CA170 Introduction to Operating Systems: Group Report

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Who is going to win the mobile OS war?

Over the last few decades our society has experienced a significant step forward in history with the invention of technology, specifically with the appearance of the computer. The difficulty that comprehended writing programs and correcting them to be able to make the machine work has made the programmers think of an easier and more efficient way of using computers, therefore the first operating system was created. The purpose of the operating systems is to control the execution of application programs, it acts as an interface between the user and the hardware and it provides the user with a comfortable and efficient environment to run their programs. However, we do not only use the operating systems in our desktops and laptops, we also use them on our smartphones and smart televisions.

In the last forty years many companies e.g. Windows, Apple, Google, have come up with different styles of operating systems depending on what the users prefer. Nowadays, there are two companies that would be considered the most famous and important ones, not only because of the number of operating system users that they have, but also because of the effectiveness of their software applications, which are Android and IOS. The competitiveness between these two operating systems creators has been increasing due to the similar number of users that both companies have. However only one can win what it is called the ‘Operating Systems Battle’.

Android has already some advantages over IOS and it became attractive for several characteristics including a completely free platform based on Linux which allows developers to easily modify new or existing applications with the Java programming language. This operating system is also compatible with numerous hardware brands such as Huawei, Samsung or LG. One thing that both Android and IOS have in common is the allowance of the update of the operating system online, only if the device meets the requirements to proceed with it. However, there is much more to take into consideration when evaluating the efficiency of such big and important operating systems. Some of the characteristics that we are going to evaluate are the hardware, the GUI or Graphical User Interfaces and the security and trust that the software provides to the users.

One of the most important factors that could affect who wins the mobile OS war is hardware – the parts that make up the phone. Without the hardware, phones would not be able to work. The hardware found in phones today differ a lot depending on the device and which company made it. In recent years, there has been a hardware race, where companies have been trying to develop the hardware in their phones to keep up with the current trends – “bezel-less” displays, fast charging, NFC, etc.

In most cases, phone manufacturers try to differentiate themselves from the rest of the crowd through the design of their devices. They tailor them for a certain price range to appeal to more customers. With Android, it is much easier for companies to produce a low-cost phone. Android OS is a platform made by google, which is licensed to companies looking to manufacture an Android phone. For this reason, countless Chinese companies have come into the market, offering reliable phones for a fraction of the cost.

These phones are made of cheap materials, have older and less powerful hardware – this helps to cut down on the costs. And this is working. These Chinese manufacturers have come from nowhere and are now challenging the top smartphone brands like Samsung, HTC and LG. They are dominating in their own market and are starting to take over in other countries, especially ones in the 3rd World. If you were to look at the top 10 global phone makers, 6 of them are Chinese manufacturers - Lenovo, Xiaomi, ZTE, TCL/Alcatel, Huawei and Coolpad (Marketing 91, 2018). The high-end phone market is still present and going strong. Companies like Samsung are still offering their “flagship” phones. These phones come packed with all the latest technology and often push the boundaries in phone design, and as a result are quite expensive.

Apple are in a different situation compared to Android. Apple is vertically integrated. This means that they control the major critical parts of the chain used to make and sell products. They build the hardware, own the core software experience, and sell the products through their own retail stores (Tech, 2011). Very few components are outsourced to competing manufacturers. This means that they have a lot more control. Their mobile OS – iOS, isn’t licensed out. With iOS only being on a handful of products, it is a lot easier to make it work with the hardware used. If it were to be licensed out, it would need to support different screen sizes and resolutions, different cameras, different internal architecture, etc. (Bajarin, 2011).

This would also make for a worse consumer experience, as Apple wouldn’t have as much of a say. Apple are not trying to sell hardware, they are trying to sell an experience (Banks, 2015). They release high-end products that come with a fully connected ecosystem, where all current Apple devices can talk to each other. However, due to Apples choice to keep to their “clean and minimal design”, but also try to keep their devices up to date with the latest hardware, they must increase the price to make a profit. This is not favourable for the consumer.

Overall, both Apple and iOS have their merits. But upon further research, it can be said that they are both suited to different markets. Android is an open platform, where devices can be designed with cheapness in mind, whereas Apple keep theirs locked down and offer high-end only. When determining the best mobile Operating System, one must take into consideration all aspects of each Operating System’s Graphical User Interfaces and determine which lies at the forefront of the market and thereby is superior to the rest. Using statistical analysis of usage among the various operating systems (Statista, 2017) it is quite clear that the market leader is Android OS with iOS at a steady position of the second most used. Prior to the 4th fiscal quarter of 2013 there were a few competitors in the race for top mobile OS including the Windows Phone OS, iOS, and RIM. However, after the 4th quarter of 2015 the market was essentially entirely consumed by iOS and Android. As for the present day there are really only 2 operating systems being used and all of 0.2% of people use other mobile operating systems.

Similar to the Linux operating system for personal computers, Android is customizable by the developer and not every version is the exact same. All phones running a version of Android OS have minute differences in design and functions while being overall the same OS. This small difference in design for each phone’s interface is a major drawing point for consumers

and is the most basic reason many people like the Android OS better than the iPhone OS. An everyday consumer is not paying a load of attention to the details of the hardware or the functionality of the operating system on the phone itself. No, the average consumer is merely looking for what they think looks and feels the best to use. While some people enjoy the monotony of iPhones and their restrictive operating system, the truth of the matter is that the more diversity there is in a product, the more customers it will attract and reach. People do not want to be restricted to simplicity whether it makes a difference in their usage or not. iPhone OS while simplistic, secure, and easy to use for the majority of people is too restrictive and leaves its users unable to customize their phones to their own expectations.

Android and iOS share many features in their GUI aspects. Both have home screens with icons for applications that can be moved around by the user, both have lock screen and there are many other similarities between the two operating systems. However, the two systems also have many of differences that make Android devices easier to use for a good amount of people. One of the seemingly most simple things is multitasking. While Android devices have enabled users to have multiple applications open at a single time since 2016, iOS refuses to implement the ability to have multiple applications open at the same time making Android far superior in the realm of productivity of the end user. Android's GUI also provides the user with the ability to place widgets around their screen giving them quick access to real-time data like weather or stock market changes. Along with all of these the variation of Android phone producers provides multiple app store availability. Each phone will have its own version of Google Play in which some apps that aren't available on other versions are obtainable. Each device can have any version of Google Play installed on it meaning a person using Android has a much wider variety of apps to choose from. The Google Play store also has much more moderate vetting process for new applications to be added to the store. This is a positive for both consumers and app developers. The consumer will usually have access to a wider variety of applications and the developer has to go through less work to ensure their app is available to be downloaded by the public.

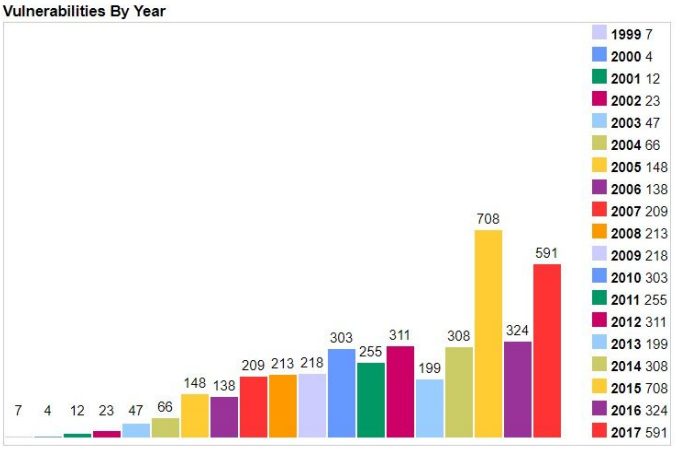
A major reason for many people buying Android phones over the second highest competitor (iOS) is price. Apple phones are priced much higher than the majority of Android devices and phones and as can be seen in the graph apple tends to have a repetitive fluctuation of usage. They drastically increase in the 4th quarter when a new iPhone is released then steadily decline over the rest of the year. However, since 2014 apple has not managed to consume more than 20% of the market while Android has been consistently above 75%. This data shows that Apple fans while loyal are vastly outnumbered by Android users.

Because they are the most popular mobile operating system, with over 2 billion monthly active users (Popper, 2017), Android devices are inevitably a common target for malware. According to Google, Android "incorporates industry-leading security features" and it was designed with "multi-layered security" as the design is open platform (2018). It is arguable that this open source policy is what renders Android vulnerable to attacks, as vulnerabilities of code are only revealed once it has been tested on the market. However, Android is notorious for being susceptible to malware attacks. For example, in late 2017, there were instances where Android devices were targeted by attackers that amalgamated malware, credential phishing, and credit card theft into a single attack. The hackers used phishing and

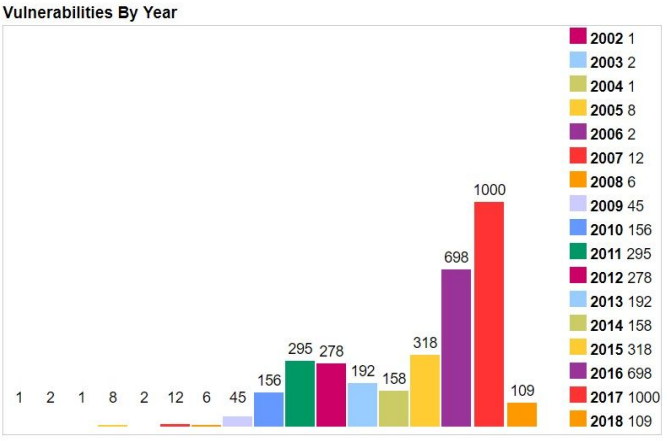
banking malware called Marcher to gain up to 20,000 people's banking information (Proofpoint, 2017).

This displays one of the major issue with Android security; the user is responsible for the security of their data. A further issue is that security features may be toggled on and off by the user, such as storage encryption. It is very easy for users to download third-party apps which are not regulated. Google have recently started a campaign where security experts will be rewarded $1,000 for discovering bugs in Android apps. Android does not support restrictions in terms of ad tracking but does allow a VPN to be continuously active. Android devices may also block internet access to apps using an independently installed VPN app.

Apple's iOS is Android's prime contester as it is the second most popular mobile OS, with 700 million active users (Reisinger, 2017). iOS certainly is more secure than Android, mostly due to the high volume of cyber-attacks that are aimed at Android devices rather than iOS. One of the areas that iOS triumphs Android is the adoption rates of updates. Many security issues are resolved through OS updates, which often are slowly distributed by Android. iOS, however, has a much higher update adoption rate at 52% for iOS 11 which is a lower rate than previous versions (Gartenberg, 2017). Android's most recent update, Oreo, is only active on 0.7% of users. iOS has also been quicker to provide security features such as the option for users to block app permissions. This feature was later added to Android Marshmallow, but this was months after it was available on iOS. According to the statistics on CVEdetails.com (2018), in 2017 Android software had almost double the amount of vulnerabilities as iOS.



iOS (CVEdetails.com, 2018)



Android (CVEdetails.com, 2018)

As Android and iOS heavily dominate the iOS market, it is difficult to say how much or less secure other mobile OSs are. An OS with a small market is less attractive to hackers and thus devices using the OS are less likely to be attacked. One of the other competitors on the market is Microsoft's Windows mobile OS. Windows boasts may of the same security features as Android and iOS such as device encryption and features that block apps if the user chooses. Windows using devices are debatably more secure, as they have a lower probability of being attacked. Similar may be said about BlackBerry OS.

Other aspects that are to be considered are hardware factors such as fingerprint scanners as biometric identifiers cannot be altered. Therefore, once stolen, they may compromise any OS.

The issue with mobile security is that the user is ultimately responsible for the security of their own device. Any mobile device that connects to other devices or networks will never be fully protected. Any OS can be hacked, by an individual with adequate knowledge. It is the user's duty to install anti-virus software to protect their devices and to have enough basic intuition to protect themselves from attacks. It seems that the most used OS will always be the weakest in terms of security, as the larger market will always be the most popular with attackers. Security is simply not an area that may be "won" by any OS without compromise in another area.

In conclusion, in order to determine which mobile OS is going to be victorious in the OS war, a number of important factors have to be taken into account. In general, it can be assumed that Android and iOS are the only real contenders in this "war" that have a realistic chance of winning. In regards to hardware, despite the obvious fact that iPhones have a much more consistently sleek and pleasant design and despite the high-quality materials used in the phones, this does not guarantee that Apple's flagship devices will come out on top. There are a few minor reasons for this, for example it can be said with only one front facing button the android phones have more functionality with their three, however the main reason comes down to cost. Apple's products are in the minority of users compared to android because only a minority of people can afford the high prices they are sold at. Furthermore, it is entirely possible that even if a person could afford an iPhone, they still might decide to buy an Android instead, because of the fact that even Android phones with similar specifications are often much cheaper in cost. However, there is also another important reason why people choose Android over iOS which has very little to do with the hardware and it is the functionality of the software, and the GUI.

As previously mentioned, this is a huge selling point of any phone, and the reason that Android is currently winning the OS war. While iPhones admittedly do have an easy-to-use and accessible GUI, this ends up being a detriment to themselves, because while their GUI is very simple to navigate, it is also quite restrictive and does not allow for very much customization. On the Android OS, users can customize their home screens by rearranging apps, using widget tools and even changing the look of the app icons by changing their phone theme. On iOS, however, users have some control over the positioning of their apps, but ultimately relinquish most of their control over the phone's aesthetics to Apple. This is also true for ringtones and text notification sounds, as users are unable to use custom sounds and are restricted to using the built-in sounds Apple provides. This simple feature Android offers that iOS doesn't reflects a much more important feature that Android has that makes a large amount of people support Android and not Apple, freedom of access and control over the phone's files.

This particular feature is a huge selling point for many potential consumers as it allows Android users to browse files, download files directly from their browser and even download apps from places that aren't on the build in app store. While this feature is very sought after and loved by many Android users, however, it does have a downside which results in a large

amount of people preferring iOS, and that downside is the weakened security. Due to Android being open source, and the fact that it allows its users to download files directly from the internet, there is a much larger potential for viruses, trojans and other malicious software. This is the main advantage iOS has over Android, and is likely a major reason why Android has not yet completely won the OS war.

Overall, the OS War has been waging for over a decade now, and despite iOS being quite popular initially, Android quickly became the most used mobile OS globally, and they are currently winning the war. Despite the fact that iOS users are very loyal and consistently support Apple, they are simply in a minority. Apple phones may look nicer to some and are consistently well-designed phones, the price and lack of functionality compared to Android leaves it well behind in this race. However, due to the high profit margin of iOS devices, Apple doesn't need to be winning this war. As long as they can consistently have their loyal customers supporting their new mobile devices, they can easily survive as a company indefinitely. As a result of this, even though Android is without a doubt winning the OS war, if "winning" the war means becoming the only mobile OS commonly used, this is likely never going to happen. However, if winning simply means being the most popular OS, then it can be said that Android has already won.

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Contributions

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