

The Chicken or the Egg Problem: Strategies for Populating Multi-Sided Business Platforms

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Submitted to the System Design and Management Program
In Partial Fulfillment of the Requirement for the Degree of

Master of Science in Engineering and Management

at the

Massachusetts Institute of Technology

May 2020

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Abstract:

Platform businesses such as Google, Amazon, VISA and Apple are major players in today's economy. But how do platform businesses start? Why would a customer visit Amazon Marketplace if there were no products, and why would businesses sell products on Amazon if there were no customers? This is a critical challenge for new platforms, and is known as the Chicken or the Egg Problem. This paper explores both successful and unsuccessful previous attempts to solve this challenge, identifies critical strategies that were used, and outlines recommendations for future platform businesses.

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Acknowledgements:

I would like to thank my family and friends, for supporting me through my time at MIT. Particularly Deb, Larry, Zoë and Colin, who provided feedback on this document.

Also, I would like to thank my advisor, Professor Cusumano, for working with me remotely to complete this thesis during COVID-19, a difficult time in the MIT and global community.

Draper Laboratory, where I have been employed as a Member of the Technical Staff since I graduated WPI, has provided generous flexibility and funding as I complete my education. I am lucky to have the opportunities I have had while employed by this institution.

Finally, I'd like to thank the MIT community as a whole. As an officer on the MIT Rowing Club for the last 7 years, I've had the opportunity to travel and compete all over the world, build valuable leadership skills, and form lifelong friendships. As a researcher in Sloan's Cybersecurity group, I was able to expand the way I approach problems. As a member of countless groups and projects, I've had the chance to learn with some incredible and fun people. Thanks!

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1 Introduction

Platform businesses, which include everything from Google and Facebook to the Yellow Pages, are an increasingly important part of the economy and our personal lives. Unlike traditional product-based business, platform businesses are characterized by having two or more market sides that interact through the platform. For example, a man selling apples to customers would be considered a conventional product business. A man who owned a street market where farmers sold produce to individuals might be said to own a platform business, or more specifically, a transaction platform.

While platform businesses are nothing new, the internet and other connectivity technologies have enabled them to grow in global importance over the last two decades. As modern technology platforms grow in power and market share, there is increasing incentive for new and existing businesses to seek a strategy to create a platform with existing resources. While there are many benefits to pursuing a platform strategy, it should be noted that competing as a platform is not necessarily the best strategy for many businesses and markets. In many cases, success and growth can be achieved without a platform strategy, or by joining an existing platform.

If a new or existing business does choose a platform strategy, one of the first and most critical hurdles to overcome is the “Chicken or the Egg problem.” If I want to start a new street market, why would farmers come to sell produce if there are no customers there? Why would customers come to my market if there are no farmers and no produce? This is a difficult question that varies from case to case and industry to industry. The purpose of this thesis is to explore strategies that have been used across various industries and situations, which strategies worked, which didn’t, and what can be learned from these cases. It is hoped that these insights will provide a basic strategic framework for new platforms to not only enter their markets but increase their chances of winning in their markets.

2 Background

2.1 Typology

In some industries, a platform is a solid foundation upon which something is built. In others, it is a product line with common parts, or even a stage on which a performance occurs. The goal of this section is to clarify the terminology used and create a common vocabulary to discuss platform strategy.

2.1.1 What is a Platform?

In this thesis, a platform will be considered any type of business that produces the majority of its value by facilitating interactions between two or more groups. For example, Amazon is a platform business because they extract value from bringing a group of sellers together with a group of buyers. However, if most of the products sold by Amazon were also produced by Amazon (such as Amazon Basics), this would cease to be a platform.

Throughout this paper, there will also be references to “Multi-Sided” platforms or a platform with a specific number of dimensions. This is a reference to the number of groups brought together by a platform.

A 2-sided platform is the simplest type of platform. It brings together two groups of people, such as buyers and sellers. The image below shows this type of interaction.

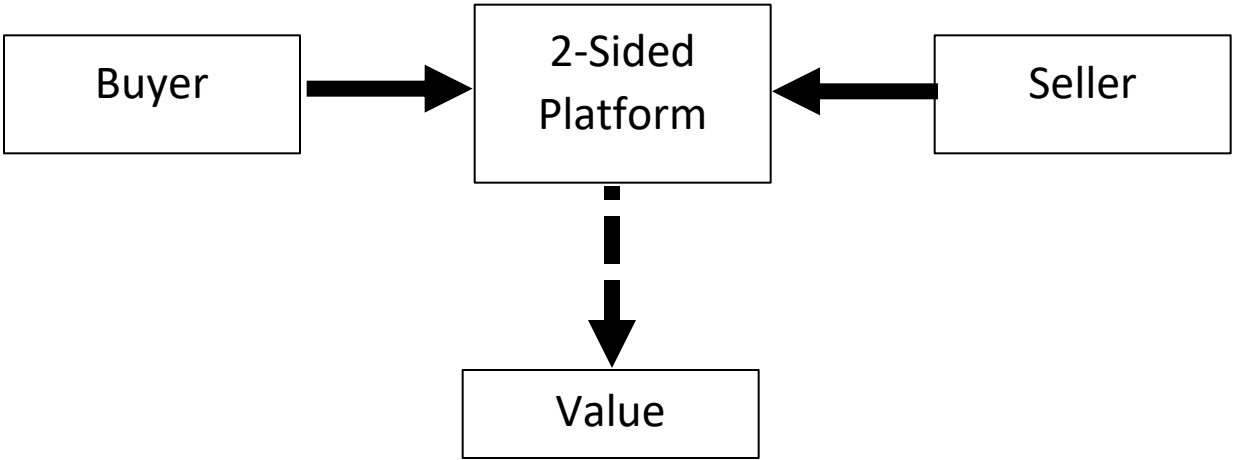


FIGURE 1: EXAMPLE OF A 2-SIDED PLATFORM

Of course, in the above example, advertisers may also benefit from gaining access to both the buyers and the sellers, to promote the product or service. This could be handled within the platform, increasing its dimensionality to a three-sided platform as shown below:

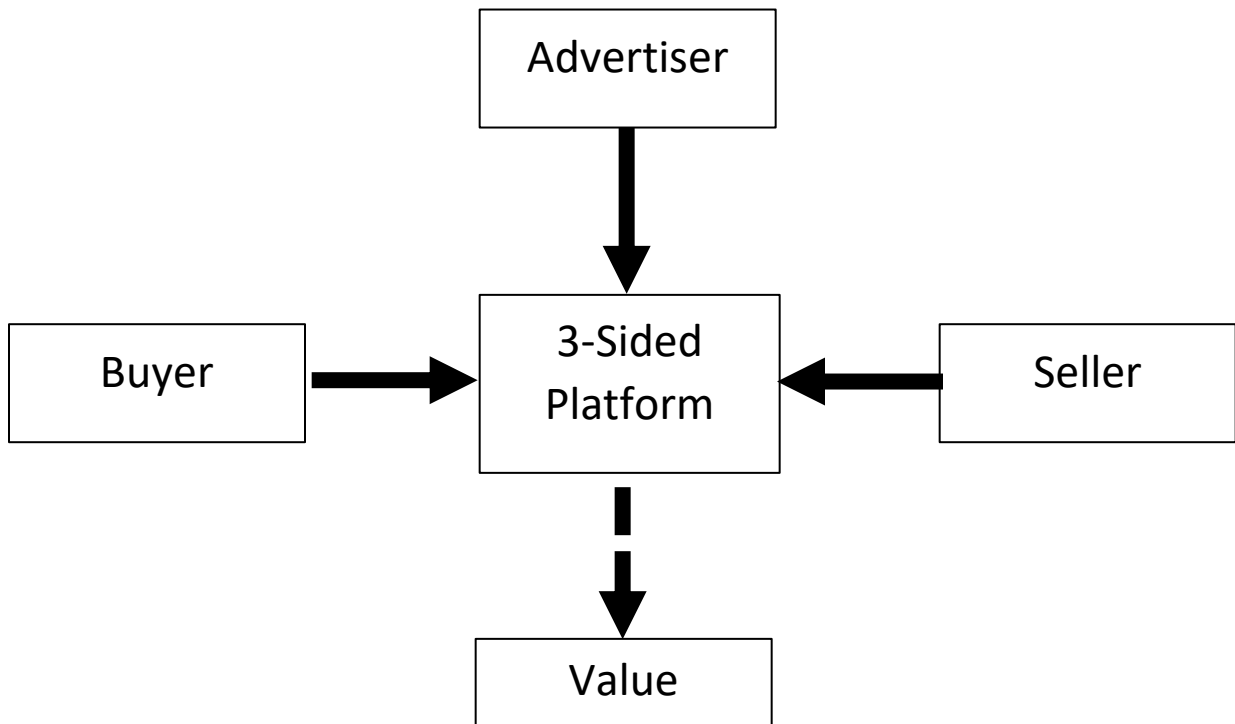


FIGURE 2: EXAMPLE OF A 3-SIDED PLATFORM

Although many large platforms seem to be 2-sided platforms upon first examination, it is often the case that as a platform grows, they increase in dimensionality by allowing additional groups to generate value through interactions on their platform.

2.1.2 Transaction Platforms

Transaction platforms are platform businesses that extract their value by facilitating transactions over their platforms. These often take the form of product marketplaces, such as Amazon or Alibaba, but also include companies like AirBnB and Uber who facilitate the exchange of services. Although this type of platform has existed for hundreds of years in the form of physical marketplaces and service middlemen, the rise of digital connectivity creates an opportunity for marketplaces like these to grow into dominant market positions.

2.1.3 Innovation Platforms

Innovation platforms derive their value off common technological building blocks shared by the owner and ecosystem partners [1]. The iPhone is a good example of an innovation platform. When the iPhone was released, it was a simple product with an innovative touch screen and some basic functionality that resembled the functionality of equivalent cell phones in the market. The iPhone became an innovation platform when it shared key technologies (the phone and OS) with other app developers, creating an ecosystem that provided increased value to customers.

2.1.4 Digital Platforms

Perhaps the greatest change in platform theory over the last two decades has been the arrival of Digital Platforms. These are platforms that access a wide user-base through the use of internet and digital connectivity technologies. These include both innovation platforms and transaction platforms and have created an environment where network effects can reach a huge segment of the market very quickly.

For example, when Facebook first began it was not dissimilar to a traditional, exclusive social club. The primary differences were that it was free and quickly became available to anyone with an internet connection. As individuals joined the platform, they generated rapid network effects that encouraged others to join the platform. Now, Facebook has over two-billion users [2], which could have never been achieved without the use of network effects over a digital medium.

2.1.5 Product Platforms

Although product platforms are not typically subject to the Chicken or the Egg problem and do not meet the definition of platforms as described in this thesis, it is important to understand what they are and how they differ from a multi-sided platform.

A product platform is a term used to describe a group of products that all share common parts, modules, frames or core technologies. Making products with a product-platform strategy provides the producer a competitive advantage by allowing them to reuse parts of the production and R&D for multiple products under a single umbrella. Perhaps the most well-known example of this was the product platform strategy pursued by General Motors during the 1980s, where they produced luxury sports and economy cars that all shared roughly 90% of their parts [3].

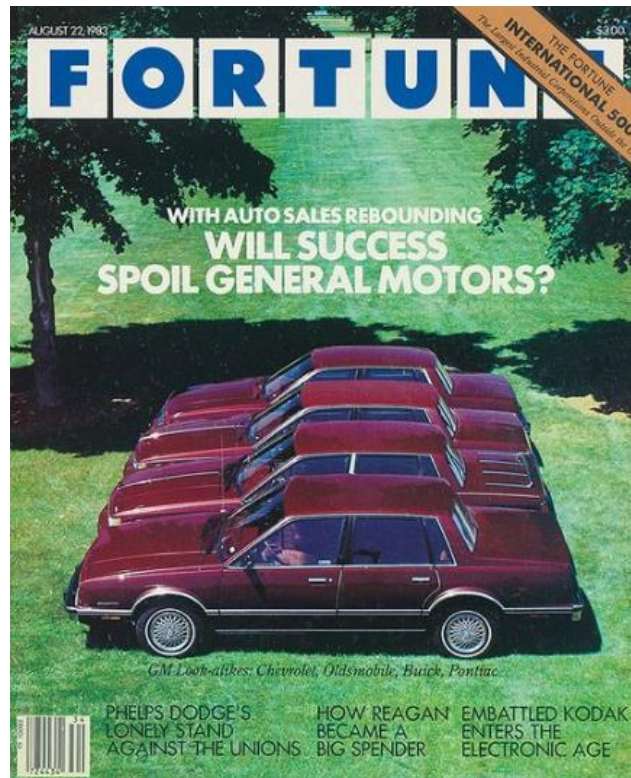











FIGURE 3: GM PRODUCT PLATFORM STRATEGY IN THE 1980s [3]

Naturally, this strategy does incur risks in branding, product performance and functionality which must be balanced with the production and technical advantages.

In this thesis, this type of platform will continue to be referred to as a “product platform,” which is inherently different than a business platform due to its lack of a multi-sided business model.

2.1.6 Typology Summary

The below diagram illustrates how this thesis defines different platform categories, and provides examples of well-known companies that are considered platform businesses. It also shows the sides of these platforms.

Business	Platform Type	Side A	Side B	Side C*
	Business Platform	Cardholders	Merchants	Other Banks
	Digital Business Platform	Buyers	Sellers	Advertisers
	Business Platform	Phone Users	App Developers	
	Digital Business Platform	Riders	Drivers	
	Business Platform	PC Manufacturers	Software Developers	Peripheral Manufacturers
	Digital Business Platform	Web Developers	Software Tool Companies	
	Digital Business Platform	Guests	Hosts	Photographers & Cleaners
	Product Platform	Car Consumers		
	Product Platform	Industrial Consumers		

*Side C was populated after the Chicken or the Egg problem was solved for many platforms listed here

FIGURE 4: DIAGRAM OF PLATFORM DEFINITIONS AND SIDES

2.2 Network Effects

Network effects are an essential aspect of how platform businesses start and grow, and are a separate field of study. The basic principle is, as members are added to a network, the value of the network increases for any given user. If you think of a network like early phones, a single phone on its own has no value because the lone user has nobody to call. As phone providers added more phones to the network, each individual phone provided more value to the users because they now have the capability of calling more people. Thus, we will define network effects as networks where the value of the network increases for the user as the number of users increases. This can be generalized to any platform that has positive feedback loops as new participants join the platform.

There are multiple ways to model these networks, and some networks scale differently in user value as new users are added. In a network where each member shares access to a single resource, such as access to a mainframe computer, the value of the network is roughly equal to the number of users that can access the resource ($V=n$). In a network like the internet, where value is gained from the interaction of a computer with every other computer, the value of the overall network is roughly equal to the number of people in the network squared ($V=n^2$). Finally, if groups can interact with other groups in a network, this yields an even higher value growth ($V=2^n$).

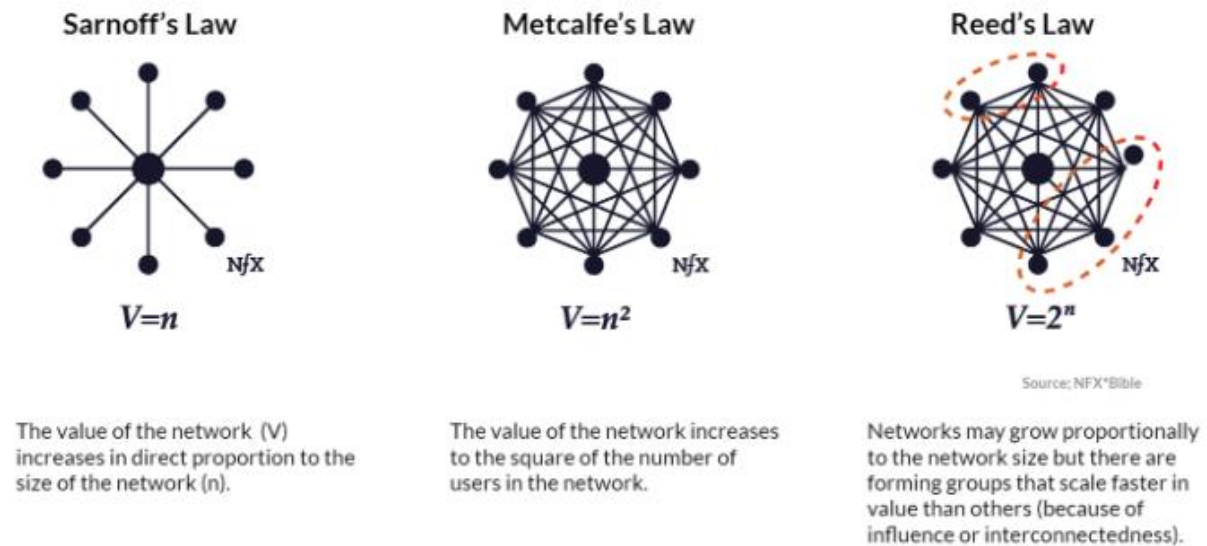


FIGURE 5: TYPES OF NETWORK EFFECTS [4]

While these are great ways to visualize network effects and begin to model their growth, most real-world networks behave differently, or use a combination of these laws. In a business platform, the value is often influenced from factors such as technology, user experience, brand perception and standalone value proposition.

2.3 Resource Based View

The basic principle of the Resource Based View (RBV) of a firm is that a company can achieve the best competitive advantage by leveraging its internal resources [5]. If a firm looks inwards and innovates new ways to use the resources it has, it may achieve greater success than a firm that looks outwards at market opportunities and builds a new set of resources to compete. For example, when Amazon developed AWS, a highly successful software infrastructure, it did so by looking at what resources it had. Amazon executives found they had a suite of expertise and technologies needed to scale internet companies such as themselves, and found a way to exploit them. Had they looked outwards for

opportunities, they may have entered markets where they would have needed to build a new set of resources and could not have competed with established competitors.

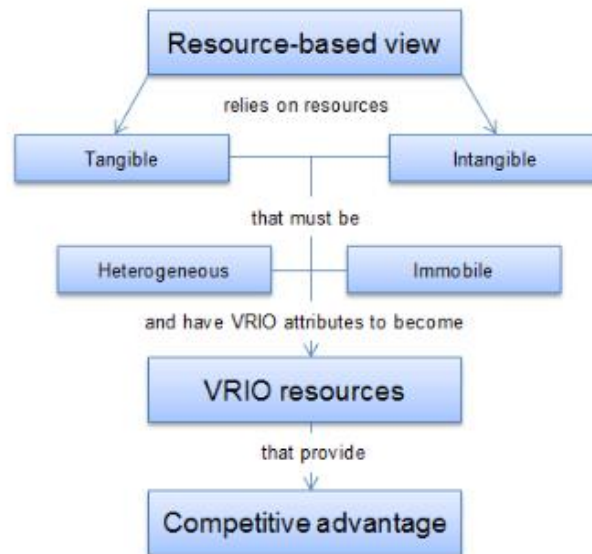


FIGURE 6: RESOURCE BASED VIEW OF A FIRM [6]

The diagram above shows a breakdown of the resource-based view. A few definitions are provided below:

Tangible: Able to be bought and sold, such as a warehouse.

Intangible: Unable to be easily purchased, often unique to the firm. Includes skillsets and reputation.

Heterogeneous: An assumption that all companies have a different, unique set of resources and thus perfect competition never exists between firms.

Immobile: An assumption that resources cannot easily be traded by firms. Resources that are highly immobile are often Intangible, such as reputation.

To be a VRIO resource which can provide lasting value, a given resource must be [6]:

- Valuable
- Rare
- Costly to Imitate
- Firm must be Organized to capture value

This paper will reference the RBV and underlying theories, however, will not analyze each case using this method. It is important to understand the fundamental argument that a company can achieve maximum competitive advantage by looking inwards, which is a reoccurring theme in this paper.

2.4 What is the Chicken or the Egg Problem?

When starting a new platform or attempting to bring a platform into a new market, one of the greatest challenges is how to simultaneously bring together two or more market groups. Because the various market sides in a platform benefit and derive value from each other, there is rarely an incentive to join a platform that lacks the complementary groups. This often leads to a period of high spending, where platforms must provide subsidies on one or more sides, populate the platform themselves, or endure high customer acquisition costs.

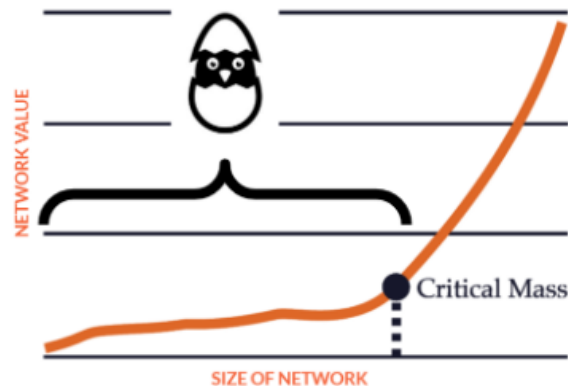


FIGURE 7: ILLUSTRATION OF PLATFORM DEVELOPMENT PERIOD [4]

Once the network achieves a certain value, that value is enough to entice users to join on their own. This is known as critical mass or the tipping point. Knowing where that point is extremely important, and allows firms to predict whether it is worth starting a platform.

Some quantifiable methods exist to achieve this (system dynamics, network theory), but often in a real marketplace it is hard, if not impossible, to predict [7]. Local experimentation is often easier and more practical to find the point of critical mass. For example, AirBnB found that it took about 300 homes to achieve critical mass in a particular city, while Open Table found it only required about 25 restaurants [4]. Once these businesses knew their critical mass, they were able to plan and scale their growth into new cities.

The goal in “solving the Chicken or the Egg problem” is to achieve critical mass in a network before the firm runs out of money and resources, or the cost of populating the network becomes greater than the long-term value of the network.

2.5 Existing Strategies for Populating Multi-Sided Platforms

Some strategies do exist to populate a multi-sided platform. Not all strategies are amenable for all platforms, and it is difficult to know what strategy will work best in any particular situation. When examining these strategies in relation to any particular platform, it is important to understand how each side of the platform derives value, how you expect the platform to grow, and how you intend to facilitate this value.

The strategies that are most typically used by today's networks can be generalized into three categories [1]:

1. **Create Standalone Value for One Side:** An example of this is the beginning of YouTube. Before advertisers entered the platform, there was value in simply uploading a video for entertainment, or to share with friends and family.
2. **Subsidize One or More Sides:** Uber is an example of a company that enters new markets by subsidizing both sides of the market. By providing large bonuses for new drivers and subsidies for ride costs, Uber has populated a huge network of riders and drivers. This requires a huge amount of capital, and is a risk if the value to the consumers is not enough once the subsidies are removed.
3. **Onboard Two Sides Simultaneously:** Often only practical in small beachheads, this strategy was famously used when AirBnB chose to launch at several small events where hotels were at capacity. They were able to convince homeowners to host using their internal network, and guests paid due to the high value of being in that location at that time.

2.6 Coring vs. Tipping

There are two strategies that are considered ways to win in a platform marketplace. These are Coring and Tipping.

Coring, which is closest to the theme of this paper, involves building a marketplace from scratch [8]. For example, Google built up a core by solving the systemic problem in the internet by improving upon existing search technologies. Google then allowed web developers to use this core search technology within their own sites. Once this core existed, Google was able to leverage it well as a business, and eventually open it up to advertising companies.

Tipping is a strategy that can be used when a platform or system is already in place, but faces strong competition that prevents it from dominating the market. An example of this is Microsoft's Internet Explorer (IE) vs Netscape in the early days of internet browsers. While both tools offered similar

functionalities, IE won the marketplace by bundling with its operating system and removing barriers to entry. This tipped the market to favor IE, which became the dominant internet browser for the next decade.

STRATEGIC OPTION	TECHNOLOGY ACTIONS TO CONSIDER	BUSINESS ACTIONS TO CONSIDER
<p>Coring</p> <p>How to create a new platform where none existed before</p>	<ul style="list-style-type: none"> • Solve an essential "system" problem • Facilitate external companies' provision of add-ons • Keep intellectual property closed on the innards of your technology • Maintain strong interdependencies between platform and complements 	<ul style="list-style-type: none"> • Solve an essential business problem for many industry players • Create and preserve complementors' incentives to contribute and innovate • Protect your main source of revenue and profit • Maintain high switching costs to competing platforms
<p>Tipping</p> <p>How to win platform wars by building market momentum</p>	<ul style="list-style-type: none"> • Try to develop unique, compelling features that are hard to imitate and that attract users • Tip across markets: absorb and bundle technical features from an adjacent market 	<ul style="list-style-type: none"> • Provide more incentives for complementors than your competitors do • Rally competitors to form a coalition • Consider pricing or subsidy mechanisms that attract users to the platform

FIGURE 8: CORING AND TIPPING STRATEGIES, TAKEN FROM [8]

The above table shows the actions used in Coring and Tipping, and when to consider these actions.

2.7 Context in Today's Marketplace

Multi-sided platforms have always existed. From shopping malls to sports teams, many common place businesses have functions that operate as platforms. As connectivity technology developed and networks could be larger, platform business models began to play an increasingly important role in the marketplace. Giants such as AT&T were some of the first technology-based platforms, and set the foundations for the companies we see in the economy today.

2.7.1 Impact of the Internet

Before the internet, companies could only expand their networks slowly. Sears catalog connected sellers with buyers (although highly curated), but was limited by the speed of the rural mail system. AT&T grew by connecting more and more phone lines over half a century, with a huge marginal cost to develop its infrastructure. This led to an economy with slow growing platforms that could build clear, long lasting competitive advantage through their sustained resource growth.

As the internet matured, and the world ultimately passed through the dotcom bubble, it became clear that the absence of marginal costs and the ease of connectivity had created a new norm for business competition. New business – such as widely known platform giants Google, Amazon, and Facebook – could rapidly harness network effects and achieve unprecedented growth. Meanwhile, older, established business were unable to effectively leverage their resources to remain competitive.

2.7.2 Current Trends

The emergence of cellular technology showed that the traditional internet was not the only way to connect users and build platforms in today's marketplace. Emerging fields are currently battlegrounds where startups and venture-backed firms struggle for market share in a winner-take-all environment.

Some of these current emerging marketplaces include:

Internet of Things (IoT): Everything from refrigerators to jet engines are becoming connected to the internet. This provides value such as reliability and maintenance data, monitoring consumer trends, and providing a new interface for the user to the web platforms. But it leaves a gap for platform businesses to compete over providing services, operating systems, and physical devices.

Cloud: With players like Amazon Web Services, Google Cloud and Microsoft Azure, the cloud is already a competitive field where Machine Learning and Artificial Intelligence (ML/AI) are an entrenched part of how we interface with the internet. From video recommendations to spam filters, machine learning is becoming more commonplace by the day. Yet, few platform businesses have dominated this space, with most focusing on specific niches such as facial recognition or recommendations.

Quantum Computing: Perhaps the most fledgling field for platform competition, quantum computing offers the ability to perform optimization problems that would take years for conventional digital computers. This will create new businesses in cybersecurity and encryption, advertising, and change the way we do machine learning. With some early technological leaders, it is difficult to tell who, if anyone, will capture quantum computing as a platform market.

All of these emerging marketplaces have companies that are asking “How do we solve the Chicken or the Egg problem to Achieve Lasting Value and Revenue?” Hopefully this paper sheds some light on strategies that could be employed in these marketplaces, as well as existing marketplaces that could benefit from a platform approach.

3 The Chicken or the Egg Problem in Transaction Platforms

This section examines examples of transaction platforms that were clearly successful or unsuccessful in solving the Chicken or the Egg problem. It then explores the similarities and differences in both strategies and techniques that were used as the platform developed, and how they contributed to this success or failure.

3.1 Successful Transaction Platforms

3.1.1 Amazon Marketplace

One of the most famous and relevant examples of successfully solving the Chicken or the Egg problem is Amazon.com. Audible, books, Amazon Fresh, Amazon Marketplace, AWS, and other complementary platforms demonstrate, at least externally, that Amazon has mastered the art of building platforms across multiple domains. This section will explore the narrative of how Amazon became a market leader, and analyze the strategies utilized as they pertain to the Chicken or the Egg problem.

When Amazon.com launched in 1994, it began by selling books online – but by no means was Amazon the first to market here. The leader in online book sales was BSU (Book Stacks Unlimited), with over 500,000 titles in stock by October of 1994 [9]. Barnes and Noble, the incumbent in their industry, dominated the book industry with brick and mortar stores.

Amazon selected this carefully for several reasons. Jeff Bezos was quoted in saying “There are no 800-pound gorillas in bookselling,” meaning that he did not expect aggressive incumbents to stomp out a new market entrant. He also speculated that it would be easy to translate into similar markets, such as CDs or videos.

It is important to note, that at its launch, Amazon was not a platform business. Amazon resembled an online book retail store, where roughly 2000 titles were stocked in their warehouse, and the other roughly 1M books on their site were procured from wholesalers as needed (mostly Ingram, located near Amazon's warehouse). The books purchased as needed from wholesalers were expensive to order and re-package, and Amazon.com lost money on each book they sold.

To compensate for these losses, Amazon raised money from private investment firms and IPOed earlier than expected, leaving them with roughly \$12M cash on hand in 1996 [9]. This is four-times greater than the amount held by Barnes and Noble, and would prove to be a critical resource.

Following their IPO, Amazon focused on developing the following resources:

- **Procurement Logistics:** Included the development of multiple parallel supply chains focused on shipment times and costs.
- **Store Operations:** Staffed roughly 250 people to handle shipments, returns, new postings, etc.
- **Software Development Capabilities:** Developed software to handle both front-end book sales and back-end operations. Named one of the 10 "Best Web Sites of 1996" by Time Magazine.
- **Customer Base:** Spent heavily on marketing, with an emphasis on retaining customers.

It was not until 1999 that Amazon began to allow third party sellers on a case by case basis, transitioning from an online store to a budding transaction platform. In 2006, Amazon truly became an open transaction platform by launching Fulfilled by Amazon (FBA) which allowed external businesses to sell their products directly on Amazon's site, using Amazon's distribution centers. At this point, Amazon had effectively solved the Chicken or the Egg problem by populating the buyer side of the market. If a business chose to sell on Amazon.com, they would have access not only to Amazon's significant customer base, but also the distribution, software and operations resources Amazon had developed.

Share Of Physical Gross Merchandise Sales On Amazon

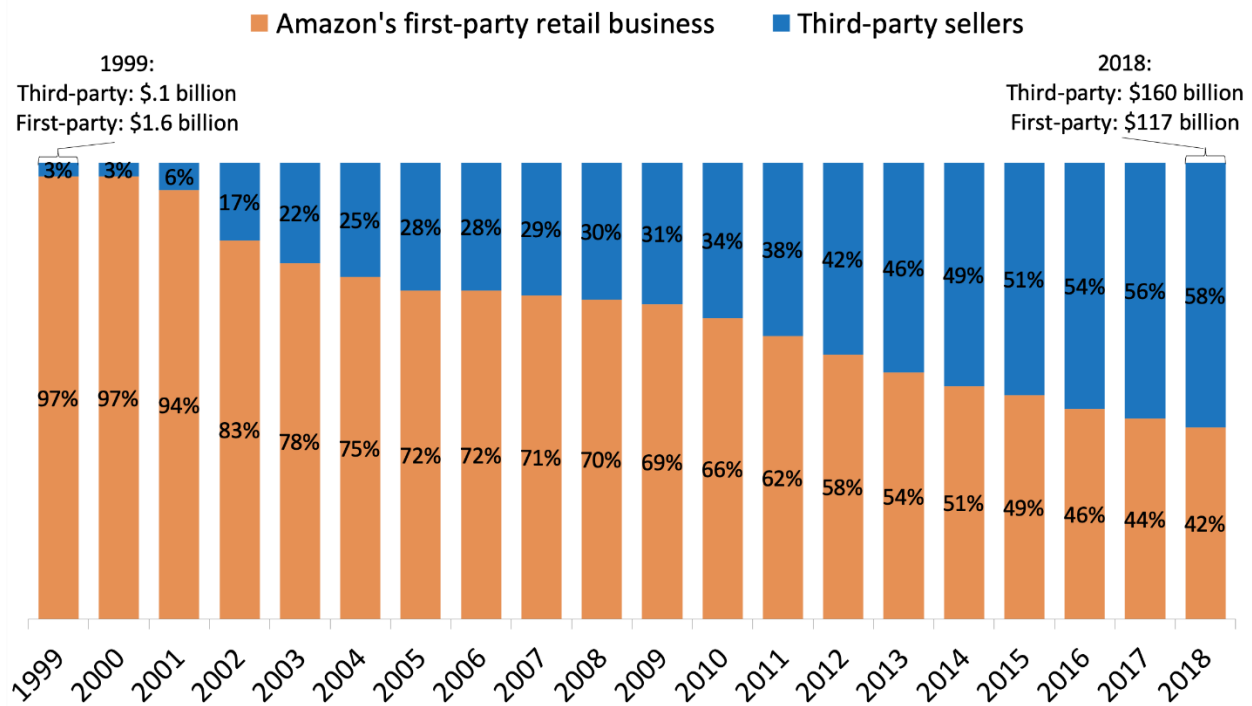


FIGURE 9: GROWTH OF AMAZON AS A PLATFORM IN TERMS OF THIRD PARTY SALES [10]

Based on the figure above, Amazon did not exceed 50% of its business operating as a transaction platform until 2015, almost 20 years after it launched. Obviously, Amazon has achieved dominance in its markets, but how much of that early lead can be attributed to its platform business? In many ways, Amazon was an established company with established resources before it attempted to solve the Chicken or the Egg problem.

Amazon's success was not based on any particular strategy, but rather a mix of strategies that were used in a rough sequence throughout the company's development into a digital transaction platform.

These strategies included:

1. **Start with a Beachhead:** Amazon's current marketplace includes millions of product categories. However, it was populated with only books at first. With limited resources, conventional entrepreneurial strategy of beginning with a small part of the market was used here, and later expanded as the platform grew.
2. **Self-Populate One Side of the Market:** Amazon started as a pure retail company, with only one market side, the consumer market. It used its resources to build this market in a conventional way.
3. **Build Standalone Value for One Side:** To self-populate this consumer side, value had to exist for these consumers. Amazon achieved this by building out as an online store where customers could expect to purchase things securely and reliably.
4. **Build Resources to Supplement the Platform:** Amazon was always more than a web marketplace where items could be purchased or sold. It produced significant value through its shipment infrastructure, fulfillment services, logistics, etc. This allowed them to attract customers and later sellers faster than rivals.

This list of strategies should not be considered the key to Amazon's success, nor a recipe for future successes for retail platforms. In many ways, Amazon is a conventional company that started at the right time, exploited emerging technology, and had a strong leadership team. These strategies represent the basic framework Amazon used to solve their Chicken or the Egg problem that could be compared or used by other companies in other situations.

A way of examining the resources and progression of Amazon is shown below. This diagram shows how Amazon built up its resources before launching as a Platform business.

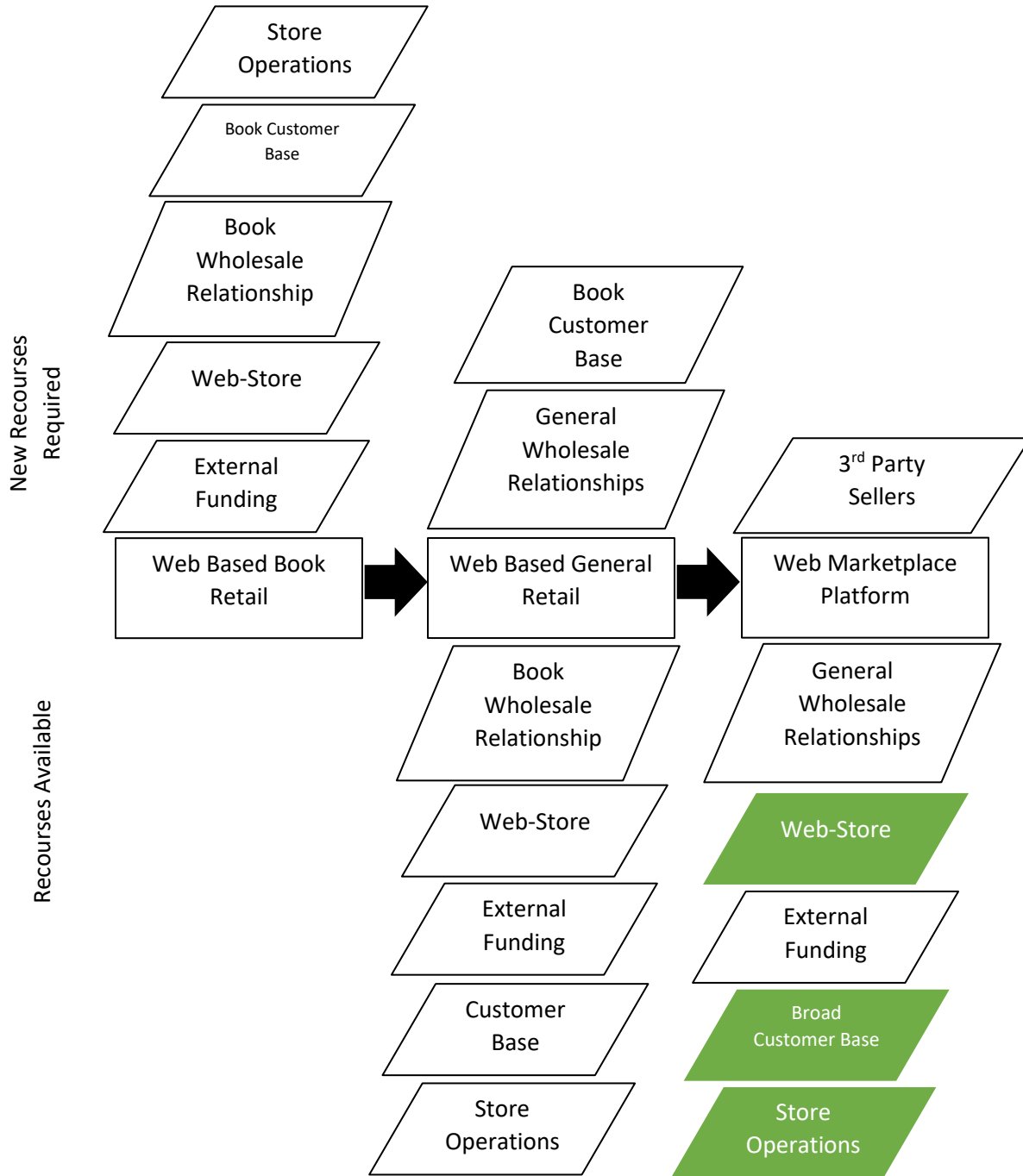


FIGURE 10: RECOUSE PROGRESSION FOR GENERATING VALUE FOR SELLER SIDE. HIGHLIGHTED RECOUSES WERE USED TO ATTRACT SELLERS.

3.1.2 AirBnB

AirBnB began as “Air Bed and Breakfast,” a site where two founders rented out air mattresses in their loft for \$80 per night. Unlike Amazon, AirBnB transitioned to a platform business within the first several weeks of operation and never truly operated as a standard BnB. To achieve this, they brought on a third founder who developed a simple website to allow for a 2-sided platform model, where other property owners/tenants could upload photos of their property with set price per night [11].

After the initial launch with a blog-based website, they had achieved only three users. The founders developed an improved website, and decided to wait to unveil it at a large local event. They chose South by Southwest, a music and film festival where local hotels often fill up and charge peak rates. During this festival, they were able to achieve two bookings [12].

Although the South by Southwest festival was not a huge monetary success, they were able to use the knowledge gained to make a debut at a larger event, an election rally for Barack Obama. At \$40 per night, this generated the first cash flow through the organization – an astounding \$30,000 [12].

This cash flow enabled the first initial seed funding (\$20,000), which enabled continued operation of AirBnB [13]. Even after this small injection of cash, the founders were not able to grow this platform. With a revenue of approximately \$200 per week and significant marketing costs, they had not yet successfully solved the Chicken or the Egg problem [13].

At this point, the founders began user testing, and closely examined why a customer would or wouldn't choose a home. They found that the few homes with attractive photos archived the most bookings, not always the ones with the best location or facility. However, up until this point, it was the hosts responsibility to take photos of the apartment. This was usually done on a cell phone, by non-professional photographers.

To help kick start the platform, the founders spent time in New York City, and photographed each New York apartment professionally [14]. Providing this marketing service instantly doubled their revenue (\$200 to \$400), which began to rapidly rise in the following weeks [14]. This increased user base allowed for the start of network effects, as well as a possible creative solution to the Chicken or the Egg problem.

At this point in the market, similar sites existed. Vrbo and other platforms shared the same basic business model, and there was certainly potential for a winner-take-all-or-most scenario. Whereas these existing platforms focused primarily on vacation rentals (lake houses, cabins, etc.), AirBnB initially differentiated itself as an urban option, allowing a customer to rent rooms or apartments in cities [11].

To achieve success, AirBnB had to grow quickly. If it did not want to risk being overtaken in its own urban market, AirBnB needed network effects greater than that of its rivals. While it has solved the Chicken or the Egg problem on an extremely local level, it needed a standardized way to do this across multiple market segments.

Below is an example of one framework used to examine these network effects on a multi-sided platform. In this diagram, we can see the conceptual effects of each new incremental guest or host on the AirBnB platform. If AirBnB planned on growing only through network effects, it needed to ensure the positive incremental effects outweighs the negative in each of the below quadrants.

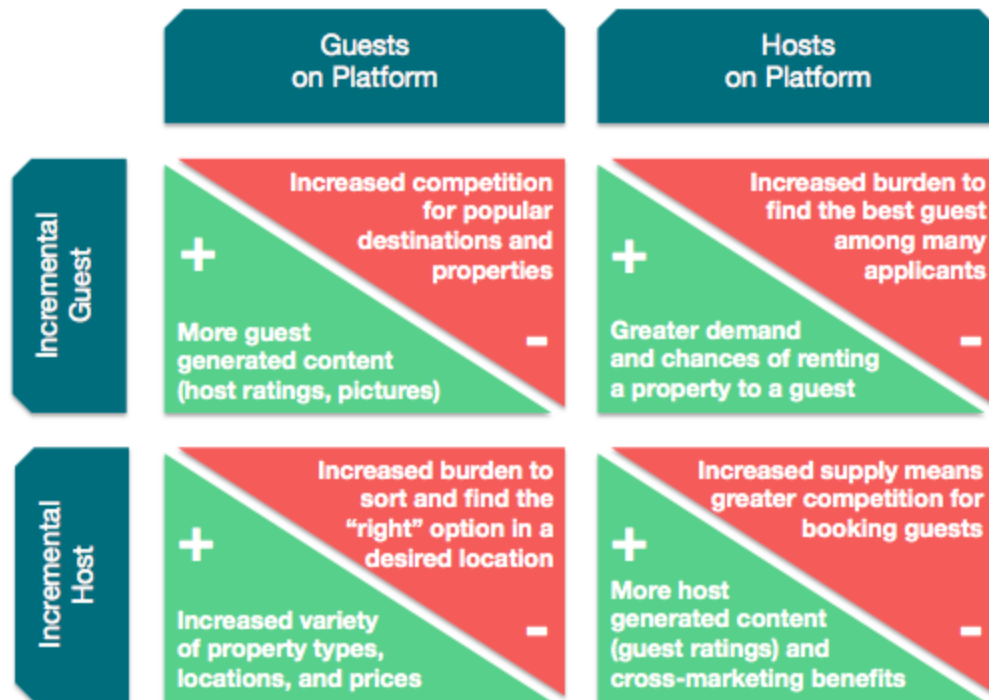


FIGURE 11: HOW NETWORK EFFECTS CAN BE POSITIVELY OR NEGATIVELY IMPACTED BY EACH INCREMENTAL AIRBNB USER

[15]

For example, in the incremental effect on the guests on the platform quadrant, additional guests above the capacity of the platform would create increased competition, which would be less appealing for the guests. This could be counterbalanced in turn by increasing the host side of the market. While one does attract the other, it would seem important to monitor and guide the market such that the imbalance of these two is never so great as to cause negative effects. AirBnB was able to achieve this balance by carefully selecting markets, controlling marketing to each side, and creating a business model that allowed for supply and demand pricing.

Because of Airbnb’s growth in only millennial urban markets, incumbent hotel chains did not initially see them as a threat [11]. They were seen as a niche solution for backpackers or lower income students, which was not a key market for any of the largest hotel chains.

While it is true, they initially did not take a large amount of the market, AirBnB was responsible for forcing hotels to charge less during peak seasons or events. For example, when colleges graduate in Boston, hotels are able to increase prices significantly and earn extra revenue. AirBnB provided additional capacity during these surges, and eliminated the typical price spikes. In response to this and a perceived risk to their business, hotels pursued strategies to gain back the millennial market segment. These strategies included making hotels a gathering place for the local community, custom artwork in rooms, and creating hotel brands that cater to younger clients. Some have also invested in their own platforms, such as AccorHotel's "One Fine Stay" [11], in the hopes of integrating these experiences. After the success of solving the Chicken or the Egg problem in the accommodations market, AirBnB is currently leveraging this customer base to expand into the greater hospitality market. Using its current customer base, AirBnB is attempting to create a third side to its platform that connects local tourism groups to customers. By leveraging its network to create new complementary market sides, AirBnB is hoping to own the travel experience.

This progression of network effects in AirBnB is not uncommon among growing platforms. This is a great way to use the existing value to generate additional revenue after solving the Chicken or the Egg problem, but often requires entering new sub-markets.

The below diagram shows the feedback loops involved in the AirBnB story, and shows how the critical innovation that lead to the breaking of the Chicken or the Egg problem may have been providing professional photographs of properties (shown in red).

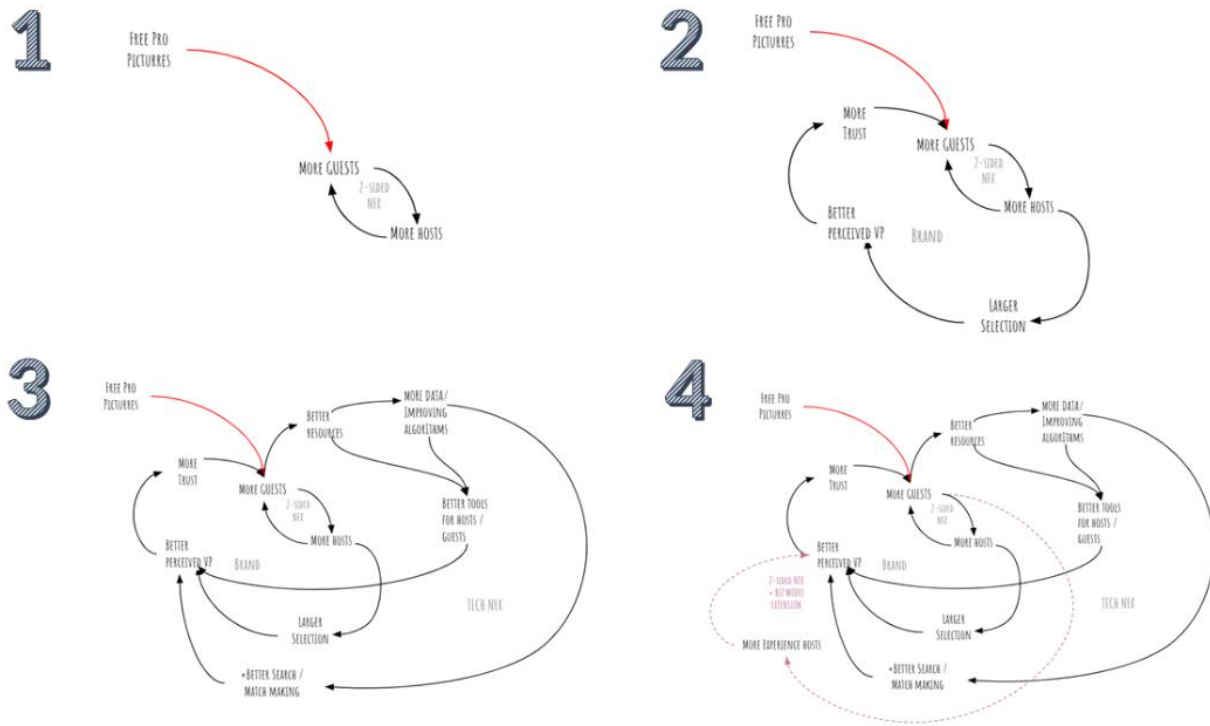


FIGURE 12: FEEDBACK LOOPS IN AIRBNB'S NETWORK [4]

AirBnB is certainly an example of a successful market entrance and a solution to the Chicken or the Egg problem. Some of the critical strategies that lead to this success, in the rough order they appeared, are:

1. **Identify an Underserved Market Segment:** AirBnB was not the first platform in this industry, but it succeeded initially because it recognized a need for inexpensive urban housing not met by existing vacation searcher rental platforms.
2. **Provide Marketing Services for One Side of the Market:** AirBnB would likely not have succeeded without professional photographers provided by AirBnB. Providing this service benefited both the relationship between the hosts and AirBnB, but also the desirability of the facilities offered on the platform.
3. **Focus on Positive Network Effects:** Although it is true for most businesses, it was particularly critical that AirBnB customers and hosts enjoyed their experience and created value to the

network with each incremental usage. This was achieved by AirBnB by maintaining a customer focused mindset and understanding the mechanics of their network.

3.1.3 Uber

Uber began its hunt for a business model by first identifying a pain point: the inefficiency and discomfort of available taxi services. To get a ride on a conventional taxi, customers had a choice between calling a dispatcher, or trying their luck hailing a cab. Dispatchers were often difficult to talk to, and you had no guarantee a cab would arrive after it was summoned. Hailing a taxi was possible in highly dense areas at peak times, but more difficult late at night and in residential areas.

The first business model proposed by Uber founders was the creation of a more traditional taxi business. They planned to lease a parking garage outside the city of San Francisco, where they would keep approximately 150 black Mercedes sedans owned by the company. This was seen as a premium taxi service, with an automated system for dispatching [16]. Initially, users texted their current address via SMS, a vehicle would then arrive, and you would communicate the end address verbally.

Before launching however, Uber switched to a 2-sided platform approach. Instead of owning the fleet of cars, they were able to find independent owners with luxury sedans. They were able to do this by leveraging their capital and network within their beachhead city of San Francisco. Uber then launched as a 2-sided platform within the city, in a similar form as it appears today.

To populate the rider side, Uber needed to have a strong value proposition to overcome the existing network effects of the taxi industry. To achieve this, they marketed themselves as a luxury brand, and charged 1.5X of a typical taxi fare [17]. This created enough differentiation from the existing market to generate a ride, and the beachhead area was small enough to ensure a ride could always be found.

While this cracking of the Chicken or the Egg problem was successful in their beachhead city, it was not necessarily scalable. It would be difficult to pre-populate the driver side in each new entrance city, and competitors (primarily Lyft) were forming. Leveraging their early lead, Uber made deals with car manufacturers like GM and Toyota. These allowed new car buyers to purchase cars from these

companies, and get a premium interest rate if they listed it as an Uber revenue generating asset. This incentivized drivers in many cities to begin driving for Uber, and also ensured that the bulk of the cars were modern cars that were recently purchased.

To encourage simultaneous population of the rider's side of the market, Uber partnered with PayPal and American Express, lowering barriers to entry for riders during the payment process. They also paired with systems such as Concur and United Airlines, which created a reliable base of business travelers and professionals who needed to navigate around a foreign city; and later OpenTable and Google Maps.

These strategic partnerships and integrations allowed Uber to embed itself into existing riders preferred systems and generated enough ridership across cities to encourage drivers.



FIGURE 13: UBERS EXPANSION FROM THEIR FIRST APP (LEFT) TO INTEGRATION WITH STRATEGIC PARTNERS (RIGHT) [18]

It was critical in the early days of the platform to maintain a continuous flow of users on both sides. If riders only drove on the weekends and riders only needed rides at rush hour, the ecosystem would fail. This created an internal economy, where Uber allowed supply and demand to determine pricing. This created an increased profitability per hour in rush hour, and helped to smooth both sides of the market.

Like all successful platforms described so far, Uber is now expanding into other industries by leveraging its existing user base to add additional sides to their platform. This includes transportation related industries like trucking, food deliveries, and possibly flights. By offering subsidies, Uber was initially able to solve the Chicken and the Egg problem and expand their business. However, they still struggle to keep drivers.

Uber drivers have high turnover rates, can easily multi-home on other platforms, and cost money to subsidize. While most platforms subsidize one side of the market during the infant stages, while trying to crack the chicken or the egg problem, Uber has not created enough value within the driver side to move past this stage. This has resulted in massive rounds of money raising, with Uber locked in a battle with Lyft for market share which is a huge cost burden to both companies. Because of this, Uber may have populated its platform, but yet never developed a successful solution for the Chicken or the Egg problem.

The strategies used by Uber were similar to other Digital platforms:

1. **Subsidize both sides of the market:** In both their beachhead city and all cities since, Uber has subsidized both sides of the market, with an emphasis on the driver's side. To sustain market share, Uber continues to subsidize the driver's side of the market.
2. **Start small:** Like many startup companies, Uber chose to carve out a beachhead in one city then expand outwards.
3. **Grow through strategic partners:** Uber experienced accelerated reliable growth by partnering with complementary platforms, such as Concur and Google, to grow the rider side. It also secured deals with key car manufacturers to provide low interest loans to grow the driver side.

3.1.4 VISA

One example of a successful transaction platform is VISA credit cards. The story of credit cards began in 1958, when Bank of America launched “BANKAMERICARD”. This was considered the first modern credit card, with a \$300 rolling limit.



FIGURE 14: ORIGINAL BANKAMERICARD APPEARANCE IN 1958, LATER CHANGED ITS NAME TO VISA [19]

BANKAMERICARD was first launched in Fresno, California with 60,000 Bank of America preferred customers who received ready-to-use cards from their local bank [20]. Bank of America had secured relationships with local retailers and gas stations to provide a way to “Go Shopping with Just One Credit Card” [20]. This was successful, and in 1959 Bank of America established similar relationships across California and distributed BANKAMERICARD to all its preferred California customers.

In 1960, there were almost one million cards in circulation across the US, with more than 30,000 merchants accepting BANKAMERICARD payments [20]. In 1966 Bank of America opened another side to its platform by allowing other banks to license the card and provide this value to their customers.

This was not simply a business innovation. VISA built upon substantial technical investments and resources developed by Bank of America in the 1950s. This included the development of an innovative distributed transaction system, which tracked and approved transactions across the US. Building on

telephone and early computer technology, these technical resources drove Bank of Americas early lead in this market.



FIGURE 15: EARLY BANK OF AMERICA TRANSACTION TRACKING SYSTEM [21]

With these resources and the novel credit card business model, the Bank of America credit card platform was able to grow. Bank of America incorporated as its own platform in 1970, and developed the technology to perform real time transaction tracking and clearing in 1973. In 1976, this corporation changed its name to VISA, and continued to grow its user base globally while other similar business models failed [21]. To fuel this growth into new countries and markets, VISA allowed banks that joined the platform to become investors in VISA and have a stake in the company.

VISA's business model has always been fairly complex. However, it only required slight modification from the first card to today's online transactions. Each incremental new customer of VISA requires credit and background checks, which were originally done manually with significant costs for each customer.

Each subsequent transaction then required semi-automated processing systems, for which a significant fee was charged to the seller side.

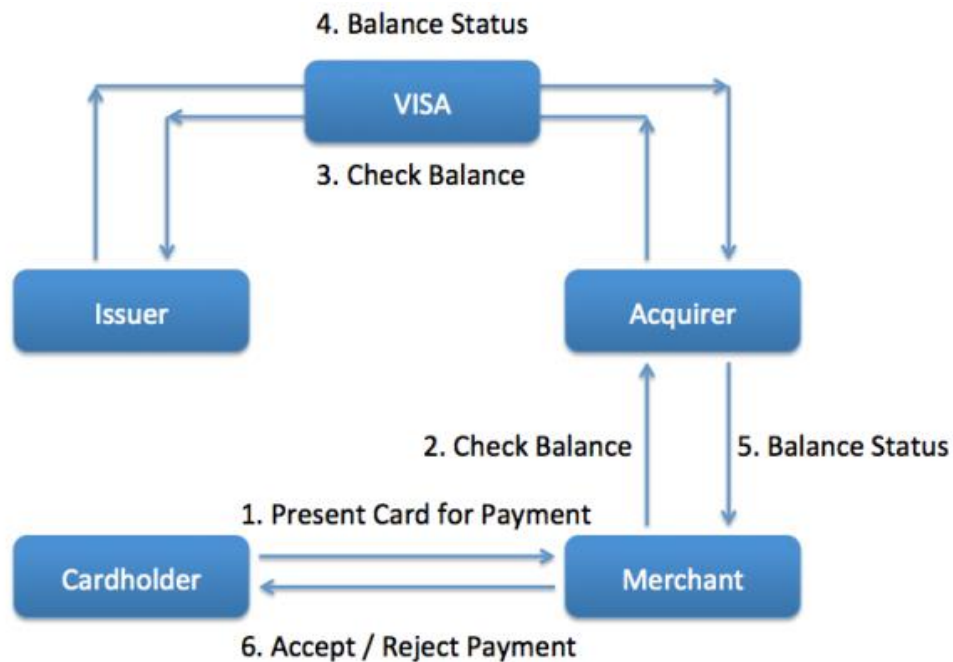


FIGURE 16: VISA TRANSACTION PROCESS AND STAKEHOLDERS [22]

The roles of the above stakeholders are described in detail below:

- **Cardholder:** The individual or corporation that initiates the transaction through the purchase of goods or services
- **Merchant:** The seller of the goods or services
- **Acquirer:** The VISA partner who provides the merchant with the tools necessary to facilitate the transaction
- **VISA:** Tracks all VISA transactions, assumes risk, and approves transactions.
- **Issuer:** Bank that gives Cardholder the VISA card and maintains credit lines and balances.

This creates a 4-sided platform for VISA, with different incentives for each side of the market. These incremental incentives and network effects are shown below:

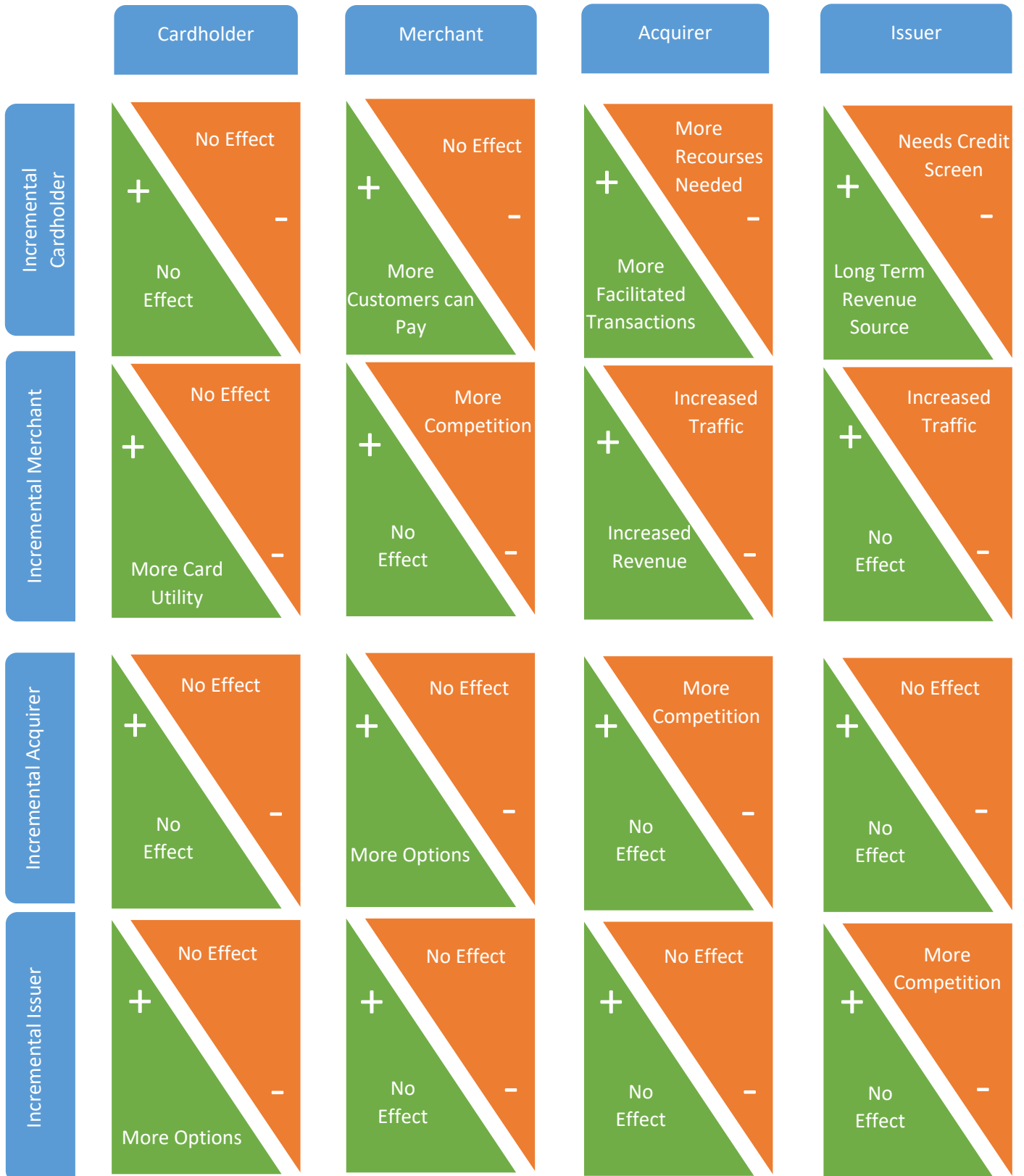


FIGURE 17: ANALYSIS OF 4-SIDED VISA NETWORK EFFECTS

Strategies used by VISA include:

1. **Differentiated Value Proposition:** Unlike similar business models that acted more like debit cards, VISA/BOA offered the first card that combined mobile transactions with a line of credit. This differentiated them enough from their early competition to attract an early buyer side.
2. **Invest in a critical technical resource:** VISA/BOA was able to appeal to buyers and sellers by providing them both access to their transaction technology.
3. **Bring in market sides as investors:** Before their IPO, VISA was partially owned by the banks that were stakeholders in transactions. This incentivized two market sides to participate, as they shared a common interest in facilitating these transactions. These included both “Issuers” and “Acquirers”

3.2 Unsuccessful Transaction Platforms

3.2.1 Brightcove

Jeremy Allaire, Brightcove's founder and CEO, was a seasoned entrepreneur and platform leader. After working for the company that invented Flash and holding a position at a venture capital firm, he saw an opportunity to create a platform in the emerging online video delivery service.

Brightcove started at roughly the same time as a dozen similar concepts, including YouTube.

Brightcove's goal was to create a "one-stop shop for internet TV content providers, advertisers and consumers" [23]. Each platform had a similar idea, but different beachhead markets and methodologies for breaking the Chicken or the Egg problem.

Brightcove had a two-step strategy for populating their platform. First, they would provide large content providers a technical platform to connect with their user base. For example, the New York Times (one of Brightcove's first large customers) would pay a fee to Brightcove, who would format their videos in Flash and provide high speed distributed web hosting services. This would allow the New York Times to provide online content to consumer's home computers without developing their own technology. This is a symbiotic relationship in which each platform reaped benefit. An example of this is shown below, where USA Today was able to use this technology to stream the 2013 presidential inauguration on their site, using Brightcove's platform.



FIGURE 18: BRIGHTCOVE'S VIDEO STREAMING SERVICE USED BY USA TODAY [24]

The second stage of this two-step process was to use the data from hundreds of different content providers and centralize it on one site (brightcove.com). In other words, rather than hosting only on the New York Times and USA Today sites, they would provide a copy of these videos in one centralized location. A consumer could then go to that centralized location and, for a fee, view these videos. This created issues on both sides of the platform:

Content Providers: Content providers, such as companies and news services, had limited incentive to provide content for another platform. They valued traffic on their own site, which fueled their business.

Content Consumers: Although there were multiple factors that influenced the limited consumer base, the two primary ones were price and content. With many other video viewing options available, there was limited need to pay for content.

This platform failed to reach critical mass, and ultimately failed in solving the Chicken or the Egg problem. One way to understand how this happened is through exploring the qualitative network effects grid below.

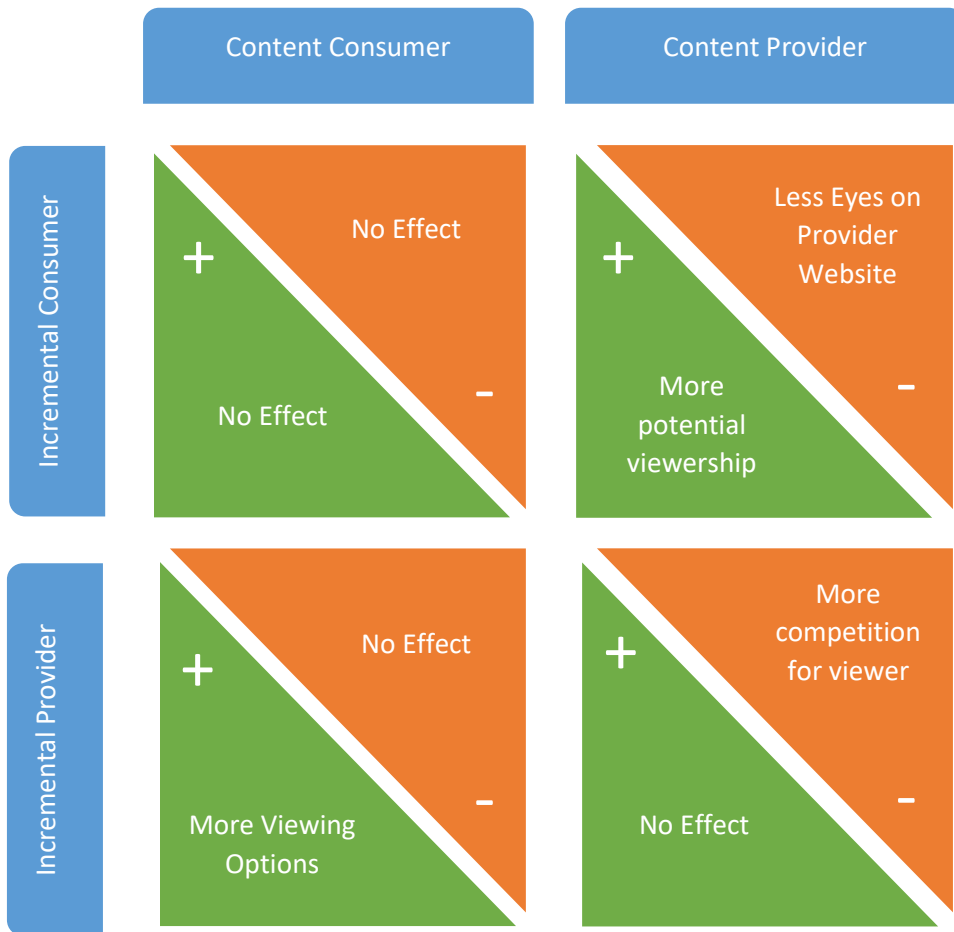


FIGURE 19: INCREMENTAL NETWORK EFFECTS OF BRIGHTCOVE.COM PLATFORM

Although the magnitude of these incremental effects is difficult to quantify, both the content provider and content consumer columns in the above grid must have a positive net effect to grow as a platform. Even if one side of the platform is seeded or subsidized, the Chicken or the Egg problem cannot be solved without strong positive network effects. In this case, the network effects for the consumer were not great enough to compensate for the cost, and the network effects for the content provider were null or arguably negative.

Brightcove may have also failed because it brought on too many sides to the network too quickly. The value to each side was unclear, and the platform was too complex. For example, content providers were attracted to YouTube as a site to upload videos for free that could be watched by anyone, while viewers valued a single site for free streamed video content. Brightcove, on the other hand, offered many ways to provide content for many different types of content providers, as well as a confusing combination of both paid and free plans for viewers.

Ultimately Brightcove was unable to achieve enough network effects to exist as a platform, and retreated into its original market as a hosting service for content providers and news companies. It has been relatively successful in this niche, with a stable publicly traded value over the last decade and a market cap at \$336M [25]. This does show that even if a company is unable to achieve critical mass or solve the Chicken or the Egg problem, it can often leverage the resources gained in this process to achieve sustained viability as a firm.

Some of the key strategies used by Brightcove include:

1. **Populate one side using a different business model:** Brightcove brought on content providers by providing a technical service to them, in the hopes of then using these content providers on their platform. This was highly successful in populating one side, but the incentives and stakeholder dynamics changed as they transitioned to a platform.

2. **Charge both sides of the market:** Although the payment systems used were complexed and varied as their platform developed, at points Brightcove charged both sides of the market to participate in the platform. This generated revenue, but slowed network effects.

3.2.2 Diners Club

Diners Club was first to market in the charge card transaction market. It is rumored that this began when two New York executives (Alfred Bloomingdale, a department store manager, and financier Frank McNamara) had a business dinner in 1949. When the check arrived, they were short on cash to pay for the meal. Both of their wives came to front the bill, which created a level of social embarrassment as well as significant inconvenience [26].

After this event, the two men (and other stakeholders) set out to solve this pain point. They conceptualized a card that could be used at restaurants or other services, that would later charge your bank account.

Although intended for use by all Americans, they chose the natural beachhead of upper-class diners at exclusive restaurants. This is a typical strategy, and there are many marketing and strategic benefits to starting at the top of the market. American Express quickly adopted this model as well, and struggled to compete with Diner's Club at the top of the market.

Securing a market side by providing a strong value proposition was a successful market move for Bloomingdale and McNamara. They were able to use the prestige appeal of the card to attract high-end restaurants which would accept the card. However, these cards would remain in the niche of high-end restaurant consumers without a deliberate branch out into other markets.



FIGURE 20: 1950'S ERA ADVERTISEMENT FOR DINER'S CLUB [27]

Therefore, Diner's Club focused on expanding the merchant market side with the assumption that they would only attract the top 5% of the American market. The company focused on creating value for this 5% by expanding its merchant side to include exclusive hotels, liquor stores, and high-end retail. This generated increased value for their target market, however delivered no or marginal value to the bulk of the consumer market.

When BANKAMERICARD entered the market in 1953, the lower 95% of the market was not catered to by Diner's Card. By creating value propositions that appealed to this market segment, BANKAMERICARD (VISA) was able to rapidly overtake the incumbent. BankAmerica offered this 95% a line of credit, which was difficult to obtain in the 1950s, and usability at food marketplaces and shops.

Global Payment Volume Market Share, 2010

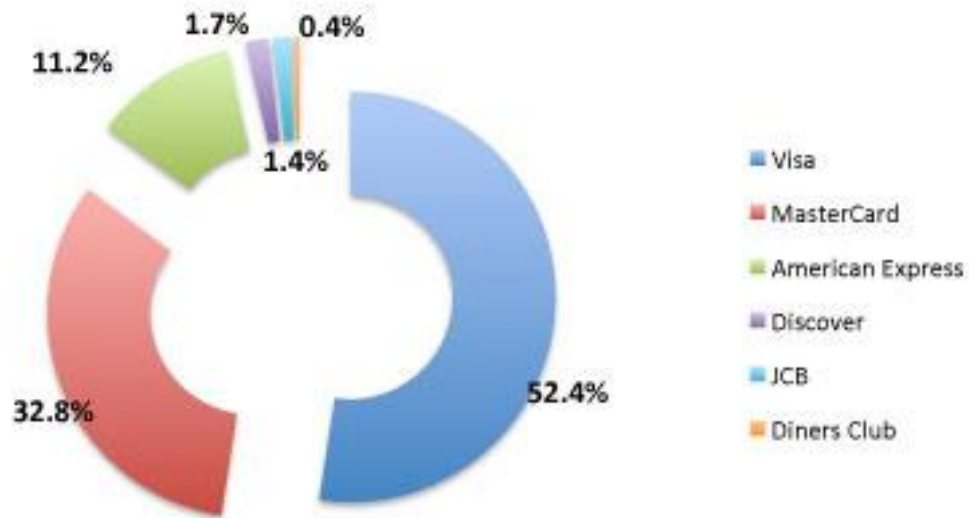


FIGURE 21: CHARGE/CREDIT CARD MARKET SHARES IN 2010 [28]

While Diner’s Club seemed to have solved the initial Chicken or Egg problem, they failed to do this in a way that addressed the majority of the market. This type of beachhead strategy works well in other scenarios, like AirBnB, but can also be a trap for companies who never leave their market segment. As can be seen in the above image, Diner’s Club has failed to maintain even its small beachhead over the last few decades. This is likely due to the importance of network effects in this industry, where larger networks will continue to gain market share at the expense of smaller networks.

Strategies used by Diner’s Club include:

1. **Target a beachhead with the greatest pain point:** Diner’s Club was first to market, and did this by identifying a particular scenario in which the use of cash for payment could be particularly challenging. It then brought on the merchant side to supplement only this need.

2. **Start at the top of the market:** One key marketing strategy is to start at the top of the market, then move down. This works well for products, such as cars and fashion items, but has risks when populating a platform.

3.3 Summary of Transaction Platforms

When looking at a variety of businesses and markets within transaction platforms, we see similar strategies emerge. Some of these strategies worked well, while others resulted in a failed or stalled population of the platform business. It's important to recognize that these strategies are not the only factor in the success of these businesses. Other confounding factors social, economic, technological and environmental circumstances.

3.3.1 What Worked?

Some key strategies that worked included:

- **Populate One Side of the Market First:** Almost all successful transaction platforms discussed in this section focused on one side of the market first, rather than build both simultaneously. The manner in which this was done seemed most dependent on the company's resources, as well as what was most practical in their market. AirBnB focused on providing marketing for hosts; Uber provided subsidies for drivers; VISA brought in banks as investors; and Amazon spent a decade building one market side in-house, then opened it up to third parties.
- **Choose a Beachhead:** Uber and AirBnB both chose a beachhead market to launch, then expanded from there. AirBnB began at events where there was expected to be a surge of guests that hotels could not accommodate, while Uber began by providing a high-end taxi alternative to San Francisco. It should be noted that this strategy is not required for success. Amazon used a beachhead (technical books) to enter the online retail market, but not for solving the Chicken or the Egg problem. VISA launched to the whole US market at once as BANKAMERICARD.
- **Develop a Key Resource:** Amazon and VISA chose to build key resources before populating their platforms. Amazon did this by building a large online store first, then gradually allowing outside vendors to sell on this platform. This is not the same as simply building up the buyer side of the

market, Amazon was able to build its online retail resource alongside shipping, distribution, software and logistics resources needed by sellers. VISA also built a limited network and state of the art transaction tracking systems before launching.

None of these companies relied on one strategy to populate their networks and they remained dynamic - changing their lower level tactics depending on the market needs they recognized as they developed.

3.3.2 What Didn't Work?

Brightcove and Diner's Club were both examples of platforms that got started, but failed to achieve critical mass. It could be argued that their existence as a platform indicates that they did solve the Chicken or the Egg problem, but made strategic choices later that limited their growth. This is not necessarily true however, as the strategy used to solve the Chicken or the Egg problem often dictates future strategy. A strategy that successfully populates an unsustainable network is not necessarily a valid solution to the Chicken or the Egg problem.

- **Stay in a Beachhead:** A key mistake made by both BrightCove and Diner's Club was staying in their beachhead longer than their competitors. Brightcove initially targeted news content producers and medium sized businesses, but continued to build up this niche while competitors like YouTube rapidly transitioned to the mass market. Diner's Club did something similar, where they continued to target the top of the market while other players consumed the much larger middle class. In platforms with powerful network effects, the larger group will eventually dominate the market.
- **Populate with a Separate Business Model:** Brightcove was able to populate the media creation side of their market using a separate business model. Rather than start as a platform, Brightcove acted more as a technical service, supporting media producers by enabling them to embed their

videos in their own site. While this did build up one market side, they did so with a population that was ultimately not interested in participating in their platform.

- **Charge for Membership:** While this borders on tactics over strategy, many emerging platforms fail due to a prohibitive cost. By charging video viewers a small fee while competitors did not, Brightcove was guilty of this.

While these strategies did not work for the companies studied, there will always be specific companies or scenarios where they make sense.

3.3.3 Innovation Platform Strategy Generalizations

This analysis does not intend to derive a rulebook for strategy, but rather to discuss what works and doesn't work in specific scenarios and extract generalizations. The successful transaction platforms here all populated their platform sides like a business. Many started one or both sides with a beachhead, used existing capital to build it up, created resources, and let them grow. The primary difference between these platforms and typical businesses is that these market sides are tightly coupled, and must grow together to generate sufficient value.

4 The Chicken or the Egg problem in Innovation Platforms

4.1 Successful Innovation Platforms

4.1.1 Amazon Web Service

The Amazon marketplace success story is well known. Amazon started by selling books, built up large software and distribution resources, and disrupted the retail market. What is less known is how this growth and development lead to the growth of their most profitable business segment – Amazon Web Services (AWS).

As Amazon grew as a retail store, it needed critical software resources, and scalable computing power to support this growth. As a startup, they developed these resources in house to meet the immediate needs of their growing business. In the late 1990s and early 2000s, Amazon marketplace began to scale rapidly and higher more software engineers to work on distributed projects required to scale the marketplace. Rather than increase the rate of development, these additional software engineers required about 3 months per project just to begin development [29].

As this development lag began to hurt Amazons scalability, Amazons leadership realized that each team was building their own internal resources (Databases, Computation, Storage, etc.). Building these common resources independently was not only wasteful, but it consumed valuable time and hurt future integration efforts. At this point, Amazon mandated that its teams all use a common API based framework, which would allow them to share resources and scale rapidly:

“We expected all the teams internally from that point on to build in a decoupled, API-access fashion, and then all of the internal teams inside of Amazon expected to be able to consume their peer internal development team services in that way. So very quietly around 2000, we became a services company with really no fanfare”- Andy Jassy, AWS CEO

In 2003, at a retreat for Amazon executive staff, the staff were asked to build a list of Amazon’s core competencies and resources. This list included distribution, fulfillment, software engineering, and supplier network – but it also included their API based development framework and scalable computational resources. Amazon then began to develop plans to capitalize these resources, with a notional plan of providing them to similar startups as a service. This service launched in 2006 as Amazon Elastic Compute Cloud [29]. With no direct competition for several years, it was able to rapidly acquire customers and build out a developer side to the network.

The function of the AWS product was to provide the tools developed and collected by Amazon that they considered essential for web development and put the all in one place. These tools already had APIs to communicate easily, and allowed web developers to simply build upon Amazon’s technical base.

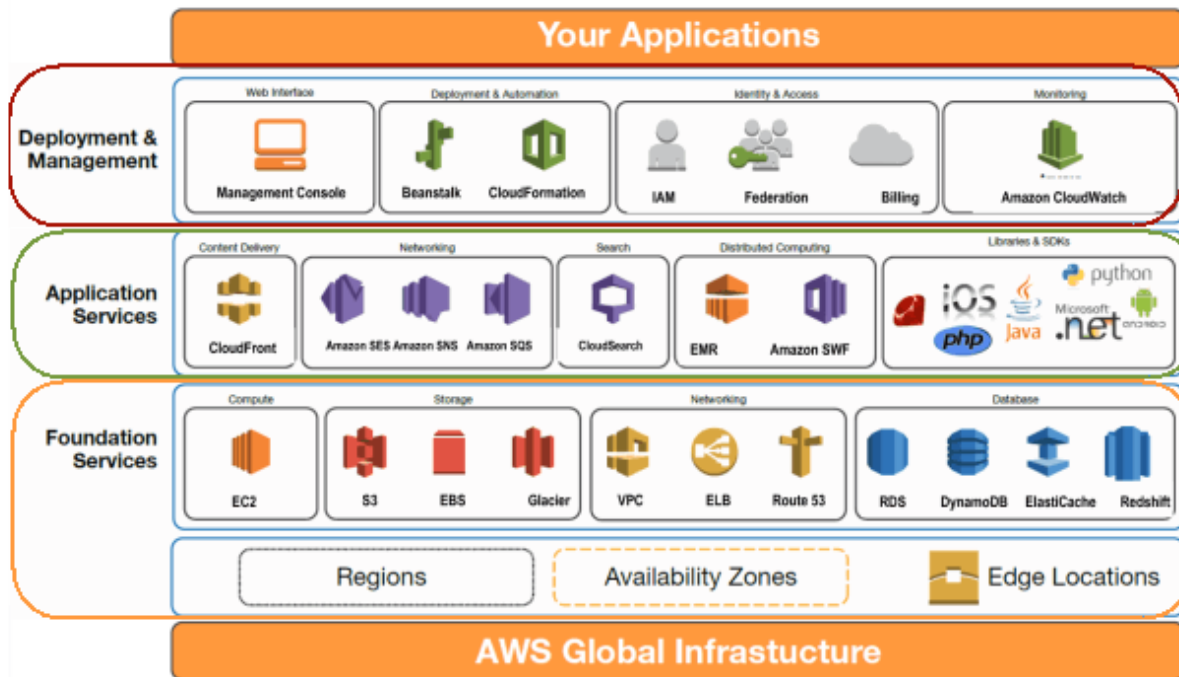


FIGURE 22:SERVICES OFFERED BY AWS [30]

AWS was then well underway as a product platform. It initially operated as a service, where rapidly scaling internet companies could rent Amazon’s software infrastructure and pay for on demand, commitment free servers and computational power. This was a powerful value proposition for existing companies and startups, who often based their competitive advantage on their capability to rapidly scale.

In April 2012, Amazon transitioned from a service business to a multi-sided platform by launching AWS Marketplace. Amazon Marketplace allowed third party developers to develop tools that functioned within the AWS environment. This allowed AWS customers to have access to the latest machine learning, big data, and internet of things tools natively through the AWS API infrastructure. Third-party developers generated revenue as AWS users used their resources, and Amazon primarily profited through increased sales of their services [31].

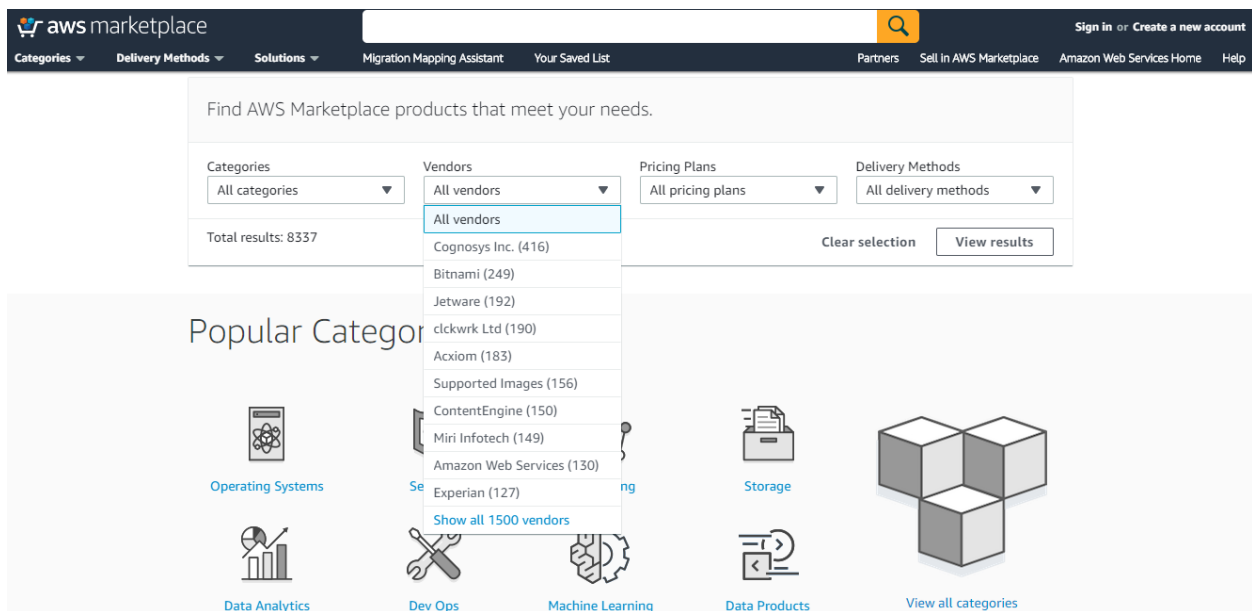


FIGURE 23: AWS MARKETPLACE HOMEPAGE IN 2020 WITH 1500 VENDORS [32]

AWS marketplace was ultimately successful, with over a thousand companies providing their unique services through AWS. This increased the value of AWS, much as apps increased the value of the iPhone. Generating value in this way classifies AWS as an innovation platform.

Strategies that Amazon employed to develop this innovation platform are:

1. **Develop a Critical Resource-** Amazon developed a critical resource that could be shared and provided it as a service to other companies. This could also be considered coring, because AWS grew to dominate the market by providing value to one side of the market first.
2. **Self-Populate One Side-** After capitalizing the existing critical resources and API environment, Amazon continued to strengthen the value proposition of their service by populating it with applications needed by modern internet businesses. This attracted more business customers to the buyer side of the market.
3. **Transition Slowly-** It could be argued that Amazon in both cases describes in this paper develops its platforms conservatively. Amazon Marketplace took two decades to gradually shift from a pure online retail store to a third-party seller majority. AWS is no different, taking almost a decade to allow third party into the platform.

4.1.2 iPhone

The iPhone is a classic example of an innovation platform. It allows millions of developers and companies to develop content, which is the attractive value to customers purchasing the phone. This success created one of the largest companies in the world, selling 1.5 Billion iPhones, enabling new industries such as on demand taxis, food delivery, and the greater cellular application industry. [33]

This was not how the iPhone started, however. Apple was a company that created its value proposition by building products that were seamless, easy to use and of overall high quality. It had built up a brand by selling home computers followed by portable iPod sound devices. These were both relatively closed ecosystems, with Apple closely vetting the IOS user experience on its computers, and no outside content developed specifically for the iPods.

When Steve Jobs announced the first iPhone in 2007, it was conceptualized as a closed architecture product. Apple would develop all the applications used on the iPhone, or contract these applications from other development firms. This would allow a fully vetted user experience, without the risk of a third-party application tarnishing Apples brand. This was not unique to apple. In the early 2000s, all or most companies in the cellular phone market were pure product companies. Samsung, Blackberry and Nokia sold phones that were highly popular as products and were highly successful incumbents.



	iPhone	Samsung BlackJack	BlackBerry 8800	Treo 700p
Price	\$499 or \$599	\$199	\$299	\$299
Weight	4.8 oz.	3.5 oz.	4.7 oz.	6.4 oz.
Dimensions	4.5 x 2.4 x 0.46"	4.5 x 2.3 x .5"	4.5 x 2.6 x .55"	4.4 x 2.3 x .9
Estimated battery life (hours)	Talk Time: 8 Standby: 250 Internet Use: 6 Video Playback: 7 Audio playback: 24	Talk time: 5.5 Standby: 264	Talk time: 5 Standby: 528	Talk time: 4.5 Standby: 300
Screen size	3.5"	2.2"	2.5"	2.6"
Screen resolution (pixels)	320 x 480	320 x 240	320 x 240	320 x 320
Built-in memory	4 or 8 GB	64 megabytes	64 megabytes	128 megabytes
Memory card slot	—	MicroSD	MicroSD	SD
Camera	2 Megapixel	1.3 Megapixel	—	1.3 Megapixel
Network	EDGE or Wi-Fi	HSDPA	EDGE	EVDO
Keyboard	Virtual	Physical	Physical	Physical
Operating system	OS X	Windows Mobile	BlackBerry	Palm
Carrier choice	AT&T	AT&T	AT&T and T-Mobile*	Sprint and Verizon Wireless

* Sprint and Verizon Wireless carry 8830

FIGURE 24: FIRST IPHONE AS A DISRUPTIVE STAND ALONE PRODUCT [34]

While the initial iPhone was not an innovation platform, it had many features that differentiated it as a product and led to its early success. This included a larger screen, more memory, and its ability to function more as a computer than as a phone. Much like a laptop in 2007, the original iPhone could connect to Wi-Fi, send and receive emails, and had a screen that enabled web browsing. This ultimately led to the iPhone being highly adopted before the launch of the App-Store platform.

In 2008, Apple released its update to the iPhone, the iPhone 3G. This had the same touch screen format as the 2007 iPhone, but had the ability to connect to high speed internet over a cellular network. Most

importantly, it included the App Store, which allowed third party developers to with some internal resistance from CEO Steve Jobs and other groups within Apple. While there was a benefit to enabling an internal innovation economy on Apples ecosystem, as previously mentioned, there was substantial risk that poor development and fraud on the platform would tarnish Apples valuable brand name. As we know today, this was worth the risk, and Apples platform has changed how we do business and accomplish daily tasks. [33]

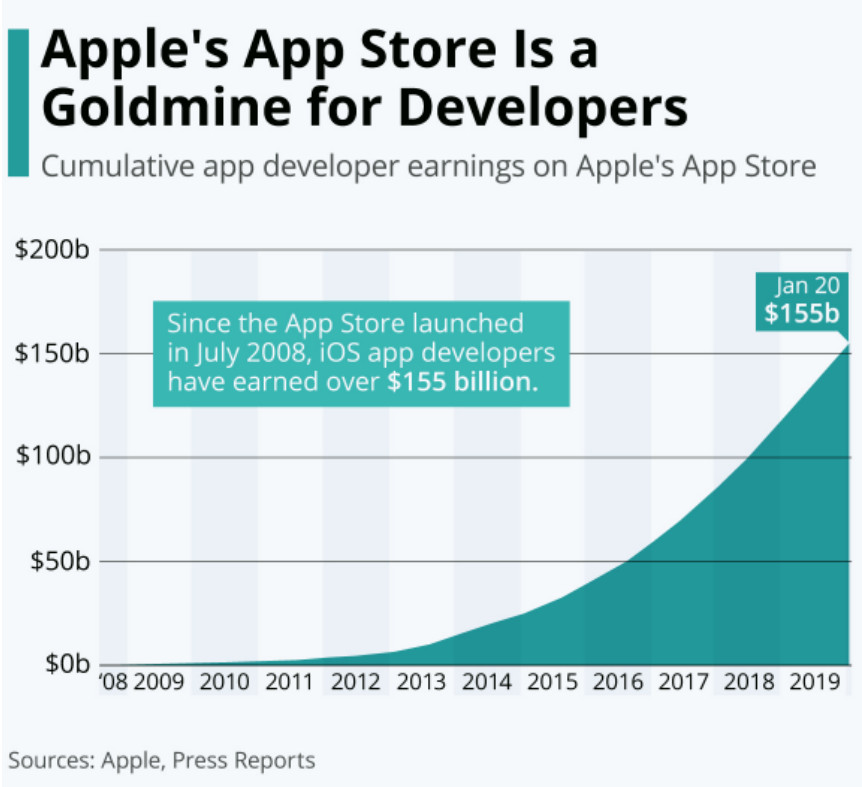


FIGURE 25: RAPID APP STORE PLATFORM DEVELOPER PROFITS AFTER 2008 LAUNCH [35]

To alleviate this risk to the Apple brand while still enabling growth, Apple chose to create a curated platform. Developers who chose to develop on the platform could access Apples rapidly growing user base, but needed to meet minimum quality and compliance requirements to be approved. These apps were then user curated through a rating and review system. Once an app was on the platform, it could set its own costs, have in-app purchases, and collect data on app usage.

The strategies used by Apple to create the App-Store were:

1. **Develop a Disruptive Resource/ Technology:** The iPhone was a device that enabled many other functionalities that were not possible on incumbent systems. This enabled a dynamic innovation marketplace which was desirable for developers seeking new markets as the personal computer markets were maturing.
2. **Populate Customer Side First:** With its initial launch as a pure product, the iPhone was able to attract a large base of customers near the top of the market. This created immediate value to developers when the App-Store was opened a year later.
3. **Curate Developer Side:** To generate maximum value for users, Apple curated the App-Store to ensure only high-quality products were available to the end user.

4.1.3 Intel

Intel was not a company that began as a platform business, and differs in many ways from other platforms discussed in this paper. When Intel was founded in 1968, it was founded as a general semiconductor fabrication house. Intel specialized in high speed memory devices, a growing niche within the semiconductor industry. These devices consisted of Dynamic Random Access Memory (DRAM), Static Random Access Memory (SRAM) and Read Only Memory (ROM). In 1970, their DRAM products were purchased by Honeywell Technologies, which used them as a critical component in their popular computer systems [36].

By the mid-1970s, Intel realized it could not compete on cost with emerging Japanese semiconductor companies manufacturing DRAM. They leveraged their position in the semiconductor industry and technical capabilities to manufacture Central Processing Units (CPUs). By 1978, Intel had both 8 and 16bit CPUs available, and were an early leader in this market. In 1981, Intel was able to use this technology lead to be selected as IBM's CPU for the personal computer market. IBM also partnered with the startup Microsoft, which produced the DOS operating system to operate on Intel's CPU.

It was at this point when Intel began to transition from a product business to a platform business by tying itself in with the Microsoft DOS architecture. With development of Intel's x86 family of instruction set architectures, Intel created a processor system which allowed peripherals a defined connection, as well as reverse compatibility of software drivers and products [37]. This situated Intel's x86 CPU family at the core of the emerging PC market.

The chart below shows the adoption of the x86 architecture, which increased dramatically during the dotcom bubble as Windows/DOS based personal computers rose in prominence. Note that while Intel did not produce all the x86 technology, it controlled the architecture and was able to leverage this advantage over time.

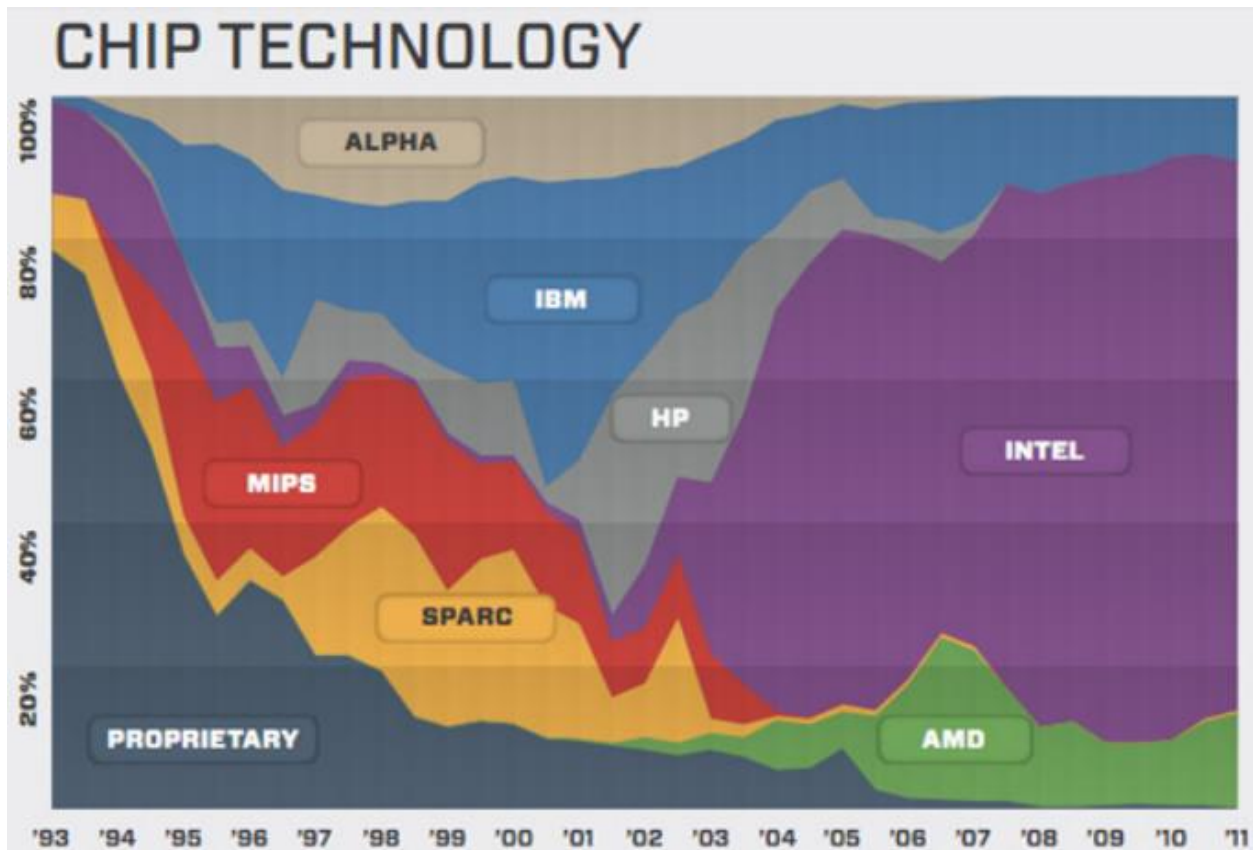


FIGURE 26: MARKET SHARE OF INTEL'S ARCHITECTURE X86 OVER PROPRIETARY ARCHITECTURES [37]

It's also important to note that the CPU is a central part of modern computer architecture. Unlike memory, storage, and peripherals such as USB devices, there are high switching costs to changing CPUs. Software is typically developed to run optimally on a specific CPU architecture, and all peripherals are designed to interface with that CPU. This puts the x86 CPU manufacturer, Intel in this case, at the center of the computer as an innovation platform. In the diagram below, the CPU is shown as central to this architecture. A way to conceptualize Intel's x86 architecture is a system for standardizing interfaces between these components, enabling other companies to develop peripherals around Intel's CPU.

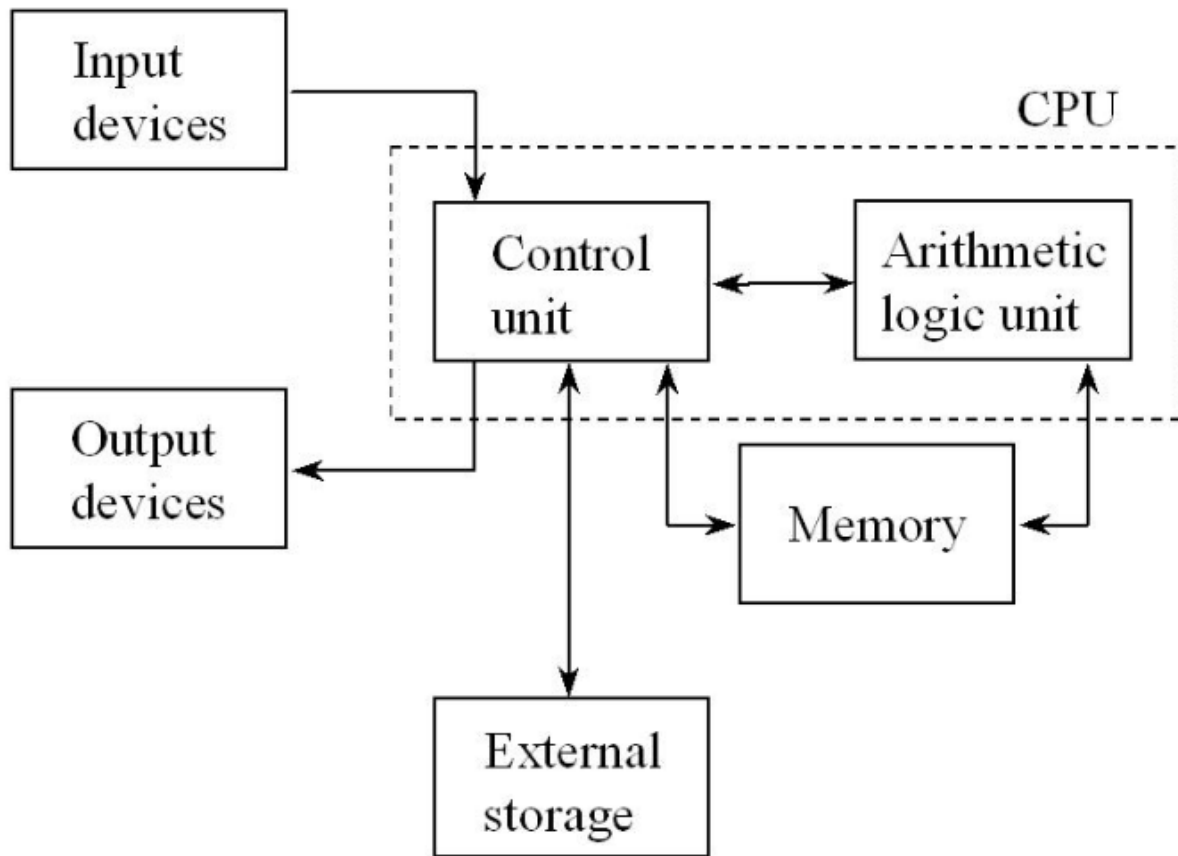


FIGURE 27: BASIC COMPUTER ARCHITECTURE [38]

Today, Intel continues to dominate the CPU market for personal computers, with a revenue topping \$60B. Although QUALCOMM overtook market dominance for handheld devices, Intel is currently attempting to strategically position itself to take on a similar ecosystem hub in the emerging IoT market.

Intel differs from most other platforms discussed in this paper. It is very much a product, but as a product, it acts as a multi-sided innovation platform connecting software and hardware developers, users and computer manufactures.

Some of the strategies that were used by Intel include:

1. **Invest in and Hold an Early Technical Lead:** Intel built up core relevant technologies slowly. It invested in being the best in the industry from a traditional technology and manufacturing perspective.
2. **Partner with Strategic Complements:** Intel holds its position as a platform business while only selling to a small number of complementary partners (IBM, Microsoft, Honeywell).
3. **Position Yourself at the Center of an Emerging System Architecture:** Rather than stay in the field of memory, which was becoming commoditized, Intel positioned itself as a hardware technology platform.

4.2 Unsuccessful Innovation Platforms

4.2.1 BlackBerry (RIM)

Blackberry, incorporated in 1984 as Research in Motion (RIM), is a company that proved to be successful at making products, but unsuccessful when confronted with platform competition. Blackberry shared the market with wildly successful platforms such as the Google Play Store and the Apple App Store. While Blackberry had many of the resources needed to solve the Chicken or the Egg problem, it failed to populate a viable platform.

When Blackberry began as a company, it primarily focused on the manufacture and sale of mobile and connectivity technologies. This included modems, pagers, and internal networks to provide pager connectivity systems to businesses. Early on, Blackberry set itself up as a B2B company which focused on providing secure and reliable connectivity products to corporations. [39]



FIGURE 28: EARLY RIM PAGER, DESIGNED FOR INTERNAL BUSINESS USE [40]

As cellular connectivity technology became available, Blackberry evolved their pager products to adopt this technology. This resulted in a product that resembled the pager in Figure 28 (above) with a fixed keyboard and screen, but included cellular communication, email services, and a camera.

As seen in the chart below (Figure 29), Blackberry had significant revenue up to the iPhones release. When the first iPhone became available in 2007, it had a negative impact on Nokia, the dominant cell phone manufacturer of the time, but not on the Blackberry. This was true for several reasons:

- The Blackberry sold to businesses, as it was considered more secure and thus the primary choice to integrate into B2B sales. Thus, faced little initial competition from the personal consumer-oriented iPhone.
- Blackberry as a product had a similar utility to an iPhone as a standalone product. With its larger screen, the iPhone was slightly preferable for browsing the web on Wi-Fi, while the Blackberry was seen as better for composing emails and texting.

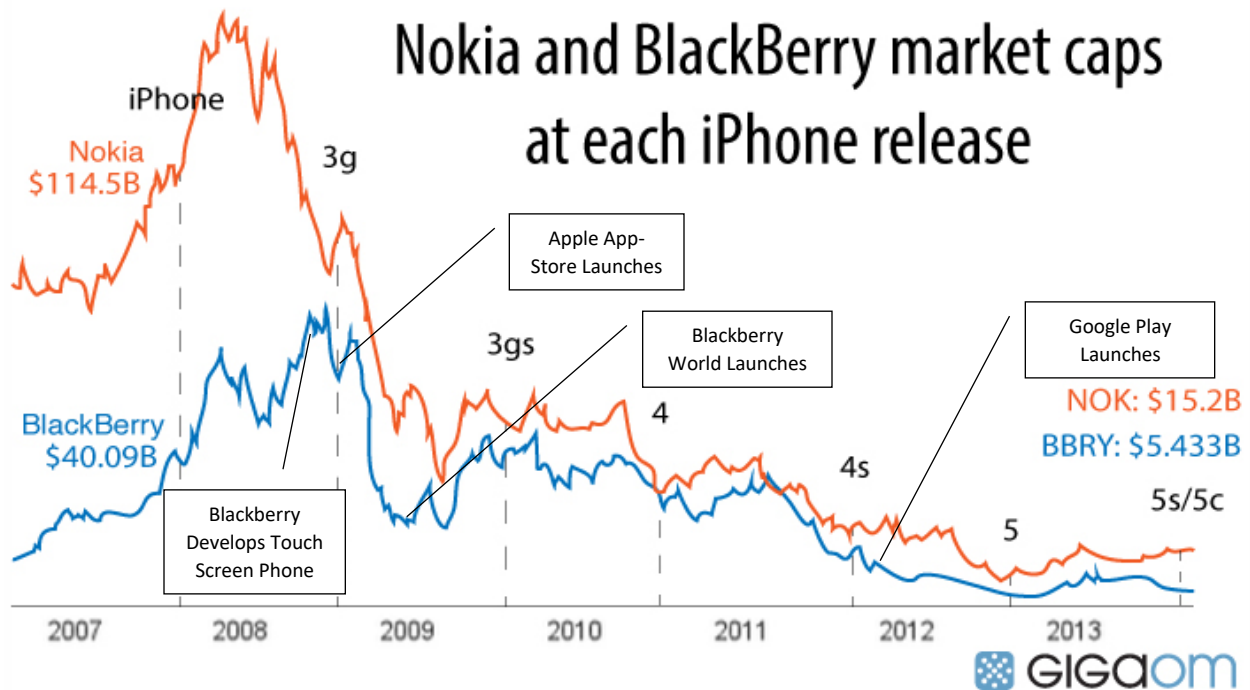


FIGURE 29:BLACKBERRY AND NOKIA AFTER EACH IPHONE RELEASE [41]

Although Blackberry held its market value longer than Nokia, neither firm could compete against the iPhone as a product or its network effects. A simple explanation to this failure to populate a successful platform would be that Blackberry (and Nokia partially) was simply too little too late. While Blackberry was able to launch similar products to the Apple ecosystem within a year of Apple, they were ultimately unsuccessful as products. The Blackberry Storm, Blackberry’s attempted at an iPhone with a touch screen and downloadable applications (“Blackberry World”), was market failure. Critics considered it "a

definite letdown because of the phone's sluggish performance and bugginess" [42]. This was mostly because it was designed as a reaction to the iPhone, with its core operating system and architecture not designed for third party applications and internet browsing.

A deeper understanding of why this attempt to capture the platform marketplace failed can be achieved by examining both sides of the market:

Consumer Market Side

The consumer required two things from their platform: the available functionality provided by the apps, and the physical hardware that made that value useful to them. Blackberry was behind on both fronts, and was unable to adapt its hardware quickly to make these consumer applications available. This resulted in some functionality for businesses clients, but an overall poor user experience as shown in the plot below.

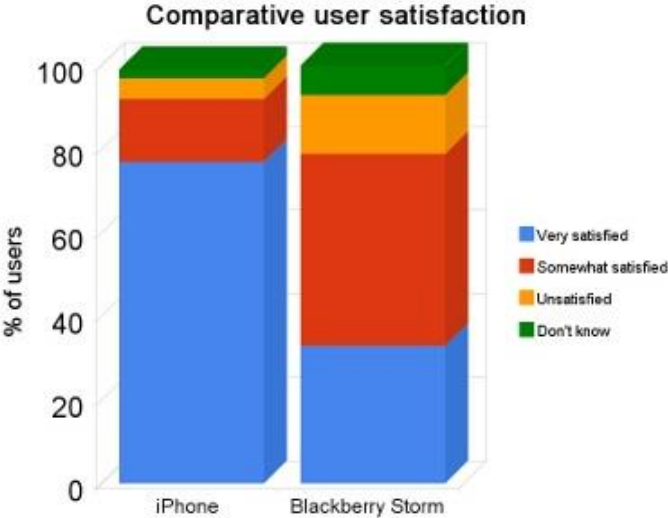


FIGURE 30: IPHONE VS BLACKBERRY STORM USER SATISFACTION [43]

One additional differentiator between the consumer side of Blackberry vs Apple was the type of consumer and typical sales channel. Blackberry focused on B2B use and sales, and provided access to top of the line business applications, while Apple focused on generating B2C value.

App Developer Market Side

App developers considered Blackberry the premier platform to develop lucrative applications when it launched in 2009. Blackberry had access to business customers, who would pay a premium for highly secure communication and financial services. As can be seen in the below table, early revenues for BlackBerry's App World were higher per app than Apple, incentivizing developers to produce business applications on this platform. The sheer size of the app collection on Blackberry's system was smaller, with a focus on paid business applications.

		2010 Revenue (Millions of U.S. Dollars)	~Avg. # Apps	Free Ratio	\$/Paid App	vs. Apple
Apple	iTunes App Store	\$ 1,782	275000	34%	\$ 9,818.18	-
RIM	BlackBerry App World	\$ 165	18000	26%	\$ 12,387.39	26%
Nokia	Ovi Store	\$ 105	16000	26%	\$ 8,868.24	-10%
Google	Android Market	\$ 102	85000	66%	\$ 3,529.41	-64%

FIGURE 31: EARLY APP PLATFORM DATA [44]

However, as cellular phones became more commonplace between 2010 and 2011, the demand for businesses to purchase phones for their employees began to decline. Employees could be reached at all times on their personal phone, and preferred not to carry two devices. Because of the iPhones early lead and focus on individual consumers, Apple rapidly took over the mobile device platform market as shown in the below plot.

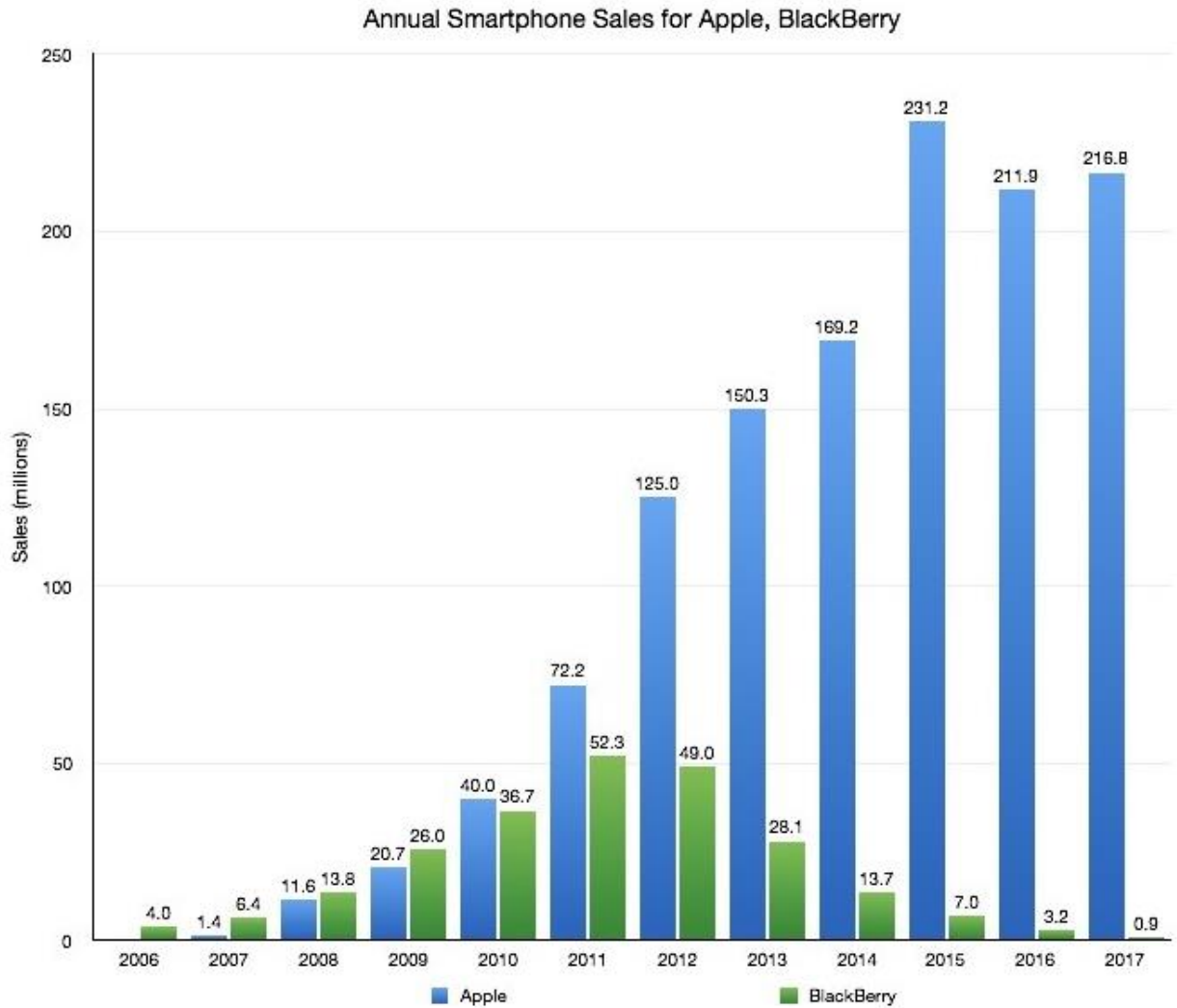


FIGURE 32: COMPARATIVE SALES OF IPHONE VS BLACKBERRY [45]

With millions of users and > 20,000 apps, BlackBerry had appeared to crack the Chicken or the Egg problem. But because they were unable to forecast (or unwilling to accept) this shift in the user base, BlackBerry was ultimately unable to create a sustainable platform as the network effects of the larger personal consumer group consumed their platform's value.

Strategies used by BlackBerry include:

1. **Focus on a Specific Market Segment:** BlackBerry populated their platform by bringing on the same types of users they had sold to in the past. These business users were available to

Blackberry, but rather than use them as a beachhead they developed an ecosystem that catered only to this small segment. As the network effects grew in the rest of the market, this segment was consumed.

2. **Respond Rapidly to Competition:** Blackberry was able to respond rapidly to changes in the marketplace, by producing touch screen phones and app marketplaces soon after the release of corresponding Apple products. This enabled Blackberry to gain market share in the early years after the release. However, the implementations of the hardware products created a poor user experience and the type of platform populated was ultimately incorrect.

4.3 Summary of Innovation Platforms

4.3.1 What Worked?

The innovation platform marketplace is different from the transaction marketplace in that early players often have a significant first-mover advantage. This holds true with the innovation platforms studied, such as AWS, Apple and Intel, all of whom had early technical advantages and were first to market with a commercial product and platform. These only became platforms after they opened a way for external developers and companies to access and generate value for their critical technology.

The innovation platforms studied in this section that were successful also had a successful standalone product or technology before launching into the platform business. Apple had significant early success with the iPhone as a consumer product; Intel had success selling its core digital semiconductor technology before partnering with IBM; and AWS was highly successful as a standalone service before it opened up AWS Marketplace.

The following generalized strategies are common across successful innovation platform launches:

- **Invest in Industry Leading Technology:** All innovation platforms examined had access to industry leading technology at the moment they opened up into innovation platforms, and were among the top if not at the top of their market.
- **Populate Consumer Side First:** AWS and Apple both focused first on populating the consumer side of their platform while developing their critical technology in parallel. This generated a huge incentive for developers to join the innovation platform and access these customers.
- **Center Yourself at the Core of Emerging Technologies:** Intel created a platform by developing a core technology and selling it to strategic partners. This populated it immediately as an innovation platform, without the need to market directly to either side of the platform.

4.3.2 What Didn't Work?

Innovators who failed to open their core technology to external developers early enough (such as Blackberry) are unable to generate enough early market share to sustain their platforms. Had Blackberry launched its App World as soon as it reached market dominance in the business world, rather than continue to develop internally, it may have secured enough of early network effects to outperform technical advances from other competitors.

Innovation platforms, like other platforms, must focus not only on populating the market sides, but also populating those sides with the correct customers. Blackberry made this mistake by only focusing on building a platform for business customers and was later swallowed by the network effects of the larger overall consumer base.

In summary, strategies to avoid include:

- **Focus on a Specific Market Segment:** Ultimately, the winner in a platform marketplace will be the firm that generates the greatest network effects. If a firm can achieve a high value in the short term in a specific market segment, it may be a good beachhead, but the focus should be on winning the largest market segment.
- **Mimic Competition:** While many transaction platforms have seen success mimicking competition, this is risky in innovation platforms where first mover advantage is much higher.

4.3.3 Innovation Platform Strategy Generalizations

Innovation platforms are typically focused around a key technology. When the technology owner opens up that technology to external developers and companies, an ecosystem of innovation is created around that technology. In order to convert a critical technology or an industry leading technology into an innovation platform, it's important that the technology has one or more of the following properties:

- **Must have "hooks" for outside firms to connect:** for example, APIs or defined interfaces

- **Modular enough to add significant innovation:** for example, “Apps” or modular AWS services.
- **Easy access to core functionality:** Often accomplished by documentation, or an inherent property of the device.

Without these properties, populating the platform and solving the Chicken or the Egg problem will be challenging, and a traditional product may be the best strategy for the organization. [1].

If these properties do exist, a platform can be populated in one of two ways:

- **Grow the Platform Organically:** Like the strategies used to populate a transaction platform, this strategy centers around creating a resource that is desirable by one or more market sides then marketing directly to these sides.
- **Partner with Market Leaders:** If you have a technology that cannot be directly marketed to the end user, such as Intel’s CPU, partnering with market leaders can leave your technology at the center of an innovation ecosystem.

5 Discussion

Even platforms that achieve critical mass and seem to overcome the Chicken or the Egg Problem are not always successful. Diner's Club, BlackBerry and BrightCove were all able to populate their platforms to some extent, but the methods and strategies used did not produce a competitive advantage in the long run. In other words, a company facing the Chicken or the Egg problem is really facing two challenges; how to achieve critical mass and how to set themselves up for long term competitive success.

When populating any new platform, choosing the appropriate strategies is always dependent on the situation and resources available. In many cases, not all the information about the future of the market or technology is known. Often a combination of strategies and innovative tactics are necessary, and examining previous platforms can help inform these choices.

This paper has examined both highly successful and unsuccessful platforms as they grew and populated. In each case, key strategies were extracted. These strategies were then generalized to be industry agnostic, and are summarize in the table below. Although these represent broad generalizations of the strategies used in the cases examined, they may be helpful references when entering a new market with a platform strategy.

Transaction Platforms		Innovation Platforms	
What Worked	What Didn't	What Worked	What Didn't
Populate One Side of the Market First	Stay in a Beachhead	Invest in Industry Leading Technology-	Focus on a specific market segment
Choose a Beachhead	Populate with a Separate Business Model	Populate Consumer Side First	Mimic Competition
Develop a Key Resource	Charge For Membership	Center Yourself at the Core of Emerging Technologies	

FIGURE 33: SUMMARY OF GENERALIZED STRATEGY OUTCOMES

While these generalized strategies don't provide a firm framework on which to base future strategies, they do provide a basis for discussion. For example, we can see by examining the above figure that successful transaction platforms often choose a beachhead market, populate one side of the market first, and/or develop a key resource to gain long term competitive advantage. Amazon, for example, followed this path by starting with books, populating the customer side first, and building up fulfillment resources to compete in the long term. In innovation platforms, a similar pattern emerges. Innovation platforms explored in this thesis, such as AWS, Apple and Intel, tend to start with an industry leading innovative technology, bring it to market as a product, then make that technology accessible to third party complements that provide additional value to the end user.

A summary of this flow is provided below (Figure 34) for both successful transaction and innovation platforms. While this summarizes the paths taken to populate successful platforms examined in this thesis, it is not a simple roadmap for success. Long term success requires consideration of competition, the future of the market, and possible winner-take-all-or-most scenarios.

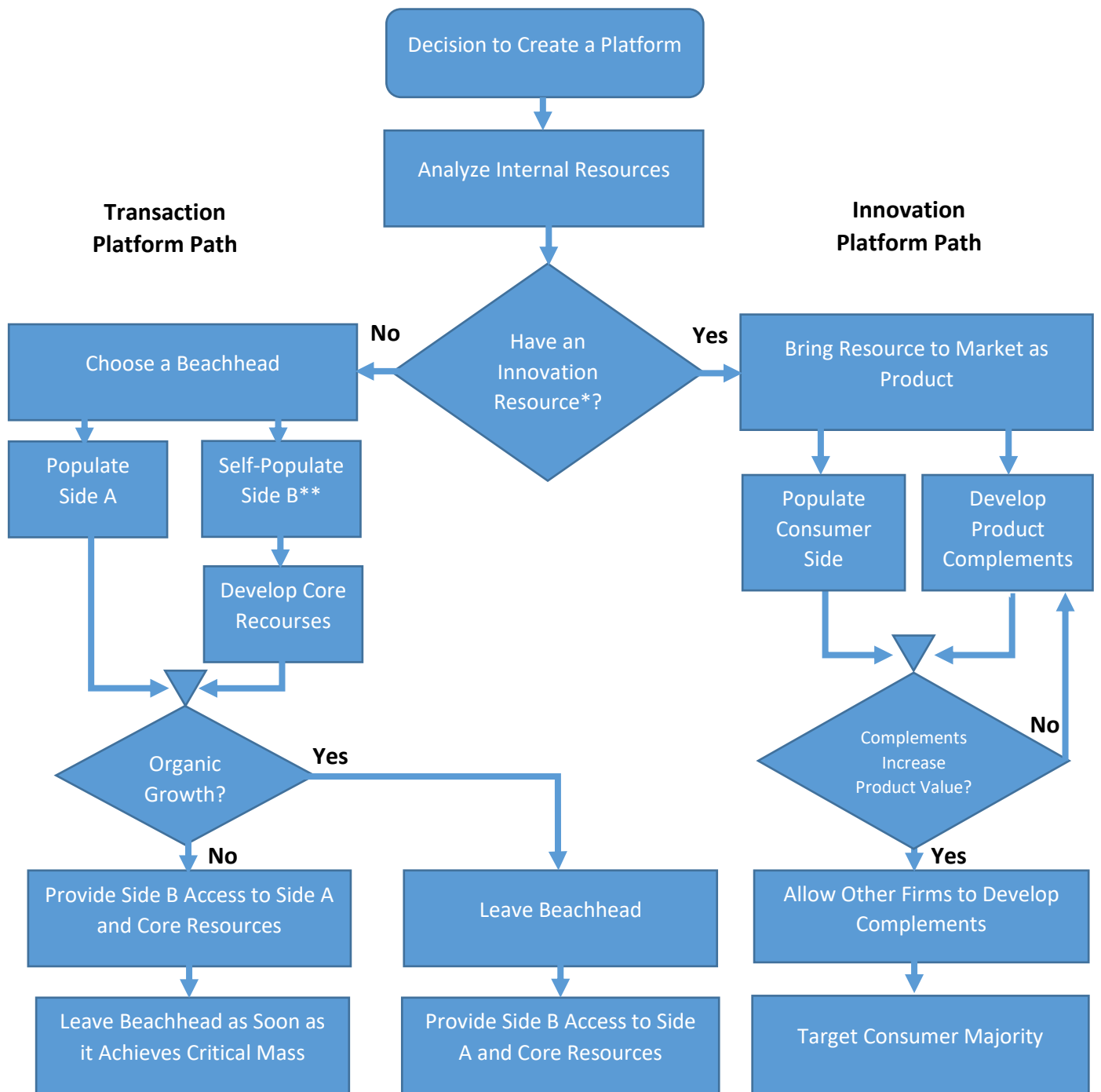


FIGURE 34: ROADMAP FOR SUCCESSFUL PLATFORM POPULATION BASED OFF CASE GENERALIZATIONS

Notes from Above Figure:

**An Innovation Resource is any resource held by a firm that is unique to the firm, valuable and divisible.*

This is typically a technological advancement or resource (such as an iPhone), but could be something less novel such as Amazon's internal API system.

***Self-Populate includes not only building a platform side internal to the firm, but also artificially enhancing one side of the market. For example, AirBnB grew both market sides simultaneously, but artificially enhanced one side through photographs and promotion. The core resources in the case of AirBnB could be the photographers, which hosts were later given direct access to.*

As mentioned many times, the above roadmap provides only a guideline for platform development, and companies can deviate from this path and still be successful. Intel, for instance, populated its innovation platform by partnering with other companies to productize its technology rather than creating a standalone product. This made more sense for Intel, due to the nature of its core technology and the competitive landscape in the early days of the PC. Other reasons to follow a different path could include, but are not limited to:

- Development of unique tactics for populating a platform.
- Need to out-maneuver competitive firms to seek strategic advantage.
- Development of a platform that does not fall cleanly into the Innovation or Transaction categories.

It should also be noted that the successful platforms explored here and detailed in this roadmap all started as two-sided platforms. While populating three or more sides of a platform at once is possible, it can be complex, risky, and is often less successful. Brightcove, for example, launched with a complex multidimensional platform model which made the value to each side unclear. It was ultimately unable to

compete with YouTube, which started as a very simple two-sided transaction platform until it achieved critical mass, then brought on advertisers and became more complex.

Another pitfall to be avoided when populating a market platform is focusing on a small market segment. While this can work temporarily during the beachhead stage of a company, staying within the beachhead too long can be a hazard to the company's competitive advantage. This is particularly true in markets that are prone to tip in another direction or result in a winner-take-all-or-most scenario. This was the case for Blackberry's focus on the business connectivity market, where they provided the best product for business consumers. That value, however, was eventually overtaken by the powerful network effects of the majority group and the market tipped towards touch screens for personal consumers. Diner's Club suffered a similar fate by remaining focused on high income restaurant and travel customers, which allowed VISA to take over the bulk of the US middle class users and eventually take over the market.

In order to solve the Chicken or the Egg problem in a way that sets the platform up for future success, the firm building the platform must understand the concept of a winner-take-all-or-most market, and be able to determine if their market is likely to end in this scenario. This is a market where over time one firm generates the greatest network effects, stifles the competition, and eventually dominates the marketplace. To evaluate if this scenario is likely to occur, a firm can analyze the market by using these criteria [46]:

Are multi-homing costs high for at least one side?

Often, when a high cost exists for a user on one side to be on two platforms, the market tends to favor a single platform which will ultimately increase in power and market share. This occurred in the iPhone case. On the consumer side, it was expensive to use more than one platform, as it required money for

separate hardware (handheld phone) as well as time to learn a new interface. Thus, consumers would not switch without a strong reason, and Apple was able to dominate this market for almost a decade.

Are network effects positive and strong, particularly for the side with the highest multi-homing costs?

Not only were Apple's switching costs high with the iPhone, but it also generated strong positive network effects. As more users had Apple phones, more Apps were developed for these phones, making them more desirable. This creates a very strong case for a winner-take-all-or-most scenario, and makes it extremely hard for new players to enter the market.

Do few users on either side have strong preferences for special features?

Continuing with the examination of the smart phone market, it was thought in the early days of the smart phone that there would be various distinct market segments, such as business users who needed email connectivity and personal users who desired web browsing and games. This was not true. Most consumers and application developers preferred roughly the same features and functionality, and there was only one strong market segment. This prevents niche players, and further tips the market to a winner-take-all scenario.

The best way to set up a platform for success in a winner-take-all market is to win. In the face of what is often fierce competition, this can often be a challenging and expensive process. The most successful platforms in winner-take-all markets are platforms that can achieve one or more the following [1]:

- Find ways for users and 3rd party complements to both adopt their platform, and innovate on top of them (particularly in innovation platforms, such as the iPhone).
- Make it difficult for users and 3rd party complements to switch to competing platforms (prevent multi-homing situations like drivers and riders with both Uber and Lift apps).

- Form coalitions or provide subsidies to tip a market in their favor (such as Google Android's approach to forming a coalition of smart phone manufacturers sharing one OS).

If a new platform does not consider the possible winner-take-all-or-most outcome and take appropriate actions, it may be able to achieve critical mass but yet still fail as a platform or as a profitable business.

Pricing is also important while populating early platforms. Creating entry barriers on the wrong side, even if small, can dramatically reduce network effects. If Facebook had, hypothetically, charged \$1 per user who joined the platform, it would have been very unlikely to achieve the success it now has in the social connectivity marketplace. BrightCove made this mistake, by initially charging subscriptions to the viewer side of the online video market and enabling free competition like YouTube to tip the market.

This paper has outlined a rough strategic framework for populating early innovation and transaction platforms based on generalizations from the cases examined. It has also provided a set of common traps that should be avoided when populating a platform, to prevent new platforms from repeating the most common early mistakes of unsuccessful platforms.

While the Chicken or the Egg problem focuses specifically on the period of growth before reaching critical network mass, a successful solution to the Chicken or the Egg problem must also consider the future of the network. It is not enough to populate the network and achieve critical mass if the methods used generate a platform that is not competitive or sustainable. This is particularly true in winner-take-all-or-most markets. For example, it could be argued that BlackBerry had successfully cracked the Chicken or the Egg problem when they achieved critical mass in their app marketplace (>20,000 apps, 1.2M Business Users [44]), but they did so in a way that set the platform up for future failure.

Even with a basic strategic structure, the Chicken or the Egg problem remains one of the greatest challenges for multi-sided platforms. This challenge often occurs at a time where the business has limited resources and is breaking into a new and experimental market. If a business does adopt an

exceptional strategy towards the Chicken or the Egg problem, it may still fail at generating value for any number of other reasons common among startups, or may simply be unable to predict the future of the market. It is hoped that these cases, discussions, and frameworks help future platforms avoid preventable mistakes as they begin to position themselves within the emerging IoT, ML/AI, Cloud, and Quantum Computing marketplaces.

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