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BLOCKCHAIN REACTION

Understanding the opportunities and navigating the legal frameworks of distributed ledger technology and blockchain


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WHO SHOULD READ THIS?

This report is designed to assist business stakeholders, decision makers and in-house counsel across a variety of sectors to demystify the jargon; understand the benefits and challenges presented by distributed ledger technology; and explore the extent to which organisations and governments should invest in or at the very least engage with the technology.

It also sets out issues for government and business leaders to consider as they navigate the inevitable policy ramifications and regulatory challenges.

OUR CASE STUDIES

This report includes insights generously shared by a range of Australian and international stakeholders during our many discussions about the opportunities and challenges facing this rapidly evolving ecosystem. We have, amongst these, thoughts on global trends provided by UBS, a window into two alternative Australian approaches to clearing and settlement provided by the ASX and Computershare, and a unique sector-specific perspective from winner of the 2016 Westpac Blockchain Hackathon, Full Profile.

We'd also love to hear your story. Please get in touch if you'd like to chat to our team about your experiences.

FOREWORD

For almost 200 years, our own business has been built on the basis that people need to transact but often lack the trust to rely on a handshake alone. In essence, we help organisations do business in the absence of trust – we design governance structures, we draft and negotiate contracts, and sometimes, if things go wrong, we litigate. Historically, physical ledgers and contracts have played a vital role in ameliorating the uncertainty experienced by the parties to a trade.

Distributed ledgers digitise a significant part of this process, enabling transactions or records to be traced and authenticated over the internet safely, swiftly and securely, and without the need for an overarching central authority. The potential revolution here is to usher in a new era of trust in commercial and government dealings. Such assurance is likely to become vital in coming years as more people transact online, across borders, with entities whose true identities are not always apparent, and in a climate of ever-present cyber security risks.

At Allens, we first began to look seriously into distributed ledger technology and the changes it portends in 2012, when a junior lawyer in our technology team with a penchant for fringe technologies swept us up with his enthusiasm for the earliest incarnation of distributed ledger technology, Bitcoin. Since that time we have seen the underlying technology and its surrounding ecosystem evolve. Our team has also grown, in step with the expansion and proliferation of distributed ledger technology, to become a multi-disciplinary group of subject matter experts from across the firm.

We've seen distributed ledger technology move out of the lab and onto the C-suite agenda of our clients, from startups to multinational giants with centuries of transactions behind them. While perspectives are many and varied, the overwhelming view is that distributed ledger technology has the power to shift economies, businesses and behaviours. Whichever side of the ledger they're on, businesses need to understand how the technology works and its potential applications, and how it interacts with existing legal frameworks. Businesses that are investing in, or considering using, any variant of this technology, must be able to assess the associated risks and benefits.

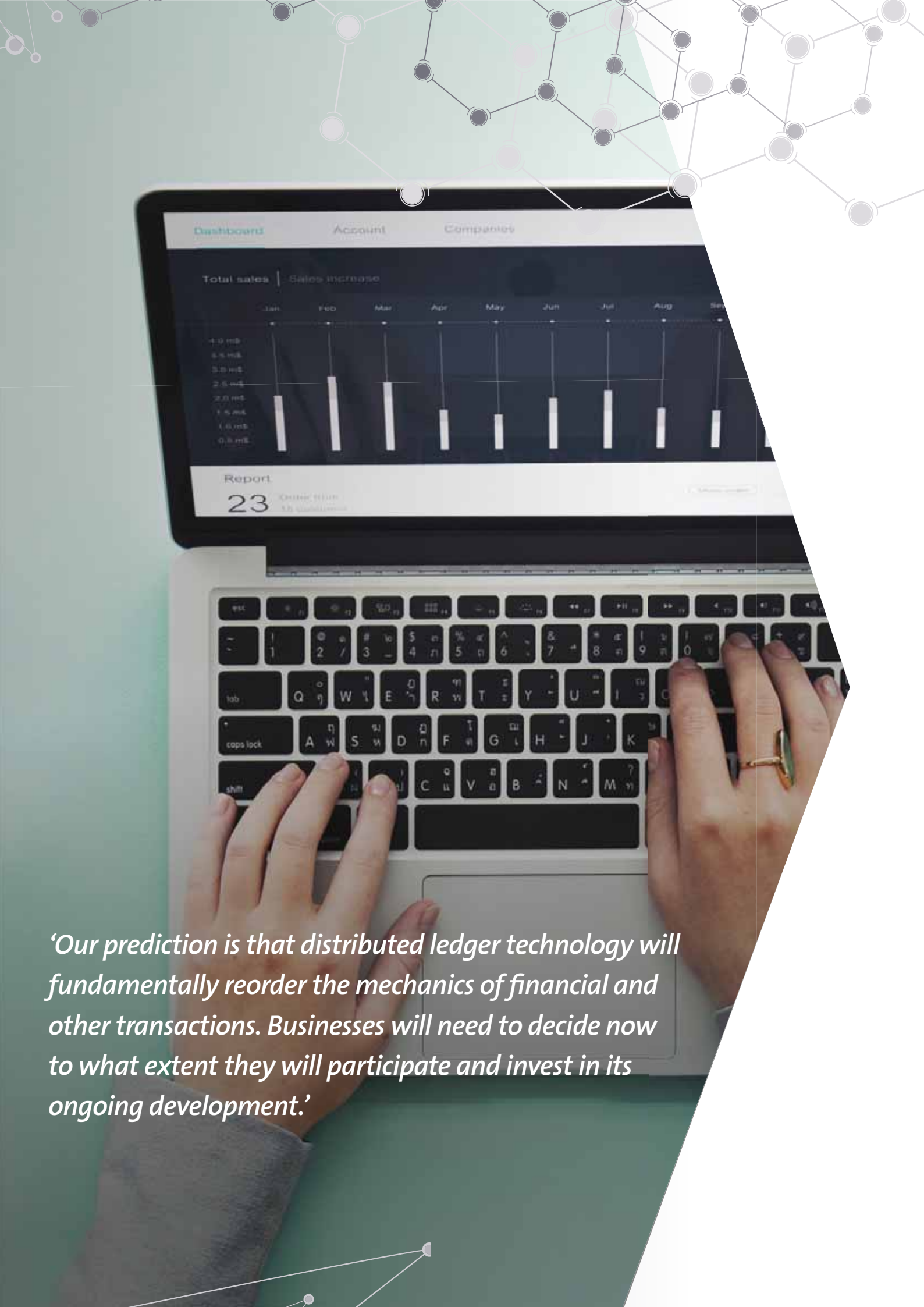
As part of our exploration, we've also put our own business, and the legal sector in general, under the microscope. While we have previously seen technology upend certain areas of our business, it is unprecedented for a technological development to cast such stark light on the future of the legal profession. For some time we have been investing in upskilling our legal and professional staff so that they are best-placed to adapt to and embrace technological change, while also navigating what this means for our clients. This includes developing both the technical skills to transform legal documents and procedures for the new era as well as the soft skills and organisational culture that attend such rapid change.

As a firm, we are in the process of asking ourselves what the lawyers of the future will look like. We are filling a toolkit in which coding and artificial intelligence will sit alongside complex problem solving and the agility to thrive in an environment of profound and ongoing change.

Our prediction is that distributed ledger technology will fundamentally reorder the mechanics of financial and other transactions. Businesses will need to decide now to what extent they will participate and invest in its ongoing development.

Distributed ledger technology already offers solutions to known problems and, as with any new technology, to problems that are unknown. In the end, few organisations can afford to sit on the sidelines waiting for total clarity as the technology evolves and is deployed by longstanding competitors and new entrants alike.

Gavin Smith, Valeska Bloch, Simun Soljo and David Rountree: lead authors, Blockchain Reaction.



'Our prediction is that distributed ledger technology will fundamentally reorder the mechanics of financial and other transactions. Businesses will need to decide now to what extent they will participate and invest in its ongoing development.'

KEY CONCEPTS

What is a distributed ledger? How is it related to the blockchain? What is Bitcoin, and is it even relevant? In this section, we try to unravel the terminology and concepts to consider the opportunities and challenges presented by this technology.

The distributed ledger

In its simplest form, a distributed ledger is a digital record of transactions (or the movement of any data) that is shared instantaneously across a network of participants. The ledger may be used to register any transaction involving the exchange of something valuable, such as rights to payment, or ownership of property (including cash, cryptocurrency, real property and intellectual property). It is "distributed" because the record is held by each of the users of the network, and each user's copy is updated with new information simultaneously.

Ledgers, of course, are a familiar concept in everyday banking. For example, bank statements set out the history of transactions on an account, and summarise any outstanding amount owed by either the bank or the customer. Before the advent of online banking, customers kept their own hard copy of the statement in a passbook that was physically updated by the bank with every transaction. There were therefore two copies of the statement – one kept by the bank, and the other by the customer – both constituting a true and original record.

In a distributed ledger, the accuracy of the database is confirmed by reconciling each individual version against all copies in existence. This enables a 'consensus' to be established as to the true record, thereby avoiding the need for duplication and expensive reconciliation. It also enables entities to immediately identify any instances of unauthorised tampering.

The trust that attaches to distributed ledgers also stems from its most basic security feature – distributed ledgers are not vulnerable to a single point of failure. To be successful, a cyber-attack would need to not only infiltrate one user; it would have to attack multiple copies of the record held across the network.

Blockchain

A blockchain is a technical component of a distributed ledger, and refers to the chain of transactions that reside within the ledger. Transactions are grouped into "blocks", and as they are verified, a new "block" is added to the chain of previous transactions. The ledger is updated – instantaneously, permanently and irrevocably for all users to reflect the new status of the ledger with the additional block. The blockchain is therefore an accurate record of the history of the entire ledger.

Importantly, not all distributed ledgers use blockchain technology, though the terms are often used interchangeably.

BITCOIN

One of the first use cases of distributed ledger technology is the cryptocurrency known as 'Bitcoin', invented in 2008 by the mysterious computer programmer Satoshi Nakamoto, whose identity remains subject to great speculation.

The innovation of Bitcoin is that it uses cryptography to create a secure network of participants, each of whom has a copy of the Bitcoin ledger, which enables users to trust that third parties, whose identity they did not know, are the legitimate owners of the Bitcoin. Transactions involving Bitcoin occur in close to real time and do not require a third party intermediary. That distinguishes them from normal currency transactions, which require exchanges to be authenticated by intermediaries such as central banks.

Bitcoin has had a wild ride, oscillating in value rapidly and dramatically over its lifespan, as hype, speculation and interest have waxed and waned. Despite some hiccups, it is still in use in a variety of areas, is accepted as currency by a wide range of vendors, and represents a living experiment into the possibilities of blockchain technology.

Currently, the Bitcoin community is subject to an ongoing technical debate regarding whether or not the "block size" of each block in the blockchain should be increased in order to support transaction growth. Each approach has its own technical pros and cons. In order for this change to be achieved, it would require near universal adoption from the community, or risk splitting the blockchain (a "hard fork").

Number of early stage Bitcoin and blockchain companies identified by Venture Scanner[1]

815

USD 11-12 billion

Projected annual global cost savings from cash securities by cutting settlement times and reconciliation costs[2]

$160 million

Amount invested by VC firms in blockchain ventures in Q1 2016[3]

$921 million

Cumulative VC investment in Bitcoin and blockchain companies to Oct 2015[4]

$2.7 billion

Value of Bitcoin trading in Sep 2015[2]

USD 3-5 billion

Projected annual global cost savings from improving anti-money laundering compliance[2]

ASX's advisors estimate the use of blockchain for equities post trade could result in annual savings of

for end users[2]

30+

Banks and financial institutions known to be testing, analysing or investing in blockchain technologies[5]

Sources:
1. venturescanner.com reviewed May 2016
2. Profiles in Innovation – May 24, 2016, Goldman Sachs
3. Coindesk state of bitcoin and blockchain report http://www.coindesk.com/5-takeaways-coindesks-state-blockchain-q1-2016/
4. Coindesk and Crunchbase
5. Firstpartner research

A GLOBAL PERSPECTIVE > UBS

> Preparing for the transactions of tomorrow

Alex Batlin, Senior Innovation Manager, UBS FinTech Innovation Lab

Distributed ledger technology has been on the radar of UBS since 2014. The financial services company quickly perceived the technology's disruptive potential to create a new business model around trust. "We saw that there may come a point where you no longer require the incumbent financial intermediaries to check transactions because the blockchain guarantees that every transaction is valid," says Senior Innovation Manager Alex Batlin. "We needed to understand the nature of the disruption, and where the opportunities are."

Batlin runs UBS's FinTech Innovation Lab in London. His team, which comprises developers, business analysts and other experts, works in the city's buzzing Level39 accelerator space alongside like-minded startups including Ripple. A natural ecosystem around distributed ledgers has arisen in the United Kingdom, he believes, because the government, regulators and central bank are all strong fintech supporters.

UBS predicts that distributed ledgers will help financial institutions to optimise middle and back office operations, and enable more efficient transactions. At present, financial market utilities transfer, clear and settle payments through a complex process that involves creating private databases and reconciling them in batches using the SWIFT messaging system. Processing often takes several days (or even longer for securities and syndicated loans). During this time, clients are effectively prevented from accessing their money, and incur financial risk. "So many issues are resolved if you can reduce settlement times and the costs of intermediaries," Batlin says. "Of course, this reduces the costs of capital for [UBS] as well."

Batlin and his team are in an experimentation phase, focused on understanding distributed ledger technology's capabilities and limits. "'Can we do [transactions] on blockchain?' The answer, in most cases, is yes. Therefore, the possibilities are only limited by the imagination," he says. One challenge is that the rate of transactions is currently too slow. Legal and regulatory hurdles must also be considered, as well as the problematic use of pseudonyms during trades. "All these questions need to be answered before we can launch into any sort of commercial proposition."

Ultimately, Batlin is convinced that distributed ledger technology could become widely accepted, despite requiring major behavioural change. Clients, for example, could in the future rely on autonomously-executing smart contracts to enforce legal obligations. "So, instead of trusting a broker to swap shares for [money], and give you refunds if appropriate, you will trust code," he says. The fast-maturing nature of the internet explains Batlin's confidence. He notes that smartphones were nascent at the turn of the century – yet in barely 15 years, "high streets have been decimated; and travel agents, book stores and bank branches closed down".

Financial institutions are generally cautious about embracing technology. Many were initially reluctant to embrace touch ID systems as a way for customers to access banking apps, but they have quickly become as legitimate as passwords. This time, the work of UBS and others in the R3 community shows that the sector is thinking ahead. "When you are looking to manage flows of trillions of dollars, you have to be careful and really explore distributed ledger technology before you are going to trust it," Batlin says. "Nonetheless, there is a genuine kind of economic shift here which is important to realise. This isn't just a fad."

UBS

PUBLIC VERSUS PRIVATE LEDGERS

Distributed ledgers can be public or private. Each type has strengths and weaknesses, which should be weighed by potential adopters of the technology.

> Public distributed ledgers

No central owner: a public or permissionless ledger has no central owner. Instead, it can be accessed and maintained by any member of the public. Identical copies of the ledger are distributed to everyone in the network.

Bitcoin was the first, and it remains the most widely used, example of a public ledger. In theory, anyone with the Bitcoin software possesses the ledger, and anyone who wishes to transfer Bitcoin can add a transaction to the ledger. Another example is Ethereum, a platform that can host transactions involving smart contracts, effectively offering distributed ledger technology "as a service".

Can be accessed and maintained by any member of the public.

Security through greater distribution: the wide distribution of users, none of whom exert central authority or control, protect the integrity of transactions recorded on the ledger.

Trust in pseudonyms: public ledgers operate without the need for identity information, and most users adopt pseudonyms. Knowing the other participants on the network is not required to trust in the validity of a transaction that occurs, as the database's accuracy is confirmed through consensus protocols.

Slower transaction processing: public distributed ledgers often require significant computational resources to show consensus and verify a transaction. Slower processing affects the volume of transactions that can be conducted at any one time.

> Private distributed ledgers

Subject to some external governance or control: a private ledger is one with limited or pre-selected participants that are authorised to transact and interact while subject to some form of external control. The ledger may be set up within an organisation or between a closed group of organisations that agree on its rules.

Limited or pre-selected participants are authorised to transact and interact.

Security through identification and controls: private ledgers allow members to enforce rules and determine who is allowed into the system. A higher level of trust is required between participants in a ledger, as it is possible to collaborate to alter the rules of transactions. Therefore, more stringent identity verification processes are usually required by the owner or administrator of the ledger.

Higher running costs: all network participants are responsible for ensuring the ledger's operation. Limited membership incurs higher running costs than a system distributed more widely.

Faster transaction processing: having a known pool of members enables transactions to be verified faster and with less computer power than a public ledger. This also makes it easier to increase transaction volumes.

Legal obligations: the owners of the ledger are legal persons that can be subject to contractual and regulatory obligations.

USE CASES

The appeal of distributed ledger technology lies in its ability to offer an accurate and authoritative record of events, without the need for intermediaries or centralised authorities. This opens up a wide range of applications for business and government. A recent report by the United Kingdom's Chief Scientific Advisor suggests the technology will "catalyse exceptional levels of innovation" and create new trust in the operation of financial markets, public information registers, product supply chains, and business and consumer transactions.

Banking

Banking, payments and financial transactions represent some of the most promising uses for distributed ledger technology. There is particularly strong potential for banks to improve the efficiency of payment services by adopting an alternative to the high transfer costs and limited distribution methods and brand options typically associated with money transfer or remittance. Cross-border banking, which has numerous inbuilt costs, can be particularly inefficient. Distributed ledgers offer a solution that would enable transactions to be approved more swiftly, without multiple intermediaries and with less propensity for error. Industry analysts predict the technology is capable of reducing the global banking industry's operating costs by $US20 billion a year.

The major Australian banks are already investing significantly and experimenting with distributed ledgers. The Commonwealth Bank, the National Australia Bank and Macquarie Bank have all invested in R3, a worldwide consortium of 30 banks that is designing protocols for a blockchain system to transfer funds to each other at low cost, without having to rely on central banks. The Commonwealth Bank and Westpac are also trialling Ripple technology.

Ironically, distributed ledger technology also has the potential to disrupt and threaten the viability of any financial institution that serves as an intermediary to transactions. By creating a new source of trust, any entity whose business model currently involves assuring trust is in danger of being circumvented. This includes centralised institutions and bureaucracies such as correspondent banks, clearing houses and government authorities.

Securities transactions

Distributed ledger technology is likely to have a significant impact on record-keeping and transfer procedures for financial assets such as securities. The securities industry currently relies on ownership transfer through a clearing and settlement process that is slow, cumbersome and involves intermediaries. This has created significant interest in the new technology among major stock exchanges.

Using distributed ledger technology in securities settlement offers several advantages. It could allow for quicker settlement, improved integration with registry and back-end systems, and reduced capital requirements. It may also facilitate the development of more innovative services, and lower costs overall.

The ASX is currently investigating whether distributed ledger technology could be used to replace CHESS as a clearing and settlement system in the Australian equity market. The NASDAQ in the United States is also working on projects that apply the technology to trading, clearing and settlement of equities and securities. NASDAQ's Linq blockchain enables private companies to track changes in ownership of shares that have been issued to founders, early investors and employees. In December 2015, the US Securities and Exchange Commission approved Overstock.Com Inc's proposal to issue and record company stock using distributed ledger technology. In each case, a record of the change of ownership is immediately inscribed on the blockchain. Payment and settlement occur simultaneously.

Another key potential benefit of distributed ledgers is their ability to act as a digital representation and record of ownership. Given that most financial assets such as bonds, equities, derivatives and loans are already digitised, it may be possible that the entire financial system is replaced by a decentralised structure in the future.

Digital currencies

Bitcoin is the most well-established cryptocurrency of the hundreds that are currently available. However, central banks are starting to explore opportunities to develop their own versions by leveraging distributed ledger technology. The Bank of England and the Reserve Bank of Australia are among those who have shown interest.

Government records

The trusted nature of distributed ledger technology makes it ideally suited for use in government record-keeping. For example, a public blockchain could be used to create an accessible ledger of public property ownership. Such a record could be used to track property ownership in jurisdictions where maintaining proper documentation has been challenging.

The technology could also help governments collect taxes, deliver social security benefits, issue passports and generally ensure the integrity of public records and services. In the area of health, for example, the technology could improve the electronic sharing of medical records using secure rules. Individual patients could control access to their records and be aware of anyone else who has accessed them.

Intellectual property

Distributed ledgers could also be used to verify the existence and contents of electronic documents or digital intellectual property. The technology has the potential to serve as a form of programmable intellectual property protection and ownership identifiers. Obvious intellectual property applications of blockchain technology include verifying ownership and the date of creation of copyright works.

Services such as Ascribe, PeerTracks and Ujo are already seeking to leverage this functionality to provide further tools for commercialising copyright works and seeking royalties. The time-stamping capability of blockchain could equally help determine issues of first inventorship in patent cases. In addition, sensitive R&D documents may be verified and time-stamped by the blockchain without requiring public disclosure.

Internet of Things (*IoT*)

The rapid growth in the number of internet-connected devices has also opened the possibility for these devices to transact and communicate in real time using the blockchain. Using smart contracts, IoT devices could become smart property, which act independently in a tamperproof manner due to the code programmed into the blockchain.

TRADING TECHNOLOGIES: THE ASX STORY

ASX Settlement provides clearing and settlement to the Australian equity market through CHESS (Clearing House Electronic Subregister System). When CHESS was created in the early 1990s, it was the world's first dematerialised share settlement system. Until recently, trades settled in three business days (referred to as T+3). Settlement now occurs in two days (T+2).

With the technology underlying the CHESS operating model approaching the end of its life, the ASX has been considering various replacement options. In early 2016, it announced that it would explore the potential of distributed ledger technology. The ASX has invested in Digital Asset Holdings, LLC, a US-based company that is looking at ways to apply the technology to securities transactions. The two companies are currently engaged in developing prototypes and testing. The ASX is expected to decide whether it will proceed with distributed ledger technology in 2017.

THE RIPPLE EFFECT

Ripple is a payment system that uses its own distributed ledger. It offers banks and financial institutions the potential to make faster payments in more currencies and into more markets with lower cost and risk than possible with conventional systems.

The platform is powered by participating users reaching 'consensus' on the composition of the ledger every few seconds. Banks clear transactions on the network 24 hours a day, 365 days a year. Importantly, they can also do so in real time, while avoiding the additional risk and cost of using intermediaries.

Under Ripple, banks and financial institutions can exchange currencies, cryptocurrencies, commodities and other tokens of value. Designed as an alternative to correspondent banking for cross-border payments, the system can also be used between local banks for domestic payments.

ripple

WHERE ARE WE NOW?

Despite the undoubted potential of distributed ledger technology, the reality is that most applications are currently in the exploration or development phase and have yet to achieve scale. For example, banks are setting up innovation labs to explore potential use cases. Some banks are focusing mainly on Ripple for international payments, while others are targeting more general uses requiring smart contracts, typically involving Ethereum. However, much work is needed to ensure the blockchain is more secure and trusted than current systems and relationships.

Even the most optimistic perspectives acknowledge the significant challenges involved in the implementation of distributed ledger technology. While consensus is critical as a technical aspect of distributed ledgers, consensus has not been reached on the best approach moving forward, the ideal business model, and how to maximise value, or monetise, the technology.

Innovation will likely require substantial upfront investment, which may only realise modest efficiencies. Significant changes to existing processes from both technical and operational perspectives will be necessary in order to fully realise the potential of this technology. These processes will need to be co-ordinated across an entire industry basis – requiring co-operation from all parties and potentially regulatory bodies.

'Significant changes to existing processes, from both a technical and operational perspective, will be necessary in order to fully realise the potential of this technology.'

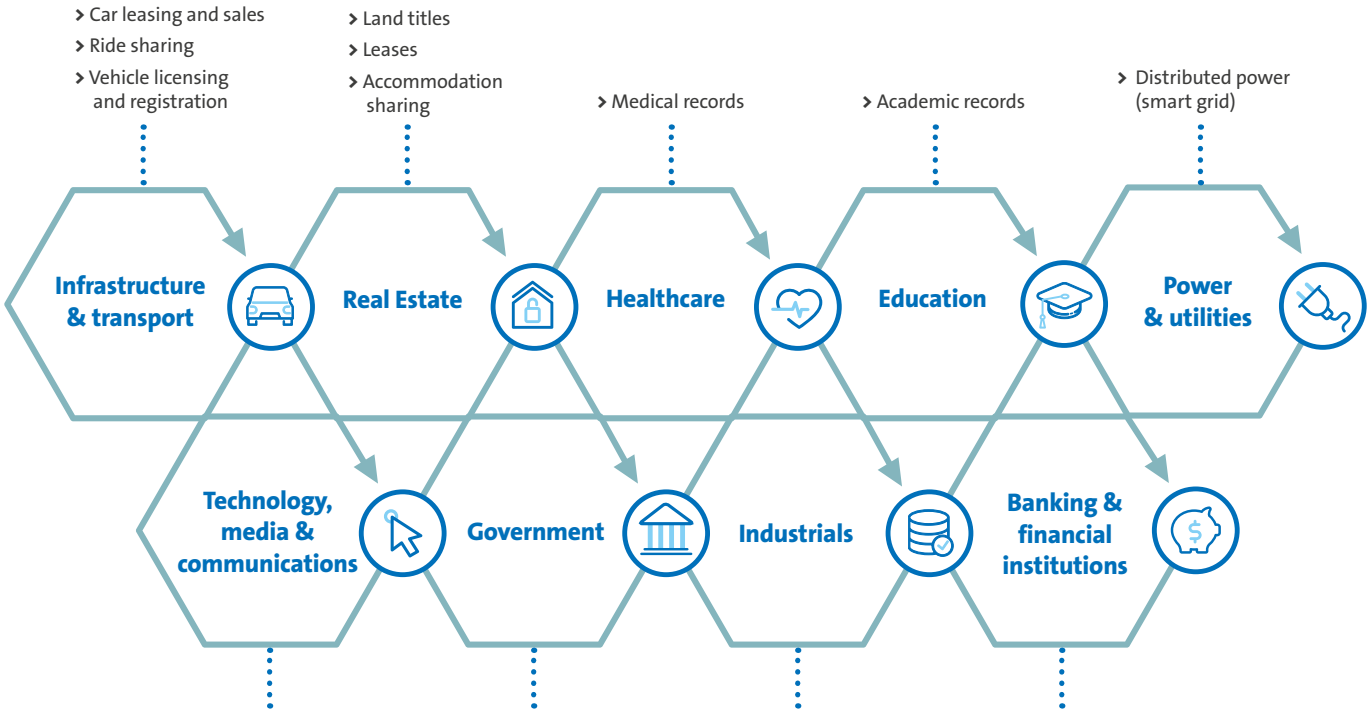
It is certainly possible for industry-wide shifts to occur. We have seen it before with the New Payments Platform project and the Principles of Reciprocity & Data Exchange. However, both of these projects have taught us the amount of time, effort, cost and energy that need to go into such an endeavour – which may need to be replicated to realise a holistic move away from legacy systems to distributed ledger technology.

Given these challenges, we are likely to see technical and operational use cases proven in more limited contexts. Early adopters may seek to de-risk the uses of the technology, or apply them in narrow circumstances. However, by doing so, the potential gains that can arise will also be smaller.

It is worth remembering that perhaps the most important innovation involved in the technology is the ability to be able to transact without needed intermediaries or relationships of trust. In a digital age, where we are now increasingly transacting in a manner which challenges the relationships of trust that were previously so important to commerce, this presents a massive opportunity.

The possibilities are exciting – and we look forward to the day that it steps out from its various siloed labs and into the everyday world. To do that, however, we predict that it will require significant leadership, investment and co-ordination.

A GUIDE TO POTENTIAL USES ACROSS SECTORS



- Cybersecurity – reducing hacking risk
- Music licensing
- Direct payments to artists
- Peer to peer file sharing
- Cloud storage
- Software
- Identity verification (replacing usernames and passwords)
- The Internet of Things – registration of devices, authentication of remote users

- Secure voting
- Tracking money (eg student loans, international aid money)
- Marriage contracts
- Personal records – birth certificates, passports, death certificates
- Criminal records
- Forecasting – economics, politics, natural disasters, gambling odds
- Tax, payments and records

- Assurance of supply chain quality
- Delivery records
- Servicing records
- Trading ownership online
- Ownership/provenance of documents and assets
- Ownership/provenance of diamonds and other valuables
- Storing warranties
- Vouchers/coupons/ reservations/tickets
- Copyrights/trade marks
- Keys – car keys, home keys, safe deposit box keys, etc.

- Cryptocurrency
- Payments and money transfers
- Banking
- Mortgages
- Stock trading
- Accounting transparency
- Crowdfunding/ microfinance
- Anti-money laundering compliance

COMPUTERSHARE AND SETL JOINT INITIATIVE

On 28 April 2016, Computershare and SETL announced a joint initiative to establish an Australian securities ownership register using distributed ledger technology. Computershare is a stock transfer and registrar company. SETL is a British-based, global blockchain developer. The project aims to establish an immutable register of securities ownership. The Australian sharemarket may be particularly suited to this technology, as it is not fragmented.

This will be facilitated by Computershare bringing together a range of parties in the market, including asset owners, brokers and regulators. SETL will develop and provide blockchain technology capable of recording and verifying payments and movements of cash, foreign exchange, securities and other asset classes in real time. In conjunction with Computershare's registry platform, the ledger will also allow instant automatic transfer of title between vendor and purchaser, solving existing problems caused by delays in settlement of traded assets. This collaboration is separate to the initiative being developed to replace the ASX CHESS System, and will potentially operate beyond ASX transactions.

In response to concerns about privacy and data breaches, SETL has indicated the system will be a permissioned (or private) blockchain limited to established market participants. SETL CEO Anthony Culligan predicts the technology will take 12 to 18 months to be operational.

Computershare SETL

A SECTOR PERSPECTIVE > FULL PROFILE

> Preparing for the transactions of tomorrow

Emma Weston, Co-founder, Full Profile, winner of Westpac's Blockchain Hackathon 2016

Founded in October 2015, Full Profile is a Sydney-based startup that is developing financial solutions for agribusiness. It sees enormous potential for the use of distributed ledger technology and is currently aiming to prototype a solution for the Australian grain sector.

The grains market has long been plagued by payment uncertainty, creating a significant imbalance of power between growers and traders. When growers deliver their grain, they are effectively trusting the buyer to pay them and abide by the agreed terms. However, the fact that physical delivery, title transfer and payment occur at different times means that growers are exposed to the risk of buyer insolvency or payment problems. Currently, it takes about 30 days for growers to be paid upon delivery. That is a long time for growers to be left in the lurch.

According to Emma Weston, co-founder of Full Profile, growers lost $70 million in NSW and Victoria alone in 2014 due to grain trade insolvencies. This resulted in an estimated $200 million loss in economic activity across regional Australia. Many growers prefer to sell to larger multinationals and incumbents who present less counterparty risk. However, this erodes innovation and competition, and places downward pressure on prices. Another problem is that financial institutions are being forced to charge a premium when lending to agribusiness. "If we can get risk priced appropriately by removing payment uncertainty, banks will adjust prices and there will be more competition in the market," Weston says.

The purpose of distributed ledger technology is to bring greater confidence to a market defined by a lack of transparency and trust. Full Profile is developing a pilot program that enables automatic payment upon title transfer or physical delivery of grain. This applies not only to growers, but also financial institutions and all other claimants on sale proceeds including the Grains Research and Development Corporation.

Another benefit is that distributed ledgers serve as a centralised record of industry activity – timestamping all transactions and confirming who paid their levies, and for which crop. Until now, the sector has had limited ability to record grain quality and establish provenance or chain of title. The technology's role could even extend to dictating the order in which parties get paid during insolvency situations. While Weston believes the possibilities are limitless, privacy and confidentiality are still issues that need to be resolved. As she puts it, "How much information should stakeholders be able to see about their competitors?"

While distributed ledger technology is revolutionary in its potential, Full Profile's approach is deliberately evolutionary. The company is seeking first to validate the technology, then give growers and traders the assurance to jump on board. Weston anticipates that value to the sector will quickly be realised as its solution attracts scale.

She believes that government should encourage pilot programs and grassroots innovation rather than regulate distributed ledger technology before its full potential is known. "Blockchain is a sandbox within itself, and there needs to be an area within which people can play and test new rules," she says. "Technology is a better cure for problems than regulation."

FULL PROFILE

GOVERNANCE OF DISTRIBUTED LEDGERS

Any entity that establishes or participates in a distributed ledger should understand how it will be regulated by two key sources of authority:

1. Legal code – legislation and other rules made and enforced by the government, often with a focus on consumer protection.
2. Technical code – the software and protocols agreed upon by the owners or participants of a system with the aim of safeguarding their private interests.

Digital environments are unique in that both legal code and technical code regulate activity. They also represent two diverging approaches to regulating problems. Under legal code, the rules can be broken, but any breach results in consequences. With technical code, the rules are programmed into the ledger from the outset and if broken, the technology simply does not work.

A public, unpermissioned system such as Bitcoin is primarily governed by technical code because no single entity controls the system. This is why attempts to regulate Bitcoin by legal code have tended to focus on regulating the businesses that deal with Bitcoin such as exchanges and wallet providers.

By contrast, a private distributed ledger is governed by both legal code and technical code. In some cases, legal obligations may be imposed on the proprietor of a private ledger. For example, the administrator might be responsible for fixing any faults in the technical code, checking whether the operation of the technical code accords with or contradicts the requirements of the legal code, or providing information to regulators regarding the contents of a ledger to demonstrate compliance.

Service-level contracts more commonly used in conventional computing settings may be the most appropriate means of holding ledger administrators or controllers to requisite standards. Of course, achieving these standards remains a challenge in circumstances where no single entity controls or administers the ledger.

Importantly, the nature and identity of a proprietor of a distributed ledger (or whether there is one at all) will ultimately depend on decisions made regarding the governance framework at the outset. It is critical that before participating in a distributed ledger, participants understand the rights that they will have, and how such rights can be exercised and modified. This is because once the governance framework is established, it can only be amended according to the rules written into the technical code.

The involvement of external regulators in assessing technical code is also likely to push new legal frontiers. Although their involvement to date has been largely limited to monitoring the plethora of proof-of-concepts emerging in the market, we expect that regulators may in time seek to intervene and approve the internal rules governing distributed ledger arrangements where the ledger is being used for a sufficiently critical or sensitive subject matter.

'It is critical that before participating in a distributed ledger, participants understand the rights that they will have, and how such rights can be exercised and modified.'

SMART CONTRACTS

Smart contracts are one of distributed ledger technology's most interesting and potentially transformative use cases, ensuring that ledgers can not only be used to store a record of what happened in the past, but what should happen in the future. They also represent an important example of how the technology is colliding with the legal system.

A smart contract can be thought of as an application that is layered over the infrastructure of a distributed ledger, which is therefore very difficult (or impossible) to tamper with. The essence of such a contract is that its terms are encoded as part of a computer program. These terms execute automatically on the occurrence of predefined triggers without relying on third parties to enforce the bargain. For example, the contract could be programmed to execute automatically through the electronic transfer of a payment by a certain date. So far, smart contracts have largely been used in the context of executing financial transactions, or operating as an autonomous escrow function. However, their potential is much greater, and can extend to a variety of legal and compliance functions.

The name "smart contract" is a slight misnomer – as not all are contracts in the traditional sense. The central legal question raised by these arrangements is the extent to which they are valid and enforceable under existing contract law. While traditional principles of contract law will assess whether the parties who use a smart contract entered into a "legal" contract, this becomes murkier where one of the actors that is responsible for performing obligations is a decentralised distributed ledger.

We predict early adoption of smart contracts will be in the following areas:

- Derivatives and other financial instruments (with the aim of automating and simplifying existing financial processes and systems);
- Conditional payment arrangements/escrow arrangements (where smart contracts can act as effective escrow agents for conditional payments); and
- Micropayments (where the cost of enforcement greatly outweighs contract value).

It is also unclear whether liability for actions performed through smart contracts can be attributed to the author (or owner or creator) of the smart contract. This is important in situations where a smart contract produces an outcome which is undesirable or not the intention of the parties.

Smart contracts do possess some legal advantages. They avoid the cost and delays of traditional contracting structures. The fact that they execute independently of external influence means there is no need for paper execution of documents, or for parties to spend time and money complying with obligations. Instead, performance is hardwired into the code. Smart contracts also use programming language that by definition requires precise outcomes, creating none of the ambiguities in contractual interpretation associated with the use of words.

On the other hand, the same ambiguity that exists in contractual documents can often be a source of comfort for parties because it offers the prospect of reaching a commercial understanding through agreement. This flexibility does not exist in smart contracts. By using a smart contract, parties effectively cede control over an aspect of the performance of a contractual obligation to a digitised process which cannot be reasoned with or influenced. Whether parties will be willing to cede that control in favour of an element of greater certainty is an open question. In addition, smart contracts do not have the benefit of traditional contractual safeguards and consumer protections. A smart contract may not be capable of recognising when it is an unfair smart contract. These issues will likely have to be navigated in future on a case-by-case basis.

At this stage, we aren't convinced that "smart contracts" will replace lawyers altogether. Currently, most use cases for smart contracts involve the execution of relatively simply contractual instructions or control functions. Some of the real advantages of smart contracts arise in the context of low value payments, which would cost more to enforce than the value of the transactions. For a smart contract to work effectively, the parties to a transaction need to be able to precisely define an outcome to make it the subject of code. The more complicated the provision or relationship, the more difficult it will be to code. However, it is likely that over time, smart contracts will apply to increasingly complicated situations, and be used for different purposes beyond simple commercial transactions.

At a minimum, lawyers, regulators and court systems need to become familiar with smart contracts, and continue to monitor their evolution as use cases become more complex. Record-keeping requirements and evidentiary rules may also need to be adapted to enable courts and other authorities to access any data that is used to generate, or that is the subject of smart contracts.

'Will individuals trust an anonymous code with their savings and finances or will they demand a trusted brand rather than putting their faith in technology? It is only human to want recourse to a reputation or relationship, a person or institution that cares about resolving problems, rather than be faced with the implacable and uncaring logic of an algorithm.'

MARK NUTTALL, PARTNER, LINKLATERS

THE DAO:
CREATED THROUGH CROWDFUNDING

Recent developments have pushed the boundaries of distributed ledger possibilities, with the creation of the "Decentralised Autonomous Organisation" (known as the DAO). The DAO is a combination of smart contracts and distributed ledger technology, which seeks to create a model of a corporation on the Ethereum distributed ledger. Established through a crowd funding vehicle, where founding members donated "Ether" (***Ethereum's form of currency***) to the project, it has become the largest crowdfunding campaign in history, having raised over $100 million worth of Ether in a matter of weeks since late April 2016. The DAO is intended to operate through business operating procedures that are coded into its structure, with participants in the DAO effectively acting as shareholders who are capable of voting on the operations and proposals of the DAO. This represents a high watermark of experiments with distributed ledger technology. Many unanswered questions exist with such an entity – particularly how it interacts with corporations law and how it (and its owners/users) accept liability. Relevantly, the DAO also has a "Curator" who is appointed by members to act as a failsafe to prevent misuse and provide protection to the members of the DAO. This reinforces the importance of governance structures and the technical code. The DAO is in its infancy, and its progress will be monitored closely.

REGULATORY RESPONSES

The development of effective responses by government to distributed ledger technology is still at an early stage in Australia and around the world. Until now, the major focus of regulators has been to consider whether existing frameworks for banking, commodities, securities and consumer protection are sufficient to accommodate digital currencies such as Bitcoin, or whether new frameworks are required. Consideration of the legal implications of alternative uses of distributed ledger technology remains extremely nascent – not least because these uses are only starting to be discovered.

However, a consensus is developing (with a few notable exceptions) that treatment of distributed ledger technology by government should be precise and proportionate to address the risks and vulnerabilities of the technology. The prevailing view is that this approach is preferable to imposing overly onerous obligations on transaction participants before the full economic benefits are understood. Our firm view is that regulators should seek to avoid stifling innovation in a fast-evolving area. Ideally, new approaches should be accommodated within existing legal frameworks. The early days of seeking to regulate Bitcoin are littered with examples of overly prescriptive and stifling rules. One example is the State of New York's "Bit License", which was widely criticised as ill-conceived and heavy-handed in its approach.

Responses to distributed ledger technology are currently being considered at the transnational level. These include efforts by bodies such as the International Organization of Securities Commissions, which has established a global blockchain taskforce, and the Financial Services Board, which sets banking regulatory standards for G20 countries.

At the national level, potential regulatory issues in Australia are being considered by the Reserve Bank and the Australian Securities and Investments Commission. However, regulators are generally taking a cautious approach, with very few pronouncements or assessments outside the context of Bitcoin. The most definitive ruling was by the ATO, regarding the tax treatment of Bitcoin. The ATO's view was that Bitcoin should be treated as an asset, rather than a currency. The operation of this ruling has a number of consequences, particularly in the GST context, where the payment of double GST would occur in some Bitcoin transactions. This ruling was widely regarded as illogical given the primary use of Bitcoin was as a currency.

In October 2015, a Senate Economic References committee published its findings and recommendations in relation to an inquiry it conducted into digital currencies. The focus of these recommendations was on digital currency applications of distributed ledgers, rather than a broader focus on other applications. The Commonwealth Government Treasury responded to the inquiry on 5 May 2016, where it:

- pledged to address the "double GST" issue, and to reconsider the tax treatment of digital currencies generally; and
- recommended a review of anti-money laundering (***AML***) and counter-terrorism financing (***CTF***) legislation to consider applying such regulation to digital currency exchange businesses, given cryptocurrencies fall outside of existing AML /CTF legislation definitions.

Other jurisdictions are more advanced in developing responses. For example, the Chief Scientific Officer for the United Kingdom, Sir Mark Walport, has recommended the creation of a flexible regulatory framework for distributed ledger technology which evolves as new uses develop. He also recommended that government and industry experts collaborate to develop standards for the integrity, security and privacy of distributed ledgers.

Distributed ledgers involve a complex ecosystem of players. These include the infrastructure host, providers of software and applications, and those who seek to transfer assets or tokens of value through the transfer of information on the distributed ledger. Therefore, a key issue is identifying the proper targets of any regulation. This is a particular challenge given the sheer number of participants as well as the cross-border nature of the technology. Put simply, when control over the ledger is distributed, who is accountable?

In some cases there may be a single proprietor or a group of proprietors of a private distributed ledger. In these cases, it may be relatively easy for regulators to have oversight of the ledger and its participants. Regulators may even be able to gain access to the distributed ledger itself, which may increase scrutiny of participants. However, regulation will be more difficult where distributed ledgers have no clear proprietor or responsible entity. In these cases, regulators may focus on how entities make use of public ledgers.

In our view, the policy goal should be to develop a functional approach to regulation, which regards distributed ledger technology as "neutral before the law". Policymakers should carefully define the specific activities they seek to regulate. It would be a perverse outcome, for example, if regulation aimed at addressing the money transfer and payment functionalities of distributed ledgers ended up having an unintentional chilling effect on non-financial applications.

Distributed ledger technology is ultimately a transmission vehicle that is capable of application across different areas. Rather than being regulated as a discrete technology or system, it is our view that it should be regulated on a user case basis with reference to the existing legal frameworks governing each industry where it is relevant. Regulatory and consumer protection issues will need to be examined as new applications evolve.

'Rather than being regulated as a discrete technology or system, it is our view that it should be regulated on a user case basis with reference to the existing legal frameworks governing each industry where it is relevant.'

DIGITAL CURRENCY LEADER OFFERS ADVICE:

Chris Guzowski, Chief Executive Officer, ABA Technology

ABA Technology is a fintech startup based at the Stone & Chalk fintech hub in Sydney. It develops products that leverage Bitcoin's technical architecture. These include the ei8.ht Bitcoin wallet, blockchain software, applications and consulting services.

Chris Guzowski, ABA Technology's Chief Executive Officer, places the significance of digital currencies on par with the advent of personal computers in the 1970s and the internet in the 1990s. "The beauty of distributed ledger technology is that it facilitates transactions between entities that do not already have a trust relationship," he says.

Members of the banking and financial industry that are considering adopting distributed ledger technology need to reckon with the risk, at least initially, of cannibalising existing revenue streams. The transition will also involve significant upfront costs, but Guzowski advises businesses to keep the bigger picture in mind. "What people often forget is that the innovation of distributed ledger technology is in the whole, not the individual parts," he says. "Many businesses make the mistake of trying to implement a small component only, or trying to completely de-risk the process. This means there is less value to be realised and therefore less reason to move away from legacy systems and processes in the first place."

Guzowski recommends that businesses interested in the possibilities attract an influential mainstream sponsor. They should work closely alongside developers and legal experts to ensure that solutions are legally and technically workable. Finally, industry and regulators should also cooperate to achieve a balanced model of governance.

DISTRIBUTED LEDGER TECHNOLOGY GOES GLOBAL WITH R3

R3 is a consortium that is developing distributed ledger architecture to allow low-cost transactions between global banks. Established in September 2015, its membership consists of 42 banks including Barclays, BBVA, The Commonwealth Bank, Credit Suisse, Goldman Sachs, JP Morgan, Royal Bank of Scotland, State Street and UBS. The calibre of membership has given weight to R3's work. However, the Bitcoin community has expressed scepticism, suggesting that R3 is being used by large banks to crowd the field and stifle competition and innovation.

R3 has made swift progress so far. In 2016, it began using IBM and Amazon capabilities to conduct mock trades using blockchain. It also announced that it would deliver blockchain services using Microsoft's cloud platform. Nevertheless, regulatory issues and the size and complexity of bank networks remain hurdles to full implementation. Also this year, R3 announced the development of Corda. This is an industry-wide platform to synchronise financial agreements among regulated financial institutions. However, R3 has courted criticism for seeking to raise $200 million from member banks in return for awarding them equity stakes in the new company delivering the technology.

Some commentators have questioned whether financial firms should be collaborating on distributed ledger technology, or developing independent solutions and letting the market decide.

Many R3 members are conducting their own investigations in tandem with the consortium's work. Other efforts are being made by blockchain technology company Digital Assets Holdings, which is developing solutions for various use cases. SETL is a blockchain platform that enables financial institutions to conduct multi-asset, multi-currency payments and settlements. The Society for Worldwide Interbank Financial Telecommunication (SWIFT) has introduced a global payment innovation initiative. Forty-five institutions are members, although major banks such as Goldman Sachs, The Commonwealth Bank, Macquarie Bank and Westpac remain focused on R3. The Hyperledger Project is another cross-industry initiative involving 30 organisations, including Digital Assets Holdings and R3.

'One of the issues is the guaranteed execution of the smart contract. If a programming mistake is made, the program will still run as read by the machine.'

TJ SAW, CO-FOUNDER OF ETHCORE, THE FIRST VENTURE CAPITAL-FUNDED ETHEREUM STARTUP

ETHEREUM – THE FUTURE OF GLOBAL COMMERCE

Ethereum is a blockchain-based platform that executes smart contracts and transfers value using digital currency. The defining feature of these contracts is that they are written in a computer programming language known as Solidity. An agreement can be precisely defined and automatically executed, without any of the ambiguity associated with the use of words.

Smart contracts are essentially unbreakable. This makes them powerful tools as more business is conducted over the internet. Billed as the "world's first publicly accessible computer", any person or institution can access Ethereum Network by paying the open network for the computation power. From there, they connect to the public Ethereum network. There is also the ability to create and run private or consortium networks. JP Morgan, for example, has already unveiled a distributed ledger prototype known as Juno using Ethereum. This is effectively a private network enabling smart contract transactions between a pre-approved group of trusted participants.

Many of the legal and regulatory issues related to smart contracts are still yet to be resolved. According to TJ Saw, co-founder of Ethcore, the first venture capital-funded Ethereum startup, particular challenges exist around privacy (as it is on a publicly visible chain), scalability (throughput of the network), and the verification of identity (via authorised signers or otherwise). However, he says, "technical solutions exist but need to be implemented in a robust way".

"One of the issues is the guaranteed execution of the smart contract. If a programming mistake is made, the program will still run as read by the machine," he says. "There will always be issues around the communications process between the programmer or lawyer, and the commercial entity."

Nonetheless, Saw is confident that blockchain platforms such as Ethereum are set to become the backbone of global commerce. "We want the everyday Joe with no knowledge of coding to utilise this, and we hope that this technology will change the world."

ethereum

RECOMMENDATIONS FOR BUSINESSES

Consider your goals

- What is the problem you are trying to solve and how might distributed ledger technology assist?
- What aspect of the technology provides the necessary edge or benefit to a particular product, service or component of technical architecture?
- Critically assess whether distributed ledgers are the most appropriate vehicle for your goals.

Engage with all internal stakeholders

- Distributed ledger technology should not remain siloed to the innovation lab, or the technology team.
- Engage early with the various stakeholders within your business in order to ensure that the solution is designed from the outset in a way that meets the regulatory, commercial and technological challenges that will inevitably arise.

Executive approval

- Board-level buy-in will be necessary to achieve ambitious goals.
- Educate to bridge technical gaps and to make the world of distributed ledgers less daunting.

Identify appropriate market

- Ensure that you have identified the market that you are seeking to engage with.
- This will ensure that you identify affected customers (and what they might need to do in order to plug into your solution or offering), relevant competitors and opportunities, as well as identifying the key legal risks.

Tackle legal challenges head on

- Certain uses of distributed ledger technology will undoubtedly raise legal uncertainties. In our experience, regulators are becoming increasingly pragmatic when it comes to considering the intersection between innovation and regulation that pre-dates certain technology.
- We recommend engaging with regulators early and helping to educate them about the solution and its benefits. Ensuring that you have considered the likely legal challenges that will arise before you do so is key.

Engage with industry

- To fully realise the potential of certain applications of distributed ledger technology, especially in the financial sector, business processes may need to be adjusted or consensus achieved on an industry-wide basis to maximise the value that can be realised by individual players.

Think with scale

- Don't be afraid to consider larger scale options. While narrower or more limited applications may be less risky, the potential benefits may also be more limited.
- The broader the scale, the greater the opportunities are to harmonise business processes, correct long-neglected inefficiencies in the market and to substantially de-risk transactions.

Assess costs v benefits in short v long term

- Many manifestations of the technology may not yield significant immediate, or even short to medium term efficiency gains or cost benefits. In order to achieve greater efficiency improvements in the future, businesses may need to accept substantial costs in the short to medium term with the (somewhat unknown) benefits stretching out into the future.

ISSUES CHEAT SHEET

GOVERNANCE OF DLT

Benefits

- ✓ DLT technology provides a safe mechanism to transact with unknown parties – something frequently required in online, cross -border transactions.
- ✓ In a public ledger, governance may be loose with the shared digital database continuously being maintained and verified by all other participants.
- ✓ In a private, permissioned ledger, governance will need to be carefully considered and agreed between participants.

Challenges & Solutions

- DLT does not entirely obviate the need for central third parties – in any use cases there will be a continuing need to fix faults in the technical code, confirm identity and asset existence (notary function), audit compliance of the technical code with any legal code, facilitate dispute resolution, enforce legal or regulatory obligations and provide access or information to regulators to demonstrate regulatory compliance. That said, this role can be narrowed.
- It remains possible that large incumbent institutions looking to create DLT networks and standards will only include their existing networks. Control over access to the ledger could become a source of market power, allowing institutions to price above cost and extract rent from users.
- It remains to be seen whether binding, industry wide agreements are realistically attainable. Involvement with both sides of the market and regulators is essential to success.
- Benefits for financial markets may require significant investment in the technology in the short to medium term.
- The memory of failed service providers costing consumers and early uptake users large sums of money (such as in the crash of Mt GoX) means businesses using DLT should have appropriate safeguards, and be mindful of negative reputational consequences if these are not in place.

MISTAKE/ ERROR/FRAUD

Benefits

- ✓ Current financial systems involve a multistep, manual process with various opportunities for transactional errors. This requires significant manual intervention, which is expensive.
- ✓ Distributed ledgers are effected automatically – reducing both the possibility of error and costs of manual work.

Challenges & Solutions

- Financial institutions currently face problems regarding data quality. DLT could help address this if it allows greater integration of transaction systems with middle and back office systems.
- Contract law principles that allow for correction of errors in transactions may be difficult to apply in DLT and smart contracts where a contractual term is executed automatically. However, the courts will still be capable of stepping in to interpret whether the execution of a contract was in accordance with the contractual terms or the parties' intentions.
- Contract enforcement may be challenging in systems which use anonymity.
- In designing permissioned ledgers, the governance around correction of errors and reversing transactions will need to be carefully designed. In a public ledger, the irreversible nature of transactions means additional transactions may be required to correct an error (it is not just a matter of correcting the record).
- Consumer protection legislation (such as the *Competition and Consumer Act 2010*) will still be relevant and capable of applying to service providers using DLT. How they will apply in the context of a distributed application will be one of the challenges to assess.
- The International Organisation of Securities Commission has suggested DLT providers should consider covering the cost of fraudulent transactions to increase uptake and consumer confidence.

PRIVACY & CONFIDENTIALITY

Benefits

- ✓ One of the key benefits of DLT is its facilitation of transparency and accountability, in part due to the persistence and pervasiveness of its transaction record.

Challenges & Solutions

- The counterpoint to this benefit is that we will need to find ways of protecting the privacy of individuals and keeping certain information confidential. Entities that can extract data about their competitors or other industry players may obtain an advantage. They may also be unwilling or unable to have transactional details made publically available.
- However, while DLT relies on strong cryptography for security and privacy, additional protection can be built into the system design. Distributed ledgers can be configured to ensure data is only revealed to those who ought to be seeing it. Another solution lies in the governance arrangements. Open and shared data might not be immediately attractive to incumbents, but reciprocal obligations might see increased competition in the short term and efficiencies realised in the longer term.
- In relation to personal information, various techniques (eg 'differential privacy') can be used to obscure data or add noise to the data before sharing.
- Anonymisation technology is key to managing these risks. However, it is not fool-proof: it may be possible to trace or deduce identity from transactions or decrypt the data.
- Users have also questioned who will own and control personal data that enters the ledger. Customers should be made aware of the legal position through privacy policies of participating institutions.
- In public ledgers, the data's permanence and its inability to be removed or altered for the life of the ledger could be a threat to privacy of personal data.

ROLE OF REGULATORS

Benefits

- ✓ For regulators, DLT could provide increased visibility into transactions and could improve suspicious transaction monitoring as well as regulatory compliance surveillance.
- ✓ DLT is likely to change how regulators access data (eg access might be by way of a provision of a token or key with direct access to the system, rather than receipt of documents). DLT may also therefore eventually reduce required response times for industry participants to make available information or access to systems to regulators under existing regulation. Despite the ability to provide greater information or access to regulators, this does not necessarily mean that the scope of a regulator's entitlement to audit or investigate should be increased. In our view, there is no pressing need at this stage for overhaul or expansion of their regulatory powers, unless DLT is being used in a way that hinders existing regulatory methods.

Challenges & Solutions

- Cross-border harmonisation is imperative. Standards must be built to ensure national systems can coexist during blockchain transactions.
- Regulators are prone to caution. While Australian regulators have been supportive of DLT at this stage, regulatory decisions in this nascent area will have the ability to determine the viability of entire business models. Ongoing support and facilitation is therefore important.
- How cross-border distributed ledgers are regulated, and by whom, remains to be seen.

INSOLVENCY/ PAYMENT RISK

Benefits

- ✓ Opportunities for reduction in counterparty and liquidity risks. The automation and decentralisation inherent in DLTs allow transactions to be settled close to real time, and reduce payment and settlement risk by providing faster settlement and possibly providing choice of final settlement time.
- ✓ The record of past transactions also provides a readily available evidentiary trail which can help simplify and reduce the cost of insolvencies.

Challenges & Solutions

- The relationship between records maintained in distributed ledgers to real world assets, or other digital manifestations of intangible assets, needs to be considered.
- Directors must continue to comply with the duty to exercise reasonable care and diligence and not trade whilst insolvent, even if payments are effected "automatically" whilst a company is insolvent.
- Regulators need to address financial stability of any DLT service providers. An insolvency or other disruption could result in losses for users and undermine the stability of the entire system.
- If a transaction is set aside as unfair or uncommercial (months or even years later), one participant's insolvency could undermine transactions which were deemed to have settled and have a ripple effect on other participants.
- Reversing of transactions that are set aside may also be challenging in a public ledger without a central governance framework.
- Entities subject to the APRA prudential standards on outsourcing will also need to consider how they can comply with the standards where the use of distributed ledger technology involves some form of outsourcing, especially where there is no single proprietor of the technology.

ANTI-MONEY LAUNDERING/COUNTER TERRORISM FINANCING (AML/CTF)

Benefits

- ✓ DLT could facilitate more efficient regulatory compliance with AML/ CTF requirements and access to records.
- ✓ If appropriate Know Your Customer (KYC) steps are taken with participants in a distributed ledger at the outset, the ledger would contain a history of transactions and transfers, making detecting suspicious transactions and tracing funds easier.
- ✓ A common KYC ledger built on DLT could allow institutions to share customer credentials securely and avoid costly duplication across institutions.

Challenges & Solutions

- Anonymity of public ledgers (eg many cryptocurrencies) still presents challenges for AML/CTF compliance and KYC compliance.
- More sophisticated AML intelligence platforms will be required to conduct real time monitoring. AUSTRAC has introduced a system with these capabilities.

FINANCIAL SERVICES/ PAYMENTS SYSTEM LEGISLATION

Benefits

- ✓ DLT is not yet directly regulated by Australian financial services regulators which presents an opportunity for innovation.
- ✓ Cryptocurrencies are not a "financial product" (under the *Corporations Act 2001* (Cth)) and not regulated as a payment system by the Reserve Bank of Australia.

Challenges & Solutions

- Some applications of DLT will involve the provision of financial services, and a licence will be required to carry on business.
- For example, offering a facility allowing use of cryptocurrency to make non-cash payments could involve a financial service requiring licensing. There may be relevant exceptions, including the exception for 'physical equipment or physical infrastructure'.
- If use of cryptocurrency for payments becomes widespread, RBA could decide to regulate it as a payment system (under the *Payment Systems (Regulation) Act 1998*).
- Some basic concepts of financial services legislation are difficult to apply to cryptocurrency and DLT. For example, who is the 'issuer' of a cryptocurrency? In a public ledger, it may not be easy or possible to identify one. In the context of private ledgers, obligations may fall on administrators or owners of particular ledgers.

TAX

Benefits

- ✓ Streamlining tax administration through a combination of automated data-capture and potentially automated reporting and remittance of tax. For example, automated PAYG withholding, remittance and reporting of payroll data via a blockchain algorithm.
- ✓ From the ATO's perspective, DLT has the potential to provide increased taxpayer accountability through indefinite retention of tax related data on a blockchain.
- ✓ Automated retention of data via blockchain may also make it easier for taxpayers to substantiate positions taken in tax returns.
- ✓ Companies investing in DLT may potentially qualify for the R&D tax incentives.

Challenges & Solutions

- DLT technology (especially crypto-currencies) has the potential to be misused for tax evasion as participants can remain anonymous and peer-to-peer transactions can take place across borders.
- We have already seen that tax treatment of crypto-currencies can greatly affect their use in the Australian market, with the prospect of double GST on crypto-currency transactions resulting in many companies who offer exchange services relocating from Australia.
- Automation of blockchain based tax reporting or payment may be problematic for subsequent corrections or where transactions do not occur as initially expected.
- The viability of traditional tax constructs (such as source and residency based taxation) will continue to be challenged.
- The advent of blockchain 'entities' such as the decentralised autonomous organisation, raises further questions. To what extent will they resemble entities, such as companies, which would normally be subject to tax in their own right?
- Applications or programs operating on a blockchain will only remit tax if they are programmed to. This may raise issues in the future as to how to deal with them if their activities are considered taxable or they are considered an 'entity' taxable in its own right.

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