# 6

# Strategy for a New Age

In the late 1990s, when physicist Albert-László Barabási and colleagues were analyzing the structure of the World Wide Web, they observed that the number of connections among network nodes evolved constantly and grew over time. They also observed that a small fraction of the nodes in the network were becoming much more connected and hublike and therefore more important than others. The web was following the principle of *preferential attachment*: the more-connected nodes attracted more new connections, and thus they became increasingly important and attractive to new connections.[1]

When one of us (Marco) drew an analogy between the web and the business networks resulting from digital connections in *The Keystone Advantage*, he argued that some firms (known variously as *keystones*, *platform firms*, *superstar firms*, or *hub firms*) would emerge as much more connected and powerful than others.[2] Although the book was essentially correct in its prediction, the authors did not realize how much that power would be amplified by the value of the data carried by the networks and processed through analytics and AI.

The strategic dynamics of AI and networks go hand in hand. As collisions between digital and traditional firms transform industries, and as firms develop increasingly digital foundations, the architecture of the economy is being reconfigured into a huge, all-encompassing, AI-powered network consisting of an array of subnetworks—social networks, supply chain networks, and mobile app networks, to name a few.

These networks have at least five things in common. They are made up of digital connections between network nodes, they carry data, they are shaped by increasingly powerful software algorithms, they ignore traditional industry boundaries, and they are growing increasingly important to our economy and social system.

Competitive advantage is increasingly defined by the ability to shape and control these networks and harvest the volume and variety of the transactions they carry. Competitive advantage therefore moves toward the organizations that are most central in connecting businesses, aggregating the data that flows between them, and extracting value through powerful analytics and AI. From Google to Facebook, and from Tencent to Alibaba, these network hubs are accumulating data and building the analytics and AI necessary to create, sustain, and grow competitive advantage across disparate industries.

Still, today, many businesses ignore network and data dynamics, focus on specific industry segments, and behave as if they were largely separate from the rest of the economy. As they collide with companies with digitized operating models, such conventional strategies are becoming ineffective.

The implications for strategy are important. Instead of focusing on isolated industries, each exhibiting unique properties and characteristics, strategic analysis should turn its focus to the structure and importance of the connections a firm creates across industries—from the firm to the rest of the economy—and on the flows of data through the networks the firm connects to. It used to be that strategy expressed itself in the way a firm managed internal resources. Now strategy is shifting to the art of managing the firm's networks and leveraging the data that flows through them. Just as *industry analysis* dominated strategy over the past few decades, we believe that *network analysis* will increasingly shape strategic thinking in the future.

This chapter examines these new strategic considerations and offers guidance on conducting network analysis, drawing heavily from the research of our HBS colleague and frequent coauthor Feng Zhu, whose work has shed truly important light on the subject.[3] We follow a specific logical thread designed to help the reader navigate through a complicated argument.

After a brief overview of the argument, we look from the firm outward to its economic networks and map the most critical interactions between a business and the rest of the economy. Then we analyze how each of the networks around a business can shape the dynamics of value creation along with the largely separate dynamics of value capture. This chapter continues with an example that integrates the dynamics of value creation and capture to present a systematic analysis of an existing business. We conclude by summarizing the key implications of network analysis for business strategy.

## The Essence of the New Strategic Problem

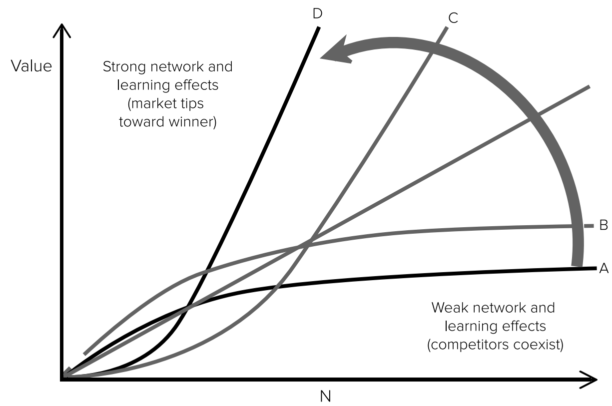
This is a complex chapter, and it is worthwhile to spend a moment capturing the essence of the new strategic problem. We spend the rest of the chapter unpacking these ideas and illustrating them with examples.

While traditional industry analysis focuses on specific, isolated industry segments, *network analysis* involves understanding the open and distributed connections across firms, with each firm connected to a large number of networks across disparate industries.[4] As firms link to each other and to different networks, and as they aggregate various data flows, firms accumulate both network and learning effects.

Network and learning effects are not the same thing.[5] *Network effects* describe the value added by increasing the number of connections within and across networks, such as the value to a Facebook user of having connections with a large number of friends, or access to a broad variety of developer applications. *Learning effects* capture the value added by increasing the amount of data flowing through the same networks—for example, data that may be used to power AI to learn about and improve the user experience or to better target advertisers. In both cases, generally speaking, the more the better, but there is a lot of nuance involved in defining how much better.

FIGURE 6-1

**The value of network and learning effects**




In figure 6-1, we illustrate the value created by different businesses as a function of scale. The scale is represented here by a single parameter, N, which can stand for a variety of variables, such as the number of users, the engagement of these users, or the number of complementors on a platform. Curve A, typical of a traditional business, shows the typical diminishing returns to scale. Even small network or learning effects can amplify the value provided, as shown by the dotted curve (curve B). Stronger network and learning effects can even exhibit increasing returns, as shown by curves C and D. The general idea in strategic network analysis is to find ways to increase the value created at scale and to capture the value created—effectively ratcheting up the value curve, as shown by the arrow.

To increase the value created at scale (and the resulting competitive advantage), you would try to move from curve A toward curve D in figure 6-1. Typically, traditional businesses exhibit strong diseconomies of scale. But as the impact of network and learning effects increases on a business, the value curve can change shape. Usually, little value will be delivered at first, with small networks and little data. But as scale increases, the value created and captured can increase, and do so more sharply, as you see in curves B, C, and D. The stronger the network and learning effects, the sharper the increase in value with scale. Critically, this logic can work not only for classic technology companies like Microsoft, Facebook, and Google, but also for businesses in traditional sectors.

Let's examine an example from the health-care sector.

# Mapping Business Networks

Network analysis begins by mapping the most important economic networks connected to a business and examining the flows of valuable data and the opportunities that exist to gain advantage through AI. Let's walk through an example featuring a traditional firm.

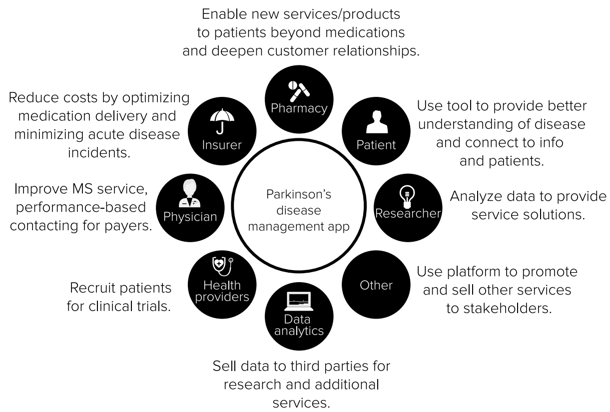
A leading pharmaceutical company recently introduced a new drug focused on managing Parkinson's disease. Leveraging the power of digital networks, the company decided that rather than simply target its traditional channels (physicians and hospitals), it would expand its reach via a broader disease management strategy based on an app designed for patients to use at home. The company would track the progression of the disease through the application's daily patient questionnaire coupled with agility and coordination tests.

The information captured in the app would be used in managing the evolution of the patient's disease and optimizing the treatment. But beyond its core application, the data and access enabled by the app could also be valuable to providers of related services—for example, pharmacies, insurers, and physicians. In addition, the app could be used to create connections among patients and among service providers.

Figure 6-2 shows how a traditional product or service can be steered to impact environments beyond its traditional core applications. Strategic analysis should examine the nature and potential of all applications to discover what uses may be made of complementary networks, considering the full variety of possible network interactions. The intrinsic value created on one network may be realized (and captured) across any of a multitude of other networks the business can now easily connect to.

FIGURE 6-2

**Network-based value creation for a disease management app**




*Source:* Keystone Strategy

Many of these connections can provide great synergies with the company's core business—in this case, pharmaceuticals. For example, the app creates opportunities to dramatically increase patient engagement. This can improve the efficacy of the new drug, deepen the loyalty of the consumer base, and gather data that is useful for a variety of complementary applications that could enhance the value the company delivers to patients. Another possibility—reaching out to the patient network and enabling patient-to-patient interactions—can also foster relationships as patients turn to each other not only to gain insight and comfort but also to share their own innovative approaches for dealing with a debilitating disease.[6] In addition, connecting directly with the networks of insurers, physicians, and health providers can establish an important base of support and amplify the impact of new data-driven insights, thus improving the overall effectiveness of the treatment. Various networks can also generate new opportunities for monetization from insurance providers or, potentially, advertisers. As the opportunities increase, the value curve will increase more rapidly, as shown by the arrow in figure 6-1.

Value creation and capture opportunities for virtually any business may multiply across the networks the business may now be plugged in to. To understand the possibilities, you should first analyze each network separately, because each will have different properties and structure as well as offer different learning opportunities, willingness to pay, and level of competition. But as the analysis works its way around the various value networks, it is important to follow up by analyzing the interactions and potential synergies across the networks. We consider these factors in the next sections.

# Value Creation Dynamics

The starting point of our analysis is to focus on how the business model dynamics of value creation and value capture are impacted by the network structure. We first examine the main factors influencing value creation dynamics, followed by an analysis of factors driving value capture. We then summarize the interactions across both and return to the Parkinson's app to develop the example in detail and systematically analyze its learning and network-based opportunities.[7]

## *Network Effects*

The most important value creation dynamic of a digital operating model is its network effects. The basic definition of a *network effect* is that the underlying value or utility of a product or service increases as the number of users utilizing the service increases.

Let us take you back to the era of the fax machine (all the way back to the 1980s and 1990s) to help explain network effects.[8] The first buyer of a fax machine basically bought the dream of being able to send documents anywhere in the world through a regular phone call. The first fax machine was otherwise pretty useless. However, as more businesses adopted fax machines, the value of all fax machines climbed. The increasing connectivity increased the value of the fax network for all users. Similarly, the value of a social media platform or an internet messaging service is also a function of the number of users. Facebook would be lonely if no one else were on it. However, as our friends and colleagues join Facebook, its value to us (and them) also increases.

Precisely how much the value increases as a function of the number of users (often referred to as N) is dependent on context and is subject to much debate. For example, Metcalfe's law for communication posits that the value of a network is the square of the number of users, $N^2$. Others have noted that not all nodes in a network are equally valuable and that the value increase may be less steep and be modeled as

NLog(N). Still others simply state that the value of a network may be a linear function of N. Regardless of the shape of the value curve, the main element to take away is that a network's intrinsic utility increases as it adds users.

Traditional products do not typically generate network effects. Think about the pen you are carrying with you. The pen's value to you is the same and is fixed, no matter how many people also have a pen or even precisely the same pen. The economics of pen production may get better if increasing the volume of pens produced makes them cheaper to make and buy. But the underlying value of the pen for the tasks you do with it remains the same for you. So in our fax example, the standalone or even networked photocopier in every office does not exhibit network effects, but the fax machine does. Note that most modern photocopiers now incorporate fax functionality, thus giving them access to the worldwide fax network.

Generally speaking, the more network connections, the greater the value; that's the basic mechanism generating the network effect. The most basic underlying operating model of a platform hosting a network is to enable a match between users, and thus capture the value generated by network effects.

There are two main types of network effects: direct and indirect. Fax machines, messaging applications, and social networks exhibit *direct* network effects, meaning that the users value the presence of other users.

*Indirect* network effects exist when users in one category—say, sellers—value the presence of users in some other category—say, buyers—on a network. Uber and Airbnb are two examples of networks that exhibit indirect network effects. Riders on Uber like to have many drivers available so that their trip request is fulfilled instantaneously, and vacationers and renters want many short-term rentals available in their preferred cities. In these instances the indirect network effect is two sided: the value created by Uber increases as the number of riders increases, and that in turn increases the number of drivers, which then increases the number of riders, and so on. So, too, with content platforms like YouTube, where creators are looking for consumers and vice versa. Other examples include gaming console platforms like Microsoft Xbox and Sony PlayStation 2, where gamers and game creators value each other greatly.

In some cases, indirect network effects can be one sided, wherein only one side values the presence of the other side. On Google, Baidu, and Facebook, users are not looking for advertisers, but advertisers are surely looking for users who may be interested in the products they're selling. More specifically, users value the speed, accuracy, and comprehensiveness of the search index built by Google or Baidu (which, incidentally, improves with more use); meanwhile, advertisers value the presence of more users, because as the volume and variety of information increase in search engines, the information sharpens the targeting power of each ad.

Companies have also learned that the presence of one type of network effect (direct or indirect) can be leveraged to generate the other type. For example, although most users are on Facebook to interact with their friends and colleagues (a direct network effect), the company quickly realized that content creators, gaming providers, and website logins also wanted easy access to the same users and that this was mutually complementary. Hence, Facebook, through its API access, enabled a two-sided indirect network effect. Similarly, makers and platforms of gaming consoles initially had a two-sided indirect network effect business, with players valuing games and game makers valuing players, but they added value when they created multiplayer functions and enabled communication among the players—thus linking previously separated network nodes to reap indirect network effects.

Although it's generally true that the larger the network, the greater the value, the actual relationship between network scale and value is much more complex, and the actual extent to which networks can increase in value as they grow differs widely. It is easier to start businesses that rely on weak network effects, but any advantage gained in the short term is less sustainable in the long term.

A premium content streaming business like Netflix, for example, can reach value very quickly, as it procures and distributes a critical mass of movies and TV shows. But over time, it attracts competitors (Amazon, Apple's iTunes, and Disney, to name a few examples) that can follow the same path without much disadvantage. Even though Netflix may have exclusivity arrangements with some content providers, there's little reason for viewers not to sign up for more than one service. In contrast, a community of content creation and distribution like YouTube enjoys much stronger network effects, and the vast majority of tiny, independent content producers has little incentive to post on any other site.

For a business to exhibit strong network effects, the value delivered must continue to increase sharply as the size of the network expands. As a rule, businesses that rely on weak network effects are characterized by many competitors, whereas those that engender strong network effects have fewer competitors and increased market concentration and therefore can claim a more substantial competitive advantage.

## *Learning Effects*

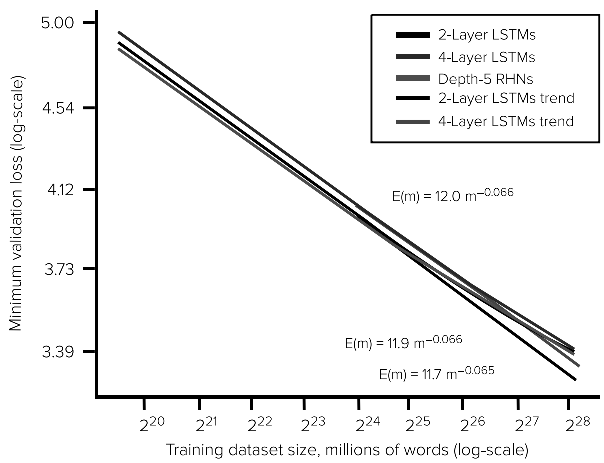
Learning effects can either add value to existing network effects or generate value in their own right. With Google's search business, for example, the more searches conducted by users, the more (and more quickly) Google's algorithms can figure out common search patterns, and the better the service will become. These learning effects are crucial to the value provided by the search engine. As it tried to compete with Google, Microsoft's Bing partnered with Yahoo! to attract more users and advertisers, in an attempt to increase its user base and resulting scale. However, it rapidly realized that even with the greater scale, its search advertising business was not competitive with Google's because it didn't benefit from the same learning effects. Google had had years to learn and experiment with a high flow of incoming data—experience that provided an unbeatable advantage in optimizing its algorithms and delivering not only better search results and engagement but also higher monetization.

Learning effects can reinforce competitive advantage largely because they're dependent on scale. Generally, the more data used to train and optimize an algorithm, the more accurate the algorithm's output and the more complex the problem that the algorithm can be applied to solve. Figure 6-3 shows how a selection of prediction algorithms will improve with the size of the dataset. As operating models grow to embody a multitude of algorithms—each requiring large, diverse, and current datasets—learning effects will amplify the impact of scale and scope on the value created by a firm. The bigger the user base, the greater the scale, the more data that is available, and the greater the value. (All this assumes, of course, that the firm has the right operating model and the capabilities to implement the right algorithms.)

The extent to which data can have an enduring impact on competitive advantage differs from application to application. There are a number of reasons for this. First, the accuracy of most algorithms rises with the square root of the number of data points, at least for a while, and then levels off as the algorithm is fully trained. The square root law is an approximation, and in the case of algorithms that operate in isolation, accuracy does not improve that quickly, because most data points gathered are not uncorrelated. But when more than one algorithm drives a business, the combined value of their learning effects can compound. In the Netflix example, a number of both user-centered and back channel algorithms are at play simultaneously.

**FIGURE 6-3**

## Impact of dataset scale on performance




*Prediction error decreases significantly with more data.*

*Source*: Baidu Research

Other factors in competitive advantage include the type of algorithm in use and the uniqueness and scale of the data required.

For a relatively simple algorithm—say, detecting the difference between images of cats and dogs—the size of the required training set will be limited, and the data required to train the algorithm may be broadly available. A business built on recognizing cats from dogs is not likely to develop a sustainable competitive advantage.

On the other hand, an algorithm that recognizes a unique type of tumor might be more defensible, because the system will require more, and more unique, data. An even more extreme example is the type of algorithms involved in driverless vehicle technologies; they are varied and complex, and they can require an extensive amount of real-time mapping and traffic data. As a result, an autonomous car business will generate considerably more moats and barriers to keep competitors away.

Learning and network effects can work hand in hand. Generally speaking, the larger a network (that is, the greater the number of its connections), the greater the value of the connections, the greater the flow of data, and the greater the opportunities for AI and overall learning. Any connection in a network can be a useful source of data, and this data can be used to learn, to train algorithms, and to amplify any advantage provided by network effects.

## *Clusters*

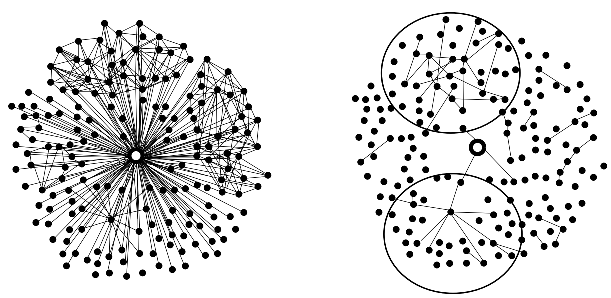
The structure of the network also has an important impact on how a network's value increases with its size. Consider Airbnb and Uber. While Airbnb offers what is essentially a global service, Uber's network is highly clustered around specific urban areas.

In a research project with Feng Zhu, Xinxin Li of the University of Connecticut, and Ehsan Valavi of Harvard Business School, we modeled Uber and Airbnb to understand how network clustering affects the sustainability of network-based business models. We found that clustering makes a big difference. Travelers do not care much about the number of Airbnb hosts in their home cities; instead, they care about the number of hosts in the cities they wish to visit. Hence, the network is global. Any serious challenger to Airbnb would have to enter the market on a global scale. It would need to create global brand awareness to attract critical masses of travelers and hosts in a sufficient number of cities to build a liquid marketplace, where many bids, offers, and participants can easily enter and exit at low cost. Thus, entry into the home-sharing market carries a high price. Indeed, there's only one successful competitor to Airbnb at scale: HomeAway/Vrbo, which entered the market with a different business model.

In general, global networks are more concentrated around a small number of critical hubs. Barriers to competition typically are high, and sustaining profitability is relatively easy for the dominant player. (Marriott's decision to compete directly with Airbnb and HomeAway will provide insight into how well incumbents can devise and execute a network-effects strategy.)

FIGURE 6-4

**The difference between local (left) and global networks**



In contrast to Airbnb's network, Uber's network is highly clustered, grouped around individual urban locations (see figure 6-4). Drivers in a Boston neighborhood will care only about the number of riders available in that same neighborhood, and the same is true for riders. Moreover, except for relatively rare frequent travelers, riders in Boston will not care much about the number of drivers and riders in, say, San Francisco.

This means that Uber's overall scale of more than a million drivers globally does not matter much to the value it can deliver locally. Therefore, the more a network is fragmented into local clusters, the less the impact of scale and network effects, and the easier it becomes for challengers to enter. Clustered networks are thus typically highly competitive. (And even with locally strong network effects, the impact of scale is effectively capped at the level required to serve the local cluster.) Any competitor with local scale can achieve similar efficiencies.

This kind of clustered network structure makes it easy for a competitor with less scale to reach critical mass in a local network and to take off through a differentiated offer or a lower price. Indeed, in addition to Lyft at the national level, Uber faces a number of local competitors in major cities. In New York, for example, it's getting strong competition from Gett, Juno, and Via, as well as from taxi operators. Likewise, DiDi—China's largest ride-sharing company—having driven Uber from its home market, now faces competition from local car companies worried about becoming commoditized by ride-sharing platforms.

Clustered networks are not limited to ride sharing. Similar structures can be observed for group buying sites such as Groupon, and food delivery platforms such as Grubhub. Moreover, the clustering is not always geographic. In many medical networks, patients are clustered around disease classes, such as diabetes or specific kinds of cancer. Sports networks are clustered around teams. In each of these cases, the firms involved are vulnerable to competition. Any focused competitor, specializing in a given cluster, geographical region, or specialty, will have a shot at a business. Typically, global hubs do not emerge in clustered networks.

The phenomenon of clustering applies to the value of data and AI as well as network structure. Consider, for example, whether data acquired in Boston will be relevant to the Uber passenger experience in San Francisco, or in Paris. Geographic differences usually limit the value of aggregation across locations.

## *Evolution of Network and Learning Effects*

Finally, because networks change continuously, the strength and structure of network and learning effects can and will change over time. Changes can either strengthen or weaken the value creation curves, making markets more or less competitive. Microsoft Windows provides one of the more interesting examples. In the PC's heyday, during the 1990s, most of the applications that a PC used were client based, meaning that they actually lived on the PC. This defined the relevant local network of Windows developers, whose applications would connect with Windows and drive much of the value of a PC. At its peak, during the late 1990s, there were around six million dedicated developers writing applications exclusively for Windows, and Windows was entrenched as a dominant platform.

Around this time, economists rightly made the argument that Windows-based network effects were strong, because the value of a competitive platform would be highly dependent on assembling a comparable number of dedicated developers. In addition, the fact that applications written for DOS/Windows were not compatible with the Apple operating system (or even on non-Intel processors like the DEC Alpha) made it difficult for app developers to work with non-Microsoft platforms. Microsoft's technological lock-in created a formidable barrier to entry.

However, as internet usage exploded, and as the power of internet-based applications and services took off, the relevant business networks changed. Most of the relevant functionality moved away from PC applications to web-based and mobile applications, which were open and typically worked across different operating systems. Not surprisingly, we see extensive Android, Chrome, and iOS operating systems on both PCs and tablets, and even the resurgence of Mac personal computers, especially at the high end of the market. Mac shipments increased more than fivefold during the mid-2000s. When the strength of a network effect decreases, affected markets become less concentrated.

## Value Capture Dynamics

In recent years, because of the ease with which digital networks can connect various types of users and businesses, options for value capture have grown dramatically.[9] Optimizing the value captured by a business can be a significant undertaking, drawing on economic analysis, strategic thinking, and technological capabilities. Digital value capture technologies allow for careful usage metering, sophisticated pricing algorithms that react to product inventory conditions, and even outcome-based pricing models.

However, even with sophisticated pricing approaches, not all the value created for a user network will be captured. The *appropriability of value* (that is, the ability to capture value) on any digital business network is a function of a number of important considerations, such as the existence of competitive solutions and the customer's willingness to pay. When several options are available—such as working with a multisided platform business or network hub—you can adjust pricing to charge the side or network having the least competition and the greatest willingness to pay. This is why search engines do not charge end users and instead charge advertisers for an exclusive opportunity to reach a user who clicks on a specific search term. Often, the search term is an indication of a commercial need, and access to the click is therefore valuable.

The key here is to realize that network effects open new types of value capture options. Take, for example, a system that has direct network effects; some companies may find it useful to charge customers for the value the companies are generating by giving customers access to the network. Xbox and PlayStation 2, for example, have opened monthly subscription access to their platforms so that players can directly connect with other players and enjoy multiplayer games.

Companies that have two-sided indirect network effects have more options for value capture, because they can find multiple ways to monetize their services by charging each side separately, depending on each side's willingness to pay. For example, Ant Financial can make money from consumers and merchants in multiple ways, and Airbnb charges both the renters and the hosts for each stay. Alibaba and Amazon have discovered that advertising fees from merchants are becoming a lucrative revenue source above and beyond the transaction fee they collect from the merchants.

## Multihoming

The first and most important force shaping value capture is multihoming. *Multihoming* refers to the viability of competitive alternatives, specifically to situations wherein users or service providers in a network can form ties with multiple platforms or hub firms ("homes") at the same time. If a network hub faces competition from another hub connecting to a network in a similar way, the first network hub's ability to capture value from the network will be challenged, especially if the switching costs are low enough for users to easily use either hub.

The more or the fiercer the competition, the lower the value captured by a network hub. For example, many smartphone app developers multihome across the iOS and Android operating systems. This makes it hard for these platforms to make money on the developer side of their market. However, even though multihoming is common on the developer side, the vast majority of consumers single-home to either iOS or Android phones and continue this practice over several phone generations, something that enables Apple and Android to extract significant profits from the consumer side of the market.

When multihoming is common on each side of a platform, it becomes almost impossible for the platform to generate a profit from its business. In the ride-hailing industry, for example, many drivers and riders use multiple platforms to their advantage. Riders can compare prices and wait times, and drivers can reduce their idle time. Not surprisingly, Uber, Lyft, and other competitors constantly undercut each other as they compete for riders and drivers.

Airbnb also experiences serious multihoming on both sides of its platform, because other home-sharing sites present a similar value proposition. Homeowners can easily list the same property on multiple sites (e.g., HomeAway and Vrbo) at the same time without much of a barrier, although the fee structures and models may be different. On the other side, renters can search all available sites looking at properties to rent. Multihoming thus hinders profitability in both ride- and home-sharing services.

Incumbent platform owners can try to reduce multihoming by attempting to lock in one side of the market (or even both sides). For example, Uber offered drivers the option to lease cars through partnerships with car manufacturers with affordable payment plans; this arrangement would lock drivers into driving with Uber only, because drivers would be expected to serve a sufficient number of Uber rides to maintain their eligibility for the loans. Uber and Lyft also offer rate discounts for drivers who drive a large number of miles on their respective platforms, again encouraging drivers to become exclusive. In addition, both companies provide the next ride request to a driver during a ride in progress to encourage another pickup very close to the current drop-off location, reducing a driver's idle time and hence the incentive to use other platforms. Both of these platforms have also introduced usage-based rewards programs for their riders to drive stickiness and reduce multihoming.

Similar approaches have been more successful at Airbnb. For example, it offers tools and advantages exclusively to power users, which provide value but also increase switching costs across platforms. But because of the low adoption cost of multiple platforms, multihoming is still common and profitability is limited.

Firms have developed a number of other approaches to try to avoid multihoming. Video game console makers such as Microsoft and Sony have signed exclusive contracts with game publishers. On the player side, the high prices of consoles and their associated subscription services, such as Xbox Live and PlayStation Plus, reduce players' incentives to multihome. In a similar vein, Amazon provides fulfillment services to third-party sellers and charges them higher fees when their orders are not from Amazon's marketplace to incentivize them to sell exclusively on its platform. It also uses Amazon Prime, a paid subscription service for free two-day shipping for most of its products, to retain customers and reduce their tendency to multihome.

## Disintermediation

*Disintermediation*, wherein nodes in a network can easily bypass the firm to connect directly, can also be a significant problem for capturing value. Take Homejoy, a home services marketplace that shut down a few years ago. After the original match was made between service provider and homeowner, there was little incentive for customers to continue to work through the hub, and disintermediation was common. Homejoy's transaction-based value capture model was doomed, and the service was shut down. This problem is a frequent one, especially for marketplaces—from Homejoy to TaskRabbit—that provide only a connection between network participants. After the first connection is made, most if not all of the value created is delivered, and it's difficult to hold a user accountable to the network hub for ongoing rents.

For better or worse, hubs have used various mechanisms to deter disintermediation, including requiring terms of service that demand users conduct all transactions on the platform or blocking users from exchanging contact information, at least before payment is confirmed. For example, Airbnb withholds the exact locations of hosts and their contact information until payments are made. These kinds of strategies, however, are not always effective. Anything that makes the hub more cumbersome to use can make it vulnerable to a competitor offering a more streamlined experience. Airbnb's substantial scale advantages are in this case defending the hub from competition.

A more honorable way to discourage disintermediation is to enhance the value for users of conducting business through the hub. Hubs may facilitate transactions by providing insurance, payment escrow, or communication tools; resolving disputes; or monitoring transactions. These services, however, can become less valuable to users after they build strong trust among themselves.

Grace Gu, a doctoral student at Harvard Business School, and Feng Zhu examined an online freelance marketplace to understand the relationship between trust and disintermediation. They found that as the network hub improved the accuracy of its reputation system to foster stronger trust between its clients and freelancers, more disintermediation did in fact occur, which offset revenue gains from better matches. After sufficient trust is established between a user and a service provider, services such as payment escrow and dispute resolution are no longer valued—and the need for the platform is diminished.

A more effective way to reduce disintermediation is to reduce transaction fees and make up the revenue on different market sides. The Chinese outsourcing marketplace ZBJ, launched in 2005, had a business model wherein the company charged a 20 percent commission, but it has estimated that as much as 90 percent of revenue was lost because of disintermediation. In 2014, the company discovered that a large number of new business owners used the site to get help on logo design. Typically, the next task these clients would need is business and trademark registration, services the platform started to provide. Recognizing the opportunities, the company started offering complementary services and now is the largest trademark registration service provider in China—an offering that generates more than $1 billion in annual revenue. The platform has significantly reduced its transaction fees and focuses resources on growing its user base instead of fighting disintermediation. The company is now valued at more than $2 billion.[10] If disintermediation is a threat, providing complementary services can work a lot better than charging transaction fees.

## *Network Bridging*

Although multihoming and disintermediation are the enemies of network-based profitability, network bridging can improve and even rescue a firm's business model. *Network bridging* involves making new connections across previously separate economic networks, making use of more-favorable competitive dynamics and different willingness to pay. Network participants can improve their ability to both create and capture value when they connect to multiple networks, bridging among them to build important synergies.

The classic example here is Google search. If Google charged users directly for search—for example, on a per transaction basis—users would use it much less. Google bridged the search business with a network of advertisers who were willing to pay handsomely for access to Google's users by matching their search intent to a relevant advertisement. Payment is another classic example. Traditionally, payment systems have not been big money makers, but access to users and small businesses, as well as the accumulation of data, has made it more than worthwhile for companies to invest in payment networks.

It is worth emphasizing that data-based assets are almost inevitably useful across many scenarios and across multiple network sides. Firms that succeed in building critical mass in users can use this asset to capture value on new and different networks. This is the fundamental reason that hub firms like Amazon and Alibaba move into many different markets.

Alibaba successfully bridged e-commerce platforms Taobao and TMall into financial services by leveraging its payment network, Alipay. Alibaba took advantage of transaction and user data from

Taobao and TMall to launch new services through its financial-services arm, Ant Financial—including a credit system for merchants and consumers based on their transaction data. Using this system, Ant Financial was able to issue short-term loans to consumers and merchants with very low default rates. The loans from Ant allowed consumers to purchase more products on Alibaba's e-commerce platforms and provided merchants with funds for inventory purchases.

These networks mutually reinforce each other's market position and help sustain each other's scale. Indeed, even after its rival, Tencent, offered a competing digital wallet service, WeChat Pay, through its popular social networking app WeChat, Alipay remains an attractive digital wallet in part because of its tight bridging with Alibaba's other services. As the most successful network hubs connect across markets, they can be increasingly effective in driving connections across previously disconnected industries.

## Strategic Network Analysis

In the previous sections we discuss factors that can strengthen or weaken value creation and capture in networks. Let's now put together the implications and distill them into a consistent approach to strategic network analysis across the multiple networks that connect to a business. We use Uber as an example.

### *Mapping the Networks*

The first step in strategic network analysis is to list the major networks a business is connected to. Uber, for example, is primarily connected to riders and drivers. A more minor network makes connections with food providers to power Uber Eats. Additionally, in March 2018 Uber launched Uber Health, a service that makes connections with health-care providers and lets clinics, hospitals, rehab centers, and other health-care institutions book rides for patients. Uber Health is one of several efforts Uber has under way to partner with different organizations to increase value creation and capture opportunities, including grocery delivery.

FIGURE 6-5

### Networks connected to Uber's core business

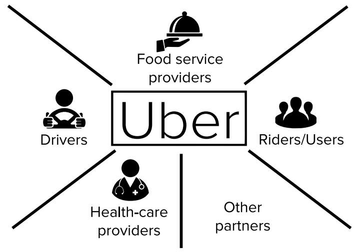



Figure 6-5 sketches out the many networks connecting with Uber's operating model. The number of networks will likely grow as Uber searches for additional value capture opportunities. We have seen the company try out UberKITTENS (users pay to cuddle with kittens) and even Uber ice cream delivery.

## *Network Value Creation and Capture Factors*

The second step is to evaluate the potential of each major network in the business for value creation and capture at scale. Table 6-1 includes a checklist of network properties that will strengthen and weaken value creation and capture.

Overall, Uber's situation is difficult. Let's go through the checklist in sequence.

Uber's main businesses do not have direct network effects. There is no value to a rider if other riders are also taking Ubers. Similarly, drivers receive no value from the presence of other drivers. Possibly, there is even a negative impact, because the more riders who exist in close proximity, the more competition there is for a ride and the lower the Uber quality of service. (One exception is UberPool, which we discuss in more detail later.)

TABLE 6-1

### Evaluating Uber's strategic networks

| Strengthen value creation and capture | Weaken value creation and capture |
|---|---|
| • Strong network effects | • Weak network effects |
| • Strong learning effects | • Weak learning effects |

| | |
|---|---|
| • Strong synergies with other networks | • No synergies with other networks |
| • No major network clusters | • Important network clusters |
| • No (or single-sided) multihoming | • Extensive multihoming |
| • No disintermediation | • Extensive disintermediation |
| • Extensive network bridging opportunities | • No network bridging opportunities |

Weakening network effects further is the geographical clustering of the Uber networks. Having a critical mass of riders and drivers is crucial, but it must be done location by location. Having a high density of drivers in San Francisco is not helpful to users in Detroit. This means that any service with local scale can be competitive to Uber's service, and it implies that the profitability of its core service will always be challenged by inevitable, low-cost competitors.

Uber does have important learning effects, and its businesses benefit from the accumulation and analysis of the extensive amount of data it collects. The learning effects help it adjust pricing due to traffic conditions and other factors, predict supply and demand to make sure that it can offer the right quality of service, and perform a number of other useful analyses that optimize the value created by its service. It is not clear whether these learning effects are massive enough to ensure sustained profitability for the company.

However, Uber's ride-hailing app suffers from extensive multi-homing problems on both rider and driver networks. A large proportion of both riders and drivers have more than one ride-hailing app and regularly check to make sure they are using the most economical service.

Disintermediation of Uber is not a common problem. In part, this is because the company has put in place many measures to enhance the stickiness and convenience of its service for riders and drivers, and in part it stems from the significant penalties the service threatens drivers with who disobey the rules.

The bottom line is that clustering and disintermediation open the door to extensive competition for Uber across all of its core geographies, and the profitability of these services is by no means assured. Absent massive learning effects, Uber's core business will likely remain unprofitable for the foreseeable future.

However, despite its challenged core business, Uber does show promise in the many additional networks it can connect to its core networks of drivers and riders. Uber's future profitability will hinge on its ability to bridge its highly engaged riders and drivers into a growing variety of additional networks. These are starting to provide a variety of other options for value capture, which may enable the company's long-term profitability and viability.

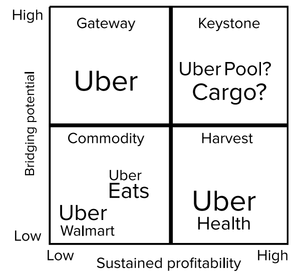
## *Mapping Uber's Opportunities*

Uber has a variety of bridging opportunities enabled by the intrinsic value of its core service, as shown in figure 6-6. Generally speaking, as long as intrinsic value is there, Uber should be able to find a way to bridge the business and make some money. Uber's core service should enable additional value creation, and especially the value capture of being a gateway to additional networks.

One kind of bridging opportunity concerns connecting the driver network with other business networks. Grocery delivery, Uber Eats, and Uber Health are all examples of this class of network bridging opportunities. Uber's driver network is thus plugged in to a variety of other providers, some less local (e.g., Walmart or Kaiser Health). The idea is to foster more enduring, global connections to differentiate Uber from other providers who are fiercely competitive on a local level because of network clustering and multihoming. Will these opportunities be profitable? Clearly it depends on the nature of deals that Uber can seal with providers. Grocery deals are quite competitive because alternatives exist, and Uber's trial with Walmart was suspended because the numbers did not look good. Uber Health seems to have brighter prospects.

**FIGURE 6-6**

**Mapping Uber's value creation and capture opportunities**




Uber Eats is another interesting option. It involves building a new network of connections with local and global restaurant providers. Although certainly providing another shot at goal, this strategy does not ensure sustained profits because again it suffers from extensive competition and local clustering challenges. Apparently, Uber Eats is profitable in some locations but generally unprofitable.

Other interesting Uber opportunities include UberPool and Cargo Systems. UberPool is a service that attempts to drive additional economies by sharing rides across multiple users. The interesting thing about UberPool is that the network effects are much stronger than in the regular Uber service. In fact UberPool adds *direct* network effects to Uber's traditional indirect network effects business. Suddenly, the more riders Uber has, the more the value to riders increases. With UberPool at scale, it is much less likely that a competitor could provide a similar service. The chance that a smaller service provider could find two random passengers starting from a close location and ending up at a similarly close location is extremely small. Unfortunately, the chances are small even at Uber's current size, and the service has been plagued by profitability and dissatisfaction problems. If UberPool ever reaches scale, however, it might truly contend for the keystone category, because it will harvest significant profits while having the same bridging potential of traditional Uber ride-sharing.

One additional interesting idea is Cargo, which was started by serial entrepreneur Mark Pincus of Zynga and Support.com fame. Cargo connects the rider network with a variety of retail opportunities by offering a convenient way to sell products to riders while they are a captive audience in a ride-sharing vehicle. Cargo advertises that drivers can make hundreds more dollars each month. This is sheer profit for drivers (and for Uber), which could make a material difference to Uber's profits.

Ultimately, the intrinsic value embedded in Uber is real and offers a myriad of bridging opportunities, but achieving a stable valuation as a public company will require work—and perhaps more modest expectations.

## Strategic Questions

We now summarize our arguments into a set of questions. These are questions entrepreneurs and executives should ask about their own businesses as they develop strategies and envision the potential value creation and capture opportunities in the networks the business could connect to. For a concrete example, let's go back to the Parkinson's app introduced at the beginning of the chapter.

### What is the core service delivered?

As with most traditional strategic analyses, the best way to start is to go back to the most essential way the business creates value. In the case of a cool AI startup, for example, what is the specific process your firm is digitizing and enabling through AI? In the case of an advanced business, what is the most basic value proposition? With the Parkinson's app, the core value is in improving the effectiveness of treatment by gathering data on the daily progress of the disease.

### What networks are key to providing that service, and what are their characteristics? Do they have strong learning or network effects? Are they clustered?

This next step is a systematic assessment of the characteristics of the core network the business is plugging in to. The most critical network for the Parkinson's app is its patient network. Its most essential dynamic is the learning effect, because the app's patient data should be highly useful in carefully monitoring the progress of the disease in a way that has previously been impossible. There are many ways to gather useful data, from basic coordination tests taken by the patient, to a simple daily survey. Given the complexity of the disease and its many rare forms, the tail of the distribution in disease characteristics is quite long, and the potential for the data to be increasingly useful at scale is very high. The learning effects are thus strong, which is both good and bad news for the app. The bad news is that it will take many deployments before the data is truly useful. The good news is that after it reaches critical mass, the app should be able to sustain a significant competitive advantage.

### If network and learning effects are weak, how do you strengthen them over time? How do you increase the value delivered?

As the business grows, one should consider the potential to ratchet up value created by driving additional learning and network effects. Learning effects are already strong in the Parkinson's app, but they could be bolstered over time by providing additional functionality to promote additional significant network effects. If functionality is added to the app to encourage interaction among the participants, for example, it could engender significant exchanges, in the form of mutual support, coaching, and advice on fighting a difficult disease. These direct network effects could help further sustain the app's competitive advantage.

### If the network effects are strong and there is very little value delivered until critical mass, how do you get there?

This is the classic chicken-and-egg problem. Any company depending on strong network and learning effects needs a way to bootstrap its business until it acquires enough scale for the learning and network effects to kick in. This is true of the Parkinson's app: its scale is still too modest to deliver much in the way of learning and network effects.

To kick-start growth, we could try several tactics. We could load the app with content to attract users. We could provide treatment advice and best practices, even invest in making live help available to answer treatment questions. We could also gamify the experience, making the app more entertaining and engaging. The Peloton app, for example, leveraged the Facebook network to bring together enthusiasts into communities that are passionate about their Peloton experience.

### What are the most important secondary networks? Can they enable

### additional network or learning effects?

Now that we understand the basics of our core network, we should start examining the business to analyze the characteristics of the many secondary networks. With the Parkinson's app, several networks are of interest. The most interesting is probably the network of physicians, because they can greatly benefit from having data on the patient's disease progression and from developing an additional channel of interaction with the patient. The app could even build functionality to help physicians or other medical staff provide additional coaching and advice. These services would add a substantial indirect network effect to the app, further improving its competitive position and business sustainability. There are a number of other interesting networks, such as researchers and insurers, who would benefit from the patient data, as well as pharmacies, which could use it to help trigger prescriptions and refills.

### Do we have challenges with network clustering? Multihoming? Disintermediation?

Now we go a little deeper on the characteristics of the networks the business is focused on. The Parkinson's app business is inherently clustered on Parkinson's patients, so scale there is limited. When the app plugs in to related networks, however, it can truly deliver daily value to patients. Engagement is likely to be high, and disintermediation and multihoming appear unlikely because the value emerges from the integration of related networks. As the app accumulates an increasing amount of patient data and perhaps even engages the patient's physicians, the likelihood of multihoming and disintermediation is even more distant.

### What are the best value capture opportunities?

To think seriously about value capture, one must first understand the characteristics of the networks in play. Now that we have examined the characteristics of the various networks plugging in to the Parkinson's app, what jumps out is the significant value that can be created at scale, to patients, physicians, researchers, and insurers. However, without critical mass, the value created by the app is limited, again because of the strong learning and network effects. This suggests a strategy *not* to charge patients or physicians for using the app, because we want to do everything we can to encourage adoption and engagement.

However, there are many other ways to monetize the app. One is simply to provide it for free and gather the benefits in increased branding and exposure to the complementary pharmaceutical business, whose revenues are already in the billions of dollars. Any noticeable increase in those revenues would easily pay for the app, with plenty to spare. We could also consider targeted ads (useful and tactfully designed), physician referrals, insurance subsidies, and anonymized data monetization opportunities. All in all, this app would make quite a good business and would add a ton of value to the treatment and management of the disease.

### Are there network bridging opportunities? Considering the data you can accumulate from your core network, is it of value to another network?

Finally, we should ask what kinds of previously separate networks this business could bridge to for additional value creation or capture opportunities. The Holy Grail for the Parkinson's app would be to transcend disease classes, but these are highly clustered, so the points of connection are few. Insurers could push for the adoption of similar apps in different environments, or even serve as a distribution channel, after the app is well established and successful in Parkinson's treatment. Physicians and other health-care providers could also enable bridging into other disease networks.

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This chapter has examined some of the more important approaches to crafting strategy in an age driven by data and AI and dominated by digital networks. In the next chapter we illustrate the broad strategic implications of these ideas and examine the resulting competitive dynamics observed in various sectors of the economy.