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BUSINESS MODELS IN TWO-SIDED MARKETS: AN ASSESSMENT OF STRATEGIES FOR APP PLATFORMS

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Abstract

„App platforms” are electronic software distribution markets for mobile devices like smartphones or tablets. They have gained popularity after Apple launched its AppStore in 2008. Since then, app platforms have transformed the entire mobile communication industry including mobile network operators, device producers, software suppliers, content providers, advertisers, etc.

Platforms (like AppStore) that intermediate between two distinct groups of customers connected through indirect network effects can be analyzed effectively using the theory of two-sided markets. The interdependencies of customers, platforms and developers require consideration of strategic issues not present in traditional models. These issues may pertain to all development phases, including platform design, launch and competition and thus, have an effect on existing and new business models in this sector.

Economics literature on two-sided markets focuses on theoretical analysis, paying not much attention to managerial implications. Strategic management literature, on the other hand, rather provides practical guidelines. Within this paper, we discuss strategic issues arising in the app platform industry, combining these streams of literature. Based on a thorough analysis of the key stakeholders in the app platform industry (platform owner, developers, and users), we use our findings to provide management recommendations and discuss probable evolutions of the industry.

Keywords: Business models, two-sided market, app platform, mobile industry, pricing strategy, competition.

1 Introduction

„App platforms“ are electronic software distribution platforms for mobile devices like smartphones or tablets. They have gained popularity after Apple launched its AppStore in July 2008. Since then, app platforms have transformed the entire mobile communication industry including mobile network operators, device producers, software suppliers, content providers, advertisers and so on (Taylor, 2009). Although the advantage of AppStore seemed to be incontestable, other app platforms like Google's Android market managed to enter the market and achieve high popularity (comScore Reports, 2011). More platforms followed Apple and Google, forming coalitions and trying to create niche markets. This led to differentiation and further development of the business model.

App platforms are not a single example but a part of a large-scale change. During the last decade, platforms became the „invisible engines“ of our economies (Evans et al., 2006). Amazon, eBay, and Google have advanced to top brands worldwide. Following Gawer and Cusumano (2007: 2), we define platforms as „systems of technologies that combine core components with complementary products and services usually made by a variety of firms.“ Platforms spread across many industries, leading to creation of new business areas and products. Moreover, they change the whole economic structure and influence business strategies in fundamental ways.

The underlying structure of platforms is that of a network with the crucial feature of network effects. That is, participants' profit depends on the number of other participants in the market (Katz and Shapiro, 1985; Farrell and Saloner, 1985). Direct network effects (or same-side effects) occur between members of the same customer group, for instance, the more participants join a telephone network, the more people can be reached, the higher is the utility of a single participant. Indirect network effects (or cross-side effects) occur between members of the disjunct groups like developers and users. That is, the more developers join a platform, the higher is users' benefit. Strategic management literature on platform management (e.g. Gawer and Cusumano, 2008; Eisenmann, 2007) provides practical guidelines on how to deal with these effects. However, it does not provide an adequate theoretical framework to thoroughly analyze the complex interactions. Economic literature, on the other hand, focuses on the theoretical aspects of two-sided markets, and is not so much devoted to the managerial implications of these theories. With this paper, we aim to bring these two streams of literature closer together. The main contribution of our paper is then the applications of the theoretical findings to the app platform industry: We show what strategic decisions are most important in the different life-cycle stages of an app platform. We will cover mainly the app platform owner's perspective, leaving developers' and customers' perspectives for future research.

The remainder of the paper is organized as follows. We start with a literature review on platform analysis and two-sided market models in section 2. Subsequently, we consider app platforms for mobile devices in section 3. Section 4 pertains to strategic issues and insights structured according to the three life cycle phases (design, launch, and competition). Although we focus on app platforms for mobile devices as an underlying industry, the insights apply to many other Internet-based platforms. Section 5 concludes and points out interesting aspects for further research

2 Literature Review and Background

In this section we provide the background for platform analysis. We begin with a short literature overview on platforms and two-sided markets and then explain the key economic principles of two-sided market models. The focus is on understanding the main features and their implications.

2.1 Platforms

In recent years, in many (especially high-tech) industries, platform competition became a key element (Evans et al., 2006; Gawer and Cusumano, 2008). Hidding et al. (2011) identify four fundamental drivers for the rise of platforms: Modularity, increased interconnectivity, self-organization, and low marginal cost of production. Given the increased number of industries with platform character, it is not surprising that management literature on this topic is growing. Main research directions include network analysis, platform competition, and management of complementors, which will be described shortly in the following paragraphs.

In the literature on networks, platforms perform a key role among actors (Eaton et al., 2010). Platforms, as a bottleneck, may constrain the overall performance (Baldwin and Clark, 2006) and limit the service level of the network (Teece, 1986). On the other hand, the gate keeping position allows the platform owner to extract a significant proportion of the economic value of the network (Baldwin and Clark (2006)) and thus sustain a competitive advantage (Porter, 1985). Basole (2009) shows how a structural analysis of networks can be used to visualize the ecosystem of actors. This can be used to identify a platform's competitive position and characterize its business strategy.

The literature on platform competition addresses what business and technology decisions help companies to become and to stay platform leaders (Gawer and Cusumano, 2008). While there is a certain advantage of being first to market (established customer base, switching costs, network effects), Hidding et al. (2011) find that in their sample of 15 platform industries, only in one market the first mover is still the leader. Successful followers mainly used a „platform envelopment strategy“ (Eisenmann et al., 2007), which means that the entrant combines its own functionality with the leader's platform in order to leverage shared user relationships and common components.

Companies providing complementary services are crucial, since they significantly enhance the platform's value. Platform owners should therefore pay close attention to how they attract and manage their complementors. In an extensive case study on Intel's strategy, Gawer and Henderson (2007) find that Intel established a good balance of encouraging entry, despite the fact that Intel has the potential to „squeeze“ entrants ex post. Related to this issue is the level of openness of a platform. Parker and van Alstyne (2009) analyze the tension between innovation and open access. In essence, they find that the platform sponsor has to establish a balance between fostering platform adoption and complementary investment versus capturing immediate profits on the platform itself. Eisenmann (2007) analyzes factors that favor proprietary versus shared models when designing new platforms. For the subsequent life-cycle stages (network mobilization and platform maturity) he explains how management challenges differ between these two types of platforms.

While the strategic management literature clearly provides several valuable recommendations for platform management, it does not provide an adequate theoretical framework to fully describe the complex network interactions. Therefore, we now turn to the (more theory-based) economic literature on two-sided markets.

2.2 Two-sided markets

Two-sided markets can be roughly defined as platforms that enable interaction between two groups of customers that value each other's presence (Rochet and Tirole, 2003; Evans, 2003; Tag, 2008). The research on two-sided markets stems from network economics and complementary product pricing (cf. Rochet and Tirole, 2003). One of the key concepts for two-sided markets is that of „indirect network effects“: The utility on the one side of the market increases with the number (and/or quality) of participants on the other side. Due to the diversity of two-sided market examples (e.g. credit cards, night clubs, shopping malls) various extensions are needed to describe different kinds of platforms.

A large body of literature on two-sided markets has emerged during the last decade, for example, Rochet and Tirole (2003, 2006), Caillaud and Jullien (2003), Evans (2003) and Armstrong (2006), to

name just a few. A lot of new extensions to the original models were introduced (see Armstrong (2006) and Rochet and Tirole (2006) on membership fees, Hagiu (2009), Jeon and Rochet (2010) on quality preferences, Tag (2008) on comparison of open and closed platforms);

Two-sided market models are usually based on three equations: the platform profit equation and the two utility equations for the two market sides (Rochet and Tirole, 2003). All of them can have a membership and a usage part. Membership benefits, fees and costs are induced only once, usage benefits, fees, and costs are recurring and depend on the number of transactions, e.g., downloads.

The key insight used in two-sided market models is that the solution does not only depend on the total fee level, but on the pricing structure. Traditional economic intuition suggests that if prices for both sides are equal in the beginning, a price increase is more effective on the side with a steeper demand curve, while a reduction will be more effective on the side with the less steep curve. This still holds for the two-sided markets. What is new in the two-sided market theory, is that in equilibrium, the ratio of fees for the two market sides should be proportional to the ratio of their price elasticities (not the other way around). The side with the lower price elasticity pays less than the other side and is even often subsidized („subsidy side“) to attract the other side („money side“).

For the model to reflect the app platforms structure, the basic model by Rochet and Tirole (2003) must be adjusted. We have to consider additional parameters and extensions like usage fees, membership fees (Armstrong, 2006; Rochet and Tirole, 2006), segmentation of participants, commission payments and adjustments for the number of interactions (Kouris, 2011). Understanding the impact of these extensions is key for addressing challenges pertaining to app platform stakeholders.

For the competition between platforms multi-homing is an important issue. „Multi-homing“ refers to the situation when participants might join more than one platform (Rochet and Tirole (2003, 2006), Armstrong (2006), Armstrong and Wright (2007), Sun and Tse (2007)). Each market participant can choose between three possibilities: do not join any platform, join only one platform („single-homing“) or join more than one platform („multi-homing“). The single-homing behavior can be driven by requirements imposed by platforms, like exclusive contracts. Alternatively, it can be driven by costs of multi-homing, for instance, when platforms are incompatible or require high membership fees.

Another key factor for the platform competition are same-side effects. There are networks with positive same side effect, for instance, for the computer users, file exchange is only possible if they work with the same (or a compatible) operating system. For many networks, they are negative due to crowding out and increasing competition: the more developers participate on a platform, the lower the attention a single developer is getting. For app platforms both effects exist.

Given the theoretical insights of this stream of literature, we now aim to derive managerial implications for app platforms, using also the findings of the strategic management literature on platforms. Therefore, we first describe the app platform industry and the key stakeholders. Consequently, we discuss how insights from the two-sided market theory can be applied to address strategic challenges arising in the app platform industry and how they affect business models in these markets.

3 App platforms

App platforms are a special form of electronic markets. Via app platforms software developers can distribute their software applications (apps) among users of mobile devices. Hence, developers and users are indirectly connected: developers get profit from the users purchasing their apps and users benefit from the apps. The groups are not disjoint, since some users are also developers and many developers are also users, but they are distinct enough. Due to these direct and indirect network effects, app platforms can be analyzed using two-sided market theory. In this section we provide background information on app platforms and show, which parameters from the two-sided market

theory are relevant for app platforms. The industry overview and the description of key stakeholders create a basis for understanding key challenges and issues of the industry.

3.1 Industry overview

Apple's AppStore and Google's Android market are probably the most known app platforms. Actually, there are many more app platforms than these two – and some of them were founded as early as 1999. For example, Handango provides apps for mobile phones since 1999. But it was not until the AppStore appeared that the app platforms have gained momentum. Several hypotheses can be provided to explain why it was not before 2008 that app platforms have gained momentum, for example, usability (size of screen), connectivity (3G and 4G coverage) or the hardware price could have contributed to the app platform development. The launch of AppStore has changed the mobile phone industry in practically all dimensions. After three years in the market there were 425,000 apps available in the AppStore. The number of downloads exceeded 14,000,000,000 (Apple, 2011)).

The app platform industry as a whole was doing well in 2011, growing by around 78% and reaching around USD 4 billion in revenues. Apple managed to stay the market leader, accounting for 75% of the total market revenues, by far outpacing other market participants. Also projections for the future are positive: Total revenue is estimated to jump to USD 5.6 billion in 2012, USD 6.9 billion in 2013 and USD 8.3 billion in 2014 (Kent, 2011). In 2011, Apple, Google, Nokia and RIM were the most important players in the market. Apple will probably remain the leader for the next 2-3 years, but other platforms will also gain traction. Android has currently high market shares in the smartphone market (53% in the USA) and high sales (e.g., 61% in Germany in 2011). Windows and Nokia are constantly losing market share (Nokia from around 70% in 2006 to fewer than 30% in 2011 number of handsets worldwide), however, together they have an interesting value proposition for the future. Due to consolidation and merging of mobile devices and computers, Windows can become the key player in this process. Nokia has the capacity to produce low-cost devices that can boost sales as soon as the high-end market is saturated (Virki, 2012).

3.2 Business models and key stakeholders

In this section, we provide a brief description of app platform business models and operations. There are three key types of participants on app platforms: the platform owner, developers, and users. Platform owners connect developers and users and provide rules and services. Developers program apps and submit them to the platform, so that the users can download them. In the following, we describe each group of participants in detail.

App platform owners provide the whole infrastructure (like user interface, server space, etc.) and determine rules for the interaction between the two market sides. They can also provide information about apps and developers and serve as a trusted third party by controlling app quality. Following Belleflamme and Peitz (2010) we call the business model used by platforms an intermediary business model. They distinguish between 4 major roles of intermediaries: dealer (resells goods), platform operator (connects sellers and buyers), infomediary (facilitates information gathering and procession), and trusted third party (certification agent). Many platforms have chosen a hybrid business model. The main difference between a dealer and a platform operator is that the latter does not control the transaction price in a direct way by buying and reselling products, they rather charge for the platform membership and transactions. App platform owners are platform operators in the first place, some combine it with infomediary and/or trusted third party roles. Neglecting some roles by certain (prominent) players leaves room for entrants in this market to fulfill these duties.

App platforms can be classified in various ways. Based on Distimo (2011), we divide app platforms into 4 categories: native platforms, pure mobile device manufacturers, mobile network operators, and independent. Compared to Distimo, we suggest differentiating between native platforms (who provide operating system and hardware) and pure mobile device manufacturers instead of device

manufacturers versus operating system developers. Our classification allows to take into account the fact that many successful app platforms provide both, the hardware and the operating system (Apple, BlackBerry, Nokia/Windows). Moreover, there are key strategic differences between companies offering an integrated experience like Apple and BlackBerry versus those providing only hardware like HTC. For instance, if an app platform provides an operating system and/or mobile hardware, it can more easily assess whether apps would work well on their system. Hence, their own apps are better adjusted to the other parts, can offer better functionality and they can also review third-party apps with less effort. Mobile network operators have already a customer base and a billing system in place, so that they can gain customers for the new products like apps fast and/or they can take over payment procedure.

Native (or integrated) platforms belong to the largest (in terms of available apps and downloads) and have the highest impact on the industry so far. These app platforms are built around different operating systems and use different programming languages and software tools. Hence, compatibility is very low. This is important for multi-homing and has an impact on the market structure. Due to the explosion in the number of app platforms, challenges around platform competition are currently in the focus of the app platform industry. However, there are also new platforms that get launched. For these new entrants platform launch and design are most important. But also incumbent platforms should from time to time re-evaluate their design and consider adjustments in the pricing and/or quality in order to deter entrance of new platforms and stay competitive.

Developers program apps, which they submit to the app platform. In general, they are entitled to choose app prices themselves. There are different pricing strategies, including „simply buy it“, „in-app-purchase“ and financing through advertisement (Gans, 2012). Key instruments to extract revenues is that of versioning (lite vs. prime), free trials and personification (Shapiro and Varian, 1999). The first challenge for many developers is the question, which platform to join. App platforms do not require single-homing (limitation to one platform), i.e., developers are allowed to develop for more than one platform. Since apps are information goods (Shapiro and Varian, 1999), the main costs are the fixed costs of programming, marginal costs are basically zero. But transition to another platform causes costs of around 50% of the development cost due to the differences in programming language, operating system and hardware. The possibilities to program universal apps that run on all platforms are still very limited (Newel, 2011)).

The other market side of an app platform consists of its users. They determine which apps are successful and, in the end, they decide which ecosystem will win. App platform users access the platform through their mobile devices. Mobile devices are complementary goods and can be considered a one-time membership fee. The features of mobile devices are key for the consumer experience, they determine which apps can be installed and used. For the users, not only the apps count, they rather see their mobile device and the software on it as a whole. Value and benefits are determined by the ecosystem.

4 Key strategic issues and insights

Business models based on two-sided markets require consideration of strategic issues not present in traditional models. In the following, we analyze what characteristics of app platforms are particularly affected by the factors described in section 2. We structure our arguments along the three life cycle stages described in Eisenmann (2007): platform design, launch, and competition.

4.1 Platform design

From a strategic perspective, it is first necessary to check the criteria for a product to become a platform. Gawer and Cusumano (2007) argue that a product needs to (i) perform one essential function or solves one essential problem for several actors in an industry, (ii) be easy to connect or build-upon,

and (iii) is difficult to substitute for. Clearly, the leading app platforms satisfy these criteria. In order to make the platform successful, the authors then recommend a „coring strategy“, which aims at making the platform the „core“ of a technological system. That was exactly the strategy implemented by Apple when they realized the potential of AppStore: Before its launch the mobile industry was organized around mobile devices and mobile network operators, with device features and network coverage being the key differentiation factors. Since the AppStore launch, the mobile industry structure changed profoundly, now having software (operating system plus apps) in the core (GfK, 2010). Hence, app platforms have recognized the importance of the coring strategy and managed to apply it, arranging the whole mobile industry around them. Once this consideration is taken into account, other important platform design issues should be considered, like pricing and quality settings.

It is a non-trivial decision, which side to subsidize (Eisenmann et al., 2006). For instance, in the video game industry the consoles are sold to the users at or even below cost („subsidy side“). The developer's side is the „money side“ and has to pay high royalties for the games development. In the personal computer industry the situation is reversed: users pay high prices for the operating system software while developers obtain free software development kits. The differences can be even observed within one and the same industry – Apple tried to charge developers a USD 10,000 for the Mac software development kit, but was not successful with this strategy having lost market shares in mid 1990s to Windows and open source operating systems. On app platforms, we observe that users are usually the „subsidy side“ and developers are the „money side“. Clearly, there are differences between the platforms. Apple charges USD 600-800 for the iPad which costs around USD 300 in production, Amazon charges only USD 200 for its Fire tablet – which is below manufacturing cost. Amazon is aspiring to install another business model, extracting even more revenues from developers. Hence, we observe that even within the app platform industry, there are different business models, but most try to extract more revenues from the developers.

The second question pertains to the different kinds of fees that are applicable. In different industries different kinds of fees are used. The two kinds that were considered in the two-sided markets literature are membership fees (one-time or periodical) and usage fees. The membership fee (also called lump sum, or access fee) is applied independently of interactions between the market sides. The membership is especially helpful if transactions between participants cannot be observed, like on partner search platforms. Usage fees apply per transaction.

Usually, it depends on the cost structure, what kind of fees should be used. Here not only the platform cost structure but also the developers' cost and revenue structure is important. Usually, for information goods like apps fixed costs are high and marginal cost are almost zero, or as Shapiro and Varian (1999: 21) put it, „information is costly to produce but cheap to reproduce.“ Contrarily, revenues are obtained on a per-download basis. Generally, information goods like apps should be priced not based on the production costs, but based on the value to the customers (Shapiro and Varian, 1999). Thus, app platforms can participate in the developers' success best if they charge a per transaction commission.

Besides the optimal price setting and allocation, quality of apps is an important issue. In the computer console and game industry, game developers pay high royalties to the game console producers. This is (at least partially) to ensure that low-quality games are not profitable and to exclude them from the platform (Hagiu, 2009). Also for app platforms quality belongs to the key platform design factors. For users it is important that downloaded apps at least do not contain malware, viruses, and spyware. That is the first level of quality differentiation – and it is objective. The next level is that of usability and content quality of apps. This may be perceived differently, and is therefore subjective. App platforms differ in their attitude towards certification of the apps quality. Apple is known for its quite rigorous approach: they review all apps before placing them in the AppStore. Other platforms like Android market do not have a pre-placement review process, but they delete low-quality apps once in a while. In addition to these kinds of quality-certification processes, every app platform has a ranking mechanism in place so that users might indicate the subjectively perceived app quality by rating and commenting it.

Theoretical analysis shows that on two-sided markets the side requiring higher quality (consumers) should be subsidized (Hagiu, 2009; Eisenmann et al., 2006). In reality, we observe that on platforms where a quality review process is installed (e.g. AppStore), app developers pay more. The exclusion of the low quality apps leads to higher benefits for users, larger customer base, and through the indirect network effects, to higher interest in developing for the high-quality platform. One more benefit for developers is that negative same-side effects are reduced through exclusion, reducing the congestion problem. Regarding platform quality, no general advice that would fit every situation can be given. However, it is crucial for platforms to decide whether they would be differentiated by quality or quantity. Those that cannot decide, can be easily dominated by other platforms in the one direction or the other.

4.2 Platform launch

The so-called „chicken & egg“-problem is the main issue during the launch phase. Caillaud and Jullien (2003) have used this expression in their first paper on two-sided markets. The key challenge on two-sided markets is that a platform must get both customer sides on board to do business. But as long as there are no users, no developers would join and vice versa. As explained in section 2.2 platform owners' revenues consist of two parts, the membership and the usage part. When the usage component is too small due to low numbers of participants, the membership part can be sufficient to get the platform up and running. For that to happen, the membership component of utility and profit equations must be high enough to compensate for low usage benefits. This provides an explanation also for the phenomenal success of Apple's AppStore or Amazon's market place. Due to high membership benefits, they managed to attract users first, and then developers and independent sellers followed very fast. The first implication for the platform operators is, that new entrants may avoid the „chicken & egg“ problem“ by charging low membership fees and providing high membership benefits. The second implication is that later on, platforms might want to reassess their pricing strategy and adjust pricing. In reality, we have not yet observed any major price changes. This could be an interesting avenue for research (and also for the industry), to evaluate whether such changes would be profitable and feasible in the current situation.

Once the platform is launched, openness of the platform appears to be a key strategic decision in a two-sided market (Rysman, 2009). Most app platform owners pursue a proprietary strategy, which means they have full control over the platform and therefore can capture most of the added value themselves. Following Eisenmann (2007), this is the right strategy for leaders in the market. Followers, however, might choose a more open, collaborative approach (i.e., cooperating with competitors or complementors) in order to differentiate and exert competitive pressure.

When entering into an also existing market, it is of strategic importance if the remaining market is still big enough to create substantial network effects or if it is possible to attract customers and developers from the existing platforms. Eisenmann et al. (2007) and Hidding et al. (2011) describe platform envelopment as a promising strategy for followers. Google successfully linked many platform markets to its search platform (like Google Docs or Chrome) and naturally also used this position to support Android. Through indirect network effects, market share of developers also affects users. As some key developers (Cheezburger Network, Foursquare) considered Microsoft's market share too small to justify development of a new app for the Windows Phone, Microsoft reacted by incentivizing developers. Not only did Microsoft provide developers with free phones and prime spots in its app store, in some cases Microsoft even financed the app development (Wortham and Wingfield, 2012). This is similar to the strategy of in-house complements described in Eisenmann (2007).

4.3 Platform competition

Many managers in the mobile industry wonder whether app platforms will show the „winner-takes-all“ dynamics or allow for existence of several competitors. This question is crucial for all business

areas around mobile ecosystems. Winner-takes-all dynamics emerges due to network effects and increasing returns to scale. For instance, the market for keyboards is 100% dominated by the „qwerty“-keyboard (with small variations). On the video market, VHS format wiped out Sony's Betamax video format. At the same time, there are markets where several platforms coexist. For instance, there are several web-browsers like Mozilla Firefox, Safari, Chrome, Internet Explorer. Also the market for the computer operating systems is divided between several companies (Windows, iOS, Linux and Unix). The crucial question is then, how to decide whether the „winner-takes-all“ dynamic will occur in the app platform market or not.

There are 4 conditions that follow from the two-sided market theory and make the „winner-takes-all“ dynamics probable (see Eisenmann et al., 2006; Sun and Tse, 2007):

1. It is costly to multi-home – at least for one market side,
2. There are high indirect network effects – at least for the side with high multi-homing costs,
3. Same-side effects are not negative and strong, that is, the congestion effect is not too high,
4. The goods are rather homogeneous and there is no demand for differentiation.

The first condition pertains to multi-homing. To „multi-home“ means to have access to more than one platform as explained in section 2.2. If platforms are not perfectly compatible, multi-homing incurs costs, like additional equipment or the time necessary to learn how to use other platforms. In case of app platforms the incompatibility is quite high: different app platforms use different operating systems, different programming languages and they run on different mobile devices with different functionality. For instance, it is costly to port an app that was created for iOS to Android or Windows. Developers must possess both programming languages and know the differences between them. They also must know the differences in the operating systems and in the middleware of both platforms. Additionally, developers have to buy hardware and for some platforms, membership fees must be paid. For consumers, multi-homing costs are also high. In order to use more than one native app platform, users have to purchase and carry more than one mobile device, which would be incompatible. In addition, there is a lock-in effect: if a user has spent some money and time for the apps on the one platform, she might be reluctant to switch the system. Altogether we can conclude that the cost of multi-homing is quite high for both market sides on app platforms. That supports consolidation of the market toward a single platform.

Developers can only make profits if there are users who would download and buy their apps. Hence, indirect network effects are relatively high. That causes the participants of the app market to converge to one platform. Once there is a clear leader, other platforms' chances to get enough customers diminish. Vogelsang (2010) shows that these network effects increase the possibility of entry deterrence by incumbents. As a consequence, the market leader does not exploit monopoly profits in early stages of the market, but rather in more mature stage. Hence, the second condition applies as well and reinforces consolidation.

The effect of the third condition is not as clear as that of the first two. On the developers' side, there are negative same-side effects, since they prefer to have fewer competitors. With more than half a million apps on a platform, the marginal visibility and utility of an additional app diminishes. Then other things like quality and variety of apps and good platform infrastructure become more and more important. On the users' side, there are positive same-side effect: people can share apps and communicate easily. For instance, they may use the same chat apps, some of which are also platform-specific, e.g., BlackBerry messenger. Altogether we can say that negative same-side effect might work against platform consolidation.

The fourth condition implies that if different features are needed, there might be room for niche building and therefore for more than one platform. Hence, the effect of the fourth condition is also not obvious. On the users' side, there are different customer segments: there are, for instance, business customers with preference for security, very high quality, and ability to pay for it on the one hand, on

the other hand, there are budgeters who are not willing to pay much, and nerds who want the opportunity to adjust apps as they wish, etc. All these customer groups have different needs. While it is possible to serve all of them on one platform, it allows for specialized platforms to co-exist. Also developers are different, for instance, in terms of their motives (Harhoff et al., 2003). Hence, there are still opportunities for niche-building and co-existence of several platforms.

The factors discussed above arise from the two-sided market theory and impact the app platforms' business models and strategy. Besides these factors, there are several other aspects that are not part of two-sided market theory but must be taken into account when talking about app platforms' strategies. These are for instance, brand image of the platform owner and the platform ecosystem, possible disruptions like new coalitions between key players, new mobile devices, trends from the neighboring industries like smart home, and question regarding possible vertical integration. These aspects must be taken into account when considering strategic issued on app platforms.

Summarizing all said in this subsection, we can conclude that the app platform industry shows a high tendency towards convergence but it leaves room for niche building and differentiation. Moreover, this market is subject to a wide range of innovations, including technologies and services. It is crucial to develop unique features, bundle products, and provide incentives to complementors to innovate in order to stay competitive. Gawer and Cusumano (2008) call this a „tipping strategy“ for platform owners. The key issue for the incumbent app platforms is to push further for consolidation. Possible challengers have to look for their niche to be successful. And developers should not spread their resources too much and carefully scan the market for disruptions and trends towards consolidation.

5 Conclusion

In this paper we have analyzed issues and strategies of the app platform industry from a two-sided market perspective. We combined the strategic management literature on platforms with the economic literature on two-sided markets in order to have a solid background for our analysis of the app platform industry. We have analyzed the current industry situation and trends, platform business model, and key stakeholders. Building on existing literature and the industry analysis, we have discussed key strategic issues in the app platform industry. Along the life cycle of a platform (launch, design, and competition) we developed several management recommendations and perspectives for this industry.

We have seen that two-sided market business models require consideration of strategic issues not present in traditional models. These issues may pertain to all development phases, including platform design, launch, and competition. For platform design, pricing represents the key strategic challenge. Two-sided market theory suggests that in equilibrium fees should be proportional to the price elasticities (contrary to the usual economic intuition). Furthermore, it provides suggestions regarding kinds of fees to charge (usage, membership, one-time or periodical fees). Subsequently, we have discussed the impact of quality on platform design. Quality is besides prices the key parameter that determines platform design. On two-sided markets, the side that requires higher quality gets subsidized. During platform launch, the „chicken & egg“ problem occurs. Two-sided market theory helps to understand and reduce or avoid it through setting of an optimal membership component. Platform competition pertains to the possible market structure – „winner takes all“ dynamics and the number of competing platforms that can share the market. Four factors specific for the two-sided markets influence the market structure: multi-homing, size of indirect network effects, same-side effects, and differentiation opportunities. Our analysis points out that the app platform industry shows a high tendency towards convergence but leaves room for niche building and differentiation. The key implication for the incumbent app platforms is to push further for consolidation while possible challengers have to look for their niche to be successful. For developers it is crucial to scan the market for disruptions and trends towards consolidation in order to efficiently allocate their resources.

For the future research agenda, we suggest three points for further investigation from a theoretical as well as from an applied perspective. The first pertains to the pricing strategy reassessment for different development phases, which seems to be recommendable from the theoretical point of view but is not observed in reality. However, as important as the pricing aspect in these markets appear, other factors, like creating a trustworthy relationship with complementors, encouraging internal and external innovation, and reacting strategically to competitors' actions (Cusumano and Gawer, 2002) must not be neglected. The second aspect concerns empirical evaluation of compliance to the fee allocation rule. This requires empirical estimation of price elasticities of the two market sides on different app platforms. The third factor that appears interesting is the level of openness (Eisenmann (2007) and the strategic perspective of developers. Collaboration of developers and openness of platform naturally has a big effect on this side of the market which deserves further analysis.

Altogether, two-sided market theory proves to be helpful in addressing strategic issues of app platforms and provides tools to analyze business models and during all development phases.

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