisco authorised the trademark "iOS" to Apple in March 2010. Cisco's innovation was excluded in the permit.

iOS was initially presented and discharged as the working arrangement of iPhone when on 29th of June 2007. 270,000 iPhones were sold in initial two days and more than a million units in month and a half.

At first there was no local SDK accessible. Apple guaranteed that there is no requirement for one, and that lone JavaScript, CSS and HTML ought to be utilised for building applications for the gadget. This implied Apple was just supporting web application development and did not see the need to bolster local application improvement. Despite the fact that Apple had bolted the iPhone from the designers, just a couple of months after the discharge, the open source group had obtained entrance, figured out the SDK and constructed an instrument permitting the improvement of local applications for the gadget. This prompted fame of "prison breaking" the gadget so it was conceivable to run outsider applications on it. At long last, in March 2008 Apple changed its psyche and discharged the iOS SDK for people in general.

History of Windows Operating System
Windows Mobile is a group of versatile working frameworks created by Microsoft for cell phones and Pocket PCs. Its sources dated back to Windows CE in 1996, however Windows Mobile itself initially showed up in 2000 as PocketPC 2000. It was renamed "Windows Mobile" in 2003, and soon thereafter it came in a few renditions (like the desktop forms of Windows) and was gone for business and undertaking customers. By 2007, it was the most mainstream cell phone programming in the U.S., yet this fame blurred in the next years. In February 2010, confronting rivalry from adversary OSs including iOS and Android, Microsoft reported Windows Phone to supersede Windows Mobile. Accordingly, Windows Mobile has been censured. Windows Phone is contradictory with Windows Mobile gadgets and software. The last form of Windows Mobile, discharged after the declaration of Windows Phone, was 6.5.5. After this, Microsoft stopped advancement on Windows Mobile, with a specific end goal to focus on Windows Phone. Windows 10 Mobile is the successor to Windows Phone 8.1 and was discharged on November twentieth of 2015. Windows 10 Mobile was intended for use on cell phones and phablets, having entered open beta testing in February of 2015. Windows 10 Mobile components Universal Windows applications, a superior notice framework, an enhanced camera experience, support for Continuum, another cycle of Office Mobile, and substantially more. The principal set of Windows 10 Mobile fuelled Lumia cell phones were the Lumia 950 and Lumia 950 XL. (Winbetaorg, 2016)

Figure 3: Windows Mobile (Source: WinBeta)
Android Versions

Within five years from the initial release of first device running Android which has now become one of the most trending mobile operating system, a lot of versions have been released.

*Figure 4: Android Versions (Source: Google.com)*
iOS Versions

Figure 5: iOS Versions (Source: bitsnapper.com)

Windows Mobile Versions

Figure 6: windows mobile Versions (Source: mspoweruser)

A brief outline of the differences between the major Operating Systems

Android: Accessible on an extensive variety of gadget sizes, weights and from an expansive exhibit of producers. Android offers adaptability, personalisation and a super smooth tie in with Google's administrations like Gmail or Google Plus. Maybe best of all, Android offers Widgets – which we let you
know about beneath. In case you're the individual who sets up the family TV when it arrives, Android may be best for user.

Apple’s iOS: Basic, solid and predictable over Apple's scope of items including iPads, Apple's iOS is well known to just about everybody. You'll discover good extras all over you go, in the event that you pick it. In case you're new to "keen" cell telephones or as of now have some Apple items in your house, Apple's iOS just could be ideal for user.

Windows Phone 10: Underrated, straightforward, steady, both personalisable and creative, Windows Phone 8 is just let around the quantity of applications which are accessible for it. In the event that you adore Nokia telephones, have a family or run your own corporate IT group, Windows Phone 8 could be the optimal OS.

Research

What factors make them different?

1. Apps

With regards to smart phone fulfilment, eventually it's about the applications. Each of the three noteworthy portable working frameworks can cover your fundamental efficiency needs, however there are huge contrasts with regards to the number and assortment of applications accessible. (Businessnewsdailycom, 2016)

Android: as far as sheer extension, the Android application store – named the Google Play store – rivals the iOS App Store, with more than 1 million applications accessible. That incorporates everything a business client requirements for taking notes, adjusting a financial plan or survey and altering records. There are some little disparities; applications now and then introduction on iOS to begin with, and iOS holds some prominent exclusives. Generally, be that as it may, the general quality and accessibility of applications on Android and iOS is about equivalent. (Businessnewsdailycom, 2016)
iOS: It's difficult to top Apple's App Store with regards to application backing and accessibility. It can coordinate practically every offering and Android and Windows Phone, and some prominent business programming, for example, the Kashoo bookkeeping application, are selective to iOS.

Windows Phone: The Windows Phone Store is maybe best known for having a much littler choice of applications than contending stages – around 100,000, contrasted with determinations of more than 1 million on Android and iOS. That doesn't mean there isn't a Windows telephone application to cover all the requirements of business clients. In case you're searching for a decent date-book application, or a famous efficiency application, for example, Evernote, you're prone to discover it. The Windows Phone Store is additionally developing quick. In any case, until further notice, in case you're faithful to a specific versatile application or administration, ensure it's accessible on Windows Phone before focusing on the stage. (Businessnewsdailycom, 2016)

2. Features

Android: Android offers Google Now, a wise individual partner that can help business clients remain focused and never miss an assemble or conference. The administration works by observing your action inside the Google biological community and pushing applicable notices to you as they're identified. By and by, the administration can advise you of activity deferrals, climate, up and coming arrangements and a great deal more.

iOS: The iWork for iOS applications are completely coordinated with Apple's desktop iWork applications, giving clients a chance to see and alter records flawlessly on numerous gadgets. The most recent emphasis of iOS likewise includes elements, for example, AirDrop, which gives clients a chance to impart documents to a solitary tap, and in addition a patched up email application with the capacity to add auto-sorting letter drops and view PDF explanations.

Windows Phone: Windows Phone is the main portable stage with Live Tiles, which upgrade progressively to show applicable data right on your home screen, guaranteeing you never miss a message or meeting. The
stage's greatest draw for business clients, in any case, is its full mix with Microsoft Office. (Businessnewsdaily.com, 2016)

3. Security

Security is a top sympathy toward business clients who handle delicate data, for example, private customer information, on their cell phone.

Android: It's anything but difficult to side-stack an unapproved application on an Android telephone by downloading and introducing the application from a source other than the Google Play store. Google is likewise more casual about which applications it permits to show up in its application store, and the divided Android scene makes it trickier to fix vulnerabilities. By and large, notwithstanding, your records ought to be secure in the event that you stick to applications from trusted sources as it were.

iOS: Apple's iOS is a profoundly secure portable working framework. It's for all intents and purposes difficult to introduce applications from informal sources - in any event without a coordinated effort- and all applications are inspected and endorsed before they get to be accessible to download in the App store.

Windows Phone: On the security front, the Windows Phone stage is equivalent to iOS. All applications are looked into and affirmed by Microsoft, and dissimilar to on Android there's no compelling reason to consider committed against infection and hostile to malware programming. (Businessnewsdaily.com, 2016)

Market Analysis of Mobile OS

Android commanded the cell phone market with an offer of 82.8%. Samsung, the #1 supporter. This comes amidst a disappointing execution by its leader discharges, Galaxy S6 and S6 Edge. Be that as it may, the Android offer has seen an ascent contrasted with 2015Q1, with solid development in unit shipments by different players, for example, Huawei, Xiaomi and ZTE. (Idccom, 2016)

iOS saw its piece of the overall industry for 2015Q2 decay by 22.3% with 47.5 million shipments. In spite of the regular decay, Apple delighted in achievement on account of customers' voracious ravenousness for the bigger screened iOS gadgets. The fame of the iPhone 6 Plus proceeded in numerous key markets including China, where the general cell phone market saw a recovery in development by 6.7%. (Idccom, 2016)
Windows Phone encountered a decay of 4.2% with a sum of 8.8 million units transported this quarter. Since its obtaining of Nokia in 2014, Microsoft has been patching up the item portfolio with Microsoft marked Lumia gadgets. In any case, now that Microsoft has chosen to assume a misfortune on its Nokia buy, the situation for Windows Phone looks bleaker. Acer is another section into the main five in this fragment. Most different merchants got destroyed in shipments, except for Samsung, which demonstrated a 8.5% expansion with its ATIV scope of telephones. (Idccom, 2016)

![Worldwide Smartphone OS Market Share](Source: idc.com)

<table>
<thead>
<tr>
<th>Period</th>
<th>Android</th>
<th>iOS</th>
<th>Windows Phone</th>
<th>Blackberry OS</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015Q2</td>
<td>82.8%</td>
<td>13.9%</td>
<td>2.6%</td>
<td>0.3%</td>
<td>0.4%</td>
</tr>
<tr>
<td>2014Q2</td>
<td>84.8%</td>
<td>11.8%</td>
<td>2.5%</td>
<td>0.5%</td>
<td>0.7%</td>
</tr>
<tr>
<td>2013Q2</td>
<td>79.8%</td>
<td>12.9%</td>
<td>3.4%</td>
<td>2.8%</td>
<td>1.2%</td>
</tr>
<tr>
<td>2012Q2</td>
<td>69.9%</td>
<td>16.8%</td>
<td>3.1%</td>
<td>4.9%</td>
<td>6.1%</td>
</tr>
</tbody>
</table>

**Figure 7: worldwide smartphone os market share (Source : idc.com)**

**Pros and Cons**

1. **Pros and Cons of Android**

Android is an open source framework, it has been produced to resemble that from the earliest starting point. This makes it usable with fundamentally every cell phone conceivable, unless the utilisation of different
frameworks has been forestalled in the particular gadget. The way that Android is an open source framework implies that designers and producers can build up the system onwards to suit their own particular needs. Truth be told, numerous makers port the base plat-type of Android into their client interfaces, a case of this is the Sense GUI made by HTC.

Android is still a developing framework in prevalence and productivity and it is being created continually. At the point when Android was initially discharged, just the most committed cell phone lovers thought about it. Presently, amid the previous couple of years, Android has picked up a greater offer of the business sector furthermore the ordinary cell phone clients have found the framework. This is mostly in light of the fact that more makers have begun utilising Android as a part of their gadgets. As more individuals begin utilising Android, the framework is produced onwards all the more effectively as per client encounters and at any rate as we would like to think, a genuinely open source framework picks up a greater offer of the business sector.

Then again, the way that more makers convey increasingly Android gadgets to the business sector can bring about issues for application designers. In any event the most requesting applications, for example, 3D amusements, can be difficult to get the opportunity to work in the least expensive gadgets: equipment issues will without a doubt emerge. The moderately thick rate of redesigning Android can likewise be viewed as a negative variable from the same reason. Despite the fact that Android applications are said to be advances good in various stages, problems can emerge particularly if an application is produced to be more stage focused and if new components are incorporated with the new stages.

Regardless, the determination of uses, free or not, accessible in the Android Market is stunning. It is conceivable to discover just about anything from the Market. The negative side of this is obviously the absence of value control; anybody can distribute their applications. The obligation falls for the most part in the hands of the last client, what is downloaded and what is definitely not.

With respect to Android SDK and creating programs for Android, we were additionally entirely satisfied. The programming dialect utilised as a part of creating applications for Android is Java. Java is an extremely mainstream programming dialect, instructional exercises and directions can without much of a stretch be found from writing and Internet articles. The nuts and bolts of Java are likewise moderately tri-vial to take in, the dialect is entirely intelligent.

The Android SDK has a devoted group looking after it. The Android Developers site has everything reported from introducing the SDK to creating fundamental applications. Additionally a hefty portion of the distinctive components of the programming dialect and Android instruments are unmistakably clarified and
the utilisation of them archived. It is conceivable to get extremely acquainted with creating applications for Android just by going to the Android Developers site.

Dissimilar to iOS designers, the engineers distributed their applications for Android Mar-ket have very great control over their items even in the wake of discharging. This requires us-ing Android Market Licensing, a component permitting the distributor to permit or prohibit the further utilisation of the item.

Another element plainly varying from programming for iOS is the expense of creating applications. Not at all like iOS, it is fundamentally free of expense to create applications for Android, the main cost results from the minor engineer's charge charged when first enlisting into the Android Market. Not at all like applications for iOS, the applications created for A droid can be circulated from anyplace. It is conceivable to download the apk record from the Internet, for instance an individual server offer, so it doesn't need to be discharged into the Android Market to be downloaded.

### 2. Pros and Cons of iOS

Apple is very known for their approach over their items. Regularly just Apple items are good with other Apple items. This sounds entirely confining, however it additionally rearranges numerous things. Since iOS and iOS SDK can just keep running on Apple's devices, it cuts down imperative regular issues like framework and programming prerequisites. The iOS SDK is additionally simple to introduce in light of the fact that everything that is required for application advancement is incorporated with the same establishment bundle, and there is no requirement for outsider applications, additional items or modules.

Lamentably, at times it feels like Apple uses their devoted client base for their own particular leeway and it may appear to be out of line for others. They totally own and control the unparalleled dispersion channel for applications, the App Store. Engineers may and do make applications, however Apple has the privilege to say what gets discharged and what doesn't. They don't have to reason their choices in the event that they keep something from being discharged and engineers simply need to acknowledge these choices. Regardless of the fact that an application gets discharged, Apple still fundamentally claims the product and can do whatever they need with it.

All the guidelines likewise make the application organisation fairly befuddling. Advancement endorsements, dissemination declarations, testaments checking different authentications, and contras tent provisioning profiles are only a major wreckage at first. It requires some investment to comprehend what the motivation behind each computerised resource is.
To try and out all the tenets, at any rate Apple offers an exceptionally intensive documentation on their engineer site. There are a considerable measure of articles about such broad matters as item situated programming, additionally extremely itemised data like Objective-C sentence structure guides, example code and data about the iOS engineering. It appears like the entire lifecycle of an application, from starting application improvement to discharging it on the App Store, has been great recorded and guided. Yet, with a thorough documentation, it is not exceptionally uncommon to discover copy data inside the documentation, and that occasionally confounds things.

Like for Android's situation, iOS applications are forward perfect. On the off chance that they are produced for a more seasoned iOS rendition they ought to keep running on more current adaptations, as well. Obviously it is unrealistic to utilise API's that the more seasoned adaptations don't bolster, yet in view of that impediment it is conceivable to create programming which is perfect with every single existing rendition. Reliable engineering and client interface between forms is additionally something the developers ought to profit by.

Contrasted with Android, creating iOS applications is entirely costly with its $99/year sticker price. Obviously anybody can turn into an Apple engineer and not join a designer program, but rather that exclusive permits the entrance to the genuine SDK application and the engineer focus assets. An Apple engineer can't test applications on a genuine gadget nor convey applications in any capacity.

The way that it is unrealistic to create applications without a Mac PC is obviously exceptionally limiting for non-Mac clients. Those utilising a PC need to purchase a Mac in the event that they need their part of the Apple buildup, and it requires more than only interests in hard-product. The client interface, summons and even console alternate ways vary from the PC-, and Windows-world, and becoming acquainted with Mac OS X takes as much time as necessary.

AI taking all things together, iOS appears like a strong stage that will be available for quite a while, and is liable to draw in a considerable measure of designers. iOS has a not too bad piece of the pie and an extending number of clients. This despite the fact that so far there are just a modest bunch of gadgets on which the working framework runs: the iPhone, iPad and iPod touch families. In the event that Apple continues to improve like they have amid the most recent years, their client base is liable to grow and that would convey more clients to outsider designers. By experience, another positive pattern among the Apple clients is by all accounts that they appear to be entirely faithful to the brand.
3. **Pros and Cons of Windows Mobile OS**

Simple. Windows Phone 8 is clear, straightforward, smooth, looks present day and is comprehensively considered. The interface feels organised and develop.

Strength. Like Apple's iOS, I've never had a dropped call or a smashed application.

Personalizable. The landing page can be designed with Tiles. Some place between an application and a Widget, tiles uncover some data from ‘in the background – whether that is pictures from your gadget appeared in a tile on the landing page or your most recent Facebook post. You can change the shade of each screen segment in settings.

Inventive programming highlights. Windows Phone 8 has a couple of new components which neither Android versus iOS have figured out how to imbed. A children zone can be designed in the settings of Windows Phone 8. Swipe left from the landing page ( once set up ) and you'll see a zone where kids can play securely. Put whatever applications you need to in there, from attracting to furious winged creatures. There's a common "Family" office where guardians and their youngsters would all be able to have entry to notes ( for shopping records, for instance ), pictures they've all taken and a logbook. Android and iOS have been in business sector for quite a while. Windows Phone 8 designers have concocted really valuable capacities. It's shockingly and if these sound helpful to you, why not investigate a Windows Phone 8 item.

Applications. There is not about the scope of applications accessible for Windows Phone 8. Of the dozen or so applications that introduce as default on iOS or Android items I'm trying, not as much as half were accessible in the Windows 8 store. After some time, this is prone to show signs of improvement. One of the center components of the Windows 8 stage is that applications can be created for the desktop and after that effortlessly exchanged to the portable stage. There are 75,000 applications a year being produced for Windows Phone 8 along these lines, after a short time, the most well-known applications will be managed. Vitally, every Windows Phone 8 gadget accompanies Microsoft Office.
Conclusion

At last, Android, iOS and Windows Phone have a great deal in like manner, and each gives a strong stage to business clients to run the applications they require. Yet, each likewise has unique, efficiency boosting highlights. Windows Phone brags an easy to understand interface and helpful elements, for example, Live Tiles. Android is the most adaptable, making it a solid match for force clients. In the mean time, iOS offers a straightforward yet effective interface that is went down by the best general choice of applications.

![Figure 8: The prediction of future mobile os market (Source: statista.com)](image_url)

In my opinion, Android will remain as the dominant of the mobile os market. Apple will be relatively constant in the market. Apple has its own status of innovation and uniqueness but it is the only producer of iOS. Windows OS will decrease its market share in the future. There are a lot of mobile device producers using Android as their smartphone platforms. Therefore, **Android OS will still win in the battle.**
References


