Increasing Connectedness and Consumer Payments: An Overview

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Introduction and Overview

This paper presents a view of the future of consumer payments. Specifically, I opine on two questions. First, will the broad trends of consumers' increasingly being connected via mobile access devices and engaging in social networking be likely to revolutionize consumer payments? Second, if so, what roles will be played by the various payment participants (e.g., consumers, merchants, banks, mobile network operators, and nonbank intermediaries)?

This is a rather daunting task. Fortunately (for me, at least) confidently making sweeping predictions that fail to materialize is something of a mobile payments industry tradition. In that spirit, I will use the occasion to make my own sweeping and, possibly, far-fetched predictions.

In short, I believe that, in the United States and other advanced economies, the ubiquity of always-connected individuals with access to computing power, coupled with the near-total loss of privacy due to social and technological factors, will lead to evolutionary developments in core payment services but revolutionary changes in services that are built on the information collected through payment services.[1] Moreover, I think that core payment services will become only one component of broader constellations of services that: (a) provide consumers an integrated user experience when dealing with merchants, and (b) provide merchants with customer relationship management and marketing services, in addition to payment services.

The evolutionary changes in payments will come in the form of additional payment options that largely are extensions of existing payment options (e.g., the extension of credit card networks to mobile-commerce transactions, and the use

of smartphones as smarter smart cards through the use of near field communication (NFC)). In the short term, we may see new mobile payment products that are complementary to, and offered separately from, existing payment products. In the long term, I predict that successful payment products will provide consumers the convenience of one-stop shopping. That is, these payment mechanisms will be useful for mobile commerce, e-commerce, and traditional bricks-and-mortar commerce, and they will be so whether the consumer is buying virtual or tangible goods and services. Widely useable payment services will also have the advantage of allowing the service providers to collect more comprehensive information about any given consumer.

I believe this latter advantage will be an important one because the revolutionary services building on mobile, connected computing and social networking will be those services that allow merchants to target their customers based on the information collected through payment and social networks. Both of the trends identified in the opening of this essay will help incite revolution. First, connected individuals can be identified and tracked so that detailed information about their environment and actions can be collected, analyzed, and used to generate personalized, context-specific communication that can be delivered in real time. Second, social networks can allow the identification of an individual's revealed preferences, demographic characteristics, sources of influence, and influencer value. The ability to predict consumer behavior, know the consumer's context, and send personalized messages can give merchants very powerful marketing tools, worth tens of billions of dollars annually.[2]

Technological and social trends will lead to the convergence of three sectors around payment systems: telecommunications, banking, and web services. The communications sector will provide fixed and mobile Internet access services that will serve as bases on which innovative services will be built. Entities in the banking sector will extend credit and provide trusted brands. Lastly, a wide range of firms from the web-service sector may be involved, with particularly important roles played by social-networking, search, and online-advertising providers.

Any given mobile payment service requires the tacit or explicit cooperation of a wide range of parties to succeed, including mobile operating system (OS) providers, app developers, mobile access device original equipment manufacturers (OEMs), wireless telecommunications carriers, financial institutions (e.g., credit-issuing banks and merchant-acquiring banks), payment network operators, and possibly others. All of these parties are also potential rivals seeking to appropriate profits for themselves. Hence, although these parties must cooperate with one another to create value, they compete to capture that value. Similar forces arise with respect to the customer-relationship-management and targeted-marketing services that are based on the data collected through payment services and social networks.

The battles to capture value will occur on several fronts. First, there may be standards wars and compatibility battles. I believe that merchant demand for

standardization of point-of-sale (POS) transaction-capture devices will lead to the standardization of those devices, but that these devices will be flexible enough to interact with consumer devices in a variety of ways. Second, there will be struggles to control the customer relationship. However, I do not expect there to be one firm or one type of firm that controls "the" customer relationship in this area. Rather, a given consumer may have business relationships with several members of the relevant value net simultaneously.

The most important battles for control will be over information ownership. Revolutionary services will be based on the unprecedented amounts of information collected about consumers, and this information will be extremely valuable. Many firms will adopt business models predicated on monetizing the information that they collect about their users. Consequently, there will be struggles among social networks, other app providers, payment network operators, mobile network operators, and even mobile access device OEMs (at least in the case of Apple Inc.) over the ownership and control of this information. In the United States, regulatory and political pressures will have significant influences on industry evolution and who captures value. The convergence of three different sectors is going to lead to complex regulatory convergence as well. The interplay of economywide competition policy and privacy regulation with the sector-specific regulatory regimes for banking and telecommunications is going to be problematical for the industry. Given the importance of information and the complexity of the issues involved in regulating the collection and handling of it, public-policy concerns regarding privacy will loom large for years to come.

An examination of the broad forces affecting the industry gives rise to several specific predictions about the roles likely to be played by various industry participants:

- *The roles of firms in the telecommunications sector will change little*. With the possible exception of Apple, I do not see wireless telecommunications carriers and mobile access device OEMs playing significant roles in mobile payments beyond offering generic infrastructure on which payments services offered by other providers ride.

- *The roles of banks will change little.* Banks will continue to be an important part of the payment ecosystem as providers of credit, for which they possess unique expertise based on extensive experience. In addition, in the light of consumer concerns about privacy and security, banks may play an important role in reassuring consumers of the integrity of mobile payment systems.

- *Current payment card networks will play a central role if they can successfully innovate.* Traditional payment card networks, such as American Express, MasterCard, Visa, and—to a lesser extent—Discover have powerful competitive advantages in form of trusted brands and large networks of consumers and merchant users. A critical question is whether they possess the organizational capabilities to innovate to take advantage of the new possibilities created by pervasive consumer connectedness.

- *Web services firms will play significant roles as information collectors and processors.* Web services firms, such as Amazon, Facebook, and Google, are largely information collection-and-processing companies. To varying degrees, these companies have valuable competitive assets that include massive amounts of consumer data and the ability efficiently to collect, store, and analyze those data to model consumer behavior. Given these assets, I expect a few of these firms to be very successful in this area.

The remainder of this paper is organized as follows. Section I examines whether consumers and merchants are likely to derive significant new benefits from the types of payment services and features enabled by increasing consumer connectedness. The presence or absence of such benefits will have a significant impact on the likelihood that mobile payments and social-network-based payment services are likely to be widely adopted. Section II discusses the potential uses of the consumer information that would be collected by these payment services. It also discusses the likely struggle for control of that information. Section III then discusses some of the possible reasons why these payment services have not been widely adopted to date, and it identifies some of the strategies that may overcome these barriers to adoption. These first three substantive sections set the stage for Section IV to offer a predictive analysis of the likely winners and losers among the various types of firms that will be involved in providing new payment services. A very brief summary section closes the paper.

I. Does Anyone want Mobile Payments (Other Than Mobile Payment Providers)?

"Mobile" payment services already are offered by cash, checks, and various payment cards. These payment instruments are lightweight, compact, widely accepted, and easy to use. Rightly or wrongly, American consumers are also very comfortable with these payment instruments with respect to privacy and security. Moreover, most consumers already have established relationships with payment service providers, and merchants have made significant investments in POS transaction-capture devices (e.g., card readers and cash registers), employee training, and supporting information technology systems to utilize these payment instruments. These facts raise the question: do merchants and consumers want new payment options based on mobile access devices and/or social networks? The answer to this question is important because, if merchants and consumers do not see value in a new payment service, then that service is very unlikely to succeed. Cool technology alone is not enough.

What Do Users Want from Payment Products?

New payment services will be successful only if they offer merchants and consumers additional value sufficient to induce them to change payment methods or service providers. What are the sources of value to these users?

Merchants' Desiderata

Logically, the ideal payment service from a merchant's perspective is one that imposes low costs on the merchant and is used by a large number of consumers to make purchases in high volumes. And, indeed, in their empirical examination of merchant behavior with respect to mobile payment services, Mallat and Tuunainen (2008) found "that the main adoption drivers are related to the means of increasing sales or reducing the costs of payment processing."[3]

Merchants care about the complete set of costs that they incur to utilize a payment service. These costs include: (a) the fees, if any, charged by the payment service provider (e.g., the merchant discounts charged by a credit card network); (b) expenditures on activities that must be undertaken by the merchant to utilize the payment service (e.g., employee training and the wages and real-estate costs associated with using the payment service at checkout); (c) payments to third-parties for activities related to using the payment service; and (d) costs incurred to detect and prevent fraud by consumers, the merchant's employees, or other members of the relevant payment service value net.

Most merchants feel the need to accept payment services that consumers would like to use. Hence, merchant demand for payment services is derived in large part from consumer demand. Indirectly at least, merchants want what consumers want. In general, a merchant will be especially interested in a payment instrument that allows the merchant to attract customers who would not patronize the merchant absent the ability to utilize that payment service. Indeed, a rational merchant will accept a high-cost payment service if doing so allows the merchant to attract customers who would otherwise not patronize it.

Consumers' Desiderata

Because merchant demands are largely derived from consumer demands, it is particularly important to understand what consumers want from a payment service and whether they are likely to adopt mobile payment solutions.[4] The research literature has identified several factors that influence consumer demand for mobile payments. In their survey of American consumers, Dewan and Chen (2005) interpreted the results as suggesting "that consumers realize the potential benefits (e.g. improved transaction speed and convenience) of mPayment, but at the same time, consumers are expressing grave security and privacy concerns."[5] Based on their survey of New Zealanders, Viehland and Leong (2007) found that convenience was a key reason for consumers to choose mobile payments, while being less convenient than cash, and concerns about security—particularly confidentiality—were prominent barriers to adoption.[6] In addition, the authors found that an aversion to paying service fees was the single reason most often stated for not using mobile payments.[7] In a more recent study, Andreev et al. (2011) found "empirical evidence that trust, willingness to transact, and perceived ease of use are key factors in explaining [a] consumer's willingness to make an m-payment, with trust having the largest explanatory power."[8]

It is useful to examine several different dimensions of consumer preferences in turn.

Convenience and ease of use: It seems to be intuitively clear that consumers want mobile payments to be quick, easy, and not require a lot of knowledge specific to a particular payment service. However, Andreev et al. (2011, p. 122) found that while causation exists between perceived ease of use and willingness to make an m-payment, the association is relatively weak. This illustrates that perceived ease of use of the technology is not a key determinant of consumers' willingness to make an m-payment using a smartphone.

Similarly, Schierz et al. (2010) found that perceived ease of use was much less important for intention to use than was "perceived compatibility," where perceived compatibility was measured by the answers to questions regarding whether the respondent agreed that mobile payment services fit well with his or her lifestyle and the way in which he or she likes to purchase products and services.[9]

Ubiquity: Consumers generally want a payment instrument that they can use to make payments at their preferred merchants. Hence, all else equal, the greater the number and variety of merchants accepting a given payment service, the more attractive one would expect that service to be to consumers. Although he is careful not to assert that he has established causation, in his empirical study of credit card usage, Marc Rysman (2007) found that a consumer's choice of card network as his or her favorite is positively correlated with the degree of local merchant acceptance of that network, which suggests a positive feedback loop between merchant card acceptance and consumer card usage.[10]

Security and privacy: As noted above, studies have found that consumers are reluctant to use payment services that they do not trust. Similarly, Mallat (2007) found that consumers were more willing to transact with trustworthy parties.[11] Security and privacy are two critical elements of trust.[12]

Credit: At the start of 2012, American consumers had approximately $800 billion of revolving-credit debt.[13] Manifestly, many American consumers desire the provision of credit by some—although by no means all—payment services.

Rewards: Many consumers are more willing to use a payment service if they are paid to do so.[14] Indeed, regulators in several nations (most notably, Australia) have expressed concern that credit-card rewards programs have led to consumers' using credit cards to a greater extent than is efficient. The use of rewards programs to motivate consumer use of mobile payment services may be a particularly important factor if it turns out that these services do not offer significant additional value for consumers but do generate significant benefits for merchants or for payment service providers in some other way (e.g., the monetization of the information they collect about consumer behavior).

Account management tools: Clearly, consumers desire the ability to monitor their accounts to at least some degree in order to check their balances, review the transactions charged against their accounts, and keep tabs on the finance charges levied on them.

Will Increasing Connectedness Enable Payment Services that Better Satisfy User Desires?

What difference does it make for payment services that consumers are increasingly connected through mobile access devices and social networks? Consider first the effects of pervasive social networking. I, at least, lack the imagination to see social networking having a huge influence on payment services narrowly defined. One could imagine embedding a payment service within a social network to facilitate online shopping or to transfer money among friends, but this strikes me as being a modest extension of the scope of existing services rather than a breakthrough new service.

Turning to connectedness through mobile access devices, the widespread adoption of smartphones and wireless tablets gives rise to several capabilities, including:[15]

- Consumers almost always have the ability to establish two-way communication links with merchants and/or payment networks.
- Consumers almost always have memory and processing power easily accessible to them.
- Consumers almost always have sensors with them, which may detect and report information such as location and temperature, or capture video images.[16]

In order to predict whether these capabilities will enable successful new payment services, one must examine if and how these capabilities enhance the ability of payment services to offer value to consumers and merchants.

Merchant Perspective

As discussed above, merchants will value payment services that make use of increasing consumer connectedness if those services either lower merchants' costs of completing existing transactions or attract additional consumer patronage.

Mobile payment services might lower merchants' costs by charging lower fees than current services. In theory, lower fees could arise because: (a) mobile infrastructure is less costly than existing infrastructure, which seems unlikely in practice; (b) other features of mobile payments facilitate new entry, which leads to increased competition in the provision of payment services; or (c) mobile payments services have other revenue streams (e.g., the sale of consumer information), which create incentives to charge lower prices to merchants and consumers in order to generate additional use. Mobile payment services might also lower merchants' costs in other ways, such as reducing the length of time it takes a consumer to check out

of a store or restaurant.[17] For example, Starbucks offers a mobile app to its customers that draws funds from Starbucks prepaid loyalty-card accounts and generates two-dimensional barcodes that customers can use to pay for purchases by having the codes scanned at the point of sale. The president of Starbucks' U.S. operations stated that a primary benefit of the application is the ability to speed up the checkout process.[18]

In terms of attracting additional customers, mobile payment services clearly are valuable to merchants that rely on online shopping channels; many consumers do online commerce via smartphones and, especially, tablets. Mobile payment services will also be valuable to merchants if there are other reasons that consumers value using mobile payment services even when not engaging in online shopping.

Consumer Perspective

So why would a consumer want to use a mobile phone or other wireless access device to pay for something? Consider how the new capabilities identified above affect the ability to satisfy the consumer wants identified above:

Ubiquity: At least initially, mobile payment services might serve as complements to traditional payment services by extending the reach of their merchant acceptance networks. E-commerce transactions require Internet access. Many people's first choice for an Internet connection is their phone or tablet. This is especially likely to be true for consumers purchasing apps or content for their phones or who are traveling, but it is also true for many consumers ordering tangible goods online from home, such as when watching television in their living rooms.

Convenience and Ease of Use: Eventually, people may stop carrying wallets to hold cash and various identification cards, such as drivers' licenses and insurance cards. If all of this information were stored in a smartphone, then storing payment-service information there, too, would be a benefit. But in the short run, people will continue to carry traditional wallets. This fact raises the questions: How hard is it to swipe a traditional credit or debit card, and why is it better to swipe a smartphone than swipe a traditional wallet with a contactless smart card in it?

The only advantage I can see is the following. If you are one of those annoying people who talks on your mobile phone when you should be handing your credit card to the cashier, now the cashier can simply grab your phone, swipe it, and send you on your way. In other words, I don't see much of a benefit from swiping a phone instead of swiping a card. But then again, I am the sort of person who would rather talk to my dinner companion than spend my time in the restaurant checking in on Facebook to tell people I am having dinner.

There are services that go beyond being a smarter smart card and eliminate the need for even contactless swiping. For example, Square has a service that does not require the consumer to touch his or her phone or a payment card in order to be billed.[19] Such services are manifestly more convenient, but they raise issues

of consumer trust. One can imagine it taking a long time for consumers to adopt this payment method anywhere other than merchants at which they shop regularly (e.g., to get their morning coffee or quick-service lunch).

Security and Privacy: Consumers might be induced to use a mobile payment service if they thought it were more secure and/or offered greater privacy protections than other payment options. Existing studies, however, indicate that many consumers hold the opposite view. For example, Dewan and Chen (2005) found that over half of the consumers responding to their survey felt that mobile payment systems were either "not secure" or "not secure at all," while just under half felt these systems posed either a "high risk" or "very high risk" to privacy.[20] The biggest concerns regarding security were whether the transactions would be properly authenticated and whether the data exchanged during the transactions would be available to unintended users.[21] In terms of privacy concerns, Dewan and Chen (2005) found that almost half of the consumers responding to their survey expressed concern about mobile payment companies' collecting too much personal information; over a quarter of respondents were concerned that personal information in the companies' databases would be used for purposes consumers had not authorized; and over a quarter of respondents were concerned that their personal information in the companies' databases was not protected.[22] The consumers surveyed expressed much less concern about errors in the information contained in the databases.[23] More recently, a consumer survey conducted in late 2011 found that the vast majority of consumers considered their personal computers to be more secure means of online shopping than their mobile phones or tablets.[24]

Will technological developments make mobile payments more secure? Some observers credit mobile payment services with having authentication based on devices (i.e., mobile phones) that are identified with particular individuals. But existing payment cards already possess this property. One might argue that mobile access devices are superior to payment cards as authentication tokens because the former can provide biometric authentication capabilities. However, those capabilities could more reliably be delivered by merchant-controlled POS devices that could check a consumer's claimed identity against a network database of biometric information.[25]

Although personal devices and biometrics do not distinguish mobile payment systems, consumers' having the ability to establish two-way communication links with merchants and/or payment networks does. Specifically, an always-connected buyer can direct payment to a merchant via communication with a payment network, without relying on the merchant's facilities.[26] This means that a consumer could communicate solely with a trusted partner when dealing with potentially untrustworthy merchants. This makes the system much safer in terms of certain types of merchant fraud, such as card skimming. In addition, an always-connected consumer can be provided real-time fraud alerts and as well as the ability to engage in real-time tracking of transactions. For example, with Pay with Square, a consumer gets a notification on his or her mobile device confirming the payment.[27]

Mobile systems also have vulnerabilities. Overall, the use of wireless might well be expected to weaken security because there are more points of vulnerability (e.g., the radio network) at which to hack a smartphone-based system than a smart-card-based one. Moreover, through the use of malicious code downloaded through apps or web browsing, a smartphone can be compromised without the attacker having to attain physical proximity.

New payment services, mobile or otherwise, may have to make tradeoffs between ease of use and privacy. For example, in a message to merchants, Square states:[28]

> After a customer elects to receive a receipt via email or text message, our system links the entered email address or phone number to their payment card. This way, the next time they pay with Square their information automatically populates, making the process much faster.
>
> Because of this feature, if you happen to enter your own information for your customers' receipts, you'll receive their receipts any time they pay another Square user with the same card.

Although this process may be convenient, one cannot say that it provides state-of-the-art privacy.

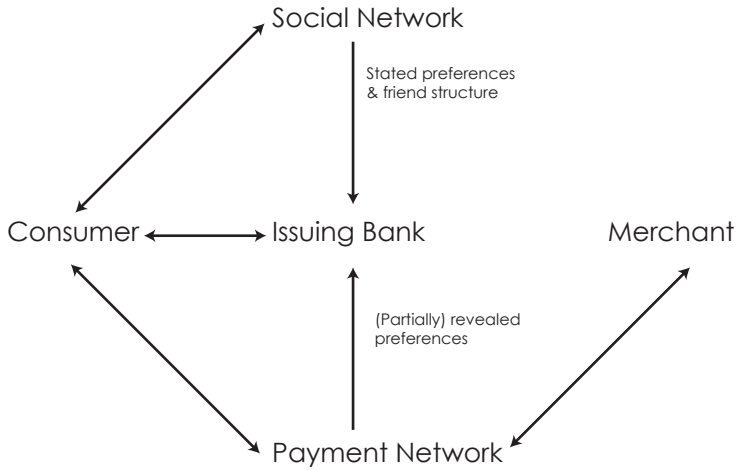
This example brings up a broader point. American consumers have a history of saying that they care deeply about privacy and security (especially with respect to new technologies) but then acting as if they care little. To the extent that mobile payments services are less trustworthy, consumers ultimately may not be troubled. And there may turn out to be limited demand for the additional security features that mobile payments systems can provide. For example, an e-commerce solution in which people handle payment transactions on a web page that is not accessed through the merchant's web page would be easy to create, yet to my knowledge consumers typically get to services such as those offered by PayPal by being redirected by the merchant's web site, and many customers are very comfortable with the security of those services.

Credit. Mobile payment services and social networks generate information on a consumer's context and transaction histories. Figure 1 presents a schematic view of important potential information flows.[29] As illustrated by the figure, this information could serve as additional input into credit scoring models (for example, if other members of your social network have poor credit histories, then you might receive a lower credit score than otherwise).

Rewards: As also illustrated by Figure 1, the information collected by mobile payment networks and social networks could be used to improve payment-service rewards programs, such as airline mileage points offered for credit card use. Although card issuers collect considerable information about consumer transactions, to my knowledge no issuer today offers real-time, context-sensitive rewards.

Figure 1

Using Additional Information to Improve Credit Offers and Rewards Offerings



Consumer connectedness could change that. Sophisticated, real-time, context-sensitive payment-service rewards programs are enabled by the presence of consumer mobile access devices with form factors that allow the display of graphics. I will say more on this point when discussing the broader uses of consumer information in Section II below.

Account management and customer service: One drawback (at least from the consumer's perspective) of many if not most stored-value cards in use today is that they are not readily auditable by the user. In principle, a smartphone-based stored value card could also store a transaction history that was easily reviewable by the consumer. In addition, such a card could take advantage of consumer connectedness to allow remote recharging. More broadly, real-time communication with relevant financial institutions enables the provision of more sophisticated and up-to-date account management services, such as checking a credit account balance while in a store considering a purchase.

In summary, the analysis of this section suggests that the changes in pure payment services due to pervasive mobile connectivity and social networking will be evolutionary, not revolutionary. Pervasive mobile connectivity and social networking will facilitate payment service features that offer additional value to consumers and merchants. In many respects, however, mobile payments primarily will be an extension of various existing e-commerce payment options to a new set of Internet access devices. I also think that consumers will want the extension to be linked closely to existing systems. I suspect that many consumers do not want to have to

use one payment instrument for online purchases made using a traditional personal computer and another payment instrument for online purchases made using a smartphone or tablet computer.[30]

II. It's All About the Benjamins, and the Benjamins Are All About the Information

If pervasive mobile connectively and social networking are not going to revolutionize payment services, then why are so many people so excited about mobile payments? I believe some are excited because they are mistaken. But others are properly excited by the potential of mobile payment services (and social networks) to generate vast amounts of information about consumer behavior, which can then be sold for tens of billions of dollars annually. Indeed, it may turn out to be a profitable business model for a payment network to pay consumers and merchants to use its service so that the network can collect information that it then sells to advertisers and other businesses.

I Saw What You Did, I Know Who You Are

Connected individuals can be identified and tracked. Mobile payment transactions generate valuable information regarding current context and transaction histories.[31] As others have observed, context can include a wide variety of information, including "the location of the user, surrounding weather, user's current yearn, social relations with nearby users, bandwidth of the user's mobile device, screen size of the mobile device."[32] Transaction histories may themselves include the contexts in which payment transactions were made and, potentially, even information about situations in which consumers shopped but did not complete purchases. In addition, consumers' participation in social networks can allow the identification of an individual's revealed preferences (e.g., what commercial postings he or she clicks on), stated preferences (e.g., what approval or "like" buttons he or she clicks on and what recommendations he or she makes to others), demographic characteristics, sources of influence, and influencer value.

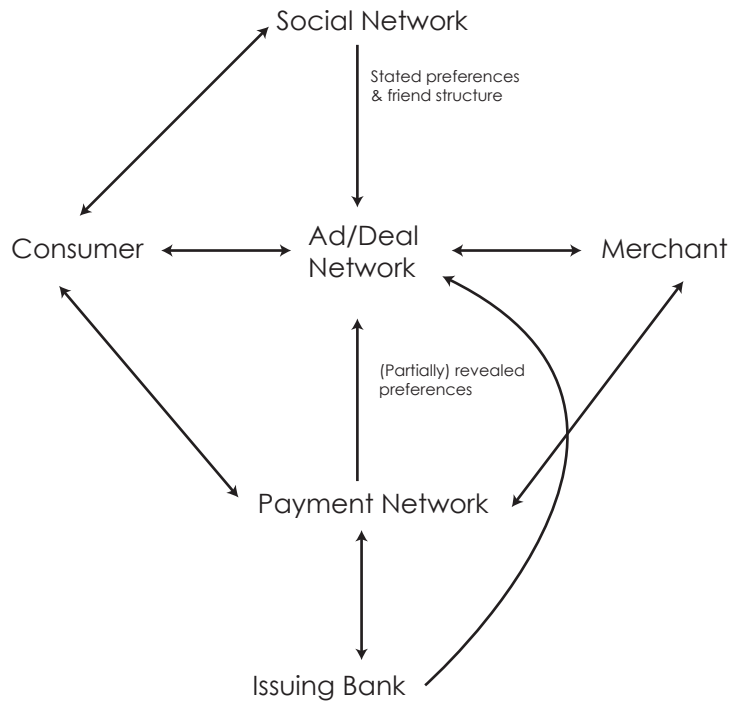
It is important to note that Figure 2 identifies different conceptually distinct functional roles. In practice, a single enterprise might serve as the social network, ad/deal network, and payment network.

The information collected through mobile payments and social-network based payments could be valuable in multiple uses. As discussed above, some uses are directly rated to payment services, particularly the offering of consumer credit. But the far greater value will come from uses outside of the traditional payments sector. Once connected individuals have been identified and tracked, and their behavior analyzed, they can be sent personalized, context-specific communications from merchants as part of broader relationship-management strategies.

The context on which the communications are customized can include elements of the consumer's current status (e.g., whether he or she is near a

Figure 2

The Art of the Deal



particular coffee retailer, the time of day, and evidence whether he or she has recently purchased coffee) and also certain aspects of the merchant's current status (e.g., whether the restaurant is crowded or empty, or whether the retailer has an excess stock of certain products). In terms of relationship management, sales histories can play a large role and can allow a merchant to reward its "loyal" customers with special deals.[33] A merchant could even offer social loyalty programs, whereby the deals offered to a set of consumers are related to the consumers' collective actions.[34]

Consumers' current contexts and transaction histories could, in theory, be used to: (a) support programs of personalized pricing and customized offers or deals; (b) improve the targeting of advertising (including direct mail, robo-calls, and various forms of online ads); and (c) improve the quality of Internet search. For example, Facebook allows advertisers to target their audience with reference to users' location, language, education, work, age, sex, birthday, relationship status, likes and interests, whether they are fans of the advertiser's Facebook page, and whether they are friends of fans of the advertiser's Facebook page.[35] Moreover, if it could be aggregated, the information from social networks combined with that from payment networks could create powerful measures of a consumer's influence on other consumers, and many

businesses are willing to pay to identify major influencers.

Searching Near or Far for a Value Proposition

As were several earlier years, 2012 is supposed to be the year general-purpose payment products based on NFC take off. I am doubtful.[36] This doubtfulness springs from the fact that other wireless technologies, such as Wi-Fi and traditional cellular networks, offer a broader range of possibilities and greater potential for value creation.

NFC can provide some incremental benefits in the form of added convenience and functionality at checkout. For example, some consumers would very likely prefer to waive their phones in the air rather than swipe their payment cards in a traditional reader, and NFC could support additional promotional activity at checkout, similar to existing instant coupons generated at checkout. Hence, NFC may make sense for the established payment networks, such as MasterCard and Visa, because it provides their users one more option and may be a particularly useful alternative for merchants with high volumes of low-value transactions.

The really exciting possibilities, however, come from communication between the consumer and merchant *before* the consumer gets to the checkout line.[37] The widespread adoption of smartphones and other mobile devices with increasing capabilities is making possible new services and products that will revolutionize the interactions between consumers and merchants.

The potential for mobile communications between a merchant and a consumer not next to the POS transaction-capture device (what might be termed "far field communication") has long been recognized. One example is a service known as SmartRestaurant, which was tested over eight years ago. This service allowed a customer to use his or her mobile access device to view a menu, place an order, pay for the order, and set a pick-up time.[38] In comparison with in-establishment ordering, the consumer benefited from being able to order and pay from a convenient location and then go through a much quicker pick-up process. The merchant benefited from having additional time to plan and adjust food preparation.[39]

One aspect of the service that was critical to enabling these consumer and merchant benefits was that the service made use of communication *before* the consumer reached the checkout counter. Indeed, the consumer and merchant communicated with one another before the consumer was even at the merchant's site. Of course, people have been faxing lunch orders for many years. And now, people can submit orders using a fixed-line Internet or mobile connection. In that respect, these are evolutionary changes.

With the rise of location-aware devices, the possibilities for communication between merchants and nearby consumers become far greater and the nature of the communication can fundamentally change. For instance, several vendors are making use of geo-fencing technologies, whereby a potential customer is sent promotional messages if he or she comes in proximity to a designated retail outlet.[40]

In October 2010, for example, Starbucks teamed with the wireless network operator O2 to offer a geo-fencing program promoting Starbucks' Via instant coffee. When a participating consumer was sufficiently near a Starbucks store or a grocery store that sold Via, a discount coupon was issued via SMS.[41] More generally, the message sent to a consumer as part of a geo-fencing program can contain: special pricing; information about the retail location's address, contact information, and operating hours; and information about the availability of specific products.[42]

The Pay with Square service described above also relies on geo-fencing, in this case 100-meter geo-fences based on Wi-Fi.[43] The geo-fencing allows the consumer to "set up Square to automatically open your tab when you walk in the door" of a merchant.[44] According to Square, there is no need for the consumer to touch his or her phone or wallet.[45]

One could easily imagine other micro-fencing applications along these lines. For instance, a consumer might visit a bricks-and-mortar retailer, pick up the desired items, and then simply walk out of the store. RFID tags on the items, coupled with identification of the consumer's mobile access device, could be used to generate an automatic charge to the relevant payment account. Clearly many other opportunities for innovative new services exist.

Who will Control Consumer Information?

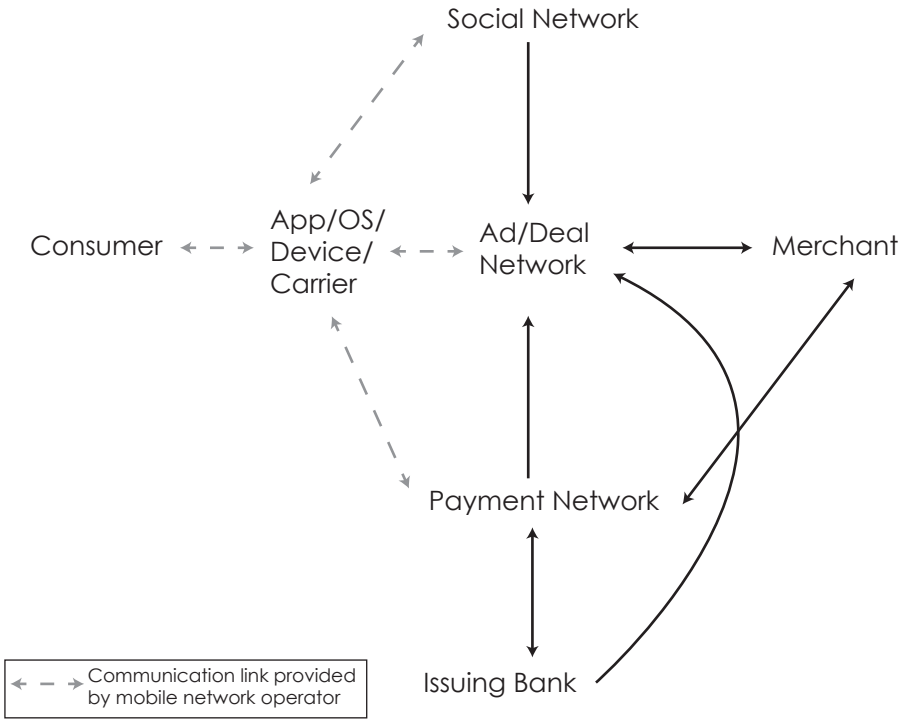
If information is where all the money will be, then intense battles to own and control access to that information can be expected. Figure 3 illustrates the information channels that may be wireless, and it provides a finer breakdown than does Figure 2. As Figure 3 illustrates, potentially one or more of the following groups might control important pieces of consumer information: wireless carriers, mobile access device manufacturers, mobile OS developers, app developers, consumer banks, and payment networks. Consequently, there may be struggles for control that cut across the telecommunications, financial services, and web services sectors. There may also be struggles within each sector. For example, app developers, mobile access device OEMS, mobile OS providers, and wireless carriers all may lay claim to consumer information related to mobile payments.

Within the financial sector, MasterCard and Visa may have disagreements with card-issuing banks with respect to who has the rights to use transaction information. At least for now, both Visa and its issuing banks appear to be able to use the information:[46]

> Gap and Visa began a pilot of a real-time text message system in November [2010]. Customers enrolled via a secure website and were sent Gap offers when they used their Visa cards to complete transactions that met certain criteria—for example, they may have had to buy something at a store in a specified ZIP code, or shop during a certain time period. Once the offers appeared on their phones, the customers took advantage of

Figure 3

Who Will Control Consumer Information?



them by showing the text messages to Gap sales clerks.

This pilot is notable because it is my understanding that this relationship between Visa, Gap, and consumers was not mediated by either a card-issuing bank or a merchant-acquiring one.[47]

One could even imagine consumers controlling their own information. For example, a consumer might have a low-cost app that allowed him or her to control who had access to his or her personal information, with the possibility of demanding compensation for the right to use this information. Here, pervasive social network poses some interesting difficulties. Would your friends be allowed to sell or give away what they know about you even if you refused to provide the information yourself? In any event, I believe that it is implausible that American consumers will go to the trouble of managing their information to this degree unless it is made very easy to do so.

"Ownership" of "the" customer relationship is often seen as critical point of strategic control in economic ecosystems and might be seen as a way to control

access to consumer information. However, there may be multiple customer relationships that come into play simultaneously in the area of mobile payments. A consumer may perceive herself as having one relationship with a mobile carrier, another with a mobile access device OEM, and a third relationship with a financial institution. Moreover, depending on public policy and private contracts, a firm might have access to a consumer's information even if that consumer does not perceive herself as having a meaningful commercial relationship.

Regulation, Regulation, Regulation

Legal and regulatory decisions regarding privacy and antitrust will very likely be critical determinants of who controls consumer information. For instance, as discussed below, the only way that I can see mobile network operators' being able to capture a large part of the value created by mobile payments services is if they could successfully limit the set of access devices operating on their mobile networks and the applications that run on those devices (i.e., if wireless carriers could control who offered mobile payment services over their networks). Hence, telecommunications-specific and economywide antitrust regulation will play important roles in shaping industry evolution.

The public-policy treatment of privacy and information ownership are likely to play very significant roles in the *creation*, as well as capture, of value from new services based on payment products enable by pervasive connectedness.[48] For example, a study of European privacy regulation found that it substantially reduced the effectiveness of targeted advertising.[49]

The convergence of three economic sectors is also going to involve the convergence (or collision) of three or more regulatory regimes. For example, telecommunications carriers and financial institutions are subject to distinct, sector-specific privacy regulation and antitrust enforcement regimes. And web services companies have been drawing attention from the FTC. Thus, the use of information about a consumer's mobile payment transactions could be subject to oversight from three or more different agencies.

In addition to creating the potential for regulatory conflict, the presence of multiple regimes may lead to consumer confusion. Consider, for example, direct carrier billing, which allows a consumer to make a purchase (e.g., buy a smartphone app) and have the charges posted on his or her wireless service billing account. According to ConsumerReports.org,[50]

> Federal law currently offers protection to consumers in the event that their credit card or debit card is lost, stolen or misused… If mobile payment transactions are linked to credit cards or debit cards, then consumers are entitled to the same guaranteed federal protections that apply when a credit card or debit card is used directly in a transaction.
>
> Mobile charges linked to other forms of payment don't enjoy any of these legal protections. If the mobile payment charge appears on

> the customer's cell phone bill, the product might escape consumer protections entirely unless the contract provides them.

Given how few consumers read contracts, it would seem unlikely that consumers know the extent of their protections with direct carrier billing.

Although industry members often are adverse to regulation, it should be noted that certain forms of regulation may make an important contribution to the success of mobile payments. In their recent study of consumers, Andreev et al. (2011, p. 123) found

> conclusive evidence of the association between trust and consumer's willingness to make an m-payment using a smartphone. By exploring trust in detail, our analysis illustrates that consumer's (sic) perceptions of legal frameworks and the regulation of these frameworks are integral parts of trust.

In addition to refusing to adopt mobile payments, consumers may engage in self-help to deal with privacy concerns by providing only limited or false information about themselves.51 From the industry's perspective, regulation may be preferable to any of these outcomes.

III. Getting from Here to There

It sometimes seems that each year begins with the prediction that it will be the year mobile payment services take off (with or without NFC) and ends with the prediction that the next year will be the one in which the takeoff will occur. If mobile payments services are so great, what is holding them back? One possibility is that, even when one accounts for the value of the information generated by mobile payment services, the benefits are always going to be less than the costs. I think the more likely answer is that, although the benefits outweigh the costs in the long term, there are difficult start-up issues that must be overcome to realize the potential benefits.[52]

On the merchant side, Mallat and Tuunainen (2008, p. 24) found that "the barriers to adoption include complexity of the systems, unfavorable revenue sharing models, lack of critical mass, and lack of standardization." On the consumer side, Mallat (2007, § 5.6) found that the lack of widespread adoption by merchants was a deterrent to adoption by consumers. And, as discussed in Section II above, Dewan and Chen (2005), Viehland and Leong (2007), and Andreev et al. (2011), among others, found that consumer concerns about security and privacy were significant obstacles.

Consumer Trust

Consumers' security and privacy concerns have been identified as barriers to the adoption of mobile payments. However, as noted above, American consumers have a history of saying that they care more deeply about privacy and security than

their actual behavior suggests. I believe that people will continue to express concern about security and privacy but in the long run they will act as if they are unconcerned. In the short run, however, the lack of trust in mobile payment systems can be an impediment to adoption.

One solution is to have mobile payments offered by established firms that have already have good reputations and are trusted by consumers. In their survey of consumers, Andreev et al. (2011, p. 117) found "that respondents considered using a secure and trusted third-party payment company as the preferred method of making an m-payment for products/services." Similarly, Mallat (2007, p. 424) concluded that focus group participants were "more willing to conduct payments with trustworthy transaction parties and regarded established banks, credit card companies, and telecom operators as reliable mobile payment service providers. Banks were slightly preferred to other providers."

Network Effects and the Chicken-and-Egg Problem

Network effects arise when, the greater the number of users on a system, the more valuable the system is to an individual user.[53] Network effects are prevalent in payment services. An increase in the number of consumers making use of a given payment service will—if the costs are not too high relative to the benefits—make acceptance of that payment service more attractive to merchants. And, all else equal, a consumer will more highly value a payment service the more extensive is the merchant acceptance network for that payment instrument. These positive relationships between the number of one type of payment-service user and the other are examples of what economists refer to as cross-platform network effects because they involve two different groups of platform users each of which values the presence of members of the other group.[54] Although the most obvious network effects are those associated with merchants and consumers, there are also cross-platform network effects in the supply of complementary products, such as smartphones and merchant POS devices that can communicate with one another.[55]

An important implication of network effects is that a payment network can suffer from a "chicken-and-egg problem." In short, a chicken-and-egg problem arises when no one wants to belong to a network unless lots of other parties belong to the network first. Specifically, a merchant will not want to bear the expenses of changing its checkout process to accommodate a new payment service if there are few consumers who would potentially use that service. Similarly, a consumer will not want to sign up for the payment service if there are few merchants who accept it. Of course, if everyone waits for lots of other parties to join the service, then the service will never get off of the ground.

There are several potential solutions to the chicken-and-egg problem. One is to begin with smaller groups that have strong cross-platform network effects among themselves. One of the most successful examples of mobile payments to date is the mobile app version of Starbucks prepaid store cards. The CEO of the developer of the Starbucks application attributed this success to "factors like Star-

bucks' complete control over the point of sale, the use of a closed-loop system, and smartphone-toting customers who are loyal and often make daily visits to the brand."[56] In addition, approximately 20-percent of Starbucks customers' in-store purchases were made using Starbucks' loyalty card before the app was launched.[57]

Another approach is to adopt pricing strategies that make joining a service attractive even if, at present, it offers relatively few benefits. One such strategy is penetration pricing, whereby prices are initially set at low (possibly below-cost) levels in order to attract users to the service. As the service becomes established, prices can be increased. A variant of across-the-board penetration pricing is to offer special deals solely to key early adopters. Specific parties may be particularly important early adopters for at least three reasons. Early adopters can: create valuable positive network effects (e.g., a popular merchant will attract buyers to the payment service); help the network achieve an efficient scale of operation; and, in some cases, add credibility.

A payment service could also offer users subsidies to cover fixed costs of participation. For example, a merchant typically has to incur fixed costs (e.g., the costs of modifying online shopping cart software) to participate in a payment service. If the merchant later determines that it is undesirable to participate in the service, then these costs will be lost. Hence, these costs represent a risk of participating and create an incentive to wait until other parties have joined a new service and shown it to be viable. Development subsidies are one way to reduce the risks of membership and thus lessen the chicken-and-egg problem. Offering free applications to consumers has a similar effect.

In market with strong network effects, the degree to which different services are interoperable, or compatible, can also affect adoption decisions, as well as industry performance generally. Compatibility can reduce costs by allowing different service providers to share some elements of infrastructure (e.g., POS transaction-capture devices). Users may also be more likely to adopt new payment services because there is less threat of lock-in or stranding when a given piece of user equipment (e.g., a smartphone) can operate with multiple services. Hence, the chicken-and-egg problem is less severe.

But compatibility can also reduce or eliminate network size as a source of competitive advantage. Consequently, firms that have large installed bases—or firms that users generally *expect* to be particularly successful under incompatibility—may oppose compatibility.[58] Moreover, particular standards may favor some service providers over others. Hence, it is not a foregone conclusion that widespread standards will be adopted and compatibility achieved simply because network effects are present.

That said, I believe there will be standardization of merchants' POS transaction-capture devices. Merchants will likely exhibit very strong preferences for compatible POS transaction-capture devices, as we have today with different credit, charge, and

debit card readers. Most merchants have limited space at checkout, and what space they do have could better be used to display products rather than house multiple payment terminals.[59] Because the demand for compatibility among POS transaction-capture devices will be so strong, I expect that the most widely adopted devices will work with multiple payment services and will drive consumer mobile access devices to have similarly standardized interfaces. Although these devices will be standardized, there will still be significant opportunities for the payment services making use of these devices to differentiate themselves from one another.[60]

In addition to issues regarding standardization across competing mobile payment services, there are also issues regarding standardization across mobile payment services and existing payment services. Compatibility with existing services can reduce the chicken-and-egg problem for new services. These considerations arise with respect to NFC. Here, the desires of at least some parties to maintain compatibility are evident:[61]

> Visa has played a leadership role in establishing global standards for mobile payments, making sure that they are aligned with existing technology and security standards for chip payment cards and can easily be integrated into the existing payments ecosystem. For example: Visa payWave on mobile devices is compatible with existing contactless (NFC) payment terminals already installed at retail outlets worldwide, enabling Visa account holders to simply wave their enabled phone in front of a payment terminal in order to pay.

Compatibility with existing systems is also valuable because, even if most consumers rely on their mobile phones to serve as smart cards, merchants will still have to deal with non-phone-enabled consumers for a significant period of time. Thus, compatibility will allow merchants avoid the costs of having to operate two systems simultaneously.

The chicken-and-egg problem faced by payment services is not limited to consumers and merchants. These effects also apply to financial institutions and other potential complementors, such as mobile access device OEMs which must choose whether to install special features such as NFC chips on their devices. One solution to the complementor version of the chicken-and-egg problem is for the payment service either to subsidize the production of the complements or to purchase them on behalf of users.

Several years ago, Wells Fargo tested a service that allowed users to make payments using a phone rather than a bankcard. Wells Fargo chose not to offer the service to its customers, in part because there was only one handset that could be used to offer the service.[62] Even today, most smartphones do not have built-in capabilities to communicate with merchant POS devices. Recently, however, Wells and other potential payment providers have experimented with microSD cards that can add these capabilities to existing phones,[63] and DeviceFidelity and Spring Card

Systems announced a micoSD card that can be inserted into an Android phone and used to make payments over MasterCard's PayPass NFC system.[64] These developments highlight the need for complementary investments at various points in the value net. They also illustrate how some parties may be able to internalize complements effects by offering the complementary products to their customers rather than waiting for independent suppliers to offer them directly to users.

IV. Who will Do what?

Having discussed many of the forces that will shape competition, I next examine what roles will be played by the various payments industry participants, including banks, wireless telecommunications service providers, financial institutions, traditional card payment networks, and web services companies.

Don't Get Carried Away with Carriers

Wireless carriers will unquestionably provide important communication links that will enable both mobile payment services and mobile advertising-and-deal services. Figure 3 above illustrates the fact that wireless carriers will provide communication links between consumers and payment networks, deal-and-advertising networks, social networks, and—directly or indirectly—merchants. Despite the importance of these links, it does not follow that wireless carriers will be successful in capturing the value created by these services.

Indeed, there is a wide variety of opinions regarding whether wireless network operators are likely to succeed in capturing value, ranging from extreme optimism:[65]

> There is a game-changing opportunity here for the operators to effectively displace credit cards and banks.

to strong pessimism:[66]

> Operators will continue to attempt to insinuate themselves into the process at a premium rather than simply accepting their long-term fate of being minimum-margin bit pipes for the masses.

Other commentators fall in the middle, seeing mobile network operators as playing critical roles but doing so by partnering with financial institutions rather than displacing them.[67]

In my opinion, the pessimistic view is very likely the correct one: telecommunications providers will neither significantly shape the evolution of general purpose payments in the United States nor will they capture significant value. Instead, they will provide essential but undifferentiated infrastructure.[68] The term "undifferentiated" is critical here. It will prevent almost all access device OEMs and telecommunications carriers from having powerful positions within the mobile payments value net (the one exception may be Apple). There is little or no need to have wireless network operators involved in planning payment services, and there is relatively little benefit to other parties from forming alliances with mobile

network operators except in their roles as distributors of mobile access devices.[69] In addition, wireless carriers and access device manufacturers generally lack strong business relationships with merchants.

Mobile network operators do not want to be commoditized, "dumb pipes." But to avoid this fate, network operators have to provide something that cannot better be provided at the edge (either for technological reasons or because network operators have locked out rivals).

Experience with fixed-line access to the Internet does not bode well for mobile network operators and access device OEMs. Personal computer manufacturers, operating system developers, and Internet service providers play no role in online payments today beyond providing generic infrastructure over which online payment applications run. And there is no reason to expect that situation to change. I don't know of anyone who expects fixed-line broadband Internet service providers to dominate online payments. Why should one expect mobile broadband providers be any different?

There are a few possible reasons. For one, mobile broadband service providers in the United States have been able to keep much greater control over how their services are used than have fixed-line providers. For example, wireless carriers can limit the set of devices used to access their networks and have some degree of control over the applications that run on those devices. But blocking competing payments services would be very difficult.

It would be relatively easy to work around bottlenecks in mobile access devices that took the form of proprietary chips or capabilities. Even if there were proprietary NFC chips installed in smartphones by OEMs or carriers, there are add-on chips and software solutions that can be utilized instead. And, of course, Wi-Fi and cellular-based systems need not rely on NFC at all. In order to keep competing payment services from reaching its customers, a mobile network operator would have to rely on more actions specifically designed and targeted to block those applications. I question whether excluding mobile payment applications in that way is a feasible long-term strategy either commercially or politically.

The two earlier discussions of the Starbucks app and banks' use of microSD cards to run an over-the-top payment application illustrate some of the difficulties that mobile network operators and access device OEMs face. There is no need for wireless carriers, wireless OS providers, or mobile access device manufacturers to provide any features or functions specifically tailored to the Starbucks app. Although banks consider microSD cards to be a transition technology,[70] these cards demonstrate the existence of a simple work-around of any device manufacturer and carrier that attempted to go a different route (as long as the devices had non-proprietary expansion slots; once again, Apple may be different than the rest of the industry).

The other way to avoid becoming "dumb pipes" is for mobile networks to provide something that is cannot—or at least is not today—better provided at the

edge. For example, network operators may be able to provide some information that, although edge devices could provide, many do not. Locaid Technologies Inc., and Placecast offer geo-fencing services that use mobile network information to determine a subscriber's location.[71] Consequently, these services are available to consumers who do not have GPS-enabled phones. Although this approach may be valuable in the short run, it seems likely that, in the long run, a very high percentage of mobile access devices will be location aware, whether by using GPS, triangulation based on Wi-Fi networks, or some other means. Moreover, in the long run, those devices that are not location-aware may be feature phones that lack the ability to provide rich graphics and, hence, will rely on SMS messages that are much less powerful marketing tools than those that can be provided to smartphone and mobile tablet users. I am unaware of any other services or features relevant to payment systems that can be offered by the core of mobile networks but not edge devices.

There may be certain niches (albeit multibillion-dollar niches) in which mobile network operators play deeper roles. For example, carrier-based billing is convenient for purchasing apps, ringtones, and similar digital goods for use on mobile devices. And SMS-based and carrier-based-billing solutions might have a place for low-value, spontaneous transactions (e.g., to pay for online voting related to a television broadcast). For mainstream mobile payments, however, mobile network operators' roles are likely to be limited.

Similar considerations arise with respect to mobile operating system providers and access device OEMs. Although, in at least some instances, these parties may be more differentiated along other dimensions, they still will serve as relatively undifferentiated infrastructure for over-the-top payment services unless they are able actively to lock out such competitors. With the possible exception of Apple, such a strategy seems infeasible for access device manufacturers given the high degree of competition they face. And such a strategy seems unlikely for Microsoft and RIM given their weak market positions, and Android given its open strategy.

Give Banks Credit

My analysis suggests that the roles of financial institutions play in payment systems will not change very much as the result of increasing consumer connectedness. There are two dimensions to this prediction: (a) banks will not branch out to play significant new roles; and (b) other types of institutions will not displace banks as sources of credit and stores of wealth.

My basis for prediction (a) is twofold. First, with the exception of the bank controlled by American Express, few if any banks have a broad enough customer bases to attract merchants to a proprietary network based on a single bank's consumer customers. Second, I expect banks to be able successfully and profitably to extend their traditional roles of providing credit and serving as stores of wealth to mobile payments by partnering with other parties that are better positioned to

develop merchant networks and the other aspects of new payment systems.

Given the existence of various regulatory constraints, prediction (b) might almost be true by definition: enterprises taking over banks' roles will have to become banks themselves. The more interesting version of this prediction is that mobile payments will not allow significant entry of new firms as suppliers of credit, at least in the short run.

This prediction is based on the fact that issuing credit is hard work. Just ask AT&T or American Express. AT&T believed that the core competence needed to issue credit cards was the ability to process large numbers of transactions efficiently and reliably. Given its experience in large-scale, highly complex telephone billing, AT&T thought it had this competence. AT&T entered the card-issuing business and amassed a large portfolio. However, the credit card industry evolved so that a critical—or, perhaps, the critical—skill is the ability to process information to predict what card offers will appeal to consumers and which consumers will be profitable. AT&T lacked this skill and exited the industry by selling its credit card portfolio to Citibank.

American Express also serves as an instructive example of the difficulties of issuing credit cards without experience or an existing customer base. American Express initially had significant difficulties when it first issued a credit (as opposed to charge card). When it began offering its Optima credit card in 1987, American Express dramatically misjudged the market and the risks that it faced.[72] Consequently, American Express ended up suffering loan losses of hundreds of millions of dollars per year between 1988 and 1994, despite being an experienced charge card issuer and having account histories for millions of charge card holders.[73] Since becoming an experienced credit card issuer, American Express has become more successful.

Banks have another competitive advantage in addition to their experience issuing credit. As discussed in Section III above, some researchers have found that consumers place greater trust in established payment companies and banks. This factor speaks well to a continuing, central role for banks and the existing bankcard payment networks.

Lastly, it should be observed that there is a further connection between parts (a) and (b) of this prediction: because banks have an important and profitable role to play as a complementary piece, they do not have large incentives to try to create proprietary systems of their own.

Wither Incumbent Payment Card Networks?

Many people see the developments discussed in this paper as very significant threats to incumbent payment card networks. It is important to recognize that many of these developments also represent opportunities for incumbent networks. These developments extend the reach and increase the utility of the services

offered by these networks. Incumbent payment card networks may be able to take advantage of these opportunities directly. These networks have several competitive advantages including: reputations with consumers for trustworthiness; large merchant acceptance networks; and lots of data, including data generated by nonmobile transactions. For incumbent payment card networks, the biggest question is whether they have the organizational capabilities to innovate successfully to build on their current strengths.

Even if incumbent networks do not take advantage of the opportunities created by pervasive consumer connectedness directly, many of the services offered by companies such as PayPal and Square are built on top of the services of incumbent card networks. That said, there is a risk that some of these complementary service providers may evolve into competitors.

Web-Services Companies

The rise of Internet payments has brought web-services companies such eBay, Google, and Facebook into the payment arena. Many of these companies are essentially information collection-and-processing companies, with valuable competitive assets that include: massive amounts of consumer data; experience efficiently collecting, storing, and processing that data at scale; high degrees of skill at processing the data to model consumer behavior (e.g., determining for what consumers are looking when submitting Internet search queries).

The role of web-services companies will depend on how a variety of political and regulatory issues shake out (e.g., whether privacy regulations limit their business models), but I expect a few of these firms to be very successful in this area. Companies that sell advertising based on Internet search and social networks can be expected to make effective use of their ability to help merchants target their advertising in ways that pervasive consumer connectedness will enable. I also believe that web-services providers will extend their success to the business of facilitating targeted offers and customized, context-specific pricing.

Will web-services companies be able to use their information as well as their information-collection-and-analysis skills to compete with banks by customizing credit products and conducting superior credit analyses? One issue is whether these companies would be better off selling the information to existing credit card issuers. Another issue is that there is more to life (and success in the payments marketplace) than information processing. As discussed at several points above, at least in the short run trust is a big issue. In my view, at present consumers can be expected to trust several of the largest web-services companies less than they trust their banks and traditional payment card networks.

What about Apple?

At several points in the discussion above, Apple has been singled out as a possible exception to statements made about broad groups of firms. The future role

of Apple is a big question mark for at least two reasons. First, Apple is uniquely positioned in the mobile economic ecosystem. It has by far the most powerful consumer brand, and it is the most vertically integrated of any company. Today, Apple is the most successful mobile access device OEM, one of the two most successful mobile OS developers, a web-services company, one of the most innovative and successful bricks-and-mortar retailers, and an online payment company (albeit one that generally rides on top of existing credit and charge card networks).[74] And, in 2006, Apple even filed a patent application for a system under which Apple would be a mobile virtual network operator.[75] Second, Apple has a history of operating closed systems that offer high levels of user convenience coupled with high levels of Apple control.

Apple has been conducting research on various wireless payments solutions and has implemented some of them in its retail outlets (e.g., Apple EasyPay, which allows a consumer to use his or her iPhone's camera to scan an item's barcode and then pay using the credit card associated with the user's iTunes account).[76] Will Apple be able to use its powerful brand and vertical integration to create a payment system that it dominates? Or will Apple be driven to be more open in this arena because even Apple will need to work with other enterprises (merchants, if no one else), and these enterprises can see how big a share Apple has taken for digital goods to date?

Conclusion

I believe that consumers' increasing connectedness via mobile access devices and social networks will lead to evolutionary developments in core payment services but revolutionary changes in services that are built on the information collected through mobile payment services and social networks. I also believe that firms in the telecommunications sector will play a smaller role in payment services than they would like, while traditional payments services providers will play a larger role than many expect. The role of web-services companies will depend on how a variety of political and regulatory issues shake out, but I expect a few of these firms to be very successful in this area. For incumbent payment card networks, the biggest question is whether they have the organizational capabilities to innovate successfully to build on their current strengths of trusted brands and large networks of consumers and merchants. Only time will tell.

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Endnotes

[1]Throughout, when talking about either fixed or mobile access devices, I will be agnostic as to whether the computing power lies in the access device itself or the cloud.

[2]As discussed below, the increased understanding of consumer behavior may also have benefits for payment products themselves in terms of improved customization of credit terms and more-effective fraud detection and control.

[3]Niina Mallat and Virpi Kristiina Tuunainen (2008). "Exploring Merchant Adoption of Mobile Payment Systems: An Empirical Study," e-Service Journal 6(2): 24-57 (hereinafter, Mallat and Tuunainen (2008)) at 24.

[4]For purposes of this paper, it is sufficient to examine the drivers of consumer adoption at a broad level. In practice, consumer payment decisions are typically made at the transaction level, and the choice of payment instrument can vary with consumer characteristics, transaction characteristics, and payment-service characteristics.

[5]Sunil Dewan and Lei-da Chen (2005). "Mobile Payment Adoption in the US: A Cross-Industry, Cross-Platform Solution," *Journal of Information Privacy and Security*, 1(2): 4-28, available at *http://www.sunildewan.com/uploads/mpayment_Journal_of_Information_Privacy_and_Security.pdf*, site visited April 23, 2012 (hereinafter, Dewan and Chen (2005)), at 23. Page cites made to this document correspond to the version available at URL above.

[6]Dennis Viehland and Roslyn Siu Yoong Leong (2007). "Acceptance and Use of Mobile Payments," ACIS 2007 Proceedings, Paper 16, Tables 4 and 5.

[7]*Id.*, Table 5.

[8]Pavel Andreev, Aidan Duane, Philip O'Reilly (2011). "Conceptualizing Consumer Perceptions of Making M-Payments Using Smartphones in Ireland," in *Researching the Future in Information Systems*, Chiasson, Henfridsson, Karsten, and DeGross (ed.s). Springer: Boston (hereinafter Andreev et al. (2011)) at 122.

[9]The correlation between perceived compatibility and perceived ease of use was only 0.25. (Paul Gerhardt Schierz, Oliver Schilke, and Bernd W. Wirtz (2010). "Understanding consumer acceptance of mobile payment services: An empirical analysis," *Electronic Commerce Research and Applications*, 9(3): 209-216 at 215. Other authors have also examined the effects of compatibility on adoption. Because of its somewhat amorphous nature, I do not discuss it further in the present paper, except to note two points. First, because consumers' notions of compatibility can vary by transaction type (e.g., quick service restaurant purchases versus major appliance purchases), these notions can have important effects on the types of transactions for which consumers will use mobile payments. Second, I fully expect the population of users obsessed with their iPhones to find any Apple mobile payment service to be compatible with their lifestyles.

[10]Marc Rysman (2007). "An Empirical Analysis of Payment Card Usage," *The Journal of Industrial Economics*, 55(1): 1-36.

[11]Niina Mallat (2007). "Exploring consumer adoption of mobile payments – A qualitative study," *Journal of Strategic Information Systems*, 16: 413–432 (hereinafter, Mallat (2007) at 424.

[12]For example, Andreev et al. (2011, p. 123) found that "that consumer's [sic] perceptions of the privacy controls employed by smart phone service providers is [sic] a critical element of trust."

[13]Federal Reserve Bank, Consumer Credit—G.19, released April 6, 2012, available at *http://www.federalreserve.gov/releases/g19/current/default.htm*, site visited April 27, 2012.

[14]See Andrew Ching and Fumiko Hayashi (2010). "Payment card rewards programs and consumer payment choice," *Journal of Banking & Finance*, 34(8): 1773-1787, and the references cited therein for empirical estimates of the sensitivity of consumers' choices of payment instruments to the presence of reward programs.

[15]Although tablets are generally more capable than smartphones, consumers are less likely to have tablets with them and readily accessible at all times. Hence, tablets may be the preferred means of engaging in e-commerce transactions at home but smartphones will be used while at bricks-and-mortar retailers.

[16]I will not discuss them further, but it is worth noting in passing that there are also new features and services enabled by the form factors of mobile access devices compared to traditional payment cards. Even the smartest smart card cannot change its look and logo in real time. But a smartphone or tablet can. This fact opens new possibilities for co-branding. For example, a mobile payment account might be co-branded with a petroleum company when used to buy gas and a department store when used to purchase clothing.

[17]There might be potential cost savings for very small merchants from using smartphones or tablets as their primary POS, transaction-capture devices (one of Square's principal services offers these benefits, among others).

[18]Kate Fitzgerald, "Starbucks in National Push for Mobile Payments," *American Banker*, Dec. 3, 2010, available at *http://www.americanbanker.com/issues/175_232/starbucks-mobile-payments-1029437-1.html*, site visited March 12, 2012.

[19]*https://squareup.com/pay-with-square*, site visited April 20, 2012.

[20]Dewan and Chen (2005) at 14.

[21]*Id.* at 15 and 16.

[22]*Id.* at 17 and 18.

[23] *Id.*

[24]Ann Carrns, "Consumers Leery of Online Shopping with Tablets and Phones," *The New York Times*, Jan. 27, 2012, available at *http://bucks.blogs.nytimes.com/2012/01/27/consumers-leery-of-online-shopping-with-tablets-and-phones/*, site visited April 30, 2012.

[25]The identity claim might be made by a consumer orally, by swiping his or her payment card, or by a message sent by his or her mobile phone to the merchant.

[26]With an NFC-based service, the consumer's mobile access device would still communicate with a POS terminal controlled by the merchant. But in other cases, such as the use of Wi-Fi or traditional cellular services, the consumer's mobile access device could communicate with the payment network "directly." The Pay with Square service allows this to be done. (*https://squareup.com/pay-with-square*, site visited April 20, 2012.) In contrast, Square's innovative mobile card reader reportedly can easily be used to skim credit card information. Square's defense is that all credit cards can be skimmed. ("Square answers VeriFone's accusations on security of mobile credit card reader," *Los Angeles Times*, March 10, 2011, available at *http://latimesblogs.latimes.com/technology/2011/03/square-answers-verifones-accusations-on-security-of-mobile-credit-card-reader.html* , site visited April 20, 2012.)

[27] *https://help.squareup.com/customer/portal/articles/108037-pay-with-square-where-can-i-find-my-receipts-and-payment-history-* , site visited April 20, 2012.

[28] *https://help.squareup.com/customer/portal/articles/197741*, site visited April 12, 2012.

[29]There could also be flows in addition to those illustrated in this simplified diagram. For example, some merchants might interact with the issuing bank directly, and merchants and social networks might also exchange information.

[30]There may be limits to consumers' desire for one-stop shopping. For example, one interpretation of PayPal's success is that consumers want to have a limited account when transacting with merchants in whom consumers have less trust (this is my interpretation of PayPal's apparent appeal from hiding a consumer's credit card information from a merchant while potentially exposing the user's PayPal password. Of course, such preferences could be accomplished by a single payment mechanism that had different transaction and liability limits for different classes of merchants.

[31]As discussed below, consumers may also be connected through the facilities of the payment network itself.

[32]Janne Lukkari, Jani Korhonen, and Timo Ojala (2004). "SmartRestaurant: mobile payments in context-aware environment," ICEC '04 Proceedings of the

6th International Conference on Electronic Commerce, Janssen, Sol, and Wagenaar (ed.s), 575-582 (hereinafter Lukkari et al. (2004)), at 576.

[33]I place the word loyal within quotation marks because one might argue that truly loyal customers do not require special deals to be induced to patronize the merchant.

[34]By way of comparison, Groupon currently facilitates offers that are sensitive only to the merchant's context (and not in real time) and that are very crude in terms of relationship management. Although in at least some cases intended to serve as introductory offers that begin longer-term relationships, the big discounts associated with Groupon deals may encourage an adversarial attitude of consumers toward merchants. Groupon has what some observers label a "social" element, but it is among strangers and is not—in my view—properly viewed as a loyalty program.

[35]See *http://www.facebook.com/business/ads*, site visited April 20, 2012.

[36]I believe that NFC is more likely ultimately to be remembered as "never fulfilled claims." Those readers with telecommunications backgrounds will recognize this prediction as a tribute to the person who first observed that ISDN stood for "it still does nothing," rather than "integrated services digital network."

[37]Like a dog taught to walk on two legs, NFC could do other things. NFC swiping stations could be set up in the store aisles or showrooms so that consumers could seek information on the products and available deals.

[38]Lukkari et al. (2004) at 576.

[39]*Id.*

[40]See, for example, Chantal Tode, "Will wide-scale adoption of geofencing happen this year?" *Mobile Commerce Daily*, April 16, 2012, available at *http://www.mobilecommercedaily.com/2012/04/16/geofencing-strategies-on-the-rise-but-challenges-remain*, site visited April 20, 2012.

[41]Placecast, "O2 Case Study," available at *http://placecast.net/research/case_study_o2.pdf*, site visited April 20, 2012, at 01.

[42]For a description of one such service, see *http://placecast.net/shopalerts/operators.html*, site visited April 20, 2012.

[43]*https://help.squareup.com/customer/portal/articles/223248-new-how-do-i-set-up-auto-open-in-card-case-* , site visited April 20, 2012.

[44]https://squareup.com/pay-with-square, site visited April 20, 2012.

[45]*Id.*

[46]Matt Hamblen, "Visa, Gap use text messages to mobile phones for promotions," *Computerworld*, April 21, 2011, available at *http://www.computerworld.com/s/article/9216060/Visa_Gap_use_text_messages_to_mobile_phones_for_promotions*, site visited April 28, 2012. See also, Sarah Perez, "Visa Launches Real-Time, Location-Based Discounts for Gap Customers," ReadWriteWeb, April 21, 2011, available at *http://www.readwriteweb.com/archives/Visa_launches_real_time_location_based_discounts_for_gap_customers.php*, site visited April 28, 2012.

[47]It is also notable in that it uses Visa's network to provide the location service and uses wireless networks solely for SMS messages, so that smartphones are not required and wireless carriers play a very limited role in providing the service.

[48]To the extent that privacy regulation distinguishes uses of information within an enterprise from uses that cross enterprise boundaries, regulation could affect enterprise's choices of their boundaries. For instance, public policies that are more lenient toward within-enterprise transactions are likely to promote greater enterprise scope. Similar issues can arise with respect to antitrust policy when two divisions of a given enterprise are permitted to engage in practices (e.g., exclusive contracting) that might be found to be antitrust violations if practiced by two separate enterprises.

[49]Avi Goldfarb and Catherine Tucker (2010). "Privacy Regulation and Online Advertising," available at *http://ssrn.com/abstract=1600259*, site visited May 1, 2012.

[50]ConsumerReports.org, "T-Mobile's "Direct Carrier Billing" Program Could Leave Consumers Vulnerable," Aug. 8, 2011, available at *http://pressroom.consumerreports.org/pressroom/2011/08/t-mobiles-direct-carrier-billing-program-could-leave-consumers-vulnerable.html*, site visited Jan. 25, 2012.

[51]Peter O'Connor (2005) "Comparative Analysis of International Approaches to the Protection of Online Privacy," in S. Krishnamurthy, ed., *Contemporary Research in E-Marketing*, Vol. 2. Hershey, Pa.: Idea Group Publishing, as summarized by Evelyne Beatrix Cleff, (2007) "Implementing the Legal Criteria of Meaningful Consent in the Concept of Mobile Advertising," *Computer Law and Security Report*, 23(3): 262–269, at 265.

[52]I don't subscribe to the conspiracy theories of the sort put forth by several of the people interviewed in a recent Pew Research Center survey. (Aaron Smith, Janna Anderson, Lee Rainie, "The Future of Money: Smartphone Swiping in the Mobile Age," Pew Research Center, April 17, 2012, available at *http://www.pewinternet.org/Reports/2012/Future-of-Money.aspx?src=prc-headline*, site visited April 28, 2012 (hereinafter, Smith et al. (2012)) at 5, 16, and 17.)

[53]For a survey of the economics of network effects, see Michael L. Katz and Carl Shapiro (1994) "Systems Competition and Network Effects," *Journal of Economic Perspectives*, 8 (Spring): 93-115 (hereinafter, Katz and Shapiro (1994)).

[54]For survey of cross-platform network effects, also known as two-sided markets, see Roberto Roson (2005) "Two-Sided Markets: A Tentative Survey," *Review of Network Economics*, 4(2): 142-160.

[55]In addition, positive-feedback effects may arise with respect to the provision of targeted-marketing services to merchants. Specifically, the larger a payment-service's merchant-acceptance network, the greater the depth of information that service will be able to collect about its consumer users because the payment service will likely capture a greater percentage of any given consumer's transactions. Hence, the greater the number of merchants using a payment service, the higher the value of the targeted marketing services that platform can offer to merchants.

[56]"POS Gets Smart," *QSR*, June 24, 2011, available at *http://www.qsrmagazine.com/news/pos-gets-smart*, site visited March 11, 2012. (The quotation in the text is of the cited article's paraphrase of what the executive said.)

[57]*Id.*

[58]See, for example, Katz and Shapiro (1994).

[59]Note that this issue need not arise in this exact form for certain payment services based on Wi-Fi and cellular networks. However, these technologies, too, will require at least some equipment located on the merchant's premises.

[60]Economic theory suggests that widespread compatibility that allows product differentiation would very likely maximize the joint profits of competing payment-service providers. Consumers and merchants might be reluctant to adopt a monopoly service, thus exacerbating the chicken-and-egg problem, while a lack of differentiation could lead to intense payment-service competition that eroded profits. From a social welfare perspective, a structure that allows service providers to differentiate themselves can spur innovation and long-run competition.

[61]Rebecca Robinson, "Smartphones for Use as Visa Mobile Payment Devices," *CardGuide*, Feb. 21, 2012, available at *http://www.card-guide-international.com/201202211911/Visa-Certifies-Smartphones-for-Use-as-Visa-Mobile-Payment-Devices.html*, site visited March 11, 2012.

[62]Rachael King, "Wells Fargo tests smart-phone mobile payments," SFGate, Jan. 5, 2011, available at *http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2011/01/04/BUBT1H3TO3.DTL*, site visited March 11, 2012.

[63]*Id.* See also Andrew Johnson, "In Mobile Payments, Lack of Interoperability Threatens Adoption, *American Banker*," Dec. 9, 2010, available at *http://www.americanbanker.com/issues/175_235/lack-of-interoperability-1029690-1.html,* site visited March 11, 2012.

[64]Mat Smith, "Moneto NFC microSD to bring contactless features to any Android phone," *engadget*, posted Jan. 11, 2012, available at *http://www.engadget.*

com/2012/01/11/moneto-nfc-microsd-contactless-payment-Android-iPhone/, site visited April 28, 2012.

[65]Dan Hays of PRTM as quoted by Leila Abboud, "Telcos battle tech, bank titans for mobile payments," *The Globe and Mail*, Feb. 14, 2011, available at *http://m.theglobeandmail.com/news/technology/mobile-technology/telcos-battle-tech-bank-titans-for-mobile-payments/article1905892/?service=mobile,* site visited April 28, 2012.

[66]Rob Scott of Nokia as quoted by Smith et al. (2012) at 14.

[67]See, for example, Jan Ondrus and Kalle Lyytinen (2011). "Mobile Payments Market: Towards Another Clash of the Titans?" *Proceedings of the 10th International Conference on Mobile Business*, Como, Italy.

[68]Telecommunications firms may play much more significant roles in developing economies (*Id.*, §I.):

Some local success stories have been observed in developing countries… However, these systems have been well adapted for the financial markets of the developing world (e.g., high penetration of mobile phones, low bank service penetration, lack of alternative solutions, clear economic value propositions for the users). Those contexts are highly specific and far from the ones encountered in the developed world.

[69]That said, several such parties apparently disagree with my assessment and have formed alliances with wireless carriers.

[70]Rachael King, "Wells Fargo tests smart-phone mobile payments," *SFGate*, Jan. 5, 2011, available at *http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2011/01/04/BUBT1H3TO3.DTL*, site visited March 11, 2012.

[71]*http://www.loc-aid.com/about-us*, site visited April 20, 2012; Ryan Kim, "O2 Turns on Geo-fencing for Starbucks, L'Oreal in UK," GigaOm, Oct. 14, 2010, available at *http://gigaom.com/2010/10/14/o2-turns-on-geo-fencing-for-starbucks-loreal-in-uk/*, site visited April 20, 2012.

[72]According to Bernstein Research, once American Express launched the Optima card, "Disaster followed. The list of what went wrong is almost unbearably long. The credit assumptions were flawed to begin with,…" ("The Future of the Credit Card Industry: Part II—Company Outlook," Bernstein Research, January 1996, at 30.)

[73]*Id.*, Exhibit 18 and accompanying text.

[74]See *http://support.apple.com/kb/HT2001*, site visited April 23, 2012.

[75]AppleInsider Staff, "Filing: Apple conceptualized smart MVNO system ahead of iPhone," *AppleInsider,* April 10, 2008, available at *http://www.appleinsider.com/articles/08/04/10/filing_apple_conceptualized_smart_mvno_system_ahead_of_iphone.html,* site visited May 1, 2012.

[76]See, for example, "Apple Gearing Up for the Coming NFC- iPhone Revolution," *Patently Apple*, April 8, 2010, available at *http://www.patentlyapple.com/patently-apple/2010/04/apple-gearing-up-for-the-coming-nfc--iphone-revolution.html*, and Lance Whitney, Apple Store's new self-checkout: Nice, but not flawless," CNET, Nov. 14, 2011, available at *http://news.cnet.com/8301-13579_3-57324198-37/apple-stores-new-self-checkout-nice-but-not-flawless/*, sites visited Jan.18, 2012.