“Platform Economics” Review and Summary

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Book Review

Platform Economics is a compilation of papers that were initially published in separate periodicals and books. Most of the papers are written by the editor, David Evans, some in collaboration with others. Evans uses this collection to describe the economic features of multi-sided platform businesses and examines how the business model is relevant to antitrust analysis.

The book is laid out in sections according to five broad themes: 1) the framework of the multi-sided business model; 2) antitrust economics; 3) internet advertising; 4) payment cards; and 5) technology developments. Each section contains three or four essays. The sections and essays aren’t reworked for the collection, meaning that at the beginning of each chapter basic terms are defined and concepts explained. This leads to considerable repetition, and those who read the book cover to cover may grow weary of repeated exposure to certain content.

Evans interposes the history and principles of multi-sided platforms with very intense economic proofs. Without a knowledge of economic theory and differential calculus, some content may be very technical for the layperson. Readers who love math, however, will probably enjoy working through the formulae. And economists with an interest in the unique nature of platform economics and lawyers who need to get a grasp on multi-sided platforms and antitrust analysis will probably find this material to be useful and worth reading.

Chapter 1

Platforms are places where people can meet and interact, often to transact business, and on two-sided platforms, two users participate in each of the transactions. Many examples of two-sided platforms come from the old economy (e.g., things like open air markets). New economy platforms are typically dependent on advanced technology (e.g., software and web portals).

There are four different types of platforms:

- *Exchanges* are marketplaces that match two groups of customers and allow them to make mutually beneficial exchanges.

- *Advertising-supported media* provides content at a low cost and then charges advertisers for access to the consumers of the content.
- *Transaction systems* provide a medium that allows buyers and sellers to make exchanges.
- *Software platforms* provide a framework for developers to create content on the platform, which reduces duplicative costs for individual developers and provides more content to users.

Pricing: Pricing on platforms is different than for single-sided businesses. With platforms, price depends on the price sensitivities of both sides, and the profit maximizing price may be zero or negative for one side of the platform. Models that apply to single sided businesses often don't apply to platforms.

Value Creation: Platforms create value by matchmaking, creating audiences and reducing duplication costs. Value on a platform is acquired through interactions. The behavior of one user affects the value for another user. To maximize value, it is common for platforms to establish rules and regulations. Policing interactions helps limit negative externalities and promote positive externalities.

Size: Platforms come in all shapes and sizes, and economies (or diseconomies) of scale influence size. When a platform grows, fixed costs are distributed over a larger number of interactions, which leads to lower average costs and more cost efficiencies. Growth, however, can sometimes turn into diseconomies of scale— for example, a platform can get so large that modifications become time consuming and expensive. Congestion and search optimization also affects size. In some cases, a platform can become too large and lose its ability to facilitate quality matches for interactions. Some platforms may choose to limit their size to maintain the quality of matches.

Differentiation: There are different ways to achieve platform differentiation, which can impact scale— for example, vertical differentiation (based on quality) or horizontal differentiation (based on appealing to a specific group). Multi-homing is when customers choose to use multiple similar platforms depending on the platforms' features.

There are a few patterns that appear in platforms across industries. Usually, platforms are not monopolies; there are often several different leaders in an industry or many small platforms. Multi-homing is common for at least one side. Platforms mostly differentiate themselves horizontally, focusing on different features or prices. Additionally, platforms usually get most of their profits from one side and charge the other side little to nothing.

Chapter 2

When two or more groups interact, there will be externalities: effects of the interaction that end up outside of the transaction itself. Platforms act as the intermediary to connect the two

groups, and they internalize externalities. Pricing is structured so that the group generating more positive externalities (network effects are one example of positive externalities) gets the better price.

There are consistent problems with which all platforms deal. The platform has no value unless both sides are on it, and one of the biggest problems is getting both sides on board. A classic chicken-and-egg problem, his can be solved by providing an incentive for one side first (providing tools, charging low costs, offering rewards, etc.). Platforms must develop a pricing structure that creates value for both sides. This is often done by heavily subsidizing one side and getting the bulk of the revenue from the other side— in other words, differential pricing. Once both sides are on a platform, pricing helps to keep them engaged.

Platforms can be grouped into three different kinds of structures, which can greatly influence users' choice to multi-home on different platforms:

- *Coincident*: Coincident platforms offer substitutable products on the same sides. Video games and payment cards are examples of coincident platforms.
- *Intersecting*: Intersecting platforms offer products that are less than completely substitutable. For example, ATM networks don't support credit cards, and credit cards don't offer ATM cards.
- *Monopoly*: Monopoly platforms don't have competition on any of their sides. True monopoly platforms are extremely rare.

Scaling and liquidity must be considered from the outset. Platforms need to establish a liquid enough market to scale smoothly, and many experiment by starting in a small market with low investment and building from there. Diners Club is one example of this. They pioneered the idea of credit cards back in the 1950s, beginning by getting a few restaurants to agree to honor the card and then recruiting the customers. Restaurants were subject to most of the fees and users were rewarded with the opportunity to "float" their money rather than paying their restaurant tabs immediately.

Chapter 3

Platform businesses are catalysts, bringing different groups of customers together and igniting a chain reaction of value creation.

Platforms must solve the coordination problem of getting both sides on board and then reaching critical mass (which is the number of users required on both sides to reach sustainable growth). A balance between sides is necessary to achieve liquidity, or a "thick market." Too many sellers and not enough buyers (or vice versa), and the platform will not take off.

Traditional methods of launching a new product, like advertising and marketing, can also be

used for a platform. But these aren't the only— or even the best— tools for igniting platform growth. A platform's growth strategy depends on the type of customers it caters to. Some platforms have customers that look nearly the same on both sides (such as a telephone network); other platforms have distinct groups of users (such as a video game platform).

A product on a platform is diffused throughout the market by its users, and different types of users help spread information about the product. Influencers are users who have lots of connections and spread information by word of mouth. Centers are users who are connected to lots of people who themselves aren't in contact with other agents, and they can spread information to corners of the network that might not otherwise be reached.

Product diffusion provides insight into how a platform can grow, and direct network effects stimulate the diffusion process. When effects are positive, each additional user increases the value of the platform and consequently increases the spread of the product. Indirect network effects work similarly.

Different customers play different roles in the ignition of a platform:

- Some customers value a product more than others. These are good customers to target early because they require the lowest cost for sales and marketing.
- Some customers are marquee customers. Famous or prestigious customers are good to draw because they attract users, and their entrance should be subsidized.
- Some customers have a lot of friends and are more likely to influence others. They are important to draw in, as they are more vocal and bring on users as well. They bring enhanced network effects wherever they go.

We can look to social networks for examples of ignition failure and success. Friendster provided a new valuable way to connect with people by connecting with friends of friends. It experienced natural, viral growth and didn't focus on marquee users. It scaled poorly, however, due to poor technology and bad community policing. It wasn't ready for a large volume of users. Facebook, on the other hand, started off by allowing students from only Harvard to join. It reached critical mass in the small community of Harvard then did the same in Stanford, Columbia, Yale and so forth, until eventually it was open to all. It used a two-step strategy by first gaining users, then monetizing through advertising.

Chapter 4

There are many types of multi-sided businesses, and this model provides unique challenges to antitrust regulation.

Market makers match buyers and sellers, creating liquidity by providing a benefit that users have no reasonable way of accessing without the platform. The intermediary then internalizes

the externality that buyers and sellers receive by creating a pricing structure that differs depending on who benefits the most.

Advertising-supported media create an audience by providing content to users. These platforms then sell advertisers access to users' attention. Users pay next to nothing; advertisers front most of the bill. While users might not like the advertising, they are willing to deal with it in order to access the content.

With *computer platforms*, customers use a standardized operating system on their devices. The operating system owners provide cheap or free tools for developers and a network of users with which developers can interact. These tools cut down developers' duplicative costs. Users benefit from more operating system programs.

Video games are like computer platforms, but with a different pricing structure. In this model, developers are supported with low cost tools, and the gaming system is sold at a low price. Much of the revenue is captured through game sales.

Payment systems provide different methods of making payments. It's important to create pricing systems that get both sides of the platform on board. Users are convinced to adopt cards by providing float pay and reward systems; merchants are incentivized through the access to more consumers. These systems get most of their revenue from merchants via an interchange fee.

Network effects aren't the only reason that two-sided markets are different than traditional markets— they also have multi-product offerings. Both sides to a two-sided market are distinct products, and users generally benefit when the same firm can internalize the interdependency of pricing between the two.

By supplying both sides of the market, platforms face unique profit maximizing conditions. A two-sided monopoly will charge different prices depending on the elasticity of each side. In a competitive market, users will multi-home, which changes the elasticities of individual sides due to the substitution effect.

Two-sided markets tend to be concentrated between few firms due to substantial network effects and the fixed costs related to getting one side on board. Firms in concentrated markets can earn above competitive profits, and factors affecting excess profits include: the level of competition, the presence of a first mover advantage, threat of potential entrants and the existence of governing institutions.

These kinds of markets introduce new issues when it comes to antitrust analyses. Traditionally, an enterprise analysis for monopolistic characteristics looks at one side of the market. But market definition is crucial, and the relevant market must be determined when analyzing a two-sided business. Both sides need to be taken into account. Another factor is market power: the amount of power a firm has in pricing a unit. Finally, barriers to entry must be evaluated—

in other words, how easily a new firm can come into the market. The two-sided business model changes all these aspects.

Concentrated markets are a double edged sword when it comes to social welfare. The larger market usually creates efficiencies through economies of scale and scope. On the other hand, concentrated markets lead to higher prices for consumers. Antitrust regulation must analyze the tradeoff.

Chapter 5

A market definition provides the context for analyzing antitrust issues and for evaluating company mergers. Analysis needs to limit their scope to the relevant markets for both sides of the platform. Sometimes markets have similar customers on both sides (e.g., dating sites), which makes finding the relevant product easier. Other markets have distinct sides (e.g., video games).

Analysts must consider the share of both sides of the market, and prices must be considered separately for each side. One side of the market may explain seemingly anticompetitive behavior on the other side. Platforms, after all, have different business models that affect competition. A two-sided market might be undercut by a three-sided market that sets super low prices on two of the sides and gets most of its revenue from the third side.

The SSNIP test provides market definition by determining what size of firm (or combination of firms) can charge a small but significant and non-transitory price and still have sales remain relatively constant.

Critical loss— the amount of loss it takes to make products unprofitable— is a way to analyze market power. Actual loss is the amount of loss that a monopoly would see if it increased prices by a given percentage. If actual loss is greater than critical loss, the market will expand to include more substitutes. Otherwise, the market will contract.

Market definition puts the focus on relevant products and businesses; it provides context for understanding potential anti-competitive behavior. Just because a firm is a multi-sided business doesn’t change the need for market-definition analysis. It does mean that the interdependence of the two sides needs to be considered, as well as the relevant products and businesses. One-sided analysis is not helpful for platforms, because it eliminates the needs of the other side. Multi-sided businesses are even more complex than two-sided businesses, and analyzing them can prove to be challenging.

Chapter 6

Multi-sided platforms have been around for a long time, but technology has provided an environment in which they thrive, so we're seeing more and more of them. They can't be analyzed using the same tools as traditional businesses without modifications that take the different sides into account. Two-sided markets are going to become more common in antitrust analyses, because they are usually highly concentrated, they disrupt traditional businesses and they are not well understood.

Pricing is much more complex for two-sided markets, but there are ways to calculate where to set prices in order to maximize profit. Evans provides a set of equations in this chapter that will help on this front (but readers without economics backgrounds may find them difficult to tease out).

Critical loss is important when looking at antitrust issues. Single-side critical loss needs to be expanded to account for multi-sided platforms, otherwise the analysis won't account for feedback loops and cross-price elasticities. As you might imagine, two-sided calculations provide more accurate results for two-sided platforms. Consider, for example, Google's acquisition of DoubleClick, which provides tools for managing advertising. Web publishers sell space on their sites for advertisements; advertisers buy space for advertisements. Sites that have more viewers can charge more for ads.

By acquiring DoubleClick, Google would be able to increase the price of its services, but due to feedback effects, DoubleClick would lose advertisers. It would lead advertisers to switch over to Google's ad service. In terms of critical loss analysis, Google would be able to increase the price of DoubleClick's tools and it would be able to be profitable. The one-sided analysis suggests that Google would not be profitable. The two-sided suggests that they would be.

Chapter 7

Advertising has been around forever, but the advertising sponsored media model popped up in the late 19th century. As is true with other realms, technological advancements are changing the world of advertising. Transaction costs between advertisers and publishers are decreasing, and the market is becoming much more liquid on both sides. Data collection tools are allowing platforms to pinpoint specific groups.

There are several different types of advertising: some is supposed to create leads; some provides information to consumers so they can make informed decisions; and some is used to create a product brand and lifestyle. The price structure of advertising sponsored media usually favors the consumers of content, who pay little to access the platform compared to advertisers.

Online search based advertising— where advertisers bid for a position on the search results

when a user types in a specific keyword— has exploded over the years. The internet provides an efficient space across which to deliver advertisements, and search information can accurately match advertisers to consumers. In what may become a winner-takes-all scenario, search based advertising is becoming more and more concentrated around few platforms. Large firms multi-home their advertising; smaller firms generally do not.

Online display advertising has numerous advantages over traditional display advertising, for example, online platforms can deliver user specific ads from user location and search history data. There are different types of platforms involved with this kind of advertising: Facebook, YouTube, The New York Times, etc.

Advertising networks aggregate demand between publishers and advertisers. Ad software tool companies supply to both sides of the market. There are two kinds of ad networks: contextual ad networks that use keyword bidding and publisher content to place advertisements; and standard ad networks that aggregate publishers and match them with a group of advertisers.

Chapter 8

There are significant differences between online and traditional advertising. With traditional advertising, it's difficult to know whether it really reaches the desired consumer. Online companies know a lot more about the customers, including what sites they visit, the time of day they visit a site and their ISP location. Some sites have users fill out forms to learn even more about them. Internet advertising is generally more efficient than traditional advertising at matching buyer to seller, and because there are more places to advertise online than offline, online advertising offers a much wider market.

There are a few main types of online advertising. Search results pages have paid search results and organic results, and some companies pay specialists to have their online profile optimized for search results. Advertising space is also sold on the margins of a website, with different spots on the page having different value. There are also online advertising exchanges where publishers make advertising space available and advertisers bid on them.

Advertisers usually work with both online and offline media. Large publishers have people who drum up clients to advertise on their sites; they also use automated methods to sell excess space. Small publishers can't afford this, so they sell ads through more automated, computer based methods.

Online advertising is not perfect. There are often problems with privacy: cookies track user preferences, but people don't like their information collected and stored. (Google reduced search history storage time from two years to nine months in response to user concern.) But people do have some control over privacy— they can erase cookies or open private browsing. Furthermore, not much research has been done on how advertising reduces transaction costs,

how much advertising has caused harm by spreading disinformation or how the advertisers themselves decide to spend their advertising dollars.

Chapter 9

Online advertising has become important to the economics of the internet. Let's look at some of the major players:

- Google puts up ads relating to user searches, and— obviously— it dominates the domain of search engines.
- Apple's iPhone is a fantastic platform for developing applications, with over 100,000 applications that users can download from their phones. Some of the applications have gone on to disrupt other industries, for example, online banking.
- Facebook was a late entrant to the social networking scene, yet in short order it has come to dominate that field. Despite this platform's impressive success, however, it is still struggling to monetize the enterprise.

There are some interesting economic features in the web economy. For example, the frequently discussed chicken-and-egg quandary presented by platforms' need to attract enough users to develop the critical mass required to succeed. From an advertising standpoint, one solution to this problem is to offer free products to potential customers of the paying side, usually for advertising. Another way is to open the API so developers can make software for the platform.

Other features include mashups (new services that are created when two existing services are combined with existing services) and morphing (when web businesses change in unexpected ways). It's important to look at mashups and morphing when analyzing market definition and market power.

Change is happening fast and does not stop. Information technology has spurred rapid, unpredictable change in our vocabularies and in our lives. And the future will continue to bring things that we never imagined or expected. Policy on competition will be able to deal with the issues that the new economy brings; however, the old, traditional methods of economic research and analysis are less dependable now. Externalities, freemium models and network effects must all be understood and included in any good analysis. These developments will likely make competition policy an intriguing endeavor for the foreseeable future.

Chapter 10

The web based economy started in the 1960s, and the invention of web browsers in 1995 made the internet much more accessible for the common user. People were optimistic that the internet was a path to easy riches once the value of network effects began to be felt. Much of

this optimism faded, however, when the tech bubble burst in 2001. Many sites failed to make money from their platforms, and so they were unsustainable. A strong web based economy has risen from the ashes of the 2001 burst. Today, the web based economy is huge and spreading rapidly. But beware of giddy predictions for the future. New technologies are always exciting, but all growth has its limits.

While a significant number of web businesses still use traditional advertising models, transaction platforms are becoming increasingly important. Social networking is a new and important form of communication. Multi-sided platforms tend to reduce the costs of transactions. They can be matchmakers; they can build communities. And various platform businesses rely on each other (for example, YouTube comes up on a Google search), which results in an interconnected web ecosystem.

Economies of scale encourage the growth of huge companies, and there's a danger of monopolies that are so big they're invulnerable to competition. Platforms tend to spread into adjacent markets, meaning dominant firms might be positioned to expand monopolies to other markets. Today, a handful of firms dominate in their category, but there is still a lot of jostling for position. Anything can happen. This situation has engendered a highly competitive market, with platforms sometimes playing a little dirty.

The scale that can be achieved by internet companies naturally invites the curiosity of authorities with antitrust concerns. Regulation is not yet well developed, and with everything changing so fast, it's hard to see how regulation could ever keep up.

The pattern we see today with information technology has played out countless times in other industries. At first, everyone jumps on the bandwagon. Hundreds, if not thousands, of companies compete for a piece of the pie. After a while, many of those companies fail and fold. Antitrust becomes a concern once the industry consolidates. We know from these past models that it will likely take years to complete the process of creating antitrust regulations for web based businesses. Eventually the dust will settle.

Chapter 11

The history of payment cards starts in 1949 with Diners Club in New York City. Originally, 14 restaurants agreed to honor the card, and the cards were given away to a select group of influential people at first. It quickly grew in popularity— within a year 42,000 cardholders were paying an annual fee of $21 for the card. People liked it because it could be used just like money in the restaurants that honored it, and the money didn't have to be paid back immediately. In time, Diners Club expanded the card to other merchants, covering not only restaurant tabs, but many other products as well. And so, the payment card was born.

As soon as someone makes money from a good idea, others follow suit. Lots of other cards

sprang up soon after (they were not all roaring successes). 1958 was a seminal year in the world of payment cards. Among the developments of that year, Bank of America introduced a card in California, and American Express launched their plastic charge card. Around 1970, banks became interoperable and were able and willing to accept and process each other's cards. Two main bank associations emerged. The industry twists and turns had led to MasterCard and Visa becoming the dominant brands by paying close attention to the industry's ebb and flow in the size of membership fees and merchant charges.

Usury laws originally limited the growth of payment cards, but this changed in 1978 when the Supreme Court decided that national banks could make loans based on the laws of the state in which their business was located. Banks no longer had to obey all the rules in every state where they operated. Antitrust laws also changed in the 1970s so that banks could process transactions for competing cards (known as duality).

Visa introduced computerized authorization in 1973, setting the stage throughout the industry for growth. More people had cards; they used them more often and for larger amounts. There were also more cards from which to choose. The 1990s brought the rise of debit cards. Regulation allowed securitization, meaning that debts could be sold to other holders which reduced risk for issuers. Lots of banks consolidated in the 1990s, and cooperatives like MasterCard and Visa got more competitive. Perhaps the most important development in the 1990s was the emergence of the web.

The turn of the century saw the end of the associations when MasterCard and Visa became publicly traded companies. Then came the 2008 financial crisis which affected all financial products. In 2010, legislation attempted to reform the consumer debt industry, and most of this reform was aimed at holding down fees.

Despite this rich history, people still use checks and cash quite a bit. In other words, there's still room for growth in the land of electronic payments.

Chapter 12

Card transactions can often involve two banks: the issuing bank and the merchant's bank. Because problems can arise when banks have different fee structures, an interchange fee is agreed on to ensure that transaction costs are covered. This interchange fee goes to the issuing credit card, and the cost goes to the acquiring side. The fee insures that the merchants, as the side that benefits the most in an exchange, pay more of the transaction costs. It helps balance the market.

Despite the suspicions of some that interchange fees are a price fixing scheme, an appellate court ruled in 1986 that they are not, and in time, these fees grew to be a greater part of retailers' costs. According to Evans, there is renewed interest among scholars in these fees.

Some have suggested different ways of doing it.

Sometimes the government steps in and establishes rules about fees and the like, which can be good if a) the market in question would otherwise function poorly or unfairly; and b) the government has regulatory solutions that would actually help the situation. Sometimes regulation is necessary. Usually, according to Evans, regulation doesn't help. He is of the perspective that the government generally shouldn't interfere in markets, especially when it comes to payment systems.

Payment systems are multi-sided platforms. Two-sided markets are often asymmetrical. An admittedly simplistic model views pricing as usually either a charge for access or a transaction fee. The point is to find the price structure that brings the most profit. The crucial decision is how much each side pays. It's almost never equal between merchant fees and customer paid transaction fees. Back in the day, most of the cost was paid by the merchant. More work needs to be done to distribute the risks and costs through the system to make them socially optimal.

Chapter 13

In Australia, authorities felt that interchange fees reduced consumers' transaction costs to such an extent that it encouraged people to use credit cards instead of other payment methods (like debit cards and cash). The authorities felt that the social costs of consumer debt were worse than the social costs associated with other forms of payment, so they started regulating transaction fees and cut the interchange fee almost in half.

This distorted the market. Prohibited from charging transaction fees, issuers lost income and responded by raising their other fees to get some of their income back. Merchants saved a little money— interchange fees are small in comparison to the size of consumer transactions, so they didn't see a big difference. Transaction costs themselves didn't move— these costs are passed on to the consumer in one way or another.

The net result was that the consumer price stayed relatively flat. Because fixed-rate fees did rise, however, consumers owned fewer cards. Although they had fewer cards, however, Australian consumers initiated about the same number of purchases as they had before the interchange fee was reduced. So the ultimate effect on transaction volume was minimal. The growth rate of purchases made on credit cards was already in decline when the fee was changed, and the rate of decline appeared to be affected little by the change. Ultimately, it doesn't seem as if regulating the interchange fee had much effect, at least over the short term. (And it's probably still too early to tell over the long term.)

The whole reason for reducing interchange fees was to push more of the transaction costs onto the consumers, so that they would prefer other forms of transactions and use credit less. Early indications show no signs that this has happened. What did happen was that banks increased

joining and yearly consumer fees and left transaction fees alone. So far, there is nothing to support the original hope that lowering the interchange fee would reduce Australian consumer debt. If anything, the results show that more research is needed into the effects of tariffs on two-sided markets.

Chapter 14

Software platforms have driven innovation and disrupted industries worldwide. These platforms are the invisible engines of the Age of Information Technology, creating value by lowering search or transaction costs.

During the first age of invisible engines from 1980 to 2004, software platforms created ecosystems in which work was mostly done on desktop computers. After 2004, the second era of invisible engines was instigated by the spread of Web 2.0. Smart phones became common and broadband spread everywhere.

Application Programming Interfaces (APIs) let programmers create programs for the platform. When companies make their APIs available to the public, they can increase the value of the platform. Consider electronic payments: various actors participate in this system, often in a single transaction. Creating a new payment application could be a nightmare of different codes, different rules, etc. This is the very type of problem that invisible engines like APIs are good at solving.

Invisible engines make complex transactions possible, and they have been crucial to the rapid economic progress of the past 30 years. The engines couldn't have done this on their own, of course. Advances in technology, such as increased microprocessor speeds and computer storage, have made the accomplishments possible. It's a symbiotic relationship of sorts between hardware and software.

We are entering a new age of invisible engines. It's hard to say how long this era will last, and practically impossible to guess what will come after. It is clear, however, that invisible engines will disrupt old industries and create new ones. Invisible engines will continue to drive innovation.

Chapter 15

In a shopping mall, merchants offer goods and services to customers. The merchant rents space in the mall, while the customer gets to be there for free (and may benefit from other perks like free parking). Platforms are like shopping malls. On a platform, developers offer applications to users. Often, the developer pays a fee to participate, users frequently pay nothing and sometimes they receive other freebies to sweeten the deal.

Platform software is documents that are written in code and that can be rewritten and changed. The larger a platform is in terms of written code, the greater the cost. At some point, there are diminishing returns. Once the software is written, however, there isn't much extra cost to copy another unit. Once created, the supply is limitless. If software is used by one person, that doesn't reduce the number of other people who can use it. In fact, the more people who use a particular software program, the more valuable that software tends to become.

Software is digital by necessity, meaning it's easy to copy. Given this reality, companies are careful to keep their source code secret, and software is protected by copyright and patent law, just like any intellectual property. Unlike commercial software, open source software makes its code available to everyone for free. Open source production can result in good applications and platforms, but the commercial software model usually works better at managing multi-sided platforms.

Software prices to consumers depend on demand, which is why the price is relatively stable compared to the ever shrinking prices for hardware. Software is often bundled, so that different functions needed for one or more related actions are put together in one package. And platform software is often installed on computers and other hardware by the manufacturer, before the products are shipped out to consumers.

Pricing is complicated. It's not like single-sided market, where price is a function of cost. With platform businesses, sometimes you have to charge the sides asymmetrical fees or try similar tactics to balance the market. Getting the balance right between the sides is tricky (as is getting both sides on the platform and in proportion to one another). It's best to scale up gradually over time as both sides grow in proportion to one another.

Chapter 16

Invisible engines are made of software code. APIs allow programmers to create applications for platforms, and some platforms freely release their APIs to any developer who wants to create software. This can benefit the platform, because the more applications created for the platform, the more valuable the platform will be to users.

A good example of how this works is the iPhone. Apple created APIs to allow developers to write programs that would work on the iPhone platform. Apple even provided a software developer kit and a developer's website to facilitate app creation for the iPhone. The more apps that developers created, the more functions the phones could provide. This appealed to customers and more people bought iPhones. The growing user base in turn attracted more developers, and so a positive feedback loop was ignited.

Platforms are driving growth and changing the world. The cloud is the next, biggest thing driving

innovation. Transactions can happen much faster on the cloud, and processing payments through the cloud will soon be a reality. The payment card industry is complex— there are lots of transaction costs, and app developers have to deal with different rules and formats for all sorts of institutions. This is the ideal condition for innovation. APIs can integrate all these payment platforms together.

Invisible engines continue to transform the payment card industry. It's difficult to predict how long and how deeply they will continue to drive change, as the industry is fairly conservative when it comes to innovation. But it's dangerous to avoid change and let the competition gain the advantage.

Innovation will inevitably continue to disrupt the payment industry. Some firms will come out on top; other firms will lose the game. In either event, the entrepreneurs, the developers and the consumers will most likely benefit enormously.