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Seminar Paper

Proprietary vs. Open markets in IT: Apple, Microsoft, Google

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Abstract

Initially, the goal of this paper was to provide a bird’s eye view on open and proprietary markets in IT and investigate the role of Microsoft, Apple and Google within those. We focused primarily on the mobile operating system market and also looked at examples that occurred on the market for desktop operating systems. We investigated the histories of the companies and what strategic procedures they used in order to rise to the top of their segments as well as to elaborate on how they achieve to retain the market leadership. For doing this, a first definition of the relevant terms was necessary to preset the scope for this working paper, as some of the terms used in platform market economy are ambiguous and allow for different interpretation. Further, I focused on the two market forms that are relevant for the classification of strategies and pointed out the relevant differences. Supported by the knowledge I gained through my literature research, I was able to provide a structured way to analyze business tactics that were used by the three organizations and provide examples that show how they are realized.

We found that proprietary platforms in general are facing higher development costs and forego many of the advantages that open market forms would provide.

In the market for mobile and desktop operating systems, attempts are made to stand out from the competition through increased switching costs and to bind customers more closely to one's own company through a closed ecosystem. Furthermore, controversial business strategies by companies are used in proprietary markets as well as in open markets to maintain market leader positions. However, we cannot make a clear statement about which market form will achieve greater social welfare for society based on mathematical models.

Table of Contents

Table of Figures

List of Abbreviations

APK	Android Package Kit
CEO	Chief Executive Officer
IT	Information Technologies
OS	Operating System
OEM	Original Equipment Manufacturer
USP	Unique Selling Proposition

1. Introduction – IT Market Systems

The existence of market systems began at the time humankind started trading goods amongst each other. A typical market emerges when the laws of supply and demand trigger the production of goods and services, i.e. sellers and buyers meet at a certain place/platform to trade products that have been developed in order to create or satisfy the needs of the customers in exchange for a monetary medium (Market economy, 2020). Usually the producers of these goods and services pursue the goal of generating value added and would like to be rewarded for their effort and business risk in form of profits.

However, there are as well non-profit organizations, associations and task forces that work together in order to improve environmental factors without the intention of making money with it.

There is a huge variety of products that can be offered on markets and these are usually dependent on entry barriers, governmental regulations and national legislation. The biggest influence on goods and services over the last decades, however, was driven by technical progress. The steady technical improvements made it possible to have our goods engineered in ever advanced manufacturing processes. At the same time, the established technical possibilities generally lead to the creation of new markets as the technologies allowed the development of goods and services that seemed to serve humankind for a better and wealthier future. Subsequently, they again caused the desire for potential buyers to use a certain product or service. Consequently, this economic cycle has repeated over time and evolved in different forms of market appearance, depending on the goods traded and compulsory market regulations. For recent developments in our economy there were three waves of technological change that have been responsible for the way products on markets are now offered at individual marketplaces (Porter & Heppelmann, 2014).

The first wave consists of 3 factors that have built the foundation on the development of the modern economy. It all started with the conversion of analogue to digital signals. This process is called “Digitalization” and has been the precondition for any other technological change since then. The first implementations of personal computers

allowed it to speed up the process of digitalization as at this time computer had been affordable for the first time ever to a wider audience of people. People getting equipped with their own PC is also referred to as the phase of “Computerization”.

The ability of computers to process large amounts of digital data using packet-based switching heralded the second phase of technological change. This wave was characterized by the new services and innovations that had been initiated through the development of network infrastructures. Subsequently, the Internet, mobile communication and later the possibility to use next generation networks were decisive for new competition where several actors could be involved in service creation.

However, the last 20 years have not been embossed through major technological developments. The third wave of technological change focuses more on the ubiquitous data processing in combination with objects and activities of everyday life and the Internet of Things. Of course, the technological progress is hardly limited as the previous evolution had shown. Nevertheless, the last actions on the tech markets showed a tendency to refinement on existing technologies like for example the upgrade of 4G to 5G networks and the perfection of artificial intelligence.

Due to the technological progress, the daily life for humankind has taken a dramatic turn over the last 50 years. The people and our economic system are now dependent on computerized processes which are supposed to support us at certain tasks and furthermore are indispensable in times of globalization and interconnection of electronic devices. As a result, there is an urgent need for machines that enable customers to be a part of this new mobile and computerized system. Big improvements over this timespan had been the reason for the emergence of new markets and services that had led to the appearance of tough competition and strict regulations. There have been several big competitors in every market that shaped the landscape of today’s IT markets. Some of them positioned their enterprise in order to compete on multiple markets, others were oriented towards individual or even niche markets.

Three big companies that expedited technological changes and benefited from it were Microsoft Corporation (“Microsoft”), Apple INC. (“Apple”) and Google LLC (“Google”). The first two mostly successful through the distribution of hard- and software, the latter well known for implementing search engines and methods of online advertisements and auctions that base on complex algorithms. Not only are these enterprises top of

the lead in the information technologies market segment, they are also amongst the top 5 most valuable businesses of the entire world and thus are global players and have had major influences on the IT markets in the past and for sure will have in the future.

As operating systems build the foundation for software to interact with hardware components on personal computing devices, they are indispensable when talking about IT markets. Furthermore, it is the basis for software applications that people around the globe use to communicate, transfer data and do other kind of computer-based operations that have been made possible by the technological progress. In this paper, we will therefore look at IT market systems as well as the above-mentioned major companies which all operate or have been operating on mobile and desktop computing markets.

In the following pages we will investigate proprietary and open market systems as they are the two main market forms in the information technology industry and have a critical influence on a company's business model. By answering the following research questions we will get deeper knowledge of how these market systems work, why the individual organizations set certain actions and also get an overview on how the different market forms affect the involved parties at economic markets:

- In what ways do proprietary and open markets differ from each other and how can market segments of the three companies, Microsoft, Google and Apple be assigned to the two forms?

- Which strategies do platform providers use to maintain their market position?

- Does an open market automatically imply increased social welfare?

In order to be able to examine the market structures, it is necessary to define the most important terms for this topic at the beginning. It is also important to mention that the terms "organizations", "goods" "environment" allow for various interpretations. For this reason, in this seminar paper we focus on companies that operate in Information

Technology (IT) markets that are characterized by the exchange of software and additional services and businesses as well as application developers who offer their products at different marketplaces and respective platforms which share the characteristics of a market system.

2. Definition of Terms

2.1 Two-Sided Markets

When comparing the three tech giants Apple, Microsoft and Google there is one thing they all have in common. For their most important business fields they all operate on so-called two-sided markets.

But what exactly is a two-sided market? To clarify, a two-sided market (also two-sided network) is a special market form where a platform is provided by a certain company (sponsor) to bring together two user groups. Thus, the sponsor is responsible for providing the infrastructure to connect the two distinct user groups and ensure the interaction between those parties. A possible way to interpret this is by thinking of it as a marketplace withing a certain industry that comprises several characteristics that are specific for market systems.

A first determining factor for the presence of a two-sided market is the existence of network effects. A two-sided market exhibits cross-side network effects as well as same-side network effects. Cross-side network effects occur when the desire to compete at a certain platform is stated through the number of the other user group. Same-side network effects, on the other hand, are existent if the number of users in one user group depends on the number of already existing users within this group (two-sided market, 2020). Network effects are thus crucial for the establishment of a platform. As a result, there is an urgent need to emphasize on the user groups that are to be convened.

By looking at operating system platforms we see that these market systems depend on end-users as well as the developers in order to benefit from it. The more end users, the more potential customers could be reached by the developers of software

applications. On the other hand, potential users might get attracted to platforms that offer a wide range of well-functioning applications or even the other users within their group to assure a standardized exchange of data and other information. Microsoft, Google as well as Apple are selling their own operating systems for PCs. Apple and Google are competing directly in the field of smartphone operating systems. Needless to say, these businesses rely heavily on cross-side network effects that result in a growth in the user basis.

However, in order to generate these benefits for the distinct user groups the platform must exhibit economies of scale. Unfortunately, the production of digital goods demands high initial costs but at the time the product is finalized and ready to launch at a market, the marginal costs tend towards zero or are even zero. Production won't run into natural limits and high number of products could be sold at the initial introduction. This is a major advantage of digital goods compared to physical ones.

Usually, a two-sided market splits into a subsidy side that is more price sensitive as well as a money side that is ought to generate the biggest part of the profits for the platform's sponsor. A more detailed analysis on the exact market conditions will follow in a later section. For the further research we will split the market systems by the way the user groups are able to participate in markets and the extend of choice the end user group has when purchasing products from tech companies that offer the access to platforms offered by operating system providers. Hence, organizations such as Microsoft, Google and Apple are competing in platform-based markets that will be investigated in more detail. These platforms could also be interpreted as marketplaces within the operating system market although they do not always exhibit characteristics that are typical for a market by definition.

2.2 Open markets

The pristine economic system is based on the concept of a free market. By definition a free market is a condition in which there are no regulations, entry barriers and prices for goods and services arise through the laws of supply and demand (Free market, 2020). Legal frameworks that are implemented in order to prevent price agreements and other ways of cheating as well as to guarantee control over markets in term of

consumer rights, safety standards and how goods can be marked are factors which have an direct impact on the “openness” of a market. Accordingly, a market that shows no or little restrictions in this regard is to be regarded as open.

The advantages for potential buyers of products in open markets are primarily due to the fact that in general open markets are more attractive for large competition which results in lower prices. Furthermore, more competitors mean a wider range of choice for customer when it comes to buying a particular product. The suppliers can then be compared against each other so that the user of a product gets to choose the good that fits best his individual needs. Subsequently, manufacturer and vendors of products and services at open markets need to ensure, that they stay competitive throughout the duration they intend to offer their products at the marketplaces. One possible way to achieve this is by standing out from the crowd either by cost leadership or by possession of major technological advantages against the competition.

This process of ongoing competitive battle demands a huge amount of input resources and might take several years for a company to be profitable but of course it also brought some companies to financial ruin.

For this reason, in general companies prefer markets without competition. These kinds of markets are also referred to as monopolies. In contrast to open markets, businesses that incorporate monopolies are able to exercise pricing power. The ability to price a product above marginal costs without having to lose customers to the competitors is desirable for every company that thrives to be as financially successful as possible.

As we focus on businesses that primarily sell operating system software and related hardware products with access to certain marketplaces, we restrict the definition of an open market system to a two-sided platform with free entry and exit of third-party application developers which Andrei Hagiu (2006, p. 4) is generally referring to as developers. For this reason, when open markets are mentioned in the following pages, we refer to them as two-sided markets that are not under the possession of a single company but are open to any developer that pursues the idea of a boundless collaboration in the IT branch and since dispense on any method that would distort a fair competition. The involved groups, in general, benefit from equal starting conditions for everyone that provides similar goods and services. We specifically focus on the mobile operating system market as well as briefly provide insights in the desktop

operating markets. Basically, you could think of the “Android” mobile platform as an open market because this system is based on an open source operating system allowing to create applications for free and decide on the way of distributing them. However, there are a few more things that need to be considered for a proper analysis of the platform. Hence, we will cover these topics in depth later in this paper.

2.3 Proprietary markets

In monopoly market systems people do not have a free choice to choose among a selection of suppliers. If they would like to do business, they only have two options. Either they buy from the only supplier who offers products for this particular market or they don`t buy at all. Proprietary markets and monopolies are very similar.

When it comes to software, proprietary means that the owner of a distinct software product owns all relevant copyrights and the source code for his software (The Linux Information Project, 2005). Proprietary is derived from the Latin word ‘proprietas’, translates into the word property, and states the legal right of ownership. The same applies to markets in the IT industry. If we consider markets as two-sided markets or platforms, as we already did with open markets, then we can derive the definition from the term proprietary to the two-sided platform.

Coming to proprietary markets we are speaking of platforms that are owned by a certain platform provider and gets to decide about the legal framework that includes access to products, information about property rights, entry barriers, costs and other administrative topics. Consequently, we adopt the definition of propriety two-sided platforms as proprietary markets (Hagiu, 2006, p. 2). By defining agreements that in general favor the provider of a two-sided platform, a company induces high switching costs. Subsequently, proprietary platforms can prevent end users from leaving their companies, and at the same time charge a high premium for their products which comes close to monopoly standards. A customer’s switching costs are considered the costs that a new user is going to face if he decides to make a new investment and has to decide between two or multiple options offered by potential new vendors that provide similar products. These costs could be measured either monetary by the amount of money that has to be invested in for example equipment that is necessary in order to

be able to use a certain product, contractual costs that a customer has to pay if he wishes to withdraw from a contract at an early stage or for example in professional staff that is paid to train employees after switching to a new software (Farrell & Klemperer, 2006, p. 12-13). Switching costs may also comprise the time it takes to setup and duplicate data that is stored at one account and transfer it to another or learning new features that are introduced by a new software. The latter type of costs, however, are difficult to measure in actual numbers, but are therefore no less relevant. Especially in times when it is possible for us to generate information about suppliers and compare products quickly, regardless of location, it makes it difficult for companies to establish a suitable cost structure that enables a lucrative business. Switching costs may occur for big companies as well as for end user in proprietary markets. Another phenomenon that is related to switching costs is the process of customer lock-in. The higher, the switching costs for a customer to buy a product from a different supplier, the more likely he will stick with a company which will more likely trigger follow up purchases. Consequently, a company strives to keep them as high as possible by offering its customers as much functionality and services as possible through its product which increases the quality of it. If a company manages to retain customers due to high switching costs, we consider this the customer lock-in. In practice, however, it is often difficult to distinguish between impacts on the retention of customers that have been achieved by focusing on improving the quality of the actual product or by rising switching costs (Chen & Hitt, 2005, p. 7).

For the purpose of this paper, we will cover the method of customer lock-in because this is a common strategy that is used by platform providers like Microsoft, Apple and Google. The exact procedure of how the big tech companies successfully lock-in their customers by using proprietary operating systems will be covered at a later point by providing specific examples from the current market of operating systems.

Windows by Microsoft as well as “macOS” by Apple are proprietary platforms resp. markets that connect app developer and pc end users. Additionally, Apple offers a proprietary operating system for their mobile devices which is called “iOS” and is part of the Apple ecosystem. Their software portfolio also consists of operating systems that have been developed for powering their handsets. The identification and analysis of the various operating system platform will be an important part of this work and will therefore cover a separate section in this paper.

3. Major differences Proprietary vs. Open markets

One essential part of this project is to compare proprietary and open markets. What one must keep in mind is that proprietary markets are not the exact opposite of the open markets per definition. Thus, we had to predefine the terms for the purpose of analyzing the markets as they could be interpreted in various dimensions and the open market definition is more of a generalized approach to define the type of market.

A big difference between proprietary platforms and open platforms lies in the type of operating software that is necessary in order to build the foundation of a platform. An open platform would require free entry and exit of developer as well as end user. Hence, the OS must be based on open source as this type of source code secures that every competitor has the same initial starting position. For a collectively driven business approach on operating system platforms, a uniform source code that is available for editing by all parties of a market, including OEMs and developers, is indispensable to guarantee the openness of a platform.

The definition for open source software by the Open Source Initiative comprises criteria that must be fulfilled by a software in order to be called open source (Open Source Initiative, 2007). The most important criteria that at the same time is crucial for the distinction between open source and proprietary software is the free redistribution. This principle is essential for the development of an open platform and speeds up the development of a platform as a lot of people get involved in developing the source code. Usually, the joint work of people that are experts in programming shows various benefits.

First, many people that are experienced in software engineering spend their time voluntarily in order to develop the source code and ensure quick troubleshooting as issues arise. Second, as there are so many experts that are working on the same project, open source software is in general more secure than proprietary software as the program's code is inspected in-depth by developers all over the world. This method also saves a lot of developing costs. There are already many code templates for different types of application on the Internet. Moreover, open source is free of licensing fees or other restrictions on the software itself. In proprietary markets the platform's sponsor bears all costs that occur when developing an operating system from scratch.

On the other hand, there are several reasons why a proprietary platform still can be very profitable. This business model is therefore very attractive for tech companies but these factors will be covered in the following chapters which focus on the strategies of companies on the different markets.

Another major disparity between open and proprietary platforms is the ability of a company to perform diverse pricing strategies. Pricing on a two-sided market for operating systems is a complex topic and varies between the platform carriers. It depends on which business fields would are concerned, since the three companies Apple, Microsoft and Google have different income streams that are based on, to some extent, creative techniques. To cover and structure all the relevant aspects of how the big tech giants make their money exceed the complexity of this paper. For this reason we will only cover the most important information on terms of conditions for and limit the field of observation to the operating system (OS) market for mobile computing devices, since those three enterprises are currently operating or at least have already been operating on these markets.

However, to perform the various strategies the precondition is that the firm is a sponsor of a two-sided platform, their product (the OS) and service have a unique selling proposition and is valued by a relevant share of the overall market. If all these conditions are fulfilled the companies is most likely able to retain consumers and “lock” them in in their ecosystems. What this exactly means will be covered in the next chapter when we have a look at market strategies.

4. Market Strategies

The global economy is characterized by firms that operate in different markets. Since all platform provider desire to set up or maintain a vital business they need to ensure that they do not get replaced by their rivals. This is where market strategies come to play. Every company acts different and has their own course of action in order to stick out of the crowd.

Nevertheless, there are some behavioral patterns that have been decisive for the big success of companies like Google, Microsoft and Apple. These tactics can be observed

and analyzed so that one can better understand the predominant market mechanisms in the tech industry. It is therefore worthwhile to take a closer look at the strategy that has contributed to the fact that the companies mentioned above are currently the most important companies in this sector.

4.1 The Way to the Top - Strategies that led to Success

4.1.1 Microsoft

When you think of personal computing devices, most people immediately think of one company name. Obviously, with a current market share of around 77% (Statcounter, 2020), the American enterprise Microsoft dominates the global market of operating systems. Almost eight out of ten computing devices like desktop PCs or Laptops that run Windows 10 on top is a tremendous share and enabled them to implement their ecosystems in almost every household where there is a computer.

To achieve this market position Microsoft had gone a long way that started in 1975 as a partnership project called “Micro-soft” and led one year later to the registration as a trademark. The founders were Bill Gates and his former school friend Paul Allen. At the Beginning Microsoft developed programming languages for Microcomputers amongst others for companies like Apple. With the development of their graphical user interface operating system that was used by IBM to launch their personal computing devices, Microsoft was able to shape an emerging market in his early steps. As there has not been much competition on the OS market, apart from Apple, Microsoft was enjoying a phenomenon that is called the first mover advantage.

Through the distribution of software bundles to hardware manufacturer and also by making their products available independent of the hardware suppliers they started serving not only the B2B market but also were able to sell their products to end users which was the starting point for the Windows OS and the Office suite as we know it today (History of Microsoft, 2020).

By suppling products by Original Equipment Manufacturers (OEM) with Microsoft’s OS the company was able to distribute their proprietary ecosystem with ease around the

globe As the computerization accelerated Microsoft offered a product that was unique and rich in its features as well as affordable for the very first time for businesses and private households. Additionally, the American firm made use of network effects by providing application developer an environment that offers a wide range of opportunities and an already big user base. As a result, Microsoft business model continued to grow and scaled even more at the time the internet was invented. But at the same time Microsoft received harsh criticism for their business practices and strategies.

Critics complained about the fact that the company managed by Bill Gates and Paul Allen were distorting competition in order to preserve their monopoly like position in the market for desktop operating systems by setting up contracts with hardware manufacturers that would prevent any potential competitor from entering the market. The aim of this paper is not to judge the business decisions that were made by the individual companies. Thus, the question if all the practices that Microsoft used were correct from the legal point of view will not be covered.

However, it is remarkable that Microsoft managed to rise to the top of its industry by distributing their product in a way that it is used by almost every 8th person that owns a desktop computing device, amongst other things.

4.1.2 Apple

Initially, Apple was founded in 1976 by Steve Jobs, Steve Wozniak and Ron Wayne. Unlike Microsoft, Apple's strategy to win customers for their platform, and further platform-based market, is not based on the software product itself. Apple always focused on the distribution of products where they were able to retain control of their customers actions once they decided to buy products from the company. In fact, Apple is the perfect example for an enterprise where the products are standalone devices characterized by proprietary standards comprising, services as well as parts of the hardware.

This strategy was chosen for a reason since Apple is known for their intensive research capabilities that have led to major innovations on devices like desktop PCs, Laptops to mobile computing devices such as smartphones and tablets, resulting in a generic

strategy of broad differentiation (Meyer, 2019). Their products are developed in order to stand out in the market by primarily focusing on design, usability, seamless connectivity among other Apple devices as well as getting the best performance through the vernier adjustment of hard- and software. These unique selling propositions are of great value for the company hence they protect them by patents and proprietary alignment of their ecosystem.

As Apple centered high quality products that were famous for their unique design and refinement Steve Jobs managed to create a brand that his clientele perceived as a status symbol.

4.1.3 Google

The Google company differs from the previously presented companies in many ways. There are, however, two main disparities that are most relevant.

First, by comparison to Apple and Microsoft, Google is a relatively young company. It was initially founded by Larry Page and Sergey Brin in 1998. More than 20 years difference in the tech-industry makes a vast difference since technologies are the fuel for technological change and progress that was described in the first chapter of this paper. Furthermore, we could deviate that the former innovation in the tech industry has been the precondition and the cornerstone that enabled the opening of new markets and business models. Like many other companies, Google could not have been established without the invention of the internet.

Second, Google was not meant to be a company that distributes hard- or software in the first place. Originally, the project that later led to the enterprise Google was named “BackRub”. “BackRub” was created primarily as a search engine algorithm at the time Brin and Page were doing their PhDs at the University of Stanford back in 1996. It evolved as part of a research project that Page was working on in order to understand the mathematical properties of the internet. He worked on it together with the help of Scott Hassan, who wrote a major part of the algorithm’s code (History of Google, 2020).

The developed algorithm comprised the idea to gather the enormous information that is added within every moment on the web and further make it available for everyone instantaneously. Search engines had already existed at the time they worked on their

idea. But Sergey Brin and Larry Page were the first that accomplished to deliver search results that are of high quality and extremely relevant for the search query by accumulating the data and crawling it by using their own developed algorithm. Their system is based on the idea that the importance of a web page is measured by the number of links that lead to back to this certain webpage, similar to the procedure of citing references in academic fields where publications are considered valuable the more often it is referred to in other scientific publications. Based on this, a ranking is created that defines the order of the output results made of the data that was available on the world wide web. The duo successfully used this algorithm to develop their very own business model that has led to the soaring evolution of their company.

By connecting search results to a selection of appropriate advertisements in their search engine, Google was in possession of a technology that allowed firms to reach relevant target groups more precisely. The market of internet advertising arose at the time Google implemented their algorithm. Before that, companies primarily had to reach their potential customers through mass media marketing channels like the broadcast of television spots or newspaper advertisements. Therefore, Google was a very attractive for investors that were convinced of the success of the company.

Over the years, the company's strategy changed and resulted in a wide range of products that Google is now gaining revenues from. By now, the company's portfolio covers hard-, software, web-based products (search, development and advertising tools), applications (desktop and mobile) as well as other services that are provided over the internet (Google, 2020).

4.2 The current Market Situation

Microsoft, Apple and Google managed to evolve as global players in the economy throughout their years of existence. As a result, they have been amongst the top ten of most valuable companies for several years now and previously ranked 1-3 of the most valuable companies in the world in 2019. Being number one, Apple reached a brand revenue of 265,8 billion US Dollars followed by Google with 136,2 and Microsoft with 110,2 billion USD (Forbes, 2019). Of course, at the time of writing this paper the

year 2020 just started, but it is predictable that for this year the companies will remain in the Top 5.

Undoubtedly, this is a remarkable achievement but at the same time this companies have a major impact on other environmental factors due to the massive accumulation of monetary goods. The revenue itself is not that much of a profitability indicator. Nevertheless, companies with this amount of income streams are more likely to spend money on research and development to secure their market position as well as drive forward the technological innovations of tomorrow. A closer look at current challenges, examples for strategies and business practices within this segment reveals some important information about ongoing processes to help better understand operative and strategic business decisions.

4.2.1 Challenges at Two-Sided Markets

The tech-industry is characterized by rapid change. Thus, sponsors of platforms that want to secure ongoing success need to be adaptive to change and master certain kind of challenges that appear when providing two-sided markets. For this reason, enterprises like Google, Microsoft and Apple must focus their activities on the two sides of their platforms as they are crucial for their business model and decide whether a platform persist at a certain market or vanish amongst the strong competition of other business organizations. This is a repetitive procedure due to ever-shifting markets and since organizations are dynamic instances which behaviors can’t exactly be predicted a priori.

As already mentioned at the definition of two-sided markets, platforms allow a relatively clear distinction between the two involved groups of interest. When studying proprietary platforms, the separation between the money and subsidy side is even easier. However, if companies do not realize that they operate in markets in which they have to adapt their strategies to network effects that exist between their user groups, they sometimes make fatal mistakes by not handling those challenges appropriately (Eisenmann et al., 2006, p. 3-4).

A first crucial challenge that many companies have to face is to get the pricing of their platforms right. Since the more price sensitive side has to be subsidized in order to

secure cross-side network effects, most of the profit is generated through the money side. Although the money side is most important for the incomes at a platform, due to the existence of cross-side network effects, platforms providers gain market power by building a strong user base that is subsequently attractive the money side. At the same time this fact improves the bargaining power of platform providers against their money side. As a result, the higher the user base, the more the money side is willing to relinquish of their share of income for a single unit, abonnement or other selling models. The precondition for the money side lies in the prospect of generating much more additional revenue by being able to have access to a wider range of people of their target group. Although two-sided networks in general have similar characteristics, the pricing depends heavily on the actual product or services that are offered within the market (Eisenmann et al., 2006, p. 6). Since pricing of goods is a complex topic that needs to be examined in more detail, we will cover it separately in an upcoming chapter.

Another challenge that was mentioned by Eisenmann et al. (2006) was the “Winner-Take-All Dynamics” on two-sided markets. The basic idea of this concept is that companies have to decide if they operate on markets that are destined to be served by only one major platform that can subsequently skim off the profit for the whole market. In most markets this position would be desirable for all ambitious enterprises that want to maximize their profits hence this would trigger a battle for customers until one company emerges as winner. When we take a look at certain markets, one could get the impression that exactly happened at the for social media marketplace. Currently, Facebook looks like the successful winner of the social media battle, but appearances can be deceptive. Facebook may have the greatest number of active users at this time (April, 2020) but there are several other social media platforms that could replace it sooner or later the same way Facebook did it with MySpace several years ago. Back in 2012 Facebook took action as it considered their supremacy to be at risk from the competing networks such as Google+ and Twitter due to raising user bases (Rodriguez, 2019). As a result, Facebook decided to overtake Instagram to gain users primarily on mobile devices and widen the product portfolio. Within 5 years Facebook was able to grow the user base from 30 million to 600 million (Wagner, 2017). This shows that even the top dogs are not safe from new competition and must take measures to prevent the loss of the lead. Due to the usual market entries and

exits, this is a recurring challenge that a company has to deal with over and over again. Inattentiveness can quickly be punished. Specifically for social media platforms, however, multihoming, where people use the service (accounts) from more than one company at the market, is usual and a growth in user basis of the competitors does not automatically mean that the business is at risk (Evans & Schmalensee, 2016).

The third major threat that a two-sided market provider is facing relates to the fact that even though the leader of a market might have established as a global player and leads his business segment, it cannot be sure that within a very short time, it's business model could be doomed to fail. If a company that is sponsors of a contiguous market with similar user groups, expands its services and products so that it is offering a platform which comprises functionalities of the market leader but leads to a higher value for customers, the new competitor might has the power to extinguish or at least diminish the business of the former market leader. This process is called envelopment and has caused many problems for enterprises around the world. A good example for envelopment is the invention of the smartphone. The devices that were initially created for the bare use to verbally communicate through wide distances adapted the functionalities of portable music players as well as navigation systems for cars.

Although Apple was affected by the envelopment of portable music players, also known as MP3 players, it handled the shift of the market well. Since it was the company that developed the IPod, a product that dominated the market for years, sales figures collapsed after the market for smartphones emerged. This was not necessarily bad for Apple revenues because it has driven the shift forward by itself through the introduction of the Apple IPhone.

Through mobile applications like Google Maps, which features a navigation functionality when driving cars, these preinstalled app made the purchase of a standalone navigation system unnecessary. Some of these companies that operated on those markets had to reconsider their business model in order to survive and found a solution in wearable computing (O'Marah, 2017). Wearables are computer technologies that are worn on the body, collect real time data and use these to deliver ad hoc information primarily for enhancement of tasks of the everyday life such as sport activities and sleep monitoring. This is a sub form of ubiquitous computing that

was mentioned earlier in the introduction of this paper. Devices such as fitness trackers, smartwatches and smart glasses are examples for wearables.

By listing this challenges, we get a good overview of what providers of two-sided markets have to deal with and further get necessary background information on various strategies the big tech giants actually use in order to secure their own growth and market positions. The key message that I want to highlight at this point is that due to the rapid changing market conditions which are particularly prevalent in the information technology markets, companies need to specially focus on their competition and need to adapt fast in order to stay competitive.

Now that we have defined the necessary vocabulary, got enough background information on the individual firms and highlighted the difficulties and idiosyncrasy of two-sided market dynamics we will analyze several strategies and business tactics that are adapted by Microsoft, Apple and Google and evaluate, which impact these decisions on the market systems have.

4.2.2 Strategies based on Examples

One of the questions we want to deal with in this work is the comparison of strategies in open and proprietary markets. The companies mentioned here have all different specialization in their branches, as has already been illustrated by the history mentioned above. The following examples therefore also refer to business areas that are less relevant for one or the other company for their specific business scope. This applies above all to Microsoft in the mobile operating system market and to Google in the desktop operating system market. Hence, we will split them in two sections and analyze both of them to highlight certain differences.

4.2.2.1 Mobile Operating System Market

Windows Phone, Android and iOS are operating systems that have been developed to run on smartphones and were the most relevant operating systems for the smartphone industry over the last couple of years. However, in 2017 Microsoft, developer of the Windows Phone platform, has officially declared to end the support of the platform by December 2019. This means that smartphones would continue to work as a phone but that they will not receive any security updates or patches. This makes them inferior

products that could be a potential target for cyber criminals. Additionally, there will not be any new Phone that comes with Windows Phone OS right out of the box. Remarkably is, however, that Microsoft explicitly recommended to switch to either the Android or iOS platforms that are offered by the former competition (Microsoft, 2019). Microsoft had to admit that the Windows Phone OS project failed. This meant a major setback in the battle for the smartphone market, as they were officially defeated by the competition. Microsoft did not manage to convince enough developer to join their platform and invest time and money to engineer apps for their mobile operating system. This means that cross side network effects have been too weak at the Windows Phone platform. The competition incorporated by Apple and Google were simply too far ahead with their operating systems at the time Microsoft released their first OS with dedicated touchscreen and smartphone features (Haselton, 2018). Subsequently, we are able to derive that Microsoft operated in a market where the two “winners took all”.

Surprisingly, Microsoft announced at the beginning of 2019 that they are working on a device that is based on the Android operating system. They intentionally did not explicitly label it as a smartphone because it offers much more functionality and is built as a two-screened device that could be used like a mini-laptop, a tablet device or just with one screen like a “usual” phone (Goode, 2019). As one of the biggest distributors of operating systems, Microsoft decided to join the Android platform as an OEM although it is provided by Google, one of Microsoft biggest contestant in several IT related markets. This decision is justified by the fact that due to the enormous market share and the added value achieved for end users, the platform corresponds to the Microsoft corporate mission statement which is: “the mission is to empower every person and organization on the planet to achieve more.” (Microsoft, 2020). By contributing to the further development by delivering tailored apps and devices that combine the best features and enable high productivity, Microsoft want to be part of the success of Android.

Currently, Android is the market leader for platforms in the mobile operating system market with 70,68 % market share overall, closely followed by Apple with their iOS with 28,78 % (Statcounter, 2020). The biggest difference between those two is that Android is an open market platform that offers the Android operating system for free to manufacturers who want to equip their devices with a powerful software that is capable of running all kinds of hardware. This platform is created by the “Open Handset

Consortium” which was initiated by Google. On the other hand, iOS is a proprietary platform which is owned by Apple and features only hardware from the American company, which is known for their special emphasis on design.

Although the Android operating system is based on an open source software, smartphone manufacturers that want to equip their handset with the OS will have to make major decisions that affects the degree of freedom in terms of configuration. If OEM’s wanted to benefit from the network effects of the Android platform in the past, they had no choice but to obey the rules of Google. The real value for Google lies in the virtual marketplace for Android called “Play Store”. On this platform, developers are able to easily distribute their applications and reach a wide range of users since android is the market leader in the mobile operating system industry. In order to get access to the Play Store on their devices, smartphone manufacturers had to agree to some terms that Google set. Amongst these were the conditions to install a selection of Google apps paired with the Google Search Application as well as the Chrome web browser. In this way, according to a Blogpost of Google’s CEO Sundar Pichai (2018), was able to gain income streams which made it possible to offer Android at no cost for manufacturers. However, in mid-2018 Google was fined 5 billion dollars because the European Commission found that the company violated antitrust laws und had to take action the counteract those violations. As a result, they introduced a license fee for devices in Europe which run Android, offer Chrome and the Google Search as an add on option and stopped forcing the OEMs to run only a Google version of Android (Kastrenakes & Patel, 2018). In an official press release the European Commission (2018) stated that Google:

- “has required manufacturers to pre-install the Google Search app and browser app (Chrome), as a condition for licensing Google's app store (the Play Store);

- made payments to certain large manufacturers and mobile network operators on condition that they exclusively pre-installed the Google Search app on their devices; and

- has prevented manufacturers wishing to pre-install Google apps from selling even a single smart mobile device running on alternative versions of Android that were not approved by Google (so-called "Android forks").”

By using those strategies, Google was able to master the challenges we mentioned in the prior chapter per excellence. They managed to quickly spread their products, the applications and search engine, through the free distribution of their operating system to smartphone manufacturers. Additionally, their binding license agreements with smartphone producers “locked” them in into their ecosystem and prevented the platform from getting enveloped by one of the OEMs as it was forbidden to develop an alternative version of android and it was almost impossible to develop a similar platform that is this much attractive for app developers and users. The user base grew as at the time the Android platform was released, there has not been an alternative for OEMs regarding a stable and innovative operating system. The network effects increased through the rising number of users and Google managed to dominate the smartphone market by making their platform available to 80 percent of smartphone users. They successfully used the “first mover advantage” but only time will tell if they manage to keep this position in the long run.

Apple, on the other hand, has chosen a different approach in the mobile OS market. In general, their devices are built as closed systems. This means that Apple retains full control on their devices by using a proprietary operating system to run their devices. As already noticed at the comparison of open and proprietary source code, this practice offers advantages and disadvantages that must be considered before implementation. Nevertheless, by going for a proprietary platform, Apple has waived the option to spread their operating System, called iOS, by licensing it to other manufacturers. Surprisingly, although this is tactic did not work out so well for other companies such as Microsoft at the mobile market, Apple did benefit from it. As a result, Apple ended the fiscal year 2019 as the biggest vendor of smartphones globally, sharing the first place together with the South-Korean company, Samsung, at roughly 18 % market share (Counterpoint, 2020).

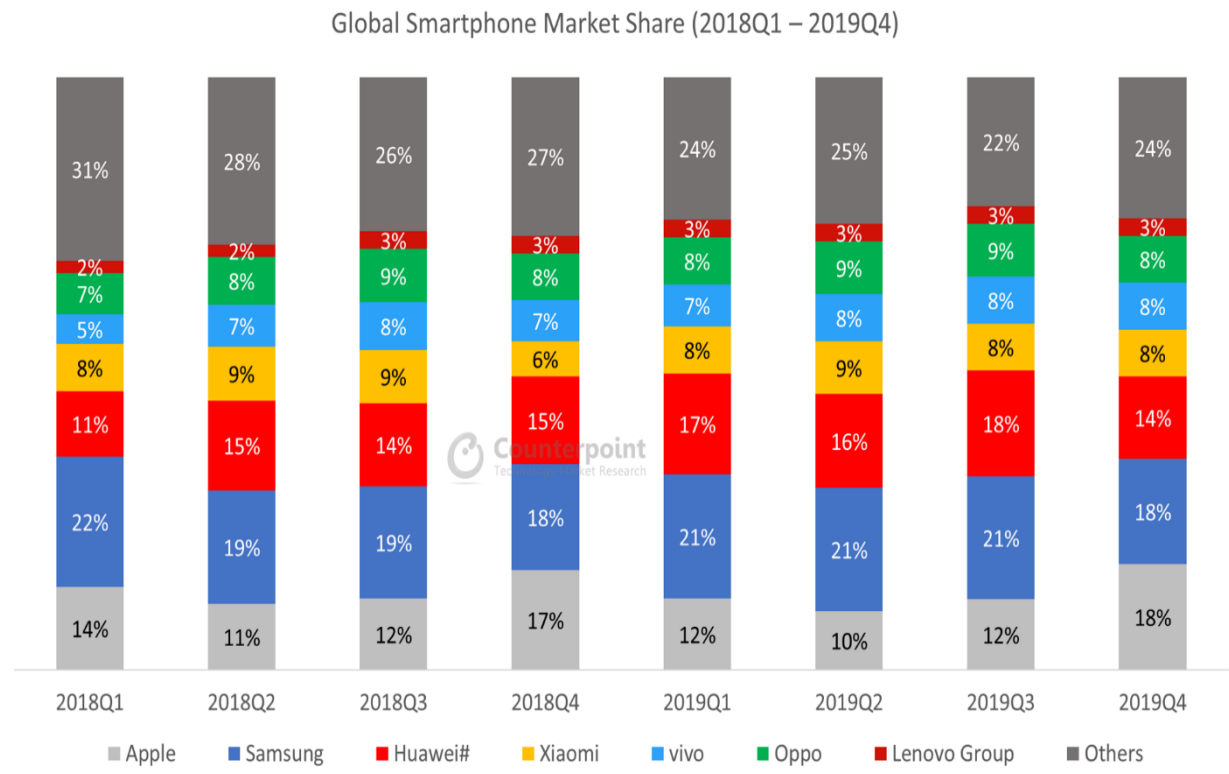

Figure 1: Global Smartphone Market Share based on Shipments (Counterpoint, 2020)

This is quite surprising considering the premium price tags for their newest smartphone "iPhone 11 pro", which start around $1,000 (Apple, 2020). Apple also sells a "budget" iPhone, the iPhone SE (2020), that might also attract a customer segment which is more price sensitive compared to the group that opts for the more expensive iPhone 11 pro. This could be interpreted as a "bargain-then-rip-off" model that is common in many markets which means to offer a product at low initial prices to attract customers and generate a state of customer lock-in and further charge higher prices at follow-up acquisitions (Farrell & Klemperer, 2006). At around $400, Apple offers the entrance to their proprietary system. This system is also often referred to as the "ecosystem" and basically stands for the interaction between a company's hardware, software and service products that creates additional benefits when they are combined. An example for this synergy effect would be a user that owns an iPhone, the Apple Watch and is able to synchronize and display images, calendar notifications and messages across both devices that are connected by the Apple iCloud account and paid services of this particular user. In addition, Apple users might also use preinstalled apps on Apple devices without considering that there is limited compatibility for most of the stored data across their Apple account which results in a hindered process if they ever want

to buy products from other manufactures and do not want to spend many hours to transfer this information to a new account at a new supplier that offers similar features like for example Google or multi-platform applications. Whereas these examples focused more on digital features, implemented through software and databases, Apple also insists to use a proprietary port called “Lightning” that is devoted to power Apple devices and could also be used to connect headphones and transfer data. By introducing these measures, Apple is trying to define strict boundaries in order to ensure to tie their customers stronger to their products by raising switching costs. For customers of Apple, the amount of services and increased product utility that is provided by the platform increases the lock-in effect. In an interview in 2019 Tim Cook, the current CEO of Apple, also pointed out the importance of the ecosystem for the American company and its mobile computing sector (Gurdus, 2019). This proves the significance of the ecosystem for Apples business model.

We have seen that Apple does everything to secure that customers that once opted for their devices, stick as long as possible with the company’s products. Another way to tie their customers closer to the platform provider is by introducing subscription services that increase switching costs. These subscription services are characterized by contractual agreements which means an additional source of income for the company through constant payments made by the platform users over a period of time. Apple Music, Apple TV+, Apple Arcade are just a few examples for Apples subscription models that offer multimedia entertainment with seamless integration across Apple devices. The Apple Music application is Apple’s own music streaming platform and a direct competitor for established platforms like Spotify and Amazon Music. The Spotify App is available simply by downloading through the Apple App Store or accessing the official website and is primarily intended to bind users who use services from other companies back to their own services and applications.

4.2.2.2 Mobile App Stores

As we have shown, network effects have the power to determine whether a platform can prevail against the competition. For instance, Microsoft's Windows Phone OS illustrated that in the smartphone market the amount and quality of available apps, offered by developers, are essential when it comes to competing against other firms.

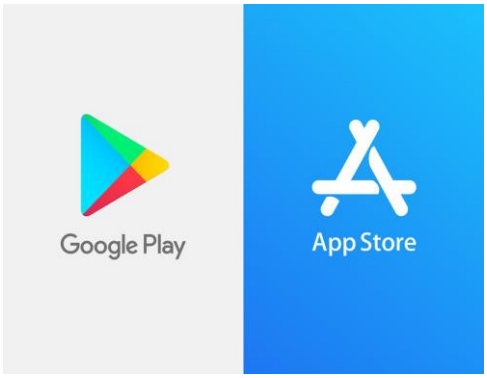

Figure 2: Google Play Store vs. Apple's App Store (Granados, 2019)

Considering the significant value that apps produce, the platform's app marketplaces are the signboard that often is decisive for potential customers. The more and relevant apps a marketplace exhibits, the more attractive it is for customers to join a platform due to the added value that is created through the applications offered.

For this reason, the access to well-equipped app stores is one of the main USPs for a platform. Huawei is a company that had to experience first-hand how important access to an established app store is. After the US government listed the Chinese company on a blacklist in May 2019 that legally prevents American firms from doing business with Huawei. This decision led to the fact that the Chinese company lost the license for Google mobile services and Google apps for new smartphones. As shown in the structure of the Android architecture for the development of apps in cooperation with Google in figure 3, these services are necessary for apps that use, for example, Google's geolocation data and further secure compatibility throughout all devices licensed by Google. As a result, Huawei immediately started building their own version of mobile services that could be used by application developers and started investing heavily in an alternative app marketplace called Huawei App Gallery and the Huawei Mobile Services. Nonetheless, revenue for consumer products was $

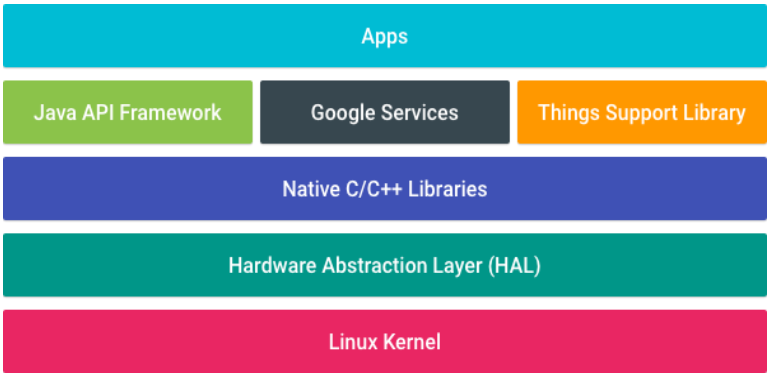

Figure 3: Core Android Framework for App Development (Google, 2020)

10 billion behind the expectations at the end of 2019 but is currently working on the further development of their independent smartphone business model (Kharpal, 2020).

As Android is an open source, Huawei can keep using it and does not have to setup a new OS from scratch. This is a major advantage for the Chinese company and saves a lot of resources. Another benefit of Android is the possibility to install APKs, a particular file format for Android, outside the Google Play Store through third party app marketplaces or other ways of file distribution (e.g. weblinks). One example for third party Android marketplaces would be the Amazon Appstore. Far from the Google supervision, the US company Amazon built a standalone app store primarily for their own devices which run an alternative version of Android, the “Fire OS”. However, these applications will also run on Android devices that are licensed by Google.

Apple, however, chose another strategy. Apps for Apple devices are only available through the proprietary App Store. Hence, Apple retains full control on applications that are published at their marketplace and can influence the requirements that available apps for iOS must fulfill in order to get listed. We will elaborate on these terms of condition more detailed in an upcoming section.

What both platforms have in common however is that they provide the necessary tools and guides to ensure that as much developers as possible create applications for their platforms. To imply that due to this fact, at the two-sided market for smartphones one could easily distinguish between money and subsidy side is a false assumption. At the time, Google had to introduce license fees for devices that are sold in Europe, the additional costs for OEMs would most likely be passed on to end users, since in total it makes producing devices with access to the Google services more expensive. Although Apple does not have to charge any license fee to OEMs, end users pay indirectly for the research and development costs that are part of the product price calculation of every company. On the other hand, application developers are not easy to classify either. They might get free access to development kits and subsequently generate profit through implemented ads or purchases of subscription models or the app itself, but they will have to share a part of the revenue made through the app stores. What they do offer for most of the available apps is a direct access on their desktop operating systems through the marketplaces.

Additionally, the app stores are proprietary marketplaces, i.e. Google and Apple own all rights for their virtual distribution infrastructure, capacitating them to set the terms of condition for developers and end users joining the platform. The owners of these platforms and their actions are accompanied by enormous power that can be used to their own advantage. It is clear, however, that these sales markets have nothing to do with open market systems, since there is a central administration that can influence the market by means of a user agreement.

4.2.2.3 Desktop Operating System Market

Microsoft might have had troubles with the establishment of a competitive platform for the mobile operating system market. In the market for desktop operating systems, however, this situation is completely different.

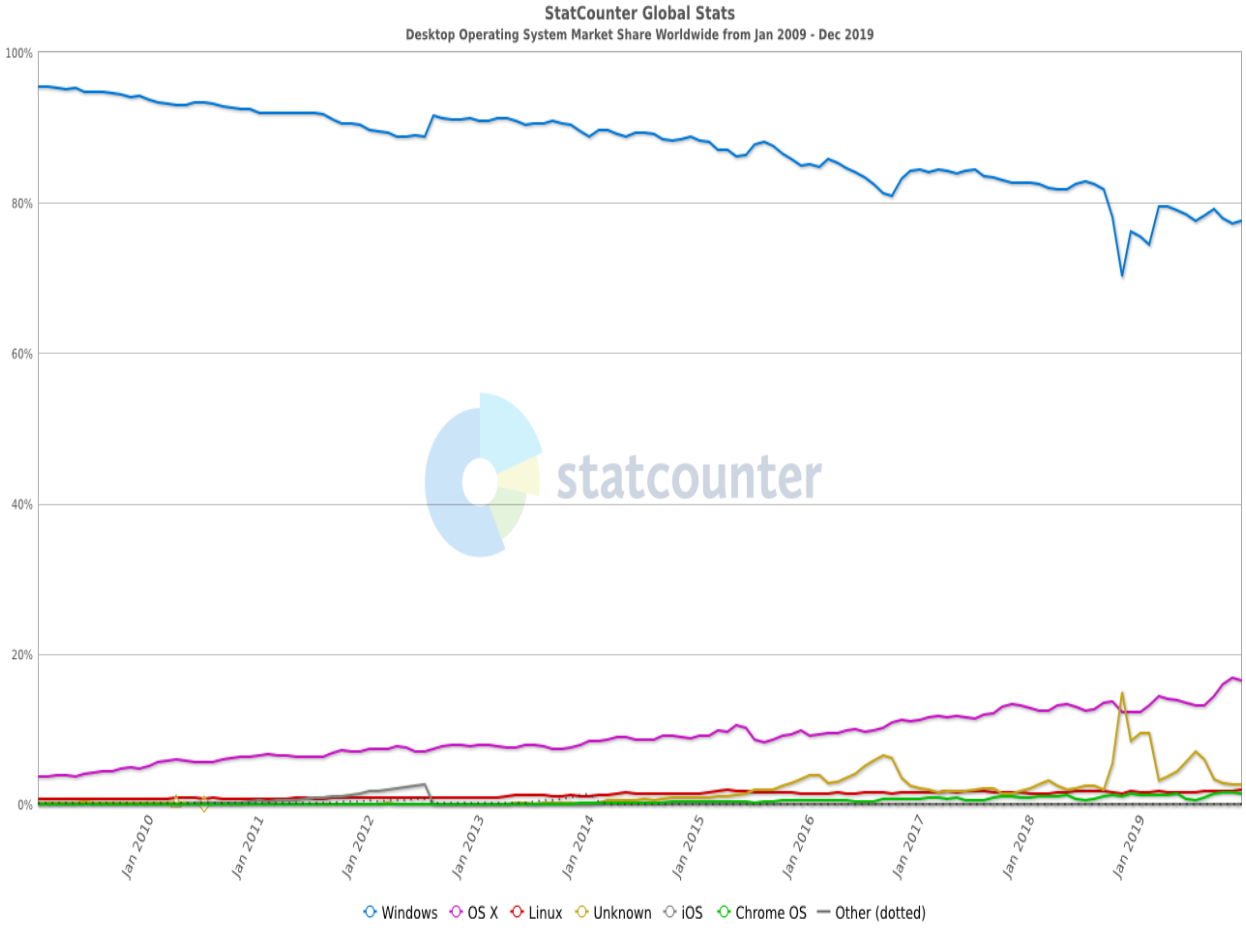

Figure 4: Global Desktop OS Market Share 01.2009 – 12.2019 (Statcounter, 2020)

As we have already discussed, Microsoft is the leader in the desktop operating system market. However, as we can see from the graph in figure 3, over the last 10 years Microsoft and its Windows OS, starting at 95 % market share, has lost around 18 % of to its rivals. Since the data from Statcounter is based on measurements of a “sample exceeding 10 billion pageviews per month collected from across the Statcounter network of more than 2 million websites”, the data is tracking the web movements of users (Statcoutner, 2020). Apple with the macOS (former “OS X”) was clearly the company that benefited to most. Googles own Chrome OS could not prevail against its competitors, however due to the fact that is an operating system that it is a cloud-connected OS with less focus on hardware parts, which reduces costs dramatically, they are able to serve a niche market for people that use laptops primarily for browsing the web and doing light weight office work. “Chromebooks”, as Laptops that ship with Googles OS are referred to offer access to various web applications via the Google “Chrome” browser and on newer models even Android apps through the Google Play Store. The actual Chrome OS that was introduced in 2011 is based on the “Chromium OS”, an open source OS project by Google, but is modified to work especially for devices that subsequently get licensed by Google to be marked as Chromebooks. With new devices starting at $179, Google offers at a price point that laptops running Windows or macOS could not reach and thus providing a cheap entry option to the Google ecosystem that is characterized by its cloud services (Google, 2020). The price range of devices that run Windows OS is relatively wide but offering features that are especially necessary for developing applications. From a strategic point of view, Google is able to extend its proprietary marketplace user basis, using a penetration bargain pricing technique and getting customers that opt for Chromebooks equipped with the full range of Google services right out of the box. The market share of 1,5 % is quite low for a company like Google. Nevertheless, they contribute an alternative for the integration of mobile and desktop computation and connecting them to its application platform that is based on apps that primarily were engineered to work for licensed Android devices.

If you look back at the history of the companies, Windows was able to spread their operating system by licensing it to many manufacturers and offering professional support for businesses as well as private users which resulted in 77 % market share. Consequently, it is the platform that offers the most range of potential users for

application software. With Apple at the second position, most software developers decide to release their products for those two systems which would cover almost the entire target group for desktop computing. Since proprietary marketplaces like the Appstore from Apple or the Microsoft Store are primarily designed for the distribution of smaller apps, software engineers that work on complex application software choose other ways to reach customers.

4.2.3 Social Welfare and Terms of Condition

Andrei Hagiu (2006) dealt with the complexity of investigating the impact that the platform openness has on the overall social welfare. In his research, he came to the conclusion that, against the intuitive assumption, proprietary platforms would actually increase social welfare and also raise the number of developers joining the platform (Hagiu, 2006, p. 15-16). This model might be suitable for some use cases. However, as we can see in figure 4, the Google Play Store has had 230.000 more active developers than the Apple Appstore in 2017 (Statista, 2017). Additionally, the amount of Android developers might be much higher due to the fact that some developers are not going to release their applications on the Play Store. For this reason, the first assumption does not hold in the market of mobile OS platforms.

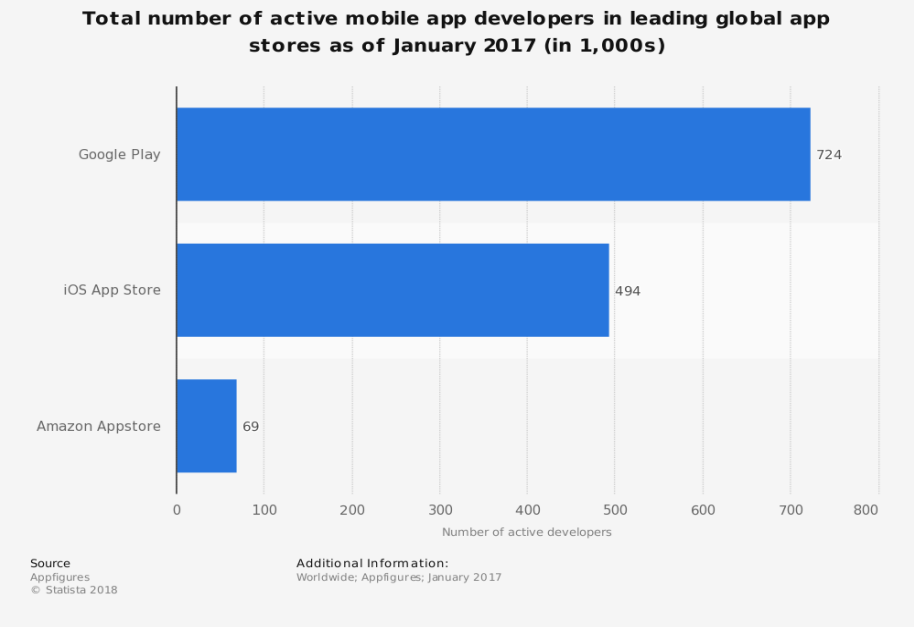

Figure 5: Number of Active Mobile App Developers - leading App Stores (Statista, 2017)

The social welfare tradeoff between open vs. proprietary platforms is a topic that has been studied by various researchers. However, the adoption of the thematic is handled differently in several studies, resulting in varying outcomes. Another approach that primarily focused on the examination of social welfare in the desktop computing market confirmed the intuitive idea that open platforms will result in better overall social welfare as long as the quality of platforms is equal (Economides & Katsamakas, 2006, p. 1064-1065). The ambiguous interpretation of two-sided platforms, different business strategies and pricing models make it difficult to conclude which platforms are in general more desirable for the global economy. Pricing models may vary upon the lifetime of a company and fees are influenced by legal decisions and other factors as well.

Just like in the desktop operating system market, developers are capable of engineering applications for the Google marketplace for free. The only prerequisite is a PC which runs either Microsoft Windows or Apple's macOS. The "Software Development Kit", which app developers need to build their applications, is available for free and can be downloaded via the internet (Google, 2020). Hence, there is no restriction on developing apps for the Google platform and sell them. But, in order to distribute finalized applications at the Google Play Store, developers must pay a one-time account registration fee of $25. Google is explicitly stating, that an alternative distribution channels, for example third parties' app stores or websites, are also possible to consider, but that the Google Play Store would offer some substantial benefits. Those include ways of monetizing apps by placing third party ads, introducing subscription models, in-app products, etc. and processing those payments as well as a secured source of applications for end users (Google Play, 2020). Apple charges a yearly recurring fee of $99 for developers that want to distribute their apps through the App Store (Apple, 2020). Moreover, a PC that runs macOS is required. Unlike on the Android platform, Apple applications could only be sold through the marketplace provided by Apple which leads Apple with total control over available apps.

Both application platforms offer developer license agreements which establish the rights and possibilities given to developers. When it comes to app development, there are technical as well as content wise guidelines that state which contents are allowed in applications and what would violate the terms of condition. Therefore, both Apple and Google got different approaches on preventing unqualified apps form entering the

market or existing on the store. At Apple's store, these go so far that for some developers publishing an app is an exhausting process which is immense time consuming and does not always lead to success. In the past, Apple was criticized for its unclear guidelines and methods on rejecting apps that are considered as non-conform to the developer guideline. In his work, Luis E. Hestres (2013), investigated the terms of condition for the app store and provided examples on how Apple made decisions branching out that the admission process was partially arbitrary and that some decisions has had significant impact on freedom of expression. This shows that provider of app stores have the power to use their market position to pursue their own interests and to offer end users a selection of available apps that they control, which speaks against the basic concept of an open market and significantly influence competition.

4.3 Outlook on Future Developments

Apple, Microsoft and Google are very innovative organizations that have had, as shown before, major impacts on the technological landscape and are indispensable for the IT markets by today's perspective. But since these sectors are in general changing rapidly, we will for sure reckon some restructuring in the coming years. This will be fueled by new developments that may be introduced by one of the companies and the changing user behavior over time.

The further development of wearable devices will certainly have a major impact on future developments on the smartphone market. Products like smart glasses, watches and wristbands may one day replace smartphones completely by adapting functionality that makes the use of relatively big devices that have substantial weight redundant (Tal, 2018). Manufacturers of such devices need to equip their devices with an OS that is able to handle changing use cases and user interfaces. As wearables like smartwatches are in the focus of hardware producers, there already has been some adaption especially for those devices so that this would probably be the least challenging obstacle. Nonetheless, as we have seen, the OS is one of the most important factors of modern computing devices and is therefore not to be neglected.

The introduction of the new 5G networks will further drive the shift towards newer services. Cloud computing, low-latency data streaming and artificial intelligence will benefit from the increased band width and speed of operation that is necessary to fulfill certain tasks. Smooth 4k gaming streams for Googles new gaming platform „Stadia“ and autonomous cars are only a few examples on how 5G networks will influence the landscape of information technologies.

5. Criticism and Conclusion

The aim of this seminar paper was to provide a bird’s eye view of two market forms that can be observed within the IT industry. At research we focused primarily on companies that have had a big influence for the technological landscape and are market leaders in various segments as of today. We set the scope to mobile and desktop OS markets because those companies all operate within these market forms and could therefore compared under the same conditions.

By first elaborating theoretical characteristics of open and proprietary market forms we pointed out their advantages and differences and have subsequently learned that open platforms are based on a uniform OS that can create substantial added value for all user groups trough the large community that works together. In the next step we analyzed the histories of the companies and found that the three companies used different strategies to scale their businesses. Especially first mover advantages and the licensing of the operating systems to OEMs had resulted in the development of strong indirect network effects. We also summed up the major challenges that the companies have to adapt their strategies in order to stay successful.

As we focused on the smartphone OS market, we have seen that the market dominating OS Android is an open platform. However, we also encountered that the company behind it uses business strategies that could be interpreted as distorting competition and had therefore been punished by the European Commission. On the other hand, app stores are key features of two-sided platform markets and are highly relevant for end users and developers. However, they offer the possibility to set up user agreements that contradict the basics of an open market form and can be used for the host’s own benefit. This means that the provider of a platform has a major

influence on the masses through their decisions, since end user in general obtain information on their mobile devices through applications that are available at popular marketplaces.

Intentionally, one would think that open markets are in general more efficient and would lead to overall increased social welfare. In references, however, there were different approaches on building models for comparing those platforms. As those assumptions and mathematical modelling led to different outcomes, we cannot make a clear statement, whether one of the market forms leads to increased social welfare and would be therefore more desirable for both sides of involved users. Finally, the decision to compare the markets without considering the differences that are present in local and global markets is not appropriate for the elaboration of this paper as we saw on the example of Google's strategy of licensing Android, which resulted in new pricing methods that differ by regional borders due to court decisions.

I am confident that in the further development of IT markets, the companies dealt with here will contribute significantly to technical improvements. However, there is a data accumulation by providing services that can lead to major violations of personal rights in the wrong hands. These companies should therefore be aware of their pioneering role and refrain from using mere tactics and strategies that only serve the purpose to oust the competition. Thus, I personally think we need more collaboration in markets that have the potential to contribute to the development of society rather than businesses.

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