Exploring the rise of Blockchain Technology: Towards Distributed Collaborative Organisations

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Article Summary
Reflections for finance practitioners when introducing blockchain technologies

Key Points:
Blockchain technology has emerged as a potential disruptor for the financial industry.
Explore the role of cryptocurrencies and blockchain technology for organisations that seek to build social and solidarity-based finance.
Reflections for financial practitioners using digital technologies

JEL Classification Codes: G32; E51; F30

Introduction

The emergence of cryptocurrencies, such as Bitcoin, has brought disruptions to the traditionally conservative financial sector. Cryptocurrencies are based on collaborative open source principles and peer-to-peer networks that suggest a commitment to principles like decentralization, social solidarity and disintermediation. This stands in contrast to the centralized and asymmetric power relations of the traditional financial sector (Scott, 2016). However, as with most disruptive forces, the real trigger for corporate and societal transformation lies with the enabling technologies that support Bitcoin, i.e. the digital technology referred to as 'the blockchain'. The blockchain is a distributed digital transaction ledger with identical copies maintained on multiple computer systems controlled by different entities. The technology enables strangers to reach consensus with each other without recourse to a central authority (Scott, 2016). This paper seeks to reflect upon some key issues that finance practitioners can consider when reviewing the benefits and merits of cryptocurrency and blockchain technology. The paper, firstly, outlines the emergence of digital technologies and their disruptive nature on corporate industries and invariably society. Secondly, the paper considers the emergence of cryptocurrencies and the influence of Bitcoin on the financial industry. The paper then outlines the merits of blockchain technology and moves on to discuss the opportunities for distributed collaborative organisations. Finally, the authors provide a series of reflections for finance practitioners.

The rise of Digital

Technology has traditionally been viewed as a tool to support organisations in conducting their work processes and business functions. Early information systems (IS) were stand-alone, functional-based, transaction-oriented tools, which moved to become more strategic in orientation, matching the enterprise-wide and global demands of most organisations, over the past decade. Today, however, something transformational is happening. Digital technology is no longer viewed as a mere tool in the support of organisations but rather as a disruptor that will create new organisations and replace many unwilling, or unable, to innovate. Organisations now find themselves embracing a digital age, where a new generation of technologies are focused on leveraging greater customer engagement, bringing further flexibility and agility to standardized, and centralized, operational processes, and providing new strategic opportunities to organisations by reconfiguring business models, creating new products and services, and in some cases disrupting and reinventing entire value chains and industries. To this end, organisations are increasingly becoming more virtual-oriented with many products and services gaining in digital presence, structures and hierarchies becoming more porous and horizontal, and industry sectors more fragmented, where many competitors are reaching across value chains to collaborate and innovate in novel ways.

Digital disruption is, therefore, spreading across all industries. For example, Airbnb has transformed the accommodation industry by offering private individuals bedrooms for short-term lease; similarly, Uber has radically disrupted the taxi business by allowing private users to offer their services, within the music industry Spotify allows people to listen across artists and tracks, while Netflix has transformed our experience with television. From a 2015 financial review both Airbnb and Uber

are reported to be worth $25 billion and $60 billion respectively. Organisations no longer drive the relationship with users with respect to products and services but rather are now constantly looking over their shoulders to see where the next consumer-driven disruption is coming from. Within the context of such disruption is the opportunity for new value propositions and business models.

A key tenet of digital disruption is the opportunities for traditional organisations to move beyond their tried and tested business models and respective market segments. For example, travel agents are moving into the insurance business and some banks see growth opportunities in travel businesses. Technology is leveraging organisational capabilities and competencies in a "plug and play dynamic", where companies can attack specific areas of the value chain without having to own the entire thing. The thousands of 'apps' available to consumers is an example of this, where boutique companies can disrupt traditional value chains and respective organisational business models.

Within the financial and banking industries such disruptions are also being experienced. In the global payments industry, Higginson et al (2016) note that disruption is driving deep structural changes. For example, with an increase in online shopping cash is quickly losing ground to digital payments. Traditional banking is losing ground to peer-to-peer (P2P) banking, where non-banks such as PayPal, Alipay, TransferWise, and Venmo have realized benefits from P2P far beyond authorization, clearing and settlement and threaten to displace traditional banks from this important category of payments. However, perhaps the most significant disruptor are financial technological (FinTech) innovations. Blockchain technology, for example, is potentially becoming a key disruptor across the financial services industry, where leading financial institutions such as Citibank, UBS, Deutsche Bank and Standard Chartered are starting to explore the capabilities of distributed and collaborative architectures to increase speed and flexibility and reduce costs. As Schatsky and Muraskin note "blockchain technology offers a way of recording transactions or any digital interaction in a way that is designed to be secure, transparent, highly resistant to outages, auditable, and efficient; as such it carries the possibility of disrupting industries such as financial services, remaking business practices such as accounting and auditing, and enabling new business models" (2015:1).

Cryptocurrencies

"I just want to report that I successfully traded 10,000 bitcoins for pizza" wrote user Laszlo on the Bitcoin forums in May 2010[1], reporting on what has been recognized as the first item in history to be purchased with bitcoins (Zohar, 2015:104). According to Raymaekers, 483 cryptocurrencies exist (Bitcoin accounting for 92 percent of total crypto market), 76,000 businesses accept them (from local businesses to Dell and airBaltic), and 6.5 million wallets[2] exist, which is a steep rise from 1.3 million in September 2013' (2015: 32). The essence of any digital currency – including digital

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[1] http://bitcointalk.org/index/php?topic=137.0
[2] Stores the digital credentials of your bitcoin holdings

euros and dollars – is that monetary tokens are 'moved'[3] through the editing of account entries on databases, in response to messages sent by people who hold the accounts. Bitcoin qualifies as a digital currency because it consists of nothing but data bits recorded on a database, attributing numbers of tokens to particular 'accounts'. Therefore, the Bitcoin system, at its most simple, consists of a widely distributed, and highly visible, public ledger (or database)—colloquially referred to as the blockchain—that people can use to record transactions of digital tokens between themselves. The database thus keeps score of their tokens on the system in a highly public and transparent[4] way (Scott, 2016).

Bitcoin, therefore, once valued as a comparative monetary currency has a number of potential advantages over traditional currencies. –For example, it is claimed that Bitcoin enables near frictionless commerce as transaction fees approach zero (Andreesen, 2014-see Van Alstyne), where credit card companies and currency exchanges can take 2-3 percent from the value of each transaction. Furthermore, issuance expenditures are prevented (in the US alone $60 billion annually is spent on storage, security, and transportation of the US dollar) (Rogojanu and Badea, 2014). Some pundits applaud the fact that, unlike traditional currencies, Bitcoin software limits the supply to 21 million units (which also helps against currency inflation) (Cusumano, 2014), thus displaying similar qualities to gold by simulating rarity (which invariably can be a disadvantage in that it promotes hoarding amongst users). Finally, it is potentially easier to detect fraud with Bitcoin than with credit cards because each transaction requires public authentication from buyers and sellers (Van Alstyne, 2014: 30).

Yet, Bitcoin, by contrast to traditional currencies such as the Euro or Dollar, has no geographically and politically discreet real economy in which it is dominant. As a consequence, a key challenge for Bitcoin as a currency is that it is, in fact, rarely used by vendors within the 'real economy' as a means of exchange. Its 'value', therefore, is open to fluctuations and differing market interpretations. In fact, Rogojanu and Badea note that in 2013, while average currency fluctuations ranged between 13 to 166 dollars, the Bitcoin currency fluctuated from 10 to over 800 tokens for the same period (2014: 110-111). Another key challenge for the use of Bitcoin is its perception as a 'risky' currency. Such breaches of security, such as system hacks of private computers where people have Bitcoin "wallets", is best illustrated Mt. Gox robbery, where Bitcoins to the equivalent of 350 million US dollars were taken in 2014 (Van Alstyne, 2014). Lastly, it is important to point out that within cryptocurrency scholarship and practice, there are a number of ongoing debates concerning how Bitcoin should interface with mainstream regulatory, legal and tax regimes in different jurisdictions. For example, questions relating to how to tax Bitcoin transactions (including VAT and income tax)[5], how to account for Bitcoin in formal

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[3] Technically speaking nothing actually moves. The movement is *implied* in the changing of data

[4] Much media attention on Bitcoin has focused on the fact that people can anonymously transact using the system, which seems to run counter to the claim of transparency. Note though, that the means by which such anonymous transactions are achieved is through the use of a highly transparent public ledger. All transactions on the system can be seen be everyone, but attributing a specific person's identity to any particular transaction is difficult.

[5] See Bal, 2015.

financial statements[6], and finally how do we regulate it, i.e. is a provider of Bitcoin services a financial services company, for example?[7] (Scott, 2016).

Blockchain 2.0

Cryptocurrencies are subject to all manner of ideological battles, but one thing most interested parties agree on is that the underlying concept of a decentralized public ledger, collectively maintained by a network of participants is very important. This has led to an interest in blockchain 2.0 technology, or the use of a blockchain ledger to record things other than currency transactions (Swan 2015). Blockchain technology first emerged in 2009 to support Bitcoin, with awareness kept primarily among the cryptographic community. Initially, the financial industry viewed Bitcoin and blockchain technology as obscure dismissing any potential disruptive threats or opportunities. However, from 2012 as Bitcoin began to establish itself as a legitimate value-transfer medium, averaging 50,000 transactions per day worldwide (Buehler et al, 2015: 5), blockchain technology became recognized as a significant disruptor. Since 2015, "a number of global signals point to a technology that has significant disruptive capabilities for the financial services, most notably; (i) over a billion dollars in venture capital has flowed to more than 120 blockchain-related startups, with half that amount invested in the past 12 months, (ii) 30 of the world's largest banks have joined a consortium to design and build blockchain solutions, (iii) Nasdaq is piloting a blockchain-powered private market exchange, (iv) Microsoft has launched cloud-based blockchain-as-a-service, and (v) blockchain concepts, prototypes, and investments are emerging in every industry" (Schatsky and Muraskin, 2015: 1-2).

Blockchain could be regarded as a database that gets developed by its participating parties using the same software by the number of times they use it. This is subject to constraints and rules set by the underlying software they run. Therefore, as the name suggests blockchain comprise of blocks and batches of approved transactions that are grouped together (Zohar, 2015). The centralized database is normally held by single entity, blockchain relies on shared network among peers, and hence even if an individual pulls out it still continues to function normally. Therefore, as far as software continues to be run, blockchain continues to be built and maintained. Blockchain offers a safe environment where an indelible record continues to be created every time a change is made by any associated partners and hence is resistant to tampering by any individual party.

A number of researchers (Lee, 2015; Noizat, 2015; Scott, 2015b, etc.) have reported that blockchain provides flexibility to handle diverse set of data. This is done by just altering some changes in the underlying software being run by the participants. This results in creation of blockchain database capable of storing diverse data sets such as property titles, contracts, shares, voting decisions and reputation scores. This flexibility offered by blockchain based systems have gained a lot of popularity among businesses which is evident from the initiatives taken by groups like Ethereum, Counterparty and Blockstream [8] who offer people or start-ups to implement

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[6] See Raiborn and Sivitanides 2015.

[7] See Levin et al. 2015; Ponsford 2015; and Tsukerman 2015.

[8] Ethereum https://ethereum.org/, Counterparty http://counterparty.io/, Blockstream https://www.blockstream.com/.

blockchain-based systems. The services offered by these groups to create a blockchain based systems in start-ups have gained a good momentum for example, Provenance, a start-up has created a highly transparent ledger of global corporate supply chain data using the Ethereum system.[9]

Recently there has been significant development in the area of smart contracts that are computer programs capable of automatically executing the terms of a contract. Wright and De Filippi (2015) report that these smart contracts can be recorded on blockchain where participants can interact with in order to undertake simple tasks. For example, Mainelli and Von Gunten (2014) present the evidence of simple insurance contacts built on the blockchain based systems. Another study by Pangburn (2015) suggests that these simple building block contracts can be integrated to form the basis for a complex multi-stage stage or multi-function entities, which are also referred as decentralized autonomous organizations (DAOs). These DAOs are essentially advanced multi-stage algorithms functioning on a decentralized network of computers, rather than controlled by a single management team.

Blockchain is capable of handling simpler as well as complex data hence meeting the diverse needs of businesses. Among the various features that have generated interest among businesses regarding its adoption, their ability to indelibly record property rights has attracted attention of those with a free-market economics orientation. Land registries (Williams, 2015) are one of the areas where blockchain has a good potential. Many developing countries and regions that have a weak governance and record keeping systems often face problems such as double-registry of land and land title frauds. These problems can be easily tackled with a blockchain system that indelibly records land title in a definitive public manner. Chavez-Dreyfus (2015) provides evidence of this by reporting the development of blockchain based land registry system for Honduras by an American company Factom[10].

Towards Distributed Collaborative Organisations

Blockchain based system has paved the way for establishment of distributed collaborative organisations. In an interview published in Forbes (Forbes, 2015) on the role of Bitcoin in resolving world poverty, Brian Singer advocated the role of blockchain technology in building strong property rights in informal economies. He asserted that if people are given identities and titles to property, otherwise inert capital can be activated. The property title can be used as collateral, enabling cheaper bank lending to informal entrepreneurs. This is however, based on the underlying assumption that property and contract are well protected and market and capitalization processes will uplift people out of poverty, bringing forth the hidden value of informal economies. Nevertheless this is a controversial argument riding on the idea that markets naturally lift people out of poverty. However it also argues that instead of hoping for a democratically governed state to optimize these market processes, the poverty-eliminating potential of property and markets might be activated by replacing weak state institutions with technology (Scott, 2016).

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[9] See https://www.provenance.org/.
[10] See http://factom.org/.

Realizing the potential of blockchain, organisations are taking their vision to different levels. One of the blockchain organisations 'Bitnation' has a vision of hosting completely alternative state institutions (such as security and legal institutions) on blockchain systems (Prisco, 2015a). They describe states as 'governance service providers' that might be outcompeted by technological platforms. As the founder of 'Bitnation' Susanne Tarkowski Tempelhof puts this in her own words "Bitnation is a Governance 2.0 Operating System, designed to disrupt the nation-state oligopoly through offering more convenient, secure and cost-efficient governance services". Therefore, according to Bitnation's vision one might theoretically be able to "opt out" of states and "buy into" new governance institutions in the same way one might select coffee from a supermarket. However, it is worth noting that this vision of a 'market in governance services' only holds together if it is assumed that markets can exist *prior* to political governance systems. This is in contrast to those who argue that markets themselves are underpinned by political governance systems that uphold the property rights that enable them to exist in the first place. Bitnation has started to diversify by recently offering their services to refugees, [11] such as providing refugees with a blockchain emergency ID, Bitcoin visa cards and Bitcoin refugee aid. They have also entered into a deal with the Estonian government to provide users of Estonia's "E-residency" system with a blockchain notarization service (Prisco 2015b). This reflects the potential that blockchain technology holds in this modern world.

Many original blockchain organizations focused on developing a 'trustless' systems enabling strangers to interact with each other without relying on normal human institutions. In modern societies, interactions between strangers rely on the involvement of formal centralized authorities and formal legal contract systems that remove the need for individuals to know each other personally before engaging in relations. Therefore, original blockchain vision focused on replacing such institutionally mediated trust systems with a technological infrastructure. Thus leading to the development of a technological infrastructure built on blockchain system that is 'politics free'.

However, this vision of technological infrastructure that challenges the normal human institutions also raises the question about the inability to trust human-run groups. Nevertheless in the internet era where millions of individuals interact with each other without knowing each other, the requirement for such infrastructure becomes more important. As a result blockchain organisations such as Blockstream and Ethereum have thus begun to characterize blockchain technologies as trust-enabling, thus providing users an alternative trustworthy means to interact, who otherwise would not trust each other. Therefore, organisations such as Blockstream and Ethereum are aiming to create a global system of value exchange where one can trust anyone (Blockstream, 2015). In this alternative system, trust is not centralized rather decentralized among members, thus establishing a new form of non-hierarchal cooperation between strangers.

Although blockchain seems to provide a more trusted platform for information exchange and interaction, a key question is whether this system can be a basis upon which people can easily interact with distant strangers for collaboration at scale. Blockchain systems—at least superficially—offer a vision of large-scale egalitarian

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[11] See https://refugees.bitnation.co/

self-organization far beyond the scale of ordinary citizen attempts at building cooperative communes. In this line Bollier et al. (2015) suggests that explicitly collaborative entities issuing blockchain-based shares—or crypto-equity tokens—gives the holders ownership or membership rights in a type of decentralized cooperative. Although the outlook of such organisations in real world still needs to be seen but certainly they provide an alternative form to explore in the quest to build social and solidarity-based finance. This leaves a number of questions that needs to be answered such as Can a city network of informal street vendors run a collective mutual insurance pool between themselves using only their smartphones to interact with a distributed ledger system, with no central financial institution involved? Or Can a regional mutual credit system—effectively a ledger of credits and debits—be implemented in a decentralized blockchain form?

Reflections for Practitioners

Central to this paper is the role blockchain technology plays in developing distributed collaborative organisations. A number of key reflections are now raised, primarily garnered from observing trends within cryptocurrencies such as Bitcoin, in order to support the development of greater blockchain technology usage, namely;

(i) Building a Platform for Trust:

Central to the eventual usage of cryptocurrencies and blockchain technology is the importance of cultivating a sense of 'trust' amongst stakeholders and users. How does a blockchain system gain legitimacy and stability, such that users will adopt it and grow to trust the safety of their position within it? While traditional financial systems are not immune from instability, enough trust exists where both parties will honor interactions. Blockchain systems, on the other hand, do not as of yet offer such protection. It is telling that Ethereum deliberately and publically crossed out the word 'safe' in its 2015 frontier release of its decentralized blockchain software platform (Scott, 2016). It is critical, therefore, that practitioners rethink the usage of blockchain systems. A natural impulse is to reengineer such systems into traditional organisations and institutions. However, the very disruptive nature of blockchain technologies requires a digitally transformative approach from finance practitioners and their respective organisations.

(ii) Increasing Political Influence

Another issue to reflect upon is the alignment of blockchain technologies with the disruptive socio-political nature of such systems. In other words, as Scott notes, how can we build decentralized governance systems that give people true voice in the decentralized technology systems? He goes on to say that, within much original Bitcoin culture, the governance system was said to be based on open source principles, in this conception, a project is open for anyone to get involved, and if they do not like the direction they can fork the code to create something else (2016). Yet, individual users that have technical skills can play a more dominant role than other users, therefore it is important for finance practitioners to reflect on how such imbalances can be overcome to truly provide an open source experience that affords an equal voice for all.

(iii) Supporting Remittances

Cryptocurrencies, such as Bitcoin, have the potential to be used as intermediary currencies between other, more dominant, currencies, and thus may be useful for remittances For example, rather than using companies like Western Union, a Filipino worker in New York might use a service that transfers US dollars into bitcoins and enables a family member in the Philippines to withdraw pesos on the other side (Scott, 2016). Blockchain technologies could be deployed to enable the development of such online contracts or remittances. For example, a driver may only be able to start their leased car once payment has been received. While such contracts will move slowly across industries, the potential afforded by blockchain technology is there.

(iv) Facilitating Global Commerce

Blockchain technology enables global commerce by offering immutable (very difficult to make changes to blockchains without detection thus increasing the confidence users have in the information and reducing opportunities for fraud) and irrevocable (increasing the accuracy of transaction records) characteristics, which support the technology playing a pivotal role in policing cyber security, offering transparent corporate auditing, and adjudicating on global data verification (Scott, 2016). Such technologies, which overcome challenges posed by traditional ecommerce exchanges such as the need for merchants to set up an account with a formal bank, offer small-scale businesses access to international markets.

(v) Encouraging Disintermediation
Blockchain technology affords significant opportunities for disintermediation, where traditional stakeholders and respective institutional entities are displaced by innovative digital transactions. Blockchain technology can allow users to remove the need for the intermediary "bank" by engaging directly with the system. For example, Scott notes that if a person has a personal computer or a mobile phone then they can obtain a public key that represents their account. This in turn comes to resemble a quasi-bank account in which you can build up savings. In the context of a country with poor banking infrastructure and reliance on cash, such a technology could—hypothetically—be a safer way to hold money, and a convenient way to transfer money in everyday transactions (2016). As a result,

Conclusion

Blockchain technology has emerged as a potential disruptor for the financial industry. In fact, its disruptive nature is beginning to be felt across other industries, where its perceived benefits could enable a new age for Internet commerce and business, ushering in new business models and organisations. It promises to bring greater security, transparency, auditability, and efficiency to currency transactions. Consequently, this paper seeks to explore this technology and its influence for greater financial solidarity across the globe. The paper begins with an overview of cryptocurrencies, focusing specifically on Bitcoin. A discussion of the underlying blockchain technology is also provided and its potential role in influencing distributed

collaborative organisations. Finally, the authors provide a number of strategic reflections on the role of blockchain technology in supporting finance practitioners in evaluating the potential of cryptocurrencies within their respective organisations.

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