Technological developments involving the Internet, web-based software, wireless communication, computers, and data analytics are coming together in ways that promise to transform how consumers and merchants transact with each other. Payments, behavioral targeting of advertising and marketing messages, location-based targeting of advertising and marketing messages, and e-commerce including mobile commerce are being integrated in ways that will transform how consumers and merchants interact with each other. Unless public policy interferes, these mashups will likely reshape—and enhance—the payment experience for consumers and merchants.

Many commentators focus on how we will pay at the point of sale and the role that Near Field Communication (NFC) on contactless cards or mobile phones will play in that. We posit that the physical method of payment—often called the form factor—will in fact vary across geography and over time as a result of past investment decisions in hardware, software, and processes in the payments ecosystem. The mashups we believe will reshape the industry as we know it today will not, however, depend on the form factor. The physical method of payment at the

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point of sale is a detail in a much larger transformation of the purchasing experience for consumers and merchants. To dwell only on the payment factor as enabling innovation in payments, in fact, minimizes the impact that technology will have on this industry. Our goal in this chapter is to describe how these mashups could affect the evolution of payments over the next decade.

History has shown that nothing is inevitable in the payment card industry. The cost of changing already good methods for buyers to pay sellers can well exceed the benefits of innovations. Government policy can also affect the direction of change by overruling the market and by adopting policies that, despite the best of intentions, have unanticipated adverse consequences for consumers and businesses in the complex payments industry. During this period of creative destruction now sweeping the payments industry globally, policymakers should especially heed the Hippocratic warning “Do no harm.”

Electronics Payment Card Industry Today

The U.S. electronic payments industry is based on a network that moves money between consumer and merchant bank accounts using computers, software, and communication links.4

Origin of Payment Card Networks

The technology that underlies today’s payment card networks was first widely deployed in 1979, when Visa introduced the first electronic data capturing terminal.5 Mainframe computers did most of the processing and storage in central locations. Consumers had magnetic stripe cards and merchants had electronic terminals. At that time the merchant swiped the card through the reader to start the process of authenticating the consumer and authorizing the transaction. The swipe initiated a signal traveled through a series of intermediate computers that switched the transaction to a central processing unit. By exchanging signals with the cardholder’s bank to assess the cardholder’s account, this unit then determined whether to authorize the transaction. If the transaction was
authorized, the unit then exchanged signals with other computers on
the network to move the designated amount from the cardholder’s bank
to the merchant’s bank. The various computers were connected over pri-
vote networks that interconnected as necessary.

One can think of this computer system as being based on the inter-
action of two thin clients at the point of sale: the magnetic stripe card
that contained a small amount of data on the consumer, and the point-
of-sale device that contained little intelligence. Most of the work for the
network was done at various hubs, especially the central one belonging
to the owner of the card scheme, which consisted of multiple large com-
puters. MasterCard and Visa have upgraded their systems over time
but the basic architecture has remained the same.

These networks are more complicated than they might seem at first
perglance. At the periphery of the networks are individual merchants, the
larger of which operate in many locations. These merchants have
installed various software and hardware for accepting cards over time.
More than forty-five vendors supply the point-of-sale equipment and
nearly 1,000 software systems on the market are incorporated into the
point-of-sale equipment.

The merchants on the network typically have a relationship with an
acquiring bank and a merchant processor, which in turn operates
remote computer-based platforms that perform a variety of steps
between the merchant and the card system. There are nine major proces-
sors in the United States. The larger ones operate several different plat-
forms. Chase Paymentech has two major platforms, for example, and
First Data Corporation has between four and ten processing platforms
depending on payment type.

Over time, every application vendor has developed its software to
work with the other essential parts of the overall network. But the mod-
ern payment card industry is much like a large corporation that, through
mergers and changes in vendors over time, has numerous computer sys-
tems and software packages jury-rigged together. Much of the software
is based on older languages rather than what is being used to build mod-
erm web-based businesses.
This fragmented structure imposes significant practical constraints on innovation. It is difficult to make a change at any point in the network if that change is incompatible with hardware or software used at other points. An innovator would have to convince other network participants to make compatible changes. These changes may require significant investments. The innovator must either absorb these costs or persuade other participants that it is worth incurring them without necessarily knowing that other participants will. As a result, innovation can be slow and may be biased toward improvements that are compatible with the existing infrastructure. In the next section, we discuss how this disjointed structure impedes collecting and analyzing data from merchants and consumers. But, as we also discuss, this infrastructure has fueled much of the innovation emerging as entrepreneurs begin to use new computing technologies that essentially work around these constraints.

**Technological Progress in the Face of Inertia**

Despite this seemingly archaic structure, and the legacy hardware and software beneath it, the payment card system has experienced great technological progress in the last three decades and works extremely well. The average time it takes a consumer and merchant to complete a card transaction has declined dramatically (as anyone older than forty is well aware). Although the time varies depending on the point-of-sale equipment the merchant uses, the average time for completing a credit card transaction is now approximately seventeen seconds, versus seventy-three seconds for checks.9

This technological progress has resulted in part from the broader revolution in computers and communications. Improvements in computer speed and capacity have more than kept pace with the increase in the volume of transactions. Telecommunications have become cheaper and more reliable. Point-of-sale equipment has benefited from the miniaturization of computers. Improvements in computing capacity and software have enabled better and faster risk management.

Most important, consumers are generally happy with the payment experience at the point of sale. In a recent survey, we asked 550 consumers
to rank the importance of various aspects of their payment experience in physical stores. The results revealed that most consumers are generally content with their current payment experience and showed little interest in changing their current use of magnetic swipe cards to contactless cards, mobile phones, or other emerging technologies. What they want is security, convenience, ease of use, and available flexible financing options.

We have not performed a survey of merchants, but have seen no evidence that they are dissatisfied with the mechanics of accepting payment by cards at their points of sale. Thus far the vast majority of merchants have not embraced any of the various alternative methods of payment that have been introduced in the last several years, such as contactless. They, of course, would like to pay lower merchant fees when a consumer does pay with plastic. The payment card system is based on technology that is several generations old. To understand why this system nevertheless forms the basis for the mashups that we believe will reshape the payment industry, it is useful to digress on the evolution of modern computer systems.

**Modern Computer Systems**

Until recently, computer networks connected client computers over private local area networks or private wide area networks to server computers that provided these clients access to centralized resources. For example, a spreadsheet developed on a local computer using a local software application quite possibly accessed data stored on a server computer and was sent to colleagues by e-mail through another server computer. The payment card system is one large private network based on mainframe computers, servers, and proprietary software running on many interconnected systems.

With the rise of the Internet, this model has begun shifting to what is known as *cloud computing*, in which much of the processing and storage takes place on server computers owned by a third party and accessed over the Internet. Many widely used applications—such as Facebook, Google Calendar, MSN Instant Messenger, iTunes, and Salesforce.com—
are “in the cloud.” Many of the interesting innovations in payments will likely take place in the cloud rather than on private networks.

As computation has moved from the desktop to servers on private networks to servers in the cloud, clients can become thinner—at least in terms of the fraction of the overall workload they perform. Moreover, over time computer networks have become more interoperable. The standardization of the industry on the Wintel platform during the late 1980s and 1990s made it easier to interchange software and hardware than in the fragmented world of multiple platforms that preceded it. The development of HTML, HTTP, and other Internet protocols has provided a standard platform for web-based and cloud-based computing. It has also made the standardization of desktop software and hardware less important, because Internet standards define an interface between the cloud and the desktop that can be used by any standards-compliant browser running on any operating system.

Yet, as thin as clients could be in the cloud-based world, nothing is as slim—or as dumb—as the magnetic stripe card, which uses a technology that one might have thought would have been phased out alongside cassette tapes. There has, however, always been great inertia in the payments industry because change requires a vast multitude of buyers and sellers to modify their behavior and make new investments. The magnetic stripe card itself became the standard in the payment card industry in part because MasterCard and Visa subsidized, through reduced interchange fees, initial adoption of electronic terminals at the point of sale.

Possibilities for Change

Indeed, cash has remained the most popular form of payments worldwide because of its tremendous convenience and simplicity. The widespread availability of cash dispensing machines that the consumer accesses with a card has even given cash a new lease on life. In the United States, it has also proved difficult to wean consumers and businesses away from checks. Despite the proliferation of new methods of paying bills online, many households continue to write paper checks. A recent
survey of small businesses found that these entities prefer to send out paper invoices and receive payments by check.\textsuperscript{16} Such inertia applies to cards themselves. The magnetic stripe card is the preferred form factor for credit and debit card transactions in many countries, including the United States. A recent survey found that, after more than three years of effort to put contactless cards in the hands of consumers and to persuade merchants to install contactless terminals at the point of sale, 83 percent of American consumers had still not used contactless and only 1 percent of store locations accepting credit cards had installed the necessary technology to accept these cards.\textsuperscript{17}

Although change in the payments industry may seem glacial, even glaciers can make substantial progress over time. The most important trend is the movement to digital money, in which a computing device captures the transaction. The share of payments that are electronic has steadily increased over time. Figure 3-1 shows estimates of the share of various electronic payments methods over time for the United States.

As of 2007 in the United States, electronic payments accounted for two-thirds of all noncash payments by number and 45 percent by value.\textsuperscript{18} When payments involve the transmission of bits, it becomes easier to integrate the payments aspect of a transaction into many other complementary services and to create synergies among these various services. It does not matter whether the payment is captured by a computer in the cloud using a not-very-smart magnetic stripe card as the authentication device or a browser-based mobile phone. As long as the transaction is digital, numerous mashup possibilities reveal themselves. Moreover, the development of these complementary services (which are based on the transaction being digital) will increase the value of digital relative to nondigital forms of payment and thereby accelerate the adoption of digital forms of payment. Thus, though paper-based payments will no doubt persist for the foreseeable future, even in developed economies, a revolution in the transaction experience—that is, all the services that relate to buyers and sellers getting together—will likely lead to a rapid increase in the rate of adoption of digital forms of payment.
Before describing the mashups this will likely involve, we explore some economic aspects of the adoption of new technologies and business models in the payments industry.

Technology in the Payments Industry

Anyone talking about revolutionary change in the payment industry—especially when it comes to how we pay—should be greeted with significant skepticism. Cash has remained the main form of payment ever since metallic money was introduced in 700 BC. Every few years someone predicts its imminent demise.

People have been paying with magnetic stripe cards only since the early 1980s, yet pundits predict its imminent replacement by contactless chip devices that users can wave at the point of sale, various mobile
phone solutions, and the odd assortment of biometric methods including the fingerprint. Table 3-1 presents a few of the predictions. However, just as cash has endured, so has the technologically unhip mag-stripe card—the form factor of choice for most of the world’s credit and debit account users.

The apparent resistance of the payments industry to innovation seems to stem from a basic economic characteristic of all payments systems.

**The Chicken and Egg Problem for Two-Sided Platforms**

The payments industry creates value by providing a method that both buyers and sellers use to consummate transactions. The insight of the ancient inventors of standard gold coins was that trade would be much easier if there were a generally accepted and uniform method of payment. Fixing prices in standard gold coins was easier than using irregular lumps of metal or oxen or roosters. The invention of the general

Table 3-1. *Recent Analyst Forecasts of Adoption of Alternative Payment Form Factors*

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<th>Description</th>
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<td>Contactless credit and debit card payments (sometimes called proximity payments), mobile payments (m-Payments) and biometrically authenticated payments will each levy its own unique impact over the next five years. Together, they could garner over $400 billion in revenue by 2011. 57 million consumers will be using chip-embedded credit cards to make contactless payments by 2013, which is more than double the 24.8 million in 2008 and will be bolstered primarily by expansion of contactless products into gift cards and private label cards. The gross transaction value of mobile payments will exceed $300 billion internationally by 2013. As many as 612 million mobile users will generate transactions in the order of US$ 587 billion during 2011 by their phones.</td>
<td>The Pelorus Group 2006  The Javelin Group 2008  Juniper Research 2008  Jupiter Research 2008</td>
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Source: Authors’ tabulations.
purpose payment card was hardly as profound. But in many circumstances cards with deferred billing and payment agreements enabled consumers and merchants to engage in transactions that could not occur otherwise, given the consumer did not carry or did not want to carry large amounts of cash.

To create a standard of payment requires, however, that buyers and sellers agree to accept it and use it. Buyers will not use a payments instrument if they cannot pay with it where they shop, and sellers will not go to the trouble of accepting one if few shoppers want to pay with it. Entrepreneurs looking to introduce a new way of paying must solve this fundamental chicken and egg problem. Doing so has become more difficult over time because these entrepreneurs compete against increasingly secure and convenient payment methods through which transactions take only a few seconds to complete. It is hard to convince merchants and consumers to change when what they currently rely on works very well.

The payment industry is based on what economists call a two-sided platform—a business that creates value by inducing two groups of customers to come together, each of whose members obtain value by interacting with members of the other group. Shopping malls, financial exchanges, auction markets, multiple listing services, advertising-supported media, software platforms, and video game consoles are all examples. In all these cases, a participant on one side gets more value from being part of a platform with more participants on the other side. Video game console users get more value from consoles that have more games, and game developers get more value from consoles that have more users. For many two-sided platforms—and this is particularly true of payments—it is very difficult to get users on one side unless there are users on the other side. The chickens and eggs have to appear almost simultaneously.

Basic Economics of Consumer and Merchant Adoption

Merchants consider up-front and variable costs of using a payment method. The up-front costs include training sales staff in how to handle the payment, modifying accounting systems, and—especially with
solutions that involve authentication at the point of sale such as payment cards—equipment and possibly integration with their information technology systems. Variable costs include merchant fees for cards or cash and check handling costs, as well as changes in the numbers of checkout lanes and clerks needed to process transactions. If that were the end of the story, merchants would only adopt a new payments system if it were cheaper and if enough consumers switched their transactions to it to warrant the investment in up-front costs.

But cost is not all that matters. Accepting a new payment method at a store may also result in customers shopping there who would not have done so otherwise. Likewise, accepting a new payment method may convince customers to buy more as a result of using that method. Shoppers may like a payment method more because it is more convenient or secure for them or because they are getting some sort of reward for using it. Having more shoppers (and more shopping) results in incremental sales. The merchant makes a profit margin on these sales, and so accepting a new payment method may in fact lead to incremental margins.

The key insight about the acceptance of new payment methods is that incremental margins are often a more significant economic factor in merchant decisions than saving money on merchant fees and other ongoing transaction costs. The profit margin on additional sales averages 29 percent for large merchants. The average cost of accepting a payment method is in the range of 1 to 2 percent of the transaction size.

Consider two payment alternatives for a merchant with $100 million of annual transactions. One promises a 50 percent reduction in payment costs—1 percent—for 20 percent of transactions that would take place using that method. That leads to a cost savings of .01 x $20 million or $200,000. The other promises a 3 percent increase in overall sales as a result of attracting new shoppers. That increases sales by $3 million and leads to increased profits of $870,000 on average. In fact, it would only take a .7 percent increase in sales to beat the method that offers a 50 percent reduction in payment costs.
A card system that can build up a significant number of users therefore has a very compelling proposition to merchants, for which it can charge a significant merchant fee. Consider a card that 10 percent of shoppers would use for transactions and assume that 70 percent of their transactions displace other transactions but that the remaining 30 percent are incremental. Using the earlier example, the increase in incremental margin is $870,000. The merchant would therefore be willing to pay, roughly, up to $870,000 of additional transaction fees on the 70 percent of overall transactions that are displaced. That works out to a transaction fee of 12.4 percent \( (870,000/(0.1*0.7*100\text{ million}) = .124) \).

Of course, consumers will not take a card if they cannot use it. They must believe that they will be able to use it at a wide range of merchants to pay. That gives rise to the chicken and egg problem. Diners Club resolved it in 1950 by signing up a few restaurants that would be of interest to its Manhattan account holders and a few account holders who would be of interest to those restaurants. There was apparently enough value for both sides to get on board initially. The restaurants just had to keep track of a few receipts, and the account holders did not yet have a wallet full of competing cards. American Express resolved the problem by buying merchant and cardholder accounts from other small systems. MasterCard and Visa, as cooperatives, did so by having individual banks sign up merchants and cardholders in several local areas.

Consider the introduction of the Discover Card by Sears in 1986, one of the greatest business success stories in a decade of success stories. In its first year, Sears persuaded more than 11 million of the 25 million Sears store cardholders to sign up for a Discover Card that would enable them to pay at a variety of merchants and convinced some 500,000 merchant locations to accept the card. Merchants had good reason to believe that millions of consumers would be carrying the Discover Card, given that Sears already had access to 25 million Sears cardholders and was offering its Discover cardholders 5 percent cash back on purchases. Accordingly, enough merchant locations accepted the card in its first year to make it valuable to the cardholders.
Economics and experience point to a critical lesson. It is very difficult to persuade merchants to adopt a new payment alternative unless enough consumers value the alternative so much that they will not shop at that merchant or will buy less unless the merchant offers that alternative. The prospect of incremental sales can provide enough value to pull merchants into accepting a new method. Shaving the already small transaction fees by switching consumers to a cheaper payment alternative generally cannot. Many new payment alternatives in recent years have bought into the fool’s gold of merchants clamoring for cheaper payment alternatives. Merchants would, of course, like their existing payment alternatives to be cheaper, but they will not eagerly incur upfront costs and change processes just for slightly lower merchant fees.

The Role of Inertia

As the payment card system has developed over the last half century, considerable investments have gone into developing networks that connect millions of merchants around the globe to hundreds of millions of cardholders. Merchants, merchant processors, merchant acquirers, card networks, card processors, issuers, and many other suppliers to these entities have invested in hardware and software for handling payments. They have also invested in internal processes that result in human capital investments. This legacy leads to inertia for two reasons.

The first is that many participants in the payment ecosystem have made sunk investments in equipment, software, and people. In many cases these investments have been largely depreciated. New technology is therefore competing with old technology that has little, if any, ongoing cost. The second reason is that many of these investments are interdependent, as mentioned earlier. It may not be possible to change the point-of-sale technology without also changing the point-of-sale software and the merchant processing platforms. It may not be possible to change the merchant processing platforms without changing point-of-sale technology or the network software.

The investments made in payment systems also lead to what is called path dependence. The value of adopting new technology at a given time
depends on the history of previous investments. A country that has made no investments can choose the best of new technology based on the net benefits of available alternative technologies. A country that has made significant past investments will have to factor in the cost of changing its infrastructure and the fact that the marginal cost of its old technology may be very low. Many countries—from China to Mexico—with low penetration of point-of-sale equipment and other investments in payment systems face very different economic decisions concerning adopting new technology than those countries with high levels of penetration and investment.

The consumer also has some inertia. People have gotten used to using cards in a particular way at the checkout. It usually works quite well: people sign or enter a PIN and either way the transaction takes place in a matter of seconds. Any change—any innovation—has to overcome this inertia. It must provide enough value to merchants and consumers alike so that both have an incentive to try something new.

_Dealing with Inertia_

Several new card innovations that have been introduced in the last few years illustrate the practical impact of inertia in payments.

Pay By Touch was founded in 2002 as a new system based on fingerprint authentication. The consumer registered her fingerprint at a kiosk and assigned her fingerprint to a particular payment method. Pay By Touch encouraged consumers to associate their fingerprint with their checking account just as PayPal encourages its accountholders to use their checking accounts. This eliminated the merchant fees from the card systems and enabled Pay By Touch to offer merchants a potentially cheaper way of paying for transactions.

To use Pay By Touch consumers had to accept registering and paying with their fingerprints. Merchants had to install point-of-sale equipment that authenticated payments with fingerprints and to switch transactions to the Pay By Touch system. Pay By Touch also needed at least some merchants to install kiosks where consumers could register their fingerprints.
Pay By Touch raised more than $300 million in capital. Targeting independently owned grocers, between its launch and 2007 it persuaded only one significant such merchant to accept the new payment method—Piggly Wiggly, a chain of 600 independently owned stores primarily in small to midsized towns in the Midwest and South. Pay By Touch filed for bankruptcy on December 14, 2007, and closed its system down shortly thereafter. Although the firm faced many problems, including squabbles among its partners, the fact remains that it obtained little merchant or consumer participation and no one has further pursued its proposed model.

The problem Pay By Touch faced is obvious in retrospect: it required merchants to make significant investments in point-of-sale technology. These investments would make sense only if enough consumers started paying with their fingers (associated with a checking account) rather than with a card so that merchants could save on card fees, or if enough consumers decided they would transact only if they could pay with their fingers so that merchants would capture incremental sales. Pay By Touch, however, did not have a compelling enough proposition for the consumer. The consumer had to go to the trouble of registering her fingerprint. Because she could then pay with her finger only at a limited number of locations, she still had to carry cards. It is unclear how much time the consumer saved at checkout when she paid with her finger. Pay By Touch counted on the novelty of paying with the finger to convince consumers to come on board their platform, but it was not enough.

The Octopus card is a contactless prepaid payment method in wide use in Hong Kong. It was initially sponsored by the Hong Kong subway as a convenient way for customers to pay and as a way for the subway to reduce queues and save on resources. In 1997, in the first three months of its entrance into the market, more than 3 million cards were in consumers’ hands. Today, with 17 million Octopus cards in circulation, more than 95 percent of Hong Kong residents between the ages of sixteen and sixty-five carry the card. With this base Octopus has been able to persuade merchants to accept the card for payment, a particularly attractive proposition to merchants in the malls at the subway stations.
Since 2000, when the card was first offered to merchants, 16,000 retail outlets have agreed to accept it and many have also installed equipment for consumers to load the card with money. Octopus has expanded its contactless payment devices to include many other form factors with contactless chips, including watches. The key to Octopus's success was having that critical mass of account holders through its initial alliance with the subway system.

The experience with contactless in the United States has been quite different. MasterCard and Visa introduced contactless cards in 2003 and 2005 respectively. Over the next several years MasterCard and Visa issuing banks distributed 35 million contactless cards, most of which were replacements of cards for existing accountholders. These cards also had magnetic stripes and therefore could be used in the usual way, as well as by waving at a contactless reader at merchants that had these readers. MasterCard and Visa persuaded a few large national chains to install contactless readers, including McDonald’s, 7-Eleven, Walgreens, and CVS. The rate of installation of contactless readers at the point of sale, however, has gone much more slowly than was anticipated. Of approximately 6 million merchant locations in the United States, only 40,000—fewer than 1 percent—have contactless readers installed, with most concentrated in multistate quick service restaurants and convenience stores.

Merchants have not installed contactless readers because they do not see the economic benefit. The cards do not lead to significant cost savings at most merchants because they incur the same merchant fees as regular credit and debit cards, and the cost savings from increased transaction speed is modest compared to the cost of changing point-of-sale technology. The main benefit to merchants would therefore be margins from incremental sales. But to make an investment in more expensive point-of-sale technology merchants need to be persuaded that enough consumers would adopt contactless cards and that enough of those cardholders would refuse to shop at a merchant that did not accept the cards. However, there is not a strong interest on the part of consumers, even though millions have the cards in their wallets. Consumers save
time mainly in situations where they can wave the card and not sign a receipt. The card systems, though, require signatures for transactions over $25 (sometimes increased to $50 by the merchant), which means that consumers save little time for many of the transactions where they normally use cards. In the United States, predictions of contactless penetration have fallen steadily with experience. Five years after the introduction of contactless by MasterCard, 91 percent of cardholders, based on a recent survey, never used it.

BillMeLater is a successful entrant into the payments business in the United States. Consumers who click on the BillMeLater alternative at the checkout for an online retailer are prompted for the last four digits of their social security number and date of birth. If the consumer is approved after a credit-risk analysis, BillMeLater pays the e-tailer and bills the consumer later. BillMeLater often provides promotional financing, such as to pay in ninety days or to pay in installments, in concert with the e-tailer. Consumers who choose to do so become BillMeLater account holders and, depending on their payment history, will be approved for larger transaction amounts in subsequent transactions.

To begin operations, BillMeLater had to persuade a merchant that if it offered BillMeLater on its website enough consumers would use it to drive incremental sales to those merchants. Consumers did not have to have existing accounts; they just needed to be attracted to the convenience of the BillMeLater payment alternative and the finance offer. The chicken and egg problem was therefore less serious than it would have been had consumers had to go through the tedious process of applying for a card and carrying it around, or had merchants had to incur significant costs for upgrading their hardware and software. Since starting in 2001 BillMeLater has, as of August 2008, more than 450 online retailers that accept its payment method and more than 4 million accountholders.

Much of the discussion about payment card alternatives has focused on methods that provide services to merchants and cardholders that are similar to those offered by traditional payment card systems but come at a lower cost to the merchant. Some has focused on some form factor innovation that is appealing to consumers. The leading alternative pay-
Innovation and Evolution of the Payments Industry

Methods for the physical point of sale introduced in the United States in the last several years include Tempo, Revolution Money, and Pay by Touch. Their business models all entailed offering lower merchant fees than traditional card systems offered. Other technological changes, such as contactless and various methods of using the mobile phone to make payments, offer a somewhat different way of paying. These have largely failed because they do not offer consumers enough additional convenience or value to modify how they have been paying at the point of sale for many years.

We believe that the real revolution in the payments industry is not going to come from improving the basic payment transaction between consumers and merchants. There is simply not much room for making transaction processing faster or cheaper and therefore relatively few benefits accrue to consumers or merchants. Instead, the revolution will come from the mashup of payments with technologies and business models outside the traditional payment card industry. Those have the potential to provide significant additional value to consumers and merchants above and beyond efficient transaction processing. The form factor is relevant for these mashups only insofar as it can facilitate their occurrence.

Monetizing Transaction Data

In the United States alone, millions of transactions flow through the electronic payment systems each day. In the course of authenticating the cardholder, authorizing the transaction and settling the charges, the various players in the payment card ecosystem collect a great deal of data. Data is captured on who the consumer is, what her socioeconomic background is, what merchant she shopped at, how much she spent, and even potentially what she bought, given that many merchants collect sku-level data on purchases.

It goes too far to say that these data are flushed down the drain. But to the extent they are used, it is only in primitive ways, such as for cross-promotional activities with merchants and for merchant loyalty.
programs. The online advertising industry has revealed, however, that these data have immense value. Not surprisingly, many firms in and outside the electronics payment card industry are exploring ways to use these data.

We begin by describing how the online advertising industry uses data collected from what users do online today and then explain how transaction data could be used to add more value to consumers and merchants.

The Online Advertising Industry

The online advertising industry accounted for 14 percent of advertising spending in the United States in 2007 and is predicted to grow to about 17.4 percent in 2008. In part advertisers are following the audience. Search and display advertising are the most revolutionary aspects of online advertising and together accounted for 72 percent of online advertising spending in 2007—the remainder went to e-mail advertising and classified listings.35

The companies that provide search engines sell advertisers space on the pages that display the search results. The user who clicks on the ad is taken to the advertiser’s website, where the advertiser will typically try to sell the searcher something. Advertisers can bid on placing ads on the search results pages for particular keywords or combinations of keywords. Advertisers pay a cost-per-click (CPC) when a consumer clicks their ad. Roughly speaking, companies auction off slots on the search-results pages based on how much in total advertisers are willing to pay for the slot. This depends on the CPC and the number of clicks they draw in.

Advertising also appears on web pages that attract viewers with content other than search results. This could be content that is provided by portals such as Yahoo!, publisher sites like CNN.com, and social networking sites such as Facebook. These display ads, as they are called, look similar to those in newspapers and magazines. Several slots on the page are devoted to ads that contain text, pictures, or video. Unlike traditional advertisements, however, when viewers point and click they
are taken to a web page just as they are when they complete a search. Nevertheless, like traditional advertisements, advertisers pay for display ads based on the cost-per-thousand (CPM) viewers where the CPM is adjusted based on the demographic characteristics of the audience. These ads are sold just like traditional advertisements.

Online advertising is not just a PC phenomenon. Many other devices are now connected to the Internet and therefore are capable of delivering online advertising. These include mobile phones, which many argue will be a larger source of online advertising than PCs, and eventually video game consoles, televisions, and other handheld devices.

Online advertising can provide much more measurable and relevant marketing than traditional advertising can. First, consumers reveal something about themselves when they search on a set of keywords (“thin crust pizza Boston”) or visit a particular website (one that offers reviews of laptop computers). Computers can, and do, display advertisements tailored to the visitors and therefore likely to be far more relevant than what visitors would see in traditional media. Second, the IP address of the person looking at a web page at a particular time, coupled with a variety of other data that can be associated with that IP address, can provide a great deal of information—for example, that the visitor lives in New Canaan, Connecticut, has recently looked for baby clothes online, and was browsing at eleven o’clock in the morning on a weekday.

The online advertisements are also more actionable because they are typically links to a product or service. When a viewer clicks the ad—which most every web user now knows they can and are meant to do—they are redirected to a site chosen by the advertiser. The site could provide more information or enable the viewer to make a purchase. Whether the viewer is driven by the desire for instant gratification or the convenience of finding and buying things online, the advertiser is happy to achieve its ultimate objective: to make a sale or, as it is sometimes known, a conversion.

An important development in online advertising now concerns behavioral targeting. By collecting and processing more data on consumers, sellers of advertising could target advertising more precisely, potentially in real time. Such targeting could enable these sellers to
provide consumers and advertisers much more relevant, and hence mutually valuable, advertisements. On the other hand, this sort of targeting has raised significant concerns over privacy that may drive public policy in directions that would retard or even prevent value-creating innovation.

We hope that public policy reflects the fact that this revolution in advertising, if it is allowed to occur, will leave both consumers and merchants better off. Consumers will receive more relevant ads and have to endure far fewer about products and services they do not care about. Targeted advertising enables better use of consumers’ time and provides them with more valuable information. Advertisers provide information more efficiently to consumers who value it and who are therefore more likely to buy their goods or services. Technological advances that can provide more relevant and actionable ads for merchants and consumers will provide tremendous benefits to the economy.

Despite its clear technological advantages over traditional advertising today, the online advertising industry still relies on brute force targeting viewers. Most computer users have on their systems countless cookies—information nuggets that track visits to websites—inserted by various players in the online advertising business. In addition, search engines record and store the search history of each user. Google even scans the e-mail of its Gmail customers. Much of this data can be correlated with that in other databases tied to the same user or IP address. If combined, entities in the online advertising business could have at their disposal rich detail on the vast majority of Internet users. Great effort is being invested in the development of behavioral targeting, which tries to glean, in addition to their personal characteristics, from these sorts of data what is on people’s minds in terms of shopping.37

Most online advertising today, however, does not use much of this information. Display ads are more typically based almost entirely on location, time of day, and some knowledge of the profile of the typical visitor to a particular site.

There are two challenges to the development of sophisticated methods for targeting. One, already mentioned, concerns privacy. The use of
private information has generated some backlash from privacy advocacy groups, the government, and various user groups. Facebook was heavily criticized for its launch of the Beacon advertisement system in November 2007 that pushed data from third-party sites (you just bought some concert tickets) to someone’s Facebook friends (all of your friends see an update that you bought those tickets). Part of the backlash has resulted from participants in the online advertising industry tracking and retaining data on users without their knowledge and consent. There is now a race between self-regulation and government regulation of the use of data. In the last year Google, under intense pressure from European regulators, moved from keeping search data forever, to keeping it for eighteen months, to keeping it “just” nine months.

The other challenge is technological. Most online advertising is delivered in what appears to be real time. When a visitor goes to a web page, the advertising looks as though it is an integral part of that page, just like the page of a magazine would look. In fact, when a visitor clicks on that page, various server computers in the online advertising business are making quick decisions on what ad to show next. It all happens so quickly that the human eye is incapable of noticing. An important problem with behavioral targeting and other sophisticated methods for using data is that they require vast amounts of computation to be performed in nanoseconds if advertising is to be delivered without viewers noticing any delay.

**Economic Value of Consumer Preference Data**

The information used for online advertising is a weak sister of what is available through the electronic payments industry. Take the earlier example of the person whose IP address was identified as being in New Canaan. Online advertising infers that the person is a young mother because the website she visited sells baby clothes, that she is not at work because she was surfing at eleven o’clock in the morning, and that she is well off financially because her IP address correlates to New Canaan. The visitor, however, could have been the housekeeper, a grandmother or aunt, or a friend who wants to buy a present for a new baby. The
individual may or may not be well off because not everyone in New Canaan is. Suppose that online advertisers had access to the person’s credit card purchasing history. The amount spent, where the person has shopped, and possibly what the person has bought would be highly relevant information on this individual. Moreover, the credit card purchasing history is factual, whereas online advertisers can often make only educated guesses.

Consider another aspect of online advertising. Advertisers would like to know how effective their advertisements have been. Have they resulted in the viewers of those ads buying the advertiser’s product? Online advertisers often know (through cookies or other tracking methods) whether an individual who saw a display ad for a new electronic device went to the advertiser’s online store to purchase it. But because most goods continue to be sold in physical stores—and probably will continue to be—there is no convenient way to track what happens once a person leaves the Internet. Maybe our Internet user in New Canaan saw a promotion for CVS when the store was offering a sale on Pampers. The credit or debit card transaction would indicate definitively that the individual actually went to CVS and could in the future also confirm that the user not only purchased Pampers but purchased a particular size.

This level of information is obviously quite valuable for both the consumer and the advertiser. Once the online advertising industry knows that the individual is a well-off young mother with a newborn baby, it can present her with ads tailored to her likely needs. With the online advertising industry acting as an intermediary, advertisers such as Procter & Gamble can target their advertising to this woman. Instead of wasting her time with products more suitable for men or older women, she will see ads relevant to her. Moreover, Procter & Gamble will value the fact that it can determine how effective its advertising has been. Advertisers can examine whether the people who actually viewed their ads actually went out and bought their products; with very aggregate data on viewership and sales, they can only approximate that now.
The payment transaction data could be mashed up in three ways. It could be used to better target traditional display and search ads and assess the effectiveness of these ads. We surmise that Google Checkout will be used this way although Google has not formally disclosed its intent. The data could be used to enhance existing direct marketing efforts such as sending individuals a coupon that could be used to purchase the good or offer a rebate directly to a particular payment card. American Express and others have done this by mailing promotions to cardholders in concert with merchants. New online advertising technologies could sharpen this focus. Cardlytics is developing an advertising network for financial institutions following these principles. It is developing technology for helping financial institutions display advertising and other marketing messages on online banking pages and on credit card portals for bill payment. The data could also be used as part of a location-based promotions drive, during which the consumer receives an advertising message on their mobile phone when they are near a store, depending, perhaps, on their past purchases. Such location-based methods promise to be the most transforming because they can truly drive incremental sales to merchants. Cellfire has pioneered many aspects of mobile couponing and location-based promotions.40

In all three cases, we may see payments and online advertising business models start to mash up, and the technologies developed for online advertising used to target marketing and advertising using transaction data. New businesses might be behind these combinations—some may act as intermediaries between the online advertising and payments industries. Existing businesses might extend themselves. A financial institution, for example, might consider using payments data to provide advertising and marketing that help their payments business and cross-sell other products, driving additional revenue. Businesses from these two ecosystems—Yahoo! and MasterCard, for example—might themselves be mashed up through a merger or acquisition. They are both, after all, businesses built on the manipulation of data over networks.
The mobile phone has the potential to play a central role in this integration of transaction data and advertising.

Mobile Phone Revolution

The mobile telephone has become the world’s most ubiquitous technology. There are more than 3.5 billion mobile telephones in use today globally, nearly four times the number of PCs and two times the number of television sets.\(^4\) Table 3-2 shows mobile phone subscriber penetration as a fraction of total population for various countries. The growth of mobile phones in the emerging and lesser developed countries is an example of the path dependence observation we made previously. Countries that had made little investment in fixed-line telephone systems simply leapfrogged the old technology and went with the new. In many parts of the world there have already been mashups of mobile phones and payments that have responded to particular local circumstances. Only a portion of the potential synergies between the mobile handset, mobile communications, and payments have yet been realized.

Development of Mobile Technology

Mobile phone technology is evolving rapidly. Although a large portion of the stock of mobile phones around the world consists of “dumb” devices, people replace their mobile phones relatively frequently. Much of the stock of mobile phones in five years is likely to consist of devices that are powerful computers, run by sophisticated software platforms, with many applications available. Many of these phones are likely to be connected to the Internet and have browsers.\(^4\)

Three aspects of mobile phone technology can prove important for mashups with payments.

—Internet connectivity. An increasing portion of mobile phones have browsers and can be linked to the Internet. As of May 2008, 95 million mobile subscribers (37 percent of all subscribers) in the United States paid for mobile access to the Internet. As more recent numbers are published, this penetration will likely increase with the entry of devices that
access the 3G network or can connect to WiFi. Some analysts predict that by 2010 more than 50 percent of cellular subscribers in the United States and western Europe will access the Internet on a mobile device at least once a week. The most successful example of such phones thus far is Apple’s iPhone. More than 8 million people have these handsets, with analysts conservatively predicting that, worldwide, 25 million additional units will be sold in 2009 and optimistically predicting that this

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Table 3-2. Mobile Phone Penetration for Various Countries

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a. Penetration reflects mobile subscribers as a percentage of total population.
number will reach 40 to 45 million. The phone’s popularity has attracted many imitators and has placed pressure on device manufacturers to meet newly defined consumer expectations. The fact that phones will be browser based means that any payment method that works online also works on mobile phones.

—Powerful computing device. Mobile phones have become much more sophisticated computing devices over time. Around 10 percent of phones sold worldwide are so-called smart phones, with computer chips for processing, rapid-access memory, and storage. Worldwide sales of these devices are expected to maintain strong double-digit growth over the next five years. Although these phones are very powerful computers, because computing is moving to the cloud, as we discuss shortly, the client can be thin.

—Software platforms and applications. Mobile phones based on sophisticated computer hardware have operating systems that control that hardware. Most of the phones have software-platform operating systems that include both the code that runs the hardware on the phone as well as the code that provides services to applications. The competition to provide software platforms for mobile phones is extensive. The leading players at the moment by order of market share on a global basis are Symbian, Research In Motion, Windows Mobile, Mac OS X, Linux, and Palm OS. In addition, Google has recently introduced its open-source Android platform.

The primary significance of these software platforms is that they can encourage the development of the same sort of rich ecosystem of applications for mobile phones that developed for personal computers. The Apple iPhone points the way. In the two months after Apple opened its iPhone application store, more than 3,000 applications were made available there—90 percent priced at less than $10 and 600 free. Since its debut on July 11, 2008, iPhone and iPod touch users have downloaded more than 100 million applications.

—Location-based technologies. An increasing number of mobile phones include GPS, which enables the network to locate the phone within a meter as long as a satellite signal can reach the phone. In 2007,
200 million mobile phones were GPS-enabled. This number is projected to reach 700 million by 2009 and 950 million by 2013. There are other methods for locating the phone as well. Triangulation methods based on using several cell towers can provide a rough idea—generally within a twenty to forty meter range. Mobile phones also emit a unit signal that could be detected by special receivers in retail stores.

**Mobile Phone Revolution in Payments**

With few of these capabilities even in place, mobile phones are nonetheless substituting for plastic cards as the preferred way to make payments in several important geographic regions. Among developed countries, however, the United States is not likely to see much near-term movement in this direction. Despite the supply-side push, unresolved market restraints and consumer concerns continue to block any substantial activity. Other developed countries, however, are seeing more encouraging growth. Japan and Korea lead the market, with broad contactless use now converging with mobile devices. In western Europe, efforts by companies such as Paybox in Austria and Payforit in the United Kingdom provide platforms that enable mobile payments.

In emerging countries that do not have mature payment networks, mobile payment schemes are unfolding to satisfy the needs of residents (many of whom are unbanked) rather than improving the convenience of an established process. The introduction of mobile phones has revolutionized communication in many emerging economies, where landline infrastructure is often undeveloped. The mobile phone is now the key access point in many of these markets.

Safaricom’s M-Pesa technology was introduced to Kenya in March 2007, for example. The service enables person-to-person money transfer and urban-to-rural remittances by Short Message Service (SMS), with currency that can be purchased at one of the many M-Pesa shops across the country. Users register for the service and, after their identity is verified, an electronic account is established that links to the customer’s mobile phone number. The customer can then deposit cash with
the agent that is reflected as e-money, which can then be used for trans-
actions carried out over the mobile phone. Payees can then collect cash
from any M-Pesa shop. M-Pesa aimed to add 200,000 new customers
in the first year but achieved this penetration within a month, reaching
2 million customers as of May 2008. Other schemes, such as GCASH
in the Philippines and mChek in India, are providing similar services.

Another interesting development in the mobile payments arena in
developing countries relates to using prepaid air minutes as a form of
currency. Mobile operator Celtel in Africa is reports that the transfer of
air minutes by SMS is the preferred means of payment for small-scale
vendors, amounting to its own $2 billion industry. It has become par-
ticularly useful in Africa, where transferring small amounts of money
through banks is costly.

**Potential Mashups Between Mobile and Payments**

Much of the discussion in the payments industry has centered on using
the mobile phone instead of a mag-stripe, chip-based, or contactless
card. There has been great interest in whether the Japanese model points
the way. This development may occur in the United States, Europe, and
other parts of the world that are still card based. Mobile phones could
become equipped with contactless chips, as many in Japan already are.
Were such phones to become ubiquitous and people to take to the idea,
it might be enough to sway merchants into investing in contactless
point-of-sale terminals. It might also be that with the opportunities
mobile phones provide for additional profit, some players in the ecosys-
tem might subsidize contactless technology at the point of sale. It is
also possible, however, that some new technology for using the mobile
phone for payment will displace the contactless chip.

We believe that the current focus on the mobile phone as a form fac-
tor is misplaced. It is by no means clear that it is superior to the plastic
card as a payment device. People may prefer to use PIN- or signature-
based cards because of security concerns. Too little thought has been
given in the industry to the consumer experience at the point of sale
with the mobile phone. Customers who use multiple cards will need to
be able to select a card on the phone. They may find doing so both time consuming and cumbersome, depending on how the phone is designed. If they were just “smarter” than mag-stripe cards, we would not be optimistic about the widespread adoption of mobile phones for payment in countries that have an efficient card-based industry.

The mobile phone is likely to become a significant method, however, because it enables the combination of a number of transaction-related services that add value to the consumer and to the merchant. The mobile phone can easily be integrated into the consumer’s shopping experience and used to locate products and services at physical stores, to compare prices, and to locate and navigate to particular stores. Consumers could also receive advertising and marketing messages related to their precise shopping experience—tailored to the store and possibly even their location within the store in real time. The phone could also store on-demand coupons. Using the location-based services on the mobile phone, it is possible to deliver coupons and advertising messages based on where the consumer is shopping at any particular moment.

Card issuers do many of these things now, but in a rudimentary way. Card issuers have loyalty programs with groups of merchants, provide rewards to consumers who shop at those merchants, and even sometimes place advertising in their monthly statements. The mobile phone would enable all these activities to be done in a more sophisticated way: to be more precisely targeted to the consumer, her shopping patterns, and current location, and to be served in real time. These mashups are facilitated by the fact that smart mobile phones have a software platform on which application programs—which embody the ultimate technology for mashups—can operate.

**Cloud-Based Computing**

The electronic payments industry today looks like the IT department of a conglomerate that has been kludged together from numerous mergers. The payment card system runs on two sets of rails: one for signature-based cards sponsored by the four major card networks and the other for
PIN-based cards sponsored by the PIN-debit networks. Each is based on a patchwork of systems that rely on many proprietary networks, hardware, and software platforms that have been stitched together over the years. Other parts of the electronics payment industry have their own sets of rails, including the ACH system and the electronic check clearing system. Businesses and financial institutions must enter into point-to-point transactions for each of these payment systems using each of these rails.

With today’s technology, one would design a very different system based on uniform standards and interoperable technology. As with many modern systems, much of the work would be performed in the cloud, with the Internet—subject to security issues—being used to connect the various entities that make up the electronic payments ecosystem. Participants, however, have little incentive to abandon their investments in hardware, software, and processes that work pretty well, making it more promising for entrepreneurs to improve the efficiency of the current system rather than to replace it entirely.

One can view PayPal as an early attempt to solve the problem of multiple payment rails in an online world. Buyers can plug several alternative payment methods into PayPal, including multiple signature debit and credit cards and their checking account. Sellers then can select to receive a direct ACH transfer into their accounts from PayPal. This provides a many-to-one payment method. One can think of PayPal as operating a platform for buyers, sellers, and payment method providers. PayPal is not of course neutral as to payment method providers: its business model is based on moving buyers to ACH-based transfer, which allows PayPal to avoid paying merchant fees on cards.

A much more sophisticated approach is being pursued by Denver-based IP Commerce, which has developed an operating system for the payments ecosystem that, in effect, provides a cloud-based software platform. Although they have difficult chicken and egg problems to resolve to get their platform established within the electronic payments industry, their approach is instructive because it shows how cloud-based computing could lead to a rapid increase in innovation throughout the payments industry.
The IP Commerce software platform provides for many-to-many connections. In effect, a buyer or seller who gains access to the platform’s services can select among a menu of sending and receiving payment alternatives without having to install the individual connections for each one. This is similar to a PC operating system that enables the user to plug into many different peripheral devices without having to install software drivers for each one. As anyone who used personal computers twenty years ago knows, incorporating these drivers into the operating system has saved users a lot of work. Likewise, in the payments system, a standard platform for accessing multiple rails could save a great deal of time and effort. IP Commerce has been working at getting its software incorporated into the major third-party processors that handle the bulk of electronic transactions.52

As a software platform, IP Commerce exposes APIs, which allows developers to use IP Commerce code to provide services. PaySimple has done this. Its application enables small businesses to accept any type of electronic payments easily and cost effectively. The business can use the PaySimple software service to handle recurring bills and to generate invoices with embedded electronic payment methods. This takes only a few minutes to set up and can enable the acceptance of electronic payments online even in the absence of a merchant website. So, in this case PaySimple has developed an application (hosted in the cloud) that provides services to small business owners, relying on the IP Commerce software platform (also in the cloud) to power many of its underlying services. IP Commerce facilitates this sort of innovation by saving developers the cost and time of dealing with all of the IT complexities of the payments ecosystem. It therefore operates in much the same way as Windows. An application developer does not have to worry about dealing with a multitude of device drivers for various kinds of hardware because Windows has already done all of that work.

If this software platform, or others, became established in the electronics payment industry, it could promote a massive wave of innovation. It would become possible to develop applications that mash up various forms of payments with other technologies, including online
advertising and mobile payments, without having to change much of the other parts of the payments industry.

What Mashups Mean for Consumers, Merchants, and Policymakers

Consumers constantly look for goods and services to satisfy their needs and desires at the least possible cost, even as providers of those goods and services are constantly looking for consumers to buy their wares. Value is generated when buyers and sellers find each other and engage in exchange. The buyer usually pays less than his maximum willingness to pay and therefore gets some additional benefit—what economists call consumer surplus—as a result of the transaction. The seller often gets some profit that covers not only costs but investment and risk-taking as well. A diverse set of businesses and institutions in the economy facilitate the process of buyers and sellers finding and transacting with each other. These include retailers who act as intermediaries between producers and consumers, payments systems that provide methods for paying and sometimes borrowing, and advertising and marketing that help consumers, producers, and retailers find each other. These businesses and institutions create tremendous value by reducing frictions and transactions costs in the marketplace. It is hard to imagine a modern economy functioning at all, let alone functioning well, without well-developed distribution, payment, and information systems.

We have tried to show here that the convergence of behavioral targeting, smart mobile devices, cloud-based computing technologies, and payments could transform the shopping experience: how consumers find what they want, how producers and retailers sell consumers what they want, how the parties exchange information in this process to facilitate this matching, and how buyers pay for goods and services and sellers receive payments for those goods and services. These mashups could change the day-to-day shopping experience in profound ways. In so doing, the integration of these new technologies could create substantial value—even a fraction of the value created by modern distri-
Bution, payment, and information activities in modern economies would be a huge number.

Consumers would benefit from targeted advertising that is closely tied to what they are looking for in the physical as well as virtual worlds. Most important, consumers could benefit significantly from more useful information and more intense competition for their purchases at the point of sale. One can think of this as extending, to some degree, the easy comparison shopping available online to the physical world.

Producers of goods and services would have more efficient mechanisms for reaching consumers during their shopping excursions, targeting relevant messages to them, and assessing whether their efforts have been successful. They currently have—or, soon will have, subject to privacy concerns—these abilities in the online environment. Offline, however, the delivery of advertising is removed in time and place from the consumer’s purchasing decisions, and methods for assessing how advertising messages actually influence purchasing behavior are limited.

These technologies would also enable retailers to provide a more valuable shopping environment for consumers. Indeed, some of these new technologies could deliver coupons and messages depending on where the shopper is situated within the store.

It is unclear how this convergence of technologies will occur and how it will affect the existing players in the payments ecosystem. A key consideration concerns the opportunities for consolidating the merchant and cardholder data for transactions. The banks that issue cards and handle demand deposit accounts sit on a treasure trove of data. However, those data would be far more valuable to advertisers (and to the online advertising industry) if they were pooled. That scale would increase the reach across the population and facilitate targeting of large groups of narrowly defined people.53 Those data would be even more valuable if they could be combined with richer merchant data, which is often held by merchant processors. MasterCard and Visa could possibly facilitate combining data. But as those entities have evolved into publicly owned companies, it remains uncertain how their relationships with the
banks will evolve. That uncertainty may provide opportunity for new players that do not pose competitive threats to financial institutions.

Another consideration involves the role of mobile operators. It is unclear at this point whether the mobile operators will seize some of the opportunities that are available for integrating mobile, online advertising, and payments, whether they will collaborate with other players on these technologies, or whether entrepreneurs will creatively bypass the operators who many see as obstacles to progress. Apple is a potentially powerful player in this business because it has shifted power from the mobile operators to itself as the handset maker. Google could be important as well, although its Android software platform for mobile phones has not yet attracted a significant following. Outside the United States, mobile phone sales are often not controlled by network operators, which may facilitate the kinds of innovation we have discussed. A variety of changes in the mobile regulatory environment in the United States could encourage or discourage payments-related innovation.

Policymakers will have much to consider as this transformation of the shopping experience moves forward. Credit and debit cards have attracted an enormous amount of attention from federal and state legislators over the years. Part of this is well deserved. Some credit card lenders in this intensely competitive industry have used deceptive practices to make money. Consumers have also suffered from the theft of large quantities of data on cards stored at retailers. Meanwhile, online advertising is also attracting increased scrutiny. As noted earlier, some online advertisers have been quite aggressive in tracking consumer behavior on personal computers without the consumer’s knowledge or consent.

Although policymakers should deal with these excesses, they should also recognize that the payments and online advertising industries bring tremendous value to the economy. Particularly in a period of potentially rapid and socially beneficial innovation, it is important to regulate with care, to avoid stifling that innovation—either unintentionally or to protect one or more entities threatened by it. Legitimate consumer protection concerns about deceptive lending practices, for instance, should
not be used to impose unnecessary and potentially costly regulation on
the performance of the payments function.

In addition, there will be legitimate concerns going forward over the
use of transaction data for online advertising and over location-based
methods to find out where people are. Traditional concerns over the
protection of personal financial information should be carefully con-
sidered. But these need to be weighed against the value that consumers,
in particular, will obtain from various new services. This is not a busi-
ness versus consumer issue. To balance privacy concerns, policymakers
must consider the extent to which consumer permission should be
required in various settings. Should we demand that consumers specif-
cally opt in to location-based services or to having their transaction
data used for delivering them advertisements and coupons? Or should
consumers just have a clear and transparent method to opt out?54 We
believe that privacy advocates tend to overstate the risks involved with
business use of consumer-specific data, but we do not deny that they
raise legitimate concerns. We would only urge that policymakers rec-
ognize the potential benefits we have discussed here and proceed with
care and caution to deal with the attendant privacy concerns.

One interesting feature of the current payment system environment
is the variety of legal regimes governing cash, checks, cards, and other
new systems of various sorts. Some have argued that the legal playing
field should be leveled, or at least made somewhat less hilly, at least in
part so that any new entrants would have greater certainty that they
would not be disadvantaged. Although we certainly understand and
appreciate the advantages of a transparent and neutral legal regime, we
would once again counsel caution. The current regime, messy though it
may be, has the signal merit of working well. We suggest that specific
problems with the legal regime under which payment systems operate
be solved only when they have been clearly identified and alternative
solutions carefully explored. We are unaware of any problems and solu-
tions that meet this standard.

Finally, we must at least touch on price regulation. Although in most
areas of the U.S. economy, and of many other developed economies,
price regulation is becoming a matter of only historical interest, price regulation of payment systems is emerging globally.\textsuperscript{55} This mainly takes the form of merchant-generated pressure for reduction or elimination of the interchange fees that Visa and MasterCard have traditionally imposed on merchants and passed on to issuers. In the United States merchants have brought antitrust litigation to reduce or eliminate these fees, whereas administrative regulation of one sort or another has generally been used abroad.

With their transformation into for-profit entities, Visa and MasterCard may eliminate interchange fees at some time in the future. That is, like American Express, they can simply impose fees on merchants (or on the acquirers who deal with merchants on their behalf) and provide subsidies of various sorts to the banks that issue their cards. After all, in every successful payment system from Diners Club onward, merchants have contributed the bulk of system revenue and have been unhappy about it. The political forces that have put pressure on interchange fees will thus naturally turn to putting pressure on merchant fees directly. But if they succeed, regulation will naturally extend to merchant fees charged by all payment systems, including American Express, Discover, and any new entrants—and perhaps, to ensure that price regulation is not evaded, to other aspects of their operations.\textsuperscript{56} If this regulation were to cascade to this extent, innovation would surely slow substantially, and the costs to consumers and businesses could be dramatic.

Notes

1. The payments industry is going through a period of creative destruction that is the result of fundamental changes in institutional arrangements, business models, and globalization over the last two years. MasterCard and Visa have transformed themselves from essentially nonprofit bank cooperatives to for-profit publicly traded firms with market values of $29.68 billion and $55.83 billion, respectively, as of September 8, 2008. A new global player has emerged with China Union Pay—a state-owned bank cooperative in China—having more than 1 billion cardholders with acceptance in twenty-seven countries and regions, rapidly expanding its footprint throughout the world. Mobile phones and related communication technologies are being used instead of traditional magnetic stripe
cards for making electronic payments in a number of countries. For more details, from the perspective of 2007, see David S. Evans, “Capitalizing on the Industry’s Inflection Points,” Our Story, pp. 45–61.

2. The term *mashup* refers to a derivative work consisting of two pieces of (generally digital) media joined together, such as a digital map overlaid with user-supplied data.

3. For further details, see Smart Card Alliance (www.smartcardalliance.org) and the NFC Forum (www.nfc-forum.org).

4. The electronic payments industry includes the credit and debit card systems, ACH-based transactions, online banking, electronic bill pay, and all other methods that providing for payment and settlement using digital money transmitted over communications networks. For much of this chapter we focus on the credit and debit card systems. Much of what we discuss, however, is relevant to the other aspects of the electronic payments industry.


6. In information technology, a client refers to a device used by an individual that can be connected to a network. A server is a node on a computer network that provides software and hardware services to these clients. A thin client is one that does not have much computing power—either processing speed, memory, or storage—often because these features are made available remotely by the server.


10. The survey was conducted online in August 2008 by Market Platform Dynamics. It was designed to get a general understanding of the consumer’s interest in alternative form factors and transaction experiences including mobile, contactless and various cardless solutions.

11. When asked “When paying at the point of sale, I wish I could pay by using,” 32 percent cited the mobile phone as important, 48 percent said a contactless card, and 38 percent said by not having to pull out a plastic card.

12. When asked to rank aspects of their payment experience as being important, 93 percent cited convenience, 87 percent cited a nonconfusing or easy-to-use process, and 91 percent cited to variety of payment methods.

13. This same survey asked consumers to rank their level of satisfaction with a variety of payment methods. When asked about contactless, 83 percent said that they had never tried it.

14. For an historical discussion of merchant reactions to merchant discount fees, please see Evans and Schmalensee, *Paying with Plastic*. 
15. It is also anonymous, which benefits merchants and consumers for a variety of reasons, including difficulty of detection by tax authorities.


30. Aite Group, “Contactless Payments and NFC in the United States: Beyond Science Fiction” (January 2008). Their reports also suggest that this number will
increase to 217,000 by 2014, representing less than 3 percent of all merchant locations.

31. According to a Jupiter Research survey of twenty-five- to thirty-four-year-old cardholders presented at CTST in Orlando, Florida, on May 14, 2008, 9.4 percent used contactless payment once a week or more.

32. Refer to the BillMeLater corporate website (www.billmelater.com).

33. Tempo, however, has moved to providing a platform for decoupled debit cards—cards various parties can issue that tap into the consumer’s checking account via ACH and Revolution Money has started a P2P payment service online.

34. SKU is a unique numeric identifier assigned to a product and used to track inventory.


36. Strategy Analytics reports that worldwide mobile ad spending will increase from $1 billion in 2008 to $2.4 billion in 2009. Other analysts are as bullish, citing the number of people worldwide with mobile phones, especially those in emerging countries, where the mobile phone is a proxy for a PC.

37. That involves looking at search histories, web visits, web e-mail, and possibly correlating those data with other sources of data.

38. The Senate Commerce Committee held hearings in Washington, DC, on online advertising and privacy (for a summary of that testimony, see www.searchengineland.com/080710-090207.php). The European Parliament held similar hearings in January 2008.

39. After a lot of public controversy and a campaign on Facebook mounted by Moveon.org, Facebook has since changed this system to be a strictly opt-in.

40. See Cellfire’s website (www.cellfire.com).


43. Ibid.

44. Piper Jaffray Companies prediction.


48. On September 25, 2008 Visa announced introducing mobile payment services via Google’s Android platform and Nokia by yearend 2008. Visa has publicized that the service will include initiatives such as mobile applications for Android that will allow Chase Visa cardholders to receive mobile notifications following
making a transaction, receive offers from merchants using Android’s LBS technology, as well as make contactless payments, remote payments, and money transfer. Jason Ankeny, “Visa expands m-payment service via Android, Nokia,” FierceMobileContent, September 25, 2008.


52. The IP Commerce software is also included in Microsoft Office, so that small businesses that use Office for invoicing can incorporate payment functionality—such as sending or receiving money electronically—into their invoices.

53. Because only a small fraction of consumers click on ads advertisers require large numbers of viewers to warrant the cost of launching an advertising campaign.


55. Courts or competition authorities have determined that interchange fees as set by card schemes are unlawful in the European Community, Australia, Spain, and Poland. Investigations and lawsuits are proceeding in many other jurisdictions. The U.S. Congress is considering legislation to regulate interchange fees. U.S. merchants have filed a private antitrust lawsuit against MasterCard and Visa that seeks to eliminate the interchange fee.

56. The late James W. McKie, professor emeritus of economics at the University of Texas–Austin, introduced the term tar baby effect to regulation to explain what happens when an agency applies a regulation, perhaps a defensible one, to one aspect of business, only to have the result not be what it had hoped and then seeks to implement additional regulation to correct what did not occur with the initial regulation.