

# Client Alert

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## Demystifying Blockchain and Distributed Ledger Technology – Hype or Hero?

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Move over Bitcoin. It's the "blockchain", the innovation that powers Bitcoin, that's now grabbing all of the headlines. Supporters have been evangelising about the potential transformative power of distributed ledger technologies for some time. Indeed, many claim that distributed ledgers will be the most significant technology to disrupt business since the Internet. A whole host of major financial companies have publicised their interest and investment in this breakthrough technology, and governments and international bodies are increasingly discussing the potential implications of distributed ledgers on business, governments and the economy.

Yet most businesses and their advisers have yet to understand distributed ledgers, let alone their real utility. Not since "the cloud" has one buzzword caused so much head-scratching. In this Alert, we will attempt to demystify distributed ledgers, cut through the hype and outline what you need to know about this technology, its potential to transform business and the legal and regulatory implications.

### 1. WHAT IS BLOCKCHAIN/DISTRIBUTED LEDGER TECHNOLOGY?

Blockchain refers to one type of distributed ledger: basically, a ledger of digital records or transactions that is accessible to all computers running the same protocol. The Bitcoin protocol, for example, results in each transaction being given a unique cryptographic number or "hash" and included with others in a "block" of similar transactions; and each completed block is also "hashed" in sequence with others to form a chronological "blockchain". This process is referred to as "mining" Bitcoins. Other types of ledgers involve somewhat different techniques, but the result is similar, with each ledger having its own "virtual currency" both as a means of rewarding those contributing the computing capacity and as a way of associating value with each record.

Distributed ledgers are decentralised in order to eliminate the need for a central authority or intermediary to process, validate or authenticate transactions. Each record is time/date stamped and provided with a unique cryptographic signature, which is designed to ensure the ledger's authenticity and integrity. All participants view the whole ledger which provides a complete history that is verifiable and auditable. The cryptographic technology means that it's possible both to compress data and to maintain confidentiality of the content and participants in each transaction. Only someone with the correct "key" can access the details associated with a specific record.

While the Bitcoin blockchain is fully public, other distributed ledger technologies are being developed for more limited participation ("permissioned ledgers") – for example, among regulated firms in particular financial markets.

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## 2. HOW COULD DISTRIBUTED LEDGERS TRANSFORM BUSINESS?

As a new type of network or technical layer, distributed ledger technology would appear to have a similar potential to transform businesses as the Internet or mobile telephony. But distributed ledgers will not replace every database. Given their characteristics, distributed ledgers seem likely to be most useful in scenarios that involve items which change their state or status frequently and where there are many interested parties who are broadly dispersed and using different operating systems and applications. Such scenarios are relatively expensive to service using today's technology, whereas sharing access to the same encrypted ledger through any device running the same protocol promises to deliver transparency combined with confidentiality, an immutable history and an audit trail at lower cost.

It is no surprise, therefore, that the financial services industry is interested in this technology, particularly in the context of trading and settlement. We summarise developments in various sectors below.

- **Financial Services**

The financial services sector is currently leading the way in terms of focus on, and investment in, distributed ledgers, as demonstrated at the recent 2016 World Economic Conference in Davos.

Most financial organisations rely on legacy systems and manual processes that are slow and inefficient and result in single points of failure, and many existing processes involve a central trusted third-party intermediary. Faced with increased reporting and capital requirements following the 2008-09 financial crash, banks are excited by distributed ledgers' potential to help reduce costs and inefficiencies, improve profits, assist with compliance and reduce fraud. Banks, asset managers, stock exchanges and clearing houses are particularly interested in distributed ledgers in the context of capital markets. A [recent Accenture report](#) highlighted that an estimated \$75 million was invested in distributed ledger efforts specific to capital markets in 2015, and it expects that figure to reach \$400 million by 2019. Organisations believe that distributed ledgers have the potential to reduce significantly the time required to settle securities transactions from days to minutes, saving significant post-trade costs.

While innovators and early adopters appreciate the competitive edge that distributed ledgers may provide, others are arguably becoming involved simply to avoid being left behind. Whatever their motivation, however, many financial institutions have publicised their interest and investment in this nascent technology, for example:

- Many of the world's leading financial organisations have announced that they are backing distributed ledger ventures, or otherwise exploring the use of distributed ledgers, including developing, and applying for patents in, distributed ledger-based systems.
- The London-based [Post Trade Distributed Ledger Working Group](#) made up of 20 financial institutions, including the London Stock Exchange, was created in 2015 to provide a forum for exploring and sharing ideas about the use of distributed ledgers in securities trading, clearing, settlement and reporting. Other exchanges including the Australian Stock Exchange have announced that they are developing and testing distributed ledger platforms for clearing and settling trades.

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- R3 is a consortium that includes more than 40 major global banks and is aimed at promoting collaboration and developing standards for distributed ledger applications in financial services. It was recently reported that R3 has completed successful trials of five distinct distributed ledger technologies. The trials involved the trading of fixed-income assets between 40 of the world's largest banks using various cloud technology providers.
- Digital Asset Holdings, a start-up aimed at distributed ledger solutions for capital markets, has raised more than \$60 million from institutions including from major global financial institutions.
- **Asset registers:** Distributed ledgers could be used to provide a secure and reliable ledger on which assets would be recorded, tracked and validated. The technology could help prove ownership and provenance in an undisputable way. UK start-up Everledger is using distributed ledger technology to tackle the diamond industry's fraud and theft problems. But there are plenty of other use-cases being considered, including land titles, cargo (bills of lading), car leasing, gold trading, fine art, energy, shares, assets under a will - in fact, virtually any assets that can be represented or stored and exchanged digitally where there is either no existing register, or where the register is expensive to maintain or work with.
- **Identity registers:** Distributed ledgers could streamline digital authentication, helping to reduce identity and claim fraud and enabling individuals to take more control of their personal data.
- **Intellectual property:** Distributed ledger technology has various potential use cases involving intellectual property registration and licensing. For example, the technology could be used to assign some or all of the rights associated with a copyright, with different tokens being associated with different rights. Distributed ledgers could also be used for patent/documentation filing.
- **Music and entertainment:** Many artists are interested in using distributed ledgers to help them control how their content is used and paid for and help prevent copyright infringement and illegal file sharing. Indeed in October 2015, British artist Imogen Heap released her song "Tiny Human" via distributed ledger. The sector is also exploring how distributed ledgers could be used to assist music labels and other distributors and licensing agencies collect and distribute royalty payments.
- **Smart contracts:** The combination of distributed ledgers with smart contracts could provide the most transformative use case for the new technology. Smart contracts are contracts that convert the terms of a traditional contract into code and execute automatically based on pre-defined triggers. Distributed ledger technology would be used to record trigger events and to document and verify the smart contract's execution.
- **Electronics and the Internet of things:** In many sectors, it can be difficult to gather accurate real-time data about industrial equipment. It has been suggested that distributed ledgers could be used to facilitate transaction processing and co-ordination amongst Internet-enabled devices (IoT), helping increase security and avoid having a central point of failure.
- **Government and agency use:** There is a variety of ways distributed ledgers technology could be used in the public sector, including in connection with the administration of benefits, pensions, tax, passports,

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driver licences, marriage licences, patient records, land registry, national archives, voting and law and order. (Chainalysis, a cybersecurity startup that uses distributed ledgers to track digital identities, has recently signed a deal with Europol.)

- **Decentralized organizations:** Distributed ledgers could be used to create and administer large scale unincorporated associations and other decentralized organizations that are effectively companies without legal personality. Distributed ledgers would be used to enforce decisions once pre-defined conditions based on collective decisions are met.
- **Internal use cases:** Much of the discussion about distributed ledgers has centred on external use cases. However, many commentators have pointed out that there many ways that distributed ledgers could be hugely significant in streamlining data, processes and procedures within an organisation. For example, different departments may have different data about the same customers, suppliers or employees; distributed ledgers technology could enable one version of the truth across the enterprise.

### 3. ATTENTION OF REGULATORS AND GOVERNMENTS

As with any potentially transformative new technology, distributed ledgers raise a number of questions for policy makers and regulators at both national and international levels. Some parties have called for regulation, believing that the legal and regulatory uncertainty is unhelpful. As detailed below, regulators and lawmakers are certainly closely analysing and monitoring distributed ledger developments and, for now, appear cautiously optimistic about its potential. This isn't surprising; despite their challenges, distributed ledgers could actually help improve regulatory compliance and compliance tracking and reporting. However, it's clear that most authorities are taking a "wait and see" approach. This appears prudent: until the technology has been properly tested, any regulation of the technology could be premature and hamper its development.

- In February 2015, the Bank of England acknowledged the promise of decentralised ledger technologies and has since created a distributed ledgers team.
- In January 2016, the IMF issued a report considering the benefits and risks of Bitcoin and distributed ledgers and stated that achieving a balanced regulatory framework that guards against risks, without suffocating innovation, is a challenge that will require extensive international cooperation.
- In January 2016, a technology policy adviser at the Law Society of England and Wales remarked that it's essential that lawyers are aware of distributed ledgers as they could have a profound impact on the law and the provision of legal services in the future, including in terms of a balance between technical code and legal code.
- In February 2016, the FSB, which sets global standards for the G20 countries, announced that it will be assessing fintech innovations including distributed ledgers to ensure that the regulatory framework is able to manage systemic risks without stifling innovation.
- In February 2016, Christopher Woolard, the FCA's Director of Strategy and Competition, said that the FCA was monitoring the development of the technology but would not take a stance until its application is clearer. He also commented that regulatory and consumer issues will need to be examined as the

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technology evolves. Security will also be a vital consideration. He said that the FCA intends to work with firms developing distributed ledgers solutions via Project Innovate to ensure consumer protections are factored in during the development phase of the technology. The FCA is also examining ways that distributed ledgers could assist regulatory compliance. Other financial regulators, including Germany's [Federal Financial Supervisory Authority](#), are exploring distributed ledgers.

- In February 2016, the European Parliament's Committee on Economic and Monetary Affairs issued a [Draft report on virtual currencies consisting of a motion for a European Parliament Resolution and an Explanatory Statement](#). Until distributed ledgers become "systemically relevant," the Committee calls for a proportionate approach to be taken so as not to stifle innovation, while taking seriously the regulatory challenges that the widespread use of distributed ledgers might pose. The Committee believes key existing EU legislation will apply irrespective of technology, but recommended a review of EU payments legislation. The Committee also proposes creating a distributed ledger task force under the leadership of the European Commission to provide the necessary technical and regulatory support at both EU and Member State level.

And it's not only the regulators that are considering distributed ledgers. The Estonian Government has been experimenting with distributed ledger technology for some time. In January 2016, the UK Government's Chief Scientific Officer, Sir Mark Walport, issued a report, "[Distributed Ledger Technology: beyond block chain](#)," which makes a number of recommendations in terms of ministerial leadership, research, standards and the need for proof-of-concept trials. With respect to regulation, the report recommended that: (i) the UK Government considers how to put in place a regulatory framework for distributed ledger technology which evolves with the development of the technology, using technical code as well as legal code. The report also recommends that the UK Government work with academia and industry to ensure standards are set for the integrity, security and privacy of distributed ledgers and that such standards are reflected in both regulatory and software code.

## 4. WHAT ARE THE CHALLENGES?

Of course, as with any new technology, it's easy to get caught up in the hype. Indeed, if you read some headlines, you might think that distributed ledger technology is a universal panacea for business challenges (and world peace!).

Many are wisely calling for a healthy dose of perspective. For example, the UK Government report identified certain unsolved problems to tackle before the full potential of distributed ledgers can be realised. And in their [response to the Government Report](#), the Open Data Institute and Digital Catapult called for more scrutiny of the risks, and more analysis of how distributed ledgers could be used practically to solve challenges. In all the excitement they believe that there is not enough consideration being given to the fact that distributed ledgers could cause significant damage if used indiscriminately. ODI research has identified cases where people are "trying to bolt old, failed or impossible policy and business ideas onto the new technology, or to unnecessarily reinvent things that work perfectly well". ODI concludes that "Blockchain technology is a new tool in our toolbox. We need to use it when it is the right tool for the job at hand."

Some of the key challenges identified with distributed ledgers include the following.

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- **Scalability and latency:** Some distributed ledger applications have been shown to scale poorly and suffer from extreme transaction processing delays, or latency. There have also been latency issues with some existing distributed ledger applications.
- **Understanding:** A key challenge remains the lack of mainstream understanding of distributed ledger technology and lack of technical skills to identify use-cases, define and measure existing problems, analyse the root causes and consider whether distributed ledger technology would resolve them.
- **Readiness:** The technology requires data in digital form, but many sectors still heavily rely on manual and paper-based business processes. In addition, many organisations (particularly financial services companies) rely on outdated legacy systems which would need to be overhauled before distributed ledger technology could be implemented. Many business processes need to be improved and stabilised before deciding whether and how they might be supported by a distributed ledger, in the same way that a business process might be prepared for outsourcing. It's likely that the costs of all necessary preparation would not be insignificant, given the need for a methodical approach to improving complex business processes. Organisations would need to persuade stakeholders of the benefits of the change, taking into account the challenges, risks and costs involved.
- **Collaboration:** To deliver on many (if not all) of the potential uses of distributed ledgers requires collaboration across all interested parties (including regulators). For example, in the financial services context, market participants and their advisers would need to work with other trading firms, exchanges, clearing and settlement services, trade bodies and regulators to settle on a workable solution. While the respective participants' roles might change in a distributed ledger environment, it seems unlikely anyone will be disintermediated entirely. Although collaboration is always a challenge (given that institutions are more accustomed to competing than working with each other), as we have seen above, collaboration is already happening within and across sectors.
- **Standardisation:** Currently, there are no standard distributed ledger tools or interfaces. Many different distributed ledgers are being developed by different organisations to different standards. Ultimately, for distributed ledgers to take off, particularly within a sector, there will need to be shared standards. Some of the world's leading companies agree, and in December 2015, the Linux Foundation, the non-profit open source organisation, [launched](#) the Hyperledger Project, a collaborative open source project to advance distributed ledgers. Founder members include some of the world's leading IT companies and global financial organisations.
- **Interoperability:** In order to maximise the power of distributed ledgers, they may need to be interoperable with other ledgers. Accordingly, agreements will need to be reached about data interoperability, policy interoperability and the effective implementation of international standards.
- **Legal and regulatory issues:** In essence, a project to create or adopt a distributed ledger solution will be similar to negotiating any large scale IT development or outsourcing arrangement, but there are some key additional challenges:

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- **Accountability/responsibility:** Control over the ledger is necessarily distributed, so how do you control or regulate the ledger, its users or other parties in the system? Who is accountable in a decentralised system? Whom (or what) do you regulate?
- **Who would regulate?** Given the cross-border nature of the technology, who would regulate? It's very likely that there would need to be agreed international regulatory principles and cooperation among regulators.
- **Definitions:** Various definitions under existing laws may need to be reassessed, e.g., in terms of the classification of assets (e.g., are virtual currencies really just commodities?).
- **Smart contracts:** How would existing contract law need to change to take account of automated or "smart" contracts? Would they be valid and enforceable? Moreover, is legislation sufficient, or would regulators need to regulate distributed ledgers via the technical code which defines the rules, rather than purely by legislation? Who would check that the operation of the technical code actually reflects the requirements of the legal code? If there is a problem with the code, how would this be identified and how would remedies be enforced and against whom? It's likely that smart contracts would still lead to disputes, and there will be limits on what smart contracts can do. Lawyers, regulators and the court systems would need to become familiar with smart contracts. Recordkeeping requirements and evidentiary rules would need to be adapted to enable access to underlying data by courts and other authorities.
- **Consumer protection:** Consumer protection will be a key concern of regulators. With such transformative technology, how do you ensure consumers understand what they are agreeing to, and their legal redress for failures?
- **Privacy and security:** The technology relies on an assumption that it is very secure because records would be almost impossible to decrypt. However, with the continued development of quantum computing, this may not always be the case. There are other security concerns, for example, that it could be possible to trace or deduce a party's identity from transactions or through access to a party that has permission to decrypt the data. In theory, at least, a ledger might also be "captured" if someone were able to control the majority of participating computers.
- **Competition/anti-trust:** If private distributed ledgers are created that are equivalent to consortia, there could be arguments of monopolistic or cartel activity. Also, there could be a risk that algorithms are set up in a manner which produces anti-competitive results that are secret or not readily detectible.
- **Decentralised organisations:** There are various issues that would need to be considered in terms of liability and accountability as existing legal systems are primarily designed to assign responsibilities and liabilities to persons (human or legal) rather than to a mechanism such as a distributed ledger that involves automated contracts. Lawmakers may need to consider how to adapt the existing law related to liability in the context of unincorporated associations to deal with the operation of distributed

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ledgers, which may be particularly challenging to the extent that these are likely to operate across borders.

- **Reputational damage:** Although much of the original scepticism with distributed ledgers has gone away, until distributed ledger applications have been rigorously evaluated, organisations will need to be mindful of the risk of reputational damage resulting from distributed ledger applications that don't work or don't provide the benefits envisaged.

## CONCLUSION

It's clear that distributed ledger technology has significant potential to transform a variety of sectors and scenarios, and an increasing number of organisations are considering how this technology could be used in their own businesses. However, the technology is not a panacea, despite what some of the overblown headlines might suggest. While certain transactions may benefit from decentralisation, it's likely that many others will still need to be handled via an intermediary and central database. Proper cost/benefit and risk analysis will be vital to ensure that this technology does not overpromise and under-deliver.

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