D+H FINANCIAL™ TECHNOLOGIES. SOLUTIONS FOR PEOPLE.

White Paper

Five Things Blockchain Must Get Right to Realize Its Full and Transformative Potential

Five Things Blockchain Must Get Right to Realize
Its Full and Transformative Potential

Table of Contents

Introduction: Heralding a New Era in Financial Services

In recent months, hardly a day has passed without news of further initiatives and investments in blockchain. With growing numbers of banks and other institutions now developing and trialing blockchain capabilities and applications in their innovation labs, venture capital funding is continuing to flow into blockchain start-ups around the world. According to industry publication cointelegraph.com, bitcoin and blockchain firms within the industry received a record U.S. $1 billion as of year-end 2015[i].

All of this points to growing confidence among both banks and investors that blockchain technologies will ultimately transform how financial services are conducted, operated and delivered. With payments near the top of the list of high potential areas, it's hardly surprising that blockchain totally dominated the conversation at the Sibos 2015 conference in Singapore. However, while blockchain's long-term disruptive potential is now widely recognized, what's less clear is the timeframe within which its full effects will be felt – or indeed where in the industry those effects will be greatest.

Against this background, D+H produced this white paper on the implications, potential and challenges that blockchain raises for banks. If 2014-2015 was the era of blockchain experimentation and innovation, then 2016-2017 is the time when this rapidly evolving technology should start to emerge from banks' back rooms and begin to be applied to solve real business problems.

Put simply, we're at an inflexion point – and in our view, all progressive banks must be prepared to respond now if they're to avoid getting left behind in the race to turn the promise of blockchain into reality. To help them take the right steps, this paper showcases "Five Things Blockchain Must Get Right" to realize that promise, and enable banks to capitalize fully on what could be the most significant development in financial services since the advent of the internet.

What is Blockchain?

Blockchain technology is essentially a computerised ledger on a distributed network, where the keepers of the ledger must all approve a transaction before it is recorded in a "chain" of computer code. The technology uses sophisticated cryptography to ensure transactions remain secure, while making the details of the transfer visible to authorized network users. In this way, blockchain maintains a single version of the truth through consensus across the ledgers on the network, without requiring oversight by a central authority – thus reducing friction and boosting the speed and efficiency of transactions. To date, blockchain is best known as the technology underpinning the Bitcoin virtual currency, but its potential applications and implications go much further.

The Market Problem

To see why blockchain is such a big deal for banks, it's helpful to step back and look at the key drivers of industry change over the past three to five years. On the regulation front, we've seen developments including the Payment Services Directive (PSD) 1 and 2 in the EU, Dodd-Frank Act in the US, Basel III capital and liquidity framework globally, and moves towards ring-fencing in markets such as the UK. In combination, these drivers are having the effect of intensifying competition by encouraging entrants such as challenger banks and third-party processors.

Meanwhile, on the industry front, banks have been dealing with the continuing advance of globalization and cross-border, multi-currency transactions across their customer bases. They've also been facing margin pressures – with a need to shift the balance between risk and fee revenues – along with developments such as payments convergence, the roll-out of Immediate Payments schemes worldwide, and new standards such as ISO20022.

At the same time, the speed of change in technology has, if anything, outpaced the other drivers. As customer offerings and experiences have become increasingly omni-channel (including mobile) and real-time, innovations like digital wallets, contactless payments and payments clouds have come to the fore.

These factors are making the banking environment ever more complex, increasing friction and costs.

These advances are now being joined by distributed consensus ledgers, whose contents are kept in alignment automatically and in real-time through blockchain, which promise to beneficially transform current inefficient and disjointed practices.

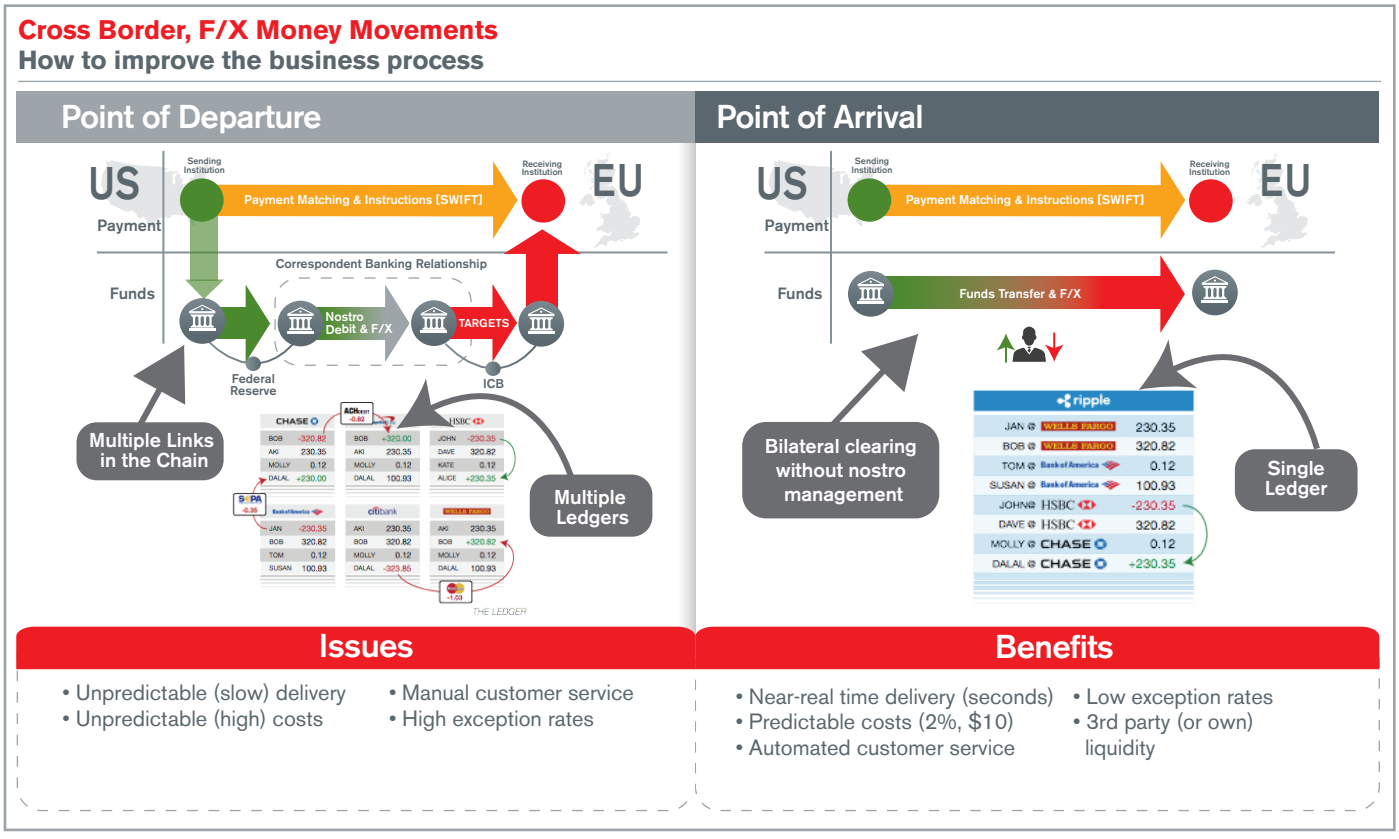
The Evolution of Blockchain – From 1.0 to 2.0

What's more, blockchain itself isn't standing still, but is continuing to evolve – both in terms of the technology itself and the problems it's being applied to solve. When "Blockchain 1.0" was developed around 2008, its goal was to overcome the key shortcomings of money. As a physical commodity, money brings inherent costs, creates friction between the different intermediaries involved in conducting and settling transactions, and is not a "pure" form of value as it's bound by national borders and can be manipulated by governments.

Blockchain 1.0 – whose most visible manifestation is Bitcoin – set out to address these issues by creating a global means of value exchange that was secure and reliable, didn't require settlement, and removed friction and the risk of government manipulation. However, while it was intended to replace money, in practice Bitcoin actually behaves more like gold. Also, the Bitcoin ecosystem is as crowded and diverse and almost as regulated as the money ecosystem it was intended to replace.

With Blockchain 2.0, the current phase of evolution, the focus has shifted away from enabling virtual currencies, and towards the capabilities and business potential of the underlying technology. This means concentrating both on the global aspects of blockchain, and also the notion of creating and sustaining trust – especially trust in the information sources that trigger blockchain actions. The accompanying information panel showcases some recent initiatives reflecting the evolution of blockchain's uses and applications.

Trust also touches on the issue of regulation. Although Bitcoin and blockchain are not regulated in themselves, many participants in the ecosystem – stock exchanges, for example – are subject to substantial regulation. This in turn imposes a certain level of regulation on the overall solution, with regulators taking a close interest in its integrity and resilience.

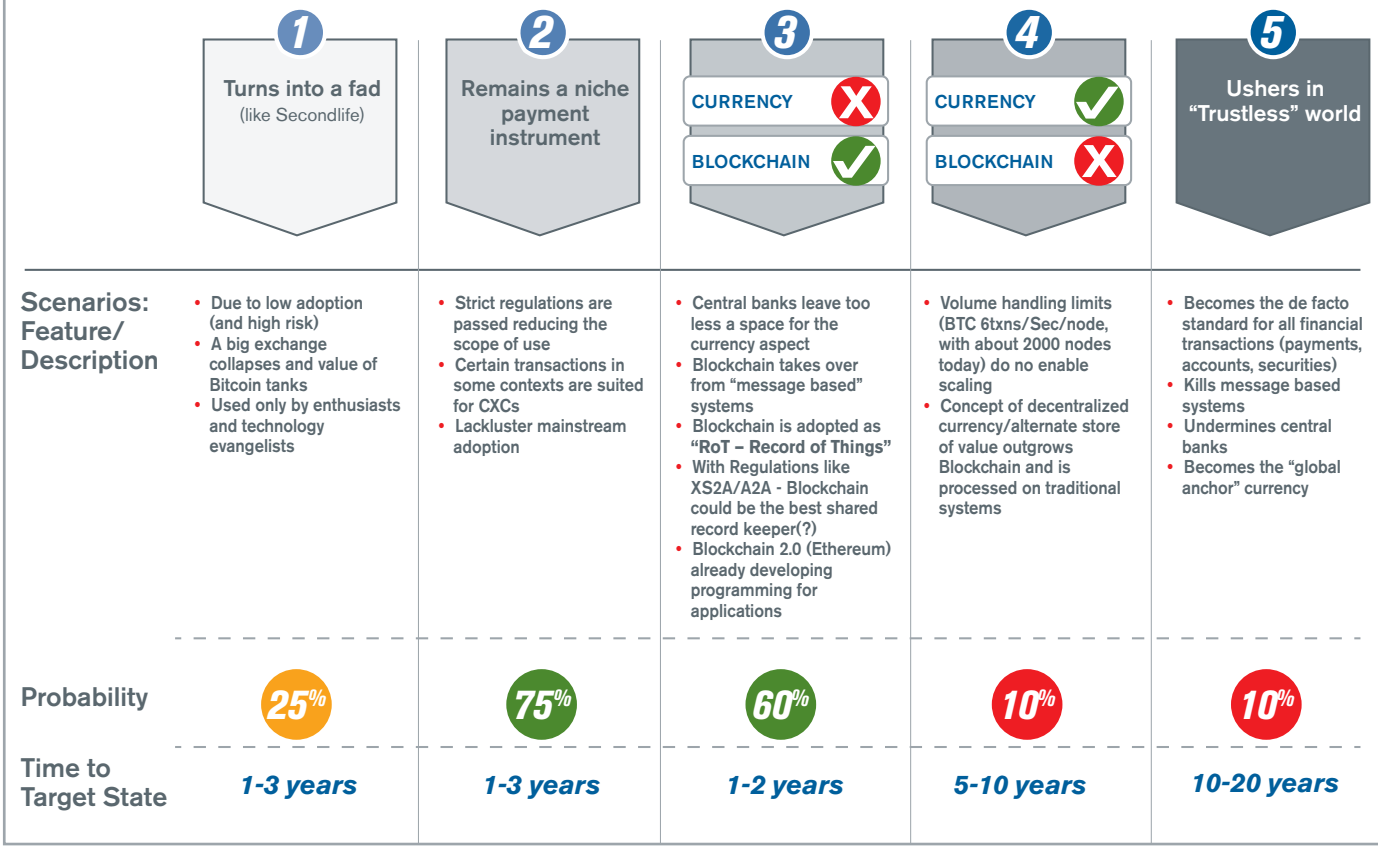


Some Recent Blockchain Initiatives

- **September 2015 –** The number of banks in the blockchain consortium led by financial technology firm R3 rises from nine to 22. The consortium is working to develop a framework for using blockchain technology in financial markets.[ii]
- **October 2015 –** Australia's main exchanges operator, ASX, says it is considering using blockchain to help replace its current clearing and settlement system.[iii]
- **October 2015 –** D+H announces that it has partnered with Ripple to integrate Global PAYplus, its global payment services hub, with Ripple's distributed ledger technology, creating a foundation for further disruptive payments innovation.[iv]
- **November 2015 –** Royal Bank of Canada announces it may launch a loyalty program that uses Bitcoin technology in 2016.[v]
- **December 2015 –** U.S. stock exchange Nasdaq breaks new ground by successfully conducting a blockchain-based share sale.[vi]

Looking at a Range of Possible Options

Research concludes that blockchain will escape from cryptocurrencies and drive standalone applications/utilities for financial services



D+H and Capgemini SIBOS open forum presentation Oct., 2015

The Promise of Blockchain

So, given blockchain's nature and capabilities, what does it promise for banks and their customers? To help frame the answer to this question, a useful analogy to use is that of an iceberg – with the small proportion visible above the waterline representing a bank's customer services and experience, while the vast majority of the iceberg below the waterline is made up of its internal processes and systems, from payments to trade finance to document management.

While the advent of the internet has been a game-changer for the delivery of financial services, the fact is that to date it has only really changed the areas above the waterline, with – for example – advances like online and mobile banking, contactless payments and mobile wallets. However, little has actually changed below the waterline, meaning the processes and legacy technology in the 'back-office' are often decades old.

The overarching promise of blockchain is to empower and enable banks to improve and modernize their entire environment of infrastructure and processes – bringing these decisively into the 21st Century, and enabling still further and faster advances in their customer offerings visible "above the waterline". However the jury is still out on how successfully blockchain can integrate with current legacy systems in a way that realizes its transformative potential.

Transformational Potential in Payments

In our view, payments is one of the most significant areas within a bank best positioned to benefit from the transformational potential of blockchain. Ten years ago, only a handful of a bank's biggest corporate customers would have been transacting regularly with markets like China and India. But ongoing economic and commercial globalization means even the smallest business customer of any bank is now likely to be making and/or receiving payments worldwide across borders and in different currencies. The same is increasingly true of personal customers.

These trends are driving the headlong growth in global payments. Coupled with the immediate payments schemes and other emerging payment types being deployed in countries around the world, these rising volumes are creating challenges and opportunities that D+H is helping banks to address. Yet the overall market issue to be solved is that there is still friction: payments are expensive, slow and there is limited transparency as to when they will be received, particularly with international payments.

Blockchain offers an unrivaled ability to tackle these issues – opening the way to the creation of a global payments environments characterized by less friction, higher speed, greater efficiency, and enhanced transparency and security. Let's look at what's needed for that promise to be realized.

Five Things Blockchain Must Get To Realize That Promise

As the blockchain ecosystem matures, there are two approaches that will evolve independently of each other. One involves financial technology companies (fintechs) building their own infrastructure in order to become money transmitters. The other involves fintechs providing technology to the existing industry players. We will consider both cases, and pinpoint five things that blockchain must get right to fulfill its potential.

1. It Needs to Find the Right Problem

The legacy technologies currently used in clearing are reasonably well suited to carrying out their function efficiently and effectively. Looking at the potential role of blockchain, there's an analogy here with the way small form-factor disk drives did not take off until the advent of PC, and solid state drives did not take off until the iPod. Just as those new disk technologies were slower, less reliable, had less capacity and were more expensive than their legacy mainframe counterparts, so the existing blockchain technology is slower, more expensive to operate, and has less capacity than the best centralized solutions.

However, the new smaller disk drives ultimately carved out their place in the market because they had the unique advantage of being the only technology small enough to fit into PCs and music players. Similarly, blockchain has the

opportunity to find the specific niche or niches where it is obviously a superior solution to the technologies that have preceded it.

Identifying these areas means going back to basics, focusing rigorously on identifying the strongest use cases for blockchain – the specific problems it's best suited to solve – and establishing the robust business cases that will justify investment. We are at too early a stage in blockchain's evolution to use it to wire up a whole institution, country or global marketplace. But a more selective approach can turn blockchain from a technology in search of a solution to a real source of rising business value for banks and their customers.

To achieve this, the key is to carefully select and pursue the right options from among the myriad use cases potentially open to blockchain. Such an approach is already emerging, with banks trialing blockchain in closely-targeted areas like international remittances, asset transfers and property records. In general, they're taking existing problems and trying to solve them in a better way. While this strategy won't result in disruptive advances in the short term, it will grow the understanding, experience and hands-on usage of blockchain that will provide the basis for future disruption.

So, what does the "right" problem for blockchain to address look like? It's likely to have three main characteristics. First, it won't have a vast array of players working on it – when everyone digs for gold in the same place, they usually all end up disappointed. Second, it will be an area where automation and removal of friction will generate substantial extra value, for example in a market where there's significant distrust between participants and the existing central counterparty is slow, inefficient and/or expensive. Third, it must be bounded to contain the risk to the main business of the financial institutions.

One such example may be loan syndication; this is definitely a process that could be done more quickly. "It still takes almost 20 days, on average, to settle syndicated loan trades."[vii], whereas the real-time settlement capabilities of blockchain can enable all participants to come together in real-time and complete the process in a day (or sooner). And it lends itself to focusing on a specific discrete area (e.g. a single loan) where a "live pilot" can be conducted without locking the market in to ongoing usage. This can thus give financial institutions the risk control they need.

Various recent blockchain experiments look promising – especially those, such as asset transfers, that leverage blockchain's inherent unique advantage of non-repudiation and "proof of work" unhampered by slow, expensive operation and restricted throughput. However, for the promise of the "internet of money" to be realized, more maturation still needs to occur.

2. The Dominant Technology – Or Alignment of Technologies and Use Cases – Has to Emerge

Blockchain is a young technology that is going through a tremendously fast evolutionary process at multiple levels. As well as ongoing advances in the underlying technology supporting distributed ledgers, we're also seeing rapid changes in the mechanisms used to keep the ledger synchronized – with a fight now under way between the heritage "proof of work" model, and the newly emerging "proof of stake" and "consensus".

To return to the analogy of the disk drive market, it's now clear that spinning disk drives and flash memory are both viable in different contexts – respectively in laptops and smartphones. In the blockchain environment, this sorting-out of the alternative technologies is yet to occur. Over time, real-world experience of blockchain deployments and operations will help to overcome this hurdle. However, until the blockchain technology and ecosystem gain greater certainty and stability, banks will understandably remain wary of basing their mission-critical business activities on companies and technologies that are less than 10 years old and still evolving at pace.

While the "proof of work" model is the proven option for synchronization, the effect of its use of cryptography is

that the more work has been carried out, the harder it is to counterfeit the ledger entries, and the higher the level of security. However, it follows that proof of work equivalent to burning electricity – resulting in previously low-cost pieces of data becoming much more expensive, and trusted information becoming denominated in Kilowatts of energy. It's no coincidence that the speed of Bitcoin settlement is proportionate to the price of electricity in China.

This resource intensity is potentially a major drawback for banks, which would like greater energy efficiency – and higher scalability at marginal cost – without losing the tried-and-tested benefits of proof of work. Moving to the newer "proof of stake" and "consensus" models offers a potential way forward, but exposes banks to the double risk of unproven technologies in an evolving area. However, current initiatives are under way that could significantly reduce the energy intensity of blockchain. These include the development of sidechains and related mechanisms, which take blocks off the chain itself and position them instead as referenceable data.

3. It Has to Retain Enough of Its Disruptive Potential When All the "Regulatory and Industry" Requirements are Added In

The essential promise of blockchain – completely open, almost free, trusted – is remarkably similar to the promise that banks saw in the internet in 1990s. Since then, the internet has obviously gone on to become a major force in areas such as social media, instant messaging, e-mail, on-line shopping and more. But it has made only limited headway in regulated markets, other than contributing technology to banks and providing an access channel into their proprietary world.

Some of the same dynamics are already emerging in the blockchain space. For example, it's widely agreed that permission-less blockchain – "anyone can join" – will not work in a regulated industry. The existing industry utilities such as SWIFT and Fedwire are inherently membership-based or "permissioned" to keep out bad actors and sanctioned entities. Although banks have had experience with a permission-less utility through using the telex network, they needed to build permission mechanisms around it, such as test words and authentication. While this approach could also work for blockchain, there would be a price to pay in terms of reduced efficiency.

A further area of debate is around the use of "open" ledgers, accessible over the web. These should be viable for non-real time financial applications, so long as compliance with the applicable data privacy and data residency laws is built in. However, given that a significant streaming event – such as a Britney Spears concert – can introduce significant slowdowns into the operation of the web, there are question marks over whether open ledgers can ever meet consumers' requirements around the speed and predictability of clearing times.

More generally, other industry and regulatory factors also need to be incorporated into blockchain solutions. Like a well-designed car, all aspects of a bank's operations need to work together, and changing one aspect may have unintended impacts on others – a risk that banks must guard against. Also, no bank will migrate all its processing onto one blockchain, so there will be a need for traditional and blockchain servers to coexist and interact within the same environment. This integration will add complexity and cost.

In terms of regulation, with regulatory frameworks for blockchain still at an embryonic stage of development, the challenge for regulators and market participants is to work together proactively to define the best supervisory models and approaches. Experience suggests that most regulators are open to discussing use cases for blockchain and providing guidance on the regulatory aspects. Indeed, blockchain promises some benefits for regulators around transparency and visibility, provided their open access complies with privacy regulations for everyone else. However, while regulators are unlikely to tolerate fully permission-less solutions, making them permissioned chips away at blockchain's overall promise, making it important to ensure the technology isn't overly stifled by rules and regulations.

An area where industry and regulatory factor overlap is around what's actually written in the ledgers. While a Bitcoin ledger contains just a handful of pieces of information, the ISO20022 industry standard has thousands of fields. So questions will arise around whether to retain the old standards or create new ones for the blockchain world.

4. It Must Be Able to Scale to Handle the Volumes and Speeds Required by the Financial Services Industry

Virtual ledger technology is already fit for purpose in many financial sectors, especially those with relatively low volumes of transactions like syndicated bonds issuance. But when it comes to high-volume areas like interbank payments, with thousands of transactions a second, current solutions do not reach the speeds and the raw throughput required for a point-of-sale (PoS) or real-time peer-to-peer (P2P) system.

The dilemma is that as fintechs and banks dive into the open source to address the limitations that have been purposely built into the Bitcoin protocol, they are coming up with high-performance solutions that do not have the empirical validation that belongs to Bitcoin – which has been running on the open internet since 2009 without the ledger itself being hacked or compromised. So these newer technologies will have to repeat the journey that Bitcoin has already made, and "cross the chasm" from early adopters to early majority.

This issue underlines the fact that Bitcoin is currently blockchain's only big success story. In two to three years' time, the likelihood is that banks will have proven blockchain implementations and deployments up and running, delivering levels of speed, scalability and resource efficiency comparable with legacy systems. That will represent an inflexion point opening the way for blockchain's move into higher-volume financial services activities.

5. The Evolution of Blockchain in Banking Needs to be Aligned with Banks' Timescales and Perspective

Banking is a long-term industry: think 20-year syndicated bonds, the centuries-old history of many major institutions, and the way the payments industry business model is founded on investment amortized over decades and through billions of transactions. Today's leading bank utilities – SWIFT, NACHA, BACS – have been around for more than four decades, and are still going strong.

To deliver on its promise, blockchain needs to be capable of standing the test of time in the same way. So to succeed in the banking space, the technology needs to offer a level of stability, governance and managed evolution that will allow the industry to make a multi-generational investment in building the next disruptive utility.

This means that the concepts of "failing fast" and "pivoting" that have sustained the momentum of blockchain's development through its early years will need to evolve into a very different environment: one founded on reliability, resilience and stability, underpinned by a technology platform that can last for five or six decades and more. This transition is set occur in the next few years as banks gain a deeper understanding of the governance, support and evolutionary path that will make blockchain a viable bedrock for markets.

One area where fintechs and banks are aligning is around the need for cooperation. It is now clear that a single global ledger is not a viable outcome and that different digital ledgers, using different underlying technologies, must be deployed as various banks apply their unique perspectives on what they need and want from this new technology. In some cases these ledgers will be standalone (e.g. a bank will use them to connect its own branches), but in other

cases coordination will be required (e.g. partners and correspondent banks need to be brought together). And again, there are many competing solutions – from "the Blocknet, a blockchain interoperability project which aims to build an 'internet of blockchains"[viii] to Ripple's implementation of the interledger protocol[ix]- all which are in a fairly nascent stages of development.

Conclusion: Time to Seize the Blockchain Opportunity – In a Smart Way

Blockchain is now moving beyond hype into business reality in financial markets – meaning banks have no choice but to respond. As they size up the potential of this technology, they face two main challenges. The first is to pinpoint and build robust use cases and business cases for investment in blockchain capabilities. The second is enablement – creating, piloting and deploying workable, scalable solutions to deliver on the business case for decades to come.

In our view, the conditions for tackling each of these challenges can be found within banks themselves. Today's major financial institutions include thousands of legal entities – and, from both a client and regulatory viewpoint, they have an absolute need for visibility and accessibility into transactions across and between those entities.

This creates a strong case for banks to use blockchain for internal utilities – in turn enabling them to gain the experience and insight needed to roll out blockchain capabilities across the banking ecosystem.

Payments – and especially international remittances – are a key area of opportunity for this to happen. As a leading financial technology provider to financial institutions across the world, offering lending, payments, enterprise and global transaction banking hubs that are trusted by nearly 8,000 banks and other financial services organizations, D+H is ideally placed and qualified to help banks realize the full promise of blockchain.

Whether your bank is at the start of its journey of discovery in blockchain, or is already well down the road in assessing this technology's potential, D+H can support and work with you through the lifecycle – all the way from identifying the right use case and building the business case, to developing and deploying solutions that truly add value.

Blockchain is technology that's here today, and which will have an exponentially disruptive impact tomorrow. To stay ahead of the game, now's the time to seize the opportunity it presents.

About the Authors

- Gene Neyer, Head of Product Management, Global Payments, D+H (gene.neyer@dh.com)
- Sue Hutchison, Senior Vice President, Payments, D+H (sue.hutchison@dh.com)
- Moti Porath, Global Head of Pre-Sales, D+H (moti.porath@dh.com)

Appendix

[i] http://money.cnn.com/2015/11/02/technology/bitcoin-1-billion-invested/

[ii] http://www.reuters.com/article/banks-blockchain-idUSL5N11Z2QE20150929

[iii] http://www.smh.com.au/business/banking-and-finance/asx-considers-blockchain-for-clearing-and-settlement-20151024-gkhs46.html

[iv] http://www.prnewswire.com/news-releases/dh-partners-with-ripple-to-deliver-innovative-payment-capabilities-and-to-create-foundation-for-future-disruptive-payment-innovation-531944911.html

[v] http://www.coindesk.com/royal-bank-canada-dave-mckay-blockchain/

[vi] http://www.ft.com/cms/s/0/eab49cc4-af18-11e5-b955-1a1d298b6250.html#axzz3wl3X4kmb

[vii] http://www.bloomberg.com/news/features/2015-09-01/blythe-masters-tells-banks-the-blockchain-changes-everything

[viii] http://cryptonewsday.com/blocknet-releases-decentralized-exchange-alpha-forms-inter-blockchain-think-tank/

[ix] https://ripple.com/insights/implementing-the-interledger-protocol/

D+H FINANCIAL™ TECHNOLOGIES. SOLUTIONS FOR PEOPLE.

About D+H

D+H's Global Transaction Banking Solutions Group, formerly known as Fundtech, is the leader in treasury services solutions. D+H is a leading financial technology provider the world's financial institutions rely on every day to help them grow and succeed. Our lending, core, payments, channel, optimization and treasury services solutions are trusted by nearly 8,000 banks, specialty lenders, community banks, credit unions, governments and corporations. Headquartered in Toronto, Canada, D+H has more than 5,500 employees worldwide who are passionate about partnering with clients to create forward-thinking solutions that fit their needs. With annual revenues of more than $1 billion, D+H is recognized as one of the world's top FinTech companies on IDC Financial Insights FinTech Rankings and *American Banker's* FinTech Forward ranking. For more information, visit **www.dh.com.**

D+H

North America
140 Broadway, 40th Floor
New York City, NY 10005
Tel: +1 212 497 1820

EMEA
D+H UK Limited
6 Bevis Marks
London, EC3A 7BA

Asia-Pacific
D+H Asia Pacific Pte Ltd
3 Church Street
#22-05 Samsung Hub
Singapore 049483
Tel: +65-6372 3123 / 6372 3131

For more information about D+H visit www.dh.com

160128-1