

Blockchain Technology for Corporate Governance and Shareholder Activism

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March 2018

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Blockchain is a technology that can offer smart solutions for classical corporate governance inefficiencies, especially in the relationship between shareholders and the company. Annual General Meetings (AGMs) are generally considered dull mandatory yearly rituals and its important theoretical functions, the information, forum and decision-making functions, are de facto eroded. In addition, the AGM suffers from procedural flaws, especially when shareholders vote remotely. Therefore we make a strong plea for the modernization of the AGM with the use of blockchain technology. Blockchain technology can lower shareholder voting costs and the organization costs for companies substantially. Moreover, blockchain technology can increase the speed of decision-making, facilitate fast and efficient involvement of shareholders. In addition, the main problems with the current chains of intermediaries and remote voting system have to do with transparency, verification and identification – issues that are directly linked to the advantages of blockchain technology. The recent prototypes of blockchain-based AGMs that are discussed in this contribution show that blockchain technology as tool for shareholder participation is definitely feasible.

Keywords: Shareholders, general meeting, blockchain, distributed ledger technology, central banks

JEL Classifications: G32, G34, G38, K22, K24, O16

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Abstract

Blockchain is a technology that can offer smart solutions for classical corporate governance inefficiencies, especially in the relationship between shareholders and the company. Annual General Meetings (AGMs) are generally considered dull mandatory yearly rituals and its important theoretical functions, the information, forum and decision-making functions, are *de facto* eroded. In addition, the AGM suffers from procedural flaws, especially when shareholders vote remotely. Therefore we make a strong plea for the modernization of the AGM with the use of blockchain technology. Blockchain technology can lower shareholder voting costs and the organization costs for companies substantially. Moreover, blockchain technology can increase the speed of decision-making, facilitate fast and efficient involvement of shareholders. In addition, the main problems with the current chains of intermediaries and remote voting system have to do with transparency, verification and identification – issues that are directly linked to the advantages of blockchain technology. The recent prototypes of blockchain-based AGMs that are discussed in this contribution show that blockchain technology as tool for shareholder participation is definitely feasible.

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1. Introduction

Although the hype around the buzzword ‘blockchain’ is currently still largely focused on speculation with virtual currencies like bitcoins, blockchain is actually a state-of-the-art technology that can, *inter alia*, offer smart solutions for classical inefficiencies in the corporate governance field.¹ In this contribution we assess the applications of blockchain technology in the field of corporate governance, paying special attention to the restructuring of the old-fashioned Annual General Meeting of Shareholders (hereinafter: the AGM). First we provide a general introduction to the agency problem and the associated agency costs between shareholders and their corporate board members in corporate governance. Afterwards, we introduce blockchain technology as a solution to the agency problem in section 3, thereby discussing the decentralized autonomous organization (hereinafter: The DAO) in section 4. Although blockchain offers the possibility to create a decentralized peer-to-peer network, we show that The DAO had still some governance problems. Therefore, in section 5 we consider blockchain and smart contracting technology to decrease the monitoring and bonding costs of companies, by introducing and evaluating a blockchain based AGM. Section 6 provides a conclusion.

2. Corporate Law and the Agency Problem

In the first chapter of the seminal book ‘The Anatomy of Corporate Law: A Comparative and Functional Approach’, the five fundamental characteristics of corporations are outlined. These are: i) legal personality; ii) limited liability; iii) transferable shares; iv) centralized management under a board structure, and; v) investor ownership.² The authors claim that in virtually all ‘economically important jurisdictions’ corporate law provides for a business form with all these characteristics.³ The fourth characteristic, centralized, or delegated, management under a board structure, is an attribute of nearly all large firms with numerous fractional “owners”. Allocation of the powers in the hands of those owners, i.e., the shareholders, would be unworkable for corporations that have numerous, and constantly changing shareholders due to the transferability of shares. Hence, also to notify third parties as to who in the corporation has the authority to make binding arrangements, most of the decision-making powers are delegated to a centralized board of the directors in corporate law.

¹ For instance, see David Yermack, “Corporate Governance and Blockchains”, 21 Review of Finance 1, 7-31 (10 January 2017).

² See John Armour, Henry Hansmann, Reinier Kraakman and Mariana Pargendler, “What is Corporate Law?”, in Kraakman et al. (eds), The Anatomy of Corporate Law (OUP, Oxford 2017).

³ See *idem*, 5. With respect to the fifth characteristic, investor ownership, the authors describe two key elements in ownership: the right to control the firm and the right to receive the firm’s net earnings. In ‘investor-owned firms’, ownership, and thus control, is tied to its investors, the shareholders. The authors argue that, although other forms of ownership exist, the dominant role of investor ownership in (large) corporations reflects its efficiency advantages. Although we generally agree with their statement, it is important to note that investor ownership differs substantially between countries and companies. Furthermore, in some continental European countries ownership is not only tied to capital, but also to labour: for instance, note the German co-determination (*mitbestimmung*) regulations and the binding right of the employees’ council in the Netherlands to nominate one-third of the members of the supervisory board.

Exactly because of this widely scattered ownership, shareholders suffer coordination problems and may completely depend on their delegated board members. These shareholders are virtually without control,⁴ and their interests and those of the delegated board members can diverge. Adam Smith already referred to this so-called *agency problem* in his famous *Wealth of Nations*.⁵ Board members may be in search of power, prestige and money for themselves, at the expense of atomic shareholders who lack controlling powers. To date, there is a widespread awareness in corporate governance that board members may enrich themselves and act opportunistically. Besides conflicting goals between board members and shareholders, also different risk preferences of these corporate actors can create agency problems.⁶

Corporate governance focuses on the question how to motivate corporate board members to act in the interests of their stakeholders and formulates contractual and regulatory solutions.⁷ With several mandatory disclosure requirements – for example regarding the annual financial accounts and *ad hoc* securities law disclosure, but also specific reports, such as on executive remuneration and more recently, on sustainability and diversity matters⁸ – and mechanisms that can align incentives such as well-structured executive pay, corporate law aims at mitigating agency problems. Jensen and Meckling (1976) argue that these solutions are generally costly and that shareholders and delegated directors will incur monitoring and bonding costs.⁹ Large part of this direct (collective) shareholder

⁴ In their seminal book, Berle and Means refer to large (American) corporations as ‘economic empires’ that have become ‘means whereby the wealth of innumerable individuals has been concentrated into huge aggregates and whereby control over this wealth has been surrendered to a unified direction’. According to the authors ‘ownership is so widely scattered that working control can be maintained with but a minority interest. [...] In such a case the greater bulk of ownership is virtually without control’. See Adolf A. Berle and Gardiner Means, “The Modern Corporation and Private Property”, (Macmillan, New York 1932).

⁵ ‘The directors of such companies, however, being the managers rather of other people’s money than of their own, it cannot well be expected, that they should watch over it with the same anxious vigilance with which the partners in a private copartnery frequently watch over their own. Like the stewards of a rich man, they are apt to consider attention to small matters as not for their master’s honour, and very easily give themselves a dispensation from having it. Negligence and profusion, therefore, must always prevail, more or less, in the management of the affairs of such a company.’ See Adam Smith, “An Inquiry into the Nature and Causes of the Wealth of Nations”, (Methuen & Co, London 1776:439).

⁶ See Kathleen M. Eisenhardt, “Agency Theory: An Assessment and Review”, 14 *The Academy of Management Review* 1, 57-74 (January, 1989).

⁷ See David E.M. Sappington, “Incentives in Principal-Agent Relationships”, 5 *The Journal of Economic Perspectives* 2, 45-66 (Spring, 1991).

⁸ Directive 2014/95/EU on the disclosure of non-financial and diversity information by certain large undertakings and groups.

⁹ See Michael C. Jensen and William H. Meckling, “Theory of the firm: Managerial behaviour, agency costs, and ownership structure”, 3 *Journal of Financial Economics*, 305-60 (1976). Note that burdensome disclosure requirements may also create an information overload and can actually add monitoring costs, for example, see Troy A. Paredes, “Blinded by the Light: Information Overload and Its Consequences for Securities Regulation”, 81 *Washington University Law Review* 2, 417-85 (January 2003). As Cahn and Donald indicate, shareholders may have to ‘sit down after work some evening and read a 150-page proxy statement’. See Andreas Cahn and David C. Donald, “Comparative Company Law” (Cambridge University Press, Cambridge, 2010: 474). In addition, strict disclosure requirements add significant costs to companies.

monitoring takes place during the AGM.¹⁰ In addition, the supervisory board or the non-executive directors monitor the management board or executive directors on behalf of the shareholders. Also the external auditor plays a role in the checks and balances. However, as Jensen and Meckling explain, despite intensive monitoring and bonding, there will be some remaining divergence between the agent's decisions and those decisions that would maximize the welfare of the principal. Jensen and Meckling call this cost to the principal the 'residual loss'¹¹.

Agency theory aims to optimize the contractual framework that governs the relationship between directors and shareholders in corporate law, resulting in many studies, also outside the corporate field.¹² Despite these efforts, following the theory of Jensen and Meckling, agency costs can never be fully excluded, unless the fundamental corporate characteristic of a delegated management structure can be removed. Therefore, in the next section, we discuss The DAO, a blockchain based association that is completely decentralized and thus removes, at least in theory, the salient agency problem and its accompanied agency costs in corporate law. Before doing this, we first provide a brief introduction to blockchain-based technology and smart contracting.

3. Blockchain and Smart Contracts

Blockchain can be described as a(n) (open) distributed ledger that can record transactions between (unknown) parties in a verifiable and immutable way.¹³ In a blockchain system, which is operating on a decentralized peer-to-peer network, information is stored on a public ledger (also called *unpermissioned*) or a private one (or *permissioned*)¹⁴ and contains all transactions that are executed. The blockchain system distinguishes itself from conventional ledgers – which are held centrally in the

¹⁰ Also the market for corporate control is often mentioned as a disciplinary device. There is a large literature base on this matter. See Henry G. Manne, "Mergers and the Market for Corporate Control" 73 *Journal of Political Economy* 2, 110-20 (1965). Sanford J. Grossman and Oliver D. Hart, "Takeover Bids, the Free-Rider Problem, and the Theory of the Corporation", 11 *The Bell Journal of Economics* 1, 42-64 (1980). Sanford J. Grossman and Oliver D. Hart, "One Share-One Vote and the Market for Corporate Control" 20 *Journal of Financial Economics*, 175-202 (1988).

¹¹ See Michael C. Jensen and William H. Meckling, "Theory of the firm: Managerial behaviour, agency costs, and ownership structure", 3 *Journal of Financial Economics*, 305-60 (1976:308).

¹² For example, see Milton Harris and Artur Raviv, "Some results on incentive contracts with application to education and employment, health insurance, and law enforcement", 68 *American Economic Review*, 20-30 (1978). Milton Harris and Artur Raviv, "Optimal incentive contracts with imperfect information", 20 *Journal of Economic Theory*, 231-59 (1979). J. Luis Guasch and Andrew Weiss, "Self-selection in the Labor Market", 71 *The American Economic Review* 3, 275-84 (June, 1981). Yakov Amihud and Baruch Lev, "Risk Reduction as a Managerial Motive for Conglomerate Mergers", 12 *The Bell Journal of Economics* 2, 605-17 (Autumn, 1981).

¹³ For example, see Marco Lansiti and Karim R. Lakhani, "The Truth About Blockchain" (*Harvard Business Review*, January-February 2017) <<https://hbr.org/2017/01/the-truth-about-blockchain>> accessed 1 December 2017.

¹⁴ The blockchain can also be established in a 'permissioned' ledger or 'private' ledger, controlled by a central organization or by a group of participants. This type of ledger supports record systems that keep track of specific documents, transactions, status of settlements and even votes and shares of companies, making it suitable for shareholder voting purposes, see section 2.4.

infrastructure of a single organization, like the accounts of all customers of a bank, or any other trusted central party – by its transparency; in contrast to a classical ledger whereby a previous record is being overwritten, each new transaction is grouped together in a block with other transactions, and is added in the blockchain system in a linear and chronological way. Hence, the ledger contains every transaction made in the past in the blockchain. Adding blocks to the blockchain is done by miners, who validate the transactions by competing in complex code solving problems. The ledger is replicated in many identical decentral databases that are simultaneously updated when changes are made to one of them.

In absence of a trusted intermediary, the validation of a transaction thus relies on a process for achieving consensus among all the participating parties or nodes. Thereto, each block contains a record of the previous block header to ensure the immutability of each transaction. In this way the blocks are chained together and as a result, in order to change a transaction, one not only has to modify the concerned block, but also all following blocks. Hence, once a block is completed, it is considered immutable and goes permanently into the ledger. From this it follows that blockchain technology is able to promote both transparency and trust between parties.

Blockchain can be used for several applications, including for example smart contracting.¹⁵ Smart contracts monitor the negotiated conditions and automate payments as soon as these conditions are met. A smart contract can be considered a syntax that is capable of entering, executing and enforcing (some or all terms of) an agreement using blockchain technology.¹⁶ Since the terms and conditions are recorded in the blockchain, they cannot be amended anymore, which removes the uncertainty of the possibility that one of the party wants to renegotiate the contract. There are several platforms that facilitate smart contracts. The most well-known is Ethereum, which is ‘a decentralized platform that runs smart contracts’¹⁷. Users of Ethereum can create their own operations and can run applications as programmed, smart contract coding. Using the Ethereum Wallet, users can access decentralized applications on the Ethereum blockchain, create their own digital tokens and write and use smart contracts. These smart contracts serve various purposes, for example to determine shares or membership in an organisation.¹⁸

¹⁵ See for a recent, condense overview Reggie O’Shields, “Smart Contracts: Legal Agreements for the Blockchain”, 21 North Carolina Banking Institute 1, 177-94 (2017).

¹⁶ One can think of an example whereby a consumer is accessing a streaming service that is triggering the right of the service provider to be funded from the bank of the consumer a certain amount of money. Upfront the parties enter into a contract including the services, currency, etc., and the events that trigger contract execution – in our example: accessing the streaming service – initiate the movement of value based on the settled conditions.

¹⁷ See <<https://www.ethereum.org/>> accessed 1 December 2017.

¹⁸ See <<https://www.ethereum.org/dao>> accessed 1 December 2017.

4. The DAO

Blockchain technology generally provides two important elements for parties that want to engage in any transaction or agreement: *transparency* – via the verifiable way of recording transactions – and *trust* – via the immutability of these transactions. These two elements are relevant to the field of corporate governance. We saw that the current structure of large corporations, small shareholders are dependent on their delegated board members who may act in their own interests at the expense of these shareholders, resulting in agency costs.¹⁹ Blockchain technology may offer a solution to the agency problem and its related costs. Actually, if smart contracts facilitate the agency relationship between shareholders and board members in a blockchain environment, established transparency and trust may eliminate as good as all agency costs that parties need to incur.

Blockchain and smart contracting technology is operating on a decentralized peer-to-peer network. This offers scope for not only eliminating agency costs as suggested above, but removing the entire agency structure in corporate governance. According to Coy and Kharif (2016) ‘true believers say blockchain could reduce the need for businesses to organize as companies, which get work done via command and control. Using blockchain, they say, collaborators will be able to work together as free agents instead of under a hierarchy of bosses’.²⁰ Accordingly, in May 2016, the first decentralized autonomous organization, also called ‘The DAO’, was launched by the founders of Slock.it,²¹ also referred to as the ‘employeeless company’²², using the blockchain platform Ethereum^{23,24}. This decentralized venture capital fund was fully controlled by its shareholders based on their ownership stake, who bought virtual DAO tokens with Ether. The DAO raised more than 150 million USD through the sale of its virtual tokens to its shareholders, to invest in projects to generate returns for its shareholders. Besides, shareholders could sell their virtual currencies on a number of web-based platforms, and thus be involved in secondary trading. In addition, shareholders were able to transfer these DAO tokens on the Ethereum blockchain and, in accordance with the White Paper, could redeem them for

¹⁹ See Michael C. Jensen and William H. Meckling, “Theory of the firm: Managerial behaviour, agency costs, and ownership structure”, 3 *Journal of Financial Economics*, 305-60 (1976).

²⁰ Peter Coy and Olga Kharif, “This Is Your Company on Blockchain” (*Bloomberg Businessweek*, 25 Augustus 2016) <<https://www.bloomberg.com/news/articles/2016-08-25/this-is-your-company-on-blockchain>> accessed 1 December 2017.

²¹ For more information, see <<https://slock.it/>> accessed 1 December 2017. The Whitepaper of this DAO is available via <<https://download.slock.it/public/DAO/WhitePaper.pdf>> accessed 1 December 2017.

²² Brady Dale, “The DAO: How the Employeeless Company Has Already Made a Boatload of Money” (*Observer*, 20 May 2016) <<http://observer.com/2016/05/dao-decentralized-autonomous-organizatons/>> accessed 1 December 2017.

²³ For more information about the coding of a DAO on the Ethereum blockchain, see <<https://ethereum.org/dao#the-shareholder-association>> accessed 1 December 2017. First the coding is shown for a shareholder association with an owner that has some controlling powers, including banning and adding members and changing the terms and conditions of a contract, for example the quorums and voting thresholds, but also changing the ownership of the DAO. Next, it is explained that the owner can change the ownership of the DAO to no one (by using the following coding: 0x00000...) or to the contract itself so that all the powers of the owner could be executed by creating proposals.

²⁴ For instance, see E. Tjong Tjin Tai, “Smart Contracts en het Recht”, *Nederlands Juristenblad* 2017/46.

Ether tokens through ‘a complicated, multi-week (approximately 46-day) process referred to as a DAO Entity “split”²⁵. The DAO was ‘hacked’ on June 17, 2016 by an anonymous ‘hacker’ that used the terms and conditions of the smart contracts in such a way that about 40 to 50 million USD could be diverted from the fund. As Raskin (2017) indicates, this ‘hacking’, which merely succeeded because this individual probably fully understood the contract terms,²⁶ can be compared to ‘using a legal loophole to effect a result that was clearly within the letter of the law, but not within its spirit’ (p. 337).²⁷ In response, the majority of the shareholders in the blockchain decided to recapture the funds, thereby actually altering the allegedly immutable code and undermining trust between parties as one of the pillars of the blockchain technology.^{28 29}

Although The DAO was meant as a completely decentralized peer-to-peer network organisation, the founders recognized that members in the community were actually looking for leadership. The founders indicate that:

‘the lack of centralized authority needed to make quick decisions was felt strongly throughout the history of DAO. This is however the nature of decentralized systems, and is both a blessing and a curse. This is exemplified by the fact that even

²⁵ Securities and Exchange Commission, Securities Exchange Act of 1934, Report of Investigation Pursuant to Section 21(a) of the Securities Exchange Act of 1934: The DAO [25 July 2017] Release No. 81207.

²⁶ Izabella Kaminska, “Legal Exploits and Arbitrage, DAO Edition” (*Financial Times*, 21 June 2016), <<https://ftalphaville.ft.com/2016/06/21/2166941/legal-exploits-and-arbitrage-daoedition/>> accessed 1 December 2017.

²⁷ Max Raskin, “The Law and Legality of Smart Contracts”, 1 *Georgetown Law Technology Review*, 304-41 (2017).

²⁸ See Peter Coy and Olga Kharif, “This Is Your Company on Blockchain” (*Bloomberg Businessweek*, 25 August 2016) <<https://www.bloomberg.com/news/articles/2016-08-25/this-is-your-company-on-blockchain>> accessed 1 December 2017. For more information on the ‘hacking’ of this DAO and how the funds were recovered from the ‘childDAO’, one may refer to a blog issued by its founders Slock.it: Christoph Jentzsch, “The History of the DAO and Lessons Learned”, (*Slock.it*, 24 August 2016), <<https://blog.slock.it/the-history-of-the-dao-and-lessons-learned-d06740f8cfa5>> accessed 1 December 2017.

²⁹ Note that The DAO did not invest in any start-up companies or other projects prior to it was hacked in June 2016, at least to our knowledge. Recently, more companies, including many start-ups, started to launch their own cryptocurrency in an Initial Coin Offering (ICO), to raise money from the public. These currencies are traded in secondary markets. In contrast to the classical Initial Public Offerings (IPOs), investors may not get shares in the company, but for example access to particular features in a project, new goods or services. Instead of having a regulated prospectus, start-ups usually disclose a white paper that contains information on the cryptocurrency. See Jonathan Rohr and Aaron Wright, “Blockchain-Based Token Sales, Initial Coin Offerings, and the Democratization of Public Capital Markets”, *Cardozo Legal Studies Research Paper 527* (December 2017), < <https://ssrn.com/abstract=3048104>> accessed 1 December 2017. These initiatives can provide good investment opportunities and create value, but may also offer scope for fraud. In a way, we can compare ICOs to the seminal Gresham’s law in macroeconomics, a principle holding that ‘the worst form of currency in circulation regulates the value of the whole currency, and drives all the other forms of currency out of circulation’. See Henry Dunning Macleod, “The History of Economics” (Bliss, Sands and Company, New York 1896). Regulators all over the world launched several recent initiatives to overcome these information problems. .

little posts by Vitalik were interpreted as decisions, even though he just gave his opinion.’³⁰

This course of affairs has a remarkable similarity with the corporate law theory we presented in the beginning of this contribution, where we stated that because allocation of powers in the hands of anatomic shareholders is unworkable in practice, corporations usually have a centralized management that is able to engage in fast and efficient decision-making. Actually, it seems to be the case that in case of The DAO, the lack of centralized authority creates a sub-optimal situation too.

To conclude, we saw that blockchain technology has the potential to remove agency costs in the corporate environment by making the need for a central delegated body superfluous. However, the DAO has shown us that (fully) decentralized organisations may suffer from governance problems too. Nonetheless, smart contracts still offer new possibilities to facilitate the agency relationship between corporate actors, thereby creating trust and transparency. In the next section we focus on the use of blockchain technology and smart contracting to reduce the agency costs for both shareholders and companies through the optimisation and modernization of the AGM.

5. Blockchain for the Modern AGM

The AGM plays an important theoretical role in (collective) shareholder monitoring. More specifically, the classical AGM has three functions to shareholders: shareholders are informed (*information function*), they are offered a venue to discuss and ask questions (*forum function*), and they take decisions (*decision-making function*). The decision-making function of AGMs is often considered to be the core function of the AGM.³¹ As a result of the inefficient decision-making of corporate owners, the corporate strategy and daily decision-making are delegated to the board of directors. Nonetheless, shareholder approval is still needed for those corporate decisions that are considered of utmost importance to the owners, such as a merger or the appointment of directors.

Despite its important role in corporate governance, the classical outline of the AGM remained unchanged. Many provisions that govern the rights of shareholders and procedures at the AGM date back to the 19th century, notwithstanding the modernization of corporate law and decades of evolving corporate governance. For instance, table B of the UK Joint Stock Companies Act of 1856 stated in article 70: ‘[o]nce at the least in every year the directors shall lay before the company in general meeting a statement of the

³⁰ Christoph Jentzsch, “The History of the DAO and Lessons Learned”, (*Slock.it*, 24 August 2016), <<https://blog.slock.it/the-history-of-the-dao-and-lessons-learned-d06740f8cfa5>> accessed 1 December 2017. For these ‘little posts of Vitalik Buterin, co-founder of Ethereum, on handling the ‘hacking’ of the DAO, see <https://www.reddit.com/r/ethereum/comments/4ro2p9/options_in_the_hard_fork_slockit_blog/> accessed 1 December 2017.

³¹ Therese Strand, “The Owners and the Power: Insights from Annual General Meetings”, PhD series 25.2012 (Denmark: Copenhagen Business School 2012).

income and expenditure for the past year, made up to a date not more than three months before such meeting'. Note that this provision is very similar to the current requirements in the UK Companies Act 2006, enacted one and a half centuries later.

In this section we outline the AGM's current flaws. Next, in section 5.3 we explore how blockchain and smart contracting technology can solve these problems. In section 5.4 we outline the current initiatives on blockchain shareholder voting in practice.

5.1. The AGM's Flawed Functions

All three theoretical functions of the AGM – the information, forum and decision-making function – are at least partially hollowed to date. First, due to market securities regulation and other disclosure obligations, (almost) all information must be disclosed and is already disclosed often long before the AGM takes place. Second, practice shows that shareholders have limited to no needs for the AGM's current forum function. A study found that in large sample of Dutch companies on average eight shareholders raised questions,³² whilst listed companies with tens of thousands of shareholders are common. In addition, there is often limited time available during the AGM and the speaking time of shareholders can be restricted.³³ For example, the German *Bundesgerichtshof* confirmed that a provision in the articles of association limiting the speaking and questioning time in order to end a regular general meeting within six hours is in accordance with the German Stock Corporation Act. An individual speaking time limitation of ten minutes per shareholders and a total speaking time for all shareholders of forty-five minutes is considered reasonable.

Lastly, the decision-making function is also flawed in practice. Economic theory predicts that, in particular, small shareholders have low incentives to engage in decision-making as voting costs are generally higher than the benefits. For example, the marginal effect of a voting stake of a small shareholder is approximately zero whereas these shareholders incur voting costs.³⁴ In addition, small shareholders may free-ride on the monitoring effort of other, larger shareholders and, moreover, small shareholders can sell their shares when they are dissatisfied with the corporate management³⁵. To see whether small shareholders indeed have low incentives to participate in practice as economic theory predicts, we analysed total shareholder and small shareholder turnout rates in practice for 251 companies listed to the main indices of seven European member states UK (FTSE-100), the Netherlands (AEX-25), France (CAC-40), Germany (DAX-30), Austria (ATX-20),

³² See Anne J.F. Lafarre, "The AGM in Europe: Theory and Practice of Shareholder Behaviour" (Emerald Publishing Limited, Bingley 2017).

³³ Bundesgerichtshof (BGH) Karl-Walter Freitag/Biotest AG-case [8 February 2010] II ZR. 94/08.

³⁴ Frank H. Easterbrook and Daniel R. Fischel, "The Economic Structure of Corporate Law" (Harvard University Press, Cambridge, Massachusetts 1991).

³⁵ Anat R. Admati and Paul Pfleiderer, "The "Wall Street Walk" and Shareholder Activism: Exit as a Form of Voice", 22 *The Review of Financial Studies* 7, 2445-2486 (2009).

Belgium (BEL-20), and Ireland (ISEQ-20) over a period of five years (2010-2014).³⁶ Total shareholder turnout rates (in %) were calculated as the ‘total number of votes casted’ divided by the ‘total amount of votes outstanding’³⁷ multiplied by 100%. For analysing small shareholder turnout rates, we use the assumption that blockholders, i.e., shareholders that hold five percent or more of the total amount of votes outstanding,³⁸ always attend the AGM.³⁹ Hence, small shareholder turnout (in %) is calculated as follows:

$$= \frac{(\text{‘total shareholder turnout’} - \text{‘the summed voting block of all blockholders’})}{(100\% - \text{‘the summed voting block of all blockholders’})} * 100\%.$$

The empirical findings are shown in table 1 and table 2 below:

Table 1: Average total and small shareholder turnout rates

	2010	2011	2012	2013	2014
Total shareholder turnout (%)	62.3	64.8	67.2	66.4	67.2
Small shareholder turnout (%)	45.1	48.5	51.6	50.8	52.5

Source: Adapted from the figure 5.1 and figure 5.3 in Lafarre (2017).

Table 2: Average small shareholder turnout rates per country

	2010	2011	2012	2013	2014
Austria	27.9	26.0	28.9	35.4	35.9
Belgium	9.9	9.5	23.7	30.1	32.5

³⁶ For more information regarding the sample requirements, see Anne J.F. Lafarre, “The AGM in Europe: Theory and Practice of Shareholder Behaviour” (Emerald Publishing Limited, Bingley 2017).

³⁷ The total amount of votes outstanding was corrected for treasury shares, which are shares held by the company itself with voting rights suspended.

³⁸ The 5% cut-off point is in line with the lowest disclosure threshold in the Transparency Directive. Since not all Member States have implemented additional lower thresholds, 5% is the lowest common threshold in our sample. Directive 2004/109/EC of the European Parliament and of the Council on the harmonisation of transparency requirements in relation to information about issuers whose securities are admitted to trading on a regulated market and amending Directive 2001/34/EC [Transparency Directive] [2004] OJ L390/38.

³⁹ This assumption enables the calculation of small shareholder turnout rates. Large shareholders generally have significantly more incentives to vote than small shareholders since they will receive a larger share of the benefits of better monitoring. See for the validation of this assumption Christoph F. Van der Elst, “Revisiting Shareholder Activism in AGMs: Voting Determinants of Large and Small Shareholders”, 311 European Corporate Governance Institute (ECGI), Finance Working Paper (2011). It should be noted that there is some uncertainty about the actual stakes of blockholders, since blockholders are only obliged to notify their issuer of their stakes in case their stake exceeds or falls below the thresholds defined by law. Hence, the actual stake of a blockholder can differ from the stake that is disclosed when his or her stake increases or decreases without passing another threshold. Because of the incomplete disclosure of information related to the attendance of shareholders and their votes, there are three possible measurement errors that may be present in our small shareholder turnout analyses: i) we *over-measure* the voting stake of a blockholder at the record date; we *under-measure* the voting stake of blockholder at the record date, and; we *over-measure* the amount of votes the blockholder actually uses during the AGM. The direction of the aggregate measurement error can go both ways, but since two of the three possible measurement errors lead to an overestimation of the blockholder’s voting stake, it may be the case that there is some underestimation of small shareholder attendance in more concentrated ownership structures. See Anne J.F. Lafarre, “The AGM in Europe: Theory and Practice of Shareholder Behaviour” (Emerald Publishing Limited, Bingley 2017).

France	45.2	52.3	53.9	50.8	52.3
Germany	45.0	45.5	48.2	35.2	41.7
Ireland	41.3	46.0	47.1	49.4	47.8
Netherlands	32.5	43.7	45.6	48.5	52.7
UK	58.2	61.1	63.7	63.4	63.7

Source: Adapted from table 5.4 in Lafarre (2017).

Although our measure remains a proxy, we can conclude that there are some substantial differences among member states. In the UK, small shareholder turnout rates are relatively high, but in other countries, especially in Belgium and Austria, small shareholder turnout rates are significantly lower. Although these findings suggest that *not all* small shareholder are reluctant to participate in AGMs, there is definitely room for improvement of participation rates. In a difference-in-differences analysis,⁴⁰ a study has shown that the Shareholder Rights Directive (2007/36/EC) – which was amended by Directive (EU) 2017/828 in spring 2017 and lowered the transactions costs of voting to shareholders substantially – significantly increased (small) shareholder turnout in Belgium, France and the Netherlands.⁴¹ This finding implies that the willingness of small shareholders to participate increases when transaction costs of voting are lower.

In addition to the costly shareholder voting decision, the AGM's decision-making function suffers from the static yearly character. An example is the co-optation of directors. This practice is for example allowed in Belgium (following article 519 Belgian Companies Act) and is in effect a deviation of one of the most fundamental shareholder rights. If a director resigns, her position can be taken by another director, co-opted by the board. The next general meeting of shareholders must approve the election of the co-opted director. The board of Ontex, a Belgian hygienic products supplier, co-opted two directors in August and September 2014. These directors resigned in March and April 2015, even before the AGM took place. Note that extraordinary general meetings (hereinafter: EGMs) form a solution to this slow, yearly pace of decision-making, but legal requirements including disclosure of lengthy preparatory reports, quorum thresholds and notice periods make these extra meetings costly and inefficient. For example, Nyrstar, a leading Belgian zinc and lead smelting company, organised nine EGMs between December 2015 and May 2017 to meet the quorum requirements under Belgian company law (note that articles 558-560 Belgian Companies Act require varying qualified majorities for different extraordinary voting items for the first EGM; no quorum is required at the second EGM ex article 558). With attendance rates varying between 2.4 and 37 percent, each EGM had to be called a second time because the quorum was not reached at the first EGM. Finally, at the EGM of May 2017 where only 2.4 percent of the shares was represented, the 'Deed of Guarantee' was unanimous approved.

⁴⁰ Difference-in-Differences estimation is an econometrical technique to study the differential effect of a treatment on a treatment group versus a control group. See A. Colin Cameron and Pravin K. Trivedi, "Microeconometrics: Methods and Applications" (Cambridge University Press, Cambridge 2005).

⁴¹ See Anne J.F. Lafarre, "The AGM in Europe: Theory and Practice of Shareholder Behaviour" (Emerald Publishing Limited, Bingley 2017).

A convocation of a certain general meeting, including a detailed agenda of the items to be discussed and voted and the draft resolutions provided on the website of the company,⁴² needs to be disclosed several weeks before this meeting. The period between this convocation and the date of the AGM or EGM is called the ‘notice period’. The minimum requirement for this notice period largely differs between countries. For example, in the Netherlands and France, the minimum notice period is relatively long with 42 and 35 days respectively. In most other continental European countries, this minimum period is around 30 days. In contrast, in the UK and Ireland, the minimum notice period is shorter with 21 days for AGMs and, in case the requirements of the Shareholder Rights Directive are met,⁴³ this period can be reduced to 14 days for EGMs. In addition, also the record date, i.e., a cut-off date for shareholders to register for the general meeting, is not the same in every country. Whereas, for instance the Netherlands requires the record date to be 28 days before the meeting, France requires three business days and the UK only 48 hours. It seems that although the minimum notice period and the record date are regulated in the Shareholder Rights Directive under a minimum harmonization requirement,⁴⁴ these provisions do not have a harmonizing effect in practice. In our opinion, there is no real economic rationale for these different periods, unless for example the disclosure requirements are more demanding in the Netherlands than in the UK, which would be why these countries require companies to provide longer notification periods – which is, to our knowledge, certainly not the case (Lafarre, 2017). In addition, the long notice period and the record date, which used to be only a technical limitation⁴⁵ put a limit to immediate decision-making by shareholders.

In a way, the very existence of corporate law mechanisms like co-optation as discussed above, show that also legislators recognize that the EGM-tool for fast shareholder decision-making is also not efficient.

5.2. Procedural Flaws

Shares are usually held through complex chains of intermediaries, especially in the case of cross-border voting. Shareholders usually do not buy their shares directly from the listed companies, but hold accounts with their national banks or other financial

⁴² Directive 2007/36/EC of the European Parliament and of the Council on the exercise of certain rights of shareholders in listed companies [Shareholder Rights Directive] [2007] OJ L157/87, art 5(4)(d).

⁴³ Directive 2007/36/EC of the European Parliament and of the Council on the exercise of certain rights of shareholders in listed companies [Shareholder Rights Directive] [2007] OJ L157/87, art 5(1). These requirements are: i) the company makes voting by electronic means possible to its shareholders, and; ii) approval by a qualified majority of the shareholders (which is at least two thirds of the votes).

⁴⁴ Directive 2007/36/EC of the European Parliament and of the Council on the exercise of certain rights of shareholders in listed companies [Shareholder Rights Directive] [2007] OJ L157/87, art 5(1) and art 8(3).

⁴⁵ For a clear analysis see Jaap Winter, “Cross-border Voting in Europe”, in Capital Markets and Company Law, 387-426 (K. Hopt and E. Wymeersch (eds.), Oxford, OUP, 2003). For a more recent analysis see Jesús G. Aparicio, “Enhancing Shareholder Rights in Intermediated Securities Holding Structures Across Borders”, 13 New York University Journal of Law & Business 2, Winter 2017.

intermediaries that either directly holds an account with the Central Securities Depository (CSDs) or only in an affiliated custodian. The chain of intermediaries and the costs of cross-border shareholder participation is already a discussion topic amongst scholars for over a decade.⁴⁶ All these intermediaries add transaction costs to shareholder participation, but there are more hurdles. As indicated in the current Shareholder Rights Directive (Directive (EU) 2017/828), but also already outlined in the previous version (Directive 2007/36/EC), the identification of shareholders is necessary to allow remote shareholder participation in the AGM, for example by the appointment of a proxy. Directive (EU) 2017/828 requires that intermediaries should provide the information regarding the shareholder identity to the company. This should be ‘a certain level of information on the shareholder identity’ (recital 5), including the name of the shareholder, the contact details and, if applicable, information on the legal person such as the LEI Code⁴⁷. In addition, the European legislator recognized the communication and information problems that are caused by these layers of intermediaries with the introduction of the new Shareholder Rights Directive in spring 2017, stating that:

‘The effective exercise of shareholder rights depends to a large extent on the efficiency of the chain of intermediaries maintaining securities accounts on behalf of shareholders or of other persons, especially in a crossborder context. In the chain of intermediaries, especially when the chain involves many intermediaries, information is not always passed from the company to its shareholders and shareholders’ votes are not always correctly transmitted to the company. This Directive aims to improve the transmission of information along the chain of intermediaries to facilitate the exercise of shareholder rights.’⁴⁸

Recital 10 adds:

‘It is important to ensure that shareholders who engage with an investee company by voting know whether their votes have been correctly taken into account. Confirmation of receipt of votes should be provided in the case of electronic voting. In addition, each shareholder who casts a vote in a general meeting should at least have the possibility to verify after the general meeting whether the vote has been validly recorded and counted by the company.’

⁴⁶ See Jaap W. Winter, “Cross-border Voting in Europe”, in K. Hopt and E. Wymeersch (eds), *Capital Markets and Company Law* (Oxford, OUP, 2003). Dirk Zetzsche, “Shareholder Passivity, Cross-border Voting and the Shareholder Rights Directive”, 8 *Journal of Corporate Law Studies* 2, 289-336 (2008). Informal Company Law Expert Group (ICLEG) Report on Digitalisation in Company Law of the Informal Company Law Expert Group (2016 Annex B) <http://ec.europa.eu/justice/civil/files/company-law/icleg-report-on-digitalisation-24-march-2016_en.pdf> accessed 1 December 2017.

⁴⁷ This is the Legal Entity Identifier, which is required under MiFID II. Directive 2014/65/EU of the European Parliament and of the Council of 15 May 2014 on markets in financial instruments and amending Directive 2002/92/EC and Directive 2011/61/EU [2014] [MiFID II], OJ L173/349.

⁴⁸ Directive (EU) 2017/828 the European Parliament and of the Council of 17 May 2017 amending Directive 2007/36/EC as regards the encouragement of long-term shareholder engagement [2017] PB L132/1, recital 8.

Hence, especially in the context of cross-border and electronic voting, there is high uncertainty that information, including the record of shareholder votes, is correctly channelled between ultimate shareholders and companies. Nonetheless, remote voting has proven to be the most common way of voicing the shareholder’s opinion on an AGM agenda item. In addition, it significantly increased shareholder participation in the last years as physical appearance at AGMs is not required anymore, thus reducing the voting costs of shareholders. For example, table 3 provides insight in the shareholder participation of Atos Origin, a large French listed company in the digital services industry.⁴⁹ The table shows that a large and increasing number of shareholders votes by mail or provides a proxy to the chairman (i.e., remote voting). One may note that only 1 percent to 5 percent of the shareholders attends the meeting in person.

Table 3: Atos Origin: Participating shareholders and shares voted at shareholder meetings (2012-2017)

Use of shareholders’ participation means in # of shareholders.						
Shareholders	2012	2013	2014	2015	2016	2017
Attending in person	43	8	43	47	47	68
represented	0	1	0	1	1	0
proxy to the chairman	71	53	60	448	448	804
votes by mail	701	567	657	1070	1070	1356
Total	815	629	760	1566	1566	2228
Use of shareholders’ participation means in % of # shareholders. Between parentheses the voting stakes (%) are shown.						
Shareholders	2012	2013	2014	2015	2016	2017
attending in person	5.3 (28.9)	1.3 (14.3)	5.7 (15.2)	3.0 (1.4)	3.0 (1.4)	3.0 (1.1)
represented	0.0 (0.0)	0.2 (0.0)	0.0 (0.0)	0.1 (0.0)	0.1 (0.0)	0.0 (0.0)
proxy to the chairman	8.7 (1.0)	8.4 (0.2)	7.9 (0.2)	28.6 (3.6)	28.6 (3.6)	36.1 (3.2)
votes by mail	86.0 (70.9)	90.1 (85.6)	86.4 (84.6)	68.3 (95.0)	68.3 (95.0)	60.9 (95.7)
Total	100	100	100	100	100	100

The importance of voting by mail is even more visible if the voting stakes are considered (Table 3, voting stakes between parentheses). The number of votes from attending shareholders steadily diminished while the votes from shareholders voting by mail increased from 71 percent to 96 percent of all votes in the period 2012-2017. For another three percent of the votes the chairman of the board acts as a proxy holder. It illustrates that the voting results are known to the board of directors before the meeting even takes

⁴⁹ Just like some other French companies, this company provides information on the means its shareholders are using to participate in the AGM. Although we chose to report the figures for this company, other (French) companies provide similar insights.

place. Therefore it can be questioned to what extent shareholder decision-making is taking place at the meeting.

Although remote voting is nowadays the mostly used voting tool, it (still) does not offer shareholders (full) transparency and proof on how their vote is actually exercised. A recent case in the 2017 AGM of Procter & Gamble on 10 October 2017 provides a textbook example. Procter & Gamble announced after the meeting that the shareholders had rejected the proposal of activist shareholder Nelson Peltz to be elected as a director, with a margin of 0.2 percent of the votes.⁵⁰ However, apparently, an independent expert found that the margin was even smaller, and that shareholders actually voted in favour of the election of Nelson Peltz. This and previous incidents⁵¹ provoke the debate on a correct and transparent procedure of shareholder voting. Vice Chancellor Laster calls the current shareholder proxy voting system a ‘daisy-chained system of share ownership’ in his speech on 29 September 2016, and advocates the use of blockchain technology and smart contracting as ‘a superior external solution’ to these problems in shareholder voting.⁵² We explore the opportunities of using blockchain technology and smart contracting to modernize the AGM and overcome this procedural and other flaws in the next section.

5.3. The Modernization of the AGM

We make a plea for the modernization of the AGM with the use of blockchain and smart contracting.⁵³ In this contribution, we further explore the possibilities of this technology in the corporate setting.

The main problems with the current chains of intermediaries and the current remote voting system have to do with *transparency, verification and identification* – issues that are directly linked to the advantages of blockchain technology. As we have seen, all transactions are added to the distributed ledger without overwriting any previous transactions. The ledger is replicated and automatically updated in identical decentral databases that are managed by the shareholders, who can verify their transactions in this blockchain.⁵⁴ Security is established because blocks that contain transactions are chained

⁵⁰ See Anna Nicalou, “P&G deadlock in board seat battle with Peltz”, (*The Financial Times*, November 16, 2017). < <https://www.ft.com/content/ad4cb4ea-cae4-11e7-ab18-7a9fb7d6163e> > accessed 1 December 2017.

⁵¹ For example, around 20% of the shareholder votes in the 2008 board elections of Yahoo were miscounted. See Vice Chancellor J. Travis Laster, “The Block Chain Plunger: Using Technology to Clean Up Proxy Plumbing and Take Back the Vote Available”, (Keynote Speech Council of Institutional Investors, Chicago 29 September 2016: 10-16) <http://www.cii.org/files/09_29_16_laster_remarks.pdf> accesses 1 December 2017.

⁵² Vice Chancellor J. Travis Laster, “The Block Chain Plunger: Using Technology to Clean Up Proxy Plumbing and Take Back the Vote Available”, (Keynote Speech Council of Institutional Investors, Chicago 29 September 2016: 10-16) <http://www.cii.org/files/09_29_16_laster_remarks.pdf> accesses 1 December 2017.

⁵³ Also see Christoph F. Van der Elst and Anne J.F. Lafarre, “Blockchain and the 21st century annual general meeting”, 14 *European Company Law* 4, 167-76 (2017).

⁵⁴ As the European Parliament Think Tank on blockchain technology and e-voting states, blockchain technology ‘would empower voters to [record, manage, count and check votes] themselves, by allowing

together, so that in order to alter one block, one needs to alter every other previous block in the ledger. Moreover, in a blockchain system, shareholders can be identified with the digital identity of their wallet or the proof of authentication outside the blockchain can be stored in the blockchain.⁵⁵

In a private blockchain, managed by the company only accessible for shareholders,⁵⁶ the company and shareholders that hold sufficient shares can place proposals. Smart contracting allows for the private ledger to be structured so that all relevant information including majority rules and access rights that are contained in the articles of association and the law are contained in the blockchain. Once a certain proposal is placed in the blockchain, shareholders that hold shares in the company are immediately notified and can exercise their voting rights during a short period. The voting results may become instantly available after a cut-off point, and majority requirements, necessary to render the decision binding and verifiable, need to be reached in a specified timeframe. Shareholders can verify their transactions, but none of the shareholders should be able to determine what voting decision was taken by other shareholders.⁵⁷

The research report of the 'CSD Working Group on DLT'⁵⁸ further outlines the requirements for shareholder proxy voting in a blockchain. The Consortium states that,

them to hold a copy of the voting record'. European Parliament Think Tank, "What if blockchain technology revolutionised voting?" (European Parliament, 29 September 2016), <[http://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS_ATA\(2016\)581918](http://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS_ATA(2016)581918)> accessed 1 December 2017.

⁵⁵ The latter is proposed by the CSD Working Group on DLT in a recent report (*c.f. infra*, table 3). Here, authentication takes place outside the blockchain and relies on a central certification authority, for example like the e-residency program in Estonia. Nonetheless, there are also solutions possible on the blockchain. CSD Working Group on DLT, "General Meeting Proxy Voting on Distributed Ledger Product Requirements" (October 2017, v.2.0). Available at the websites of the CSDs.

⁵⁶ Given the governance problems with the DAO on a public ledger (see section 2.3), the authors propose this blockchain application on a private ledger. In addition, note that the miners in the Ethereum network who validate the transactions by competing in complex code solving problems are quite concentrated. The two largest miners together have more than 45 percent of the computational power in the Ethereum network. If a cartel of miners would have 51 percent of the computational power, these miners can, for instance, alter valid transactions, forming a threat to the Ethereum network. For example, see Matthew De Silva, "Seven Critiques of Ethereum According to the Creator" (*Ethnews*, 7 July 2017), <<https://www.ethnews.com/seven-critiques-of-ethereum-according-to-the-creator>> accessed 1 December 2017. For an overview of the mining stakes, see Ing. Lele, "Mining Pool compare for XMR ETH ZEC", (*Inglele*, 26 July 2017), <<https://inglele.wordpress.com/2017/07/26/mining-pool-compare-for-xmr-eth-zec/>> accessed 1 December 2017.

⁵⁷ Note that since institutional investors need to publicly disclose information about the implementation of their engagement policy and in particular how they have exercised their voting rights following the new Shareholder Rights Directive ((EU) 2017/828), for these shareholders other shareholders may actually be able to determine what voting decision was taken by them. Member States need to implement this Directive in their national laws by June 2019. Directive (EU) 2017/828 the European Parliament and of the Council of 17 May 2017 amending Directive 2007/36/EC as regards the encouragement of long-term shareholder engagement [2017] PB L132/1, recital 18 and article 3g.

⁵⁸ CSD Working Group on DLT, "General Meeting Proxy Voting on Distributed Ledger Product Requirements" (November 2017, v.2.1). Available at the websites of the CSDs. The first version was published in Spring 2017 and its current version stems from October 2017. This is a Consortium of Central Securities Depositories that formed a Working Group on Distributed Ledger Technology. This Consortium

in line with the findings of the European legislator and Vice Chancellor Last, ‘the most prominent problems today are complexity of the processes involved in the voting and lack of finality’ (p.5). The Working Group proposes a process flow for shareholder voting on distributed ledger technology, consisting of eight steps, which are described in table 3. The process starts with the announcement of the meeting, including the meeting’s materials, and setting the record date on the distributed ledger. Next, the intermediaries that are notified upload a list of beneficial owners to the ledger at the record date,⁵⁹ who are provided access to the meeting’s materials and are provided with a certain amount of tokenized voting rights.⁶⁰ Shareholders need to identify themselves in order to be able to vote or perform other shareholder rights. The report proposes that the authentication process takes place outside the blockchain environment,⁶¹ but the proof of authentication should be stored in the blockchain. Before the voting process starts, shareholders are able to appoint a proxy holder. After the shareholders or their proxy holders casted their votes on the blockchain, each of them can verify how their votes or voting instructions are casted and that these are included in the vote count in the blockchain. Moreover, after the voting process, shareholders are independently able to verify the voting results, and all actions that established these voting results, in the identical decentral database that they manage.

Table 4: Proposed Process Flow of the CSD Working Group on DLT

#	Step	Description
1	Meeting Initialization and Notification	Setting the meeting date and record date on the distributed ledger. The meeting’s agenda and supplementary materials can be stored on the distributed ledger.
2	Ownership Record Loading	Intermediaries load a list of beneficial owners and ownership records at the voting record date into the blockchain. This provides shareholders with access to the meeting’s agenda and other materials.
3	Voting Right Allocation	Issuing of tokenized voting rights to all shareholders who are eligible for voting at the record date, taking into account voting restrictions, share types with different voting rights, etc. The system needs to supports the harmonization of records between all intermediaries and the issuer and uses a single source for determining the amount of voting rights.
4	Voting Party Authentication	Authentication of shareholders via one of the means supported by the local system, for instance an online identification system, or in case of Estonia, the e-residency

includes NSD in Russia, Strate in South Africa, Six Securities Services in Switzerland, Nasdaq Nordic, and DCV in Chile.

⁵⁹ The report indicates that intermediary chains can be long and that the responsibility to upload a list of beneficial owners needs to be forwarded between intermediaries. The report furthermore indicates that the exact process varies on the participating actors in the chain.

⁶⁰ The report also proposes that shareholders may choose whether they want to participate in the voting process and different mechanisms are proposed (for instance, participation by default with voluntary opt-out or mandatory opt-in registration).

⁶¹ According to the Working Group, this is to comply with privacy regulations.

		program, which may take place outside the blockchain. The proof of authentication must be stored on the blockchain.
5	Proxy Assignment	Possibility to transfer voting rights from the shareholder to the assigned proxy holder.
6	Voting	Issuing voting instructions by shareholders or proxy holders, using their tokenized voting rights. Voting can, for example, take place during the meeting time itself, any time between the record date and the end of the meeting.
7	Meeting Management	Shareholders must be able to see that their voting instructions are included in the voting outcome and actions should be traceable to their origin. Closing the meeting, either automatically or by the issuer must prevent further instructions to be issued and shareholders need to be able to calculate the voting outcome after this cut-off point. Other facilities including live streaming of the meeting and chat application can be provided.
8	Post-meeting actions	Any events that happen after the meeting independently of the rest, for example the access for auditors and regulators to review the data. Anonymity of the beneficial owners and confidentiality of their actions should be guaranteed when voting results are published.

Source: Adapted from the table on p.10 of the CSD Working Group on DLT report, using information from pp. 9-17 of this report.

Shareholders need to be able to exercise their voting rights during a certain period. After a certain cut-off point, casting votes or voting instructions is not possible anymore. As discussed in section 5.1., the minimum notice periods in Europe differ between Member States. In order to facilitate faster decision-making and to make optimal use of the blockchain technology, we suggest to harmonize these periods across countries and probably even reduce the minimum notice period for AGMs. Also the record date, i.e., the date on which the ownership stakes are determined and the voting process starts, can be set closer to the cut-off date, for example 48 hours like in the UK.

Remote voting has substantially lowered the transaction costs to shareholders in the past. With the blockchain technology, this voting manner becomes yet more transparent and reliable and thus further reduces the transaction costs to shareholders, which further stimulates (small) shareholder participation rates. Moreover, blockchain technology makes it possible for companies to scrap costly physical AGMs, and thus significantly reduce costs. Organizing a blockchain-based AGM only would decentralize the AGM in two ways: shareholders can participate in a decentralized blockchain network environment *and* the centralized yearly nature of the current AGM can be abrogated because voting items can be placed in the blockchain, and shareholders can be notified accordingly, at any time. The latter further fosters immediate decision-making by shareholders. A co-

option right for the board of directors is no longer necessary. When a new director needs to be elected, a blockchain election process can be started.

In contrast to US state law,⁶² the law in many European countries does not allow for organizing an electronic AGM only.⁶³ The option to organize virtual-only meetings led to some shareholder rebellion from smaller shareholders in the US, arguing that the physical general meeting is their only opportunity to speak to the management.⁶⁴ The blockchain can offer a discussion platform for shareholders and board members, but this platform will remain digital, for example in the form of a (video)chat (see also step 7 of the proposed process flow by the Working Group). Although previous research shows that very few shareholders actually make use of their forum function, the merits of face-to-face discussions and *ad hoc* questions may therefore disappear. Opponents of virtual meetings in the US claim that board members may ignore their questions in AGMs, and that this is much harder to do at physical meetings.⁶⁵ Here blockchain technology may offer scope for improvement: all questions from shareholders are included in the blockchain and thus become transparent, and so do the (absent) answers of the corporate board. Moreover, shareholders are not limited to the traditional duration of the AGM, but can be enabled to ask questions during a longer period, for example from the record date onwards. In this way, in contrast to what the opponents of virtual-only meetings suggest, blockchain technology may actually enhance the forum function of the AGM to shareholders.⁶⁶ Nonetheless, a recent survey of ISS (Institutional Shareholder Services) shows that a majority of institutional investors are at least hesitant about virtual-only meetings.⁶⁷ They fear the company would cherry-pick favourable questions. However, blockchain can

⁶² According to Fontenot, approximately half of the US states, including Delaware, allow for virtual-only meetings. Fontenot outlines the legal landscape of these virtual-only meetings and their use in practice. See Lisa A. Fontenot, "Public Company Virtual-Only Annual Meetings", 73 *The Business Lawyer* 1, Winter 2017-2018.

⁶³ The Belgian Companies Code requires the company to organize an AGM in the municipality provided in the articles of association (Article 552 Belgian Companies Code). A similar provision can be found in the Dutch Civil Code (Book 2: 116 Dutch Civil Code).

⁶⁴ See Attracta Mooney "Nuns tell companies to get real over virtual AGMs" (*The Financial Times*, 20 October 2017), <<https://www.ft.com/content/cce89ddc-b4eb-11e7-a398-73d59db9e399>> accessed 1 December 2017. In addition, also some institutional investors and other parties are opponents to virtual-only meetings. See Lisa A. Fontenot, "Public Company Virtual-Only Annual Meetings", 73 *The Business Lawyer* 1, Winter 2017-2018.

⁶⁵ See Attracta Mooney "Nuns tell companies to get real over virtual AGMs" (*The Financial Times*, 20 October 2017), <<https://www.ft.com/content/cce89ddc-b4eb-11e7-a398-73d59db9e399>> accessed 1 December 2017.

⁶⁶ Besides, one may ask the question whether the term "virtual general meeting" would be the right one for blockchain-based shareholder involvement.

⁶⁷ ISS, "2017-2018 ISS Global Policy Survey Summary of Results", (ISS, 25 September 2017) <<https://www.issgovernance.com/file/policy/2017-2018-iss-policy-survey-results-report.pdf>> accessed 1 December 2017. Following Steven M. Haas and Charles L. Brewer, "A Practical Guide to Virtual-Only Shareholder Meetings", (*Harvard Law*, 17 November 2017) <<https://corpgov.law.harvard.edu/2017/11/17/a-practical-guide-to-virtual-only-shareholder-meetings/>> accessed 1 December 2017. Also see Hunton & Williams, "Making the Switch: A Company's Guide to Virtual-Only Shareholder Meetings", (*Hunton & Williams Client Alert*, November 2017) <<https://information.hunton.com/34/2143/uploads/companys-guide-virtual-only-shareholder-meetings.pdf>> accessed 1 December 2017.

easily manage this issue. This offers interesting avenue for further research on the merits and demerits of full virtuality.⁶⁸

Lastly, we would like to emphasise that the CSD Working Group still assigns a large role to intermediaries in its proposed process flow, and therefore undermines the potential of blockchain technology. In case ownership over shares can be transferred in a blockchain environment as well, there is no need for any central intermediary anymore.^{69 70}

5.4. Blockchain Shareholder Voting Initiatives⁷¹

Blockchain technology in the field of shareholder voting is still in an early, exploratory phase, but some recent initiatives have shown that blockchain technology in this area is definitely feasible.⁷² In this section we discuss and compare these initiatives. However, it should be noted that most of these initiatives are announced via press releases, not (yet) providing detailed information on how the blockchain technology is used in these technologies and the related experiences.

During its 'Open Day 2015' IT Conference, Deutsche Börse Group presented its corporate voting proxy voting prototype, a 'browser-based' software prototype that uses a private blockchain.⁷³ The interface of the browser-based software shows the voting items and voting options 'yes', 'no' and 'abstain' to shareholders, including the option to delegate voting to a proxyholder using the wallet address of this person. However, after revealing the construction of this early prototype on shareholder voting, there was no further

⁶⁸ See Informal Company Law Expert Group (ICLEG) Report on Digitalisation in Company Law of the Informal Company Law Expert Group <http://ec.europa.eu/justice/civil/files/company-law/icleg-report-on-digitalisation-24-march-2016_en.pdf> accessed 1 December 2017.

⁶⁹ See Vice Chancellor J. Travis Laster, "The Block Chain Plunger: Using Technology to Clean Up Proxy Plumbing and Take Back the Vote Available", (Keynote Speech Council of Institutional Investors, Chicago 29 September 2016: 10-16) <http://www.cii.org/files/09_29_16_laster_remarks.pdf> accessed 1 December 2017.

⁷⁰ Examples like the t0 platform of Overstock.com, where this American internet retailer issued its preferred stock in December 2016, show that this is indeed feasible. See Overstock.com, "t0 platform successfully employed in the world's first public issuance of a blockchain equity" (Overstock.com, 22 December 2016), < <http://investors.overstock.com/mobile.view?c=131091&v=203&d=1&id=2231332>> accessed 1 December 2017.

⁷¹ The authors thank Greta Krasteva for providing research assistance for section 5.4 of this contribution.

⁷² In contrast to shareholder voting blockchain applications, there are numerous stock exchanges that are looking into blockchain technology for stock trading processes in order to reduce transaction costs in a secure manner, including for example Nasdaq, Australian Stock Exchange, Japan Exchange Group, Deutsche Börse, London Stock Exchange and Moscow Exchange. For an overview, see Prableen Bajpai, "How Stock Exchanges Are Experimenting With Blockchain Technology" (*Nasdaq*, 12 June 2017), <<http://www.nasdaq.com/article/how-stock-exchanges-are-experimenting-with-blockchain-technology-cm801802>> accessed 1 December 2017.

⁷³ See Deutsche Börse, "Open Day 2015 Blockchain technology", <<http://www.mds.deutsche-boerse.com/blob/10304/649c21aa656ba788026f9d371caa557f/blockchain-technology-data.pdf>> accessed 1 December 2017.

disclosure on these developments. In June 2017, Deutsche Börse Group announced to focus on market settlement instead.⁷⁴

The Nasdaq⁷⁵ pilot of e-voting in Estonian AGMs was the first to apply blockchain technology to corporate voting in practice. In February 2016, Nasdaq announced, in cooperation with the fully digital Estonian government, this blockchain based e-voting application that allows shareholders that hold shares in companies listed on the Tallinn Stock Exchange to vote remotely in AGMs.⁷⁶ The pilot highly relied on the Estonian e-residency program. For example, secure remote identification was possible using the secure digital IDs.⁷⁷ On 23 January 2017, Nasdaq announced that, according to the company, the AGM blockchain pilot in Estonia was a success and that a Proof of Concept (PoC) was established.⁷⁸ Besides Nasdaq, for example also the ADX, the Abu Dhabi Securities Exchange, started exploring blockchain technology for shareholder voting in 2016. In spring 2017 it announced that the blockchain technology was used to organize the shareholder e-voting in AGMs of six listed companies.⁷⁹ In addition, also the Russian CSD, the National Settlement Depository (NSD), which takes part in the CSD Working Group, announced in 2016 that it had tested an e-proxy voting system prototype using blockchain technology.⁸⁰ Stating that existing blockchain technology did not ensure complete confidentiality during the prototyping stage, NSD, together with DataArt, developed a solution using 'special encryption techniques' implemented on the Hyperledger Fabric platform.⁸¹

⁷⁴ See Michael Del Castillo, "Deutsche Börse Reveals Three 'Pillars' of Its Pervasive Blockchain Integration" (*Coindesk*, 6 June 2017), <<https://www.coindesk.com/deutsche-borse-reveals-three-pillars-pervasive-blockchain-integration/>> accessed 1 December 2017. However, note that neither press releases nor the 2016 and 2015 annual reports of Deutsche Börse explicitly mention this change of focus.

⁷⁵ Besides, the e-voting pilot was not the first engagement of Nasdaq in blockchain technology; on 30 December, 2015 it announced that its Linq blockchain technology was successfully used to complete and record a private securities transaction by Chain.com.

⁷⁶ Nasdaq, "Nasdaq's Blockchain Technology to Transform the Republic of Estonia's E-Residency Shareholder Participation", (*Nasdaq*, 12 February 2016). <<http://ir.nasdaq.com/releasedetail.cfm?releaseid=954654>> accessed 1 December 2017.

⁷⁷ Estonia is currently the only country that has a fully digital government that allows citizens to cast their ballots online in Estonian political elections. See: , accessed in June, 2017). In addition, the e-residency program allows people from other countries to setup (location independent) companies online. See Nanette Byrnes, "This Tiny Country Thinks Virtual Citizens Will Make It Rich" (*MIT Technology Review*, 27 July 2016) <<https://www.technologyreview.com/s/601998/this-tiny-country-thinks-virtual-citizens-will-make-it-rich/>> accessed 1 December 2017.

⁷⁸ Richard Demarinis, "Is Blockchain the Answer to E-Voting? Nasdaq Believes so", (*Nasdaq*, 23 January 2017) <<http://ir.nasdaq.com/releasedetail.cfm?releaseid=954654>> accessed 1 December 2017.

⁷⁹ See Finextra, "ADX showcases blockchain voting at AGMs" (*Finextra*, 9 October 2017), <<https://www.finextra.com/pressarticle/71057/adx-showcases-blockchain-voting-at-agms>> accessed 1 December 2017.

⁸⁰ See NSD, "National Settlement Depository Tested a Blockchain-Based E-Proxy Voting Prototype", (*NSD*, 28 April 2016), <<https://www.nsd.ru/en/press/ndcnews/index.php?id36=628973>> accessed 1 December 2017.

⁸¹ See NSD, "NSD makes it possible to maintain financial privacy in blockchain use", (*NSD*, 17 October 2017) <<https://www.nsd.ru/en/press/pubs/index.php?id36=633655>> accessed 1 December 2017.

In April 2017, TMX Group (the Toronto Stock Exchange operator) announced the development of a blockchain application for shareholding voting together with the listed company Accenture Plc,⁸² but these parties did not (yet) disclose whether the prototype was a success. In spring 2017, TMX Group stated that regulatory approval was needed before engaging in testing the prototype.⁸³

Beside TMX Group, Broadridge, a large proxy voting business, also pioneered with the proxy voting progress process in cooperation with J.P. Morgan, Santander Investment and Northern Trust in April 2017. Information on how the process was organized is scarce but it was announced to have been successfully run in the shadow of an AGM: ‘The pilot was run in support of a corporate issuer's annual general meeting (AGM) and included participation of Santander Investment, the issuer's agent. The pilot was run in parallel of the AGM, with the blockchain being utilized to produce a ‘shadow’ digital register of the proxy voting taking place in the traditional model.’⁸⁴ It seems that Broadridge will explore the use of blockchain based proxy voting further with several US listed companies in 2018.⁸⁵

Another initiative that was recently announced in the media is the collaboration between the Central Securities Depository of Poland and IBM to use blockchain technology for shareholder voting in AGMs. This initiative disclosed more information on the used blockchain technology: the IBM Blockchain Platform.⁸⁶ In its White Paper it is stated that the blockchain uses Linux Foundation’s Hyperledger Fabric and Hyperledger Composer and is not an (entirely) unpermissioned ledger, as participants are known to the network, but confidential communications are made possible through particular channels.⁸⁷

The most recent publicly announced initiatives, at least to our knowledge, are the collaboration between Strate, the South African CSD, and Nasdaq on remote shareholder

⁸² See Solarina Ho, “Canada’s TMX taps blockchain for shareholder voting technology”, (*Reuters*, 6 April 2017), <<https://www.reuters.com/article/cbusiness-us-tmx-grp-blockchain-idCAKBN1782BV-OCABS>> accessed 1 December 2017.

⁸³ See Solarina Ho, “Canada’s TMX taps blockchain for shareholder voting technology”, (*Reuters*, 6 April 2017), <<https://www.reuters.com/article/cbusiness-us-tmx-grp-blockchain-idCAKBN1782BV-OCABS>> accessed 1 December 2017.

⁸⁴ Broadridge Financial Solutions, “Broadridge, J.P. Morgan, Northern Trust and Banco Santander Successfully Complete Pilot of Blockchain-Based Proxy Vote Solution” (*Broadridge Financial Solutions*, 11 April 2017), <<http://www.prnewswire.com/news-releases/broadridge-jp-morgan-northern-trust-and-banco-santander-successfully-complete-pilot-of-blockchain-based-proxy-vote-solution-300437857.html>> accessed 1 December 2017>.

⁸⁵ See Bloomberg BNA, “Broadridge Tests Blockchain for Corporate America’s Ballots” (*Bloomberg BNA*, 14 February 2018, <<https://www.bna.com/broadridge-tests-blockchain-n57982088782/>>). Note that we note able to find any press release from Broadridge that confirmed this statement.

⁸⁶ Slawomir Panasiuk, “How Poland’s Central Securities Depository Uses IBM Blockchain to Revolutionize AGM Voting” (*IBM*, 13 October 2017), <<https://www.ibm.com/blogs/think/2017/10/poland-blockchain/>> accessed 1 December 2017.

⁸⁷ IBM, “IBM Blockchain Platform Technical Overview” (*IBM*, November 2017), <<https://www-01.ibm.com/common/ssi/cgi-bin/ssialias?htmlfid=KUW12555USEN&>> accessed 1 December 2017.

voting in South Africa, the ‘successful scaled pilot’⁸⁸ of AST Financial and the Vote room of the Dutch custodian bank KAS Bank. With respect to the initiative of Strate and Nasdaq, this blockchain solution will be (partly) based on the PoC from the Estonian pilot.⁸⁹ Interestingly, Nasdaq’s press release refers to the initiative as ‘an agreement to deliver a new blockchain solution [...] based on the [...] PoC’⁹⁰, suggesting that it is in a further stage than the earlier prototypes. After announcing its plan to work on a blockchain proxy voting technology in May 2017,⁹¹ AST Financial announced on 13 December 2017 that they successfully completed a ‘scaled pilot of its blockchain-enabled proxy voting and tabulation network, developed through its strategic partnership with blockchain specialist firm NuArca’⁹². AST Financial claims that their pilot included ‘more than 400 securities and 8 million shareholders representing more than 1 trillion shares’ and it reached a speed of 100 transactions per second.⁹³ KAS Bank also sees possibilities for using blockchain technology in shareholder proxy voting services, claiming that it would make voting ‘safer, faster and more transparent’⁹⁴. KAS Bank’s ‘Vote room team’ is currently developing a first prototype of this blockchain based proxy voting service, which they have tested with a ‘few customers’ in January 2018.⁹⁵

Table 5 summarizes the ten aforementioned AGM blockchain initiatives:

⁸⁸ AST Financial, “AST Completes Successful Pilot of Blockchain-based Solution for Proxy Voting, Processing at Volumes Simulating the Largest Proxy Campaigns”, (AST Financial, 13 December 2017, <<https://www.astfinancial.com/us-en/news-events/newsroom/news/ast-completes-successful-pilot-of-blockchain-based-solution-for-proxy-voting-processing-at-volumes-simulating-the-largest-proxy-campaigns/>>).

⁸⁹ Nasdaq, “Nasdaq to Deliver Blockchain e-Voting Solution to Strate” (*Nasdaq*, 22 November 2017), <<http://www.nasdaq.com/press-release/nasdaq-to-deliver-blockchain-evoting-solution-to-strate-20171122-00117>> accessed 1 December 2017.

⁹⁰ Nasdaq, “Nasdaq to Deliver Blockchain e-Voting Solution to Strate” (*Nasdaq*, 22 November 2017), <<http://www.nasdaq.com/press-release/nasdaq-to-deliver-blockchain-evoting-solution-to-strate-20171122-00117>> accessed 1 December 2017.

⁹¹ For instance, see Nasdaq, “Blockchain Comes To Corporate Governance With AST Proxy Voting”, (*Nasdaq*, 18 May 2017), <<https://www.nasdaq.com/article/blockchain-comes-to-corporate-governance-with-ast-proxy-voting-cm791465>>).

⁹² AST Financial, “AST Completes Successful Pilot of Blockchain-based Solution for Proxy Voting, Processing at Volumes Simulating the Largest Proxy Campaigns”, (AST Financial, 13 December 2017, <<https://www.astfinancial.com/us-en/news-events/newsroom/news/ast-completes-successful-pilot-of-blockchain-based-solution-for-proxy-voting-processing-at-volumes-simulating-the-largest-proxy-campaigns/>>).

⁹³ AST Financial, “AST Completes Successful Pilot of Blockchain-based Solution for Proxy Voting, Processing at Volumes Simulating the Largest Proxy Campaigns”, (AST Financial, 13 December 2017, <<https://www.astfinancial.com/us-en/news-events/newsroom/news/ast-completes-successful-pilot-of-blockchain-based-solution-for-proxy-voting-processing-at-volumes-simulating-the-largest-proxy-campaigns/>>).

⁹⁴ See KAS Bank, “Kas lab” (KAS Bank, <<https://kaslab.nl/blockchain/>>). Also see Het Financieele Dagblad, “Blockchain, robots en innovatielab voor 200 jaar oude Kas Bank” (FD, 13 November 2017, <<https://fd.nl/beurs/1227129/blockchain-robots-en-innovatielab-voor-200-jaar-oude-kas-bank>>).

⁹⁵ See KAS Bank, “Kas lab” (KAS Bank, <<https://kaslab.nl/blockchain/>>).

Table 5: AGM Blockchain Initiatives

<i>Founder</i>	<i>Start project</i>	<i>What?</i>	<i>Information on the technology used?</i>	<i>Launched in practice?</i>	<i>Experiences in practice made known to the public?</i>
1. Deutsche Börse Group	2015	Prototype	'browser-based' software on a private blockchain, no whitepaper	Unknown	No, only indicated that the firm 'took a step back' ⁹⁶
2. Nasdaq and Estonian Government	2016	Prototype	No, but Nasdaq cooperated with the blockchain startup Chain and made use of the e-Residency platform of the Estonian government. The project seems to have a lot in common with the proposed process flow of the Working Group (see table 4). ⁹⁷ Several articles suggest that Nasdaq used the original (open) Bitcoin blockchain. ⁹⁸	Different AGMs in Estonia, including the AGM of LHV Group.	Nasdaq announced that the pilot was successful and that they have established a Proof of Concept (PoC). ⁹⁹
3. NSD	2016	Prototype	It is based on the NXT platform and uses ISO 20022 international standard for messaging. NSD cooperates with DSX Technologies and	The prototype was tested in bondholder meetings.	Yes, they encountered privacy issues, but solved this problem in cooperation

⁹⁶ See Michael Del Castillo, "Deutsche Börse Reveals Three 'Pillars' of Its Pervasive Blockchain Integration" (*Coindesk*, 6 June 2017), <<https://www.coindesk.com/deutsche-borse-reveals-three-pillars-pervasive-blockchain-integration/>> accessed 1 December 2017. The article mentions that Deutsche Börse Group is developing three projects to move the vast majority of its post-trade services on a blockchain.

⁹⁷ For instance, Nasdaq indicates that "The Estonia e-voting project was an opportunity to use the blockchain's immutable transaction ledger technology in a different way. The system uses the blockchain in the traditional way to record the ownership of securities as reported by the CSD. Based on those holdings, the system also issues voting right assets and voting token assets for each shareholder. A user may spend voting tokens to cast their votes on each meeting agenda item if they also own the voting right asset. This model successfully demonstrated how a blockchain could be used for something other than transaction settlement." See Richard Demarinis, "Is Blockchain the Answer to E-Voting? Nasdaq Believes so", (*Nasdaq*, 23 January 2017) <<http://ir.nasdaq.com/releasedetail.cfm?releaseid=954654>> accessed 1 December 2017. <http://business.nasdaq.com/marketinsite/2017/Is-Blockchain-the-Answer-to-E-voting-Nasdaq-Believes-So.html>

⁹⁸ For instance, see Giulio Prisco, "Nasdaq, LHV Bank, Technology Startups Develop Blockchain-Based Fintech Applications in Estonia", (*Bitcoin Magazine*, 18 November 2015), <<https://bitcoinmagazine.com/articles/nasdaq-lhv-bank-technology-startups-develop-blockchain-based-fintech-applications-in-estonia-1447870921/>> accessed 1 December 2017.

⁹⁹ Nasdaq also published some enthusiastic user quotes. See Richard Demarinis, "Is Blockchain the Answer to E-Voting? Nasdaq Believes so", (*Nasdaq*, 23 January 2017) <<http://ir.nasdaq.com/releasedetail.cfm?releaseid=954654>> accessed 1 December 2017.

			the project code is open-source.		with DataArt in 2017. ¹⁰⁰
4. ADX	2016	Prototype	No	Yes, six AGMs of listed companies.	No
5. TMX Group	2017	Prototype	No	Unknown	No
6. Broadridge, J.P. Morgan, Northern Trust and Banco Santander	2017	Prototype	Only that it is 'built on an Ethereum blockchain platform'.	Yes, parallel to the AGM of a corporate issuer with participation of Santander Investment. ¹⁰¹	Only stating that 'it was a success' ¹⁰²
7. IBM and CSD Poland	2017	Prototype	It is build on the IBM Blockchain Platform, white paper available.	Unknown	No
8. Nasdaq and Strate	2017	'solution'	The PoC established in the Estonian pilot.	Not yet	No
9. AST Financial and NuArca	2017	'scaled pilot'	'The proxy voting network utilizes Hyperledger Fabric and will be deployed as a cloud service'. The project is called 'TransactChain'.	Yes, and it will launch in March 2018.	Yes, indicating that is was a 'successful pilot', also in terms of speed and scale.
10. KAS Bank	2017	Prototype	Unknown	Not yet (only a 'few customers').	No

Note to table: the shareholder e-voting blockchain initiatives are researched until 15 February 2018.

To conclude, the recent developments on the use of blockchain technology for shareholder voting show that the modernization of the AGM is possible. Although most of them are still in an exploratory stage and many initiatives do not share technology and experiences with the public, the initiatives of, for example, Nasdaq and NSD show that the needed conditions for shareholder voting, including the verification of transactions, security and privacy, can be met.

Interestingly, intermediaries like several central securities depositories, are playing a large role in these initiatives – we question how much involvement of these intermediaries is needed when shareholder rights can be exercised on a decentralized peer-to-peer network.

¹⁰⁰ See NSD, "NSD makes it possible to maintain financial privacy in blockchain use", (*NSD*, 17 October 2017) <<https://www.nsd.ru/en/press/pubs/index.php?id36=633655>> accessed 1 December 2017.

¹⁰¹ Broadridge, "Broadridge, J.P. Morgan, Northern Trust and Banco Santander Successfully Complete Pilot of Blockchain-Based Proxy Vote Solution", (*Broadridge*, 11 April 2017), <<https://www.broadridge.com/press-release/2017/broadridge-j-p-morgan-northern-trust-and-banco-santander-complete-proxy-vote-solution>> accessed 1 December 2017.

¹⁰² Broadridge, "Broadridge, J.P. Morgan, Northern Trust and Banco Santander Successfully Complete Pilot of Blockchain-Based Proxy Vote Solution", (*Broadridge*, 11 April 2017), <<https://www.broadridge.com/press-release/2017/broadridge-j-p-morgan-northern-trust-and-banco-santander-complete-proxy-vote-solution>> accessed 1 December 2017.

6. Conclusions

In this contribution we discuss the opportunities offered by that blockchain and smart contracting technology can offer new solutions for the classical agency problem in corporate governance and provide tools improving governance processes. Although a fully decentralized organisation may not be an efficient solution yet, as it has proven to still suffer from different (governance) problems, this article has outlined that blockchain technology actually can play an important role in the modernization process of the AGM. We signalled that blockchain technology can lower shareholder voting costs substantially and offers opportunities for enhancing the AGM's forum function. In addition, it can also decrease the organisation costs for companies and increase the speed of decision-making, making the AGM a fast and lean corporate organ.

The recent prototypes of blockchain-based AGMs, of which some were already tested in practice, show that this modernization of the AGM is indeed feasible in practice and perhaps just around the corner. Given the large opportunities we expect more initiatives to be launched soon, probably before this contribution's ink is dry. Nonetheless, it is important to recognize that the blockchain-based AGM would also raise important corporate legal questions, including whether it is desirable to abolish the physical classical AGM or let it coexist besides the blockchain-based one. And if it is desirable to organize decentralized AGMs on the blockchain only, how much of the forum function then be incorporated in this technology? Record dates and notice periods have to be reconsidered, just like the role of intermediaries in the (cross-border) chains. Not the least, are shareholders and companies ready to move to non-physical meetings? Recent evidence shows that even most institutional investors are not yet in favour of full virtuality, offering room for a step-by-step process.¹⁰³

¹⁰³ Cf. *supra*, nt. 67. ISS, "2017-2018 ISS Global Policy Survey Summary of Results", (ISS, 25 September 2017) <<https://www.issgovernance.com/file/policy/2017-2018-iss-policy-survey-results-report.pdf>>, accessed 1 December 2017.

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