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NFC Mobile Payments

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Abstract

Near Field Communications technology has huge potential in changing industry, most notably in the way the average consumer makes a purchase. The technology behind NFC has already been largely developed, and is currently being trialed by companies. However, the technology also sits amidst a complex ecosystem of various competitors, complementors, and suppliers, and in order for NFC to become a successful means of mobile payment, all of these players must head harmoniously in the right direction.

Our focus is to analyze this complex ecosystem, in order to sift out the key actions that must be taken by each player in order for NFC to become a successful means of mobile payment in the next few years. Distribution platforms such as iTunes, Android, Amazon, and PayPal already have large consumer bases that they can use to their advantage to garner support for this technology. Banks and credit card companies can also serve as complementors to these distribution platforms. Also hugely significant are the customers, retailers, and hardware manufacturers who will determine the success of this technology and mobile payment method.

This research paper is structured in the following way. First, we seek to clearly define our hypothesis and prediction of industry change with regards to NFC becoming the dominant form of mobile payment. Next, we give an explanation of how the technology works, as well as market research data to describe the landscape behind NFC technology. Finally, we break down the complex ecosystem underlying NFC technologies to understand each and every component underlying its success.

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Introduction

Our hypothesis and prediction of industry change is that Near Field Communications technology, hereafter known as NFC, will become the dominant technology for mobile payments in America in the next 10 years. A major societal driver behind this change is the fact that American consumers have been using more electronic methods of payment over cash in recent years. Thus, American consumers will be looking for a more convenient way to efficiently consolidate their methods of payment into one device. As for technological drivers behind this change, more users are purchasing smartphones that are capable of many functions, and one of the most exciting developments is integrating NFC chips to facilitate mobile payments.

Part A: How NFC Works

NFC technology is a short-range wireless technology that allows NFC-capable devices to communicate to each other. NFC typically requires a distance of 4 inches or less to operate, which is ideal for mobile payments. NFC technology is the evolution of similar technology such as Bluetooth and Radio Frequency Identification (RFID).

To use NFC technology for mobile payments, a user would briefly wave their phone over a NFC reader until the reader receives the wireless transmission from the phone. From thereon, the reader handles the credit card or bank information like any other credit card reader that is currently deployed. The action is very similar to how a customer uses a Visa PayWave or a MasterCard PayPass. In addition, the NFC reader might also retrieve the customer's purchasing data and display ads or coupons on the reader that are relevant to her current or previous purchases. In order for this scenario to work, the phone has to have an embedded NFC chip, and the retailer has to have readers that are capable of reading NFC wireless signals.

NFC and RFID technology are often compared to each other to better understand the significance of NFC. Both NFC and RFID use radio waves to transmit small amounts of data in short distances. RFID is already used quite commonly; popular examples include the MasterCard's PayPass credit cards, FastTrak transponder, and UC Berkeley ID cards. However, one draw is that the RFID chips in these devices can only transmit stored data to readers.

Why not use RFID for mobile payments like the MasterCard PayPass then, since all it needs to do is send the credit card details? What sets NFC apart from RFID is its shorter range and security. RFID has been shown to be readable up to 10 meters away (Bubley), which is extremely dangerous and can open up vulnerabilities for simple uses that do not require such large distances for transmission, like mobile payments. In 2008, the U.S. State Department issued over 2.7 million passports that were equipped with RFID chips containing an access key, a unique identification of the passport owner. However, various security experts quickly found out that it was extremely easy to forge and spoof the access key, simply because the RFID chips lacked basic encryption and were readable at large distances (Conneally). RFID has its own upsides, but for mobile payments, a shorter transmission range with stronger security makes NFC a more appealing choice.

In Asian countries like Japan, using mobile devices for mobile payments is already the standard. Europe and North America have been conducting NFC trials over the past few years, and with the exploding smartphone boom, NFC will gain even more presence and attention in the Western hemisphere. Even though NFC trials in the United States have been conducted since 2003, they stall and wither away because all the relevant players cannot agree to a single standard (Segan). For mobile payments via NFC to take off, distribution platforms, banks, retailers, and hardware manufacturers have to actively promote and standardize the use of NFC to appeal to customers.

In 2004, a non-profit industry association called the NFC Forum was created by NXP Semiconductors, Sony, and Nokia to promote the use of NFC technology in consumer electronics such as mobile devices (About the Forum). In addition to promoting the use of the technology, the NFC Forum is also responsible for ensuring cross-platform support and open standards such that any device wishing to transmit or receive data via NFC is able to do so. The NFC Forum wants to guarantee interoperability to ensure that companies would not develop their own proprietary protocols over NFC. By ensuring interoperability, it allows NFC technology to be adopted at a faster pace and assist in standardizing the use of NFC so that a market can be created to start manufacturing NFC hardware and technology.

Part B: Market Data and Analysis

The success of mobile payments is based on the premise that smartphone penetration in the United States will continue to increase exponentially. As shown in Figure B-1, almost a third of American mobile consumers were smartphone users as of December 2010 and Nielsen predicts that by the end of 2011, 50 percent of phone users in the U.S. will have a smartphone (Kellogg). Also, market data shows that 14 percent of new feature phone owners use their phones only for voice communications, whereas this number is only 3 percent for smartphone owners. Usage of the built-in camera and video capability increased by about 20 percent among smartphone users (Entner). These two data points show that people are taking advantage of the applications used in their smartphones, a trend that highlights NFC's potential as an application in a smartphone.

Smartphones are being manufactured already equipped with NFC chips that will enable users to quickly make purchases by briefly waving their phone over a NFC reader. Representatives from NXP Semiconductors have predicted that 40 to 50 million NFC phones will be in the market by the end of 2011 (Balaban). As such, the potential growth for the mobile payments market is huge.

In order to further analyze our hypothesis, it is useful to understand the spending habits of consumers. In recent years, American consumers have increasingly depended on electronic forms of payment over paper forms of payment (such as cash and checks). According to the 2008 Study of Consumer Payment Preferences conducted by BAI and Hitachi Consulting, 63 percent of all consumer purchases are made using electronic payment methods. Across three major payment venues—bill payment, Internet payment, and in-store payment—electronic payments are now the majority. Also, according to Chris Allen, the director of consulting services in the Financial Services Practice at Hitachi Consulting, the shift from paper to electronic payments should continue as consumers increasingly use their cards and electronic forms of payment (Hitachi Consulting). The amount of debt created by credit card usage also serves to illustrate the degree to which American consumers rely on non-paper methods for their purchases. As of November 2010, the total U.S. revolving debt was \$796.5 billion, 98 percent of which was made up of credit card debt. (Woolsey, Schulz). Additionally, even though the growth of payment methods complexes the management of these payments, it also creates many opportunities for payment service providers. NFC technologies will definitely play a large role in these payment service providers (Hitachi Consulting).

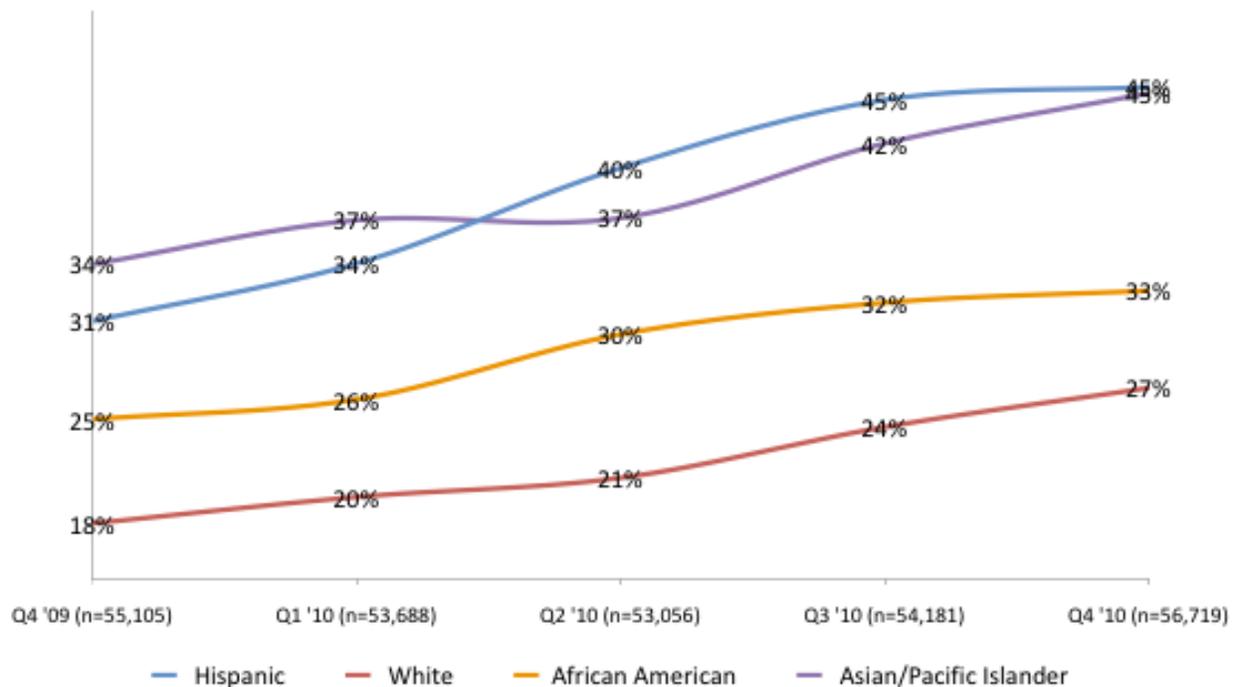
Other forms of electronic payment are also popular with American consumers. Eighty percent of consumers own a debit card, 78 percent own a credit card, and 17 percent own a prepaid card. Another statistic showed that as of January 2010, more consumers now have debit cards than credit cards, and that debit card usage was higher than cash, credit card, or check usage individually (Woolsey, Schulz). It is also interesting to note that people aged 18 to 34 use debit and alternate payment methods in-stores as much as or more than those aged 35 to 54, and more than those aged over 55. This group of people cite ease of use (35 percent), financial security (29 percent), security and safety (27 percent), and speed (20 percent) as important in-store buyer values (Hitachi Consulting). NFC for mobile payments has the potential to hit all four of those in-store buyer values, and thus, has the potential to be the primary form of payments in the future. Collectively, these statistics show that electronic payments are definitely set to hold a larger influence in the payment trends of American consumers than other forms of payment.

Regarding mobile payments, Hitachi Consulting also found that “consumers are not showing signs of adopting mobile payments.” Although there has been a lot of media coverage regarding this

new payment method, 88 percent of consumers said “they do not currently use mobile payments for in-store purchases nor do they plan to use them in the next two years.” According to this source, the reluctance comes from consumer concerns regarding security issues that could result in theft or fraud. Therefore, before mobile payments with NFC can truly take off, security issues must be addressed.

An important trend to keep in mind is that people are increasingly consolidating all of their data into one place, as opposed to having their data come from various sources. One of the key features of the smartphone is its ability to do just this. As one blogger from the Associated Press noted, having a smartphone efficiently consolidated various devices into one—it could serve as a digital camera, mp3 player, and palm pilot (Spurbeck). The next function a smartphone could serve is that of a mobile wallet. Bank of America, for instance, is already starting to trial a new Mobile Wallet payment service program based on NFC technology, which is only available for BlackBerry smartphones at this point (Geller).

Smartphone Penetration by Race / Ethnicity - U.S. Q4 '09 - Q4 '10



Source: The Nielsen Company

Figure B-1: Smartphone usage in the U.S. across various ethnicities has been on the rise for the past few years.

Part C: Ecosystem

Even though there is significant trending evidence that mobile payments via NFC is the solution that Americans will be adopting in the future, there are many players involved that can make or break the entire market. In regards to mobile payments using NFC technology, the major players are the distribution platforms, banks and credit card companies, retailers, hardware manufacturers, and customers. Each player's contribution is crucial to the success of mobile payments, if one player folds, then the entire ecosystem is at risk of failure. In the following sections, we will dissect each component with the risks and benefits that each stands to gain or lose, and evidence of whether they are adopting NFC technology as the platform for mobile payments.

1. Distribution Platforms

1.1 iTunes

Apple's most popular product of all time is the iPhone. The iPhone launched in 2007, which marked the beginning of the smartphone era in the United States. The operating system (hereafter named OS) for the iPhone is called the iOS, and according to Figure C-1, it currently holds 28.6 percent share of the U.S. smartphone market. Because the iOS is deeply integrated with the iTunes application on computers, it provides a seamless experience for users to sync their iPhone using iTunes and purchase apps and music from the iTunes Store. The iOS has the largest market share in the smartphone OS market, and is poised to make the greatest impact in mobile payments due to the fact that they already have a large database of credit cards. The Android and Research In Motion OS may also have very similar market share, but they do not provide the same user experience as the iOS, where the phone is tightly integrated with an application on computers such that users can easily purchase media content for their device.

iTunes is the digital media player application created by Apple for their lineup of Apple products. iTunes serves as the hub and interface for devices such as the iPod, iPhone, as well as the iPad. The media player is ten years old, founded in 2001, and has been absolutely critical in helping Apple capture over 70 percent market share of legal music downloads (The NPD Group). The benefit of having an iTunes Store is the ability to collect customer data, including their credit card information. Any iPhone, iPod, or iPad user, as well as anybody who has purchased an mp3 from iTunes, has created an iTunes Store account that stores the customer's name, email address, and credit card information. According to Sam Bhavani, an analyst from the market research firm Current Analysis, estimates that iTunes has 200 million users (Kahney). With such an incredible amount of user information already, Apple has the largest influence when it comes to mobile payments.

Sources indicate that the next generation of the iPhone, called the iPhone 5, will have an embedded NFC chip that will allow customers to use their phone to make payments. Although it is not absolutely confirmed, it is in Apple's best interest to do so because they already have a large wealth of customer data, and can leverage that to dominate the mobile payment market in the United States. Currently, Americans spend \$6.2 trillion dollars on consumer goods and services. If Apple can penetrate that market with their mobile payment system, it would be a huge revenue source for Apple. Apple can also use NFC technology to improve the relevancy of their iAd advertising network.

By utilizing NFC tags and readers, Apple can create more personalized ads that they can charge a premium for. Richard Crone, an advisor from the Crone Consulting LLC, says that making the ads more personalized and relevant can “double or triple the ad rates that Apple charges” (Kharif).

Apple owns about 29 percent of the U.S. smartphone market, and they can use the customer data that they already have from the iTunes Store accounts to accelerate the adoption of NFC technology for customers and retailers to use as an alternative payment system. Apple has a chance to create an extremely large revenue source in mobile payments, but at the same time is at risk of losing millions, perhaps even billions of dollars if they do not adopt NFC technology. Google’s Android OS already has NFC support and have been undergoing NFC trials with their phones for mobile payments. Apple must act quickly and aggressively, even if it means subsidizing their NFC reader terminals to retailers, if they want to be the dominant leader in mobile payments.

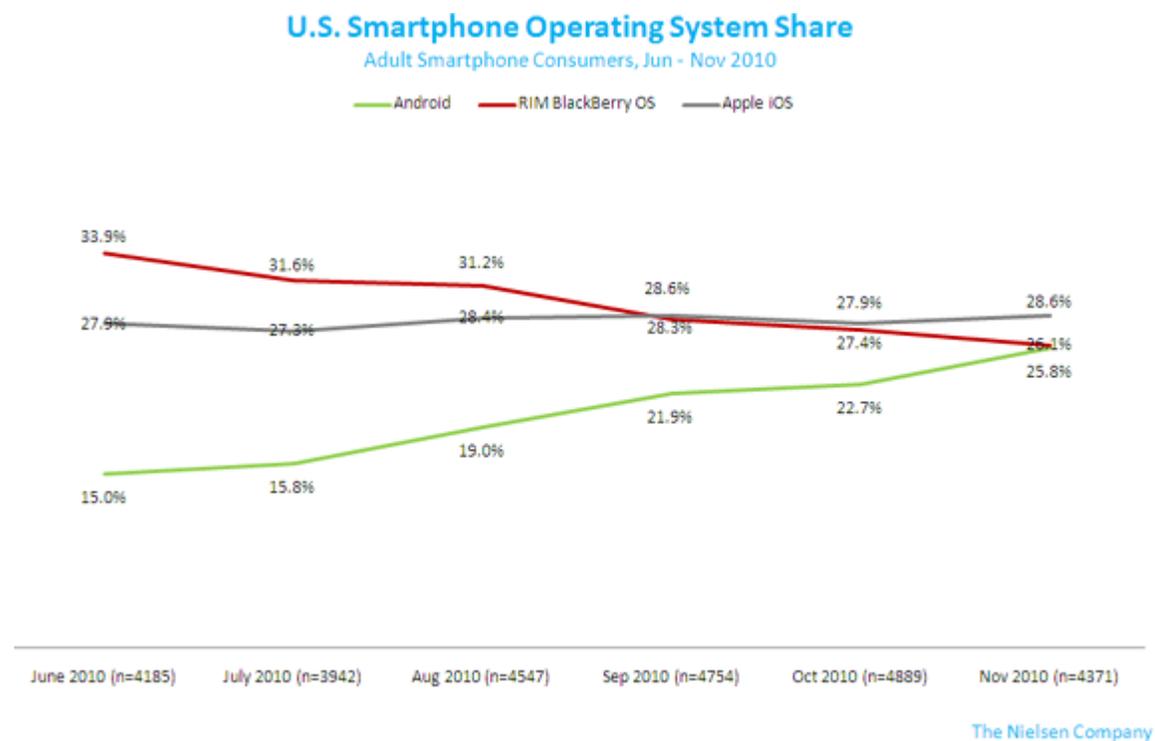


Figure C-1: Apple has consistently been the leader in U.S. smartphone OS share.

1.2 Android

Google's Android OS is a distribution platform that has already integrated NFC technology in their system. The relationship between Google and Android differs from the relationship between Apple and the iPhone in that Google doesn't make any money from Android hardware sales.

However, Android phones come with over 150,000 apps in the Android Market, and developers can place ads in the apps so that users can click on them. When users click on mobile ads, Google makes money (Sterling). The more users with phones that can access the web, the more surface area Google can impact with their ads, whether it would be from the mobile browser or in-app ads. In October 2010, Google announced that their Android OS generated \$1 billion revenue in 2010 (Brian).

It is this marketing strategy that allows Google to give away their Android OS for free. If it does not cost money to license the OS, manufacturers are more inclined to choose those operating systems for their phones. The more phones that can access the web, the more money Google stands to make. The first Android phone debuted in 2008 and since then, the Android OS is the fastest growing OS for smartphones. The following table illustrates the increase in sales of the Android OS from the year 2009 to 2010, and it is only expected to grow further.

Table C-1: Worldwide Smartphone Sales by Operating System in 2010
(in Thousands of Units)

Company	2010 Units	2010 Market Share (%)	2009 Units	2009 Market Share (%)
Symbian	111,576.7	37.6	80,878.3	46.9
Android	67,224.5	22.7	6,798.4	3.9
Research in Motion	47,451.6	16.0	34,346.6	19.9
iOS	46,598.3	15.7	24,889.7	14.4
Microsoft	12,378.2	4.2	15,031.0	8.7
Other OSs	11417.4	3.8	10432.1	6.1
Total	296,646.6	100.0	172,376.1	100.0
Source: Gartner (February 2011)				

The smartphone market share of the Android OS jumped from 3.9 percent to 22.7 percent and is expected to grow even more in 2011 (Sterling). Google will stand to make millions from all the advertising opportunities on the Android phones alone.

Although Google has the Google Checkout system, which is similar to PayPal, they lack an iTunes-esque experience where buying apps, music, and other media are seamlessly integrated with the iPhone. As such, Google Checkout was not a success and is currently seen as just another service that Android users have to deal with to purchase apps. According to some sources, Google is not planning to have its own mobile payment service (Balaban). Instead, it will act as the distribution platform where customers can link to their banks and credit card information for mobile payments. Thus, Google plans on excelling in the NFC industry through the use of banks as complementors. They plan on creating an app that allows the user to use NFC technology to pay for purchases and the app is directly connected to the user's bank.

While consumers buy goods, Google will track their purchases and offer them coupons and advertisements (Cheng). For example, Google could track a hypothetical user named Nancy who has a young child. During her next checkout, Google could display “Hello, Nancy. I see that you buy diapers regularly - would you like a coupon for 50 percent off diaper rash cream on your next purchase?” By providing ads on their mobile payments platform, Google is again a provider of a great, “free” service in exchange for serving ads to users. Google’s revenue has always been almost entirely from ads, and now they are looking to enter the mobile market.

Google has made definitive plans to implement NFC technology. There are over 340 million global mobile users that would be using mobile payments. From those users, Google stands to make over \$245 billion dollars as early as 2014 (Boulton).

Currently, Google makes nearly all of its revenue from ads clicked on by users on a computer. However, computers are losing steam in sales, as compared to smartphones. As seen in Figure C-2, the sales of PCs has been only marginally increasing, with respect to the large increase in smartphones. From the same figure, observe that for the first time ever, smartphones sales surpassed PC sales in 2011 (Derek). Since Google’s primary market demographic are users with computers, and computer sales are starting to stagnate, they would be losing a major part of the online advertising market if they do not start claiming a stake in the mobile advertising world. As computers become more obsolete, Google will see their revenue decreasing, and without a strong hold on the mobile market, they stand to lose billions of dollars.

With their Android OS predicted to have the largest smartphone market share by the end of this year, Google can leverage that to their advantage by supporting NFC and using NFC technology for mobile payments. Google is looking to partner with banks and credit card companies to develop a platform where customers can use NFC-enabled smartphones to pay for transactions. With Google as the distributor platform, Google can then track customer data and use that to generate relevant advertisements for the customer. Smartphones are currently selling faster than PCs, and it would be wise for Google to be more aggressive in the mobile advertising market right now while the market is still small so they can establish themselves as the dominant platform for mobile payments.

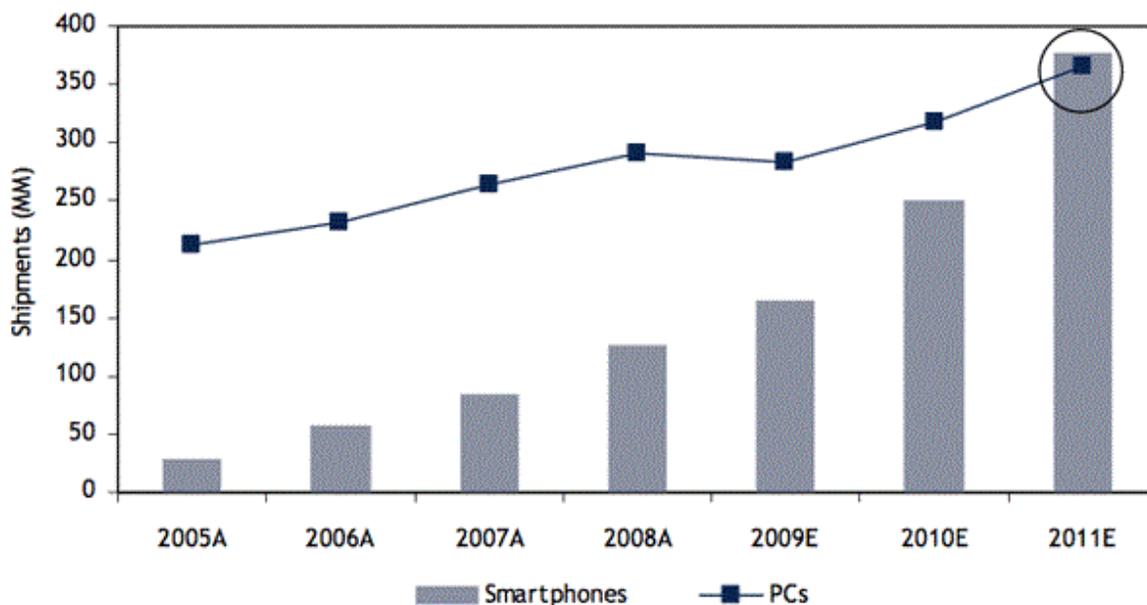


Figure C-2: A Comparison of Actual and Expected Smartphone Sales and PC Sales

1.3 PayPal

PayPal is another contender for mobile payments via NFC technology. Since their acquisition by eBay in 2002, they have gained huge momentum in payment methods. By providing safe and secure ways to pay for purchases online, PayPal has become the most popular payment method online, mostly when purchasing from sites that users may not trust completely with their credit card information.

Furthermore, PayPal offers direct access to paying with one's banking account, instead of having to go through a credit card (though that is also an option). Most importantly, it is charge-free, with a few exceptions. PayPal is already the preferred method of payment for millions of users, with their number of accounts totaling over 100 million (Nguyen). With that large amount of accounts, they could gain billions of dollars by becoming a player in the NFC mobile payments market.

Sources say that PayPal is currently in talks with Google about partnering up and creating an app using NFC that would allow users to pay using their PayPal accounts (Nguyen). Even though they could create their own app apart from Google, PayPal would then have to be a direct competitor against Google in the market; since Google has already laid down so much groundwork that has essentially set them up to be a huge player, PayPal is making a strategic move by making Google their partner as opposed to their competitor. Moreover, a partnership with Google could prove to be equally beneficial for both companies, considering the vast number of customer accounts and users that both companies have.

PayPal currently has an app that allows a user to "bump" money to another user (Perez). Bump Technologies is a start-up company that allows users to share information by "bumping" their phones together. The company already has its own app, used to share users' contact information, pictures, etc.; now, the same technology will be used to send money from one user to another. Considering this open connection between PayPal and Android, it would not be a far stretch to say that the chances of a continued relationship between the two companies are high.

PayPal is already doing incredibly well within the Internet payment market, and as a subsidiary of eBay, they will continue to be a huge force in the online sales payment market for a very long time. However, an NFC partnership with Google could mean billions more dollars funneled through their system, and thus additional revenue. Furthermore, this gives PayPal an opportunity that they have never had before: a chance to extend their reach. PayPal is a service that is only offered online - a user currently cannot pay for their purchases at a retail store using PayPal. Thus, if PayPal invests in NFC technology, a whole new market would open for them. Not only would they still have revenue from people shopping online, but they would also gain revenue from shoppers who physically go to brick and mortar stores. PayPal has the opportunity to double or even triple their revenue by extending their reach to the mobile market.

1.4 Amazon

Amazon is currently the major distribution platform for online commerce, and according to some sources, Amazon is considering a service that would allow customers to use NFC enabled devices to pay for consumer goods in stores (Kharif). One might think it is a bit outlandish for an online retailer to enter a mobile payments market. However, Amazon is the largest online retailer in the United States with \$34.204 billion in revenue in 2010 (U.S. SEC). With no doubt, the online retailer has an enormous amount of customer data from shoppers on amazon.com. With credit card information tied to each customer, going into mobile payments is a logical step for Amazon.

Amazon has been known to be aggressive in invading into other ecosystems. For example, in March 2011, Amazon launched the Amazon Cloud Player, which is a “music locker” which allows you to upload your own media onto their servers and be able to access the media from any computer or network device. It has largely been known that Google and Apple have both been working on their own “music locker” service, but Amazon beat them to it. Currently, on an Android smartphone, a user can stream their music using Amazon’s services, but not Google. Also announced in March 2011, Amazon launched the Amazon App Store for Android, which is a direct competition to Google’s official Android market. The App Store allows Amazon to be an alternative distribution platform for paid and free Android apps. Amazon is not afraid to enter new markets, even if its services are directly competing against other companies’ services.

Amazon Payments was launched in 2006 as a subsidiary of Amazon that serves as a distribution channel for online transactions, similar to PayPal. Although it does not have as much market share as PayPal, it uses the customer base from amazon.com and has the potential to explode if it moves into the mobile payments market. Amazon wants to maintain its dominance in online retail by moving into mobile commerce. For example, the Amazon App Store for Android was a major step into the mobile market by being the middleman for Android apps, and with the Amazon Cloud Player, it is building an entire suite of mobile service that allows Amazon to be a major player in mobile commerce. By utilizing NFC technology for mobile payments, Amazon would be a fearsome competitor to Apple and Google in the mobile market. According to research done by Gartner, 340 million global users will be using mobile payments with transactions totaling \$245 billion by 2014, compared to \$32 billion last year (Kharif). If Amazon invests in mobile payments using NFC technology, then they can be looking at a huge revenue source in the future. If they choose not to adopt mobile payments, then they are at risk of losing to other competitors in a market that will grow exponentially in the near future.

2. Banks and Credit Card Companies

Banks are considered a complementor to the NFC technology. Since they do not have a solid distribution platform, gaining a large part of the market would be difficult, mostly with competitors like Google and Apple. The same holds true for credit card companies. For this reason, most banks are already having talks with various distribution platforms about joining forces. For example, JP Morgan Chase and Citigroup have already expressed interest in teaming up with Google, as has Mastercard. Google has already declared that they are not interested in being the actual payment source, only the funnel in which to direct payments through (Balaban).

However, if the credit card companies or banks choose not to join forces, it would cause their ability to enter the market much harder, considering they would not have as many technological resources as, for example, Google or Apple; thus, their NFC system that they would come up with would be delayed and thus would not necessarily gain as much power in the market as the ones that came before it. Their success would depend on how large of a company they were and how many customers they had. JP Morgan Chase, for example, would have the potential to do well, considering they have so many customers and many people might prefer to do business through their bank. Hudson City Savings Bank in Illinois, however, has a fraction of the customers of JP Morgan Chase, and thus would probably not survive in the market.

If credit card companies and banks choose to completely ignore NFC technology, they could potentially lose millions of dollars by not taking an active role in its payment. Most of the payments would still end up going through the banks and credit cards regardless, but without an active role, they would lose millions of money from fees that normally attached to a credit or debit card. If they choose to partner with distribution platforms, on the other hand, they could make millions just on small fees alone. For example, if they charged one cent for every \$100 a customer spent, they could make hundreds of millions of dollars extra a year. By not taking an interest in NFC payments, they would be missing out on an excellent opportunity to boost and maintain their revenue.

3. Retailers

"Gaining merchant acceptance is always one of the cardinal challenges of getting a two-sided market, consumers and merchants," Todd Ablowitz, president of the U.S.-based payments consulting company Double Diamond Group, told *NFC Times*. "If you look at it, Google has a tremendously powerful consumer relationship, so it's not a big stretch to say Google would have an easier time on the consumer side than on the merchant side." (Balaban)

With Google spearheading the technological side and with their strong connection with the consumer base, getting retailers on board is one the biggest issues that may make or break NFC mobile payments' success. It is quite like the chicken or the egg argument: what needs to come first, a strong consumer base with NFC-enabled mobile phones or retailers with NFC mobile payment compatible checkout terminals? That is one of the biggest challenges facing NFC--it needs to have a lot of customers and retailers on board with NFC mobile payments at the same time. One cannot survive without the other. Ultimately, in order for retailers to take on NFC mobile payments, all or a number of the following things must happen: large portions of customers must have NFC-capable phones, Google and it's competitors must provide incentives, NFC technology must reduce stress factors on a store, and competition driven by another retailer who already uses NFC technology.

Before NFC mobile payments technology takes off, NFC capable phones must take off first. NFC would take off with consumers first through its other features, such as marketing through the use of its technology. For example, movie posters can be scanned with an NFC-enabled phone, and then a trailer would automatically play on that phone. Once more people have NFC-capable phones, retailers will be more inclined to take on the risk of costly conversions of their checkout stands to handle NFC mobile payments. For this reason, NFC mobile payments may first take off in stores that tend to attract a younger crowd that buys the latest mobile technologies. Figure C-3 shows the breakdown of who currently owns smartphones by age group. There seems to be four major and distinct age groups that make up the smartphone community: 18 to 24, 25 to 34, 35 to 44, and 45 to 54.

Clothing stores like Urban Outfitters, American Apparel, and H&M tend to attract younger crowds like the 18-24 and 25-34 groups that have the latest mobile technology. “H&M has captured the 18-24 market, as well as 30-something fans looking for new additions to their wardrobes.” (Karimi). Urban Outfitters and American Apparel also state on their own website that their target range is this same market group. Therefore, these companies might be most interested in taking on the NFC mobile payment checkouts. For instance, H&M has already created an application for Android and Apple phones to drive traffic into stores. Once one of these stores implements NFC mobile payments, it could drive its competitors to adopt the technology as well. Another good retailer group to trial the NFC mobile payments would be department stores like Macy’s, JCPenney, Nordstrom, and Kohl’s. These department stores tend to attract a wide range of the smartphone users’ age groups. People from the older age groups (35 to 44 and 45 to 54) also tend to shop for their whole families at these stores, which generates even more spending from these stores. Lastly, stores like Wal-Mart and Target could also be good retailers to take on NFC mobile payments. They both generate interest from a very large range of age groups that touch all of the major age groups using smartphones.

Now that we realize which stores generate interest in our smartphone users, why would these stores take on NFC mobile payments other than just customer interest in using their cool new applications? What do they have to benefit from customers using mobile payments at their stores rather than purchasing with cash or credit? Through NFC technology, phones can also offer retail shopping opportunities such as coupons and smart posters that offer product information, which would spur NFC payments into stores. Retailers are much more inclined to jump on board with this targeted marketing offered through NFC technology to offset the initial cost of \$200 to install the new payment readers that supports NFC payments. If the new payment readers are instead subsidized by Google or another company in the beginning stages of mobile payments at just a few store locations, then retailers might be more inclined to try it out and purchase more in the future, should it show a substantial benefit to their sales. In other words, at first this will be a slow process of getting carriers, banks, and hardware manufactures to finish up standardization and deployment, but once these initial steps finish, it will be a matter of getting merchants and customers on board. These incentives of target marketing help the retailers, and the coupons and offers bring the customers to the retailers. It is a win-win situation for all involved.

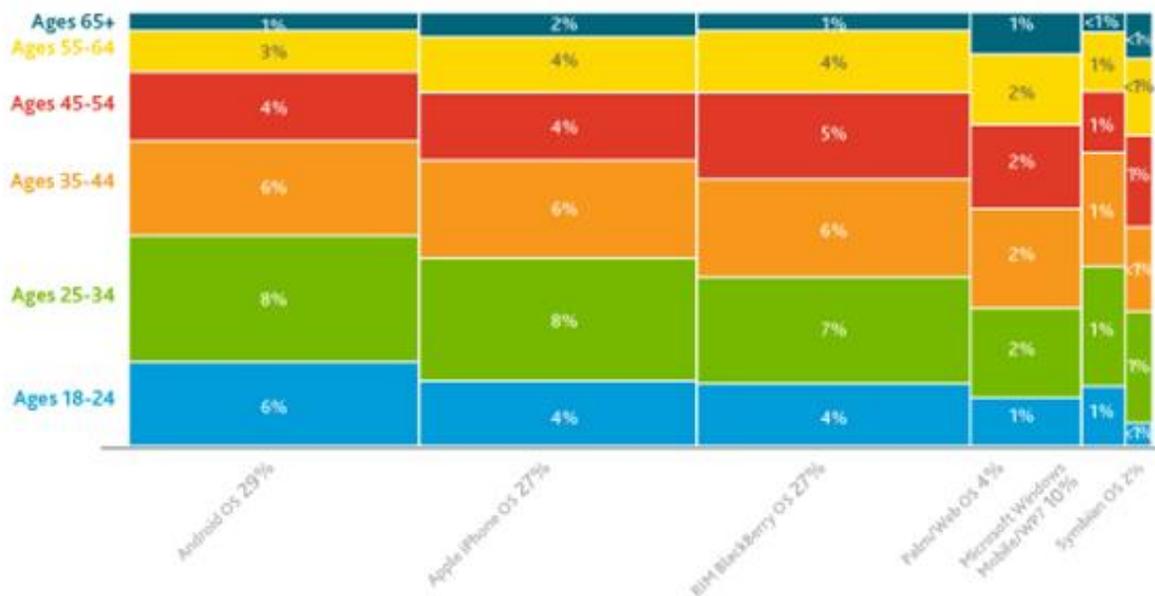
Next, all retail stores must worry about the stresses put on the customers, or they can possibly lose customer business. Potential stresses that involve NFC payments are lack of response by retailers, crowd density, and impulse purchasing pressure. The response by retailers can improve in two major ways. First off, advertisements could be set up in the store to help reach the customer directly at the retail store. Rather than not being able to talk to a retailer right away, they would get

an immediate response from this NFC advertisement. The second way would be that once the customers have the items they want to purchase; they would be able to be served much quicker through NFC mobile payments, causing smaller lines. This carries over to crowd density in lines, because with more people being served more quickly there is less wait time, and with less wait time, the customer has a more satisfactory experience at the store. Lastly, one double-edged sword of NFC mobile payments is that it allows for much more impulse purchasing. This is good for retailers because customers will end up purchasing more without the guilt of physically pulling cash from their wallets. However, this could potentially lead to overspending on the part of the customer, and as a result, people may just return to what is natural for them and revert back to swiping credit cards if incentives are not good enough to need to pay phones.

Competition will play a much bigger role for merchants. Think about the many department stores and imagine that they did not accept credit or debit cards, would customers continue to shop there? When it comes to larger purchases, most customers would not be interested anymore, because studies have shown that people do not carry as much cash anymore. NFC mobile payments have the potential to bring about the same mindset, especially with incentives such as coupons and deals. Imagine a customer who regularly shops at Wal-Mart, which does not support NFC mobile payments. The customer hears from friends that Target does and offers deals and coupons, that customer might be more inclined to go to Target more often if they have an NFC-capable phone. This is potentially lost business for Wal-Mart from this customer.

Age and operating system share—smartphones

Nov '10 - Jan 11, postpaid mobile subscribers, n=14,701



Source: The Nielsen Company.



Figure C-3: Smartphone Operating System shares by age distribution.

4. Hardware Manufacturers

The first types of hardware manufacturers that influence NFC mobile payments' success are the companies making the payment terminals. In many ways, these manufacturers are in the hole with NFC mobile payment technologies until it becomes more popular. They currently have all the technology developed for cashiers to take purchases using NFC mobile payments. The problem is that retailers are not willing to fork out the \$200 cost for each of these stations until they know that they will have a cost benefit big enough to justify the price tag. Should NFC mobile payments not take off, they stand to lose a lot in invested technology.

VeriFone is one of the companies heavily connected to Google in the efforts to try and get NFC mobile payments off the ground. VeriFone manufactures the NFC readers that will be installed into stores that will be able to read the NFC mobile payments sent by smartphones. They have been the biggest player in the hardware manufacturer realm for these NFC readers. They, like Google, have invested in NFC technology. They know that retailers should not have to foot the entire bill without any incentive, so they are looking for retailers and customers to see enough incentive to make the difference in this technology.

In order for more hardware manufacturers to get involved in NFC readers, VeriFone and NFC mobile payments will probably have to take off first. Soon after, other hardware manufacturers will get involved in not only making readers cheaper through competition, but also improve the technology and security such that malicious people cannot forge or intercept any transmissions. Until now, VeriFone is the company going out on a limb that can potentially make them a ton of money or be a giant bust, and only time will tell. One thing is for sure: hardware manufacturers will be closely watching how both retailers and customers react to the new NFC mobile technology.

The second type of hardware manufacturers would be the companies making the NFC chips for smartphones. Companies like NXP Semiconductors, who has partnered up with Google, manufactured NFC chips for Google's recent smartphone, the Nexus S. They will be in a better situation than those relying purely on the NFC's mobile payment aspect. Even if mobile payments do not take off right away or do not take off at all, NFC has many other features it adds to the smartphone. Currently, all of the major phone companies are having their newest smartphones include this technology. "Using natural touch gestures NFC devices can easily pair with accessories, interact on a peer-to-peer level to exchange data, and connect to a huge installed base of reader and tag infrastructures." (Gomez) As NFC technology takes off in the future, more semiconductors will get involved in manufacturing NFC chips, which will help improve the technology and lower the cost of NFC chips. Lower cost will eventually lead to more phones sporting NFC chips in their phones.

NFC capable smartphones are increasing in number everyday. According to Figure C-4, it is predicted that 13 percent of cell phones in the world will integrate NFC in 2014. It is estimated that the number of phones with NFC chips are expected to almost double in 2012, and quadruple by 2014 to 220.1 million units. In the end, semiconductor companies like NXP can fall back on the fact that even if mobile payments do not take off right away, NFC could potentially still be successful, thus increasing the demand for NFC chips for the newest phones. In order for more companies like NXP to get involved generally, NFC technology only needs to become more popular, not necessarily NFC mobile payments alone.

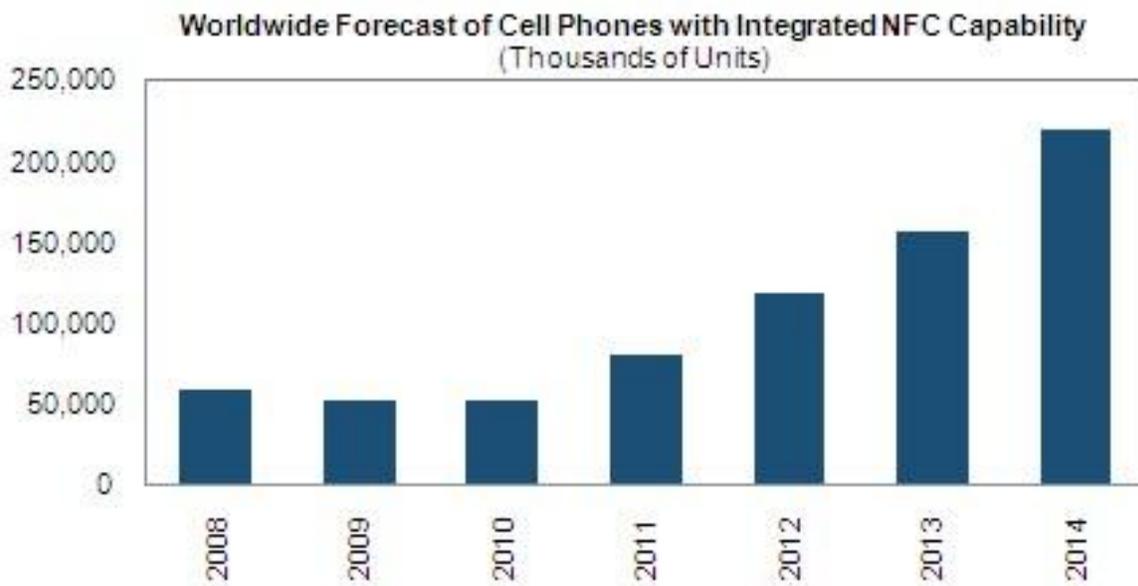


Figure C-4: Analysts predict that 220.1 million phones will have NFC capabilities, or 13 percent of all phones in the world by 2014.

5. Customers

In order to build interest with the retailers, there needs to be interest from the consumer base first. However, before they can become more interested in NFC technology and ultimately NFC mobile payments, they need to first own smartphones capable of using NFC technology. Then they must be convinced that mobile payments are more convenient than credit or debit card transactions. Along with that convenience, customers want to make sure that their money and accounts are safe using this technology, especially if their phone is lost or stolen. On top of all that, they will also look for further incentives as to why they should use mobile payments.

According to Figure C-5, U.S. smartphones are projected to increase to be equal in number to feature phones by the end of this year. Beyond 2011, they will continue to grow even quicker based on the trend of the graph. This shows that in the near future, there will be more than 50 percent of the phone-owning population in the U.S. who will have the capability to use this NFC technology in their phones. There clearly is a market that can be tapped into by NFC technology and eventually NFC mobile payments.

Next, the customer must find that it is more convenient to use this NFC mobile payment than debit or credit cards. As stated earlier in the Retailer section, customers will be able to move through cashier stations more quickly, lines will become much shorter, and everyone involved will become happier. Customers will be able to add all their credit cards, debit cards, gift cards, customer loyalty cards, and coupon subscriptions to their smartphones through their NFC payment application, and be able to switch between the cards easily without having to dig through their wallets or purses to find the specific card they want to use. They no longer have to worry about leaving cards at home, clipping coupons, or losing cards around the house. With all of their cards and accounts in one place, their financial lives simplify immensely.

The downside to having all of one's accounts and cards in a single place is that should this

central device get stolen or lost, so too does all your financial information. Security is a huge issue that must be addressed before customers will want to get on board with NFC mobile payments. First off, just like losing a credit card or a phone, NFC phones must have the mobile payment aspect be cancelled. In addition, smartphones already have the capability to be tracked remotely using GPS. Lastly, NFC phones would require people to come up with a unique password for their phones, just like they would for their debit cards, in order to use the mobile payment feature (or even to use the phone in general; all smartphones already have this security feature). The account number and other banking information will not be stored on the phones, only the ability to make transactions with the credit card or bank data that you have specified. In many cases, NFC phones would actually be safer than most debit and credit cards.

Lastly, the incentives that are given to the customers are key to overcoming customer apathy for NFC mobile payments. The various coupons, deals, and rewards given to customers through NFC mobile payments will be what drive customers to NFC mobile payments. It not only makes their shopping experience more convenient, but it will add value to their experience.

There are still other downsides that will need to be overcome in order for NFC mobile payments to take off, even if all of the above are addressed. First off, people know how to use credit cards--swiping is second nature to most consumers now, whereas waving a phone over a reader is not. Next, customers will be more willing to spend and not have as much buyer's guilt with NFC mobile payments as they have with credit cards, and especially cash. This may lead to large amounts of overspending. While this is good for retailers and for credit card companies, it hurts the customers. In the end, the mobile payments market via NFC ecosystem is very fragile and requires all players to contribute in order for NFC mobile payments to take off.

U.S. Smartphone Penetration & Projections

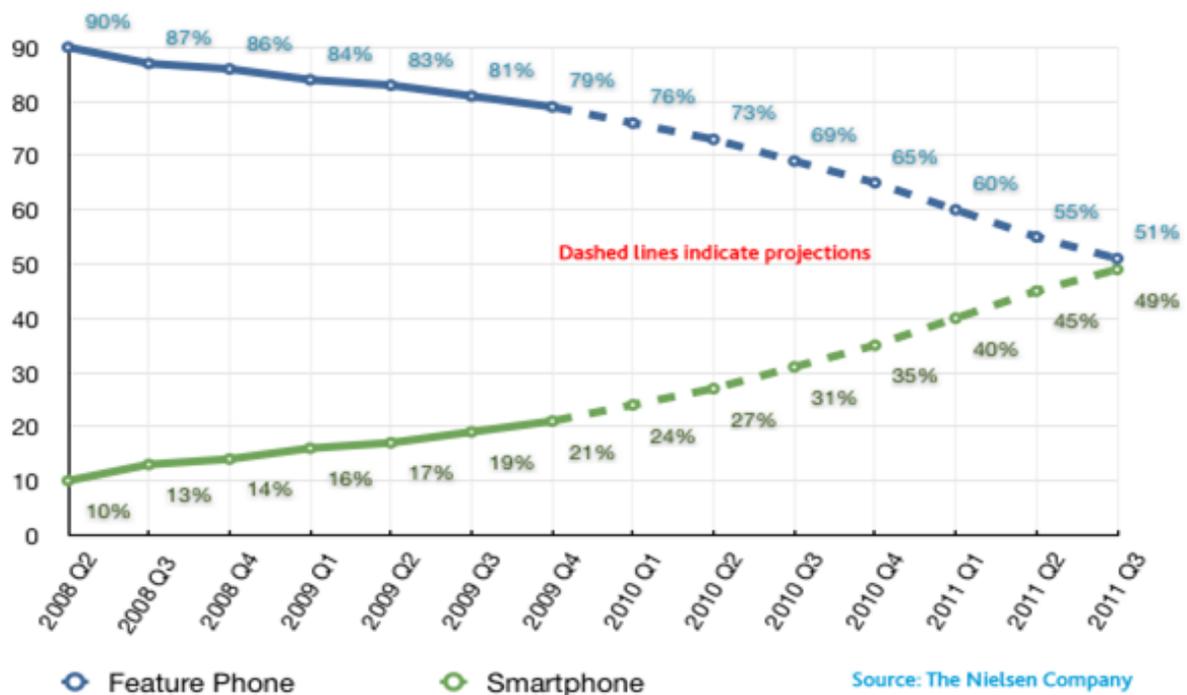


Figure C-5: The Nielsen Company predicts that 50 percent of phone users in the U.S. will have smartphones by 2011.

Conclusion

Our market analysis shows that although the mobile payments market right now is small, it will grow exponentially in the next 10 years. Americans are more inclined to use electronic forms of payments over cash and checks, and when NFC technology matures, we believe that customers will migrate towards mobile payments. Consumers today are overwhelmed with the amount of plastic cards that they must keep track of, and there is evidence that consumers are looking to consolidate all their forms of payments into one device. By the end of 2011, analysts predict that over 50 percent of phone carrying Americans will have smart phones. The phone is a mobile device that nearly every single adult in America carries in his or her pockets everyday and thus, we believe the logical step is for phones to eventually serve as our means of a wallet. Multiple companies including Google are already testing their NFC mobile payments system right now at cities such as San Francisco and New York, with plans to possibly launch by the end of 2011.

One can clearly deduce from all this information that the key players must work in harmony with each other in order for NFC technology and mobile payments to take off in the coming years. We have established that the technology behind NFC does work, and when compared to similar technologies like RFID, it is superior in its security capabilities as well as functionality. We have also proven that the mobile payments market is projected to be huge in the future because more NFC-enabled smartphones are entering the market. Thus, the majority of consumers in the future will be able to take advantage of NFC mobile payments and they will benefit from the ability to consolidate various forms of payment into one device.

This market knowledge, coupled with our research on the complex ecosystem behind NFC technology, proves that NFC truly does have a huge potential to be the next big form of payment in the next few years. Distribution platforms like iTunes, Android, Amazon, and PayPal are already geared with large customer bases and immense consumer information to kick start this movement toward NFC as the dominant mobile payment method. Banks and credit card companies profit largely from being complementors to these distribution platforms. Customers, provided that they are informed about the security benefits and have large incentives for using this technology, would readily jump on board to use NFC to make purchases. In turn, consumer enthusiasm about this payment method would drive retailers to adopt NFC quickly in order to keep up with competing retailers. Hardware manufacturers are ready to make the chips and hardware necessary for NFC to truly take off. All in all, each component of this ecosystem influences each other, and we have shown that each player will head in the direction that supports NFC technology as the main method of mobile payments and a huge phenomenon in the near future.

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