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Blockchain in a Digital World

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Financial Technology

Blockchain in a Digital World

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Abstract

Blockchain technology has certainly attracted attention since 2014; from Bitcoin's murky reputation and increased adoption, to the World Economic Forum paper published in 2016 pointing to the technology as one to revolutionize financial services' infrastructure. Somewhere in between, the financial services industry has leapt into gear and an ecosystem is emerging that comprises incumbent banks and financial institutions, FinTech start-ups, peer-to-peer payments, and distributed autonomous organizations built on top of blockchain technology. The definition of disruption put forward by Clayton Christensen in 1997 has been built on and revised over the last two decades to describe a continuous and relative process. Certain methods have been shown to arm against disruption, in particular, business model innovation. This research is based on a series of interviews with high-profile industry players with the aim to gather insight as to how business models could change. The interviews cover insight from within highly regulated financial services, where process and entire markets are said to be disrupted, and outside of financial services, where new business models are emerging with the aim to reach new customers whose needs are not being currently met.

"Blockchain is a vast, global distributed ledger running on millions of devices and open to anyone, where anything of value – money, but also titles, deeds, identities, even votes – can be moved, stored and managed securely and privately. Trust is established through mass collaboration and clever code rather than by powerful intermediaries like governments and banks." Tapscott [2016]

In 2008, the pseudonymous Satoshi Nakamoto (2008)[1] outlined a new concept for a cryptocurrency called Bitcoin, with a view to disrupt existing financial services by circumventing the value chain. Bitcoin is a currency, intertwined with a mechanism of recording transactions without spending the same coin twice: the blockchain. The new currency achieved notoriety and intrigue in equal measure. Its volatile price and murky commerce were journalistic fodder.

The funfair had begun. Exchanges shot up and down like a game of whack-a-mole and its price rose over time relative to the dollar, hitting a peak of U.S.$1100 for 1 Bitcoin (BTC) late 2014. It would be remiss not to mention the numerous scandals that temporarily engulfed the ecosystem, such as exchange hacks or accusations of terrorist financing, but blockchain technology, to its credit, remained steadfast throughout.

Blockchain, or as it is often referred to, distributed ledger technology (DLT), captured the hearts and minds of the very sector it was set to disrupt. Many existing financial services firms have reacted quickly and innovatively to this potential disruption, appearing to embrace its characteristics by launching joint ventures, creating industry alliances, joining consortia, and implementing proof-of-concept use cases. But will this be enough to combat the effects of disruption? Disruption leads to growth in new markets, and historically novel business models have emerged as a result.

This research is based on a series of interviews with high profile participants representing either their own views or the views of their company, which are mostly blockchain or distributed ledger technology focused start-ups. Each was asked the same core set of questions to investigate their views on business model innovation in a blockchain paradigm. The aim is to gain insight into the potential for change and to add to the literature some forward-looking insight in what has the markings of an early stage disruption.

ECONOMIC PROPERTIES OF DIGITAL GOODS

"Bitcoin is a remarkable cryptographic achievement and the ability to create something that is not duplicable in the digital world has enormous value" – Eric Schmidt, Chairman of Alphabet (Google's parent company)

In order to understand the broad significance of blockchain technology, let us first take a step back and look at the economic properties of digital goods and their effect on businesses. Digital goods are public, durable information goods. In an analog world, an information good such as a book, a photo, or a music track cannot be replicated without a lot of work and a large potential for loss of information. In a digital world, these can be replicated easily without loss of information. This makes them durable. A public good must satisfy the conditions of being non-rival and non-excludable. A digital music track, for example, can be copied and consumed concurrently, making it non-rival. Moreover, its non-excludable property simply means that in practice no one can be excluded from listening to it.

This almost unfettered access to an abundance of music, coupled with a drastic decrease in reproduction, distribution, and even initial production costs, has led to a significant loss of market power for incumbent music companies since the turn of the century. Yet, this has not undermined the very fabric of the industry itself.

In fact, new business models have emerged, such as Spotify, which leverage its durable and non-rival properties via streaming services. Emerging artists can exploit the non-excludable property of a digital good shared over the internet and achieve fame and fortune via platforms such as YouTube or SoundCloud. The difference between the music industry and the financial services industry, however, is that to avoid undermining the very concept of money, it is necessary to combat the issues that arise from these public, durable information goods.

Simply put, sending a music track doesn't diminish the value of the song, but sending money without recording the transaction destroys the value of the currency.

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1   Nakamoto, S, 2008, "Bitcoin: a peer-to-peer electronic cash system," Bitcoin.org, http://bitcoin.org/bitcoin.pdf

Blockchain and its significance to digital goods

In the fairground of digital goods, music can run rampant in the house of mirrors. But money must remain on the rival roller coaster, riding a fixed journey.

Nakamoto (2008) put forward an elegant solution to the "double spend" using a nexus of existing technologies: a timestamp server, public/private key encryption, and a proof-of-work consensus. This solution became known as the blockchain. In short, a blockchain is a ledger of all existing transactions, which can be either public or private, and a consensus mechanism to cryptographically secure transactions into the chain. Pilkington (2016)[2] gives a detailed and technical breakdown of the innovation.

A blockchain is a way of recording possession and transfer of digital goods. A digital good is non-rival, a digital good secured on a blockchain exhibits rivalness. Put another way, a blockchain underpins the transfer of a digital good and traces its provenance to negate the replicable and non-rival properties that arise from being a public, durable, information good.

Blockchain as a disruptive innovation

"You can't stop things like Bitcoin. It will be everywhere and the world will have to readjust. World governments will have to readjust" – John McAfee

Although conceptually dating back much further, disruption only became formally defined in 1997. In The Innovator's Dilemma,[3] widely regarded as one of the most important business books ever written,[4] Clayton Christensen defined disruptive innovation as "a new product or service that initially takes root at the lower end of the market, servicing a niche segment, and then gradually moving its way up the chain to replace the existing product or service." More recently, disruption is regarded as a process and not an event that one can retrospectively label, and that it is relative and not absolute.

What Bitcoin and other cryptocurrencies offer is the opportunity to send money electronically over a peer-to-peer network without passing through a financial institution; certainly a different set of features than traditional payment mechanisms.

Other entirely new features exist, such as the ability to encode secret messages into the blockchain. In the very first Bitcoin block, known as the genesis block, Nakomoto encoded the phrase "The Times 03/Jan/2009 Chancellor on brink of second bailout for banks."[5] Noted security researcher Dan Kaminsky also encoded a tribute to his friend, Len Sassaman,[6] after he passed away.

Bitcoin has flourished in niche markets where Bitcoin evangelists "fighting the power" (or at least circumventing the power) laud the ability to cut out the middle-man: banks.

Blockchain technology, having decoupled from Bitcoin around 2014/15, has gone through significant testing and evolution and become more appropriate for regulated industries.[7] For example, private chains were considered preferable to public chains for financial services, which meant the energy intensive proof-of-work mechanism could be replaced with a simpler consensus mechanism. Successful proof-of-concepts have been reported,[8] start-ups have emerged, alliances and consortia formed,[9] and now the first end-to-end trade finance transaction has been completed.[10]

According to research released in August 2016 by the World Economic Forum,[11] 80% of banks are predicted to initiate DLT projects in 2017, more than 90 corporations have joined blockchain consortia, and more than U.S.$1.4 billion has been invested in blockchain technology since 2013. The report states "new financial services infrastructure built on DLT will redraw processes and call into question orthodoxies that are foundational to today's business models."

Recognizing the signs of disruption, reports and white papers emerged along with the insightful and eminently readable books by Tapscott and Tapscott (2016) and Mougayar and Buterin (2016).[12]

2 Pilkington, M., 2016, "Blockchain technology: principles and applications," in Olleros, F. X., and M. Zhegu (eds.), Research handbook on digital transformations, Edward Elgar, 2016

3 Christensen, C. C., 2011, The innovator's dilemma: the revolutionary book that will change the way you do business, HarperBusiness

4 Economist, 2011, "Aiming high," June 30, http://econ.st/2cTyhvt.

5 http://bit.ly/2dtXPSY

6 http://bit.ly/2dsYeGa (Slide 13)

7 Swanson, T., 2015, "Consensus-as-a-service: a brief report on the emergence of permissioned, distributed ledger systems," April 6, http://bit.ly/1IDWPm9

8 Grygo, E., 2016, "Rabobank, D&H complete blockchain proof-of-concept Project," Financial Technologies Forum, October 4, http://bit.ly/2dEXjmm

9 Kelly, J., and G. Chavez-Dreyfuss, 2016, "Thomson Reuters joins R3 blockchain consortium," Reuters, August 2, http://reut.rs/2aIJXTk

10 Allison, I., 2016, "Barclays and Wave complete world's first blockchain trade finance transaction," International Business Times, September 7, http://bit.ly/2c7lxBe

11 World Economic Forum, 2016, "The future of financial infrastructure," report, http://bit.ly/2aObRdV.

12 Tapscott, D., and A. Tapscott, 2016, Blockchain revolution: how the technology behind bitcoin is changing money, business, and the world, Portfolio; Mougayar, W., and V. Buterin, 2016, The business blockchain: promise, practice, and application of the next internet technology, John Wiley & Sons Inc

How to ride the wave of disruption

By definition, disruptors will find a way to cater for a segment of the market that has been priced out, or their needs overlooked. Incumbents, on the other hand, cater for the needs of their existing customers [Christensen et al. (2015)].[13] Alliances, joint ventures, acquisitions, and licensing can be tools for incumbents to react to disruption [Helfat and Lieberman (2002)][14] and this rings true of the current ecosystem, as financial institutions partner with startups to find solutions to existing problems.

However, Christensen (2006)[15] observed similarities amongst incumbents that had succeeded with disruptive innovations. He found that those that had succeeded had in common the freedom to forge different business models to the ones they were founded on.

Business model innovation as an antidote to disruption

Many firms have failed because their business model was inappropriate to capture value: "business model innovation may be far more potent than market dominance or technological or product leadership" [Rayna and Striukova (2014)].[16]

The most straightforward way to envisage business model innovation is to consider the changes in each of the value components [Abdelkafi et al. (2013)].[17] In short, the more business model components that change, the more radical the innovation.

The five components of a business model are [Rayna and Striukova (2016)]:[18]

1. **Value proposition:** e.g., product or service offering, pricing model.
2. **Value creation:** e.g., core competencies, governance, complementary assets, and value networks.
3. **Value delivery:** e.g., distribution channels and target market segments.
4. **Value capture:** e.g., revenue model, cost structure, and profit allocation.
5. **Value communication**: e.g., communication channels, ethos, and story

The research that underpins this piece is a series of interviews with high profile players in the industry. The aim was to explore their views on the extent to which business model components could change, or are changing, in a post-blockchain world. The participants are working on solutions within four use cases or application layers, which are outlined below. The participants were asked the same set of questions for consistency. The interviews were semi structured, meaning the questions were open-ended and provided room for ideas. The idea behind this was to capture opinions and nuances shaped by experience.

Use cases or application layers

Bitcoin (cryptocurrencies)

Bitcoin is a new method of sending peer-to-peer payments and has generated a new market, which reaches new customer segments, such as the unbanked. The Bitcoin blockchain is currently the most prolific proof-of-concept for blockchain technology.

Identity

Identity could be described as both a use case and an application layer. In financial services, billions of dollars a year[19] are spent on arduous and redundant KYC and AML processes, which could be streamlined and made more efficient by using blockchain technology. An identity use case also has wider implications, such as ownership of one's identity and reputation management. The concept of identity does exist today, but it is fragmented and in many cases the data is owned by the firms that hold it, for example Experian or Facebook. The unification of digital identity-related information is of "utmost political, legal, societal (and arguably philosophical) relevance" [World Economic Forum (2016)].

Capital markets post trade

There have been vast improvements to front office functions this century; however, middle and back office functions have been left woefully behind. A high-frequency trade can be executed in microseconds, but settlement can take between three days and three weeks [Masters (2015)].[20]

As Morgan Stanley (2016)[21] puts it: "Blockchain technology could help banks reduce the clutter and cost of numerous processes." Current regulatory and cost pressures have driven capital markets firms to investigate methods of achieving significant efficiency

13 Christensen, C. M., M. E. Raynor, and R. McDonald, 2015, "What is disruptive innovation?" Harvard Business Review, December, http://bit.ly/1HT2VUc.

14 Helfat, C., and M. Lieberman, 2002, "The birth of capabilities: market entry and the importance of pre-history," Industrial and Corporate Change 11:4, 725-760.

15 Christensen, C. M., 2006, "The ongoing process of building a theory of disruption," Journal of Product Innovation Management 23, 39–55.

16 Rayna, T., and L. Striukova, 2014, "The impact of 3D printing technologies on business model innovation," Digital Enterprise Design & Management 261, 119–132

17 Abdelkafi, N., S. Makhotin, and T. Posselt, 2013, "Business model innovations for electric mobility - what can be learned from existing business model patterns?" International Journal of Innovation Management 17:1, 1-41

18 Rayna, T., and L. Striukova, 2016, "From rapid prototyping to home fabrication: how 3D printing is changing business model innovation," Technological Forecasting and Social Change 102, 214–224

19 Chan, K., and A. Milne, 2013, "The global legal entity identifier system: will it deliver?" working paper, Loughborough University, August 12.

20 Masters, B., 2015, "Blockchain: the financial challenge of our time", Presentation made at the Exponential Finance conference, June 2, retrieved from http://bit.ly/2dfyLNq.

21 Morgan Stanley, 2016, "Global insight: blockchain in banking: disruptive threat or tool?" report, http://bit.ly/1XZtWuv.

improvements by applying mutual distributed ledgers to securities settlement [Mainelli and Milne (2016)].[22]

Smart contracts

The term "smart contract" was an abstract concept coined in 1997 by Nick Szabo, which was later formalized as Ricardian contracts. This designed a way of linking a contract of law to systems such as accountancy or issuance of value [Grigg (2004)].[23] One benefit of a smart contract in financial services is to reduce counterparty risk due to the automated execution of clauses, instead of relying on the willingness of a counterparty to meet its obligations. Additionally, a smart contract could negate the need for some entities that mediate disputes and resolve business outcomes. This could reduce manual effort to support execution of financial agreements and accelerate business outcomes [World Economic Forum (2016)]. Smart contracts can have varying complexity, from automating existing processes, to creating new concepts, such as distributed autonomous organizations. Ethereum, the second most prolific blockchain, features such smart contract functionality. In this paper, a smart contract is described as an application layer and not a use case.

Participants

Antony Lewis is a sought-after public speaker and consultant on blockchain and cryptocurrencies to large banks and writes the popular and accessible bitsonblocks.net blog. Prior to this, Lewis was an FX-spot trader at Barclays Capital and product manager and change agent for fixed income and equities trading systems at Credit Suisse.

Toni Lane Casserly is a cofounder of CoinTelegraph, a Bitcoin and blockchain media network and an advisor or board member to several blockchain start-ups, such as BitNation, ChangeTip, Factom and Mycelium. Notably, Casserly used Bitcoin as a tool for direct response to the Ebola crisis in Sierra Leone.

Rayan Goutay is a keynote speaker and regulatory advisor to FinTech and blockchain firms on cryptocurrency regulations, currently working on Identity Derivatives using cutting edge technology. Prior to that Goutay has worked as regulatory consultant at Goldman Sachs and the FCA. Now founder of DeepTechInSight.

Rouven Heck is product manager for uPort, a self-sovereign identity solution on Ethereum and part of the ConsenSys spokes. uPort recently won the Demo Day at Devcon2 in Shanghai. Prior to joining uPort, Heck spent over 12 years at Deutsche Bank in IT & program management, architecture and strategy roles. Heck represented Deutsche Bank in the R3 distributed ledger consortium working group.

Tyler Welmans is a blockchain specialist at Deloitte Digital working on identity on the blockchain and was previously a digital transformation specialist at Deloitte. Welmans has a total of 13 years' experience in technology consulting.

Peter Randall is CEO of SETL.io, a proprietary, permissioned blockchain settlement and payments platform. Randall was also the founder and CEO of Chi-X Europe, the first pan-European equity exchange, and has 35 years of financial market experience.

Thorsten Peisl is CEO of RISE Financial Technologies, a proprietary, permissioned blockchain for multi-asset and multi-currency settlement and safe-keeping. RISE recently won SWIFT's annual industry challenge, announced at the September 2016 Sibos conference. Prior to RISE, Peisl worked at State Street, driving multi-million dollar revenue products from concept to market adoption and launched a firm wide corporate venture program to scout and invest in innovative and strategically aligned FinTech start-ups.

Olaf Ransome is a consultant at 3C Advisory and has over 25 years' experience in Financial Services covering investment banking and private banking. Ransome was one of the pioneers in the CLS business. He worked extensively with the industry and clients to help CLS establish itself and Credit Suisse to build one of the leading CLS franchises and set-up full service in-house custody organisation for Goldman Sachs in Switzerland.

Colin Platt is cofounder of DPactum, a next-generation listed derivatives clearing solutions leveraging smart contract and blockchain technologies. Prior to this, Platt spent six years at BNP Paribas in advisory and strategic transformation and subsequently as Blockchain Lead in Global Markets Innovation.

Vinay Gupta is a technologist and policy analyst with a particular interest in how specific technologies can create or close off avenues for decision makers. This interest has taken him through arenas including cryptography, energy policy, defense, security, resilience, and response to natural disasters. He was a strategic architect at ConsenSys and release coordinator at Ethereum and now runs a venture capital project http://hexayurt.com/capital.

Professor Michael Mainelli is the chairman for Z/Yen, a commercial think-tank he founded in 1994. Mainelli has been working with mutual distributed ledgers for over 20 years, was commissioned by the SWIFT Institute to write a paper exploring DLT and has published numerous articles and run community events, amongst other things.

22 Mainelli, M., and A. Milne, 2015, "The impact and potential of blockchain on the securities transaction lifecycle." SWIFT Institute working paper no. 2015-007.

23 Grigg, I., 2004, "The Ricardian contract," in Proceedings of the First IEEE International Workshop on Electronic Contracting, http://bit.ly/2dyiqET

Sebastien Meunier is a senior manager at Chappuis Halder & Co., where he is Head of Digital for North America and in charge of the FinTech watch for CH&Co globally. He was Blockchain Keynote Speaker at the European Identity & Cloud Conference 2016 and has been named FinTech influencer. Meunier has over 10 years' experience in financial services and consulting.

THOUGHTS FROM THE FIELD

"I'm reasonably confident that the blockchain will change a great deal of financial practice and exchange." – Larry Summers[24]

What follows are excerpts from the interviews that underpin this research. The participants were from start-ups looking to solve current solutions in financial services, and also from firms propagating new business models or providing new products or services to market segments whose needs are not being catered for. The structure loosely follows the business model components from above and starts by looking into the solutions in the existing financial services infrastructure, followed by those reaching new markets.

A value proposition has many interpretations, but in short, it is the reason customers should purchase the product or service from a particular firm.

Michael Mainelli believes that the value proposition for trusted third parties at scale will change significantly: "A central third party takes on three roles: validation of either membership of a trading community or existence of an asset; safeguarding against fraudulent transactions; and preservation of the records. They can easily become natural monopolies because the central third party needs to be on both sides of every transaction. What we are disrupting here are natural monopolies, largely because mutual distributed ledgers move two of the three roles – safeguarding and preservation – into the technology." The effect, he believes, will diminish the ability of trusted third parties to set the price by being the sole owner of data; distribution of data also distributes ownership.

Colin Platt highlighted reduction in downtime as a competitive advantage for a blockchain firm due to distribution, but also the need for a firm to review its value proposition: "It is for banks to figure out their value is not transmitting payment, their value is not actually holding deposits. Their value is not being a behemoth where you can get a mortgage. Their value is helping you along the journey of your financial success, in the case of retail banks – your savings, your planning for the future. If we are talking about the capital markets and related financial services, managing your risk, ensuring that you can effectively correlate and hedge or reduce unforeseen

circumstances, or increase in some cases your exposure to financial circumstances and economics." This technology is evolving in conjunction with other threats faced by banks in this environment.

Value creation is often thought of as creating value for shareholders and creating value for customers via superior products or services. More recently, however, a broader definition of value creation has been taken to include less tangible concepts such as value networks, governance, and core competencies.

Olaf Ransome describes a potential threat to the existing ecosystem of a trade life-cycle: "If you look at the life cycle of financial services transactions, they go through a lot of stages which create work. We execute trades at one place that we make sure that we record them, we then pass those recorded trades from a trading system to a back office system and make sure that those are in sync with the back office system, we get a confirmation from the other side of trade of agreement. We then pass them to be settled somewhere and blockchain technology threatens to seriously disrupt that ecosystem. If you do not have to do that "passing in," then whole swathes of activity will disappear."

Bitcoin and other cryptocurrencies are a way to access and transfer funds peer-to-peer without using the existing infrastructure, thereby reducing the value network of the current system. Similarly, in capital markets, as described above, the reduction of value networks compared to the current environment was a sentiment shared by many, with Peter Randall predicting: "those that will survive will be the ones closest to the consumer." Although Thorsten Peisl believes in theory that parts of existing value networks could be replaced, he is more pragmatic about the execution in capital markets: "Yes, in theory, we can go very far with technology. In practice no, because you cannot ignore market position and interests of dominating incumbents and you are not going to change the regulation overnight."

Governance, in particular regulation in the current environment, and standards, were common themes that emerged in value creation across participants from all use cases. Peisl stressed the need for governance in order to successfully deploy this technology. Both Platt and Antony Lewis noted market standards as the primary reason for market timings: "What takes the time in the existing systems is market structure, market habits and the reluctance from markets to, as a whole, change the way they do things, probably because of the cost of change makes it, possibly, not worth doing it this year, so you keep punting it to next year, because whatever you're doing now still works" said Lewis, adding "but that's not a reason to stop

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24 http://cnb.cx/1SZfkYZ

experimenting." In order to create value under this new technological paradigm, the right flavor of governance is important. Rayan Goutay went a step further to say regulators need to disrupt themselves, as their rules were created for the old, centralized world where they were supervising every firm from their ivory tower. He suggested the creation of a global governance protocol that could be a mandatory layer in every blockchain stack. This sentiment was shared by Sebastien Meunier: "For cryptocurrencies to be widely adopted, you first need to change the existing environment: regulations, business models, the whole financial system."

Greater value creation could come through optimization and efficiency that could be achieved using the technology to automate processes, leading to greater profits. This view was shared by Randall, Lewis, and Goutay, while Ransome and Meunier hoped that these cost reductions are passed onto the customer.

Platt and Mainelli warned, however, that using a blockchain can be expensive and slow in comparison to a centralized database and urge innovators to ensure the use case fits the technology. "There's a lot of overhead in these systems when you decentralize them, when you put on a consensus mechanism, and if you don't have a network where adding this level of complexity and cost brings value, don't do it," said Platt.

Value delivery can be thought of as the way to deliver value to the customer directly, or in reaching customers through new distribution channels and or reaching new target market segments.

In capital markets, from an end-to-end perspective, the value delivered will not change significantly, but the way it is delivered – in other words, it is not that what, but the how. This could be a reduced necessity for reconciliation, or even compliance functions by using a shared ledger with a single source of the truth. During a demo of the OpenCSD platform, Randall demonstrated near instant settlement, as well as the record of each trade across multi-asset and multi-currency on one system, simplifying both reconciliations and some compliance functions. Randall stressed that for general use in financial markets, a blockchain had to process billions of transactions per day. He also noted it must do KYC/AML as a native, use real world money and assets, and be able to communicate between chains.

Value capture is the ability to retain some of the value for every transaction, usually defined by the revenue model, cost structures, or profit allocation in a company.

Cost reduction could be achieved by optimization of the value chain, both within a company and across the ecosystem. Reduced need for reconciliations and a transparent and consistent data source could increase efficiency internally for a firm, especially in the case of multinational institutions, which are naturally distributed. Transaction fees for the end customer should be reduced as the value chain collapses, challenging the current revenue model for some. Moreover, regulatory pressure to report transactions could ease if regulators had direct visibility over the canonical source of data. Cost reduction was an important discussion point amongst the participants looking to use the technology to solve current financial services inefficiencies.

Value communication of a company is the story of what differentiates them or their ethics, or it can be the distribution channels used to communicate that value.

Many participants did not believe that the underlying technology would change the method by which value is communicated, and moreover that the technology that underpins these products or services will not be a contributing factor to the communication of a firm's value.

From an ecosystem perspective, however, trust was a theme that emerged from several discussions, in particular those wishing to replace technology or replace markets. Peisl described the trust model that exists within and in between banks: "There is a lot of trust in the industry; an entire segment has their business model based on trust. So you cannot render that as being completely redundant because those institutions are the cornerstone of the financial markets today." This view was shared by Ransome, Randall, and Goutay.

Platt believed this necessity for formalized trust in the market precludes banks from implementing a permissionless blockchain solution, as privacy and confidentiality are of utmost importance to users of financial services. Ransome specified that for capital markets, a lot of the value proposition and creation comes from non-technological capabilities, such as customer insight, and did not believe that a technological paradigm shift will change that value-add. Reputation is an important communicating factor in the existing model of financial services.

Trust has been a recurring discussion in the field of blockchain and distributed ledger technology.[25] The recent BitFinex hack[26] adds to this discussion, as around U.S.$70m worth of bitcoins were drained from customers' accounts. To be clear, this was not a blockchain hack, but a hack to a piece of software in the surrounding economy,

25 Economist, 2015, "The trust machine: the technology behind bitcoin could transform how the economy works," October 31, http://econ.st/1kdABAZ
26 Kaminska, I., 2016, "Bitcoin Bitfinex exchange hacked: the unanswered questions," Financial Times, August 4, http://on.ft.com/2axwaj4

an exchange. Public/private key encryption, the method used to secure Bitcoin balances, relies on keeping the private key secret and safe. Unfortunately, this was not the case in the BitFinex hack and some members found their accounts completely drained. It is of the utmost importance to have somewhere safe and secure to store these keys. Perhaps somewhere that provides a level of protection akin to what we see in the traditional banking services now.

Within the existing financial services infrastructure, solutions are being sought for problems and inefficiencies that exist now. Although the trusted third parties may find their monopoly diminished, value propositions of intermediaries may become defunct and some value networks may collapse under the weight of this technology, massive cost reductions are predicted across markets, which will hopefully be passed onto the consumers. An institution that currently deals in trust could extend their value proposition to provide a secure storage for private keys and find they open up to new markets.

Outside of financial services directly, new markets and new customer segments are being sought. Propositions are emerging that create value for those unable to access services and enable users to deliver value to one-another directly and quickly.

Ownership as a value proposition was a common theme that emerged; from ownership of identity to emergent services such as voting and ownership of one's creative wares. Lewis specifically referenced being able to own, as a bearer, a digital good. "Bitcoin came along and suddenly we have the concept of self-custody of digital assets. I control my digital asset because I have the private key. I do not have to open an account with a third party and I do not have to request a specific third party to take action with my digital assets. I create a payments instruction, I broadcast it to the network and if it conforms to the rules of the network then the payment happens. I think there's something actually very profound about this concept in Bitcoin of being able to control your own digital assets." Meunier agrees: "I think the whole purpose of decentralization is to give back the ownership to individuals: ownership of their identity, of the content they produce, of their financial assets."

Live examples of new value propositions exist, often outside of financial services directly. Toni Lane Casserly described Steemit.com, which allows peers to tip other peers in cryptocurrency for written content, highlighting the possibility for artists to monetize their creations in a peer-to-peer manner instead of traditional payments traversing existing value chains in finance. Mainelli referenced SafeShare, which use blockchain technology to provide insurance solutions to sharing economy platforms and their users.

Rouven Heck also agrees that a value proposition will change: "[Application of] this [technology] will fundamentally change company's

value position. Companies need to rethink what their actual value is." and elaborates: "I think with blockchain we can dismantle a value proposition into individual, modular ones and generate more competition in each of them rather than have everything bundled together. I think that's where it gets really interesting." An individual, modular value proposition could be safeguarding an identity or reputation, for instance. Tyler Welmans sees potential for a new value proposition whereby a firm attests to the validity of an identity. Goutay describes a future value proposition for a KYC firm, where tapping into data could result in a service offering currently not available that could give rise to new pricing models. "Identity data is fundamental to business and markets today so changing how it shared could drastically transform the way businesses operate."

Alterations of existing value networks and ecosystem were sub-themes that emerged during discussions about value creation in a blockchain paradigm, in particular network effects. Welmans emphasized the network effect of identity on the blockchain; it is at its most powerful when the majority of services are connected and the user only has to change their details once, which is then communicated across the network. Conversely on network effects, Heck describes how current value creation in some models is ultimately an aggregation of reputation, and the largest network locks in users on both sides of transaction. This allows these firms to set the price on the size of their network, not the actual value of the service.

These are the two sides of the coin on network effects that tie back to Mainelli's assertion that distributed shared ledgers can disrupt monopolies. A trusted third party that sits necessarily on both sides of the transaction benefit from a network effect that can lead them to be able to set the prices. With the distribution of the data, or indeed the ownership of one's portable identity, we could see value creation for intermediary firms diminish in favor of value creation for the customers.

When it comes to key competencies in financial services, the current set consists of gathering and providing access to data, aggregating services, providing trust, storing assets, and facilitating transfer of those assets. With distributed ledger technology, competencies may move towards creating customer-focused solutions, facilitation of ownership, and attestation of proof-of-existence and transparency. Welmans believes blockchain could be the next step in the platform economy: "I think there's already a lot of focus on how organizations can reconsider some of the core competencies and structural components of their businesses and really evaluate whether or not some of the traditional parts of the business are necessary anymore, or whether there would be advantage in outsourcing or changing the way that they're managed. I think blockchain is the next step in that evolution. I don't think it's something totally new, but I think it is a continuation of that evolution towards much more digital, asset-light and

intermediation-based processes, products, and services that bring people together around platforms that contain the business logic."

Delivering value outside of traditional financial services, new customer segments and markets could be achievable by lowering the cost of KYC. Heck said: "We often hear about the unbanked. If we are able to provide a digital identity, there would be less friction to provide smaller services. To get a $5 loan or $20 loan, you might not need to go through an extensive KYC process because money laundering is less of a concern. I think there is a lot of potential in expanding the market." The global unbanked population of adults stands at over 2 billion. The World Bank has set itself the target of universal financial access by 2020, which will require them to "think about what they need to do differently" when it comes to current financial services infrastructure.

On a global level, blockchain has the potential to be a mechanism to provide heightened stability. Vinay Gupta is someone who does think differently. This global stability could be achievable by giving a token created on a blockchain intrinsic value: "We take the couple, 3, 5, 10 thousand most stable companies on earth with the most fundamental productive value. We take no more than 1% or 2% or 5% of the stock in any given company. We put all of that into an enormous ETF, Exchange-Traded Fund, and then we buy, sell, and trade using that token on a blockchain. At that point, you have a stable currency and the money supply expands and contracts according to the needs of the economy, because the share prices go up and down in harmony with demand. Then, if you want to put some politics on top of that, you could then have selection processes, the biased companies against the green or the socially just, when they're negotiating for inclusion inside of that fund.

Those kind of mechanisms, I think, are much more likely to be a real disruption caused by blockchain than banks doing their transaction processing without having to go through reconciliation."

When capturing value, a more equitable revenue or profit allocation through peer-to-peer models could be achieved by using a blockchain. In cryptocurrencies, the process of mining allows members of the ecosystem to capture value by participating in validating transactions onto the chain. Not only is this more equitably allocating the overall revenues, it incentivizes the network to continue.

Some noted the potential for declining ability to capture value. Casserly used the example of Steemit, the content creation platform, that facilitates direct peer-to-peer payments, circumventing both traditional publishing models and traditional payment models. Heck believes firms will be driven towards marginal costs through unbundling of services and increased competition. "I think identity and reputation will become more and more important. A portable reputation

or identity could make it even harder for some platforms to monetise in the long term. Take a company that provides attestations or verifications of a cars or drivers, for example, issuing a certain token to the reputation of the driver after a successful inspection. This is a new service that doesn't exist in itself; it's something that Uber provides today implicitly, and that could be extended outside their network to other taxi drivers. I think that's back to this whole market economics that the platform, is the unbundling of existing service of today into its more modular, purest form of value that should drive to a more real cost."

Gupta ponders whether blockchain as a technology could be as difficult to capture value from as email: "I think what we're dealing with is a massive increase of baseline efficiency. Nobody has really succeeded at capturing very much of the value that is generated by email, yet email continues to generate enormous amounts of excess value for everybody that touches it."

Trust also emerged as a value communication theme within the new markets or new segments participants. The other side of the trust equation, however, aligns closer with Nakamoto's original intent. The technological characteristics of blockchain enforce the trust that payments will not be censored due its distributed nature, said Lewis and Gupta, or records altered due to immutability, said Casserly.

Another aspect of the change in communicating value is offering a more direct access by the customer to the product or service. For example, Gupta describes an example of an information market that can support a search across a number of platforms for the best solution, given a "fuzzy" criteria. In that sense, what is being communicated is efficiency of the solution, as opposed to a brand communicating the size of their platform. Heck described how people frequently return to the same few websites to access a product or service, and therefore the brand makes a difference in today's model.

Further building on the above, some respondents felt that the technology could lead to more customer-oriented solutions than today's offerings. For example, being able to self-custody assets, as noted by Lewis and Welmans, or products and services that enhance financial inclusion as described by Heck.

For Casserly, the value of a network is based on the community that uses it: "what all of these cryptocurrencies are about is actually the tangible value of the community existing in them. Money is actually becoming a tribal culture, not a symbol of nationalist pride that's controlled by one source."

Mainelli also discussed the community of a cryptocurrency: "Money is a technology that communities use to trade debts across space

and time. A cryptocurrency is a virtual element, not a currency, until there is a community for it." He highlighted the difference between a cryptocurrency and a digital currency, pointing out that a digital currency does not need a validation algorithm, such as the one employed in the Bitcoin blockchain or Ethereum blockchain, because the central bank would want to maintain control of transaction validation.

To move into new markets, these participants are using novel thinking to generate new business models. Propositions that allow one to self-custody value and retain ownership and control over one's own portable identity records could remove friction and may lead to the waning ability to capture value from network effects. Smaller and more modular value propositions and a review of core capabilities appear to follow the trend away from vertical integration towards a more open and collaborative ecosystem. While the technology might not be the protagonist of the story, it may well change the plot.

PARTING THOUGHTS

Blockchain, or DLT, shot to fame in payments and continued its trajectory in financial services. But some of the more interesting and genuinely innovative solutions occur by using the mechanism to transfer value of non-financial assets, such as identity. These new markets are nascent and even embryonic when compared to the colossal institutions that comprise global banking and capital markets. However, these emergent players intend to cater for overlooked needs and generate new business models around the technology. These are signs of both actively disrupting markets and ways to leverage disruption, respectively.

Banking and capital markets have ancient architecture and the industry as a whole is right to look for solutions to increase efficiencies and reduce cost. There is certainly a lot of work to be done. While the immediate disruption by blockchain, or distributed ledger technology, may not occur within the regulatory rigidity of the current infrastructure – after all, what are financial services if not a record of balances and transactions – traditional financial services should be mindful of the emerging model and ecosystems that are developing. They might look up and realize the world has changed around them.

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