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NETWORK EFFECTS

The Power of the Platform

For several weeks in June 2014, a very public debate over a seemingly arcane topic raged between a famous finance professor at New York University and a renowned venture capitalist in Silicon Valley.

Aswath Damodaran—a chaired professor at NYU, author of textbooks on corporate finance and valuation, and the 2013 recipient of the prestigious Herbert Simon Award—launched the debate when he published an article estimating the value of Uber, the platform company whose smartphone app connects riders with drivers. Earlier that month, investors had ponied up $1.2 billion in financial capital for Uber, receiving in return a share of the company that suggested the overall value of the business was around $17 billion. Damodaran called this "a mind-boggling sum for a young company with only a few hundred million in revenue."[1] He implied that the idea that Uber was worth this much—or even more, as some were claiming—was yet another mark of Silicon Valley hubris.

Damodaran's judgment was based on the classic tools of finance. He estimated the size of the global taxi market, Uber's prospective market share, and the revenues this was likely to yield. Then he used risk-adjusted cash flows to come up with a company valuation of $5.9 billion. With admirable forthrightness, he even posted his spreadsheet online so others could examine and test his assumptions.

Bill Gurley, a partner at Benchmark Capital and one of Uber's Silicon Valley investors, took up the challenge. A venture capitalist famous for having been among the first to spot such technology sky-

rockets as OpenTable, Zillow, and eBay, Gurley argued that the $17 billion valuation was likely an *underestimate*, and that Damodaran's figure could be short by a factor of 25.[2] Gurley questioned Damodaran's assumptions about both the total market size and Uber's potential market share, basing his calculations on economist W. Brian Arthur's analysis of network effects.[3]

In classic platform style, Uber performs a matching service. It helps riders find drivers, and vice versa. As drivers sign on and coverage density rises within a city, a number of striking growth dynamics are set in motion. Riders tell their friends about the service; some even start driving themselves in their spare time. Wait time falls for riders, and downtime falls for drivers. Less downtime means that a driver can make the same amount of money even if fares are lower, because he has more riders during the same number of working hours. Thus, less downtime means that Uber can cut fares and stimulate even more demand, which creates a virtuous cycle that increases coverage density still further.

In his article, Gurley reproduced a graphic from another investor that illustrates how this virtuous cycle works—a napkin sketch created by David Sacks, co-founder of Yammer and veteran of PayPal (Figure 2.1).

Sacks's napkin sketch captures a classic example of *network effects*. It shows how the value of Uber to each of its participants grows the more people use it—which attracts still more users, thereby increasing the value of the service even more.

Network effects refers to the impact that the number of users of a platform has on the value created for each user. *Positive network effects* refers to the ability of a large, well-managed platform community to produce significant value for each user of the platform. *Negative network effects* refers to the possibility that the growth in numbers of a poorly-managed platform community can *reduce* the value produced for each user.

As we'll see, positive network effects are the main source of value creation and competitive advantage in a platform business. However, network effects can also be negative, and in this chapter we'll explain how and why negative network effects arise and what

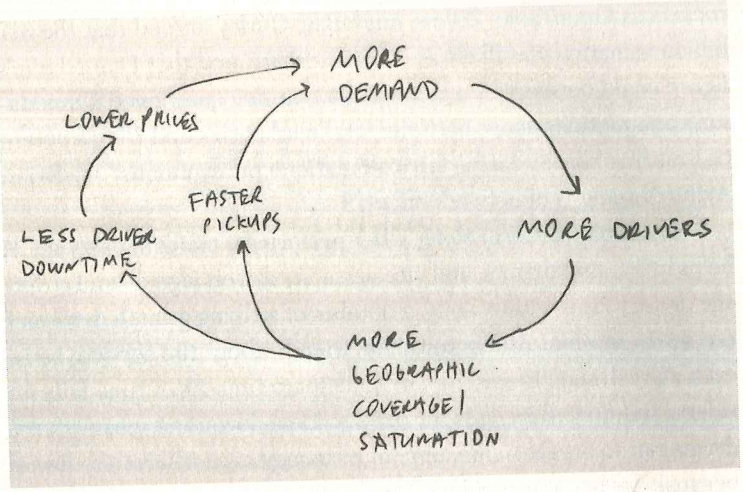

FIGURE 2.1. David Sacks's napkin sketch of Uber's virtuous cycle. Reprinted by permission.

platform business managers can do about them. But understanding value creation via positive network effects is the essential first step.

Gurley's data showed that, by mid-2014, network effects were already beginning to drive Uber's growth. When Travis Kalanick, CEO of Uber, sought seed funding in 2009, the size of the taxi and limousine market in Uber's hometown of San Francisco was $120 million. Based on Uber's own data, the market in 2014 appeared already to be three times as large and still growing. This threefold multiple would, all by itself, justify increasing Damodaran's $5.9 billion valuation to the $17 billion value imputed by investors. Unaware of this insider information, Damodaran hadn't adjusted his equations for network effects—as he graciously conceded in an elegant and well-reasoned response.

DEMAND ECONOMIES OF SCALE

The network effect represents a new economic phenomenon, driven by technological innovation. In the twentieth-century industrial era,

giant monopolies were created based on *supply economies of scale.* These are driven by production efficiencies, which reduce the unit cost of creating a product or service as the quantities produced increase. These supply economies of scale can give the largest company in an industrial economy a cost advantage that is extremely difficult for competitors to overcome.

Consider some of the giant businesses that grew up during the industrial era. In steel production, the British Bessemer process of blowing air through molten slag removed impurities and cut costs of production from £40 to £7 per ton. Operating eighteen five-ton Bessemer blast furnaces, Barrow Hematite Steel Company became the largest steel mill in the world at the turn of the twentieth century. Similarly, the German Haber-Bosch process of producing fertilizer from nitrogen in air, which is used in the production of half of all foodstuffs consumed today, was one factor contributing to rise of giant BASF, which is still the world's largest chemical company. And American Thomas Edison's inventions in lighting and cheap power generation gave rise to General Electric, while Henry Ford's use of mass production accelerated the rise of Ford Motor Company. The bigger the business, the cheaper the costs of production, marketing, and distribution—a positive spiral that helped companies grow steadily larger and more profitable (until the process was derailed by government intervention or disruptive technological change that rendered the old economies obsolete).

In the twenty-first-century Internet era, comparable monopolies are being created by *demand economies of scale* (a term used by the two experts largely responsible for popularizing the concept of network effects, Hal Varian, the chief economist at Google, and business professor Carl Shapiro).[4] By contrast with supply economies of scale, demand economies of scale take advantage of technological improvements on the demand side—the other half of the profit equation from the production side. Demand economies of scale are driven by efficiencies in social networks, demand aggregation, app development, and other phenomena that make bigger networks more valuable to their users. They can give the largest company in a platform market a network effect advantage that is extremely difficult for competitors to overcome.

Demand economies of scale are the fundamental source of positive network effects, and thus the chief drivers of economic value in today's world. This is not to say that supply economies of scale no longer matter; of course they do. But demand economies of scale, in the form of network effects, have become the most important differentiating factor.

Metcalfe's law is a useful way of encapsulating how network effects create value for those who participate in a network as well as for those who own or manage the network. Robert Metcalfe, co-inventor of Ethernet and founder of 3Com, pointed out that the value of a telephone network grows nonlinearly as the number of subscribers to the network increases, making more connections among subscribers possible.

When there's only one node in a network, no connections are possible. An MIT professor we know likes to joke that the prize for "greatest salesperson in history" should go to whoever sold the *first* telephone. Arguably, it had zero value, because when there's only one telephone in the world, you can't call anyone. But as more people buy telephones, the value grows. With two telephones, one connection is possible. With four telephones, six. With twelve, sixty-six. And with 100 telephones, there are 4,950 connections. This is known as *nonlinear* or *convex growth*, and it is precisely the characteristic growth pattern seen in companies like Microsoft in the 1990s, Apple and Facebook today, and Uber tomorrow. (Working in reverse, it explains the *convex collapse* of Blackberry in the 2000s: as users began to flee the Blackberry platform, the loss of network nodes caused the value of the network itself to plummet, encouraging still more people to abandon Blackberry for other devices.)

Major economic consequences follow from this pattern. Growth via network effects leads to market expansion. New buyers enter the market, attracted by the growing number of friends who are part of the network. If prices also fall—as they often do when technology matures and production quantities increase—then network effects work together with more attractive pricing to drive massive market adoption.

TWO-SIDED NETWORK EFFECTS

David Sacks's napkin sketch suggests a second dynamic at work in the growth of Uber, one we refer to as a *two-sided network effect*.[5] In Metcalfe's telephone example, phone users attract more phone users. But in the case of Uber, two sides of the market are involved: riders attract drivers, and drivers attract riders. A similar dynamic can be seen in many other platform businesses. In the case of Google's Android, app developers attract consumers, and consumers attract app developers. On Upwork (formerly known as ElanceoDesk), job listings attract freelancers, and freelancers attract job listings. On PayPal, sellers attract buyers, and buyers attract sellers. And on Airbnb, hosts attract guests, and guests attract hosts. All of these businesses attract two-sided network effects with *positive feedback*.

The importance of these effects for stimulating network growth is so great that platform businesses will often spend money to attract participants to one side of the market. They know that, if they can get one side to join the platform, the other side will follow. Two-sided network effects with positive feedback explain how Uber can afford to use millions of dollars of money from Bill Gurley and other investors to give away free rides worth $30 each. Uber's coupons buy market share in a way that attracts a virtuous cycle of drivers and riders who will later pay full price to participate in the network.

A familiar (non-tech) example is a local bar that holds a weekly Ladies' Night, when discounted drinks are offered to female customers. When the women show up, the men appear—and they're happy to buy their own drinks at full price. Thus, in a two-sided market, it can sometimes make economic sense to accept financial losses—not just temporarily, but permanently!—in Market A if growing that market enables growth in a related Market B. The only proviso is that the profits to be earned in Market B must outweigh the losses incurred in Market A.

NETWORK EFFECTS VERSUS OTHER GROWTH-BUILDING TOOLS

It's important to distinguish network effects from other familiar market-building tools, such as *price effects* and *brand effects*. Misunderstanding of these distinctions is a source of the current confusion over how to value platform business models, and contributed to the dot-com boom and bust of 1997–2000.

During the dot-com boom, investors in startups like eToys, Webvan, and FreePC regarded market share as practically the only significant metric of business success. Captivated by slogans like "Get big fast" and "Get large or get lost," they urged companies to spend lavishly to lure customers in hopes of achieving an insurmountable market share advantage. The companies responded: for example, via discounting and couponing, they created price effects. Attracting customers through extraordinarily low pricing—as low as zero in some cases—is a foolproof way of buying market share, at least temporarily. Books like the bestselling *Free: The Future of a Radical Price*, published in 2009 by Chris Anderson, then the editor-in-chief of *Wired* magazine, preached the gospel of the giveaway, positing a steady climb from "free" to "premium" to "freemium" (free + premium) pricing of the product or service.

The problem is that price effects are evanescent. They disappear the moment the discounts end or another firm offers a better price. Typically, only 1–2 percent of customers convert from free to paying. Thus, as David Cohen, CEO and founder of the venture incubator Techstars, says, you need to reach millions of customers before the giveaway model becomes profitable.[6] Freemium models also create freeloaders than can be hard to monetize (that is, to profit from), as FreePC discovered in 1999 when it gave away free Pentium PCs in exchange for viewing ads and the prospect of online sales.[7]

Brand effects are stickier. They arise when people come to associate a particular brand with quality. But brand effects, like price effects, are often difficult to sustain. They can also be extremely expensive. EToys spent millions to establish a brand in hopes of competing with Amazon and Toys"R"Us. Kozmo, an online company that promised free one-hour delivery of food, books, coffee, and other basic goods in major U.S. cities, hired actress Whoopi Goldberg as a spokesperson and paid her in stock, only to have the business collapse soon thereafter. In January 2000—the peak before the dot-com crash—nineteen startups bought Super Bowl ads, spending over $2 million each in order to build brand recognition. A decade or so later, eight of them no longer existed.[8]

Price effects and brand effects have their place in a startup's growth strategy. But only network effects create the virtuous cycle we described above, which leads to the building of a longlasting network of users—a phenomenon we called *lock-in*.

Another growth-building tool that's easy to confuse with network effects is *virality*. Derived from the expression "going viral," virality is the tendency of an idea or brand to be circulated rapidly and widely from one Internet user to another.

Virality can attract people to a network—for example, when fans of an irresistibly cute, funny, or startling video persuade their friends to visit YouTube. But network effects keep them there. Virality is about attracting people who are off the platform and enticing them to join it, while network effects are about increasing value among people on-platform.

When the dot-com boom turned to bust in 2000, two of the authors of this book (Geoff Parker and Marshall Van Alstyne) were recent PhD graduates from MIT. We watched the cycle with fascination, observing as smart investment firms like Benchmark and Sequoia made both lucrative hits and expensive misses. (Benchmark Capital, the venture capital firm that is now getting it right in the case of Uber, invested in Webvan, which was listed by CNET as one of the biggest dot-com disasters in history,[9] as did Sequoia Capital, which nonetheless got it right with Apple, Google, and PayPal.)

Curious about what separated the successful companies from those that failed, we examined dozens of cases and found that the failures mostly relied on price or brand effects. By contrast, the successes hit on an idea that really worked—driving traffic from one user group in order to drive profits from another user group. We described our findings in a paper that analyzed the mathematics of two-sided network

effects.[10] Today, such successful platform businesses as eBay, Uber, Airbnb, Upwork, PayPal, and Google exhibit this model extensively.[11]

SCALING NETWORK EFFECTS: FRICTIONLESS ENTRY AND OTHER SCALABILITY TOOLS

As you can see, network effects depend on the size of the network.[12] So one important corollary is that *effective platforms are able to expand in size quickly and easily, thereby scaling the value that derives from network effects.*

It's hard to remember now, but there was a time when Yahoo was a more popular portal to the Internet than Google. The story of how Google overtook Yahoo—despite the latter's four-year head start—vividly illustrates the importance of being able to scale both sides of a network.

Yahoo started out as a human-edited database. It classified web pages using a tree structure of subcategories within categories the same way librarians organize books or biologists organize plant and animal species. This worked well for a time. But during the 1990s and early 2000s, growth in Internet users and web page producers increased exponentially—and it soon became apparent that employee-edited hierarchical databases do not scale well.[13] One of the authors recalls submitting web pages to Yahoo, then waiting days and weeks until the results showed up in master lists. (No wonder frustrated users began claiming that Yahoo stood for "Yet Another Hierarchical Officious Oracle!")

By contrast, Google found a way to serve web page searchers by harnessing the work of web page producers. Google's page rank algorithm considers the extent to which web pages link to one another. To attract page viewers, page producers already consider what viewers want. More links from more important pages mean higher-priority search results. Therefore, Google's algorithm effectively matches both sides of the network. Not only do algorithms scale better than employees, but using web links as the key sorting tool shifted the focus from inside the firm to outside the firm, where the choices of

the crowd could control the action—a far more scalable model than Yahoo's.

As the story of Google suggests, networks that permit *frictionless entry* are able to grow organically almost without bound. Frictionless entry is the ability of users to quickly and easily join a platform and begin participating in the value creation that the platform facilitates. Frictionless entry is a key factor in enabling a platform to grow rapidly.

Threadless is a T-shirt company founded by people with expertise in information technology services, web design, and consulting. Their business model involves holding weekly design contests open to outside participants, printing only T-shirts with the most popular designs, and selling them to their large and growing customer base. Threadless doesn't need to hire artistic talent, since skilled designers compete for prizes and prestige. It doesn't need to do marketing, since eager designers contact their friends to solicit votes and sales. It doesn't need to forecast sales, since voting customers have already announced what numbers they will buy. By outsourcing production, Threadless can also minimize its handling and inventory costs. Thanks to this almost frictionless model, Threadless can scale rapidly and easily, with minimal structural restrictions.

Threadless's business model arose by accident. The founders originally thought they were in the web services business, selling consulting to firms who needed websites. But selling web consulting didn't scale: each project had to be negotiated individually, each project required dedicated staff, and after completion, no project could be resold without modification. The company founders launched the T-shirt contest website as a side project to illustrate their capabilities. It was simply an online copy of an offline contest that one of the founders had entered. When this side venture exploded in popularity, its enormous scalability advantages became obvious.

Scaling a network requires that both sides of the market grow proportionally. For example, one Uber driver can serve an average of about three Uber riders an hour. It would make no sense for Uber to have one rider and 1,000 drivers—nor 1,000 riders and one driver. Airbnb faces a parallel issue in scaling both hosts and guests. If one

side becomes disproportionally large, coupons or discounting to attract more participants to the other side becomes good business.

In some cases, the growth of a platform can be facilitated by an effect we call *side switching*. This occurs when users of one side of the platform join the opposite side—for example, when those who consume goods or services begin to produce goods and services for others to consume. On some platforms, users engage in side switching easily and repeatedly.

Uber, for example, recruits new drivers from among its rider pool, just as Airbnb recruits new hosts from among its guest pool. A scalable business model, frictionless entry, and side switching all serve to lubricate network effects.

NEGATIVE NETWORK EFFECTS: THEIR CAUSE AND CURE

So far, we've been focusing on positive network effects. But the very qualities that lead platform networks to grow so quickly may also lead them to fail quickly. The growth of a network can produce negative network effects that drive away participants, even leading to the death of a platform business.

One negative network effect occurs when the growth in numbers that enables more matches between producers and consumers also leads to increasing difficulty, or impossibility, in finding the best match. To avoid this dilemma, frictionless entry must be balanced through effective *curation*. This is the process by which a platform filters, controls, and limits the access of users to the platform, the activities they participate in, and the connections they form with other users. When the quality of a platform is effectively curated, users find it easy to make matches that produce significant value for them; when curation is nonexistent or poorly handled, users find it difficult to identify potentially valuable matches amid a flood of worthless matches.

Dating platform OkCupid discovered that scale can cause network collapse if not carefully managed. According to CEO Christian

Rudder, when you get lots of users on a dating website, the natural tendency of men on the platform is to approach the most beautiful women. Scaling male behavior creates the problem that most of the men who approach a highly attractive woman will be markedly *less* attractive—she is "out of their league," as the saying goes. When these B-level males (our description, not Rudder's!) bombard the A-level females with requests for a date, no one is happy. The beautiful females are unhappy and likely to abandon the site because of all the unfiltered attention, while the B-level males are unhappy because the women of their choice never respond. And the few highly attractive men who might have been a good match for the most attractive women are unhappy because the women they want have left the platform.[14]

Once this happens, the men at all attractiveness levels converge on the women in the second most beautiful tier, and the whole process repeats. Network effects reverse, and the business model breaks down.

To solve this problem, OkCupid implemented a curation strategy involving multiple levels of network matching. The first level addresses the obvious issue of matching compatible interests. Do both parties smoke? Do both parties like tattoos and horror movies? Do both parties believe in dinosaurs? This level eliminates many clearly unsuitable matches and reduces the number of participants in the process.

The second matching level addresses the question of comparative attractiveness—the "in her league" question. If OkCupid's algorithm determines, based on reactions by other users, that Joe is significantly less attractive than Mary (for example), then Joe's routine search for matches will not turn up Mary's picture. (She might show up in a highly targeted search, but not otherwise.) Instead, Joe will be presented with a selection of women thought to be comparable to him in attractiveness. The result is win-win. Mary is happier because the platform helps her find what she's looking for while protecting her from an onslaught. And Joe is happier, too, because women are returning his messages when previously he got the cold shoulder.

Of course, the use of this algorithm means that, if a guy only sees pictures of average-looking women when conducting an OkCupid search, he probably doesn't have the movie-star good

looks he thought he had. But his chances for a successful match have greatly increased, which should lead in the long run to a higher level of satisfaction.

Skillful curation like that practiced by OkCupid greatly reduces negative network effects. At the same time, it increases and leverages the benefits of positive network effects. As the number of participants in the network grows, the volume of information about them increases. As any statistician will tell you, having more data to work with generally increases the accuracy and value of the inferences you can draw from the data. Thus, the larger your network grows, the better your curation can become—a phenomenon we refer to as *data-driven network effects*. Of course, this is dependent on having well-designed curation tools that are continually tested, updated, and improved.

By contrast, poor curation leads to greater noise, which makes the platform less useful and may even cause it to unravel. Such a negative feedback loop following the exponential growth of Chatroulette quickly led to an equally dramatic collapse.

Chatroulette pairs random people from around the world for webcam conversations. People can leave a conversation at any time by initiating a new connection or simply by quitting. The strangely addictive site grew from twenty people at launch in late 2009 to more than 1.5 million users six months later.

Initially, Chatroulette had no registration requirement and no controls of any kind, leading to what became known as the Naked Hairy Men problem. As the network grew without policing, a growing number of naked hairy men showed up to chat, leading many of the non-naked, non-hairy others to abandon the network. As legitimate users fled, the noise level on the platform increased, setting a negative feedback loop in motion.

Chatroulette realized it needed to curate access in a way that scales with platform growth. The platform now lets users filter other users in addition to using algorithms to screen callers with undesirable images, and it is growing again—though more slowly than during its initial phase.

Every successful platform faces the problem of matching content and connections at scale—which means that, at some point in its growth, every successful platform must address the challenge of effective curation. We'll return to the issue of curation in later chapters.

FOUR KINDS OF NETWORK EFFECTS

A two-sided network (i.e., one with both producers and consumers) has four kinds of network effects. It's important to understand and consider all four when designing and managing a platform.

In a two-sided market, *same-side effects* are network effects created by the impact of users from one side of the market on other users from the same side of the market—the effects that consumers have on other consumers and those that producers have on other producers. By contrast, *cross-side effects* are network effects created by the impact of users from one side of the market on users from the other side of the market—the effects that consumers have on producers and those that producers have on consumers. Both same-side effects and cross-side effects can be positive or negative, depending on the design of the system and the rules put in place. Here's how these four types of network effects work.

The first category, *positive same-side effects*, includes the positive benefits received by users when the number of users of the same kind increases—for example, the effect that arose as the number of subscribers to the Bell Telephone network grew. The more of your friends and neighbors who were accessible on "the Bell," the greater the value you received from your Bell membership. Today, a comparable positive effect on the consumer-to-consumer side can be seen with a gaming platform like the Xbox MMOG: the more fellow gamers you encounter on the platform, the greater the fun you experience when using it.

Positive same-side effects can also be found on the producer side. For example, consider Adobe's all-but-universal image production and sharing platform. The more people who are creating and sharing images using the PDF platform, the greater the benefit you

get from using the same platform for your own image production needs.

However, not all same-side effects are positive. Sometimes there is a downside to the numbers growth on one side of a platform. This is called a *negative same-side effect*. For example, consider the information technology platform Covisint, which connects businesses that are interested in developing cloud-based networking tools with service providers. As the number of competing suppliers on the Covisint platform grows, customers are attracted to the platform, which makes the suppliers happy. But when the list of suppliers grows too great, it becomes more difficult for appropriate providers and customers to find one another.

Cross-side effects arise when either consumers or producers gain or lose based on the number of users on the *opposite* side of the platform. *Positive cross-side effects* occur when users benefit from an increase in the number of participants on the other side of the market. Think about a payment mechanism like Visa: when more merchants (producers) agree to accept the Visa card, the flexibility and convenience of the shopping experience increases for shoppers (consumers), creating a positive cross-side effect. The same effect works in the opposite direction, of course; more Visa cardholders lead to more potential customers for merchants. In a similar way, when the number of app developers for Windows grows, the versatility and power of the operating system increases for users; and when the number of Windows users grows, so do the potential benefits (financial and otherwise) for app developers. Positive cross-side effects produce win-win results.

Of course, cross-side effects are not necessarily symmetrical. On OkCupid, women attract men more than men attract women. On Uber, a single driver is more critical to growth than a single rider. On Android, a single developer's app attracts users more than a single user attracts developer apps. On Twitter, the vast majority of people read, while a minority tweet. On question-and-answer networks like Quora, the vast majority asks questions, while a minority answers them.[15]

Again, however, there is the dark side to consider—the situation

in which *negative cross-side effects* arise. Think about a platform that facilitates the sharing of digital media—music, text, images, videos, and the like. In most circumstances, a growing number of producers (music companies, for example) leads to positive benefits for consumers, but it can also lead to growing complexity and expense—for example, too many varying digital rights management forms to read and accept. When this happens, the cross-side effects flip from positive to negative, leading consumers to abandon the platform or at least reduce their usage. In a similar way, when the proliferation of messages from competing merchants on a platform site leads to unpleasant advertising clutter, the positive impact of expanding producer choice may be transformed into a negative cross-side effect that turns off consumers and damages the platform's value.

We can foresee the arrival of growing pains at Uber as a result of increasing negative cross-side effects. If Uber attracts too many drivers relative to the number of riders, driver downtimes will go up; if Uber attracts too many riders relative to drivers, rider wait times will go up (see Figure 2.2, in which the resulting feedback loops have been inserted).

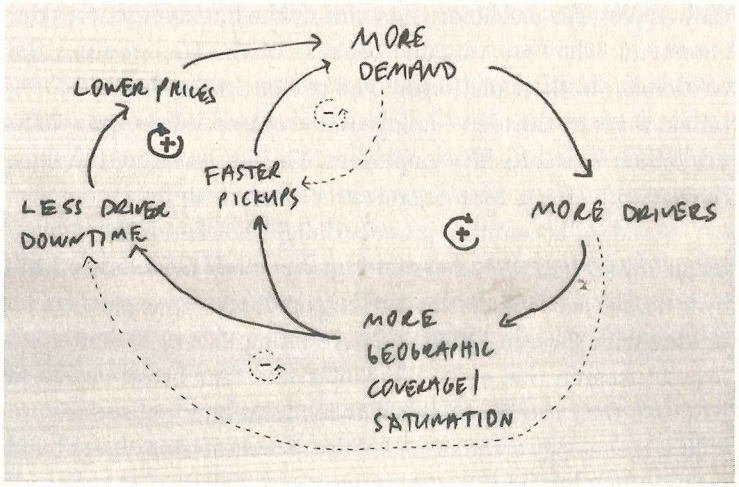

FIGURE 2.2. David Sacks's napkin sketch of Uber, with negative feedback loops inserted.

In fact, this is happening already. As Uber reaches saturation within a given market, too many drivers conflict with one another, increasing downtimes and causing some drivers to abandon the market. The more complete depiction of Uber's growth spiral in Figure 2.2 highlights the fact that a firm in a two-sided market must manage all four network effects. Good platform husbandry seeks to reinforce positive network effects, creating and strengthening as many positive feedback loops as possible. This is another topic we'll return to in later chapters, where we'll offer specific advice about how to manage these challenges effectively.

STRUCTURAL CHANGE: NETWORK EFFECTS TURN FIRMS INSIDE OUT

As we've seen, in the industrial era, giant companies relied on supply-side economies of scale. By contrast, most Internet era giants rely on demand-side economies of scale. Firms such as Airbnb, Uber, Dropbox, Threadless, Upwork, Google, and Facebook are not valuable because of their cost structures: the capital they employ, the machinery they run, or the human resources they command. They are valuable because of the communities that participate in their platforms. The reason Instagram sold for $1 billion is not its thirteen employees; the reason WhatsApp sold for $19 billion wasn't its fifty employees. The reasons were the same: the network effects both organizations had created.

Standard accounting practices might not factor the value of communities into the value of a firm, but stock markets do. Little by little, the accountants are catching up. A team of experts collaborating with the consulting and accounting firm of Deloitte published research that sorts companies into four broad categories based on their chief economic activity: asset builders, service providers, technology creators, and network orchestrators. Asset builders develop physical assets that they use to deliver physical goods; companies like Ford and Walmart are examples. Service providers employ workers who provide services to customers; companies like

UnitedHealthcare and Accenture are examples. Technology creators develop and sell forms of intellectual property, such as software and biotechnology; Microsoft and Amgen are examples. And network orchestrators develop networks in which people and companies create value together—in effect, platform businesses. The research suggests that, of the four, network orchestrators are by far the most efficient value creators. On average, they enjoy a market multiplier (based on the relationship between a firm's market valuation and its price-to-earnings ratio) of 8.2, as compared with 4.8 for technology creators, 2.6 for service providers, and 2.0 for asset builders.[16] It's only a slight simplification to say that that quantitative difference represents the value produced by network effects.

Furthermore, where network effects are present, industries operate by different rules.[17] One reason is that it is far easier to scale network effects outside a firm than inside it—since there are always many more people outside a firm than inside it. Thus, where network effects are present, the focus of organizational attention must shift from inside to outside. The firm inverts; it turns inside out. The management of human resources shifts from employees to crowds.[18] Innovation shifts from in-house R & D to open innovation.[19] The primary venue for activities in which value is created for participants shifts from an internal production department to a collection of external producers and consumers—which means that management of *externalities* becomes a key leadership skill. Growth comes not from horizontal integration and vertical integration but from functional integration and network orchestration. The focus on processes such as finance and accounting shifts from cash flows and assets you can own to communities and assets you can influence. And while platform businesses themselves are often extraordinarily profitable, the chief locus of wealth creation is now outside rather than inside the organization.

Network effects are creating the giants of the twenty-first century. Google and Facebook each touch more than one-seventh of the world's population. *In the world of network effects, ecosystems of users are the new source of competitive advantage and market dominance.*

TAKEAWAYS FROM CHAPTER TWO

- ❑ Whereas giant industrial-era firms were made possible by supply economies of scale, today's giants are made possible by demand economies of scale—expressed as network effects.
- ❑ Network effects are not the same as price effects, brand effects, or other familiar growth-building tools.
- ❑ Frictionless entry and other features of scalability maximize the value-building impact of network effects.
- ❑ A two-sided market (with both producers and consumers) gives rise to four kinds of network effects: same-side effects (positive and negative) and cross-side effects (positive and negative). A growing platform business must manage all four.
- ❑ The key to minimizing most negative network effects is quality curation, which increases the chances of a happy match between producer and consumer.

3

ARCHITECTURE

Principles for Designing a Successful Platform

How do we build a platform that invites participation and creates significant value for all its users? How do we provide tools and services that make it easy for producers and consumers to interact in mutually rewarding ways? And how do we design a technological infrastructure that is capable of scaling rapidly, and encouraging positive network effects while minimizing negative ones?

These are daunting challenges. Platforms are complex, multi-sided systems that must support large networks of users who play different roles and interact in a wide variety of ways. An industry-wide platform—a platform for the health care industry, for example—may need to facilitate interactions among an enormous range of industry participants with motivations that vary widely and change frequently as economic, regulatory, and technological circumstances evolve.

Designers and builders of any complex system often find it difficult to identify a logical starting point. This problem is particularly acute with platform businesses, since they are less familiar and much more complicated than pipeline businesses, which generally feature a straightforward linear design. The natural tendency of those charged with creating a new platform business is to study similar implementations and imitate them. But because no two markets are identical, this strategy often fails. A poorly designed platform produces little or no value for users and generates weak network effects, or none at all.

So where do we start in designing a new platform? The best way