

BANKING ON BLOCKCHAIN: CHARTING THE PROGRESS OF DISTRIBUTED LEDGER TECHNOLOGY IN FINANCIAL SERVICES



Finextra

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FOREWORD

REALISING THE BENEFITS OF THE INDUSTRIAL BLOCKCHAIN



By John McLean
CTO, VP Global Blockchain Team, IBM Systems

Blockchain – the shared ledger technology which allows any participant in a business network to see the system of record – will have a transformative impact on a number of industries, including financial services, in the future. Blockchain is still in its relative infancy, but a number of initiatives under way are already driving its progression to an industrial solution which will yield several important benefits in the context of the transfer of assets within business networks.

Today, participants in business networks are all maintaining their own traditional ledgers to record transactions between them within their ecosystems. Despite efforts to reduce the complexity and increase the interconnectedness of these systems through investment in integration and B2B technologies, business network participants are still typically swapping files of data between them. As a result, the processes to underpin asset ownership and asset transfer in business networks are frequently inefficient, expensive and vulnerable.

Blockchain holds the potential for all participants in a business network to share a system of record. This replicated, shared ledger will provide consensus, provenance, immutability and finality around the transfer of assets within business networks – reducing costs, complexity and time, underpinning shared, trusted processes, enabling trusted recordkeeping and improving discoverability.

This paper explores the current state of play with blockchain in financial services, looking at the challenges and opportunities of implementing the technology across banking and the capital markets, and examining a number of use cases, for many of which proofs of concept are already under way. Financial services will not be the only industry impacted by blockchain, but it is currently leading the field in experimenting with and implementing the technology.

As a ledgering technology, blockchain will not replace the payment systems or the messaging systems deployed by banks, but these systems will connect to the blockchain, augmenting existing business networks and providing increased discoverability and trust. The benefits of the industrial blockchain outlined above are clearly very relevant to an industry focused on de-risking, improving its compliance capabilities and streamlining, automating and reinforcing trust in some very long-standing business processes.

Indeed, the industry commentators who have contributed to this paper confirm the potential of blockchain to bring great value in a number of important financial services activities, from trade finance to payments to securities settlement to regulatory compliance.

The paper also flags a number of prerequisites for blockchain to fulfil its potential in financial services – and beyond. Key among these is achieving a standard way of implementing the technology. A shared ledgering technology that can provide a consistent view across the broad business network needs a standard way of transferring ledger data. Organisations will participate in multiple ledgers – an FX network, a bond network, et cetera. Just as the internet and intranets share the same technology, so the blockchain proposition needs interoperability to function.

In this context, the recently announced open ledger project being orchestrated by the Linux Foundation is critical. Under an open governance model, this project will develop an enterprise grade, open source distributed ledger framework – freeing up developers to focus on building robust industry-specific applications, platforms and hardware systems to support business transactions, in banking and capital markets but also in other industries.

Alongside a range of other important participants, IBM is committed to the open ledger project. We are donating code and corresponding IP to this open source community as one of the first contributions that will enable blockchain to achieve its potential as a mainstream solution. The initiative is also timely. The contributors to this paper suggest – and we agree – that alongside numerous proofs of concept of blockchain that will run during the course of 2016, we are also likely to see one or more significant production solutions going live next year. A standard, robust distributed ledger framework will be a crucial underpinning for these early blockchain implementations and all those that follow.

In line with our support of the open ledger initiative, at IBM we are always interested in participating with a broad base of our clients in innovation efforts, and we are eager to partner with our customers to reap the benefits of these technologies and accelerate the use of blockchain for business.

In the meantime, I hope you find this paper interesting, informative and useful.

INTRODUCTION

BANKING ON BLOCKCHAIN: CHARTING THE PROGRESS OF DISTRIBUTED LEDGER TECHNOLOGY IN FINANCIAL SERVICES

Blockchain is undoubtedly one of the most talked-about technologies in financial services today. At SWIFT's Sibos conference in Singapore in October 2015 it was almost impossible to have a conversation without the 'b-word' being mentioned, and it was very clear that blockchain had made the transition from being a technology discussed by the few people 'in the know' to being a mainstream preoccupation.

Inevitably perhaps, having emerged from the shadow of Bitcoin, blockchain is now almost too much in the spotlight and in danger of being positioned as a panacea for all ills. As the saying goes, when you have a hammer, everything looks like a nail. However, while expert opinion varies as to the way in which blockchain will impact financial services, the extent to which it will disrupt the existing ecosystem and the speed at which this will happen, there is widespread agreement that the technology has powerful potential to herald a new age of efficiency in the industry.

This paper seeks to explore that potential, examining exactly what blockchain is and the benefits it could bring; the areas within financial services in which it is most likely to be applied; the current state of play with blockchain implementation in the industry; the challenges that need to be overcome in order for it to fulfil its promise; the likely way in which the blockchain story will develop in the coming months and years; the implications of that development for existing market participants; and possible approaches for institutions to ensure they benefit positively from the blockchain phenomenon.

“The good news is more financial institutions are interested in blockchain and are working to understand and think through where it could be used. Whether blockchain completely changes – or is just an addition to – the way we solve problems remains to be seen.”

**SURESH KUMAR, SENIOR EXECUTIVE VICE PRESIDENT
AND CHIEF INFORMATION OFFICER, BNY MELLON**

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WHAT IS BLOCKCHAIN, AND WHY IS EVERYONE TALKING ABOUT IT?

Put simply, the blockchain is a secure transaction ledger database shared by all parties in a distributed network, which records and stores every transaction that occurs in the network, creating an irrevocable and auditable transaction history. An increasingly interesting aspect of blockchain use is the concept of smart contracts – whereby business rules implied by a contract are embedded in the blockchain (encoded in programming language) and executed with the transaction. A smart contract could for example define the conditions under which transfer of a bond occurs.

By potentially providing a common, ubiquitous ledger technology, blockchain could reduce the friction created in financial networks when different intermediaries use different technology infrastructures. In theory, the distributed nature of blockchain (also known as distributed ledger) could also reduce the need for intermediaries to validate financial transactions. The prospect of streamlining infrastructure and/or removing redundant intermediaries from the process creates the opportunity to generate significant efficiency gains.

As Beth Shah, Head of Business Development at blockchain start-up Digital Asset Holdings, explains: “There are many areas that distributed ledger technology can positively impact. If you can share an infrastructure and record important financial information on a replicated, secured prime record of transaction history, then costly reconciliation processes across separate but different renditions of the same information can be avoided. Distributed ledger technology has the potential to reduce duplicative recordkeeping, eliminate reconciliation, minimise error rates and facilitate faster settlement. In turn, faster settlement means less risk in the financial system and lower capital requirements.”

Currently the most prevalent blockchain application in the financial industry is the Bitcoin blockchain. This has some characteristics which do not marry well with the requirements of regulated financial markets – at least as they look today. The Bitcoin blockchain is anonymous and ‘permissionless’. It does not reveal identity or offer privacy. In addition, the cryptography required to achieve consensus slows processing down and currently such an infrastructure could not scale to cope with mainstream financial market volumes. And much as the idea of an intermediary-free financial market might appeal to purists, in reality it is likely that regulators – and customers – will prefer the idea of orderly markets managed by one or a group of trusted parties, at least for the foreseeable future. They will also want the ability to roll back transactions in instances of fraud or error – which can be done on blockchain by adding a compensating record, as long as there are permission mechanisms to allow this – and a framework for dispute resolution.



Shah: blockchain can speed settlement and reduce risk

“Blockchain could bring down cost and open up opportunities for smart people and companies with not so deep pockets to do useful applications. If you want to develop a bank you still have to invest heavily in infrastructure. If you had blockchain, you could just hook up to that.”

RAIN LÖHMUS, CHAIRMAN OF THE SUPERVISORY BOARD, LHV CAPITAL

As a consequence, the blockchain – or more likely blockchains – we see deployed in the financial industry are likely to be private and permissioned. For most this is not an issue. “Blockchain is a collection of technologies – five or six,” says Simon Taylor, VP Blockchain R&D, Barclays. “You can be inspired by how Bitcoin works, you can be inspired by smart contracts. You don’t have to chain blocks of transactions that multiple parties share – or you might want to chain blocks of transactions. Bitcoin came up with five or six lego bricks and put them together in one way – but you can twist them around and use them differently, depending on the use case.”

There is a school of thought which says the rush to move beyond Bitcoin is happening too quickly, before the full implications of how cryptocurrencies and permissionless distributed ledgers work have been explored – and that it suits the banks rather too well to separate blockchain from Bitcoin as rapidly as possible, since Bitcoin purists see no role for banks. “I am wary of binary decision-making in technology,” says Taylor. “For payments use cases the anonymity part of Bitcoin is difficult to make work in our current financial services infrastructure. But that doesn’t therefore invalidate the use of the technology, period.”

But whether or not permissionless blockchains could end up having a role in mainstream financial services, it is certainly true that having reached fever pitch a year or so ago, the excitement about cryptocurrencies does seem to have stalled. Yes, there may be more than a dozen Bitcoin wallets on the market and yes, hundreds of thousands of merchants accept Bitcoin, but in the context of the number of merchants – and people – in the world, the uptake of cryptocurrencies is not yet statistically significant. Bitcoin purists may say that people don’t want to put trust in institutions but prefer instead to trust cryptography – but that view is probably not the majority view today.

So while it is fast becoming a cliché to say that it’s the blockchain – not Bitcoin – which is the really powerful innovation, this distinction does resonate with most industry experts.

Does the size of the prize – significant operational and capital efficiency gains, immediacy, auditability, transparency – justify the level of blockchain excitement? “As with any new and exciting field, there is a bit of a ‘gold rush’ right now,” says Mariano Belinky, Managing Partner of Santander InnoVentures. “I would question whether distributed ledger is always necessarily the best approach, but there are certainly problems that still need to be solved by a centralised database which is cryptographically secured.” And it’s probably necessary “to let a thousand flowers bloom”, observes Zilvinas Bareisis, Senior Analyst at Celent. “It’s important for the market to experiment in order to hit on the one killer app.”

As the level of real engagement by a broad array of industry participants indicates, the majority view is that there is certainly something about blockchain that justifies investigation. “We think it’s worth spending meaningful time and effort exploring and understanding blockchain,” says Fredrik Voss, Vice President, Blockchain Innovation, Nasdaq. “It holds great potential for changing the way some of the capital markets activities are done today – enabling more efficiency and more security than today’s technology and market structure can provide.”

Suresh Kumar, Senior Executive Vice President and Chief Information Officer, BNY Mellon, also views the ‘gold rush’ to blockchain positively. “The good news is more financial institutions are interested in blockchain and are working to understand and think through where it could be used.” He adds a note of caution however. “Whether blockchain completely changes – or is just an addition to – the way we solve problems remains to be seen.” Indeed, there is quite a widely held view that blockchain is a powerful new technology alongside existing technologies like databases, transaction processing systems, and enterprise messaging. Using it in conjunction with these will often be appropriate, because of its power operating between counterparties.

Mark Buitenhek, Global Head of Transaction Services at ING, also describes blockchain as “extremely promising”. “We see the potential,” he says. “But we are a bit careful with hypes. If it works, it’s going to have a huge transformative effect in situations where complex information streams come together such as in the financial sector. The jury is still out, but we find the potential so impressive that we are stepping up our efforts.”



Belinky: blockchain not always the best approach – but there are problems it can solve

WHAT ARE THE POTENTIAL APPLICATIONS OF BLOCKCHAIN IN FINANCIAL SERVICES?

There is a long term, big picture vision for blockchain – a ‘fabric for financial services – a books and records for the world’ – as Taylor describes it. “There is definitely a desire to look at how this might work,” he says. For Rain Lõhmus, Chairman of the Supervisory Board at LHV Capital, a decentralised universal database could be used in a variety of interesting ways. “What banks today are basically doing is running databases and recording claims against them,” he says. “There are thousands of banks in the world using similar databases – all separately maintained. That’s quite expensive. If we were using blockchain it could be universal – and used by many institutions – bringing much more efficiency and also helping to bring various systems closer together. Blockchain could bring down cost and open up opportunities for smart people and companies with not so deep pockets to do useful applications. If you want to develop a bank you still have to invest heavily in infrastructure. If you had blockchain, you could just hook up to that.” In this vision a ledgering fabric would reduce costs and create more open access – and, as Lõhmus says, in this regard blockchain captures both the spirit and objective of the EU’s PSD2.

Estonian bank LHV is actually experimenting with blockchain by issuing EUR100,000 worth of ‘cryptographically protected’ receivables claims against the bank. It is using coloured coins – an open source protocol for creating digital assets on the Bitcoin blockchain – to create what it calls Cryptographic Universal Blockchain Entered Receivables (Cuber), a kind of certificate of deposit that can be used as a building block for innovative financial products. The bank also plans to enable its customers to make free person-to-person fiat currency payments using blockchain. LHV’s aim, it says, is to drive financial innovation at smaller software developers, and it suggests start-ups and cryptocurrency exchanges could take advantage of its platform. This is a good example in practice of a bank creating a more efficient platform, and enabling wider, more open access.

Kumar at BNY Mellon also sees significant long-term implications of blockchain. “If you think about the concept of utilities, there has always been an entity in the middle to bring order to a market. The internet on the other hand was always designed to be distributed so that in the event of war or nuclear threat we could make sure it survived. What used to be not practical in the past because of the cost of technology may be so now with the advent of electronic networks and wide participation from retail customers and financial institutions. There may be a better way to look at our business models. That is the opportunity with blockchain – instead of one entity, is there a way a group of entities can get together to solve problems? In the longer term, this would be much more resilient than a hub and spoke approach.”



Kumar: blockchain creates an opportunity to improve business models

In other words, the initial introduction of blockchain will be to bring efficiencies, but over time, the ubiquity could create a new fabric to more easily connect counterparties in innovative network configurations, rather than the more centralised models we're used to seeing today.

The cost effectiveness of such an infrastructure would also be critical to underpin a future 'internet of things', he adds. "With the number of devices connected to the internet exploding and them all becoming potential users of banking services, this technology may enable us to offer services at much lower cost," he says. "Real distributed ownership enabling machine to machine interactions – that is going to be really transformational," agrees Julio Faura, Head of R&D, Banco Santander. "A use case for this could be payments in the context of the internet of things."

Of course, as Enrico Camerinelli, Senior Analyst at Aite Group, points out, a blockchain underpinning transactions on the internet of things would need millisecond response times – which can't be achieved with blockchain mining protocols today. That said, a blockchain without millisecond latency could still bring significant value in this context. For example, smart contracts held on a blockchain can give devices autonomy, and allow them to find counterparties to support temporary ownership or maintenance. A good example might be a smart lock that can transfer ownership of physical goods or request servicing without the need to refer to a central management system.

However grandiose the ultimate blockchain future, market observers are agreed that for now, it is essential to apply blockchain in areas where there is a genuine problem to solve. As Buitenhok says: "It is important that the technology meets a need, that it offers a solution for our clients and for us. We need to be wary of using new technology just for the sake of it. Then you get technology searching for a problem instead of it providing an

"Our niche is where the physical world meets the financial markets – and our target use cases can be tackled without necessarily changing an industry. We are looking to distill specific use cases through the consortium rather than try and boil the ocean."

GUILLAUME KENDALL, HEAD OF BUSINESS DEVELOPMENT, KYNETIX

actual solution to a problem.” Equally important is to ensure that the problem targeted can be solved by technology in the first place. “There was a whole discussion very early in the game that blockchain could be used for non-CLS currencies,” says Belinky. “The issue with those isn’t a technology one, it’s a legal one – and blockchain won’t solve that underlying legal issue.”

When it comes to thinking of problems to solve, some of the most often-cited examples tend not to be related to dematerialized and electronic financial markets, but to transactions which are rooted in the physical world, where there is plenty of paper (which we can easily imagine being digitalised), and where a number of parties have to do a similar action but in sequence to enable a transaction to be processed. So the house purchase process and car ownership through a vehicle’s lifecycle (linking to insurance) come up very often. “You have to ask what the technology is good at,” says Taylor. “If you need verifiability and certainty you can achieve that with blockchain. So, where is it good to have more people pointing at something, to confirm its accuracy?”

One example of blockchain use in an area where there is a clear interconnection between the physical and the financial world is the effort by commodities platform provider Kynetix, which has convened a consortium of players from across the commodity trade lifecycle including exchanges, investment banks, clearing houses, storage companies and brokers to explore the application of blockchain in the physical markets.

As part of its R&D in the space, Kynetix has recently announced it has successfully transferred title to a single lot of pepper on the Bitcoin blockchain using Sentinel, its inventory management and physical delivery platform, which creates electronic records of title, ownership and storage of commodities.

As Guillaume Kendall, Head of Business Development at Kynetix, points out: “Our niche is where the physical world meets the financial markets – and our target use cases can be tackled without necessarily changing an industry. We are looking to distill specific use cases through the consortium rather than try and boil the ocean.”



Taylor: if you need verifiability and certainty, you can achieve that with blockchain

TRADE FINANCE

One of the most frequently suggested examples of where blockchain can be applied is in the trade finance area. “Trade finance has real potential. It is very tangible – it’s the same thing whichever way you look at it,” says Taylor. Market commentator Lee Fulmer agrees, but adds a qualification. “If some banks decide to put the financial supply chain – for example letters of credit – on the blockchain, then that is pretty powerful – but to be really powerful the big corporates, the big shippers, and manufacturers, need to be on board, as well as the customs authorities.” As both letters of credit and bills of lading have very complex and intricate information flows, even if only a few participants were using a blockchain solution this would generate significant advantages – but the power of this solution certainly increases with the network effect.

Camerinelli says his research with 100 corporates revealed few who had even heard of blockchain, indicating banks need to do more to involve the corporates in the process of automating trade finance on the blockchain. He also observes that there have been many attempts to automate trade finance already, but still document-heavy letters of credit processes remain firmly in place. “You have to look at what’s in it for a corporate. With letters of credit corporates are somehow outsourcing to banks additional services – checking goods have arrived et cetera – so in the cost of LC processing they are also receiving a value-added service. If this process goes digital the corporate has to find it more beneficial. The bank payment obligation (BPO) was a powerful solution, but it also shows what happens if banks develop a solution between themselves and just assume corporates will jump on it. They have to be involved from the outset.”

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PAYMENTS

Despite doubts about Bitcoin, a number of observers continue to believe the potential for blockchain in payments is high, and companies like Ripple have garnered a lot of attention in the payments space. As Fulmer says, the theory here is potentially strong. “Blockchain allows everybody involved in a transaction to see the entire transaction lifecycle and everyone else’s involvement in it. That’s very good. We have been trying to achieve that in payment systems with messages – but if you have a complex chain, that’s difficult to do.” While messages are a reasonable way to offer clarity on each step in the payments process, blockchain could add to this by providing provenance and auditability for these messages. Smart contracts could then be used to make payment terms and positions more visible, reducing risk.

As the current preoccupation with enabling instant payments on a national, regional and potentially even global basis suggests, the payments space is ripe for innovation, as the banks look to fend off competition from new entrants. “Smart people at the beginning of the 1990s were predicting we would have 24/7 payment mechanisms with everything linked already – and we don’t have that yet,” points out Löhmus.

For some, blockchain could be the answer here. As Michael King, Chairman, Credits (a blockchain platform provider) says: “If you look at the efforts to think about instant payments in Europe now, it’s in the interests of existing players to talk about a hub and spoke approach. But the intellectual side of instant payments is that it’s distributed.” Belinky goes so far as to say: “If you ask me, will we have a distributed ledger for cross currency payments globally, I would say there is a very strong probability that we will. I can’t see now a major blocking factor.” Faura agrees. “Payments, especially international payments, are very ripe for a change and an improvement in terms of costs, quality of service, making the process more transparent and continuous,” he says. “It’s not as transformational, it’s more incremental... leveraging the fact that the ledger is distributed and shared between trusted institutions. I think the technology is close to being production-ready. It’s a matter of succeeding with proofs of concept and then deploying in a collaborative manner.”

“Payments are very ripe for a change and an improvement in terms of costs, quality of service, making the process more transparent and continuous”

JULIO FAURA, HEAD OF R&D, BANCO SANTANDER



King: the intellectual side of instant payments is that it’s distributed

CAPITAL MARKETS

A far more transformational opportunity created by blockchain, says Faura, is the fact that “we can now attach behaviour to money – which opens the gate for new capital markets instruments”. While he acknowledges that the industry is a long way from a production environment for this aspect of capital markets innovation, a second realm in which he sees the potential for implementation of blockchain in relatively short order is “everything that relates to settlement... for use across the capital markets”.

Here, the vision is to achieve T+0 settlement with all the efficiencies that would create, by utilising the blockchain to achieve instant finality, reducing cost and vastly improving timeliness. There could also be an opportunity to eliminate intermediary steps in the process. “Central counterparties were put in place to mitigate counterparty risk,” says King. “But if you had instant collateralisation and instant settlement, you would not have counterparty risk. The reason blockchain can be potentially disruptive is that the distributed ledger forces us to rethink business models and how to move away from a hub and spoke model.” Blockchain might not lead to the removal of intermediaries but it could force them to provide new and innovative services to remain relevant in a low cost, abundant network.

Taylor urges caution around the speed at which change in the capital markets will happen, but acknowledges the potential, and points out that it is in the capital markets area that the biggest number of blockchain start-ups are active, looking to pick off certain asset classes and move them to a bilateral model. “The business rationale for a CCP won’t go away. We might have options now that we didn’t have before, but if anything, blockchain technologies could create more efficient markets. Over a 10 year period the market could start to look different, with a mix of central counterparties playing a different role, and banks and CCPs operating more efficiently,” he says. So blockchain could bring value now, and value later, as relationships and counterparties evolve.



Voss says Nasdaq started to look at blockchain 2.5 years ago, “attracted by the potential operational and capital efficiency the technology if correctly deployed can bring”, alongside “the immediacy, auditability and transparency aspects”. “It remains to be proven if these attributes can come to fruition and be deployed in larger scale capital and financial market use, but we think it holds great promise. We are actively trying to understand how it can be deployed, and we are early out in deploying some solutions and proofs of concept,” says Voss.

**Voss: Nasdaq early
out in deploying
blockchain POCs**

“Our positive view of blockchain’s ability to meet the needs of a large ecosystem is tempered by the time aspect. We take a 5-10 year view on true network wide adoption but from what we have seen there will definitely be commercial use cases in a 12-24 month period”

**EDWARD BUDD, MANAGING DIRECTOR WORKING ON DIGITAL STRATEGY,
GLOBAL TRANSACTION BANKING, DEUTSCHE BANK**

Nasdaq’s first proof of concept transaction was symbolically recorded on New Year’s Eve 2015 by Chain.com, the blockchain development company that is helping Nasdaq to build the distributed ledger-based Linq platform. The first blockchain-based solution Nasdaq is bringing to market is for efficient, electronic services for the issuance, transfer and management of private company securities. “Our innovation strategy is to go live with a minimum viable product,” Voss says, “which will satisfy a genuine need to improve efficiency and reduce risk, keeping track of movements of paper-based certificates.” Alongside an application for proxy voting in Estonia, Nasdaq hopes that this use case will start to prove blockchain technology can be used for other applications in financial services than cryptocurrencies. Voss sounds the familiar notion of caution about how rapidly change will occur. “When we look at larger scale capital market use, it is clear that there needs to be further innovation around performance and scalability,” he says.

Deutsche Bank too has reached the conclusion that it is in the capital markets that blockchain has the most immediate potential. Edward Budd, Managing Director working on digital strategy, Global Transaction Banking, Deutsche Bank, says it has been looking at blockchain for about 20 months. “As a large transaction banking player we wanted to investigate the Bitcoin developments. Actually when you look at blockchain use cases in the already highly efficient and lean wholesale payments market, the question is why the market should invest to move to a blockchain based solution? We see more potential for blockchain in the securities world.”

Deutsche has been experimenting internally with blockchain specifically smart contracts applied to the lifecycle management of corporate bonds. “The reason we did the project was that we really wanted to actively understand the capability of the technology and separate the hype from the practicality,” Budd says. “We have done two proofs of value in parallel on two different blockchain rails in order to learn about the technical capabilities and also the legal and regulatory aspects. The smart contract aspect is suited well to corporate bonds, and we have been able to look at lifecycle management events and transfer of ownership and testing blockchain in both the technical and legal senses.”

Deutsche has concluded that the technology is capable of performing these functions, he says. “Our positive view of blockchain’s ability to meet the needs of a large financial ecosystem is tempered by the time aspect. We take a 5-10 year view on true network wide adoption but from what we have seen there will definitely be commercial use cases in a 12-24 month period.”



Faura: ability to attach behaviour to money opens gate for new capital markets instruments

THE 'REGULATORY APP'

The notion of a blockchain irrevocably recording all transactions in a market has given rise to the 'regulatory app' concept – a vastly simplified way for a supervisor to view the information it needs to ensure a market is in good order. For Credits' King, this is “the biggest application for blockchain”. “With MiFID, Basel III, PSD2 et cetera, the amount of data that firms have to provide into regulators, locally, regionally, globally, is growing exponentially, and often the regulators don't have an efficient way to consume this data. If there's a problem, they still call up firms and ask, regardless of what they have been sent.”

In theory, AML processes would be eliminated (along with a good proportion of GBP1.5 billion in costs), he says, as the regulator could track the provenance of funds on the blockchain. “A central bank could say, here is my currency blockchain – so you no longer have to report,” he says. Blockchain could also help to solve KYC and identity management challenges, he adds. “The data we use to prove identity is already digital. The blockchain could enable instant identity verification.”

As Belinky points out, there are start-ups already offering blockchain applications in the compliance area, and the 'regulatory app' does have potential, observers agree – though there are issues. “Given everything is in the ledger, it would be possible to create the right window for the regulator, but there are some questions about identity, anonymity, how much information about the transaction to publish, what is private, what levels of access to allow,” Belinky notes.

Budd echoes this view. “A window for the supervisors based on the blockchain could in principle work. Practically this could be tested in one of the permissioned blockchain projects coming to the surface. There remain practical questions to answer about the provision of reference data, providing the right level of transparency perhaps at a data attribute level based on the different roles hosts of nodes play, and ensuring appropriate confidentiality is maintained.”

Bringing clarity to regulatory reporting is a challenge in the pre-blockchain world, as Kumar points out, and blockchain would not automatically solve this. “When firms send their data to the regulator today, an issue is that they all have different definitions of counterparties, for example,” he says. Whether you use the physical reporting mechanism or the blockchain, you still have to have standards that work, and that's complicated and takes a long time.”

For Fulmer, the biggest problem with the regulatory app concept is the relative immaturity of the blockchain itself. For this application as for others, more innovation is needed. “The reality of the situation is that no bank would ever open its books completely to the regulator or to competitors, which the blockchain will do,” he says. “The commercial terms of contracts need to remain confidential. For areas of commercial sensitivity, blockchain is not ready yet. We are still working out how to put confidential information on it – and to restrict access. This is why ledger initiatives need to continue developing.”

The good news is that work is under way by technology companies on the cryptography needed to ensure identity management and privacy on the blockchain. Privacy is needed for both transactions and identity, and it needs to be tunable, so that counterparties can see only the transactions for which they are permissioned. The regulatory app especially highlights the need for scalable privacy – but it is also required to make blockchain suitable for use in other areas including capital markets and payments.

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NON-BANK DRIVEN BLOCKCHAIN IMPLEMENTATIONS

It is important to remember that the first implementations of blockchain which really impact banks' customers may in fact have nothing to do with banks. "Because it started with currency, people assume that banking and capital markets will be the first users," says Taylor, "but the most obvious applications to the consumer may not be banking related. If blockchain follows the trajectory of big data, then the biggest users could be companies like Facebook, Netflix, Google and Amazon." Organisations which participate in very large business networks could view blockchain as an adjacency, a natural extension to their current business and/or something which could add tremendous value to it.

Fulmer too sees the potential for giants such as Amazon and DHL to steal a march with blockchain. "If players like this look at blockchain from a logistics point of view, see how powerful it could be for them, how they could get better control and provide better service, then this could be the way we see blockchain go mainstream," he says.

And given the very real possibility for players like Google and Facebook with their massive customer bases to take a sideswipe at the banking business, it is not a big leap to see them getting ahead of the banks in terms of driving mass market blockchain innovation, including in areas of financial services such as payments.

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SIMON TAYLOR, VP BLOCKCHAIN R&D, BARCLAYS

HOW COMPLETE IS THE BLOCKCHAIN TECHNOLOGY STACK?

As discussed, many of the technology ‘concerns’ about blockchain in financial services stem from issues with the Bitcoin blockchain. For example, the issue of how to manage the loss or theft of private keys for a blockchain with no central point of control disappears if there is some kind of central point – or points – of control. Similarly, scalability and performance are an issue because of the cryptography required to ensure consensus – but in a permissioned blockchain there could be other less computationally demanding ways of establishing consensus which could help to address this. Indeed, experimenters are already claiming performance numbers that get ever-closer to what would be required for mainstream use, and the rapid pace of technological change makes it unlikely that performance is an insurmountable challenge over time.

In short, taking the more flexible ‘lego brick’ view of blockchain technologies – cherry-picking the features which suit the use case – could mean that the blockchains which are implemented in financial services will look less and less like the Bitcoin blockchain – but unless you happen to be a purist, this is unlikely to be an issue, and most financial institutions have already reached this conclusion.

There remain some genuine issues, however. One is around standards and the danger that a lack of standards could impede interoperability. “With all the major vendors and utilities looking at this and the banks all doing their own thing and filing patents, interoperability could become a real problem,” warns Fulmer. “If a major bank develops its own version of blockchain and expects everyone to use it, while its smaller customers may, other major banks won’t. We need a standard for the protocol, regulated by an industry body like the IETF or IEEE, to which every interested party has access – like TCP/IP.” Clearly, if everyone has a different ledgering technology, then we would be back to the world of multiple different fractured systems in a business network – creating exactly the friction that blockchain is trying to reduce or eliminate.

ING’s Buitenhek suggests one of the most important challenges is setting joint standards and protocols. “You need standardisation in order for a new technical protocol to work,” he says. There are many standards elements that must be worked on, adds Kumar, including a taxonomy and a mechanism to manage the transition to a blockchain environment. On top of the standards needed in the technology stack – to cover privacy, smart contracts, identity etc), there is also a need for standards to enable different businesses to use the blockchain. For example, banks would have different standards to those used by automotive manufacturers, but still be able to use the same underlying technology standards – just as they do with the internet.



Buitenhek: you need standardisation for a new technical protocol to work

The good news is that work is under way, says Belinky. “We are already starting to see the underpinnings of this. The R3CEV initiative has most representative players at the table, and standards are on its agenda,” he notes. “We are also seeing more interoperability protocols – such as the inter-ledger protocol from Ripple. We will see more and more of this and it is critical.” Inter-ledgering is much easier if there is one, common, ubiquitous fabric for ledgering: just like the internet and intranets, it is possible to get from anywhere to anywhere else across multiple ledgers because they are all using a single, agreed, open standard.

Another boost to blockchain standards comes from the recently announced collaborative effort spearheaded by the Linux Foundation – the non-profit organisation supporting innovation through open source. Early commitments to this work come from IBM, other companies include ANZ Bank, Cisco, CLS, Credits, Digital Asset Holdings, Fujitsu, IC3, Intel, London Stock Exchange Group, Mitsubishi UFJ Financial Group, State Street, SWIFT, VMware and Wells Fargo. The project aims to develop an enterprise grade, open source distributed ledger framework, and free up developers to focus on building robust, industry-specific applications, platforms and hardware systems to support business transactions.

Belinky also highlights another major technological challenge for blockchain: the fact that it is still in its infancy. “The building blocks are there. More of the complementary components are starting to appear. But a number of components need to come together before we get to an enterprise level solution.”

Budd reinforces this point. “The technical conclusions of our proofs of value are positive, in respect to the use of the blockchain rails and the potential use of smart contracts. The technology basics are in evidence – but there are open questions about how this scales, how infrastructure is configured in reality for permissioned use cases, how much the element of large computing power is traded for increased the levels of trust in a permissioned model.”

Voss agrees the jury is still out on how blockchain will be used in a mainstream way. “The next phase is proving the technology under some stress of commercial applications,” he says. “Potentially we get through that phase and the technology proves it’s capable of handling them, and then the next step is using it for more complex and advanced commercial challenges. If instead we reveal issues which need to be remedied, and it’s reasonable to remedy them, we will deal with those. If for some unlikely reason we discover some lethal flaws in the technology then it’ll slow down.”



While it is reasonable to assume that, given the level of focus on blockchain right now, any flaws in the technology will be resolved in time, for now they do create a potential credibility problem for prime time use. As Kendall from Kynetix puts it: “Blockchain is in its infancy by comparison with other database technologies. How do you take it to your board as a credible solution?”

WHAT MIGHT PREVENT BLOCKCHAIN FROM GOING MAINSTREAM IN FINANCIAL SERVICES?

Aside from the immaturity of the technology, there are other hurdles for blockchain to overcome.

One could be the degree to which the banks have an appetite right now to make the necessary levels of investment, beyond the experimentation they are already doing in order not to be left behind, says Fulmer. “The banks have had to spend vast amounts of money on capital adequacy and regulatory requirements, and the business side has suffered. In general they have not been able to invest in products. They are pulling out of markets. I think they may find it challenging to invest the necessary money to truly leverage blockchain over the next 2-3 years while they are trying to fix themselves. The CEOs of lines of business are more fixated on delivering new services and products for their customers – if they have money to invest in the next 12 months that is where it will go.”

That said, blockchain could be the technology that enables banks to introduce new products and services, and this is all the more worth considering given the fact that new entrants, unencumbered by legacy constraints, could utilise blockchain to create a radically cheaper platform for innovation.

Another hurdle could be regulatory and legal issues. Avoiding some of the more contentious elements of the Bitcoin blockchain could help to make the regulators more comfortable, and, as Voss says, as far as blockchain is about improving the efficiency of today’s markets, it may not impact the regulatory question. “The regulator today is already fairly tech neutral,” he points out. “The regulators are not concerned about the technology used as long as you can satisfy the criteria for approval.” This could change, however, if blockchain were to lead to a “restructuring of how the markets operate”. “If blockchain starts to significantly change the business model of some of these activities, and who does what – if we end up with business models and activities that the regulators weren’t formerly able to contemplate – then we might end up revisiting the regulation,” he suggests.

“Blockchain could be the technology that enables banks to introduce new products and services, and this is all the more worth considering given the fact that new entrants, unencumbered by legacy problems, could utilise blockchain to create a radically cheaper platform for innovation”



Fulmer: banks may struggle to invest to truly leverage blockchain in next 2-3 years

The regulators have shown they are keen to encourage innovation, with the UK Financial Conduct Authority for example recently announcing a fintech sandbox expressly designed to enable it to get familiar with new products early, in order to advise on and plan regulatory change as required.

Legal issues will also have to be addressed. “There is no jurisprudence around smart digital documents,” says Belinky, “so we will have to write it”. As Bareisis of Celent points out, in the world of smart contracts, programmers have an elevated importance. If instead of armies of lawyers writing contracts, programmers are governing this through smart contracts, what will be the legal implications of coding errors? And different ownership laws in different markets cannot simply be overcome by blockchain, as Kendall points out. “In the commodities world, launching a new commodity contract can take months and months, considering tax and ownership laws across different jurisdictions. Even if you get an industry to buy into a new way of doing things, legal and regulatory compliance will inevitably add some complexity to wider adoption.”

One aspect which may help is the likely availability of a range of different smart contract programming languages, some of which could be used by lawyers directly. Just as spreadsheets have moved beyond specialist use to mainstream, with the right programming language and metaphors, technology can become usable by a wider community.

Moving to a new world also begs the question of what happens to open interest on a market that is transferring to the blockchain, Kendall adds. “Day 1 is a problem!” Moving a market in flight on to a new infrastructure would clearly be a challenge – and this supports the idea of a more gradual move, adopting blockchain for new or totally unautomated activities first, to establish the benefits and learn more about the wider implications of such an infrastructure change.

A related point could be the impact of vested interests on the speed of blockchain adoption. The banks remain positive about their role and the roles of their utilities in a blockchain future. It seems far-fetched to imagine blockchain will not change the intermediary landscape to some degree, however. As Kumar says: “The financial institutions with the relationship with the clients and that have the balance sheet, the reputation and the branding – unless for other reasons they lose it – should continue to play a role. But the way we solve problems could change and the intermediaries we all have to facilitate transactions could change.”

Shah of Digital Asset Holdings says: “Banks and other trusted market infrastructure providers play a very important role in the ecosystem. It’s not just about being an intermediary, but about being trusted to perform certain services and meet regulatory requirements. The best financial firms will take advantage of this new technology and deploy it to their own benefit with the result that those benefits will accrue to their customers. It does have the potential to be disruptive and if firms don’t explore it there is that risk. But it’s also constructive in the sense that it can be a material competitor advantage.”



LHV's Lõhmus points out that there are clear conflicts of interests for intermediaries in a blockchain world, even if the blockchain model that is adopted is not a pure imitation of the Bitcoin blockchain. "There has to be wastage in an industry so big. There is a conflict – but then again there are always conflicts. In the early 1990s we were the first bank in Estonia to enter the internet banking space, and accountants in banks were our biggest critics – because they didn't want to lose the opportunity of a coffee break when they visited a physical bank branch!" Of course, those accountants are probably now engaged in more productive activities and enabling new business; internet banking has clearly created more than it has destroyed.

That notwithstanding, we shouldn't underestimate the number of turkeys that would have to vote for Christmas to usher in the blockchain model in a thoroughgoing way in the banking and capital markets industries – not just the market infrastructures whose *raison d'être* could be called into question, but those banks that have invested in them and have ongoing relationships with them. "To be really effective on an industry scale, blockchain needs banks and the market infrastructures which already exist to work together, and at the moment I don't see a compelling business case for that," says Fulmer.

In reality, blocking factors like regulation, legal constraints and even vested interests will almost certainly be resolved in time. They are part of what the banks are investigating now, as Deutsche Bank's Budd points out. "We are very clear that these types of technology evolutions could redefine the roles up and down the value chain and therefore the business models those roles are based on today. By investigating blockchain that is one of the critical aspects we want to test further. This is not primarily a new technology pilot and project. The primary business driver here is learning more about the potential evolution of business models, surfacing the key regulatory and legal aspects and of course, understanding which aspects of the new models the customer will value? It's very important that we stay focused on the outcome for our clients in these developments."

The blockchain has the potential to significantly change business models, Voss believes, but "lots of things need to happen first" – including "proving the technology, use cases and deploying blockchain into already existing infrastructures and ecosystems". "During the transition phase we need to create acceptance and desire in the community," he says. "Any strategic plan needs to involve issues like how we change attitudes from where they are today to ones that are positive. The only way to get to that is to actually prove it – in markets that are understandable to influence thinking. But you can't start in the most challenging markets. Once you have proven over and over again that the technology is efficient on a small scale, it's easier to conceptualise how it could make processes more efficient on a big scale. A roadmap is critical for this to happen."

In short, prime time blockchain use in financial services needs time and consideration. As Fulmer says: "I am an avid supporter of blockchain. It's a revolutionary way to package a set of technologies – and it will have huge implications – but it's going to take time to mature. We need to stop with the hype for five minutes and see how we are going to make it work."



07

OVER WHAT TIMEFRAME WILL WE SEE BLOCKCHAIN IMPLEMENTED IN FINANCIAL SERVICES?

Though observers are united in their view that nothing massive will happen quickly, it is also clear that blockchain developments are happening now and an impact is likely in the short, medium and longer term. The consensus is that a probable timeframe will look like this:

Now to end-2016

Continued experimentation and proofs of concept and work on developing the requisite components including standards. Possibility of a high-profile deployment in 2016 given the level of activity.

2016-2018/19/20

Significant applications solving real-world problems in certain areas of the banking and capital markets industries.

2025 and beyond

True network adoption and mainstream penetration (matching internet adoption today).

Remember how recently Uber and Airbnb came about, considering the length of time the internet and Web have been channels for commerce: it takes a long time before the benefits of new technology are completely understood, and it scales to a point of major industry disruption.

“I am an avid supporter of blockchain. It’s a revolutionary way to package a set of technologies – and it will have huge implications – but it’s going to take time to mature. We need to stop with the hype for five minutes and see how we are going to make it work.”

LEE FULMER, MARKET COMMENTATOR

WHAT SHOULD FINANCIAL SERVICES PLAYERS BE DOING ABOUT BLOCKCHAIN RIGHT NOW?

Even if it were possible to ignore blockchain, given the hype around it, doing so would be a bad idea, despite the many competing demands on time and budget in the current environment.

Finextra's five key recommendations around blockchain are:

- 1) **Experiment.** Get your hands dirty, to establish the strengths and weaknesses of the technology, work out how to bring value to your customers, and get ahead of the killer apps.

"We believe there will be many permissioned blockchains and interoperability will be a key element in the future landscape. The maturity of blockchain business model development is equivalent to that of the internet in the late 1990s, before most of the really powerful business models of today emerged. The Facebook equivalent may not appear in the next 12-24 months. That's why we are so actively learning ourselves and engaging in the market"

Edward Budd, Deutsche Bank

- 2) **Collaborate.** There are internal wins to be had with blockchain, maybe even in the next 12 months (such as an internal golden source reference data application). But for the most part it is a community play. It requires cross-market participation – between not just banks, but their market infrastructures and their corporate customers.

"All of these use cases will probably become something like industry consortia ultimately. The use cases are typical utility problems. It makes a lot of financial sense that such a blockchain solution is owned by participating financial institutions. Eventually we will see more and more investing strategically alongside each other."

Mariano Belinky, Santander InnoVentures

- 3) **Contribute to the development of standards, from the protocol upwards throughout the stack, and to an understanding of the regulatory and legal implications of blockchain.** To be a de facto standard blockchain needs a TCP/IP like basis and different blockchains need to interoperate. The consortia approach is good for standards development and for the creation of roadmaps for real-world ecosystem adoption. An open governance model will enable banks, technology companies, regulators and others to contribute to the development of a blockchain standard.

"We see it as positive that there is so much brainpower focusing on the space. We need to understand the technology – its strengths and its weaknesses – and there is also a lot of thinking about how it fits into the existing ecosystem and infrastructure, and how it fits into the regulatory environment."

Fredrik Voss, Nasdaq

- 4) Define the right use cases. Blockchain can't solve all the world's problems. It isn't good for everything. And it can't solve problems that are beyond the reach of technology. Some use cases will fail – but apply your energies where they can yield the most payback. Use cases with real value for end users are essential. Also, using blockchain where a simpler technology would solve the problem (e.g. a database) will just lead to a solution with a suboptimal cost profile. Look for business networks, markets, counterparties and asset transfer activities where provenance, auditability, consensus and finality are important.

“As you get closer to blockchain it'll start to change shape a bit. You will see more detail and make different decisions accordingly. It's also got to solve a real problem. And just because you have a new tool in your toolbox doesn't mean that difficult problems will be suddenly easy to solve. My job has flipped from having to get people to consider the technology to having a more considered approach to using it. It can't change the world tomorrow. We need to very sensibly and steadily cut to the core.”

Simon Taylor, Barclays

- 5) Prepare for the future impact on business models. It won't happen overnight, but all things being equal, blockchain looks set to impact the fabric of the financial services infrastructure. Thinking about that impact and what it might mean, and formulating strategies to respond, is essential. Banks are getting used to reinventing themselves to evolve, and blockchain has the potential to provoke another evolutionary change. Innovative products need to help the banks' customers achieve their objectives as much as they do the banks.

“We think that blockchain technology, if it meets all the challenges and criteria we have discussed, could help transform the financial industry further. But this is happening already now, in many ways, so it's really a continuation of the development to anytime, anywhere digital banking. Payment systems will evolve, but all the market leaders and key players are on board so we expect them to integrate it into their business models, products and services.”

Mark Buitenhek, ING

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