Deloitte.

The Future of Exchanging Value

Cryptocurrencies and the trust economy

Centre for the *Edge*
Australia

Contents

Foreword

Ice becomes water when warmed. Only familiarity prevents us from marvelling at the mysteriousness of this 'phase change', as physicists call it. Nevertheless, we've witnessed a similar phase change as the physical hardware that delivered the phone network was repurposed to also deliver a new network – the Internet.

And where the phone network depended on point-to-point connections, the Internet connects people via packets of information that travel through cyberspace until they arrive at their address.

Initially, the old 'connect first' phone network was monopolistically competitive. The upshot of that market structure has produced all manner of frustrations and complexities, such as incomprehensible pricing structures and prices way above cost for peripheral services such as texting and international roaming. However, all this is different online because of the different market structure produced when each node in the network helps out – redirecting digital packets in return for reciprocal help from other nodes.

Thus, all the transaction costs of the old network melt away. If you have a great product – such as Google, Wikipedia, Salesforce or Xero – you can just put it on the net and it's there for everyone. And we've watched on as this miracle has unfolded, just as astounded as if we were watching ice melt for the first time.

This analogy helps us understand the potential costs of a financial system that looks like the phone system – with complex terms, price gouging, etc. For me to exchange value with, say, an American airline, I'll pay about 2 per cent commission to a bank to facilitate the cross-currency transaction. That amount vastly exceeds the bank's cost. Large corporates get the same service for a 20th of that margin!

So the hunt is on for the 'internet of money' – a technology and overarching architecture to displace the oligopolistic position of the too-big-to-fail banks.

It's a reflection of these exciting times that less than four years after the first instalment *The future of exchanging value: uncovering new ways of spending*, Deloitte is up for a sequel. *Exchanging value 2* explores this world pregnant with possibility ranging from the edges of the payments system to its centre and it shows that the architecture of the system is up for grabs.

Read it and try to keep up with our runaway world.

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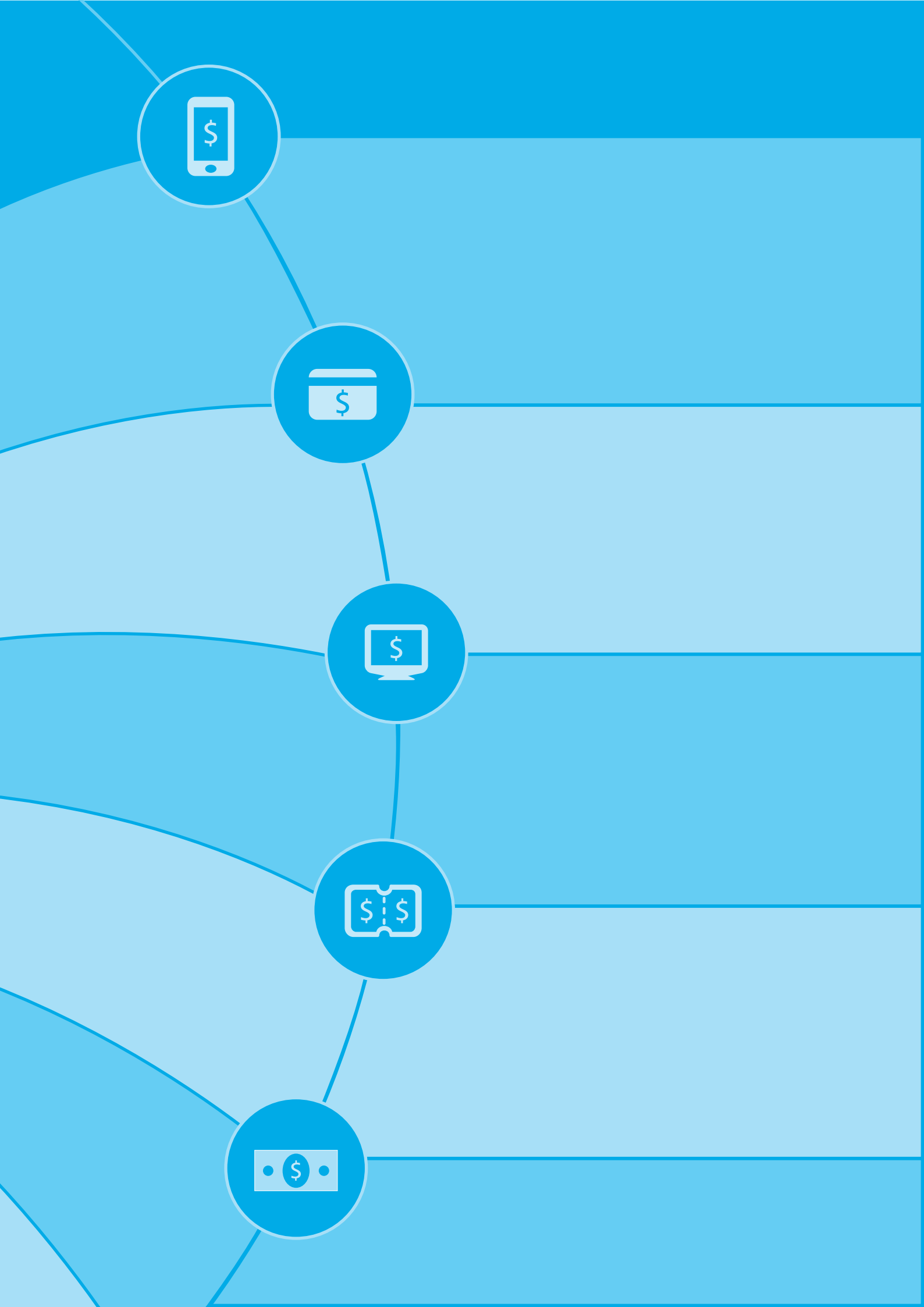
1 Exchanging value



In 2012, we published a report entitled *The future of exchanging value – uncovering new ways of spending*[1] which broadly examined how money is used rather than focusing on individual elements such as payments, currency, and so on. Our view was that only by looking at the whole system could we understand how the financial system might evolve.

Our findings in that report centred on the realisation that we were reaching the end of the initial build-out of a digital payments infrastructure. The task of provisioning the infrastructure merchants require to accept real-time digital payments, or for two individuals to settle a debt, was largely complete. Consequently, our focus had shifted to streamlining the buying journey – from the pieces and parts to the whole.

The rush to implement near-field communication (NFC) technology such as payWave and PayPass and the then recent emergence of Bitcoin and other complementary digital currencies were part of this shift. The business case for NFC has been built around streamlining the checkout experience and reducing fraud rather than providing a distinctly new capability. Bitcoin was proposed as a cheaper, more efficient mechanism for peer-to-peer payments and currency transfers.

In the first report, we reasoned that the future of exchanging value would stem from how consumer behaviour changed. Like many areas of society, consumers rather than businesses or governments are setting the technological ground rules. We suggested that organisations needed to look beyond traditional payment platforms, narrowly defined in terms of features and functions, and consider their customers a broader 'job to be done'.

What was needed was a customer-centric approach – one focused on simplifying the buying journey by ensuring the right payment solution was available in the right place at the right time. Payment solutions needed to be perceived as instantaneous by their users, allowing users to exchange value and move on with their day, whether they were interacting with an established merchant or simply standing on the kerb splitting a bill with friends after an evening meal. The solutions needed to be ubiquitous, allowing customer and merchant to transact at the far end of the store or deep in the aisles just as easily as if they were both standing next to the till. And finally, these solutions needed to be open, both in their implementation and governance, so consumers could understand and develop trust in these new ways of exchanging value. The next generation of finance solutions should be seen as tools to improve engagement with customers rather than as service delivery platforms.

As it turns out, the first report was published at the leading edge of an explosion in the use of new payments technologies and complementary currencies. Many of the predictions we made in the first report came true.

We saw NFC as an interesting technology but the business case was not as strong as the technology's proponents claimed. Most of the wasted time and effort in the buying journey was in taking the goods to the till and tallying them, not in the final transaction, which would lead many merchants to view NFC as an excuse for the card providers to increase fees at the expense of the merchant's margins. Since then, some retailers in the US have banded together to create an alternative payments platform, called CurrenC™, intended as a lower-cost alternative to the solutions from the entrenched payments providers. There is also anecdotal evidence of many merchants adding a surcharge for using a card, or providing incentives such as prize draws for customers who pay cash. Apple also introduced Apple Pay, which showed the industry how to build a payments solution using existing standards and deliver a much higher-quality and more compelling user experience.

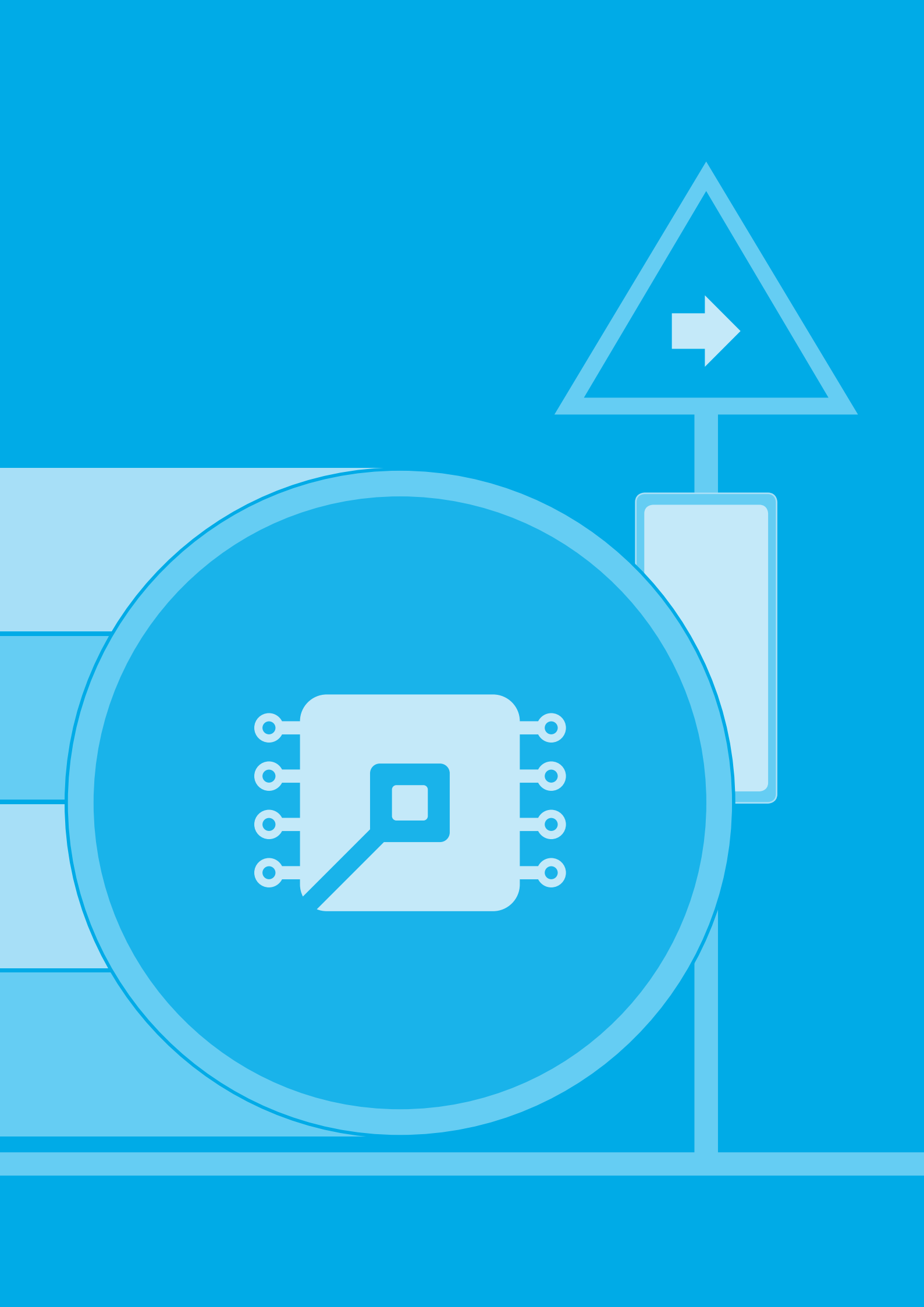
We considered Bitcoin and other cryptocurrencies (which use cryptography for security and anti-counterfeiting measures) in the context of the long history of complementary currencies – from recent schemes such as Bartercard through the demurrage currency from the Austrian town of Wörgl in the 1930s, and back into history. We viewed with scepticism claims that cryptocurrencies were unique and unprecedented and would result in a huge shift of value from traditional state-sponsored commodity and fiat currencies to stateless cryptocurrencies. We expected cryptocurrencies to have a role, as the idea of a virtual, digital currency is a good one, but we saw nothing inherently different from the more traditional complementary currencies. All complementary currencies have since been brought into existing regulatory frameworks once they threatened the tax base. The same is true for Bitcoin and the other recent cryptocurrencies, which are being pulled gradually into established regulatory frameworks.

We also highlighted how moving the exchange of value from the physical to the digital – and the creation of virtual (borderless) currencies – would create new opportunities for fraud and crime. Digital networks have fundamentally different threat and risk profiles than the physical environment, and organisations that choose to transact via digital technology can easily be caught unawares. The root of this difference is that in the physical world – the defender has a significant advantage, while in the virtual world, the attacker has the upper hand. In the physical world, the attacker must struggle with the challenge of marshalling the necessary resources to attack the defender's heavily fortified castle. In the virtual world, this is no longer true, attackers can co-opt resources and marshal them to attack from the dark corners of the Internet.

Operational risk is disconnected from a physical presence and established governance. More, and often small firms, are also coming under the eye of anti-money laundering/counter-terrorism financing (AML/CTF) regulators in the online marketplace. Online businesses are finding their services used for laundering money. Examples range from the prosaic, such as fraudsters washing money from stolen credit cards though myki (the Victorian transit pass) and eBay[2], through to more innovative solutions such as thieves crowdfunding themselves[3]. Even pubs and clubs with pokie machines and ATMs are coming under the wary eye of the regulator. An extreme example of this is Bitcoin mixers[4], which were developed to industrialise the process of mingling legitimate and illegitimate transactions, rendering illegitimate transactions untraceable and facilitating money laundering on a large scale at a fairly low cost. Participating in the digital economy means being exposed to new and unfamiliar risks.

In this report, we explore the pros and cons of the proliferation of new payments solutions, technologies and currencies, and how they are shaping the way we exchange value.

2 Technology-driven change



How we pay for goods and services and exchange value is clearly changing. Cheap and ubiquitous digital communication is moving payments from the physical to the digital world. Actions that would have seemed bizarre only a few years ago – such as buying clothes or renting a movie using our phones – are now common practice. We are organising our lives differently, storing our savings in our mortgage or investments then using credit to manage our daily cash flow. We have the convenience of debit and credit cards to pay for even quite cheap items.

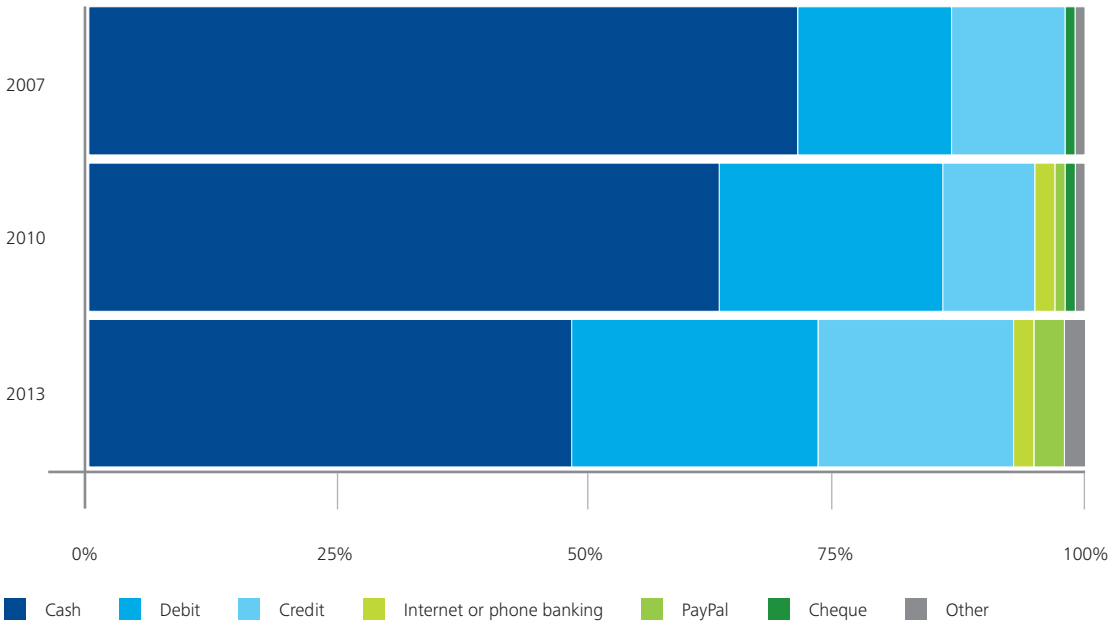
The introduction of the consumer Internet – and the smartphone in particular – has resulted in a raft of new payments solutions and financial products, each designed to erase one of life's little annoyances or provide access to a financial product. New technologies and the new payments solutions that use them are shaping how we think about and pay for the products and services we consume. We are choosing to pay with the tap or wave of a card, click of a mouse or the tap of a finger, rather than handing over the folding currency that has been used for generations.

Payment trends

There is plenty of anecdotal evidence that how we exchange value is changing, the most obvious being the rapid growth of the FinTech (financial technology) start-up community. Consumers must be using at least some of the solutions coming out of this area for the sector to be growing so strongly. There's a lot of noise, but is this noise borne out by data?

The most recent Reserve Bank of Australia's (RBA) Trends in Retail Payments[5] survey (the third in a series) found that the use of cash and cheques – the two main physical mechanisms for exchanging value – had both declined noticeably over the previous three years, while the main electronic forms of payment (debit and credit) increased. The hurried trip to the bank late on a Friday afternoon to obtain enough cash to last the weekend is a distant memory.

Figure 1. Percentage of each payment type

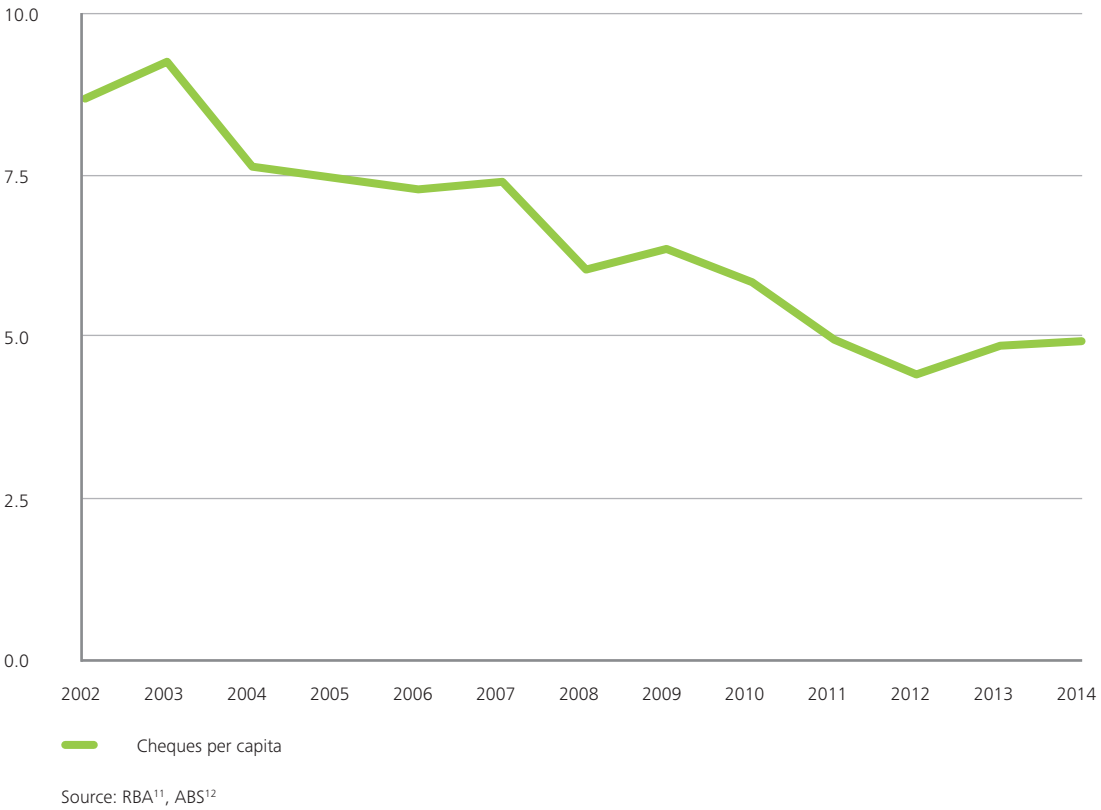


Source: RBA[6]

The use of electronic funds transfer is increasing at the expense of cash and cheques due to a number of factors. Cards are being used in preference to cash and to buy more expensive things; transaction value and volume are increasing across all digital mechanisms. Point-of-sale technologies have streamlined the buying experience, the most recent of which is NFC-based contactless cards. The convenience of contactless cards is leading consumers to use them even for quite minor purchases and was one of the drivers of Apple Pay in the U.S. At the same time, the increasing importance of remote transactions (particularly to support online commerce) is moving many transactions from the physical to the digital world. The number of electronic transactions[7] averaged about 353 per person per year in Australia in 2013, an increase of about 48 per cent from 2007.[8] In 2013 cash payments accounted for only 18 per cent of the value and 47 per cent of the number of transactions.[9]

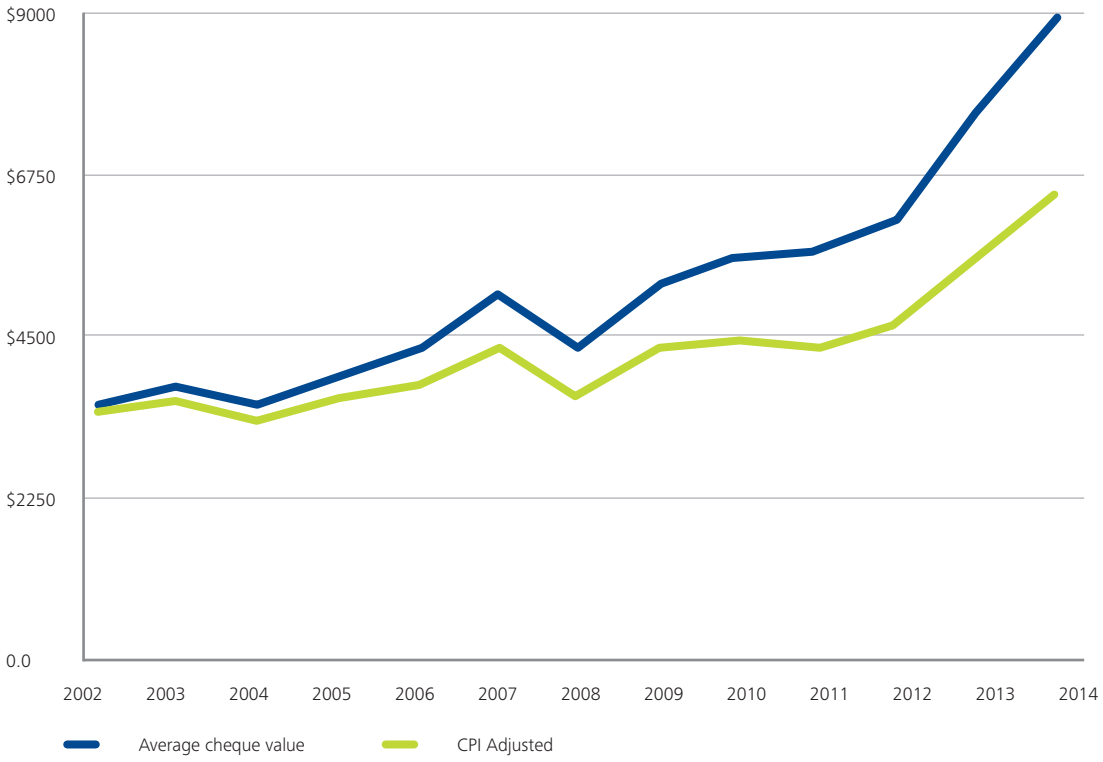
Despite all this technological innovation, and the fact that the use of cash is in decline, cash is still the most frequently used form of payment. Consumers use it for most of their low-value transactions – about two-thirds of all payments under $20. Cheques, in contrast, are retreating to the high ground. While their use is also in decline – with an average of eight cheques written per person in Australia in 2013–14, down from 28 cheques per person 10 years earlier – the average value of a cheque rose by 19 per cent to roughly $6,800 in 2013–14.[10] Cheques are mostly used for high-value payments where there is currently no suitable digital alternative. This shift to digital payments suggests that the future of payments is online.

Figure 2: Cheques per capita



Source: RBA[11], ABS[12]

Figure 3: Average cheque value



Source: RBA[13], ABS[14]

As more payments move online, many are now being processed in real time. New platforms are being developed that enable instant transfers of value – of even quite low amounts – between institutions, between individuals and institutions, and even between individuals by supporting new 'split the bill' functions. Start-ups such as Stripe[15] and Square[16] are the architects of some of these platforms, as are industry groups and government bodies such as the Australian Payments Clearing Association's (APCA) with its New Payments Platform and the Property Exchange Australia, which has launched an electronic conveyancing platform.

Support is building to eliminate physical money. This would improve in-store security and reduce cash-handling costs for businesses. Many governments have a favourable view of a cashless society as it would reduce tax revenue leakage and remove an important tool from organised crime (which is why many governments have been retiring the highest denomination bank notes). Denmark has started down this road by proposing that by January 2016[17], selected retailers (such as clothing stores, restaurants and petrol stations) be no longer obliged to accept cash, though there are some fears this might increase the risk of fraud. Essential services – such as post offices, hospital cafeterias, dentists and chiropractors – would still have to accept Danish krone.

The prospect of a cashless society raises important questions as the less fortunate members of society, who often can be unbanked, could find themselves further marginalised if a bank card of some kind was required to access many products and services. Western populations, with their extremely high banking penetration and ubiquitous payments infrastructure, can address this by ensuring that even the poorest segments of society have access to bank cards. Some governments are even starting to pay benefits electronically, using the savings from electronic payments to offset the cost of issuing cards to the individuals receiving benefits.

Merchants are also turning to loyalty cards, using the value held in the customer's loyalty account to manage the relationship. Research shows that consumers choose brands that offer loyalty rewards – and spend more with them – over brands without, preferring store credit over other rewards. "Basic monetary rewards give retailers a 'ticket to play' in the loyalty game but the real opportunity lies in building deeper engagement with members through more personally relevant, unexpected and emotional rewards," said Adam Posner, CEO of Directivity, a loyalty and retention consultancy. "This plays out in the research, which shows surprise rewards such as a gift on your birthday, exclusive offers or special experiences go a long way to overcoming the belief that programs don't offer any real value."[18]

These loyalty programs, for all practical purposes, often use complementary currencies with an exchange rate is tied to the local sovereign currency. Nowhere is this more apparent than with airline frequent flyer programs where members leverage the program's relationship with other (sovereign) currencies to create value from nothing, such as by buying dollar coins from the US Mint with a credit card and paying off the charge immediately, a practice called 'manufacturing spend'.[19] The European Central Bank has classified airline miles in the same category as Bitcoin, while *The Economist* magazine valued the global stock of frequent flyer miles at more than US$700 billion in 2005. Airlines should be considered the central bankers for these complementary currencies, as they can unilaterally set the exchange rate (and devalue the points) or close accounts.

The increasing use of complementary currencies extends beyond loyalty schemes. One example is the small but growing movement to create local currencies. Cities as far apart as Brixton[20] and Bristol[21] in the UK, Langenegg[22] in Austria, Nantes[23] in western France, Ithaca[24] in New York, and Berkshire[25] in Massachusetts have issued their own currencies, pegged to the national sovereign currency. Technically these currencies are not legal tender, and are commonly treated as vouchers.

The intention is to try to keep money circulating in the local economy rather than having it sucked up by the national economy. Local businesses accept local money in payment for food, arts and crafts created locally. The co-founder of the Bristol Pound, Ciaran Mundy, said: "The practical vision was to get something that would connect local communities with their businesses in a way that kept money building up in their local communities. What happens is that if you spend it at a large supermarket chain, 80 per cent of that will exit the [local] economy very quickly."[26] Some communities also allow local taxes and rates to be paid in local currency, keep purchasing power in the region. The mayor of Bristol, George Ferguson, even takes his entire salary in Bristol Pounds.[27]

There has also been a large increase in the number of cryptocurrencies in the past few years, starting with Bitcoin. Cryptocurrencies are promoted as the future of money, with their low transaction fees and independence from government or central bank control. Distributed cryptocurrencies are often seen as the natural solution for exchanging value in an increasingly networked, interconnected and digitised global environment.

It's the system

The adoption of new technology is rarely straightforward. While technology can change society, society can also change technology.

Past predictions of technology-driven futures have always proven to be far from the mark. For instance, few of us have a flying car or a landing pad on the roof. We forget that our overflowing optimism for a new technology ignores many of society's constraints, and the technology's limitations, or unfortunate side effects. The invention of the nuclear reactor, with its promise of an unlimited power source, did not result in a nuclear reactor in every home, nor was the nuclear-powered Ford Nucleon[28] ever developed beyond a concept car. It's also unlikely that recent developments in artificial intelligence will put us all out of work or result in the creation of some analogue to either *The Terminator* or *The Avengers' Ultron*.

Our enthusiasm for a new piece of technology leads us to consider only the technological possibilities it seems to present – the world of the possible. We don't consider the social aspects – what society will allow or accept. History has shown repeatedly that the social aspects are as important, if not more important, than the technological aspects. The reductionist approach of technological determinism, which presumes technology drives the development of social structure and cultural values, often has proven to be wrong. Even if we can find a way to miniaturise a nuclear reactor, social pressures will shape how and where it can be used, or even if it is appropriate to use the technology at all.

As this example suggests, technological and social systems shape each other. The same is true on a larger scale. Technologies – such as gunpowder, the printing press, the railroad, the telegraph and the Internet – have shaped society in profound ways. On the other hand, social systems – governments, the courts, formal and informal organisations, social movements, professional networks, local communities, market institutions and so forth – shape, moderate and redirect the raw power of technologies.

If we are to understand the possible futures the rapidly expanding world of FinTech is presenting, we need to expand our view to consider the social systems as well as the technological systems. Nintendo's Wii and Apple's iPhone were able to sweep aside more complex and technically sophisticated rivals by paying attention to the social systems. Both products were widely considered under-powered, under-featured and technologically inferior to their competitors at their launch, but they were successful because their creators paid close attention to how consumers related to the products and how the product fitted into consumers' lives.

What is true for 'hard' technology is also true for money.

Indeed, money is a technology. What we think of as modern money emerged as a solution for streamlining commercial exchanges between two parties who know little of each other. Money is a technique – a way of carrying out a particular task, especially the execution or performance of an artistic work or a scientific procedure – for resolving the problem of the double coincidence of wants[29] in barter exchanges.

Money is a formalisation of the technique of using a third commodity with a stable value – such as gold – to facilitate the exchange of goods. Money initially was the testing of a commodity's quality and weight, and stamping a seal on it meant you knew it was good. Bank notes were created from the realisation that a deed granting ownership of a valuable commodity stored in a safe place could be exchanged instead of the commodity itself. This raised the interesting question: is money founded on debt (an IOU), or is it a commodity itself? The obvious answer is that it's both.

Before barter and the double coincidence of wants, there was debt and obligation. Communities were small (by today's standards), few people travelled more than a day's walk from home and most commerce was done with someone who was part of the same social tribe. 'Money' was used primarily to pay taxes to a distant ruler or to quantify criminal damages. The need to pay taxes in a sovereign currency drove many communities to adopt money even though they found it largely unnecessary otherwise.

The key point is that barter and money developed in response to the need to resolve obligations between individuals who don't know, or don't trust, each other. Neighbours had little need for formal money as they had little reason to engage in barter. Most debts were accounted for informally and were grounded in the individual's shared trust or their trust in the community to enforce the debt.

The degree of trust between two parties is one of the strongest factors shaping how money and the technologies around it are considered, adopted and used. English shops issued their own wood or leather money tokens for many centuries, providing customers with small change in the form of IOUs redeemable at their own stores. Often these IOUs were accepted at other stores in the local area, though merchants would demand that larger debts be settled in money accepted anywhere, typically a sovereign currency. This token money was unlikely to travel far from its source and typically never circulated more than a few blocks. This practice, while technically illegal, continued until quite recently. The development of local currencies (mentioned earlier) is a continuation of this.

Trust underpins what we think of as money.

This reliance on trust means that, fundamentally, money is a social construct. Money – any form of it – has value only when we all, as a society, agree that is has value.

Commodity money's value stems from the commodity from which it is made. Typically, that underlying commodity has value only because as a society we have agreed that it is valuable. Take gold, for example, which is chemically uninteresting as it barely reacts with any other elements and has few industrial uses. It is because gold is chemically uninteresting, rare (but not too rare, like many other noble metals) and fairly easy to refine and reshape, that makes it useful as a currency, even though it has little practical value elsewhere. Gold is valuable simply because it is attractive and its chemical and mechanical properties make it a good choice for creating physical money.

A fiat currency derives its value from government regulations or laws and is pushed into circulation by a government issuing debt and/or demanding taxes in the fiat currency. In the first instance, it is our trust that the government will honour its debts – primarily as a government can compel the governed to pay taxes – that makes the currency valuable. In the second instance, the need to obtain fiat currency to pay taxes is what makes the currency valuable.

Even Bitcoin is based on trust, as Bitcoin is only valuable if everyone in the community using it agrees that it has value. You must trust that someone will be willing to exchange the currency for the goods and services you want. There is nothing preventing society from deciding that Bitcoins are worthless and abandoning them. This would be a bad outcome for all cryptocurrencies, as it would imply that a loose community of otherwise unrelated entities is not a suitable foundation on which to build a currency, casting doubt on the suitability of other cryptocurrencies.

3 The nature of disruption

'Disruption' seemed to become part of the business lexicon midway through the 1980s. It was then that digital technology finally reached the point that business best practice could be reconsidered en masse. In the eighties, Rolls-Royce formalised TotalCare® (the first 'power by the hour' service that enabled airlines to buy aircraft engine operating hours rather than the engines themselves) which is credited with being a key enabler of the low-cost airline industry. The eighties was also when Walmart invented the data warehouse and used it to provide consumers with the 'everyday low prices' that enabled it to become the largest retailer in the world.

The pace of change now seems to be so rapid that disruption is somewhere near the top of every firm's agenda. Disrupt or be disrupted.

Short-term vs. long-term change, and the bullwhip effect

We can thank Bill Gates for the aphorism:

"We always overestimate the change that will occur in the next two years and underestimate the change that will occur in the next."[10]

As individuals dealing with the current moment, typically we focus on incremental change – the slow burn of technological development where each new idea is stacked on top of the previous one. For example, both Apple and Nintendo experimented with various ideas and technologies before arriving at the iPhone and Wii respectively.

Progress is rarely so linear. Often there are long periods of relative calm interrupted by sudden bursts of change. This is called a 'punctuated equilibrium' in evolutionary biology theory. While the unpublicised development of the iPhone involved a long period of relative calm, its introduction induced a sudden burst of change as Apple updated the device in response to consumer reactions and added significant features such as the App Store in short order.

It's best to think of each rapid shift in a punctuated equilibrium in terms of three factors: enablers, drivers and barriers. Enablers are the technologies that spark rapid change. Drivers are what motivates us to push through the rapid change. Barriers are the regulations, laws and social mores that prevent the change. Incremental development of the enabling technologies happens in the long periods of stability, but the larger shift is held back by the barriers. Rapid change is triggered when all the enabling technologies are in place and the drivers overcome the resistance from the barriers, with regulators and laws changed to enable society to capture the value latent in the drivers.

Our financial system runs with very little tolerance for change. It sits at the centre of the economy and therefore is highly regulated. Experience has shown that a failing or untrustworthy financial core has knock-on effects that hold the rest of the economy back.

Regulators take a justifiably cautious approach to change, as any negative consequences have the potential to destroy the savings and retirement plans of many individuals, or broad swathes of government services used by our more vulnerable citizens. If FinTech start-ups take market share on either the supply or demand side, the system runs the risk of a whiplash effect that could take a year or so to work its way through, as regulators and consumers react to market changes and societal preferences.

Over-exuberant investment in new technologies can also result in a technology-driven over-shoot before society pulls the technology back into line (or before large financial institutions and governments manage to pull it into existing regulatory frameworks). This can leave some firms and individuals with nasty hangovers when they find they have invested in a possible future that society has ruled out. We can see this in action with the emergence of high-speed algorithmic trading resulting in the flash crash of 2010, a trillion-dollar stock market crash in the United States, which started at 2:32pm and lasted for approximately 36 minutes.

Firms that use technology to disrupt markets rather than simply providing compelling solutions can create significant systemic problems. Many regulations are enacted for social rather than economic reasons. For example, many governments provide pensioners with taxi vouchers that regulations compel taxis to accept. These help the elderly stay mobile and retain their independence without the need to continue driving. There are good reasons to rethink the foundations on which our industries are based, but we need to be careful that the new foundations are as equitable as the old and that they can act as the pillars of the new society.

Many new FinTech solutions expose consumers and businesses to risks they have no experience in quantifying or managing. There's also the chance of collateral damage as firms and individuals experiment outside the light of the regulator or established products and services. Projects funded through platforms such as KickStarter, and which subsequently fail, foreshadow problems with crowdfunded equity, while Bitcoin's high volatility creates currency risks that few are equipped to manage. The stakes are higher when people's retirement savings are in the mix.

There is more than enough opportunity for all, but disruption in the finance sector is something that needs to be managed carefully. Banking disruption over the decades – from sub-prime loans through to credit default swaps – has caused big problems for those least able to cope. As this is a social change, it will have winners and losers. However, we can make navigating between the various possible futures that technology enables an active process, working to shape the one we want rather than simply being victims of change.

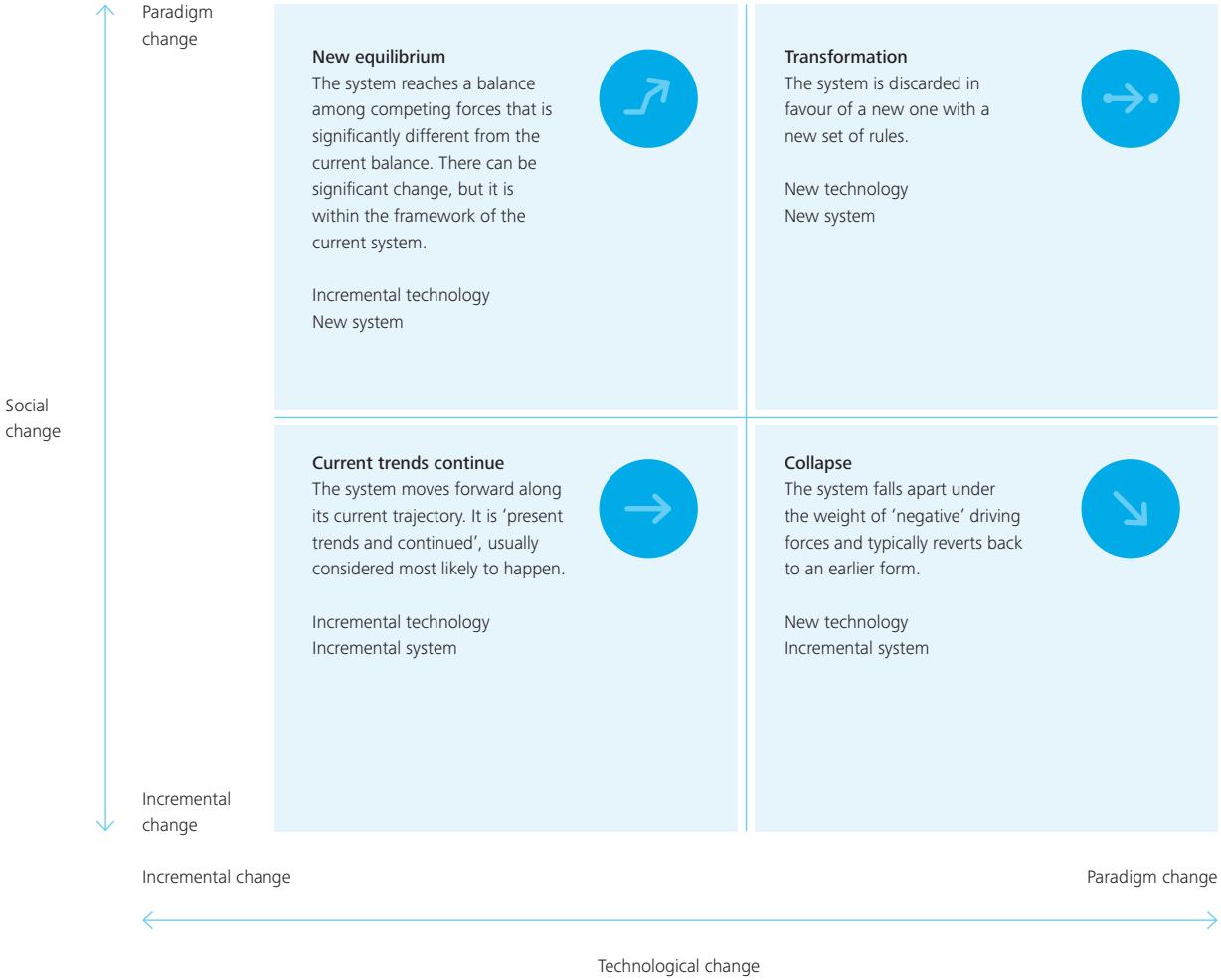
Competing futures

Ever since William Gibson's novel *Neuromancer* gave birth to the cyberpunk movement, a digital future in which we're jacked into the global network has been the popular image. It's a libertarian ideal in which nation states have little meaning as technology evolves to the point that we can more or less do without them.

Less time has been invested in trying to understand how society might also shape the future of money. We must accept that some of the short-term but large shifts predicted will become true. However, no technology has survived contact with society unscathed. While elements of a technology-driven vision may really happen, we need to explore alternative scenarios.

We need to consider both social and technological change. To do this, we explore four possible scenarios that cover the big and small changes for both the social and technological factors.

Figure 4: Four scenarios for the future



The first scenario is the simple continuation of the current trends. While new technologies are developed and society continues to evolve, the nature of the change in both of these dimensions is incremental.

Payments will continue to move from the physical to the virtual world (or, more accurately, from physical places to mobile devices). The use of cash will continue to decline and cheques will retreat further to the higher ground until regulatory and social change allow individuals to make all large and small payments electronically. Bitcoin and the other cryptocurrencies will continue to be developed but will remain a niche interest, though the best ideas from the cryptocurrency community will be co-opted by the established financial sector and integrated into the status quo. Most importantly, the relationships between the finance sector and government, business community and the public will remain the same, with the established banking and payments providers retaining their roles.

This future would be like today but more digital and online, providing governments of the world with complete visibility into how we transact, reducing tax revenue leakage, financial crime and tax evasion.

The second scenario is a future in which a new technology paradigm disrupts the existing social system. This scenario represents the technology determinist view of the world, where technologies such as Bitcoin disrupt the finance sector and accelerate the trend, driven by the Internet, for society to move from centralised, geographically based systems to distributed systems. This may be seen as collapse, as the social and governance systems revert to a state similar to what came before the current global institutions.

This second scenario represents an update to *Neuromancer*, one in which Bitcoin replaces fiat currencies and the role of nation states diminishes. The existing payments systems collapse as both large and small payments are conducted via global, distributed payment networks based on Bitcoin or one of its descendants, with each payment being instantaneous and (in effect) free. The banking system fragments as the government guarantees for deposit-taking institutions mean little, and individuals and firms move their capital into the exploding number of fintech start-ups. The trend for shared infrastructure – from roads to hospitals – to move from government funded to user-pays accelerates as the shift of currency to the virtual world erodes the government's ability to tax its population.

This future is quite unlike today. It is also a future that looks increasingly improbable. Many of the ambitious predictions made for cryptocurrencies are being set aside as it becomes clear that mass adoption is unlikely.

The third scenario is the transformation to a new paradigm – high technological change and social change. Cryptocurrencies and FinTech redefine the relationships between the existing participants in the finance sector and accelerate the trend for products to be transformed into value-added services (called 'servitisation') where the payment occurs at a time and place separate from where the goods are exchanged or the service provided. An example is Uber, a smartphone-based driver dispatch service. You book a car using a smartphone, jump in when the car arrives and are taken to your destination, at which point you get out without (explicitly) paying.

The exchange of value can happen somewhere else, at another time, possibly in a different geography and in a virtual non-sovereign currency beyond the reach of the government. The payment and finance sector becomes consumer-centred (the consumer chooses where, when and how to pay, and the currency), rather than the current government- and finance sector-centred approach.

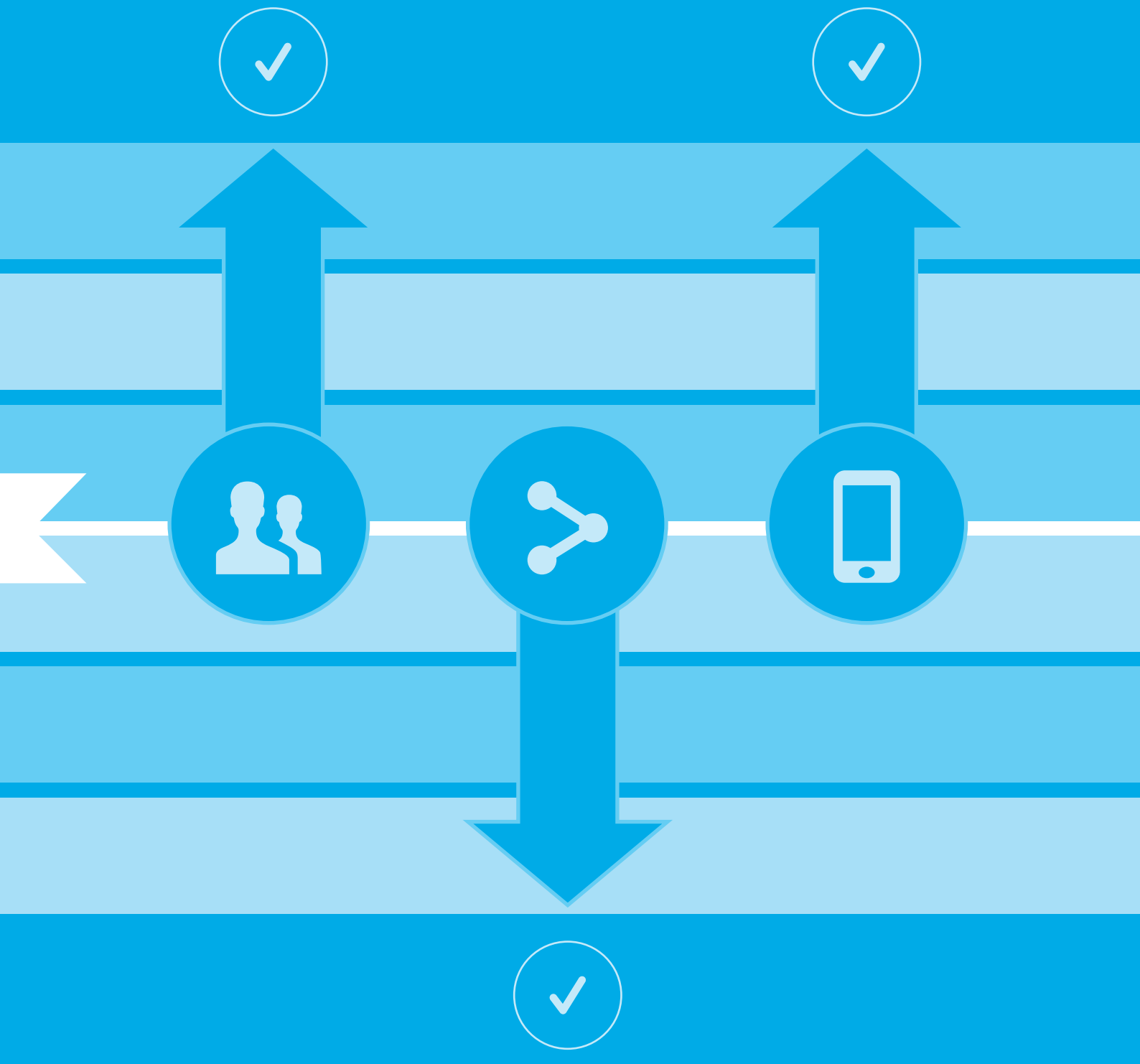
This future is quite unlike today. The relationships between the participants have been redefined, ushering in a new social paradigm. Governments will also struggle with the leakage of tax revenue. Firms and individuals will store and exchange value in virtual networks and cryptocurrencies that live on the network and beyond the purview of regulators.

The final scenario is the establishment of a new equilibrium. The accumulation of incremental technological change results in a social shift that redefines the relationships between consumers, merchants and the finance sector. This creates a significant change in how we exchange value, but the social framework in which it happens – the relationship between government and citizen – remains largely the same.

In this world, an established sovereign currency remains the major tool for governments to manage their economies. People are paid and taxed in the country's sovereign currency and most individual wealth is measured against assets in the same currency. While the relationship between state and citizen remains largely the same, ubiquitous digital technology enables consumers to redefine their relationships with merchants. The value a business creates moves (or has moved) from the simple provision of a product or service into the space between the business and its customers. Loyalty programs expand from simple reward schemes to provide businesses with finer control of the shared value between firm and consumer, becoming complementary currencies in the process. This, coupled with the growth of in-game currencies for online games, results in a rapid increase in the number of complementary currencies alongside sovereign currencies, with all the attendant benefits and problems of being a currency for their owners. Settlement moves to low-cost, instantaneous transfers via the 'block chain' technology that underpins Bitcoin, transferring value directly between entities. FinTech start-ups mature and their innovative services – from new value transmission services through to crowd-funding and crowd equity – are absorbed by the mainstream regulatory environment.

The future is quite recognisable from where we stand today, but there are key differences. The long-term decline in the cost of communications technology results in a fundamental change in the relationship between firm and consumer. Banks' deposit-taking role continues but the context in which they operate has changed, potentially disintermediating existing payments networks in the process through the adoption of peer-to-peer technologies.

4 Consumer preference



It's widely accepted that digital technology is reshaping the business and social landscapes through what's commonly referred to as 'digital disruption'. Monopolies and even entire industries are being toppled, creating new winners and losers. By far the most obvious winners so far have been consumers.

First, the emergence of the consumer Internet has reversed the historical information asymmetry that allowed firms to assume they were more informed than consumers. The firms were able to use their superior knowledge of prices and sources of products to shape customer behaviour, guiding the consumer to products the merchant favoured at the expense of the customer's preferences. However, consumers are now better informed and can find either the cheapest or best products (at the best prices) from a global pool of merchants. One fairly immediate result has been the death of many mid-market products and firms as consumers are no longer forced to compromise.

Second, smartphones and social media have enabled consumers to rely on peer recommendations rather than brand promises. The information consumers use to shape their decisions now comes from the opinions of peers – the other individuals in their social graph – rather than from communications from firms. Companies are finding that any unsavoury practices in their supply chain are soon uncovered and revealed to the world. It is also no longer possible to crowd out smaller organisations and prevent them from communicating with customers, or to prevent customers discovering competing products and services. This puts a small deli or café on an equal footing with a multinational franchise.

However you expect the world to evolve, and whichever of these scenarios you think is the most likely, it is clear that consumer preference will be a significant factor in shaping this future.

A more secure wallet

Incumbents and FinTech start-ups are now focusing heavily on the challenge of creating a more secure and convenient payment experience using digital technology. The desire is to create a smartphone-hosted virtual wallet to move transactions from the physical to the virtual world by replacing plastic cards with cryptography.

Technology has streamlined the checkout experience incrementally. The first mechanical cash register – the Ritty Model I, called Ritty's Incorruptible Cashier – was developed in 1879 and patented in 1883 by James Ritty and John Birch. Designed to stop employee theft, the Ritty Model I was little more than an adding machine and cash drawer, with a bell to be rung to mark a sale and alert the business owner (with prices set slightly off whole values so staff were forced to use the cash register to provide change). Computing technology has been chipping away further at the processes, making sales more secure and convenient.

The cash register became digital in the early 1970s with the IBM 3650 and 3660 store systems, which could control up to 128 IBM 3653/3663 point of sale (PoS) registers, electronically tying the tills (the clients) to the store accounting systems (the server). William Brobeck and Associates introduced microprocessors at McDonald's Restaurants in 1974, where each station in the restaurant had its own device displaying the entire order for a customer, which streamlined the ordering process.

More recently, NFC technology has enabled tap-and-go systems to replace the need to swipe cards or plug them into a reader and type in a PIN, slicing a few seconds off the transaction. This has proved hugely convenient for both merchants and consumers. The rapid acceptance and use of contactless cards has resulted in this method becoming almost ubiquitous in the Australian payments system. Visa's statistics show that in January 2015, contactless payments accounted for more than 60 per cent of all face-to-face Visa transactions in Australia.[30]

A new generation of payment solutions is also emerging. One example is Square, a payments and PoS provider with a solution built on consumer-grade computer tablets and the public internet. This slashes the investment required from merchants to accept credit card payments digitally, enabling even quite small merchants to move from cash- and paper-based processes to digital ones. Indeed, Square's early growth stemmed from the craft markets, boutiques and artisan stores that couldn't afford a traditional merchant account.

Part of the growth of digital payments is due to consumers using upgraded PoS systems in stores to pay with a wave or via tap-and-go. The growth is also due to this new breed of payment solutions, bringing more merchants into the digital payments infrastructure and the possibility of a cashless society one step closer.

While shiny, new consumer technology may be getting the lion's share of media attention, the government is quite aware that our ageing inter-institution payments infrastructure is holding back the development of many new real-time solutions. While two individuals may be able to exchange value instantly if they use the same bank, peer-to-peer payments between individuals who use different banks still take days to process and are comparatively expensive.

APCA's New Payments Platform aims to address this deficiency. APCA is building infrastructure that can support multiple 'applications' for exchanging value, the first of which is a traditional payment process. The new platform will support real-time, low-value payments, initially between deposit-taking institutions, but eventually between any two 'suitably accredited' institutions (institutions that easily could include new, alternative payment providers).

Many pundits envisage end-to-end digitisation of the process of exchanging value. Credit cards will be virtualised, with transactions flowing directly from a digital wallet hosted on your smartphone through real-time payments infrastructure into the waiting wallet of an individual, or the trading account of a firm or institution.

Ubiquitous digital infrastructure coupled with cheap and effective real-time payments processing solutions will enable anyone – individual or institution – to accept or issue payments wherever, and whenever, needed. Apple's recent development of Apple Pay may be a sign that technology, regulation and social mores have developed to the point that the digital wallet may finally be coming of age. Apple Pay, which uses NFC and card information stored on an Apple device, was developed within the constraints of the existing payments standards and infrastructure, making it an impressive example of what is possible within established technology and industry norms.

Potential sources of disruption

Clayton Christensen coined the term 'disruptive innovation' in his book *Innovator's Dilemma*[31] for ideas that help create a new market and value network, eventually disrupting an existing market and value network (possibly over a few years or decades) and displacing an earlier technology in the process. 'Sustaining innovations', in contrast, do not create new markets or value networks because they focus on improving existing solutions to create more value, allowing established firms to compete against each other.

The Wii and iPhone are both examples of disruptive innovations. The Wii disrupted the video game market by encouraging casual gaming, while the iPhone was really a pocket-sized computer that enabled many road warriors to set aside their comparatively bulky laptops and cameras, disrupting the mobile phone, stand-alone camera and laptop markets in the process. In contrast, hybrid cars such as the Toyota Prius are sustaining innovations; they work within the existing industry structures to sustain them.

Will the new low-cost payment solutions work their way up through the market to disrupt established players? Could Stripe's solution, based on consumer-grade technology and focused on usability and convenience, be a more compelling solution than the established payments networks? Or could Bitcoin (or another cryptocurrency) completely replace the current paradigm, one based on intermediaries to manage the transaction flow, with a paradigm based on direct and low-cost peer-to-peer transactions?

Apple Pay's early success in the US was not surprising given its slick design and Apple's commercial weight. The US had poor chip-and-pin penetration and many banks saw Apple Pay as a tool to improve adoption. This triggered intense competition between US banks to be the first account registered in Apple Pay as the typical user registers only one card with the service. Few cardholder details are required beyond basic credit card information in an attempt to streamline the process for adding new cards to the system, and make it as 'frictionless' as possible. Information such as phone numbers and addresses that might help banks detect early fraud were left out. The processes for dealing with potential fraud via Apple Pay were also flawed, with affected card holders directed to customer care rather than fraud prevention, where the customer representative would help the caller to use their cards, leading to more fraudulent cards approved for use. The fraud rate for Apple Pay was estimated at 6 per cent, which is low compared with traditional credit card fraud in the US, but higher than expected with Apple's tokenisation technology.[32]

We should consider Apple Pay a qualified success, with high early adoption rates. But the drivers for adoption appear to be tightly bound to the US regulatory and commercial environment. The story might not be the same in Australia or New Zealand where high chip-and-pin penetration rates mean banks will not see Apple Pay as a tool to facilitate the adoption of these technologies. Australia's regulated interchange fees, which are roughly half the level in the US, mean there is less room for Apple's estimated 15¢ on every $100 of transactions.[33]

Apple Pay's usability advantage is not as dramatic in Australia as it is in the US and the tighter regulatory environment weakens the commercial proposition. However, it clearly demonstrates that new ideas, approaches and technology can eliminate the friction in the traditional payment process. The questions we should ask are: Have we entered an era of diminishing returns, and does the future of payments rest somewhere other than shaving another second or two off the existing process in an attempt to make it as frictionless as possible?

We must ask similar questions of APCA's New Payments Platform. While the short-term benefits of providing cheap and effective low-value transactions are clear, the longer-term strategy of creating a platform that enables new payments 'applications' is an approach that has a less than impressive track record.

Telcos adopted a similar approach when they shifted to Internet protocol (IP) networks – moving from proprietary technologies to the 'open' technologies used by the Internet. The thought was that voice was simply one application that would run over the new IP networks and that the future would be filled with a wealth of innovative new applications that would sit beside voice and use the platform's capabilities in new and interesting ways that we couldn't predict. This is similar to how the Internet developed, with the networking technology split into layers. The lowest layers define the platform and the higher layers take the raw functionality provided by the platform and repackage it to create useful applications. The core services the network needs, such as managing domain names and email, the Internet's killer app, were built this way. So was HTTP, the technology that underpins the world wide web, as well as BitTorrent, which is used for peer-to-peer file transfers. However, since HTTP was developed, the creation of new platform applications has become rarer. Most modern solutions simply use (and abuse) HTTP rather than creating a new application-level protocol. The wealth of innovative IP network applications anticipated by the telcos – platform-level applications that could be managed, measured and metered by the platform operator – never appeared. Instead, the telcos have voice, the traditional IP applications such as email and a lot of web traffic. The expected bonanza from approving and metering high-value IP platform applications never arrived.

The same story is likely to emerge from the New Payments Platform. After the initial low-value, real-time payment application – a push payment, where the sender pushes the payment to the receiver – some of the effort behind the upwelling of FinTech start-ups can be expected to result in a simple but effective solution to support pull payments in which the receiver pulls the payment from the sender. Other types of payments may be built into the basic push and pull payments system. Examples include 'mutual' (or 'third-party') transactions – in which the payment is pushed to a third party by the sender before being pulled from the third party by the receiver – or 'deported' or 'complex' transactions that blend the other three types of payments to create more sophisticated services such as those provided by PayPal.

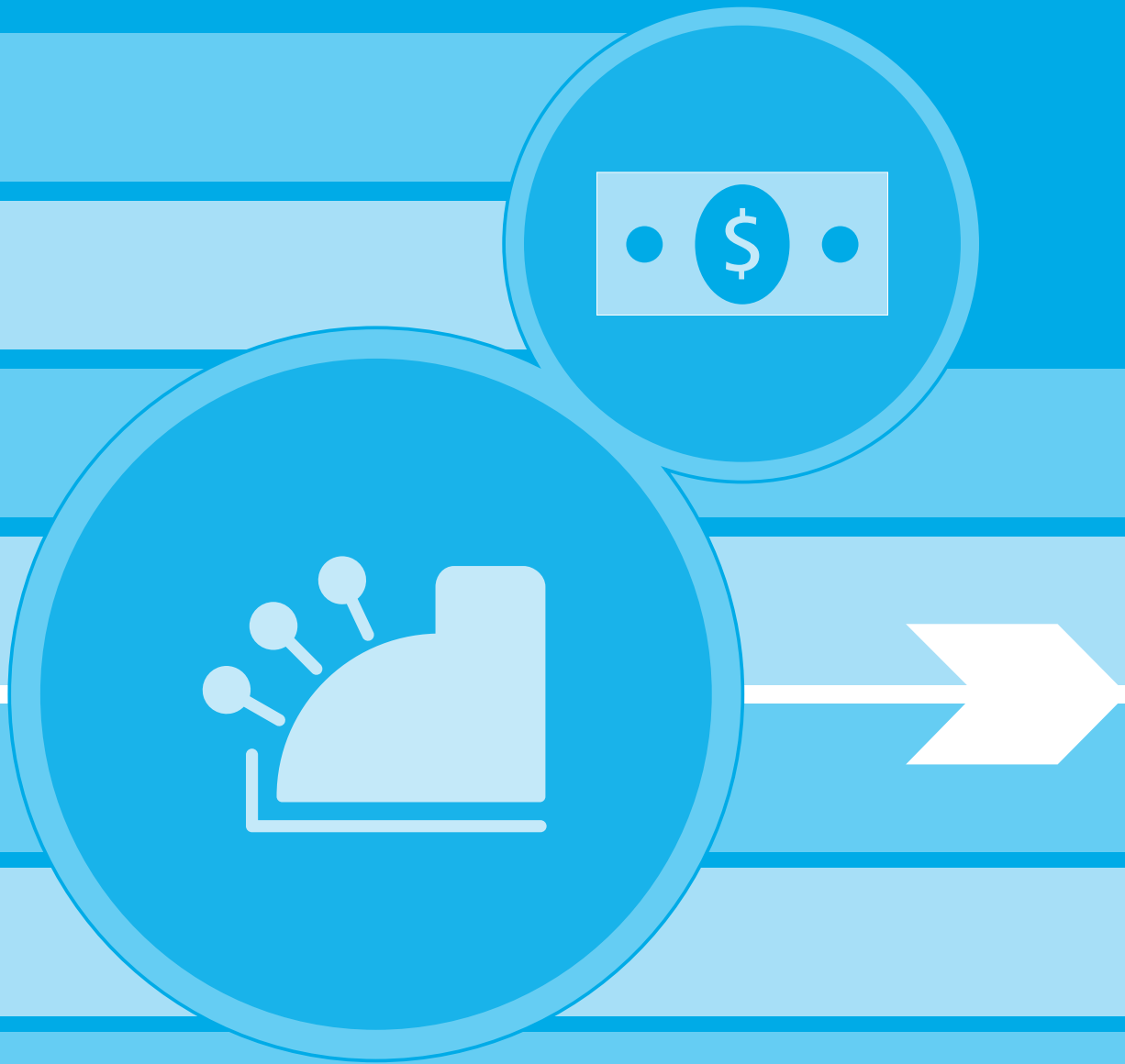
The telcos' IP networks now support a special-purpose voice service and a general-purpose data service, with most of the innovation at the edge of their networks, not in the core platform. The innovators have found it easier to work with established platform services and innovate at the edges where they have the freedom to do what they thought necessary, rather than attempting to design, implement and seek approval for a new platform-level application controlled and metered by the platform provider. Can we expect payments to go the same way, with retailers and consumer applications innovating, and the New Payments Platform simply used as a cheap and efficient transport?

While the finance sector has been investing heavily in upgrading the established payments infrastructure, many users are starting to question its value. Many, if not all, firms are finding that the pressure on their margins is rising. Consumers are using their smartphones and ubiquitous access to the internet to find either the cheapest or the best (and cheapest) items from a global pool of merchants. The same consumers are using their smartphones to browse reviews and recommendations and share their experiences. The balance of power is firmly in the hands of consumers and they are using it to push prices down. Coupled with the shift from physical to virtual (digital) payments, merchants are finding that the transaction fees charged by the major processing networks are becoming a significant expense.

The convenience of being able to pay via a tap or a wave is clear, but the wisdom of having the service provided by an intermediary is being questioned. At the small end of town, restaurants, pubs and clubs are encouraging customers to pay in cash or by debit card to avoid paying interchange fees. They do this by either providing a discount for cash, or by some other means, such as entering cash-paying customers in a monthly prize draw. At the other end of town, larger retailers are funding the development of alternative payments solutions. The industry solution with the highest profile is CurrentC™[34] being developed by US-based industry group Merchant Customer Exchange (MXC), led by Walmart. CurrentC™ provides consumers with a smartphone-hosted mobile wallet that can interact with merchant terminals to enable direct bank-to-bank transactions and cut out payments intermediaries.

Financial institutions should be worried about new payments paths that remove them from the process, as most of their interactions with customers are based on customers' need to pay for products and services.

5 Moving payments away from the till



If the future of payments rests in finding technological solutions that streamline existing processes and make them more secure, this assumes the only forces shaping payments – how we exchange value – are technological. However, as we have already shown, social forces also shape technology. Technology has streamlined the payment process and is enabling us to find new approaches to paying for and consuming the things we want.

Ritty's Incorruptible Cashier enshrined in technology the idea that payments would happen at a point of sale, somewhere secure where merchant and customer could exchange value, swapping goods for currency. The NFC tap-and-wave point of sale is the best current expression of this paradigm, removing nearly all the friction from the transaction other than the need to tally the goods and acknowledge the exchange of value.

Smartphones and ubiquitous networks create solutions that shift the payment away from the place where the goods are handed over by allowing us to transform products into value-added services. Purchases at the point of sale are converted to subscriptions billed separately on a regular schedule. They also allow commercial interactions with customers at a time or place away from the conventional point of sale.

Showrooming

Consumers, rather than merchants, now decide when and where they pay. Thanks to the emergence of ubiquitous mobile digital communications. Consumers also seem to prefer to pay somewhere other than at the till.

Technology that enables someone to browse a web store from the comfort of the couch also enables them to browse the same web store from the aisles of a bricks-and-mortar competitor. A consumer can just as easily research a product and compare prices on a competitor's website as they can inspect the physical merchandise on the shelf in front of them. This trend is called 'showrooming', as the customer is using the bricks-and-mortar store as a showroom for the web competitor.

Showrooming is putting pressure on the margins of traditional retailers as they struggle to compete with online retailers that inherently have lower costs. Consumers are still researching their purchases – from books through to clothing and expensive bikes – which can include wanting to hold the product, try it on, or kick its tyres (should there be any). However, customers are making the purchase online from web-only businesses that charge less.

Cost is not the only driver of these purchasing decisions. In some instances, a mobile purchase may be more convenient, even if the consumer is standing in the middle of the bricks-and-mortar store.

Amazon introduced a mobile app some time ago that enables users to scan the barcode on a product and have the app take them directly to the product's information in Amazon's online store. All Amazon needs to ship the product directly to the customer's home and bill them is one click or tap. The positive use-case has someone at a dinner party discussing a book, then scanning the barcode on their friend's copy rather than taking a note of the title, author and publisher. It's not a large stretch to envisage a consumer using the same feature in a busy store. Consumers may find it more convenient to buy the product online using a smartphone while standing in the aisle (and having it shipped directly to their door) than to pick it up and take it to the point of sale at the front of the store if it is bulky and awkward, or if it won't be used immediately. This becomes even more attractive up against long queues at the till, a paucity of merchandise on the shelves, or simply the challenge of finding products that haven't been mishandled, especially for mass-produced goods where one instance of the product is as good as another in the consumer's eyes.

In our previous paper on the future of exchanging value[35], we also talked about how mobile payments may be even more convenient when consumers want to leave the store with products. We used the idea of a trip to the hardware store for some odds and ends to fix some things around the house. With four screws, two bits of wood and leaf blower in hand, we're ready to head home and start, apart from the fact the goods need to be taken to the point of sale. There we have to stand in line and then wait for the goods to be tallied so we can pay with a wave of our credit card.

While NFC and new payments infrastructure may make payments nearly instantaneous, a much more preferable solution for the consumer would be to avoid the point of sale altogether. The idea would be to use their mobile phone to buy the products in hand – moving the till to them, rather than them to the till – and walk directly from the store.

This is something Apple has done with the Apple Store app (as opposed to the App Store or iTunes apps). The Apple Store app provides the typical mobile shopping experience. You can browse the catalogue, purchase and have your selection shipped directly to your front door. The app also attempts to bridge the gap between the physical and virtual by providing a store locator should you want the product immediately. You can also use the app to make appointments at the Genius Bar support service for Apple products. Once you're in a store you can use the app to find out the waiting time for appointments. You can also pluck a product from a shelf, scan the barcode with the camera on your iPhone and pay for it from your iTunes account. You can then walk out with your purchase without having interacted with any staff.

This ability to empower customers to manage their own payments may be seen as a straight-forward extension to the self-checkout trend. While it requires new risk models and deeper integration into the retailer's supply chain, it provides a more convenient solution for the customer, with the side effect of reduced staff numbers.

Loyalty

Some retailers have responded to showrooming by focusing on loyalty programs that offer store credits and bonuses. While there isn't any evidence existing programs have improved loyalty per se, they do increase a consumer's spending with the store.

Some are experimenting with moving the loyalty scheme to the centre of their relationship with consumers. They do this by enabling the loyalty scheme to be used for daily transactions rather than having it as an afterthought post-transaction ("do you have our loyalty card?").

Starbucks shifted its loyalty scheme, My Starbucks Rewards, to a stored-value card. As well as accruing points, members can load funds onto the card and use it to make purchases, enabling Starbucks to connect the customer's preferences and loyalty scheme with the payment. The act of paying now triggers both the accrual of points and the harvesting of transaction data.

The stored value on the card also creates a problem for consumers as they have committed funds, called a 'sunk-cost' that takes some effort to recover. The stored value should lead them to prefer Starbucks over competing coffee shops even if there is a small price difference against Starbucks. However, the scheme does require the consumer to pre-purchase, as there must be funds on the card before it can be used, adding an initial step to some transactions.

Starbucks needs to demonstrate that the scheme gives consumers enough value for them to be willing to commit funds. The benefits for Starbucks might not apply when members have insufficient funds as they are forced to add funds rather than simply make a purchase.

My Starbucks Rewards can best be thought of as bringing future purchases into the present to foster loyalty.

Another option is to use a loyalty scheme to delay purchases. This has the effect of pushing the payment into the future, moving from a pre-pay to a post-pay model, making it easier for consumers to commit to the purchase. Consumers need only to decide that they want (and can afford) the product without concerning themselves over the details of the transaction.

A good example of this is Skip[36], a mobile app that enables consumers to 'skip' the queue at their local café. The app uses your location to provide a list of local cafés. Selecting any café takes you to a menu from which you can select what you want. Alternatively, you can choose what you want – a flat white with one sugar, perhaps – then pick from a list of nearby cafés that can fulfil the order. When you arrive at the café, you make yourself known and the coffee is handed to you when it is ready. Skip accumulates the transactions and bills weekly. It's not much of a stretch to imagine an integrated loyalty scheme, where the act of ordering triggers both the accrual of points and the harvesting of transaction data.

Skip is underpinned by the assumption that people don't like to queue for coffee and wait for it to be made. Streamlining this process by enabling customers to order via their smartphones before they arrive eliminates a couple of pain points, creating a little bit of value Skip can share with the café.

Nevertheless, a survey of the app's users found that the ability to skip the queue wasn't its most attractive feature. Instead, it was the elimination of the need to pay at the point of sale, with customers ranking payment convenience as either the biggest benefit or equal to the benefit of skipping the queue. Some customers see queuing and waiting for their coffee as a social occasion rather than a burden and take the opportunity to chat with other regulars or the staff. The payment, however, is seen as an unnecessary burden. This may tie into a deeply held bias in many cultures that handling money is somewhat dirty. Historical examples include the Christian Church's probation against charging interest in the Middle Ages, or the Qur an forbidding Muslims to charge interest on a loan, through to the modern usage of the phrase 'filthy rich' to mean very rich, possibly having become so by unfair means, which originated in the 1920s in the United States.

Disconnecting payment from product

Many of the emerging 'digitally native' services are taking this trend a step further and explicitly disconnecting the payment from the provision of the product or service.

Products are increasingly transforming into value -added services – servitisation. This has the effect of shifting payments from a transaction at the point of sale to an ongoing subscription. TotalCare®, Rolls-Royce's 'power by the hour' service for jet engines mentioned earlier, is seen as the first and best example of this trend. Jet engines used to be sold at competitive prices with margins made from the spare parts business. TotalCare®, first conceived in the 1960s but formalised in the mid-1980s, shifted the relationship with the customer from products and spare parts to a long-term contract (often spanning multiple decades) to keep the engines running.

Most airlines have moved their purchasing of engine operating hours to TotalCare® or a similar model, where a flat cost per hour provides them with the engine, services, monitoring, spare parts and a guarantee of on-time performance, with Rolls-Royce managing the risk just as much as the revenue opportunity. This shift from selling jet engines to hot air from the back of planes was a significant factor in creating a low-cost airline industry by shifting the large capital expense of jet engines (often about US$50 million) and the complexity of managing the engines and their maintenance from the consumer to provider.

The same trend is occurring in consumer products, with a shift to consumers paying for what they use rather than needing to own a product. Music streaming services such as Pandora[37] and Spotify[38] allow consumers to create personalised radio stations that can stream the world's music directly to their devices for a monthly fee. Flexicar[39], ZipCar[40], and GoGet[41] provide cars by the hour so their customers don't need to own a second car (or, in some cases, a first car) that is rarely used. Instead, they get access to cars parked at convenient locations around them, with their account settled automatically at the end of the month.

A new generation of digital services is – as a design choice – moving the transaction to the edge of the relationship between merchant and customer. As with Skip, mentioned before, consumers prefer not to deal with payment at the point of purchase. Uber builds on this insight by moving the payment beyond the flow of service delivery to provide a better customer experience. The app enables customers to order a car, track the car as it arrives, hop out at their destination, then rate the driver. The only visual acknowledgement of the payment is the fare quoted when the car is ordered. The trip is billed to the customer's credit card automatically at the end of the trip.

The end of cash

Predictions about the end of physical cash typically assume it will be replaced by something new, a functionally equivalent technology that is more convenient, cheaper and easier to use. This may be NFC and the existing payments networks or it may be something more radical, such as Bitcoin or another stateless cryptocurrency. The shift to electronic payments has been a significant driver in the decline of cash. New digital technology is replacing the old physical technology, enabling us to buy online from far-flung merchants. The assumption is that while cash may disappear, the manner in which we pay will remain largely the same, with customers and merchants exchanging value at the point of sale.

It may be wise, however, to think of this as a shift from the merchant's PoS system to the customer's smartphone. Payments are not just moving online, they're going mobile, and increasingly the PoS is accessed via the smartphone. While most 'card not present' transactions are from an online store, a growing proportion may be customers using mobile devices to buy products while standing in physical stores. These may be purchases from the store, such as using the Apple Store app on a smartphone to buy goods within an Apple Store or the purchase may be from a competitor, with the customer using a third-party app (such as the one provided by Amazon), with the physical store being little more than a showroom. Moving the point of sale from the merchant's premises to the customer's smartphone eliminates the need for cash.

Digital technology is also enabling the payment to be moved in time. Starbucks Rewards brings the payment forward, creating a sunk-cost to foster consumer loyalty. Skip, on the other hand, allows the payments to be pushed into the future, removing one decision ("How will I pay?") from the buying process. Clearance occurs when the customer orders via the Skip app. In both cases, the merchant can aggregate transactions to reduce interchange fees, or even avoid them entirely by using a direct bank-to-bank transfer to route settlement through conventional debit mechanisms or via an alternative low-cost service such as CurrentC™. Payments are moving in time away from the point of sale.

Finally, products are being transformed into value -added services – servitisation – converting a payment for products or services into an account settled at the end of the month.

The shared value created between a merchant and customer is increasing being captured in a shared account, either a stored value card or loyalty scheme, that is settled periodically. The merchant and consumer use this shared account to build trust. If the customer needs to commit funds to the account before transacting, the customer must trust the merchant. If the merchant allows the customer to go into credit before reconciling, the merchant must trust the customer.

We assume that digitisation implies swapping physical tools – cash and cheques stored in a leather wallet or purse – for digital tools such as credentials stored in an e-wallet on a smartphone. The new technology replacing the old. Digital technology, however, enables us to do more than remove pain points and streamline existing practices.

Hard currency's utility rests on its ability to streamline transactions between two parties who have little knowledge of, or trust in, each other. Today this trust can be built with the wealth of communication tools and data that the Internet and smartphones provide, enabling some of the more prominent loyalty schemes (particularly those managed by airlines) to take on similar functions to the leather money tokens issued by some shops, mentioned earlier. These shared accounts, in effect, are denominated by complementary currencies that can expose the firms that create them to all the benefits and risks of managing a currency.

While digital transactions are replacing physical transactions, the bigger threat to cash in the longer term may be use of shared accounts – complementary currencies – to reduce the need for traditional payments.

This raises the interesting question of how to support peer-to-peer payments, such as when friends split a bill. Typically, these debts are settled with cash, or via the time-honoured ritual of friends taking it in turns to pay on subsequent outings, or simply refusing to accept settlement of small debts. Solutions are emerging that allow individuals to transfer money directly between accounts, both from established financial institutions (a good example is goMoney[42] from ANZ) and start-ups (where Venmo[43] and Snapcash[44] are experiencing some success on university campuses).

The trend for the payment to be embedded in the value -added service between merchant and customer is being replicated by peer-to-peer payments as firms integrate payments into social media platforms. Facebook is integrating payments into Messenger, its messaging app. The intention is to capture messages that imply payments, such as telling a friend "the movie ticket was $10", and to convert the dollar amount into a hyperlink to make a payment to the initiating party. The intention is that a debt organised via Facebook (such as when a group of friends organise to go to the cinema together) is also settled via Facebook.

These informal arrangements become more difficult to organise as transactions move away from the point of sale. The cinema outing, for example, may result in each individual in a group wanting to buy their tickets separately so the purchase is associated with their own loyalty account (and any bonuses and discounts) rather than that of the organiser. Peers will need to choose between exchanging value via their transactional payments app (provided either by their bank or a start -up), via a shared social network, or potentially via a common loyalty scheme.

We can expect cash to have a continued (though diminished) presence in peer-to-peer transactions. Even though it is low-tech, it is flexible and can be used in circumstances in which two individuals who want to split a bill don't share the same bank, social network, or loyalty program.

Cash also has an important role in bringing many of the disadvantaged in society into the economy. Any effort to create a cashless society must ensure that people who are unbanked or unable to obtain credit can access the services they need.

There is clear evidence that the use of cash will decline in the long term. There is also government impetus to eliminate cash, partly as a cost saving and partly to hamper organised crime. However, the future of payments may not simply be to replace physical money and payment solutions with more secure and streamlined digital equivalents. We also need to consider how the changing relationship between merchants and consumers is removing the need to transact at the point of sale.

Increasingly, we are choosing to transact with merchants and peers with whom we have a relationship, often mediated by social media. We are managing these relationships via a shared store of value that behaves as a complementary currency. We're using this to move purchases away from the point of sale, both in time and in space, so we can focus on our relationship and the value created rather than the need to transact with an individual or organisation we don't trust. We are not just replacing physical payments with digital – swapping our leather wallet for an e-wallet – but we are also moving the payment from the centre of the relationship to the edge.

However, if electronic payments are to replace physical ones, all use cases need to be covered, including various permutations of peer-to-peer payments and support for the disadvantaged and unbanked in society. While cash may be low-tech, it is very flexible and inclusive and we can expect it to be part of the payments landscape for some time.

Digital Disruption and Exchanging Value

Deloitte's 2012 report, *Building the Lucky Country #2: Digital disruption – Short fuse, big bang?*[45] outlined how new digital technologies are disrupting customer transactions, currency and payments:

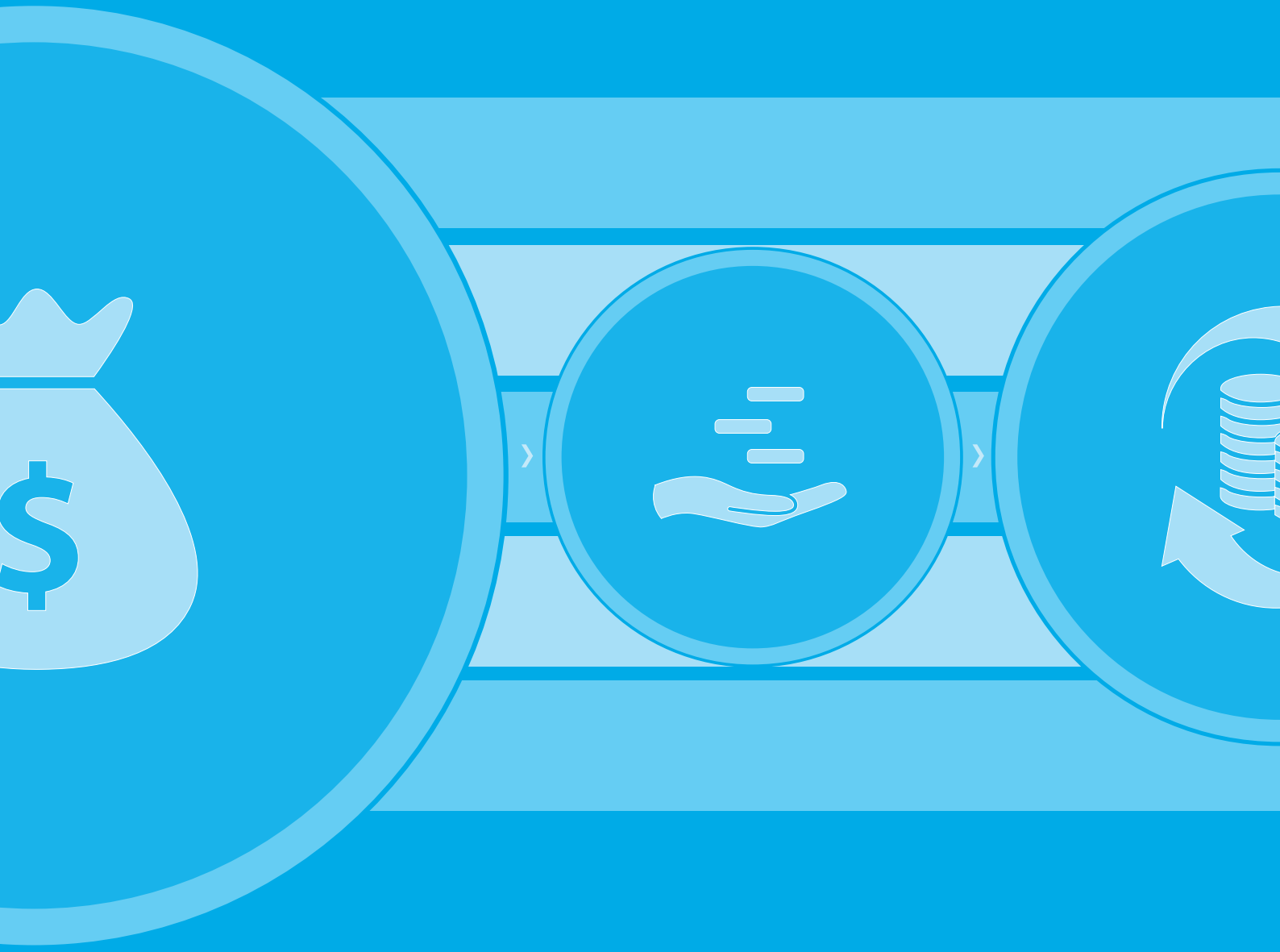
- Mobile payments are gaining prominence, with many transactions moving to mobile phones, tablets and other portable devices because of their convenience
- NFC-technology is enabling faster and more efficient transactions through platforms such as the tap-and-pay feature of payWave and PayPass
- New mobile applications and products such as virtual wallets with integrated payment options are streamlining payments processes
- Online and mobile payments are enabling companies to develop web applications and e-commerce platforms, providing new and integrated ways for businesses to reach customers.

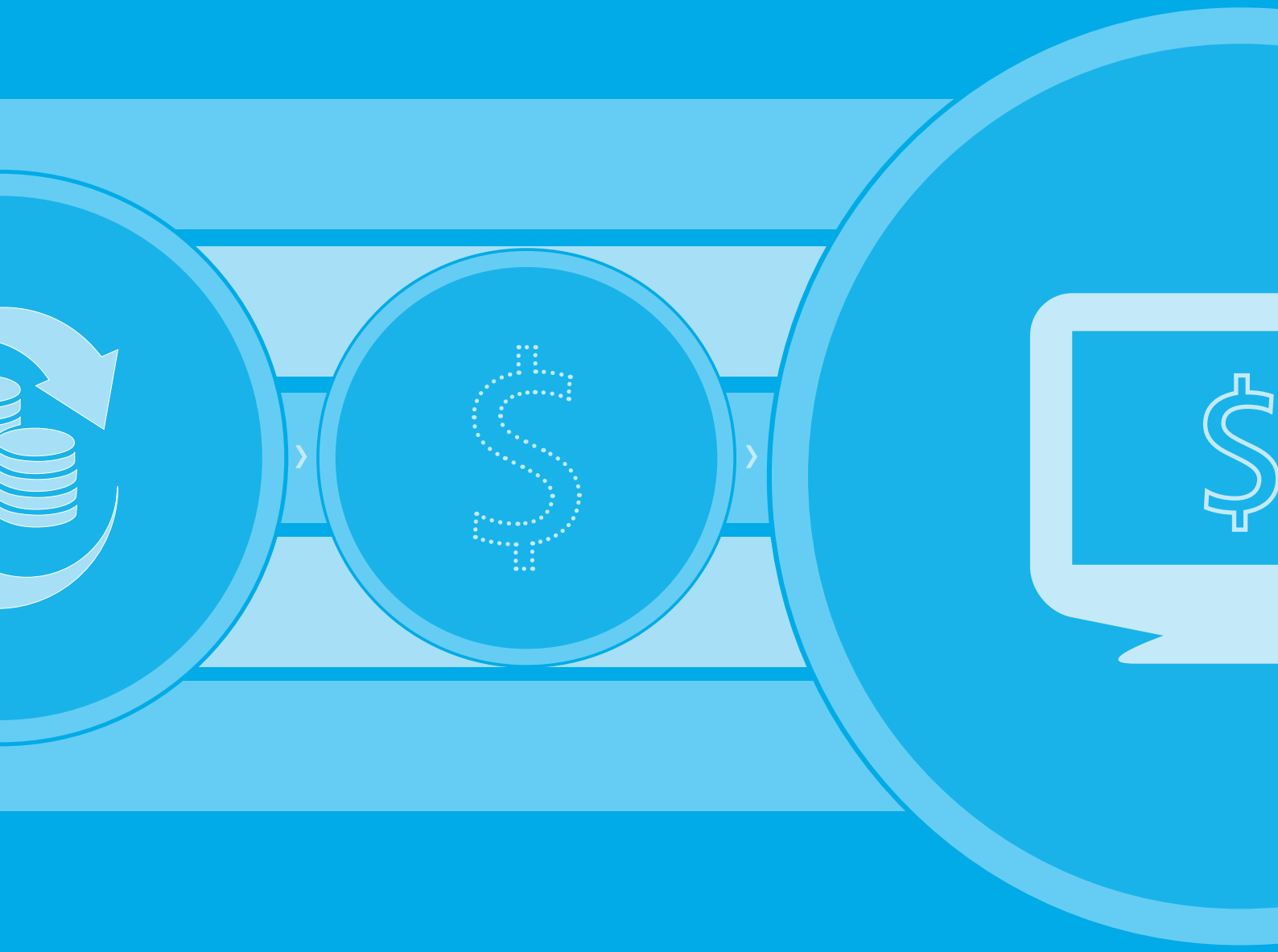
The report found that customers were driving many of these trends as they sought ways to make payments more efficient and to reduce the time taken for financial transactions. The report highlighted the need for businesses to provide a better customer experience by offering the more efficient payment methods now available using these new technologies. It also noted that more efficient new payment technologies could cut costs for businesses.

Work conducted in 2015 by the World Economic Forum in collaboration with Deloitte suggests the digital disruption of transactions and payments may have significant implications for financial institutions and payment providers. As businesses seek to provide their customers with more streamlined and integrated payment methods, financial institutions and payment providers may have less control over the elements of a transaction. This reduced visibility means that becoming the default option for businesses and customers will become critical – for example, being the payment platform linked to specific services (such as PayPal) or the payment instrument that is pre-selected when a user 'taps' their virtual wallet. On the other hand, institutions that are able to capture large market segments will have access to huge amounts of information on spending patterns, allowing them to build a more holistic understanding of users' preferences and subsequently create more competitive offerings.

Deloitte Access Economics

6 Rum and cigarettes





It's clear that how we pay is changing. What we use to pay – the currency, the unit of account and the medium of exchange – is also changing. New stateless digitally native currencies (Bitcoin being the most prominent example) threaten to supplant sovereign currencies. If the future of society is virtual and stateless – a world in which we identify more strongly with a global tribe knitted together by social media than the geographically defined nation we happen to live in – then the future of exchanging value must also be virtual and stateless.

A store of value

The libertarians, techno-utopians and gold bugs have seized on Bitcoin as the solution to many of the problems they see in the current economic system. Libertarians see Bitcoin as the tool that will enable them to move the world economy out of the hands of national governments and fiat currencies and into the hands of individuals. The technology boosters argue that Bitcoin's low-cost, peer-to-peer approach will enable us to bring the unbanked into the digital system and create a truly global currency. Others see Bitcoin as a tool to avoid government-created inflation (and the devaluing of savings) by moving to a deflationary currency, as the number of Bitcoins that can be created is finite. Demand rises, the value of the currency can only go up, making the prices of goods and services fall. The gold bugs see Bitcoin as a more achievable goal than (to them) the desirable return to the gold standard, with similar benefits.

As a currency and a technology, Bitcoin has many supporters who are betting on a future in which national fiat currencies are much less important than they are today. This is our 'new paradigm' scenario, where a shiny new bitcoin paradigm replaces the current financial infrastructure. ('Bitcoin', with an uppercase 'B', refers to the currency, whereas 'bitcoin', with a lowercase 'b', refers to the underlying technology platform.)

While some early adopters are using Bitcoin preferentially to store their wealth or pay for their daily needs (where possible), it has not been broadly adopted by the public. Bitcoin and other cryptocurrencies, for all their media attention, remain a niche interest.

One line of thought is that while Bitcoin is a compelling technology, there is no sign of the 'killer app' – the combination of end-user functionality and currency attributes – that will get most of the population on board, similar to how email was the killer app that attracted the general population to the Internet. This belief in the need for a killer app has resulted in many new FinTech solutions and start-ups as financial institutions and entrepreneurs search for that combination of functionality and business model that will take Bitcoin, or some other cryptocurrency, into general use. New solutions are emerging every day that enable people to save, trade or spend Bitcoins, from new e-wallets and exchanges through to services that anonymise payments by passing them through 'Bitcoin mixers'[46]. These mixers combine unrelated payments in a single bitcoin transaction to hide each payment's origin, industrialising money laundering in the process. There's also a proliferation of new cryptocurrencies, each intended to tweak a previous cryptocurrency or create a new one that takes a different spin on the same basic ideas.

As we have already discussed, currency is woven into the relationship between two parties, and the needs of this relationship have significant influence on what currency will be used. One example is the leather money tokens issued by English shopkeepers, mentioned earlier, that provided a way to exchange value but had little value outside the local area, so that merchants demanded a more universally accepted sovereign currency to settle larger debts. We see a similar dynamic with the development of local currencies, such as the Brixton Pound, also mentioned earlier. One of the most successful examples of a local currency was the demurrage currency used in the Austrian town of Wörgl between 1932 and 1934. The parish printed paper notes called 'labour certificates' in the midst of the Great Depression when the number of unemployed people in the parish had risen to 350 out of a population of more than 4,000 at a time when federal tax revenue was dropping. The nominal value of notes depreciated by 1 per cent a month unless the owner affixed a stamp covering the full extent of the devaluation to the note before the end of the month. These stamps were sold at the parish hall, providing Wörgl with much-needed tax revenue to support works programs to benefit the unemployed. The currency was withdrawn in 1933 after repeated demands from the Austrian government.

Indeed, the most significant factor affecting widespread adoption is government intervention. Governments can use the rule of law (backed by the threat of violence) to force currencies into circulation. National governments of developed countries issue debt in a sovereign currency and require it to be used as legal tender. Colonial currencies typically were brought into circulation when a coloniser compelled subsistence communities to pay land taxes in the sovereign currency, forcing them into the coloniser's economy and monetary system. Governments can also use the rule of law to prevent widespread adoption of non-sovereign currencies. In some instances, such as happened in Wörgl, the currency is simply banned once it is considered a threat to the tax base. At other times, the legal status of the complementary currency is refined so that the currency is treated as a voucher, as with the case of the Bristol Pound. In other instances, the currency is legally considered an 'intangible asset', a commodity rather than a currency, forcing it to be taxed as such, which is what happened with Bartercard in the early 1990s.

It is clear that the single most significant driver-of or barrier, to widespread adoption of a currency is the national government's attitude to it. The government can choose to ban a currency, preventing its circulation. Classifying the currency as a commodity for legal purposes hinders adoption by ensuring that all exchanges of value denominated in the currency attract additional taxes. The government can also take a neutral stance by treating the complementary currency as a foreign currency, neither hindering its use nor encouraging its adoption. Finally, the government can promote, or even compel, the adoption of a currency by considering it legal tender or, more strongly, by requiring citizens to use it to settle tax debts.

The single most powerful driver for the adoption of a currency is a government's demand that taxes or debts be paid in the currency as this encourages (or forces) firms and individuals to use it. Similarly, the most powerful inhibitor is the classification of the complementary currency as a commodity (forcing all exchanges to be taxed as if they are an exchange of goods), or the outright banning of the currency.

It is quite possible for complementary currencies to achieve widespread adoption within these constraints. Indeed, loyalty programs finally found their stride with the development of frequent flyer miles. Cross-border (cross-currency) transactions may play a similar role for cryptocurrencies.

The role cryptocurrencies now play is similar to the role rum played during Australia's colonial days or cigarettes played in the prisoner of war camps of World War II. The Australian colonies found English currency in short supply as the colonial power was at the far end of the world, forcing them to improvise, while prisoners of war turned to cigarettes when they needed a means of settling debts. Valuable commodities such as rum and cigarettes became a means of exchanging value when there was a shortage of sovereign currency.

Cryptocurrencies may be adopted in a similar way to a loyalty scheme or shop-issued tokens until a national government agrees to accept taxes or issue debt in a cryptocurrency. Complementary currencies such as rum, cigarettes, local currencies and even loyalty schemes can play an important role by providing alternative means of exchange and stores of value for times when a sovereign currency is not the most appropriate tool for managing the relationship between two parties. This role will wax and wane depending on the circumstances. For instance, it may be more important in troubled economies, such as in Argentina with its volatile national currency and dysfunctional banks, where less than half the population uses banks, credit cards. Cryptocurrencies may play a smaller role in mature, stable economies such as Australia's.

Few individuals, however, will accept the risk of being paid in a stateless cryptocurrency when they are taxed in a sovereign currency. Similarly, few governments will choose to have tax receipts or national debt at the mercy of exchange rates with a stateless cryptocurrency beyond their control.

A means of exchange

As we have just discussed, it is unlikely that Bitcoin will be adopted across an economy. Even its many fans will readily admit that a wholesale shift to Bitcoin is unlikely. This has resulted in a growing view that it is the block chain – the public ledger technology that underpins the currency – that is the important part of Bitcoin, not the currency itself. There is significant hope that the block chain technology can create cheap and effective solutions for international, inter-currency transfers and for transfers between major institutions. This has the potential to disintermediate the existing clearing houses and exchange services, causing significant disruption to the firms involved in the current payments processes, if not to the finance sector as a whole.

The existing system of international monetary transfers is awkward, slow and expensive. This is especially true given that ubiquitous Internet connections mean commodity prices can be found, and ownership transferred, instantly. International monetary transfers currently are done via intermediaries, take days to effect and are comparatively expensive. If we can buy and sell stocks and commodities around the world, why not transfer funds? Block chain is seen as a solution to this problem as it would enable the creation of a distributed, peer-to-peer solution that would remove intermediaries. The result would be cheap and speedy transfers of funds that reduce risks by narrowing exchange spreads, credit risk and collateral costs.

The challenge is that cryptocurrency and protocol are not easily separable. Put another way, it is not possible to separate the currency (Bitcoin) from the technology (bitcoin, the block chain) as they rely on each other. As initially conceived, the currency is a key technology in the overall Bitcoin solution.

Bitcoin is built around the idea of Bitcoin mining. Miners assemble Bitcoin transactions into blocks and then 'sign' these blocks, where each transaction specifies how a Bitcoin (or fraction of a Bitcoin) is to be split into one or more parts, with each part distributed to a new owner. Signing is the process of computing a hash – a complex mathematical process that creates a number associated with the block – then distributing the hash and its accompanying block of transactions to other miners. This series of signed blocks of transactions forms the block chain. A transaction is accepted into Bitcoin's distributed ledger when a block containing the transaction is accepted by a group of Bitcoin miners. In the short term, the miner is rewarded with a few Bitcoins. In the longer term, when the supply of unallocated Bitcoins is exhausted, individuals will encourage miners to add transactions from the individual to a block by including in the transaction a small amount of value (denominated in Bitcoin) that the miners can keep.

As is plain, the Bitcoin currency is a key component of the bitcoin process as the value transferred to miners provides the incentive required for them to bundle transactions into blocks and sign them. Without this bundling and signing, the bitcoin process won't work. Bitcoin's promise of near-instant transfers of value is possible only if there are enough miners to ensure transactions are picked up promptly and bundled into blocks.

It is quite possible to remove Bitcoin (the currency) from the other technologies that underpin bitcoin (the platform). However, doing so removes the incentive for miners to bundle and sign transactions, leaving a collection of useful but otherwise unrelated technologies. These technologies may be used to create a galaxy of 'block chain' solutions, though often these will have only an incidental relationship to a traditional currency. Filecoin[47], for example, allows users to store files in the block chain, and rewards them with Filecoins for storing blocks on their computers. Another example is ZeroNet[48], which uses a combination of block chain and BitTorrent technologies to create distributed websites that don't exist on any single server. Block chain technologies could even be used to exchange value via a distributed ledger within a closed system, without involving a cryptocurrency and with all value denominated in an established currency, as miners can be incentivised via other means.

Removing the underlying technology, on the other hand, creates an unusable currency not backed by a government (and its ability to extract taxes), a private institution (which is expected to honour its obligations), a commodity (a scarce and valuable resource) or a formally defined community (as Bitcoin is, since its value rests on trust that the community brought together by the mining and exchange of value process will provide stability and liquidity).

Clearly, the currency is an integral technology in the overall Bitcoin solution to exchanging value. If Bitcoin, or a related cryptocurrency, is used to create faster, cheaper and more efficient international money transfers, they would need to be triangulated through Bitcoin with the associated risk of passing value through a highly volatile currency. Many institutions and individuals will find this unacceptable.

Ripple is another cryptography-based approach to exchanging value and one that makes the role of the cryptocurrency (XRP, in this instance) much plainer. Ripple replaces block mining with a distributed database of information about all Ripple accounts. A network of independent services each maintain a copy of the database and constantly compare the transaction records with those of other services. New transactions are accepted in the network only when a majority of services agree that the transaction is valid.

XRP is a key technology in the overall Ripple solution. The Ripple protocol allows any currency to be traded over the network, not just XRP, though all accounts are required to hold a small amount of XRP (20 XRP, or A$0.21 as of 15 September 2015[49]) as the currency performs three important roles in the protocol. First, the requirement to hold a small amount of XRP hinders the creation of spam accounts. The amount is insignificant for normal users but rapidly becomes expensive for malicious users with large numbers of accounts. Second, each Ripple transaction destroys a small amount of XRP (0.00001 XRP, or A$ 0.00000105). This should be insignificant for normal users, but would rapidly become expensive for malicious users trying to spam the network with transactions. Third, XRP can be used as a bridging currency to facilitate exchanges between two currencies not commonly traded, making it challenging to establish an accurate currency-to-currency exchange rate.

One hundred billion XRP was created at Ripple's inception, with the protocol's rules specifying that no more is allowed to be created. This makes XRP a scarce asset, which should cause the currency to appreciate over time. The company behind the protocol – Ripple Labs[50] – has reserved 20 billion XRP for fund development.

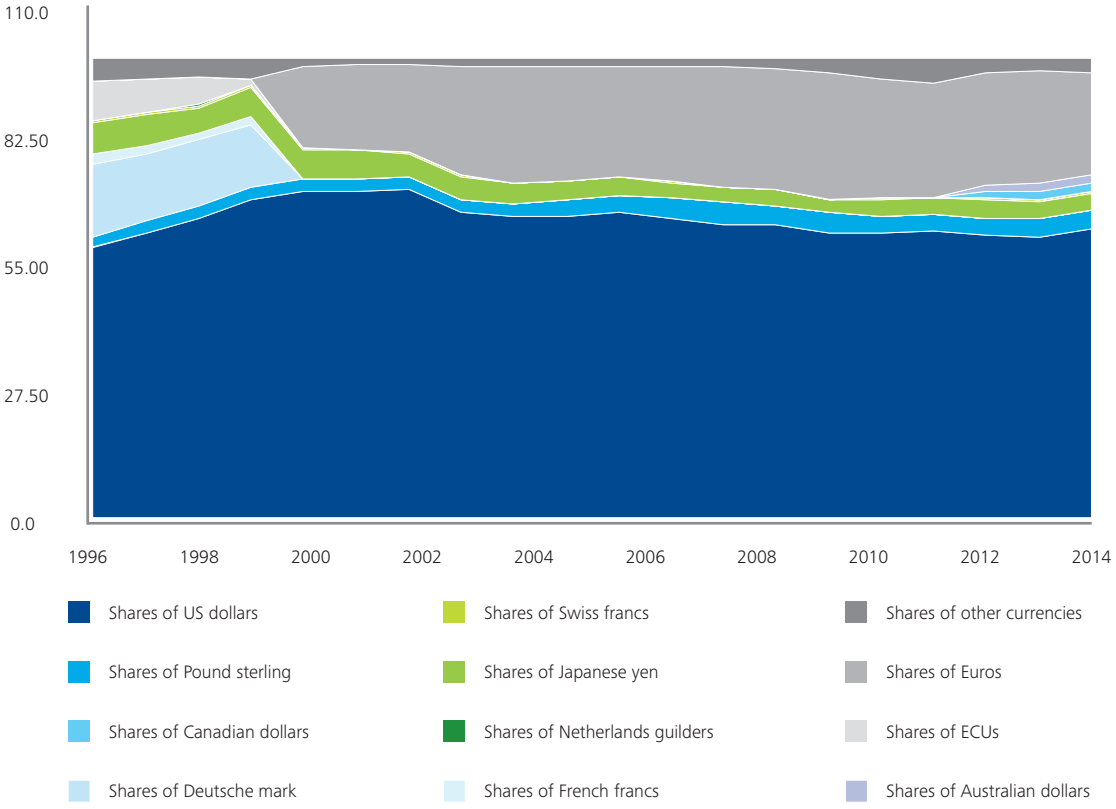
Cryptocurrencies are caught in a Catch-22 situation. On the one hand, the unstable nature of many of "the currencies hinders their widespread adoption. The highly variable exchange rates between Bitcoin other stateless cryptocurrencies and sovereign currencies means prices for goods and services quoted in them must be constantly maintained by merchants, while also making them poor stores of value for consumers. The most obvious solution is to foster widespread adoption so that the speculators who dominate these currencies, and who create the instability, are crowded out by less active investors, the merchants and consumers who are looking for a means of exchange and store of value. A government could drive this adoption simply by mandating that citizens use a cryptocurrency to settle their taxes. However, as we've already discussed, this is highly unlikely.

If not a government though, then why not a sufficiently large and stable institution?

Multinational firms have expressed interest in using cryptocurrencies to settle cross-border transactions within their organisations. Commonwealth Bank of Australia (CBA) is a case in point. It announced recently that it was trialling Ripple for transferring payments between subsidiaries of the bank . However, it is not known if CBA will participate in the global pool of XRP (and thereby ensure its Ripple protocol will interoperate with other institutions using the protocol) or whether CBA will issue its own version of XRP (making CBA's implementation stand-alone). CBA can even forgo XRP if the firm doesn't require the anti-spam features provided by the currency in the closed environment of the bank and its subsidiaries. Nine of the world's biggest banks – including JP Morgan, State Street, UBS, Royal Bank of Scotland, Credit Suisse, BBVA and CBA – are also working together to use block chain technology (bitcoin, the platform, but without the cryptocurrency) to streamline the financial markets. Their focus is on using the technologies post-trade for settlement. One possible example is the issuance of commercial paper on the block chain, allowing two parties to transfer ownership within minutes and with no need for a third party to verify the transaction.

There is also growing interest in Bitcoin, or another stateless cryptocurrency, to replace the US dollar as the global reserve currency. The intention is to find a reserve asset for central banks that better reflects the global economy as the US dollar is vulnerable to swings in the domestic economy and policy. This shows in commodity prices, which go up when the US dollar depreciates. A stateless currency could help prevent spikes in energy prices when the US dollar weakens significantly. Indeed, there is a trend away from using the US dollar to denominate international exchanges of value, shown by China's agreements with various trading partners to settle trades in their own currencies. Stronger evidence can be found in the diversification of reserves held by many nations. Other major government-backed currencies of sufficient scale – primarily the euro – have similar problems.

Figure 5: Composition of foreign exchange reserves



Source: IMF[52]

There has been talk of replacing the US dollar with special drawing rights (SDR) created by the International Monetary Fund (IMF) in 1969 to supplement its member countries' official reserves. The SDR's value is based on a basket of four international currencies – the US dollar, pound sterling, euro and yen – and can be exchanged for freely usable currencies. Typically, the funds the IMF lends to countries are denominated in SDRs. China, eager to take the yuan global, wants the IMF's five-yearly review of the basket of currencies to include the yuan, which requires formal recognition of the yuan as a reserve currency. For many stakeholders, the SDR seems an ideal candidate for a global reserve, particularly once its basket of currencies contains the yuan[53].

The SDR was created to support the Bretton Woods fixed exchange rate system. Bretton Woods requires participants to hold official reserves to purchase their domestic currencies in foreign exchange markets to maintain exchange rates. A new reserve asset was required as the supply of two key reserve assets of the time – gold and the US dollar – proved inadequate for supporting the expansion of world trade and financial development. One of the hopes for the SDR was that it would function as a reserve currency, though the SDR is neither a currency nor a claim on the IMF. Instead, it is a potential claim on the freely usable currencies of the IMF's member countries. One school of thought when the IMF was established 70 years ago was that it would be the custodian of a global reserve currency. However, SDR was overtaken by history when the Bretton Woods system collapsed and the major currencies shifted to floating exchange rates, facilitated by the growth in international capital markets that simplified borrowing by creditworthy governments.

The opposite point of view is that adopting SDR as a reserve currency would not change the fundamentals of the current status quo as it is simply an aggregate of fiat currencies and would lose value like a fiat currency if the nations in the basket print currency with abandon. It could also be considered a risk management tool as it allows holders to spread their exposure across multiple reserve currencies, something many organisations may choose to do directly as it enables them to tune the weightings of the basket of currencies to more closely meet their needs.

If the global reserve currency is to be stateless, it also needs to be independent. This means it would need to be supported by enforceable taxation rights across participating countries, or valued against a single commodity (gold, for example) or a basket of commodities such as gold, oil, grain, etc. owned by an issuing entity. A third option, enabled by our increasingly globalised and virtual world, is to adopt a stateless cryptocurrency.

The trust dynamics that limit the adoption of cryptocurrencies within a closed community also limit adoption across communities. Money is a technology for resolving obligations between individuals who don't know, or don't trust, each other and for whom barter is too awkward. The strongest possible driver for national adoption of a cryptocurrency is for the national government to mandate that taxes be paid in the cryptocurrency. Similarly, the strongest possible driver for global adoption of a global reserve cryptocurrency would be global institutions that can force their will on most cross-border trade, mandating its use. Otherwise, stateless cryptocurrencies will continue to play a niche role in the global economy, just as they do in national economies. Individuals and institutions will still find it more convenient to conduct their business in one of the currencies at either end of the transaction (which, as we've already stated, is most likely to be a national fiat currency), in a trusted third currency (which, by sheer size, may be the global reserve currency) or in a weighted basket of currencies as a risk management strategy to limit exposure to any single currency.

International inter-currency exchanges may travel over peer-to-peer technology platforms based on (or inspired by) the technologies that underpin cryptocurrencies such as Bitcoin or XRP, but value will continue to be stored and exchanged in conventional sovereign currencies.

7 Conclusions

The tools of exchanging value – the bill, (physical) credit cards and even the wallet – were created to manage trust in a world where we had little, if any, information about who we were dealing with. Debt and credit will always exist, but the tools to manage the relationship between two parties can change dramatically. Simply digitising our existing wallets – swapping leather for bits – does not address the changing nature of trust. Digital technology is changing how we interact with the world, but it is also changing how we relate to each other, which is often overlooked. The disruption narrative that seems to dominate conversations today comes from a strongly technological determinist world view, though no technology has ever survived intact after contact with society. We need to consider society and technology together to understand what the future will bring.

In our first report on exchanging value, we found that consumer preference rather than technology would be the strongest force shaping how we measure, store and exchange value. We'd come to the end of the technology build-out phase, and our focus was shifting from deploying infrastructure to streamlining the buying journey from the pieces and parts to the whole. The focus for many organisations was on removing pain points from the established processes for clearance and settlement.

In this report, we've dug deeper to understand how consumer behaviour is changing. Trust has emerged as one of, if not the, most important factor in the future of exchanging value. Money is best seen as a technology for resolving obligations between individuals who don't know, or don't trust, each other and for whom barter is too awkward.

We noticed that consumers find the process of handing over some form of money to the merchant to be annoying. It's not that we don't want to pay merchants for the goods and services, but we prefer it if the payment happens at the edge of our shared relationship rather than in the middle, as services as diverse as Skip and Uber have demonstrated. The focus on optimising the existing payment process, removing pain points and transforming physical wallets to e-wallets represents a legacy approach based on how merchants have done things in the past, not how customers want to interact with merchants in the future. This is a production-centred mindset, in which the merchant defines the relationship with the customer. Digital technology has changed this relationship, with the balance of power shifting to the consumer, who now sets the ground rules. The consumer now defines the value, and the mindset is consumption-centred. We believe this creates an opportunity for merchants to use loyalty schemes to manage their relationships with customers. They can use these schemes as a shared store of value, in effect a complementary currency. This provides both merchants and customers with much greater control over the relationship. Merchants can use the shared store of value to move the payment away from the exchange of goods or provision of service both in time and in space to create a 'sunk cost' that fosters customer loyalty. Customers can use the shared store of value to streamline their interactions with the merchant and simplify access to loyalty rewards, allowing them to focus on what they care about: interacting with employees and building the relationship, not transacting. However, expanding loyalty schemes in this way can bring merchants under the purview of AML/CTF regulations, which the airlines with their mature loyalty schemes are all too aware of.

Cryptocurrencies, with their distributed ledgers, have clearly brought something new to the table. The technologies that underpin cryptocurrencies promise to transform how value is exchanged, with today's intermediaries cut out of the process in the move to peer-to-peer approaches. These technologies are faster and more efficient than the current processes and will replace them as part of a Darwinian evolution of technology. Only regulation is preventing this change, and regulation always changes when enough pressure is applied. While the intermediaries may be happy with the current situation, the parties at either end of the transaction – the merchants, financial institutions and consumers – are unhappy and actively looking for alternatives. A consortium of merchants in the US, led by Walmart, is investing in a peer-to-peer payments solution under the banner of CurrentC™, where clearance is via direct account-to-account transfers. A cryptographically based peer-to-peer approach is a logical technological step and we expect it to be simply a matter of time before direct account-to-account, peer-to-peer transfers are used to settle payments.

The adoption of technologies on which cryptocurrencies are based does not imply that the currencies themselves will be adopted. The strongest possible driver for the adoption of a currency is a national government mandating that taxes be paid in the currency or, potentially, declaring the currency as legal tender and forcing merchants to accept it as payment. We also note that both of these events are unlikely. Consequently, we expect cryptocurrencies to play a niche role in the economy, a role similar to Bartercard or the leather debt tokens that merchants issued in the past. This isn't to say that these cryptocurrencies won't be successful, just that they won't supplant a sovereign currency as the primary store of value for most people and institutions.

There is also significant interest in finding innovative new uses for the technology platforms that underpin cryptocurrencies. If not Bitcoin (the currency), then why not bitcoin (the technology platform)? Cryptocurrencies are not necessarily separable from their technology platforms, as the currency itself is integral to the end-to-end solution. Clearly, we can take apart the constituent technologies and reuse them to create a wealth of new solutions, many of which could disrupt the financial sector by disintermediating the current payments process. Many will also have little resemblance to a cryptocurrency, such as a distributed ledger to track transactions within a firm, or a distributed content management solution that enables the creation of distributed websites that don't live in any single location. In this report, however, our interest is in exchanging value, not on accounting, content management, maintaining authoritative registers or other possible uses of the core technologies. Once the cryptocurrency is removed from the technology platform, the platform is no longer capable of supporting the use case we care about: measuring, storing and exchanging value between two entities that do not know enough about each other to develop mutual trust. The use of a peer-to-peer paradigm to address many of the deficiencies in our current approaches to managing information storage and transfers is a worthy topic of study and one we will investigate in our next report.

Finally, we considered the possibility of using a cryptocurrency as a global reserve currency, a global store of value and a means of exchange. Many nations and institutions are dissatisfied with the US dollar in the role of reserve currency – being the most liquid and stable currency on offer – because, as the saying goes "when the US sneezes the world catches a cold". At first glance, a distributed, Internet-native currency would seem best suited to the role of reserve currency in a digital and online world. Unfortunately, individuals (and institutions) will use the most convenient currency at hand based on the level of trust between the two parties unless they are coerced by higher powers. In international exchanges, this usually will mean a currency from one end of the transaction, or a currency from a much larger (and trusted) third party. We can expect cryptocurrencies to take on a similar role as that held by SDR, as a specialist tool for exchanging value used in specific circumstances, with most international transfers remaining in sovereign currencies.

Near and far future

Looking back to the scenarios in which we explored big and small change aspects for both technology and society, and considering what we know about how technology and society interact, we may conclude a number of things.

It is highly unlikely that Bitcoin or other distributed and online cryptocurrencies for a digital and borderless world will trigger a collapse of the existing system as there is no indication they could ever achieve the level of adoption required. The ambitious predictions for sovereign currencies being supplanted by cryptocurrencies are clearly wrong. As we have mentioned, no technology survives contact with society unscathed. Cryptocurrencies enable many possible futures, but one in which technology forces us to rethink the foundations of our financial system with high technological change but incremental social change – is clearly not viable.

We can expect digital payments to take an increasing share of transactions and the use of cash and cheques – physical money – to continue to decline. However, the shift from physical payments to digital payments is better thought of as a move away from the point of sale, both in time and space. It is also clear that the peer-to-peer technologies used to create cryptocurrencies are more efficient and effective than the intermediary-based solutions currently in place. A future of purely incremental technological and social change – where the incumbents integrate these new technologies into their current solutions to improve the existing processes – also looks unlikely.

Nor can we expect the future to bring a new paradigm in which consumers set the terms and determine how, when and in what currency they will transact – a future in which the current processes for exchanging value are transformed by high technological change and high social change. The balance of power may have tipped from merchant to customer, but the customer's choice on how, when and in what currency they transact is still constrained by the context in which they operate. While customers or merchants may prefer to store their wealth and make all their payments in Bitcoin, they are also forced to deal with the preferences of others and the constraints placed on them by the government.

The most likely outcome is a transition to a new equilibrium. This future involves a significant change in the relationship between merchants and consumers and between institutions in the finance sector. However, it is also a future in which the technology we use to exchange value changes incrementally.

Sovereign currencies will remain and individuals will continue to measure and store their wealth (and be taxed) in the local sovereign currency, as the relationship between state and citizen remains unchanged.

The customer–merchant relationship, on the other hand, is changing dramatically. Value is now defined by consumption and consumer preferences, rather than by production and the features and functions a merchant chooses to make available. This means social rather than technological forces will shape the future of payments. Consumers' deep-seated dislike of handling money is pushing the payment – the exchange of value – from the centre to the edge of their relationship with the merchant. We expect these payments to be mediated via complementary currencies and loyalty schemes where value is defined relative to the local sovereign currency. The current practice of payment at the point where the goods are exchanged or services consumed is likely to fall into decline.

Settlement between institutions will move to new instantaneous payments mechanisms. These mechanisms may be based on exchanging value via a trusted intermediary in the short term, such as APCA's New Payments Platform and the electronic conveyancing platform of Property Exchange Australia. In the mid to long term, settlement is expected to move to peer-to-peer solutions, possibly based on block chain or other technology platforms derived from cryptocurrencies, which are more efficient and effective than intermediary-based solutions.

Finally, international transfers will migrate to new peer-to-peer cryptocurrency-based solutions where the solution's native currency (such as XRP for Ripple), other than facilitating the payments process, is used only for triangulation between two currencies not commonly traded.

Considerations

Money is a technology for managing the exchange of value when the parties involved in transactions either don't know, or don't trust each other well enough to develop the level of trust required. Consequently, the future of exchanging value looks like it will be shaped primarily by social pressure rather than technology. This is both an opportunity and a challenge.

The challenge is that it is difficult, if not impossible, to predict the outcome of a socially driven change. We can see this on the stock markets, where quoted prices represent the consensus opinion of the stock's value rather than the numerical result of a computation on the firm's potential, based on fundamental business indicators. It can also be seen when active funds managers who pick stocks struggle to perform better than passive, automated, index-tracking strategies.

The opportunity is that the future will not be determined by the dispassionate logic of technology, enabling us to interact with the change as it unfolds – exploring, learning and creating opportunities and new roles for ourselves.

With this in mind, we'll discuss what different stakeholders may consider as they navigate the future of exchanging value.

Merchants should consider the shift to virtual payments as a move to mobile payments. The long-term trend we see is for consumers to use their mobile devices to mediate their interactions with merchants, including payments. This may not be via an e-wallet on a mobile phone, though. It is more likely that payments will be embedded in the end-to-end service provided by the merchant. Apple's Apple Store app is a good example, as are the solutions provided by Skip and the Starbucks loyalty scheme. Merchants need to understand how customer payments are woven throughout their interactions and that customers will determine when and how payments are made. If merchants make the payment inconvenient (by forcing consumers to find their way to a physical till, for example) they can expect customers to find more convenient options (using Amazon's app from the aisle, perhaps). Merchants should experiment with payments technologies and solutions to find ways to build closer relationships with customers rather than simply upgrading to the latest solutions provided by the incumbents. Merchants should also consider how they can use their loyalty schemes to foster customer loyalty as a shared store of value rather than treating them simply as a convenient tool to pass discounts and vouchers to customers. Caution is required, though, as this shift may expose merchants to AML/CTF regulation.

Financial institutions face a different challenge. Payments now represent most of their interactions with customers, typically somewhere around 80 per cent. We expect this figure to drop significantly as payments move away from the point of sale, enabling merchants to aggregate transactions. These payments will also be hidden within the merchant's product or service portfolio.

Financial institutions should consider themselves the platforms for the creation of payments solutions rather than the providers of a small number of well-defined end-to-end payments solutions. The payments landscape is becoming an innovation battleground on which the winners will be determined by consumer preference rather than technical merit. While we can be confident that these payments will be in sovereign currency, how and when these payments will be made is not certain as we can see the cracks in the 'buy at the till' model. As we noted for merchants, the shift away from the till will likely result in the growth of loyalty schemes that function as complementary currencies. Financial institutions have the expertise in AML/CTF regulation to ensure these loyalty schemes are safe, secure and compliant.

Financial institutions might also explore new ways of creating value for their customers. The current focus on products and transactions is a result of a historically product-centric relationship with customers. However, as we've noted many times, value is now defined by consumption rather than production. It's been often said that banking customers want a home, not a home loan. Similarly, the customer of a super fund wants a happy retirement, not investment products.

Firms involved in the existing payments and value exchange processes used by the finance sector should be wary. Peer-to-peer approaches to exchanging value are proving to be more efficient and effective than the historical centralised solutions, and we expect these to be replaced rapidly. However, disruption of the established centralised solutions does not necessarily imply disruption of the responsible firms. Development and maintenance of the technologies these peer-to-peer solutions rest on must be supported. This support may come from an open-source model, such as the one used to develop and maintain Linux and, more recently, Bitcoin. It could come from a consortium-based approach supported by a standards body, or it may even be provided by a firm willing to invest the time and effort to ensure the peer-to-peer solution is correct and compliant with the relevant national and international regulations, of which Ripple Labs may be a good example. Indeed, the finance sector is heavily regulated and the need to support this regulation (with its accompanying burdens of proof and penalties) will be a significant driver in determining how these peer-to-peer solutions will be integrated into the finance sector. This may favour a conventional firm with significant experience in the regulatory environment.

Other stakeholders should be less concerned by the disruption ahead. Regulators have shown time and again that new ideas can be integrated successfully into existing regulatory frameworks. We see no reason why cryptocurrencies and peer-to-peer technologies will be any different. Consumers also have no need to worry, as it is their preferences that will shape the future.

Managing disruption

There is more than enough opportunity for all, but disruption in the financial sector is something that needs to be managed carefully. This is largely a social change and any shift will have winners and losers. However, by considering this a social change we can actively navigate the various possible futures enabled by the technology, working to shape the future we want rather than simply being victims to one we think we're forced to accept.

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Peter has spent his entire career working at the intersection between business and technology. During his career he has worked in Asia, Australia, Europe and the US, lived in Silicon Valley through boom and bust, and held leadership roles in global organisations as well as start-ups and research and development labs. These days he works as a consultant and advisor on the business and technology sides of the fence.

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Ian Harper is one of Australia's best known economists. He chaired the Federal Government's Competition Policy Review, served as inaugural Chairman of the Australian Fair Pay Commission, and was one of three panellists chosen to review Victoria's state finances. In March 2011, Ian joined Deloitte Access Economics as a Partner, following a 25-year academic career that included 16 years at the Melbourne Business School and was elected Emeritus Professor of the University of Melbourne on his departure. Ian is currently a member of the Australian Advisory Board of Bank of America Merrill Lynch.

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