Chapter 1
Corporate Finance in the New Business Ecosystem in the Digital Age

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Abstract In the digital age of continuous technological evolution, business ecosystems are being renovated. This study aims to explore the impacts of blockchain technology—a foundationally innovative technology—which is reshaping and even revolutionizing corporate finance. This underlying technology in the heart of all financial innovations has a great disruptive potential for the financial sector. In this context, it is deeply focused on how corporate finance is being transformed by blockchain technology and its extensions (distributed ledgers and smart contracts) and what the reflections will be on corporate governance, capital markets, corporate voting, and accounting matters in corporate finance.

1.1 Introduction

We are living in a digital age where technology is changing at a greater pace than ever before in the history of mankind, triggering important and radical changes in the business ecosystem. Technological evolution triggers changes in market demands, inviting the incumbents of the financial infrastructure to innovate and enhance time and cost efficiency. In this context, "Financial Technologies (FinTech)" is a trendy topic which has a great disruptive potential for reshaping and even revolutionizing corporate finance. FinTech is a technologically enabled financial innovation that could result in new business models, applications, processes, products, or services with an associated material effect on financial markets and institutions and the provision of financial services. According to this definition, FinTech includes such innovations as online marketplace lending (or peer-to-peer lending), crowdfunding, robo-advice, financial applications of blockchain and distributed ledger technology, financial applications of artificial intelligence, and digital currencies (Schindler, 2017).

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Online platforms for peer-to-peer lending and crowdfunding enable retail investors to lend money directly to retail customers, easing the way money flows and removing the formal barriers for financing investments. The growing transactions in digital currencies, such as bitcoin, change the method of payment, enabling people to make monetary transactions without a trusted third party (e.g., government-backed currencies). These innovations also enlarge the scope of financial inclusion through their ability to reach people and businesses in remote and marginalized regions (Patwardhan, Singleton, & Schmitz, 2018).

In the heart of these financial innovations lies the blockchain or distributed ledger technology enabling FinTech innovations to go further. According to International Monetary Fund (IMF) Chief Christine Lagarde (2018), "Blockchain innovators are shaking the traditional financial world and having a clear impact on incumbent players. In order to ensure stability and trust in the financial markets, the transformative potential of blockchain-based technologies and assets should be broadly embraced by regulators and central banks, who recognize the positive effect new inventions can offer for the business model of commercial banks".

Starting from the year 2008, blockchain technology has attracted attention all over the world as it has significant power to radically change the financial ecosystem. Blockchain is a new disruptive information technology that enables many users to complete their own financial transactions without any need for further approval by an intermediating party which has a central power to supervise all transactions. Distributed ledgers empowered by blockchain technology provide a secure way of storing data that make it largely unchangeable. With this technology, information about a history of transactions can be stored in a decentralized way. Blockchain technology can be utilized in many areas such as easing the ways the payments are completed in remote regions of the world, obtaining financial sources as debt or equity instruments, collateralized asset management, legal reporting activities to guarantee the adherence to related laws and regulations, and voting in absence in the annual shareholders meetings of the companies (World Economic Forum, 2016).

This chapter aims to investigate the impact of this foundationally innovative technology in an effort to shed light on how this new financial ecosystem will continue to grow and evolve in the future.

1.2 New Financial Landscape in the Digital Era of Financial Innovations

Blockchain technology and distributed ledgers have extensive usage areas in many different industries. However, the financial industry seems to be the forerunner among other industries. This is not only due to the fact that the most well-known application of this technology is the crypto-currency bitcoin, but it is also driven by substantial process inefficiencies and a massive cost base issue specifically in this industry. On top of this is the need for tracing ownership over a longer chain of

changing buyers in global financial transaction services. The blockchain technology promises to overcome problems and inefficiencies related to the traditional intermediation process, which include possible human errors, representing "a shift from trusting people to trusting math" since human interventions are no longer necessary (Nofer, Gomber, Hinz, & Schiereck, 2017).

The blockchain eschews a bank or other intermediary and allows parties to transfer funds directly to one another, using a peer-to-peer system. This disruptive technology has done for money transfers what email did for sending mail—by removing the need for a trusted third party just as email removed the need for using the post office to send mail (Lee, 2016).

Blockchain introduced by Satoshi Nakamoto in Nakamoto, 2008, is popular due to the first cryptocurrency, bitcoin; it was created and supported by blockchain technology. Going further, this new technology underlying bitcoin and other cryptocurrencies has also started to shake the world of finance by transforming corporate governance, shareholder activism and dialogue, corporate voting, double bookkeeping accounting, and stock exchange transactions (Nakamoto, 2008).

Blockchain technology not just provides a reliable infrastructure for bitcoin and other cryptocurrencies, it is also a breakthrough in future technologies which will disrupt everything with a great pace in similar way to the world wide web (www) technologies which were introduced in the early 90s. In the beginning of 90s, IP-based technologies led by world wide web (www), http and html protocols became publicly available and since then a great wave of change such as development and commercialization of internet applications have swept away traditional business models. In the same vein as the world wide web during 90s, blockchain technology will also be a revolution changing the financial ecosystem by lowering the cost of transactions, providing transparency of ownership, and accurate financial record keeping.

The 2008 financial crisis was a breaking point for blockchain technology as this crisis apparently became a motivating factor for the creation of bitcoin and other cryptocurrencies. The 2008 financial crisis awakened mistrust in fiat currencies (US dollar or British pound), or currencies created and backed solely by faith in a government. This underscored the fragility of the modern financial system with heavy reliance on banks and other financial institutions showed the importance of high costs of financial intermediation which later have become a burden on national governments and tax payers. In the aftermath of the 2008 financial crisis, many banks and financial institutions failed and had to be bailed out by national governments, being a burden on tax payers.

As a result of this turbulent environment after the 2008 financial crisis, investments in the blockchain technology have risen sharply. Blockchain Technology (also called Distributed Ledger Technology (DLT)) allows for the entire financial services industry to dramatically optimize business processes by sharing data in an efficient, secure, and transparent manner. In many countries, central banks are investing in projects improving blockchain technology which will shape the future of financial sector. Although central banks are among the most cautious and prudent institutions in the world, it is indicated that these institutions, perhaps surprisingly,

are among the first to implement blockchain technology. Central banks around the world are actively investigating whether blockchain can help solve long-standing issues in banking, such as payment-system efficiency, payment security and resilience, as well as financial inclusion (Lannquist, 2019).

There are many possible application fields of blockchain in various industries such as e-government practices (property registry, voting and e-citizen applications), media, healthcare, manufacturing, supply chain management, energy and finance. Financial industry including capital markets, banking and insurance is making the hugest investments in blockchain technologies in order to ensure stability and security for their customers.

Global spending on blockchain solutions is forecast to be nearly $2.9 billion in 2019, an increase of 88.7% from the $1.5 billion spent in 2018. It is expected that blockchain spending will grow at a robust pace over the 2018–2022 forecast period with a 5-year compound annual growth rate (CAGR) of 76.0% and total spending of $12.4 billion in 2022 (IDC, 2019).

1.3 Benefits of the Blockchain System in Comparison with Traditional Financial System

A blockchain is a digital, immutable, distributed ledger that chronologically records transactions in near real-time (Bhattacharyya, 2018; Fig. 1.1). The prerequisite for each subsequent transaction to be added to the ledger is the respective consensus of the network participants (called nodes), thereby creating a continuous mechanism of control regarding manipulation, errors, and data quality. It creates a digital ledger of transactions and thereby allows for it to be shared among a distributed network of computers and maintains a continuously-growing list of records called “blocks” which are secured from tampering and revision (Shah & Jani, 2018). The existing traditional financial system which depends on intermediation has two basic problems. First, it is difficult to monitor and evaluate asset ownership and its transfer in a trusted business network. Second, it is inefficient, expensive, and more sensitive to human risks and errors. Blockchain provides decentralization of the powers of the decision-makers and makes the system less prone to human based errors such as bounded rationality and opportunistic behaviour. When there are more than one party involved in making decisions, any possible mistake will be reduced to it’s minimum level. Similarly, in decentralized decision-making, since parties would have less power, they could accommodate the needs of other parties more easily in their decisions, which could ultimately deal with the bounded rationality problem. Hence, the hierarchy of decision-makers in a decentralized system, may serve as a system of checks and controls, which could reduce the negative effects of the opportunistic behaviour (Avdzha, 2017; Fig. 1.2).

When compared with traditional systems, blockchain has the advantage that a record which is maintained in a ledger is available to each party. This distributed

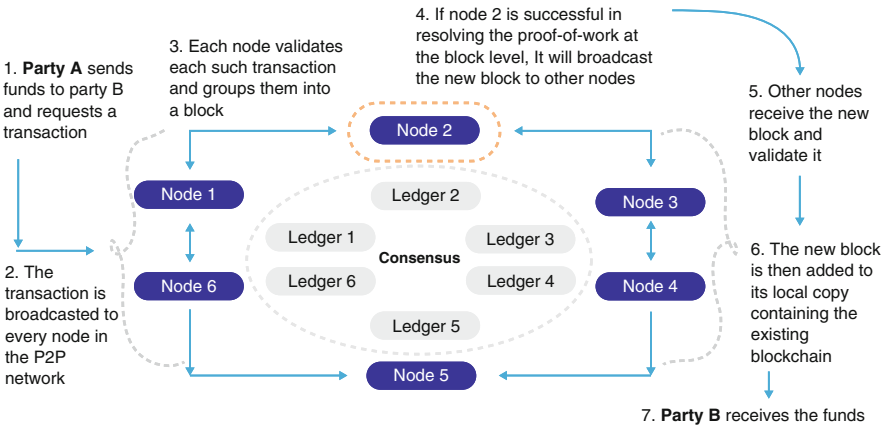

Fig. 1.1 How a transaction takes place in a blockchain. Source: Bhattacharyya (2018)

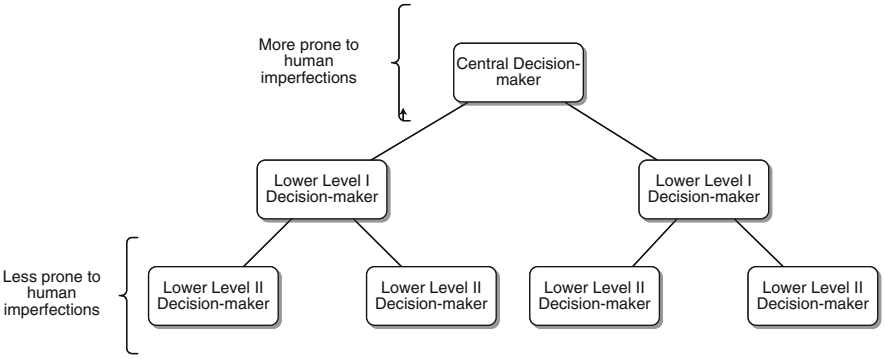

Fig. 1.2 Traditional centralized decision-making versus decentralized decision-making. Source: Avdzha (2017)

ledger can be widely passed between multiple users and creates a shared database for all users who have the access right for it. The distributed nature of blockchain increases transparency in processing by decreasing the need for manual verification and authorization. The main advantages of the blockchain are (Shah & Jani, 2018; Tapscott & Tapscott, 2017) can be mentioned as follows.

Real-time settlement of recorded transactions is ensured, decreasing the level of human risk and errors. There is no intermediation. Blockchain provides cryptographic proof which eliminates the need for a trusted third-party intermediation. Every participant on a blockchain can reach to the database and its history archive completely. There is no central power controlling the database. Each participant in a transaction can approve the records of its transaction partners without any need to an approval by a central intermediating authority. A shared database (distributed ledger) of public history of peer-to-peer transactions between the parties is distributed and made available to all users or parties to transactions. The blockchain contains a

certain and verifiable record of every single transaction ever made. The records related to a transaction can not be changed since all records are linked to each other historically on a blockchain. Smart contracts can be used. They are stored procedures that are executed in a blockchain to process pre-defined business steps and execute a commercially and legally enforceable transaction without involvement of an intermediary. As a result, blockchain increases transparency and accountability in decision-making while decreases the occurrence of human related errors in decision-making.

1.4 How Blockchain Is Transforming Corporate Finance

Blockchain technology will affect how trades are taking place in between financial institutions in a number of ways. Firstly, financial transactions will be processed and settled more securely and faster than before due to the peer-to-peer network and cryptographic security properties of blockchain technology. Secondly, for legal compliance matters, it will be much more easier for regulating parties to carry out auditing of transactions since they will be able to reach each step in a transaction in real-time manner. Thirdly, blockchain technology allows for automatically executed contracts or smart contracts in between parties to a transaction. In the future, blockchain will be critically important to a firm's survival in the long-run. Because it is going to transform all mechanisms of the financial industry and will have huge impacts on corporate governance, capital markets, corporate voting and corporate accounting (Bhattacharyya, 2018).

1.4.1 Impact on Corporate Governance

As long as there are human imperfections such as bounded rationality and benevolence, corporate governance mechanisms will be unable to solve agency problems between different stakeholders within a firm. Corporate governance mechanisms such as independent directors, executive renumeration packages, and a debt concentrated financial structure are not adequate as human related errors based on bounded rationality and benevolence will still remain though they may be reduced by making use of these specially designed corporate governance tools. A total solution for all types of agency related problem areas, which would work in different types of companies, seemed like a fantasy until blockchain technology arrived and offered alternative solutions due to its potential to make corporate transactions more accurate, transparent, and efficient than ever. The pioneering article by Yermack (2017) asserts that blockchains will noticeably lower wasteful uses of corporate sources and misbehavior by managers.

Irreversibility and immutability properties of blockchain make records of transactions transparent and open to all available parties. Since transparency and full

disclosure are the bottom lines for a good corporate governance environment, all stakeholders will be informed with more knowledge simultaneously, limiting the scope of agency costs related with asymmetric information. Changes in ownership can now be easily tracked as the authorized users only have to reach to the shared ledger, allowing for the accurate and timely transmission of information to stockholders (Lafarre & der Elst, 2018)

A blockchain produces copies of each block transactions simultaneously and forms an archive which are made available to all parties in a transaction. This is the distributed ledger property of the blockchain technology. This property makes the functions such as auditing and verification of the transactions unnecessary since all participants of a financial transaction would be able to see the changes in the ownership structure at any time as they occurred (Yermack, 2017).

Removal of verification and validation by trusted third party intermediaries, such as banking or clearing, will make the financial system work faster, effectively, and efficiently. There will be less corruption and errors. Blockchain transactions will be safer than traditional financial transactions which need time for settlement and clearing before being completed.

Smart contracts empowered by blockchain technology enable the removal of possible errors in principal-agency relations, minimizing the agency costs for the parties. This is due to the property of smart contracts that they run as coded, preventing any opportunistic behavior of the agent. Thus, smart contracts provide automatically executed protocols and eases the verification, monitoring of contracts between the principal and the agent, making information asymmetries between interest holders in a company, breaches of contract terms and fraud impossible. All information is publicly available in a transparent manner. For example, a company's financing position can be seen by anyone on the blockchain. This information is not limited to the use by company's insiders or managers. Smart agency contracts run on a custom built blockchain which permits all interested parties (managers and investors) to view records of company debts (Kaal, 2018).

1.4.2 Impact on Capital Markets

In many countries, stock exchanges are making every effort in order to exploit possible advantages of the usage of blockchain technology in the financial sector. These advantages focus on minimization of transaction costs and on-time settlements of financial transactions. National stock exchanges such as NASDAQ, the Australia Securities Exchange, the Tallinn Stock Exchange, the London Stock Exchange, and the Korea Stock Exchange are the pioneers on this front.

In these stock exchanges, trade settlements will be made by the confirming parties in the peer-to-peer network of buyers and sellers enabled by blockchain technology. There will be no need for a custody for confirmation of trade settlements. This will lead the trade settlements to be made almost simultaneously, instead of the existing t +3 trade settlement scheme and the related costs will be minimized. The settlement

process will be carried out on blockchain which will reduce the time and manual work needed for the settlement of financial transactions by intermediaries in the existing centralized system.

Great attention has been paid by stock exchanges to the use of blockchain technology in order to eliminate the costly and inefficient dependency of traditional stock exchanges on centralized systems which make the existence of a stock transfer agent or a trusted third party for verification and completion of the transactions necessary. This dependency also prevents the true pricing of stocks as full information cannot be provided to the parties because of counter-party risks.

There are many benefits for stock exchanges in the areas of reconciliation, trade validation, reference data, faster settlement, collateral management, regulatory reporting, and audit trail (Bhattacharyya, 2018).

Reconciliation There will be no need for third parties or intermediaries such as stock agents. This is one of the primary benefits expected to be derived from blockchain technology in the capital market. The related costs will be cut severely.

Trade Validation Blockchain enables smart contracts which makes the trade validation process simpler and more efficient. The parties in the peer-to-peer network can view and trace history of ownership structure and contract terms in a more effective and efficient way.

Reference Data Share price information, security data, calendar days and client data are essential reference data for completing a trade between buyers and sellers. Storage of this huge data and providing its validation across a number of participants involved in the trade is a very hard and long process. Instead of this time-taking process, the shared reference data can be collected on blockchain, with running it's confirmation codes among the participants in the network and parties in a transaction can trace changes in the reference data records. Blockchain enables validation of data creation by parties to the transaction in a peer-to-peer network instantaneously. Hence, supervision of the real-time data in the ledger would be much easier.

Faster Settlement Blockchain technology could decrease the time spent in the custody and settlement processes. When a transaction is validated and sent to the the distributed ledger, the digital wallet of the owner can be updated instantaneously. Increased speed in settlement will lower associated costs and risks.

Guarantees Management Smart contracts enabled by blockchain technology can run coded rules for automated margin calls for a trade. The seller and buyer take place on the same blockchain network. Hence, the movement of digital recording of assets through tokens makes possible the tracking of asset movement in between the parties and automated smart contracts allow exchange of assets for collateral purposes.

Regulatory Reporting As there will be a single, reliable and transparent archive including records of all transactions made by all parties, the costs related to the reconciliation and verification of the data will decrease sharply, leading to huge

savings. Regulators will monitor trade transactions in real-time, increasing the efficiency of supervision.

Audit Trail Distributed ledgers enabled by blockchain technology make every entry transparently seen by participants of the trade activity and there is no way to hide or falsify records. As all transactions are completely digital, auditing of such transactions can also be done digitally. This will reduce much of the manual work, and the time and cost associated with it. Since on the blockchain, each node on the block can see full history of all transactions, audit trail can be traceable transparently from beginning to the end of the trading process.

Blockchains will allow for a fully transparent share registration system so that the market makers can view investors' ownership and shareholding positions in various shares. This will lead to pricing of assets reflecting all available information and efficient capital markets in which capital is allocated more effectively and efficiently with assets fairly priced and decision takers can make better decisions about their investments in the capital markets (Yermack, 2017).

1.4.3 Impact on Corporate Voting

Blockchain is a technology that can offer smart solutions for classical corporate governance inefficiencies, especially in the relationship between shareholders and the company. Blockchain technology can reduce shareholder voting costs and the organization costs for companies substantially by increasing the speed of decision-making, facilitating the fast and efficient involvement of shareholders in company meetings for all corporate governance matters. Moreover, the main obstacles with the existing chains of intermediaries and the remote voting system can be solved with transparency, verification, and identification advantages which are uniquely provided by blockchain technology (Lafarre & der Elst, 2018).

Inefficiencies inherent in the existing system of corporate voting like incomplete voting, errors in the distribution of ballots, and vote listing problems can be completely overcome by blockchain supported distributed ledgers and smart contracts as the safe recording of the votes will be ensured by this new technology. Furthermore, digital voting in the annual shareholders meetings will enhance shareholder participation in company decision-making, modernizing dialog with shareholders by removing the barriers to physical attendance. This will contribute to the democratic environment in the company, protecting shareholders rights by motivating speedy and accurate voting. More practically, voting by using blockchain system would be performed by the help of eligible voters tokens or "vote coins" which will represent the voting power of each shareholder (Piazza, 2017).

In 2016, NASDAQ Tallinn (Estonia) Stock Exchange became the first stock exchange to apply blockchain voting in company meetings for publicly traded corporations on stock exchange. Speedy, transparent and accurate usage of

shareholder votes provided by blockchain voting can further motivate shareholders to be more demanding and participative in corporate governance issues (Yermack, 2017).

This specific use of blockchains and smart contracts in voting process provides increased transparency, accountability and decentralization which can directed to eliminate human-related agency problems and conflicts of interest between principals and agents of companies. If this technology could be adopted prevalently by companies, in the future, it may eliminate all human related mistakes from the voting process.

1.4.4 Impact on Corporate Accounting

Since the medieval period, accounting has relied on double-entry principles and has not changed its core principles based on mathematical integrity and accountability. For example, the technology of data representation in documents has changed the generalization of information from simple accounting to double accounting—where the events have are entered into documents along with the grounds for their implementation. Such records were made (and are still made today) in paper registers, later they were transferred into the digital environment with the wide use of software of all kinds. Thus, the method of data accumulation has changed. However, some approaches remained unchanged such as the need for processing by auditors, and checking the accounting data, regardless of their form (paper or digital). Blockchain, providing a distributed ledger of all transactions immediately in an immutable and irreversible manner, eliminates the need for a third-party approval or assurance by auditing (Melnychenko & Hartinger, 2017).

Blockchain technology as an infrastructure to support the transactions of bitcoin, the most widespread cryptocurrency, has exceeded beyond its initial role from when it was first initiated in 2008. Blockchain is a distributed digital ledger with the chronological records of transactions available to all those who have the access to view recorded data. All data in the blockchain can be transparently seen by the parties in a transaction but copying or changing data is not allowed on blockchain system. This technology is predicted to affect many accounting practices such as auditing, cybersecurity, and financial planning and analysis. All transactions can be fully automated by being programmable as smart contracts between the parties. When the transactions are validated by nodes, the nodes will have a confirmation and guarantee that prepared financial statements will be free from any substantial error. Use of blockchain technology can optimally lower the need for the accounting and auditing processes, leading to a revolution in corporate accounting (Milosavljevic, Joksimovic, & Milanovic, 2019). As a result, the blockchain will decrease the costs related to bookkeeping and auditing functions since all information about the company will be available without delay on a real-time basis with accurate and transparent recording.

The use of blockchain technology will be a breakthrough in accounting having far-reaching and important results. Real-time accounting without any delay will signal suspicious assets transfers in the company, severely limiting the scope of abuse by managers. This will prevent tunneling by managers who have insider information and will guarantee the health of the company's financial position to the creditors by enabling a real-time surveillance against fraudulent attempts. On the other hand, window-dressing or earnings management activities that are directed to manipulate financial reports in order to pay less tax or make the financial outlook attractive to outside investors can be eliminated by irreversible recording of time-stamped transactions. Investors can make their own judgements about the company with certainty, free of any bias or the judgement of managers or auditors (Yermack, 2017).

1.5 Conclusion

In the past few years, words like FinTech, blockchain and cryptocurrency went from being used by only a few experts in the field to words that are used daily. The development in the financial technology infrastructure enabled by the technological breakthroughs in the last decades triggered a fast-paced and technology-driven financial environment (Davradakis & Santos, 2019). In the digital age where technology is changing at a great pace, FinTech has the power of shaping the financial ecosystem going forward by reducing imperfections and inefficiencies in the traditional financial intermediation. This can take many forms: faster and safer payments and settlements through the use of distributed ledgers supported by blockchain technology, greater real-time control of personal and business finances by consumers and small businesses, simple person-to-person transfers including cross-border remittances, easier mobilization of savings to fund investments through crowdfunding, cheaper investment management for small investors through robo-advice, and better and faster credit decisions through big data analytics (Demekas, 2018).

Some FinTech innovations have deeper impacts on the financial ecosystem. Blockchain is the technology that supported the infrastructure for bitcoin. Most importantly, it is a secure way of storing data that makes it largely unchangeable so that a history of transactions can be recorded in a decentralized way. It is commonly agreed by researchers that blockchain and its extensions, distributed ledger and smart contracts, are foundational innovations which will change the traditional centralized financial system in a radical and revolutionary way (Schindler, 2017).

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