Payments: the Next Generation
It's Payments Jim, But Not As We Know It

These are the voyages of the Payments Enterprise. Our electronic mission … to boldly pay where no-one has paid before.

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We live in a world where we can communicate with anyone, anywhere for less than the cost of a packet of chewing gum. We can teleport ourselves around the world from the comfort of our home virtually through Google Earth, and we can send messages anywhere instantaneously through emails and texts. We can physically travel around the world for less than the cost of a train journey, and we can buy goods from the other side of the world and receive them within 24 hours.

We are living in the 21st century.

We are also living through the greatest commercial revolution in history. The revolution of the networked world.

This revolution began when *Star Trek* first launched four decades ago and now, the *Star Trek* age has arrived. So why are we still paying for goods and services with ancient forms of payments, such as cash, cheques and cards, and what will happen when this *Star Trek* world finally hits the payments markets?

Major headlines from this report:

- payment innovations occur each time there is a revolution in commerce
- the last three commercial revolutions created coins, cheques and cards; what will the latest revolution create?
- many believe that contactless, mobile and biometric micropayments are the answer, replacing previous forms of payment such as cards and cash
- this report demonstrates that such thinking is completely wrong: future payments will not be contactless, mobile or biometric; there is another form of payment for the future

Payments Revolutions of the Past

In order to get a grip on where we are today, we need to take a brief tour through the history of payments.

The Agricultural Revolution: Cash

Payments were originally made through barter systems. It was only when the priests in Ancient Sumeria five thousand years ago were working out how to manage their society that cash was invented.

The first cash was the shekel.

The shekel was created because Sumeria was moving from the disorder of the ancient world, to a more formalised society. We would call this civilisation. As one of the most advanced of the Ancient Civilisations, Sumeria used religion as the political force to manage law and order for their society.

As the political and spiritual leaders of their community therefore, the Sumerian priests were considering how best to ensure farmers worked hard on the land, and the methods to control such labour and focus.

The answer was cash.

Sumerian priests invented the shekel to reward farmers for the production of wheat. The farmers would receive a shekel in exchange for their bushels of wheat. Why would the farmers want to do this?

The answer was that the shekel could then be used at the temple as a payment to meet the Goddess. The Goddess were actually ordained women, priestesses, who represented the Goddess on earth and, in exchange for a shekel, would have intercourse with the farmers as a holy act.

So, farmers gave their shekels to the priests in exchange for sex with the priestesses.

Well, yes, you guessed it, the world's most ancient profession is claimed to be prostitution and this was it. The shekel was given in exchange for an ancient form of prostitution, inspired by the spiritual politicians to ensure a strong work ethic amongst the farming population. As a by product of this first commercial revolution – the agricultural revolution – we therefore saw the invention of the first form of payment – the coin.

Roll forward a few thousand years, and local farming populations were now roaming the world on ships. As the ships discovered new lands – the Americas and Australasia – the

shipping merchants began to do more business across national borders. Now, coins did not work in this world, so it was back to bartering goods and carrying huge great cargo holds of gold in order to transact with other nations.

Until the Italians invented merchant banking that is.

Merchant Banking evolved during the 15th century and worked on the basis of a country's government providing certificates to organisation to work as the managers of their gold. These national banks, as we know them today, could then offer certificates of trust to each other and these certificates could be traded as the backing for honouring any payments required.

In other words, the central banks were acting as counterparties in risk, to honour the exchange of payments related to the trading of goods between two merchants. Whereas the merchant could only trade with physical goods of value through barter before, they could now trade using paper certification issued by the counterparty of the bank in the nation they were dealing with.

Hence, the whole growth of banking began through the basic need to trade across borders without carrying heavy weights of gold or silver; and the rise of trade across the world, backed by counterparty banking, enabled commerce to flourish. In the process, there was a gradual erosion of barter and gold for more easily carried payments: banknotes and then bank cheques.

The Industrial Revolution: Cash and Cheques

Banknotes and cheques expanded exponentially in use during the industrial revolution. Now, with trains, factories, manufacturing production and industrialisation, the banking system formalised and flourished. Therefore, the move from the agricultural coin to the industrial cash, banknote and bank cheque became the fuel for trade and the industrial revolution spawned our second great form of payment – the cheque.

During the next century or so, not a great deal changed on the payments front. The world fought great battles and wars, and invented fantastic new ways to fight each other through the invention of the aeroplane, the automobile, the submarine and the tank. Yes, wars and tensions between nations continued apace.

Trading of goods was also continuing apace, which is why so many people were now moving from agricultural work to working in factories.

For example, in the last half-century of the 19th century, employment in industry in America doubled whilst employment in Agriculture halved as shown by the statistics below:

USA Distribution of Labor, 1849-1909[1]

	Agriculture	Industry	Services
1849	60.0%	17.1%	22.9%
1869	48.3%	23.8%	27.9%
1889	41.6%	25.5%	32.9%
1909	30.4%	30.2%	39.4%

Interestingly, employment in services were also increasing as rapidly as industry, but the services were often related to basic unskilled labour such as porters, restaurant and bar staff and similar.

Through this process, as industry and services increased, and trade increased, banking became an institution. An institution with rules and discipline, as illustrated by the song *"A British Bank"* from the musical *Mary Poppins.* Set at the turn of the 20th century, Mary Poppins is hired by Mister Banks, a banker, to look after his children. Mister Banks one song in the show is *"A British Bank"* where he is trying to explain that the children need the same discipline at home as he sees in his bank. He opens with the lines:

> *"A British bank is run with precision.*
> *A British home requires nothing less!*
> *Tradition, discipline, and rules must be the tools*
> *Without them - disorder! Chaos!*
> *Moral disintegration!*
> *In short, we have a ghastly mess!"*

Yes, banking was precise, disciplined, with rules and tradition. That was until the post-Second World War growth of the services industry and the third commercial revolution in history.

[1] Source: http://www.dartmouth.edu/~dirwin/C19USUK11a.pdf

The Services Revolution: Cash, Cheques and Cards

The services revolution led to the move away from hard industrial work or agricultural work, and the rise of the professions. This is illustrated by the table below, taken from the Census Bureau's Occupational Groupings, 1880-1990[2]:

1880	1910	1950	1990
Agriculture	Agriculture	Professional	Managerial and professional
Professional and personal service	Extraction of minerals	Farmers	Technical, sales, and administrative support
Trade and transportation	Manufacturing and mechanical	Managers, officials, and proprietors	Service
Manufacturing, mechanical, and mining	Transportation	Clerical	Farming, forestry, and fishing
	Trade	Sales	Precision production, craft, and repair
	Professional service	Craftsmen	Operators, fabricators, and laborers
	Domestic and personal service	Operatives	Military
	Clerical occupations	Service	
		Farm laborers	
		Laborers	

What this shows is the rapid expansion of "white-collar" roles during the 1900's, with management and the professions being the fastest growing category. In fact, by 2005, only 0.7% of Americans worked in Agriculture, 22.9% in industry and a staggering 76.4% in Services. Even more telling is that 34.7% of the workforce were now in managerial, professional or technical categories of occupation, and a further 25.4% in sales or oficework. The days of unskilled "blue-collar" labour had diminished to the point of being hard to find.

As blue collar gave way to white collar, what did we find? We found that white collar professionals wanted meals, drinks, parties and decadence. Hence, when Frank McNamara had lunch one day and found he had left his cheque book and cash at home, as had his companion, what could he do? Well, he had to call his wife up and ask her to

[2] Source: http://usa.ipums.org/usa/chapter4/chapter4.shtml

come to the restaurant with the cash he had left at home. What a rum state of affairs for a reputable, upstanding leading community figure[3].

That was why Frank invented the Diners Club Card, so that leading community figures – professionals – could pay for their meals without having to call their wives up and get a great big dressing down for being such a dumb husband.

Diners Club was the first charge card, and arrived in 1950, but it was the BankAmericard that really created the plastic revolution.

BankAmericard – now Visa – created the mass market for cards through automation under Dee Hock in the 1970's. Mr. Hock was a great believer in automation – not surprising as, at the time, hundreds of people were employed to match signed payment slips from merchants with cardholder accounts and perform manual data entry of amounts and dates. Suddenly, through the introduction of mainframe computing, Bank of America automated the payments process.

This was the first introduction of electronic payments and spawned the near three billon cards that are in use globally today through Visa, MasterCard, American Express and friends.

The third revolution in commerce was therefore based upon the convenience of paying and was the first time that we moved as a society from physical forms of payment to electronic forms of payment. We moved from coins and notes to signatures and Personal Identification Numbers (PINs).

So there you have it. Three historical revolutions created three forms of payments:

- The agricultural revolution created coins.
- The industrial revolutions was fuelled by the growth of banknotes and bank cheques; and
- The service revolution required the use of debit and credit cards

In the 21st century, we are experiencing another revolution. An electronic revolution.

What form of payment will this revolution create?

[3] From the Diners Club website: "In 1949, Frank McNamara schedules a business meal at a New York restaurant called Major's Cabin Grill. Prior to dinner, he changes suits. After dinner, the waiter presents the bill. Frank reaches for his wallet...and realizes that he has left it in his other suit. McNamara finesses the situation, but that night he has a thought, "Why should people be limited to spending what they are carrying in cash, instead of being able to spend what they can afford?" In February 1950, McNamara and his partner, Ralph Schneider, return to Major's Cabin Grill and order dinner. When the bill came, McNamara presents a small, cardboard card - a Diners Club Card - and signs for the purchase. In the credit card industry, this event is still known as the First Supper."

The Information Revolution

No-one would deny that technology has transformed the world but, until the late 1980's, nearly all technology was developed and controlled by Governmental requirements for defence. The first computer for example, was the ENIAC which was developed during the Second World War to monitor atmospheric conditions and give the Allies a boost in their strategic war planning.

Mainframe computing through IBM and other providers focused primarily on national government orders and requirements. Bill Gates and his mates changed all that.

Bill came along with a vision of a computer in every home and created Microsoft. Suddenly, the old school east coast America computer providers, who depended upon U.S. federal government demands, were undermined by an upstart geek with glasses who changed the rules of the game. The major rule that changed was by placing technology into the hands of children.

The 1990's saw a massive surge in technology deployment, development, usage and change as not only were personal computers shipping in volume into the home, but parents were buying the technology to support their children's education. As kids used technology, they pushed the boundaries.

For example, most folks were not aware of chat rooms and instant messaging until their children showed them how to use these services. Most parents were challenged by email until their children setup their email accounts and showed them how. Most parents were not adept at typing, but their children's use of the keyboard is about as deft as Mozart's was of its predecessor: the piano keyboard.

As children pushed technology to its limits, so the technology industry responded by developing easier to use systems. Then the internet combined the power of technology with globalised connectivity. Then the mobile telephone allowed communication anywhere, anytime.

Suddenly, there was an explosion of connectivity, communication and commerce, being driven by the PC and the internet based upon a fundamental shift of power from government driving technology to children. The result is a melting pot of rapid change which some think is changing too fast. Just as you get on email, your kids are on blogs. Just as you get an iPod, your phone becomes an MP3 Player. Just as you get a Plasma TV, your PC becomes a TV.

This will not stop, as it is in the nature of the revolution we are living through.

By way of example, here is a description of how some may feel:

> *"The stress of modern life is overwhelming. The world is torn apart by a controversial war; scientific and technological change is taking place too fast; religious faith has given way to materialism and greed; there is a tide of immigration, alcoholism, child abuse, and sexual deviance; there is a massive growing divide between the rich and the poor."*

If you recognise this description it is because it could have been written any time in the last few years. It may surprise you that it is actually my summary of the views expressed in 1881 by George Beard with regard to the Industrial Revolution[4].

Nothing much has changed … except that revolutions make us nervous and no more so than the current one.

But what is this 21st century revolution all about?

I call think of it as being about the networked world.

The networked world is wired and electric. The networked world communicates and is connected 24*7. The networked world allows goods and services, thoughts and ideas, sex and pornography, travel and commerce, music and entertainment – life – to travel around the world freely and easily.

Borderless capital and liquidity. Borderless commerce. Borderless banking.

OK, we are not quite there yet. We still have friction and issues between countries and nations. We still have tariffs and protectionism. But we are moving rapidly away from the ability of governments to stop such activity. After all, just think of how challenged governments are by taxation of goods on the internet. How the Chinese are challenged to maintain censorship on the internet. How the music and film industry have struggled to maintain control over copyright.

And so, to payments.

[4] George Beard's book *American Nervousness: Its Causes and Consequences* was published in 1881

Payments in a Networked World

Payments are being forced to adapt to the networked world, in the same way that governments are being forced to adapt. However, the adaptation is not the obvious one that you may think we would identify.

For example, after three revolutions in history which created cash, cheques and cards, what do you think the network revolution will create?

Micropayments?
Contactless payments?
Mobile payments?
Wearable payments?
Biometric payments?

Let's look at each of these in turn.

Micropayments

Although micropayments means sub-$1 payments to some, as in cent or even micro-cent payments, in this area micropayments today alludes more to payments that could not be processed profitably by banks electronically using previous means, as in sub-$5 payments. Micropayments of sub-$5 account for about $40 billion of all payments worldwide today, according to Jupiter Media.

How come? Because micropayments have been driven by the demands for online and mobile services.

In the former case, we can all point to the success of PayPal who now have more customers than Bank of America, Wells Fargo, Barclays Bank and Deutsche Bank combined, and more credit-card accepting merchants PayPal-enabled than the combined number of merchants for Visa and MasterCard.

Transacting over $1,000 a second, PayPal is the gorilla of online payments and part of its success is not just being owned by eBay, but having a unique model of business that supports micropayments. Think about it. Before PayPal, how many sub-$5 payments would you have transacted. Today, it is easy.

In the words of one of PayPal's founders, Elon Musk:

"A vital competitive advantage was that PayPal had significantly lower transaction fees … part of the secret behind PayPal's much lower fee structure was having a low cost way to authenticate a customer's bank account, so that we could pull money into our system for a few cents per transaction."[5]

In other words, because it cost PayPal peanuts to transact, it cots the customer peanuts to transact and so the customer could transact in peanut amounts. Not in peanuts though, but in real dollars, Euro's and yen.

Is it any wonder that PayPal's transaction volumes continue to break all records, with $37.75 billion transacted in 2006, a 37% increase over 2005 ($27.51 billion) which was a 45% increase over 2004 ($18.5 billion).

But not all of that is micropayments. In fact, much of that is macropayments. In fact, micropayments in PayPal account for less than 5% of sales. Even so, that is $2 billion per annum.

Is it any wonder that Booz Allen Hamilton forecast a number of critical impacts that micropayments would have on card issuers and acquirers. In the 2006 study[6], they found that existing debit and credit card firms could lose up to 30% of transactions to online retailers offering PayPal and Google Checkout.

Having said that, if PayPal only accounts for $2 billion of micropayments, where are the other $38 billion coming from?

A great deal is coming from music downloads.

For example, iTunes generated $634 million in Apple's Q1 2007 revenues compared to $491 million for the same quarter the year before. The digital media research firm comScore Networks reckon that Apple's iTunes Store sales rose 84% in the first three quarters of 2006 versus the same period in 2005, with a 67% increase in customers. The report also found that the number of people visiting the iTunes Store increased significantly from 11.2 million unique visitors in November 2005 rising 85% to 20.8 million unique visitors in November 2006.

So what?

Well, each tune is priced at $0.99. That is a micropayment.

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[5] Full interview can be found at:
http://www.valleywag.com/tech/paypal/an-alternate-history-according-to-elon-musk-230076.php

[6] Source: a study by consultancy Booz Allen Hamilton, 2006; for more details go to:
http://www.finextra.com/fullstory.asp?id=15611

Equally, look at ringtones and games which sell on mobile telephones today. Ringtones alone are already outselling traditional CD sales for music, with each download costing under $5. In 2006, ringtone sales were estimated to be worth $5 billion with the best-selling *Crazy Frog* from Jamba generating almost $500 million in sales on its own. Those are micropayments.

Between online payments, PayPal payments, downloads of tunes and articles, games and ringtones, the micropayments market is burgeoning. But most of that is driven by traditional payments using credit cards. So, it's not the revolution in payments we are looking for in the networked world. It is, instead, purely a logical extension of electronic payments being taken into smaller and smaller amounts through the increasingly affordable technologies available today.

What about contactless payments then – are they the information revolution's payments product?

Contactless Payments

Contactless payments are based upon RFID or NFC chips being integrated into a plastic card. RFID, Radio Frequency Identification, chips require close proximity whereas NFC, Near Field Communication, chips transmit wirelessly and can be received over longer distance. The former is being used for most contactless payments programmes, such as American Express's ExpressPay. MasterCard's PayPass, and Visa Contactless. The latter is just starting to be picked up by for use in mobile telephones and for access to stadiums and theatres to replace ticketing, and is targeted for use in mobile phones.

This payment method is pretty standard already, even though a number of countries are yet to roll-out programmes that support contactless payments, and is proving to be a low-cost, robust and proven technology.

The actual coverage of the markets for contactless is also huge as, for example, Data Monitor estimated the total value of all cash payments under $25 in the USA were worth over $724 billion in 2004. That's a lot of cash to get rid of and both micropayments and contactless payments will erode the traditional cash market areas.

In particular, stores and customers like contactless "tap and go" payments.

In a study by MasterCard[7] in 2006, their contactless system PayPass was being used by about 10 million consumers in 32,000 merchant locations with the result of a:

- 36% increase in usage per account;
- 45% increase in total transactions per account;
- the average transaction, credit or debit, is approximately US$20;
- consumers use their payment cards 18% more often on average;
- 75% of all PayPass transactions are for purchases below $25; and
- 45% of all transactions are for purchases below $10.

Why is this happening? Because the consumer is no longer limited by that amount of cash in their pocket and, according to another study by Javelin Research, 84% of users thought it was as safe as or even safer than credit cards.

This is why various organisations forecast contactless payments will transact around $40 billion a year. But contactless still requires a card today, so it does not displace a prior revolution's creation. Equally, contactless is bounded by being quick which means no authentication, so they are no use as a means to make higher value transactions. In other words, contactless payments are not the end game of the networked world revolution.

What about mobile payments then?

Mobile Payments

Mobile, to be honest, is just an extension of contactless with two major forms of mobile payments in operation: the text-based messaging payment and the contactless chip-based payment.

The former is the service that has been used for a while now based upon SMS text messaging a number with the amount, for example, when you travel through London and need to pay the "Congestion Charge" – an £8 ($16) tax for driving in London – you can pay by SMS text message. This is also the approach being used by PayPal Mobile, where you text 63336 to any firm displaying the PayPal Mobile logo and the payment is taken there and then from you PayPal account and the goods are yours.

However, text messaging a chunky, clunky way of paying when compared to the contactless chip phone, such as NTT DoCoMo's Felica phone. The Felica phone was the first contactless mobile telephone payment service in the world, and was launched in Japan in 2005.

[7] For more details, go to http://www.finextra.com/fullstory.asp?id=15614 and http://www.finextra.com/fullstory.asp?id=15617

The way it works is that you hold the phone over the payments station, a terminal not dissimilar to the contactless payments terminals used above, and the payment is made from, in the Felica case, a mobile wallet called Edy that is associated with the mobile telephone account.

The latter approach is therefore one that is simple, fast, easy and convenient, combining the best of both contactless and mobile payments. As a result, it is increasingly likely to be the mainstream form of contactless payment over time. Why? Because Nokia have a deal with MasterCard PayPass to integrate this capability into their future phones, and have already rolled this out in trial from with Citibank in New York and are likely to do the same across many other U.S. and European cities during 2007.

Having said that, if you can put a chip into a telephone why stop there? Why not put a chip into a watch, ring, cuff link or even stitch the chip into the cloth of a jacket, blouse or shirt?

That may sound silly, but that is exactly what some banks and providers are doing. For example, Chinatrust Bank launched a special Swatch-style watch during the summer of 2006 to celebrate the Football World Cup in Germany. Again, MasterCard PayPass was selected as the payment mechanism, and this delivered a contactless wearable payments device. This example, along with several others such as the JCB Watch in Japan, demonstrate that there is no reason why a bank should not take offer their customers designer goods to promote there accounts, and even take this further by designing such gifts in other jewellery or clothing. Give it a few years, and I'll buy my suit from the bank …

The only downside is that it is still all based upon RFID and NFC chips, and therefore has the same restrictions as contactless payments, such that mobile and wearable payments are only good for low value transactions requiring no authentication.

However, combine contactless, mobile and wearable payments with biometrics and surely that solves the issue?

No.

Biometric Payments

Biometrics is an area that is taking off rapidly as a secure authentication mechanism for managing national borders. Passports and identification cards incorporating fingerprint, palmprint, voice, signature, iris, retina or other body parts as a form of identification and authentication is becoming the government mantra in these days of terrorism and concerns over national security. These technologies are all growing in terms of scalability, resilience, usage and stature and yes, they all enable secure and reliable authentication.

Many of us still have concerns around security of the individual if biometrics are used for recognition and authentication, as in the removal of hands and eyeballs is a potential liability, but many are experimenting with the idea of combining such recognition technologies with a payments method.

In particular, biometric identification is proving to be successful with those individuals who would have traditionally struggled with identification or authentication, such as those who do not have passports or driving licences, or those who are illiterate. This is the reason why Banco Azteca in Mexico has one of the largest biometric payments card rollouts of any bank in the world, with over 8 million customers making 200,000 biometric payments daily using their fingerprints. Similar programs are in use with Bank Danamon in Indonesia and ICICI Bank in India to reach the rural farmer who is illiterate and therefore cannot sign their name.

Although some of us therefore may feel that the biometric payment concept is uncomfortable, because it is intrusive to the individual, many are supportive of more widespread usage. For example, you even find biometrics in use at Universal Studios and Disney theme parks in Florida these days to secure lockers using fingerprints whilst most airports now offer fast track immigration using iris recognition for regular travellers. Equally, most passports are moving towards biometrics, with fingerprints and iris scans as part of the identification. Further examples include U.S. immigration, where fingerprints are part of the identification checks as you enter any U.S. border controls.

As governments and theme parks move towards increasing usage of biometrics, so citizens will expect this service to be used. Therefore, it will become acceptable for banks to leverage these capabilities to improve services through convenience.

In fact, it is particularly interesting to note that most biometric trials with consumers so far have been through retailers, who see the deployment of biometrics as increasing transaction size and improving speed of checkout.

For example, a recent report by Sanford Bernstein found that the use of biometrics for retailing reduced the potential for fraud and identity theft, speeded up the checkout process, and most importantly, lowered transaction processing fees for retailers,

improving their bottom line. A 20% reduction in processing costs at big-box discounters like Wal-Mart over the next several years could result in a 3% to 4% increase in earnings per share by 2009, the report estimated.

In another trial by U.S. grocery chain Piggly Wiggly[8] using a technology called Pay-By-Touch, the retailer discovered that biometric payments were 70% faster than traditional forms of payment.

Finally, a 2003 Federal Trade Commission survey found 13% of the 10 million cases of identity theft occurred during a retail payment transaction and so increasing security through biometrics is seen as the retail solution.

That is why it is likely that banks will ignore the rollout of biometric payments at their peril as retailers see this as a critical program. I think it is especially interesting, for example, that the largest bank-based biometric programme from Banco Azteca may be also due, in part, to the fact that the bank is owned by Grupo Electra, a major Mexican retail group.

So, you are probably now thinking that the combination of contactless, mobile and wearable payments with biometrics is my answer to the payments revolution that evolves out of our networked world revolution. That this will be the solution that will be on a par with the creation of cash, cheques and cards – the payments solutions from the last three revolutionary periods of commerce.

Nope. Almost, but not quite.

The fact is that all of these forms of payment are mere off-shoots of the longer-term. Just as the typewriter gave way to the word processor gave way to the PC gave way to the laptop gave way to the telephone gave way to the blackberry and so on, the information revolution is an ongoing march of change, not some stultifying moment in time. Just as WAP-banking, SMS-banking, text-banking, email-banking and back to WAP-banking has evolved, so will payments.

Therefore, today's micro, mobile, contactless, biometric payments will eventually evolve into a true form of new world payments. What will be the final form?

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[8] The Piggly Wiggly rollout involved customer making biometric payments through their debit account, in other words as an equivalent to a cash transaction. As a result, they were able to reduce the average cost per transaction by 40 to 70 cents, because 15% of customers who normally did not pay by cash enrolled in the Pay By Touch system. Not only that, but those customers increased their store visits by 15%, which translates into an additional 7,350 transactions a year, and spent 12% more on groceries because it was easier to spend by touch than through the limitations of the amount of cash in your pocket or purse. For more details, go to: http://www.thepig.net/

Payments: the Next Generation

We cannot be sure, but here is my contention.

The final form of payments will be based upon an implanted chip and will be invisible payments.

All of today's payments are chip-based and the chip is getting more powerful and more capable.

Just as today's laptop is the equivalent of yesterday's mainframe computer, today's mobile telephone is the equivalent of yesterday's laptop and today's silicon chip is the equivalent of yesterday's smartphone.

Moore's law of twice as much processing power for half the cost continues to apply, as much to chips as to computers.

Think about Mondex for example. The Smart Card of 1996 was expensive and unusable – the EMV card of today is cheap and easy. The RFID and NFC chip of today is cheap and basic; the wireless chip of tomorrow will be cheap and powerful. Probably as powerful as today's most capable computers and laptops.

If that is the case, what would you do with it?

My guess is that you would be using chips to automate almost everything from washing and cooking to mowing the lawn to driving cars. We are almost there already. Today, I can buy a BMW that can monitor its speed on cruise control, and slow down or speed up automatically based upon surrounding traffic speeds. Equally, the car has inbuilt sensors that allow it to robotically park in tight spaces on the kerbside. I can also buy automated lawnmowers and internet ovens.

Therefore, the chip-based product is becoming hugely pervasive. But banks have so far purely placed chips in traditional products – plastic cards – because of the limitations of traditional thinking. By the mid-2000's banks, led by competition from other industries, are just starting to experiment with other chip-based payment vehicles as discussed, such as the mobile telephone. But here's the most radical concept of payments for the future, and one which is probably only about five years away.

Implant the payment.

Stick the chip inside the customer's body.

Make the human the payments vehicle.

You may think that is idiotic, but when do you ever see anyone on the *Star Trek* series pay for anything? Unless everything in the future is free, what is taking place? The fact is that the Trekkies are all paying through invisible, wireless, chip-enabled human interactions.

Invisible Payments

Here's the idea.

Chip-based products become really powerful within the next five years, as powerful as a laptop in 2000. As a result, the chip is offered as an implant for anyone to use in one of four applications.

The first is as a health monitor. The chip automatically senses and tracks blood pressure, cholesterol, brain activity and heart rate continually 24 hours a day, and wirelessly sends this to a base station in the automated home. The base station reports any unusual or suspicious changes in these parameters to your doctor should strange activity occur. This guarantees that early indications of anything like a stroke or heart attack are caught before you would even have thought there was a problem.

Equally, because the chip is monitoring your heart, brain and blood, should the chip be removed from the body, it becomes null and void. Hence, the chip is always guaranteed to only be operating as long as the human owner of the chip has it implanted.

As a result, the second usage is for immigration and identification purposes. Instead of passports and identification cards, governments rapidly move towards the promotion of chip implants to provide fast and convenient travel services:

> *No more heavy duty and intrusive searches at airports, ports and terminals, just turn up and go. For citizens who have the National Chip ID, you can just go through the wireless fast track station and hop on your boat, plane or train … meanwhile, for the rest of you, please join the thirty minute queue for the security scan, take off your shoes, belts and jewellery and ensure that your pacemaker is switched off.*

I know many folks would jump at the chance of such a fast track system, even if it meant having a small chip implanted in your arm.

Another reason I would have such a chip implanted would be for location services, which is our third application of the chip implant. Just as we chip our dogs and cats so that, should they become road kill, the vet can identify who the deceased belongs to, so we will chip ourselves so that our loved ones and family can track down where we are. This is partly due to our own concerns over security and terrorism, but also in order to enable us to be found if we are lost or if we just want our family to be reassured we are ok

during travels overseas. This is also not so far-fetched, as many people already chip their children, just that the chips are not implanted. They are in telephones and we use GSM tracking to find out where they are. Now, various firms manufacturing shoes are offering chip-implanted shoes so that you can do the same without your child knowing! Soon, chip-based location services will become standard and the idea of having one inside is going to be the most reassuring way for a parent to track their child as, unlike shoes and telephones, such chips cannot be lost or dumped whilst doing other mischievous activities.

This leads to our fourth application. If chip implants enable us to be guaranteed health, security and ease of travel, why not use the same services as Payments: the Next Generation.

An implanted chip would enable people to pay in exactly the same way as we are thinking of payments for mobile and contactless, it is purely a small step forward to use chip implants for payments. After all, it is all still chip-based, just that the chip is now much more powerful and usable for multiple applications. The chip is now meeting government and society needs for security, health and safety, so why would a bank not use this capability?

How would it work?

In order to illustrate how the process would work in practice, let us use the example of John Jones.

John is a hardworking man with a complex multi-channel financial account with Acme Bank. John has signed up for the National Chip ID program and, in order to get his chip implanted, has handed in his driving licence and passport. All of this information is now part of his wireless chip information. He has visited his local doctor's practice, and his doctor has wirelessly enabled the health application to start the health monitoring services of blood pressure, heart rate and brain activity. John has also signed up with "TrackIt" services who can let his wife and parents know his location within 200 metres anywhere on the planet … as long as John has his open broadcast enabled. This is a facility which is purely for user's discretion where the TrackIt service can be switched on and off dependent upon what your family needs to know. Nevertheless, if the police want to override the user's broadcast block, then they can. Finally, John has arrived at Acme Bank and has asked them to enable his payments service.

Acme's wireless application has already identified John and verified his details with the government's national identity database. As a result, they purely switch on the "wireless payments" service related to his unique chip identification, in the same way that they would have done for his mobile RFID or SIM chip, or his EMV contactless card.

John is now free to leave the bank and start making invisible wireless payments. His first port of call is therefore to the electrical store to buy Apple's latest release of iGod, where users are able to control everything in their house using a simple iPod style control panel. The branding had been questionable, but Steve Jobs was powerful enough to ignore such challenges.

The iGod, priced at $5,000 – a 95% mark-up – is a pretty sizeable purchase and John is keen to see if his new Acme wireless payments service will work. Therefore, as he picks up his order, he sees the store's payments screen flash up "Payment made of $5,000 from debit account John Jones, Acme Bank". John is free to switch this to another account if he actively changes the payment instruction, but he is happy with that payment and walks out of the store all set.

What had happened in terms of the actual payments process, was that as John picked up the iGod at the checkout, the wireless sensors had picked up John's chip signal, indicating a preferred account for payments and had activated the payments process.

These wireless sensors are the same sensors as are already being deployed for NFC payments … just a bit more powerful.

You may wonder how come John did not need to authorise the payment.

The authorisation was the fact that John walked away with the goods without changing any of the instructions. If he had left the goods instore, no payment would have been taken. If he had actively changed any of the payment instructions by touching the screen, the payment of $5,000 would not have been taken form his preferred deposit account. The fact John took the goods and did not change the payment method, meant the payment was taken and made wirelessly without any authentication or further identification required.

In terms of John himself needing to provide identification, no identification or authentication is required because the system is just looking for the chip to be live.

The fact the chip is enabled and live is good enough. The chip does not work if it is removed from John's body. Furthermore, the chip is monitoring John's heart, brain and blood and knows there is no change of situation and that he is alive. The system knows John is therefore not being robbed or mugged or forced to make a payment he does not want to make because he is calm, alive and the system knows that it can only be him … so why would you need any other identification or authentication?

No biometric, no PIN, no signature, no nothing. Just simple, wireless, convenient, seamless payments. As easy as breathing.

That is the future of payments.

The Future of Payments

The future described in this paper is not that far away. For example, the conceptual outline shown above is actually already implemented. OK, only in quirky little nightclub in Barcelona[9] right now, but it is already here. You may retort that it's still implying something far too intrusive and wacky for any bank to contemplate as well.

The idea of customers having "Intel Inside"? Ludicrous.

But some people thought the same about people using telephones outside. Many people thought that mobile telephones were only for rich idiots when they first came out, but now virtually everyone on the planet has one, or access to one.

Only a few years ago, many people did not believe that MP3 players would succeed. Who would want to mess around getting music off their PC? Then the iPod became a multi-billion dollar global market that rescued Apple.

In 2004, a group of payment professionals told me that mobile payments were about ten to twenty years away and would only succeed when a Wal*Mart of Virgin launched the service. Two years later, PayPal Mobile was launched and, within a few months, mobile payment pilot programs were everywhere.

Customers with "Intel inside" are going to be used in a number of pilot applications by 2010, will be noticeable by 2015 and common by 2020.

Chip implants will become common if and for no other reason than it makes sense. It makes sense for national security and cross-border movements. It makes sense for family health and security. It just makes sense,

As a result, chip-based invisible payments will become common.

Think about it.

Paper, cardboard and plastic as identification with passwords, identification numbers and fingerprints is all so … it is all so … so twentieth century.

All of the areas described in this paper – contactless, mobile, biometric payments – are therefore just the transient evolutions of the information revolution and the networked

[9] The Baja Beach Nightclub in Barcelona chips its regular clientele with an implant in the arm which allows them to visit exclusive areas of the bar, credits and debits their account with any payments for drinks and provides them with privilege services only available to the Chip ID personnel.

world. They are here today and gone tomorrow, just like the Dodo. The final outcome of the world's latest revolution in commerce will be chip-based, wirelessly transmitted invisible payments. And gradually, the five thousand year old coin, the two hundred year old cheque book and the fifty-year old plastic card, will disappear.

After all, when do you ever see them being used in *Star Trek*?

About the Author

Chris Skinner is Chief Executive of Balatro, a think tank studying the future of financial services, and Chairman of the Financial Services Club, a UK-based group which meets regularly to debate the future of the financial markets. He is also a member of the Financial Services Club Advisors, a group of senior executives who work with Club members on their strategies and markets.

Chris is well-known for his regular columns on Finextra.com and in *the Banker* magazine, and is the author of two books released by John Wiley & Co in 2007 titled: *"The Future of Banking"* and *"The Future of Investing"*.

Chris is Chairman of *the Banker's* Technology Awards, a Judge with the TradeTech Awards and with the Asian Banker's Excellence in Retail Financial Services program. He is a contributor to the World Economic Forum's Scenario Project on Technology Innovation in Financial Services, and has worked closely with the financial markets research firm TowerGroup, managing their European Research programs.

Prior to founding Balatro, Chris was Vice President of Marketing and Strategy for Unisys Global Financial Services and Strategy Director with NCR Financial Services. He is also a co-founder of the website for strategists www.shapingtomorrow.com.

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