Introduction

Timeline

Our 2001 predictions

Consumer attitudes

Looking to the future
Report by Dr Ian Pearson

pay
your
way

PAY YOUR
WAY 2025:

Future Payments

PAYMENTS
COUNCIL

DRIVING CHANGE IN UK PAYMENTS

| Introduction | Timeline | Our 2001 predictions | Consumer attitudes | **Looking to the future** Report by Dr Ian Pearson |

PREVIOUS   NEXT   1

INTRODUCTION

By Adrian Kamellard
Chief Executive, Payments Council

INTRODUCTION By Adrian Kamellard

Up until the 1960s we really only had two ways to pay — cash or cheque, but improving technology and changing lifestyles have seen a steady stream of innovations since. Nowadays we take for granted the extra choice offered by credit and debit cards, electronic payments, online shopping and banking.

A single day for any one of us could involve paying a gas bill by Direct Debit, using a credit or debit card in a supermarket, transferring money using online banking, taking money out of a cash machine connected to the LINK network or even instructing a solicitor to make high-value CHAPS payment to buy a house! All of these payments were created in the 60s, 70s and 80s, yet during the last few years we've seen innovation continue apace and consequently our choice of ways to pay continues to grow.

"The Payments Council is the lead body making sure UK customers and businesses get the payments they need and want, both now and in the future."

Fast forward to the present day and the world of payments is changing like never before. The Payments Council is the lead body making sure UK customers and businesses get the payments they need and want, both now and in the future. A key part of the Payments Council's day-to-day work is acting as a trusted source of data on payments and carrying out the research that is required to inform the National Payments Plan and other plans for the future.

This report, *Pay Your Way 2025: Future Payments*, looks beyond the probable to take a broader look at what could become available in 2025 for the most enthusiastic consumers of technological advances. With that in mind, we asked leading independent futurologist Dr Ian Pearson to use his expert knowledge of trends in technology and society to offer his view of the potential developments in payments.

To set the context for Dr Pearson's predictions, our Head of Policy and Markets, Mike Bowman, reflects on the predictions we made ten years ago and considers what factors limited or led the changes that we actually saw. In that time, chip and PIN was introduced and the internet opened the door to a new world of innovation.

One of the predictions made by Dr Ian Pearson in this report is that we will start to see more items of 'digital jewellery', which can be used as a contactless device to either make or authorise a payment. Other concepts explored in his report are: transferring data through handshakes, augmented reality visors, electronic cash and even tiny electronic data printed onto fingers to enhance the security of using fingerprints to authenticate payments.

Our predictions

Our own predictions already point towards some potential big changes, long before 2025. The adaptability of the chip and PIN technology used on our bank cards means that the chip need not be on a card, but instead could be on a whole range of platforms, which can enable payments to be made by mobiles and other devices.

Arguably the biggest factor in the acceleration of innovation over recent years has been the internet and the changing way that we are using it. Contactless technology (also known as Near Field Communication, or NFC) is also driving change – it has now been available in the UK for five years and is approaching a potential tipping point in terms of usage.

As an indicator of how quickly things can change, just a few years ago, back in 2008, the Payments Council introduced the first new payment system in over 20 years. This is called Faster Payments and it has revolutionised the time it takes to process a phone, internet or standing order payment, enabling them to be made almost instantaneously outside of banking hours, seven days a week. It was built to meet future demand and by only its third birthday it had processed over a billion payments.

Our projects

It is certainly intriguing to look further ahead at possible future payments, but there is plenty happening in the way of innovation right now. The Payment Council's mobile payments project is working to help banks and others make it possible to pay securely on a mobile without needing to know account details. This collaborative project should deliver new benefits for customers of any financial institution that wants to offer the service, with a new central service being built that can link mobile phone numbers to account details and make it possible to seamlessly make payments from one institution to another. It could become an attractive option when making person-to-person payments – such as paying a friend for lunch – or where a business doesn't accept cards but needs immediate payment which they can check at a glance.

Another major project for the Payments Council goes above and beyond payments to help customers switch current accounts. It will deliver a faster, easier switching service. The new service will be up and running in September 2013 and will be backed by a customer guarantee. It will ensure the same level of service across the industry regardless of where a current account is held.

"Arguably the biggest factor in the acceleration of innovation over recent years has been the internet and the changing way that we are using it."

continued

Security and virtual worlds

Looking ahead, the next generation of customers will have grown up online, fully connected through social networks. This continuous and uninterrupted conversation will probably lead to greater demand for payments to be instantaneous or "real-time and 24/7". The barriers between 'real' and 'virtual' worlds and communities are not as they can appear to older generations – there will be a need for new payment products to fill this new space whilst upholding the high levels of security and reliability we've come to expect.

Innovation in payments unfortunately isn't limited to new products being created – there will always be a battle with criminals who want to exploit our payments for their own financial gain. The research we carried out to accompany this report has demonstrated that security remains the foremost concern of people using payments – more than half of us worry that new technology won't be as secure.

As Dr Pearson rightly points out in his contribution to the report, technological advances will offer new ways to authenticate our payments – so could potentially make things safer. In any case, customers in the UK enjoy excellent legal protection from fraud and should do in future too. For our part, the Payments Council will continue our proactive work with the public and private sectors to ensure customer authentication standards are set at an appropriate level – no matter whether we are talking about a signature, a PIN or a handshake.

Pay Your Way

Pay Your Way already contains a wealth of information on the ways we currently pay in the UK, ranging from the familiar, like cash and cheques, to what we now consider cutting edge – mobile payments and beyond. Looking back from 2025, our opinion and usage of these payments may have changed. Regardless of any changes, the Payments Council will continue promoting innovation, inclusion and integrity in payments and strive to ensure that the right options are available to meet consumer needs. I hope you enjoy the report.

"Regardless of any changes, the Payments Council will continue promoting innovation, inclusion and integrity in payments and striving to ensure that the right options are available to meet consumer needs."

Introduction

Timeline

Our 2001 predictions

Consumer attitudes

Looking to the future
Report by Dr Ian Pearson

◀ PREVIOUS   NEXT ▶   5

TIMELINE

A history of innovation in payments

TIMELINE

We've pulled together a simple timeline to show how far money and payments have come. This certainly isn't everything, but it gives an indication of particular milestones in our history.

600 BC
Coins

The earliest coins were made in the seventh century BC in the ancient kingdom of Lydia (part of what is now Turkey).

12th Century
Bill of exchange introduced in Italy

Bills of exchange were the predecessor to the cheque, allowing traders to buy and sell goods without having to carry cumbersome and valuable gold and silver.

16th Century
Receipts system developed

Goldsmith-bankers would accept deposits of gold and issue receipts to the user. These usually carried the name of the depositor allowing them to circulate in a limited way. This lays the foundations for paper-currency.

1659
Date of the earliest known surviving English cheque

Cheque use peaked in 1990, when 4 billion cheque payments were made. Since then, cheque use has fallen by about 40 per cent, although more than 682m are still written every year.

1668
Bank of England established

There were calls for a national or public bank to mobilise the nation's resources and broker a loan for the government. William Paterson proposed a loan scheme of £1,200,000 to the Government.

1717
Bank of England introduces printed cheques

1966
First UK credit card

The first credit card in the UK is issued by Barclaycard. A second credit card (the Access card) was introduced 11 years later.

1965
The first guaranteed cheque was written using a Cheque Guarantee Card

1946
World's first 'mobile' bank

National Bank of Scotland introduces a 'Travelling Bank' on the Isle of Lewis to save crofters from having to take the day off work to visit the branch in Stornoway.

1881
Postal orders created

After some falling popularity, postal orders are now enjoying a comeback. Last year the Post Office sold £334 million worth.

1797
Bank of England issues the £1 note

A series of runs on the banks compelled the bank of England to issue its lowest denomination notes ever, the £1 and £2 pound note.

1772
First Traveller's cheque issued

This new, secure form of payment was valid in 90 European cities and issued by the London Credit Exchange Company.

continued

1967

First cash machine introduced to the UK

The first ATMs predated plastic cards, so cheques impregnated with carbon 14, a mildly radioactive substance, were used. By the end of 2011 there were 64,369 cash machines in the UK.

1968

Bacs established

Bacs is the company responsible for the clearing and settlement of automated payments in the UK including Direct Debit and Bacs Direct Credit.

1971

Decimal day – 15th February

Britain officially switches over to the decimal system and leaves behind shillings and florins, even though the currency had been circulating for a few years prior.

1972

First magnetic stripe card

Lloyds Bank issues the first magnetic stripe cards for use at their new online networked 'Cashpoints'.

1976

First SWIFT international payment

Society for Worldwide Interbank Financial Telecommunication (SWIFT) sends first message – making electronic international financial transactions possible for the first time.

1974

Consumer Credit Act comes into force

Legislation comes into force, giving extra protection to people using their credit cards to buy goods costing between £30 and £10,000 (the limits changed to £100 and £30,000 in 2005).

1990

'Cashback' is introduced

7 million transactions made in the first year.

1987

First debit card introduced in the UK

The first debit card was issued by Barclays in 1987. Midland, National Westminster Bank and Royal Bank of Scotland followed soon after in 1988.

1986

LINK network created

The national cash machine network LINK was formed in the mid 1980s to allow smaller banks and building societies to compete against the cash machine networks of the larger banks.

1984

CHAPS established

The UK's real time, high value electronic payment scheme.

1984

First online shopper

The world's first online shopper was Jane Snowball, a 72 year old resident of Gateshead. Using Michael Aldrich's Videotex technology, she purchased food from Tesco, helping her to work around her physical disability.

1980

Telephone banking launched

Girobank establishes the first telephone banking system.

continued

1997

Online banking launches

Nationwide is the "first UK provider" to launch an Internet Banking Service, Royal Bank of Scotland launched its own online banking service slightly later in June 1997.

1999

Half of all UK adults hold a credit card

The average value of a credit card purchase exceeds £50 for the first time.

2003

PayPal launched in UK

2003

Chip and PIN introduced

Rolled out in 2003, the chip and PIN was eventually made mandatory in 2006.

2008

First Faster Payment sent

Faster Payments becomes Britain's first new payments service for more than 20 years, making it possible for internet, phone and standing order payments to be processed almost instantly.

2008

First UK contactless card issued

Currently there are about 23 million contactless cards in issue. The Post Office has announced that it will become the largest adopter of the new technology in Europe, with 30,000 counters offering this payment.

September 2013

Central account switching service

New Payments Council switching service will reduce the amount of time it takes to switch an account to just seven working days, with a customer guarantee.

2012

Pingit mobile payments service launched

Barclays launches mobile app Pingit, enabling customers to send money using just a mobile number.

2012

Smartphones for cash withdrawals

Technology developed enabling people to withdraw money from cash machines using their smartphone. Customers are given a six-digit code to enter into an ATM which will then release the cash.

2011

Payments Council announces mobile payments project

Collaborative project aims to make it possible to pay someone else without knowing account details, by building a central service linking mobile phone numbers to account details.

2011

Phones used as debit cards

Barclays teams up with Orange to develop the 'Quick Tap' payment method. Using near field communication (NFC) technology, users can pay for products using their phone.

2011

Payments Council announces decision to keep cheques

The Payments Council commits to keeping the central cheque clearing open for as long as customers still need cheques.

Introduction | Timeline | **Our 2001 predictions** | Consumer attitudes | **Looking to the future**
Report by Dr Ian Pearson

◄ PREVIOUS   NEXT ►   9

OUR 2001 PREDICTIONS

By Mike Bowman
Head of Policy and Markets,
Payments Council

# OUR 2001 PREDICTIONS *By Mike Bowman*

For an organisation like the Payments Council, which works to ensure payment methods are appropriate for everyone, it is vital to keep one eye on the future and consider what changes we need to prepare for, as well as which initiatives we may need to facilitate. In addition to this, it is useful to look back at earlier predictions – to see what came true and what never materialised, looking at the real shift in societal need and behaviour, so that we can refine our next round of future projections accordingly.

Looking at 2011 from 2001

In The Payment Markets Report 2002, issued by our predecessor APACS, we looked at how the way we make payments might change by 2011, tracking against 2001 figures. The report was produced at a time in which we heralded a new era in online commerce and we looked excitedly to the prospects that mobile technology might bring us. It was also produced as we welcomed the Euro and started to debate the long term consequences for the widely available credit of the time. Much change was predicted. Crucially, the report was also produced soon after it was announced that chip and PIN would be rolled out from 2003 and become mandatory for card payments.
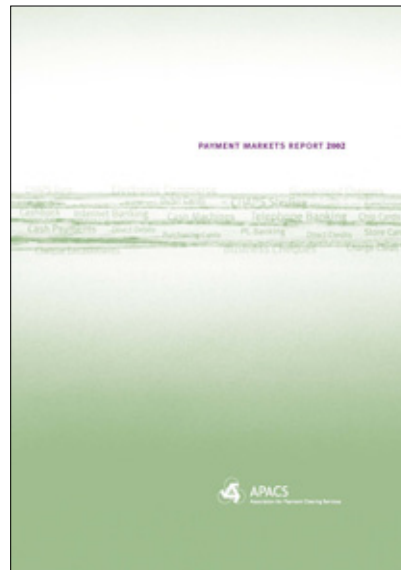
Back then, we said the change to PIN represented a 'huge technological and customer education challenge' – and with good reason. Banks and retailers had to upgrade or replace over 100 million debit and credit cards, 750,000 point-of-sale terminals and 35,000 cash machines, and over 40 million cardholders had to be guided through the transition process as PIN replaced signature at the point-of-sale. But all this was done and the change has led to many further developments in security of payments, as well as opening up wider access to e-commerce and paving the way for easier mobile payments. It also made possible unattended payment terminals, such as in supermarkets, which we correctly pointed to having a growing prevalence.

> **"The report was also produced soon after it was announced that chip and PIN would be rolled out from 2003 and become mandatory for card payments."**

It goes to show that if some of the more impactful projections made by Dr Pearson in his *Looking to the future* report are brought in by 2025, it will be phased and implemented as seamlessly as possible. Major change will only come about if it genuinely facilitates the way we pay, and the security of transactions.

Electronic purses

We explored the possibilities of electronic purses in 2002, but concluded that there were too many uncertainties to make any firm predictions – whilst we stated these would make travel much easier (such as that used for the Oyster system), we stopped short of suggesting they would be widespread in everyday lives. At the time, most banks were waiting to see the success (or otherwise) of Oyster, and the limited number of general purpose solutions that had been piloted had not shown much consumer demand.

Debit and credit cards

Whilst we correctly predicted the increasing dominance that debit cards would have over the past ten years, the credit crunch was one factor that meant the gap between the amount of payments made on debit vs credit grew faster than we had anticipated back in 2002.

We said there would be 26 million people using credit cards to make payments by 2011 and there were 19 million. We said debit card payment volumes would rise from 2.7 billion in 2001 to 5 billion in 2011 and they rose to 7 billion. Debit payments became the nation's favourite way to pay in 2010 when spending on debit cards overtook cash.

Exploring how different demographic groups make existing payments is a useful way to predict changing need – one factor behind our projections that debit card payments would rise sharply was that we knew younger customers are more likely to be heavy users of debit cards and would be entering an age demographic of heavy spending.

"Money moves around much faster today – we get paid faster, we use more Direct Debit payments for bills and our busy lifestyles have lent themselves to more micro payments than we anticipated."

Money moves around much faster today – we get paid faster, we use more Direct Debit payments for bills and our busy lifestyles have lent themselves to more micro payments than we anticipated. This has also boosted the use of debit cards and a share of this will be taken over by mobile payments when this becomes more widespread.

Cash, cheques and paying another person

In 2002, cash and cheques formed the largest share of person-to-person (P2P) payments. This was predicted to change as we explored the emergence of systems which allow us to pay each other via email, by mobile phone, or online. Whilst email and mobile have not led this change, online payments have certainly taken a large share of P2P payments from cheques. Further moves away from cheques have also been made by small businesses adopting greater card use, greater use of Direct Debits for paying bills and by many retailers no longer accepting them. Cheques were expected to be used for only one non-cash transaction in twelve in 2011, compared to one in five in 2001 and one in two in 1991. The use of cheques in 2011 was actually lower than predicted at one in twenty.

continued

In terms of cash, in 2002 we thought that cash use would continue to decline with the biggest uncertainty over the rate at which low value payments would shift to card payments. In our main forecast we were fairly conservative and expected the share of all payments made by cash to fall from 73% in 2001 to 61% in 2011.

"In reality the ease of making payments with chip and PIN has meant that many more low value payments are now being made by debit cards. Cash was used for only 55% of payments in 2011."

Another factor in our predictions for cash was a 2004 change in the way benefits were paid, with transfers being made directly to bank accounts. This led us to predict a one per cent annual rate of decline in the number of spontaneous cash payments, we also stated that the growing popularity of cards for lower value payments could make this decline steeper – and that turned out to be the case. In reality, there was a steeper decline of 2.9% per year, although that still meant there were more than 2 billion spontaneous cash payments made in 2011.

Online and mobile

We were right in saying that the online world would become 'an ever more pervasive part of everyday life', and we projected that over 18 million adults would be using internet banking to access their current accounts in 2011, up from 6 million in 2001. The real figure is 26 million.

Around the turn of the millennium, there was a common belief that e-commerce would revolutionise the retail industry. However, by 2002, we had scaled down our projections in the wake of the dot com stock market crash and were then looking ahead to three main e-commerce channels as drivers: the PC internet, mobile networks and interactive digital TV (iTV). As we all know, iTV didn't take off to anywhere near the extent originally envisaged and more broadly, as e-commerce markets became more mature, the general view of the potential for e-commerce became much less radical.

However, we did predict strong growth and we felt that mobile payments could potentially be a large part of that growth. At the start of 1999 just over a quarter of UK adults were mobile phone users; it is now universal in many groups. This has opened up the internet to nearly everyone and many payments are made to online retailers now using our mobile phones.

But in 2002, we went further – we suggested that mobile technology would provide a platform for innovation in payment systems themselves. One potential scenario we explored saw the mobile device being used as a terminal to help facilitate the use of plastic cards. In this scenario the mobile handset would be used as a secure authentication and communication tool. We also suggested that mobiles equipped with a short-range wireless link capability such as infra-red or bluetooth might be able to communicate directly with a point-of-sale terminal.

Another, less secure scenario saw the cardholder key their card number into their mobile device to authenticate a payment.

Whilst the development of mobile is now starting to take shape, it is coming a little later than we had anticipated. When mobile payments do become widespread, we stand by our prediction in 2002, that 'mobiles might, unlike other e-channels, actually change existing payment behaviour rather than just adding new situations for payment.'

Introduction | Timeline | Our 2001 predictions | **Consumer attitudes** | **Looking to the future** Report by Dr Ian Pearson

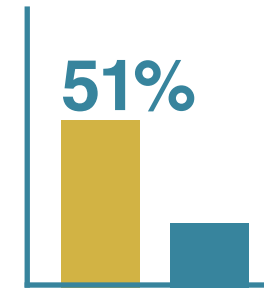◀ PREVIOUS   NEXT ▶   13

CONSUMER ATTITUDES TO FUTURE PAYMENTS

CONSUMER ATTITUDES

Pay Your Way commissioned research into the predictions, views and concerns people have around future technologies and future payment methods. Here are some of the findings:

In the year 2025:
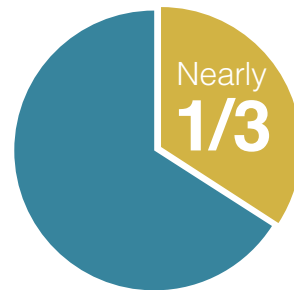
Nearly 1/3 __ OF PEOPLE EXPECT TO HAVE SELF-DRIVEN CARS IN 2025

51% __ OF PEOPLE THINK WE'LL BE PAYING BY FINGERPRINT SCAN IN 2025
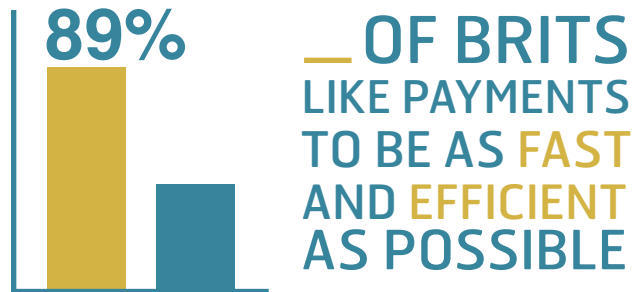
General perceptions of the year 2025

- 65 per cent expect to be able to have a speech enabled home

- Nearly a third (31 per cent) expect to have self-driven cars

- Almost a quarter of men (24 per cent) believe that head mounted 3D displays will be part of everyday life, compared to just 11 per cent of women

- Nearly a third of men (28 per cent) think that microchips under the skin for GPS tracking, data and payment transfers will be available, compared to just 18 per cent of women

Perceptions of payments in 2025

- 42 per cent of Brits think that they won't need a purse or wallet in 2025

- 51 per cent of people think we'll be paying by fingerprint scan

- 35 per cent by iris scan

- 32 per cent anticipate paying by voice command

continued

When it comes to payments:

89% — OF BRITS LIKE PAYMENTS TO BE AS **FAST** AND **EFFICIENT** AS POSSIBLE

Nearly **2/3** — OF ADULTS WORRY THAT PAYMENTS USING **NEW TECHNOLOGY** WILL NOT BE SECURE

Humans and technology

- Most Brits do welcome new technologies, with nearly three quarters (72 per cent) believing that technological advancements are good for society

- Nearly a third of 18 to 25 year olds are worried about new technology changing the way they live

- Over half of Brits think that science-fiction films and books influence the development of technology (54 per cent)

- 89 per cent of Brits like payments to be as fast and efficient as possible and over a third (68 per cent) admit to getting impatient if a transaction seems to take too long.

Security

- 46 per cent of 18 to 24 year olds think that new ways of paying for things will not be as secure as cash or credit cards

- Nearly two thirds of UK adults (62 per cent) worry that payments using new technology will not be secure

Populus interviewed 4,104 GB adults online on behalf of the Payments Council between 31st August and 7th September 2012. Results have been weighted to be representative of all GB adults. Populus is a member of the British Polling Council and abides by its rules. For more information see **www.populus.co.uk**

Introduction	Timeline	Our 2001 predictions	Consumer attitudes	**Looking to the future**
				Report by Dr Ian Pearson

◄ PREVIOUS   NEXT ▶   16

LOOKING TO THE FUTURE

Report by Dr Ian Pearson
Lead Futurologist, Futurizon

About the author

Ian Pearson is a full time futurologist, tracking and predicting developments across a wide range of technology, business, society, politics and the environment. He is a Maths and Physics graduate and has worked in numerous branches of engineering, from aeronautics to cybernetics, sustainable transport to electronic cosmetics.

He was BT's full-time futurologist from 1991 to 2007 and now works for Futurizon, a small futures institute. He writes, lectures and consults globally on all aspects of the technology-driven future. He has written several books including 'You Tomorrow', and made nearly 500 TV and radio appearances. He is a Fellow of the World Academy of Art and Science, the World Innovation Foundation, and the Royal Society of Arts and a Chartered Fellow of the British Computer Society. He holds a Doctor of Science degree from the University of Westminster. Full contact details are available on futurizon.com.

LOOKING TO THE FUTURE Report by Dr Ian Pearson, Lead Futurologist, Futurizon

Most of us have used credit or debit cards to pay for things for decades, but in the last few years we have also adopted some new electronic payment systems. Many use Oyster to pay tube fares, we may use Girovend in our office restaurants, use PayPal online, and even use our mobiles to pay for coffees. We are also increasingly used to alternative forms of currency such as air miles or supermarket loyalty points. Most of us have also got used to having to remember passwords or personal identification numbers (PINs) to get into our bank account or authenticate a card transaction.

New technologies are opening up new opportunities for businesses to offer new kinds of payment and new forms of currency. Some of these will fail in the market and some will stay. By 2025, we will all be used to paying for things in a variety of new ways, and authenticating payments in new ways too. This paper looks at some of the changes I believe could be coming along and the key factors that will determine which ones will have a lasting impact.

Technology generally succeeds or fails depending how well it meets our everyday social needs, so it is a good idea to look at these. Then, expanding on one important area of these, security, we will address some other key factors that will affect adoption. We will consider how all this could play out in the 5 and 10 years periods, leading up to an overview of how payments will look in 2025.

2025 has been chosen for this report because it is far enough away for technology to have time to develop and mature, and for society to adopt or reject the various types of contenders, but not so far in the future that predictions are just guesswork or science fiction.

continued

SOCIAL DRIVERS

Human nature hasn't changed much in thousands of years, and technologies that work with our nature are more likely to thrive. Mimicking rituals that we have always used in everyday interactions is a sure foundation for the long term future. That implies success for interfaces like speaking an agreement to pay someone, making good eye contact, shaking hands on a deal, taking a virtual product off an augmented reality shelf, even tossing a virtual coin into a virtual hat, or pointing a device in their direction and making a gesture.

Simplicity

Adding lots of fashionable technological complexity can be fun for a while but would have shorter longevity. Simplicity and naturalness will be the long term survivors in payments, as in everything else. That implies intuitiveness, trust, and security too, as these are all essentials for something to be taken for granted and be naturalised.

Social networks and trust

Social networks such as Facebook and Twitter are well established, successful partly because they tap in to an innate tribalism that is part of our human nature. This flourishing tribalism makes it easier to form groups for bulk purchase, discount communities and community based cash forms and payment mechanisms. In a globalised world, community-specific trading systems are flourishing, with their own local currencies. These range from exchanging favours or work chores to simple things like babysitting circles, and actual payments being made using anything from web databases to exchanging pieces of hose pipe. Users of local exchange trading systems are creative!

Governments and some companies are moving away from strictly financial assessments of wealth and incorporating more quality of life measures, and social strengths are big components. Far future companies will become much more integrated into the fabric of communities. This makes community cash forms and direct peer-to-peer payment systems more viable, but also means social networks will keep companies in check and punish those that misbehave.

As social entrepreneurs continue to make clever use of the web and phones, some social network based payment systems could be developed that are free of commission and fees, and if so, they will provide strong competition for today's payment systems, which charge retailers a percentage of each transaction. Governments would encourage this since removing fees and commissions will be an economic stimulus equivalent to reducing VAT. Tribal social networks will therefore be a key driver of change for banks, credit card companies and phone based cash providers.

This will also make it hard for walled gardens to survive, where companies try to take a slice of each transaction on their systems. People will demand the ability to spend their own cash on any platform without having to pay commissions and social entrepreneurs will deliver the means to do so. Companies that try to resist will suffer and likely see people simply boycott their platforms.

continued

Walled gardens

A walled garden is a technology term used to describe a carrier or service provider's control over the types of information that users have, such as placing restrictions over the type of applications, content and media on a device (such as a mobile phone with internet access). The carrier retains control over what the user has access to and therefore can retain exclusivity of that content, but if a rival carrier provides a more open service with less control, it may be a tempting proposition for the customer.

There is huge potential for integrating many forms of value into the same payment system. Rather than just 'Pounds Sterling' – store rewards, air miles, babysitting tokens or any other forms of cash could be integrated into the same exchange systems. This would allow the creation of structures for direct trading of these new types of currency by individuals, and businesses will face increasing pressure to allow this.

Trust is a key factor in any financial service, and companies are learning fast. Google+, requires people to use their real names, unlike Facebook. Knowing whom you are dealing with makes any kind of interaction more secure and this will be important for social network based payment systems. Social networks will be important in many future payment systems, and ones that have trust technology built in will likely flourish.

Accessibility

Accessibility is essential for success. Everyone needs to be able to make payments, not just those with a particular kind of gadget. Adoption of smartphones or keeping investment costs low accelerates deployment, but no device or operating system is used by everyone. It is also important that we can still pay for things even when our phone battery is flat or there is a poor signal, or no access to satellite positioning to certify location. Coins and notes used to be universally accepted but the spread of various electronic payment mechanisms that offer reduced handling costs for suppliers means that, in a few circumstances, they no longer are. The result is that no universal electronic payment system exists now and there is fierce competition to try to grab market share, and this may mean some incompatible parallel systems in place. However, the more competition and uncertainty that exists in the electronic payments space, the more market share will be retained by hard cash – coins and notes.

Anonymity

Demand for at least one anonymous form of payment will be one of the reasons why hard cash continues to survive. Anonymity is not essential for a payment type to flourish, but electronic payments won't be used 100% of the time, since they can be more easily tracked. However, governments may use crime reduction as an argument to justify making payments harder to do anonymously.

SECURITY

We all learn as small children why we need to take precautions when we handle money. Security is an essential part of any financial transaction. With hard cash, it is simply a matter of spotting forgeries and making sure you keep your purse secure. With electronic payments, the risk of theft from a distance exists, and so does the potential to fake identity to spend someone else's money. A lot of security measures have therefore evolved around all the various forms of cash and payment mechanisms. Some of these work well in science fiction but not so well in practice.

Iris recognition is a good example of a fantastic technology that sadly is hard to implement in the world of routine payments. Iris recognition just involves looking into a camera, and the computer recognises your eye. In practice, you have to make sure you hold still to enable the reader to get your iris in focus, which takes time and can be tricky. You'd also need to convince every customer to participate.

Face recognition

Face recognition as a security measure is at least as old as the technology to take photographs, yet authentication via photos is not very secure. Face recognition falls foul of the commonest bypass in biometrics (as does iris recognition) – persuading someone that it really is you in spite of the biometric recognition failing (e.g. it is me, but I just got my hair done this morning). The use of photos as a security feature has been incorporated into some new mobile payment systems like Square, the US phone app that allows small businesses to accept card payments. Yet it sometimes fails as a security measure because some people upload pictures other than their own, and it only works when the person trying to pay has their phone with them. Many people are similar in appearance too.

In fact, adding any other security 'token', such as a PIN, gesture or voice recognition, would make the use of photos better as a trusted payments mechanism. Combinations of security tokens increases security, but this comes at the expense of simplicity, speed and accessibility. We accept different trade-offs in different circumstances, and are generally happier with heavier security measures where larger transactions are concerned.

The presence of the phone is a useful additional security measure in itself, since people generally take care of their phones and quickly report them missing if they are lost or stolen. The phone can communicate electronically with other devices at high speed too, to transmit any required data associated with the transaction. So they can help confirm the carrier is who they claim to be. Smart phones can even run security apps such as fingerprint or voice verification, so can help in authentication at several levels.
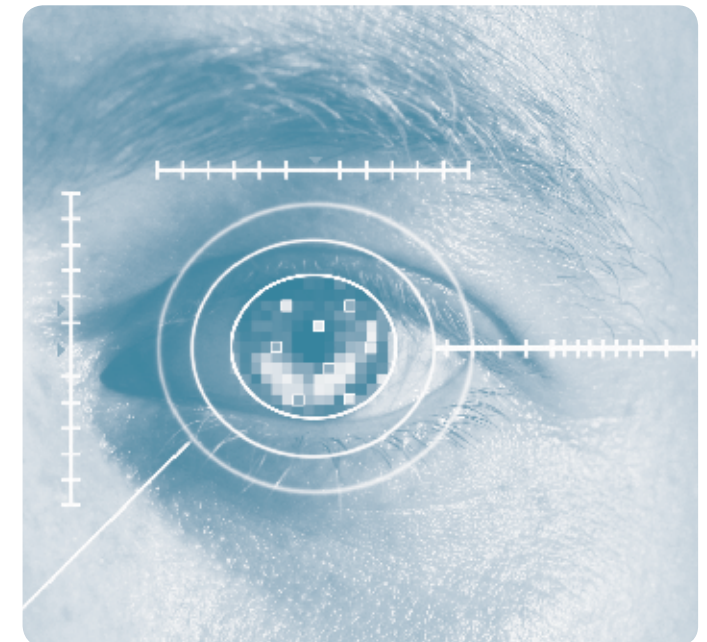
Security jewellery

We will soon see pieces of security jewellery entering the market for payment authentication, such as electronic signet rings. It is a lot harder to lose a ring than a mobile phone. Other pieces of jewellery could also be used, such as necklaces or ear rings, but rings have the advantage of being on the finger so are likely to be easier to get physically close to a reader. I'll talk about jewellery a lot more, throughout this report.

On the fringes of acceptability are security technologies such as pet identity chips that can be implanted into the forearm. A few people are technophile enough to want to use these, and they are already used in some clubs, but the vast majority of us wouldn't accept this level of invasiveness.

Some credit cards and mobile phones use near field communications (very short range radio transmission that is only activated near a scanner) to allow payments just by waving them near the reader, (near meaning within a few centimetres). The perception of risk from near field comms has been growing of late, (e.g. concerns about thieves brushing past with scanners hidden in their clothes) but banks can easily address such concerns by requiring the use of other security tokens such as a PIN entry before a payment is made.

Tiny cameras are a problem for security, being ever easier to hide in bank machines or near shop counters. If cards can be skimmed in some way (e.g. using readers in the card slot entrances) and PINs picked up by watching typing, then this is a clear risk that is likely get worse.

Smart dust

Smart dust is a term describing dust sized particles that contain electronics. It is still partly science fiction, since what usually passes as 'dust' today is still several millimetres across. However, in the long term, 2025-ish, it will be possible to make electronic devices smaller than a speck of dust that contain significant capability (i.e. smaller than a tenth of a millimetre, which is the threshold of visibility for most people). These could easily be concealed anywhere, even on banknotes. It will be possible to make them so lightweight that they can float into buildings via air conditioning systems, land on keyboards, and intercept keystrokes even before the sensitive data gets into the computer's security defences, or brush onto clothes by casual contact to record gestures. Smart dust could also be sprinkled into office machines and detect anything printed or copied. The ability of smart dust to intercept signals, passwords and generally eavesdrop on transactions via computers means that it will undermine the confidence in the security of electronic payments.

continued

| Introduction | Timeline | Our 2001 predictions | Consumer attitudes | **Looking to the future** |
| | | | | Report by Dr Ian Pearson |

◀ PREVIOUS   NEXT ▶   22

Handshakes

Not all new technology is a security threat. Some could help make payments easier and more pleasant. In the late 1990s, The Massachusetts Institute for Technology (MIT) demonstrated that data can be transmitted electrically through the skin, so that an electronic business card could be exchanged via a simple handshake. They showed a data rate of 2Mbits/sec was achievable even then (equivalent to over 100 pages of text during a handshake). Clearly, this sort of mechanism could also be used as part of authentication process for a transaction, with plenty of capacity to carry all the data needed. Handshakes are a well-established social ritual that has always been used to express trust or friendship, so using them as part of payment transactions would feel very natural.

The amount of money transferred during a handshake could be stated verbally, typed on a smart phone display, or even determined by a gesture. Electronically augmented handshakes could enable easy certification and recording of identities of the two parties, time and location for tax or legal purposes, legalising documents or contracts, or even to initiate large financial transfers. Any number of other rituals or tokens could be added to increase the level of security.

Fingerprint

When people think of how they will authenticate payments in the future, fingerprint recognition is often one of the first options they consider. Fingerprint recognition has been around quite some time, but at best works to varying degrees. It isn't secure on its own either. It is pretty easy to get hold of someone's fingerprints. They could be lifted from a glass used in a pub, or from many surfaces in a hotel bedroom. (DNA samples are similarly easy to get hold of, in hairs left in hotels or on public transport, so are also inadequate as a reliable form of ID verification).

By themselves, fingerprints are inadequate to authenticate valuable transactions, and should only be considered as part of a security process in conjunction with other security tokens, such as a card, PIN, voice or face recognition or gesture. But new systems could be made that combine these in ways that can be friendlier and integrate more comfortably into everyday social culture, such as handshakes or other gesture use.

Secured payment zones

Another area where technology can help reduce inconvenience associated with making secure transactions is to make trusted zones, where lighter security is adequate. This can be arranged by using location data from urban or satellite positioning systems as part of the security protocol. This information could be used to mark out the physical boundaries of premises such as a bank branch, where local physical security would offset some of the risks associated with a payment. Businesses may choose to police such systems in their own shops or malls, and take on the risk of fraud instead of the customer. Making transactions feel easier and safer will often increase business.

continued

FUTURE DEVELOPMENTS

Games technology is likely to be a convergence point for some of the advances in shopping. People will often wander in computer-generated 3D worlds when they play games, and will often use the same technologies when they shop. Included in this are the semi-transparent video visors likely to become common in the next 5 years. These will superimpose computer generated graphics into our field of view via a visor. This is called augmented reality (simply the normal view of reality, augmented by the addition of computer generated information or graphics). They will be followed by the first generation of active contact lenses by 2020 that do exactly the same function, but shrunk down into a contact lens. These could be commonplace in 2025.

A new shopping experience

Augmented reality will be used extensively in shopping, with virtual devices and gestures used to pay, adding electronic signatures and security onto simple physical transactions and making shopping more 'natural'. On the web, shoppers will expect to be able to use similar interfaces to those they are familiar with in the high street, as well as more familiar web ones. This interface-level convergence of the real and physical will destroy many of the boundaries between web and high street shopping, but will also increase markets for electronic payments.

Augmented reality removes the need for plastic cards, which can be virtualised, and even mobile phones – as we know them today – are likely to vanish in this technology background, replaced by assorted digital jewellery and video visors. Card providers could preserve their services with virtual cards but they would have to offer them through an augmented reality interface layer that would be controlled by other companies such as Apple, Google or mobile network operators, and these companies will probably look to launch rival services of their own.

Plastic cards could fight back against being absorbed into smartphones by offering e-ink (like Kindle) displays on the card to provide useful services, such as navigation, shopping around, discounts or even to replace tickets, boarding passes and various other financially or identity-related products. Although expensive today, costs will fall fast.

continued

Future kinds of currency

The nature of cash will change. In 2025, many people will use PayPal, electronic vouchers, virtual currency such as BitCoin and others yet to enter the market. Although PayPal is used to facilitate transactions in other real currencies, there is no fundamental reason why it could not have been a currency in its own right, and PayPal could still develop one. These kinds of electronic payment need not depend in principle on other forms of currency.

As a promotional tool, to encourage sales in quiet periods, retailers could issue vouchers that are worth different amounts in different circumstances, such as varying by time of day. The value of cash would therefore depend on the circumstances of its use. Algorithms could take into account time of day, the identity, age, employment status or social group of the user, location, or indeed any other measurable factors.

Electronic cash offers the potential for tracking payments too, enabling a wide range of options – for example you could earmark some of your kids' pocket money for certain kinds of produce, so that they can't spend it all on sweets. Electronic chips could also be added to physical forms of cash such as notes or coins to let them also be tracked easily. Tracking electronic cash in this way could also lead to a situation where, by being able to show exactly where the money has previously been, an electronic note or coin may be worth more than its 'face value', if it has been spent previously by someone famous. Cash could accumulate provenance and collectability in the same way as antiques that have been used by the famous. Also we will see some celebrities with their own cash brand, or endorsing a particular form, or helping design it, just as they do today with perfumes.

Trackable electronic cash also allows taxation at the point of sale, where the cost of the payment depends to some degree on the tax liability of those taking part in the transaction. Similarly, benefits vouchers could be implemented electronically, reducing black markets by ensuring they are only spent on what they were intended for. There are obvious political considerations for deploying such developments, but the technology is certainly feasible.

Global electronic currency

Many people would prefer currency that is accepted globally, since it would avoid many of the expensive currency exchange costs currently present in travel. Corporations have advantages over governments here, both in geographic presence and trust, so we may well see a few corporate currencies, backed up by alliances of large companies rather than governments. These could work with existing payment mechanisms such as PayPal, or they could incorporate their own mechanisms and compete with PayPal.

Introduction	Timeline	Our 2001 predictions	Consumer attitudes	**Looking to the future**
				Report by Dr Ian Pearson

◄ PREVIOUS   NEXT ►   25

Miniaturisation

Electronic devices will continue to shrink in size (except of course where they need to be large for some reason). As I stated earlier, in the next few years, digital jewellery will emerge, and ultimately, this might even cause the disappearance of phones in the form we have them now. Many tiny pieces of jewellery such as lapel pins, rings, badges, necklaces, even ear or nose studs will carry out a wide range of electronic functions, so phones could be replaced by a range of jewellery with specific functions. Some of these will be used in security systems, such as identifiers, encryption devices, accelerometers (the clever device inside your smartphone that detects and measures movement and orientation) and personal profile managers. A high degree of personalisation will be possible, and using combinations of personal devices, gestures or procedures can increase the level of security enormously.

3D printers already allow small accessories to be printed at home from downloadable templates. Some of these could have chips added during fabrication for security purpose such as authentication. So someone might print their own digital jewellery in their home or office, and could incorporate their use in personal or business-specific security protocols. Local businesses that offer commercial 3D printing on more sophisticated machines will also become widespread.

Social rituals

Humans are social creatures and over millennia have evolved a range of sophisticated rituals for greeting other people, forging agreements with them and finalising transactions. These include simple nods, full bows, handshakes, salutes, signatures, and use of wax seals. The first of these lend themselves easily to adding accelerometers or even the camera-based gesture recognition already common on games consoles.

The wax seal used with a signet ring to authenticate letters also is suited to modernisation. It would be quite easy to make security wax that incorporates some special ID particles. These could work by using molecular signatures (a personalised mix of special molecules), fluorescence (shining with a particular colour mix when exposed to UV), radio or infrared signature or even visible light emissions. Or they could just respond electronically when asked. Much easier.

The special security wax particles could be programmed with a code by contact with the ring. A fingerprint in the wax at the same time could be a nice touch too. Security wax would therefore be a good security addition. Any melting or reforging of it would affect distance between the particles, or their temperature, measurement and recording of which could also be added as extra functions.

Fingerprint security enhancement

It is possible to print simple electronic circuits onto almost any firm surface using inkjet printers, and this could easily combine with existing fingernail printers to enhance security when fingerprints are being used. Similar functions could be added into digital signet rings of course. Either of these would allow interaction with an electronic circuit to be integrated into a fingerprint scan. Depending on the electronics, this could offer one-time codes or a personalised algorithm. (One time codes are codes that are only used once, and a new one is calculated each time according to some clever mathematical procedure that uses the time and a few equations). Your internet banking may already use a calculator-like device that creates a one-time code each time you use it. In future, a ring could also contain an accelerometer, making it easy to add gestures into the authentication process. This could be a particular hand movement or a signature.

Fingerprints could safely be used as a simple biometric part of such a system, and if the added security is via electronics on the fingernails or a ring on the same finger, it would be totally unobtrusive. It would still be possible for a mugger to steal the ring and take a fingerprint but the use of one-time codes makes it easy to cancel it. Adding the accelerometer and the third security token of gesture recognition would make it very secure, almost impossible to steal.

Further in the future it will be possible to print electronics into the skin itself, in among skin cells. This could be done using compressed air jets to blast 10 micron sized electronic capsules into the skin. This is already done with similar sized drugs particles today, so no new technology is required except ongoing miniaturisation and encapsulation in body-safe material. Depending on the printing depth, these devices could stay in the skin for variable periods. Surface layers would wash or wear off in hours to days, whereas deep printed devices could stay for life. Again this offers an unobtrusive way of adding enormously to the level of security possible using fingerprint scans. They would be impossible to steal without severely physically assaulting the wearer, although the wearer could still be forced to make the transaction themselves.

As an alternative to a complex circuit printed into the skin surface, a more reliable and less intrusive mechanism may be to print an 8 x 8 array of magnetised particles into the skin surface. These could be around a micron is size, maybe smaller, so would be invisible, but could have their polarity changed each time they are used to make a readable one-time 64 bit PIN. This could add high security to an otherwise insecure fingerprint recognition system.

DR PEARSON'S PREDICTIONS

There are a lot of changes ahead for payments, but they won't all come at the same time. On these pages, Dr Pearson summarises his view of the key changes, and when they are likely to arrive

5 years

- The next five years are critical for the success of electronic payments, particularly Near Field Communication (NFC), the technology used on contactless cards or NFC-enabled mobile phones.

- Rival smartphone operating systems will battle for supremacy with supposedly safer 'walled garden' versions such as Apple's iPhone iOS where the company that created the software can restrict access to non-approved applications or content, competing with open but supposedly risky ones such as Google's Android.

- Many new payment systems are emerging, hoping to grab market share, often using the phone as both proof of presence and to run the app that processes transactions. Some of these payment systems will be cross platform, while others won't, echoing the battle over smartphone operating systems.

- Security will be critical for all of these emerging payment systems – the next five years will thoroughly test them with imaginative and sophisticated attacks. Significant security breaches for any of them will tarnish the whole market.

- Low battery life and signal coverage problems will combine with security issues to guarantee the continuation of physical cash. Particularly at stake are biometric based systems such as face, voice, fingerprint and iris recognition – security fears will either be confirmed or proven misplaced, and that will determine the longer term future.

- Battery drain on phones will remain a problem, particularly when people have to use many applications that rely on continuous access to wireless comms or positioning systems.

10 years

- If electronic cash is shown to be secure and systems proven to meet the other needs such as universality, interchangeability and convenience, then electronic cash should accelerate rapidly over the 5-10 year period.

- Walled gardens are unlikely to survive much into this period, since people will want to spend how they choose. A variety of devices will be used to manage payments. Some will be offline devices, others will use the network, some will use either, such as mobiles. Some will be cloud based, but systems that need network access will fail if high speed coverage isn't excellent everywhere.

- Digital jewellery will make large advances in the 5-10 year period, and some will be designed as means to hold or transfer cash or authenticate transfers. Pieces of jewellery could be worn so as to make transactions very simple, while verifying presence, and even combining with electronic data transfer during a handshake.

There will be many more ways to accept payments for businesses and individuals as the technology required to accept credit cards or contactless mobile phone payments becomes cheaper, and evolves to accept signals from tiny Radio Frequency Identification (RFID) chips or QRcode jewellery, provided additional tokens are present. Rings could contain accelerometers too so that signatures or other gestures could be verified and transactions digitally signed. Combining this with handshaking could permit data transfer via the skin, or via radio to another piece of jewellery.

2025

- By 2025, most of the major battles will be over and people will be able to spend their money electronically anywhere without worrying about what kind of devices or apps they have or whether there is a good signal there.

- Even in 2025, there will still be times where coins and notes will remain useful, so they will stay in common use too. The ongoing battles with fraudsters over security and among competing businesses and products for market share will ensure that it will take much longer than 2025 for electronic payments to approach full market penetration.

continued

The far future, 2040

Technology won't stop developing in 2025, but it becomes more and more uncertain. As we start to use the skin as a platform and link into the nervous system, and even start to make direct links into the brain, whole new realms open up for payments. It may be possible to pay just by thinking the intent to pay, or snapping your fingers. Thought recognition is feasible, but this is an excellent example of the level of uncertainty in the far future. How reliable it will be, and how much we can learn to control our thoughts to make it useful remain to be seen. It is possible to read a PIN by thought recognition even in 2012. Security concerns could potentially wreck such payment methods in the long term. Also in the further future, there is much more scope for radically new inventions to change the whole field. So, although 2025 is close enough that we already know most of the technologies that will have enough time to play out properly, that simply isn't the case for 2040 or beyond.

Conclusion

By 2020 and certainly by 2025, electronic payments will have matured to be even more secure and easy to use, available to everyone, pretty much everywhere, almost all the time. But even in the 2025 period, in spite of a range of electronic currencies, and electronic ways of paying, coins and banknotes will still be in common use.

We won't have to learn lots of new tools. The good news is that some of the new technologies will hide in the background or be integrated into everyday social rituals like handshakes. The technology will adapt to us, making it easier to pay for things, even for people who dislike technology. As in so many other areas, the more advanced technology becomes, the less visible it will be, and the more human.

pay
your
way

payyourway@paymentscouncil.org.uk

PAYMENTS
COUNCIL

DRIVING CHANGE IN UK PAYMENTS

September 2012