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**Enhancing Corporate Governance: Exploring Blockchain
Solutions in General Meetings of Shareholders under Portuguese Law**

Dissertation to obtain a Master's Degree in Law, in the
specialty of Business Law and Technology

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September, 2023

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ACKNOWLEDGMENTS

To Professor Fabrizio Esposito, for all the guidance and encouragement,

To Bruna, Mariana and Maria, and to my incredible friends, for providing laughter, solace and constant motivation during these months,

To my family, who, through countless sacrifices, always supported all my aspirations. Especially, to my grandmother Júlia, who celebrated all my accomplishments and would've cherished seeing this one come to life,

Thank you.

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ABBREVIATIONS

AGM – Annual General Meeting

ASX – Australian Securities Exchange

BaaS – Blockchain-As-A-Service Cloud Solutions

BEV – Blockchain Enabled E-Voting

CC – Portuguese Civil Code (Código Civil)

CCA – Portuguese Commercial Companies Act (Código das Sociedades Comerciais)

CEA – Commodity Exchange Act

CFTC – Commodity Futures Trading Commission

DAO – Decentralized Autonomous Organizations

DLT – Distributed Ledger Technology

GP - General Partnerships

KYC – Know Your Customer

MS – Member-States

PSC – Portuguese Securities Code (Código dos Valores Mobiliários)

SA – Sociedades Anónimas

SRD – Shareholder Rights Directive

ZKP – Zero-Knowledge Proofs

ABSTRACT

Conventional corporate governance frameworks have historically been characterized by centralization and hierarchical structures, marked by a clear separation of ownership and control. While this separation has its merits, it also presents inherent challenges. In pursuit of effective corporate governance, it is imperative to provide shareholders with a diverse array of tools and mechanisms, empowering them to actively monitor and shape corporate decision-making processes. General Meetings are essential in this regard, offering a crucial door for shareholders to exert influence over corporate decision-making. Nonetheless, the traditional model of General Meetings currently encounters various flaws related to transparency, verification, and shareholder identification, which are present in the voting process *per se*, in proxy voting, and in voting verification. In addition, economic burdens related to corporate monitoring imposed on shareholders are making this mechanism function sub-optimally. Recent developments in blockchain technology have attracted the attention of both legal academics and tech experts as a potential solution to these corporate governance challenges, as blockchain's decentralized, autonomous and tamper-proof transaction records promise enhanced transparency, accuracy, and cost-efficiency within corporate decision making in commercial companies. This dissertation will thus focus on assessing whether and how Portuguese commercial companies can leverage emerging blockchain applications such as Decentralized Autonomous Organizations (DAO) and Blockchain Enabled E-Voting (BEV) to address the specific issues associated with the traditional model of the General Meeting. For this purpose, it will suggest the creation of a hybrid corporate entity/body, based on the implementation of a DAO structure within a legally incorporated company and the use of BEV for corporate voting. It will conclude that, although legally possible and advantageous in theory, the deployment of these technologies in a corporate setting ought to still overcome various legal challenges and structural limitations.

Keywords. Corporate Governance, General Meeting of Shareholders, Blockchain, Decentralised Autonomous Organizations, DAOs, Blockchain Enabled E-Voting.

RESUMO

Os enquadramentos legislativos tradicionais do governo das sociedades têm sido historicamente caracterizados pela centralização e por estruturas hierárquicas, marcadas por uma clara separação entre titularidade e controlo. Embora esta separação tenha os seus méritos, também apresenta desafios inerentes. Na prossecução de uma governação empresarial eficaz, é imperativo proporcionar aos acionistas um conjunto diversificado de instrumentos e mecanismos que lhes permitam acompanhar ativamente e influenciar as decisões empresariais. As Assembleias Gerais são um instrumento essencial a este respeito, constituindo uma porta crucial para os acionistas exercerem influência sobre o processo de tomada de decisões. No entanto, o modelo tradicional das Assembleias Gerais depara-se atualmente com várias falhas relacionadas com a transparência, a verificação e a identificação dos acionistas, as quais surgem tanto no processo de votação em si, como no voto por representação, e na posterior verificação do voto. Além disso, os encargos económicos impostos aos acionistas associados à monitorização das decisões empresariais fazem com que este mecanismo funcione de forma subótima. Desenvolvimentos recentes na área da tecnologia blockchain têm atraído a atenção de académicos e especialistas na área, que encaram esta tecnologia como uma solução potencial para estes desafios, visto que os registos de transações descentralizados, autónomos e imutáveis prometem uma maior transparência, precisão, e eficiência a nível de custos no processo de tomada de decisões das sociedades comerciais. A presente dissertação centrar-se-á, assim, em avaliar se e como as sociedades comerciais portuguesas poderão utilizar as aplicações emergentes da blockchain, nomeadamente as Organizações Autónomas Descentralizadas (DAO) e o Blockchain Enabled E-Voting (BEV), para resolver as falhas associadas ao modelo tradicional da Assembleia Geral de acionistas. Para o efeito, será sugerida a criação de uma entidade societária híbrida, baseada na implementação de uma estrutura de DAO numa sociedade comercial legalmente incorporada e na utilização de BEV para votação em sede de Assembleia Geral. Esta dissertação concluirá que, apesar de legalmente possível e teoricamente vantajosa, a implementação destas tecnologias num contexto empresarial deverá ainda ultrapassar diversos desafios legais e limitações estruturais.

Palavras-chave. Governo das Sociedades, Assembleia Geral de Sócios, Organizações Autónomas Descentralizadas, DAOs, Blockchain Enabled E-Voting.

1. INTRODUCTION

Traditional corporate governance is characterized by centralized organizations that operate within hierarchical relationships: shareholders, the board of directors and employees. In corporate law, shareholders are the “owners” of the company and mostly control it by voting in company-related matters in the General Meeting, while the board of directors and the corporate management oversee the day-to-day operations of the company.¹

It is acknowledged that the division between ownership and control brings forth advantages, such as specialized decision-making by management, complemented by the risk-taking tendency of shareholders. However, due to that separation of power, shareholders become owners who do not run their company. That poses various issues.

Effective corporate governance ought to encourage board members to act in the best interests of the shareholders and other stakeholders; similarly, it ought to also motivate shareholders to actively engage in the decision-making processes. In this light, various corporate governance instruments are provided to shareholders to monitor and influence boards and their decision-making processes.

General Meetings, in particular, play a significant role in this regard, offering an essential door for shareholders to exert influence over the corporate decision-making, for facilitating monitoring and active engagement.

However, shareholders are confronted with various problems concerning the outdated model of General Meetings, which is subject to many procedural flaws, having to do with “transparency, verification and identification”.² Essential pillars of a sound corporate governance framework, these elements empower shareholders with the essential tools for well-informed decision-making and establish a mechanism through which management can be held responsible for their actions. Still, the integrity of these vital components frequently faces disruption.

¹ PANISI, Federico, BUCKLEY, Ross P., & ARNER, Douglas W., “Blockchain and Public Companies: A Revolution in Share Ownership Transparency, Proxy Voting and Corporate Governance?”, *Stanford Journal of Blockchain Law & Policy*, 2(2), 2019, 189-220. p.1.

² FUNG, Benjamin, “The Demand and Need for Transparency and Disclosure in Corporate Governance”, *Universal Journal of Management*, 2(2), 72-80, 2014.

In recent years, experts in both the legal and blockchain fields have been asserting that emerging blockchain applications hold the potential to address these corporate challenges. These applications appear to harness the technology's inherent ability to create decentralized and tamper-proof transaction records, thereby ensuring transparency, accuracy and reducing operational costs within commercial companies.

While EU Regulation regarding shareholders' rights is moving forward in the digitalization of some corporate voting proceedings to improve shareholder engagement, introducing blockchain technology within commercial companies is a largely unexplored venture, both in theory and in practice. Yet, this quasi-dystopian idea is getting closer to corporate reality by the day, with several companies, stock exchanges and even NGOs already delving into the potential of these technologies.

In this dissertation, it will be assessed whether and how Portuguese companies which issue shares admitted to trading on a regulated market could take advantage of these blockchain applications, namely a Decentralized Autonomous Organizations (DAO) and Blockchain Enabled E-Voting (BEV), to mitigate the procedural flaws of the classical General Meeting of Shareholders (General Meeting).

In Portugal, the mentioned companies are classified as “Sociedades Anónimas” (SA). Even though not all SA are issuers of shares admitted to trading on a regulated market, for the purposes of this dissertation, only SA which trade their shares on a regulated market will be considered. For convenience, they will also be referred to as “publicly listed companies”.

Aware that this dissertation cannot, and should not, cover all the matters relating to blockchain technologies and corporate governance, it will still refer to questions and concepts that, although lateral to the focus of this study, are indispensable for a full analysis and understanding of the subject under consideration.

This dissertation is organized as follows. Chapter 2 provides an overview of the general flaws of the current model of the General Meeting of Shareholders. Chapter 3 then delves into blockchain technologies and DAOs, explaining how they function, their development in the markets and how they can be incorporated to benefit corporate practices. Chapter 4 then attempts at combining both law and technology and study whether this incorporation would be possible and adequate under Portuguese Law. At last, Chapter 5 concludes this dissertation.

2. THE TRADITIONAL GENERAL MEETING AND ITS FLAWS

In traditional corporate law, General Meetings serve as the legally stipulated forum for shareholders to become informed on corporate issues, interact with one another, directly engage with the company's board of directors and ultimately make decisions.³

In General Meetings, numerous relevant corporate decisions are subject to shareholder approval, such as changes to the company's Articles of Association (Article 85.º, n.º1 of the CCA), the distribution of dividends (Article 31.º of the CCA), the election, remunerations and destitution of directors (Article 391.º, 399.º and 403.º of the CCA, respectively), the approval of mergers and acquisitions (Article 103.º and 120.º of the CCA), the annual accounts (Article 65.º, n.º1 and 376.º, n.º1, e) of the CCA), among others.

As schematized by Professor Anne Lafarre,⁴ the General Meeting serves shareholders through three key functions: (i) information dissemination to keep them informed, (ii) provision of a platform/forum for discussions and inquiries, and (iii) enabling of collective decision-making.

Despite these essential functions, and in parallel with what we can observe in the rest of Europe, as well as in the UK,⁵ the provisions governing the procedures and functions of the General Meeting in the current Portuguese Commercial Companies Act (hereinafter: CCA) are still very similar to those that can be found in the CCA of 1886 (i.e., the first CCA). The exception consist mainly in the changes introduced by Decree-Law n.º 76-A/2006, de 29/03 in Articles 377.º and Article 384.º, regarding the utilization of telematic means for calling the Meeting and voting by postal correspondence.

Due to this inaction by the legislator in the last decades, the model of the General Meeting has become static and outmoded.

It can be further argued that the three fundamental functions of the General Meeting briefly mentioned – namely, and by order referred, information dissemination,

³ VAN DER ELST, Christoph, "Revisiting Shareholder Activism at AGMs: Voting Determinants of Large And Small Shareholders", European Corporate Governance Institute (ECGI) Finance Working Paper No. 311, 2011., p.2.

⁴ LAFARRE, Anne & VAN DER ELST, Christoph, "Bringing the AGM to the 21st century: Blockchain and Smart Contracting Tech for Shareholder Involvement", European Corporate Governance Institute (ECGI) Law Working Paper No. 358, 2017, p.4.

⁵ Ibid.

discussion, and decision-making – are today somewhat shadowed by 21st century technologies.

The technologies which exist today are undoubtedly capable of doing much more to enhance and democratize the General Meeting than merely allowing the shareholders to cast their votes via email, or allow the company to keep an “electronic minutes book”, as allowed by Article 39.º, n.º1 of the Portuguese Commercial Code.

2.1. Decision-Making flaws

The decision-making function of the General Meeting, often regarded the central function of the General Meeting, is the most affected by the reservations and skepticism of the legislator.

For shareholders, it is paramount that the voting process is efficient and transparent and that it delivers accurate and fast results, so that they can rely on these results in a legally binding way. Yet, historically, there have been many global challenges with the process of corporate voting through which the shareholders make corporate decisions.

In an acclaimed study from 2008 regarding corporate voting in American companies,⁶ professors Kahn and Rock identified many pathologies in the voting process, such as imprecise shareholder lists, delays and omissions in ballot distribution, deficient vote tabulation and failures in the verification of votes, some of which are still a reality today.

A more recent study from 2019⁷ found more deficiencies in the decision-making function of the General Meeting regarding the current architectures of proxy-voting systems. Utilizing proxy voting, shareholders are able to delegate their voting rights to a designated proxy, allowing them to cast votes on their behalf and avoiding the need for their physical presence at the Meeting.

⁶ KAHAN, Marcel & ROCK, Edward B., "The Hanging Chads of Corporate Voting", Faculty Scholarship at Penn Carey Law, 164, 2008., p.1248.

⁷ PANISI, Federico, et al., "Blockchain and Public Companies: A revolution in Share Ownership Transparency, Proxy Voting and Corporate Governance?", p.8.

While the proxy voting system revolutionized corporate governance, allowing companies to reach a voting quorum without having all the shareholders physically present at the place of the Meeting, it has been found that, due to the large number of shareholders of publicly held companies using proxy voting, some beneficial shareholders (i.e., shareholders who hold their shares through an intermediary, such as a broker, custodian, or financial institution) frequently encounter delays or even complete non-receipt of proxy materials.⁸ As a result, they are unable to cast their votes and are left deprived of their rights. This flawed system thus contributes to a significant number of uncounted and/or miscounted votes.

The supra-mentioned study further revealed that the existing proxy-voting structures generally suffer from inexact voter lists, inadequate vote verification systems and lack end-to-end audit trails,⁹ leading to a lack of finality in the voting process (i.e., ambiguity and uncertainty in the voting outcome).

In the same light, Nasdaq¹⁰ also recently claimed that shareholders using proxy voting often do not have control over their votes and/or easy access to their voting history. Within large companies, shareholders depend on the board of directors for information, constrained by restricted access to corporate records or validation resources. Shareholders find themselves compelled to place trust in the board, frequently lacking means to independently confirm the accurate tabulation of their votes.¹¹

The 2008 vote for control of Yahoo's board serves as a clear illustration of the significant influence of some mistakes in proxy voting. While the errors did not impact the final outcome of the ballot, having two of its directors' secured approval from 80% of the shareholders, a major investor asked Broadridge to review the ballot's outcome

⁸ A set of documents that companies provide to their shareholders in preparation for a shareholder Meeting, such as the annual report, shareholder proposals, instructions for attending the Meeting,

⁹ PANISI, Federico, et al., "Blockchain and Public Companies: A revolution in Share Ownership Transparency, Proxy Voting and Corporate Governance?", p.8.

¹⁰ NASDAQ, "Is Blockchain the Answer to E-voting? Nasdaq Believes So", Nasdaq, 2017. Available at: <https://www.nasdaq.com/articles/blockchain-answer-e-voting-nasdaq-believes-so-2017-01-23>.

¹¹ COHEN, Lewis & GHEBLEH, Soraya, "On Governance: How Will Blockchain Technology Change Organizational Governance?", The Conference Board, 2018, available at: <https://www.conference-board.org/blog/environmental-social-governance/Blockchain-Organizational-Governance-Impact>.

after the vote, and, upon investigation, Yahoo disclosed that nearly 20% of the votes were misattributed.¹²

Further, the frequent lack of transparency in share ownership in publicly held companies gives rise to yet another cause of inefficiency, as it leads to confusion about what individual shareholder has the right to vote in the General Meeting taking place. As a result, over-voted ballots have emerged as recurrent problem, significantly threatening the reliability and legitimacy of decisions taken during General Meetings.¹³

In addition, and deeply connected to the complexities already mentioned, there are two substantial economic flaws of the decision-making function of the General Meeting.

The first is what can be called “rational apathy”. In continental Europe, notably, many companies have ownership concentration structures (e.g., Italy, France, Spain, Germany),¹⁴ granting substantial control to large shareholders.¹⁵ Because of this reality, small shareholders, specifically, sometimes find the costs associated with participating in the General Meeting to be excessively high and prohibitive, resulting in reluctance to cast their votes.

Every shareholder, in order to vote consciously, has to study and analyze the efforts of the board and/or the changes in the company to be voted in the General Meeting. In some cases, because of the *de jure* or *de facto* control by the large shareholders, it is rational for the minority shareholders to adopt a passive stance. They know that the final outcome of the vote in the General Meeting will remain unaltered regardless of whether they choose to participate or abstain. After assessing the costs of actively and prudently participating in the General Meeting in relation to the benefits and realizing that the potential benefits of voting are almost zero, and the act of voting itself incurs a considerable cost, individual shareholders are seldomly willing to bear this expense.¹⁶ In

¹² LASTER, Vice Chancellor J. Travis, “The Block Chain Plunger: Using Technology to Clean Up Proxy Plumbing and Take Back the Vote”, Unpublished Manuscript, Documentation of Remarks of Keynote Speech. Council of Institutional Investors, Washington, DC., 2016.

¹³ PANISI, Federico, et al., “Blockchain and Public Companies: A revolution in Share Ownership Transparency, Proxy Voting and Corporate Governance?”, p.8.

¹⁴ KIRCHMAIER, Thomas, & GRANT, Jeremy, “Corporate ownership structure and performance in Europe”, CEP Discussion Paper No. 631, 2004. p.12-14.

¹⁵ Ibid.

¹⁶ Ibid., p.7

such a scenario, their optimal course of action is to refrain from voting, reflecting a state of rational apathy.

Another related economic concern is the “free-rider problem”, which arises due to the nature of shareholder monitoring (or information acquisition through shareholder monitoring) being considered a public good.¹⁷ The characteristics of non-excludability and non-rivalry in shareholder monitoring mean that one shareholder cannot prevent others from benefiting from their monitoring efforts and consuming these benefits does not diminish the benefits for other shareholders. As a consequence, other shareholders, in particular minority shareholders, have the ability to partially free ride on the monitoring efforts of an individual shareholder. Consequently, no individual shareholder would be motivated to endure the full costs of monitoring.¹⁸ This free-rider problem leads to a substandard reduction in the provision of the public good, in this case, board monitoring.

All of these problems lead to a less than optimal voting turnout of shareholders in the General Meeting. Minority or individual shareholder turnout in continental Europe is often less than 50% and sometimes even as low as 2%.¹⁹

2.1.1. The Shareholder Rights Directive: an electronic solution

Shareholder voting and turnout rates is something that the European Commission has been worried about since the first Shareholder Rights Directive of 2007 (SRD I), which was meant to facilitate and improve shareholder voting.

The SRD I already emphasized, for instance, on the role of electronic voting for enabling shareholders to vote at a General Meeting, as well as on participation rights consisting of real-time transmission of the General Meeting or real-time two-way communication. Both solutions aim on decreasing voting and participations costs and thus decreasing shareholder apathy.

¹⁷ RAFF, Konrad, “Information externalities in corporate governance”, AFA 2012 Chicago Meetings Paper., 2011.

¹⁸ LAFARRE, Anne et al., “Bringing the AGM to the 21st century: Blockchain and Smart Contracting Tech for Shareholder Involvement”, p.8.

¹⁹ Ibid. p.7.

As showcased in recent studies, it seems that electronic voting before the General Meeting and remote attendance have since become prevailing practices for shareholders.²⁰

In a study published in 2019 focusing on French Companies,²¹ Professor Christoph Van der Elst found that the shareholder turnout rates in General Meetings did increase after the transposition of the SRD I, in 2007. It is important to note, however, that, since the SRD I introduced the possibility for shareholders to vote remotely, this turnout increase does not necessarily mean that there was an increase in the shareholders' physical attendance at the place of the Meeting. In fact, the study unveiled that "in 2018 less than 7 per cent of the shareholders were present *in personam* at the General Meeting".²²

It also concluded that the most common technique for voting in the General Meetings has become voting by mail/remote voting. It demonstrated that, while in 2011 only half of the companies received more than half of the votes by mail, "in 2018, this number soared to two thirds of the companies and, in close to 20 per cent of those companies, voting by mail stands for more than 90 per cent of the voting turnout."²³

The study further supports the belief that many shareholders and companies are already resorting not only to electronic means for voting, but also to alternative platforms, such as telephone calls, emails, in-person discussions, to exchange of viewpoints and discuss ahead and during the General Meeting.²⁴

This data noticeably reveals that shareholders and companies are welcoming to innovation and new technological possibilities.

²⁰ VAN DER ELST, Christoph, "Shareholder Engagement and Shareholder Voting Models: Two of a Different Kind Law", European Corporate Governance Institute (ECGI) Law Working Paper No. 435, 2019, p.3.

²¹ Ibid.

²² Ibid, p.9.

²³ Ibid.

²⁴ Ibid. p.18.

2.2. Discussion flaws

Although not the focus of this dissertation, it is relevant to showcase that the discussion function of the General Meeting is similarly become obsolete.

It's been argued that the adoption of remote voting methods undermines the traditional General Meeting, as it currently stands.

The General Meeting used to serve as a space for board presentations followed by debates with the shareholders. These interactions were instrumental in shaping shareholders' opinions and aiding them in making informed voting decisions. However, today less and less shareholders are attending the General Meeting physically, as observed. Despite this fact, hardly any new forums, namely digital forums, are being brought forth by companies to mitigate this issue.

As way of example, it has been evidenced by research that, currently, on average, only eight out of potentially tens of thousands of shareholders raise questions during the General Meeting.²⁵ As there are scarcely any solutions adapted to the new remote reality that would allow shareholders to participate and ask questions freely, nonparticipation increases.

2.3. Information dissemination flaws

Regarding the information dissemination function, it's established that the right to information in a General Meeting is essential for shareholders to be able to either react against the management bodies, if they become aware of any fact that gives rise to such a reaction, or to adopt the position most favorable to the corporate interest (namely, by exercising their free and informed right to vote).

Yet, it has also become apparent that this function flawed, for a few reasons.

Firstly, for logistical purposes, the company information relevant to the General Meeting is not actually disclosed to the shareholders at the Meeting. Most of this information is disclosed in a certain time period before the Meeting, so that the shareholders have enough time to get informed and prepare.

²⁵ LAFARRE, Anne, "The AGM in Europe: Theory and Practice of Shareholder Behaviour", Emerald Publishing Limited, 2017.

Nevertheless, the timeframe for disclosure is brief, and disclosure is not notified to the shareholders directly. What's more, not all the information about the corporate matters which could be relevant to the decision-making in the General Meeting is made available to all shareholders.

In Portugal, as per Article 289.º of the CCA, the management shall disclose to the shareholders the important documents for the meeting at the company's headquarters and the company's website, if there is one, at least 15 days before it takes place. These documents include proposals for resolutions to be presented to the General Meeting by the board of directors; the names of the persons to be proposed for election, their professional qualifications, etc. if there is an election of members of the corporate bodies in the order of business; and, whenever the meeting is the AGM, the annual report, the accounts for the financial year, any other financial statements. These documents can be sent via e-mail to the shareholders, but only if they so require, in 8 days (Article 289.º, n.º3, b)). Nevertheless, the information that a publicly held company has over a shareholder and their shares is limited, so this process is far from simple.²⁶

Other information related to the company, but not directly connected to the agenda of the General Meeting, is only disclosed upon request of shareholders who own shares corresponding to at least 1% of the share capital, such as the total value of remuneration paid in relation to each of the previous three years to members of the corporate bodies, or the minutes of meetings carried out in the previous years, or the annual reports and financial statements relating to the previous few years (Article 289.º, n.º1). Additionally, more important information about company matters, namely about the responsibility of the members of management, is restricted to the request of shareholders whose shares amount to 10% of the share capital, under Article 291.º, n.º1. Naturally, these restrictions hinder transparency and trust between shareholders and the management and are especially harmful towards minority shareholders.

Furthermore, some changes to the company are disclosed throughout the year, *ad hoc*. This is because certain changes to the company need to be legally disclosed in the

²⁶ MAGNIER, Véronique, & BARBAN, Patrick, "The Potential Impact of Blockchains on Corporate Governance: A Survey on Shareholders' Rights in the Digital Era", *InterEULawEast: Journal for the International and European Law, Economics and Market Integrations*, 5(2), 189-226, 2018., p.202.

days after they take place, such as the acquisition or disposal or major proportions of the voting rights of shareholders.²⁷

During the course of a Meeting, a shareholder is still able to ask the management bodies for information about the company under Article 290.º. Notwithstanding, this right is limited. Firstly, the shareholders' request is formulated and answered directly and verbally. As for the type of information that can be requested, there are different interpretation of the mentioned article in the Portuguese legal doctrine. According to Professor Soveral Martins,²⁸ for instance, the shareholder can only request information on a matter that is foreseen in the agenda of the General Meeting and in relation to which a discussion has already started. Also, there must be a direct connection between the request for information and the matter foreseen in the agenda. Other matters cannot be questioned.

Limiting information rights helps maintain the efficiency and orderliness of the General Meeting, making sure that discussions are objective and that the Meeting can be conducted within a reasonable timeframe. Nonetheless, it sacrifices transparency and hurts the rights of shareholders.

2.4. Blockchain technologies: a possible solution to a flawed functioning?

Due to the various challenges outlined in this chapter, it can be argued that the current architecture of the General Meeting is causing it to function sub-optimally.

In the last years, both legal and blockchain scholars have been claiming that blockchain applications might be a solution to the corporate problems outlined here.

²⁷ Article 12 of Directive 2004/109/EC of the European Parliament and of the Council of 15 December 2004 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, PB L nr. 390 of 31 December 2004.

²⁸ MARTINS, Alexandre de Soveral, "Código das Sociedades Comerciais em Comentário", Almedina, V., 2012.

In 2017, Professor Marco Iansiti and Professor Karim R. Lakhani from Harvard University argued that “the way we regulate and maintain administrative control has to change” and that “blockchain promised to solve this problem”.²⁹

In the same vein, Professors Anne Lafarre and Christoph Van der Elst, from Tilburg University, have been strongly arguing that, “a decentralized system that makes use of blockchain solutions can strongly enhance the position of the Annual General Meeting (AGM), adapting it to 21st century technology, and offering real solutions to the impediments of this 19th century static corporate organ”.³⁰

In the blockchain domain, Professors Aaron Wright and Primavera De Filippi claim that “by facilitating coordination and trust, a blockchain enables new forms of collective action that have the potential to bypass existing governance failures”³¹ and that “the technology could impact the creation, management, and of going operation of companies – changing the way existing firms operate by reducing their operational costs and improving their internal control mechanisms, while simultaneously increasing the overall transparency of these organizations”.³²

Additionally, when it comes to corporate voting, the proposal for proxy voting of the CSD Working Group on Distributed Ledger Technology (DLT), which is a Consortium of Central Securities Depositories (*NSD* in Russia, *Strate* in South Africa, *Six Securities Services* in Switzerland, *Nasdaq Nordic*, and *DCV* in Chile; henceforward: the Consortium), is worthy of attention.³³

Corroborating what has been said in this dissertation, the research report of the Consortium, published in 2017, demonstrates that shareholder voting has been facing various challenges, including the correct issuance and delivery of voting rights, the authentication of shareholders and authorized proxies, and the counting and reporting of

²⁹ IANSITI, Marco., & LAKHANI, Karim. R., “The truth about blockchain”, *Harvard Business Review*, 95(1), 118-127, 2017., p.2702.

³⁰ LAFARRE, Anne et al., “Bringing the AGM to the 21st century: Blockchain and Smart Contracting Tech for Shareholder Involvement”, p.3.

³¹ DE FILIPPI, Primavera & WRIGHT, Aaron, “Decentralized Blockchain Technology and the Rise of Lex Cryptographia”, 2015. Available at: SSRN 2580664, p.16.

³² DE FILIPPI, Primavera & WRIGHT, Aaron, “Blockchain and The Law: The Rule of Code”, Harvard University Press, 2018, p.133.

³³ CSD WORKING GROUP, “General Meeting Proxy Voting on Distributed Ledger: Product Requirements”, National Settlement Depository, 2017. Available at: [https://www.nsd.ru/en/publications/news/press-releases/csd-working-group-on-dlt-releases-product-requirements-for-general-meeting-proxy-voting-on-distribut-2017-05-31_163300/.](https://www.nsd.ru/en/publications/news/press-releases/csd-working-group-on-dlt-releases-product-requirements-for-general-meeting-proxy-voting-on-distribut-2017-05-31_163300/)

voting results. The Consortium argues that “the most prominent problems today are complexity of the processes involved in the voting and lack of finality”³⁴ and that “it is important that the voting process is streamlined and transparent, the meeting results are reported precisely, quickly and with guaranteed finality, so that [shareholders] can rely on these results in a legally binding way”.³⁵ In their statement, they advocate that blockchain technologies can provide an “easy, accessible and reliable voting process”,³⁶ which would motivate both foreign and minority shareholders to engage in General Meetings of shareholders.

Taken all of this into account, in the subsequent chapters, this dissertation will delve into the features of blockchain technologies and one of blockchain’s novel applications, the DAO, to assess how these cutting-edge technologies could, in fact, revolutionize the age-old General Meeting model and if such an endeavor would be possible under Portuguese law.³⁷

³⁴ Ibid.

³⁵ Ibid.

³⁶ Ibid.

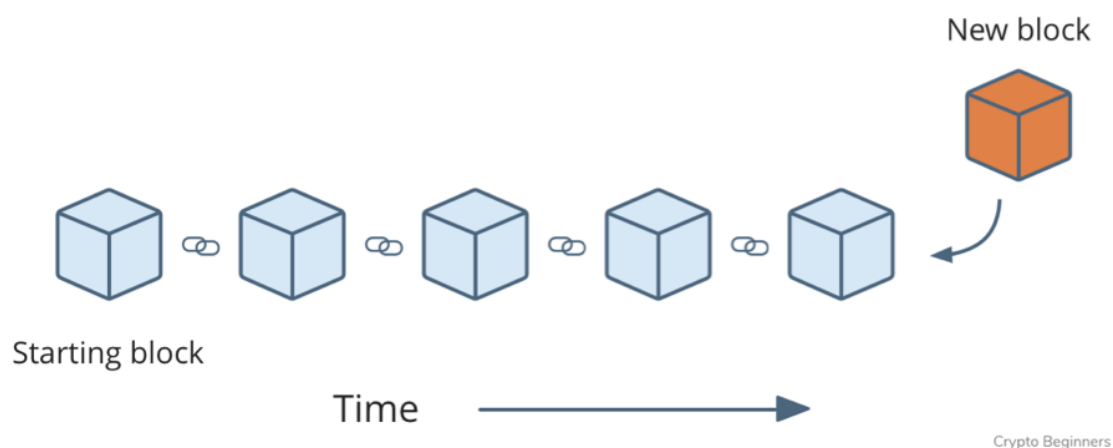
³⁷ LAFARRE, Anne et al., “Bringing the AGM to the 21st century: Blockchain and Smart Contracting Tech For Shareholder Involvement”, p.11.

3. THE TECHNOLOGY

3.1. Blockchain

Blockchain technology was introduced to the world in 2008 by Satoshi Nakamoto, whose real identity is yet to be known to the public, in the Bitcoin original whitepaper, "Bitcoin: A Peer-to-Peer Electronic Cash System",³⁸ which outlined the fundamentals of how blockchain works.

Blockchain can be described as a distributed and decentralised database which stores a list of records in a verifiable and permanent way. These records are encrypted and are called "blocks" by the blockchain community. Every encrypted block holds the historical record of all preceding blocks, along with timestamped transaction data, chaining those blocks together in a linear and chronological way and creating a chain. Thus, its name: blockchain.³⁹ Once added to the chain, a block cannot be removed or altered – it's immutable and permanent on the blockchain.



Blockchain Example 1

The blockchain is distributed because its software runs on devices provided by participants around the world. There is no one place where the processing of the transactions in the blockchain occurs. Additionally, it's decentralized because no single

³⁸ NAKAMOTO, Satoshi, "Bitcoin: A Peer-to-Peer Electronic Cash System". Decentralized Business Review, 2008. Available at: <https://bitcoin.org/bitcoin.pdf>.

³⁹ MARVIN, Rob., "Blockchain: The Invisible Technology That's Changing the World", PCMag, 2017, Available at: <https://www.pcmag.com/news/blockchain-the-invisible-technology-thats-changing-the-world>.

person or institution controls the blockchain, nor the information it holds.⁴⁰ There is no need for intermediaries, third parties or any kind of central authority to oversee the transactions on the blockchain.

Each participant of a particular blockchain has access to the entire database and its complete history and only the participants collectively can modify it and approve transactions according to pre-established protocols and governance rules.⁴¹ It is thus a “peer-to-peer network”, as peers communicate and transact directly with each other instead of through a central authority.

Because of these features, all transactions, their associated value and their records are visible to all blockchain participants at all times.⁴² Because of this, the blockchain provides transparency of transactions and allows for real-time auditing and verification, which significantly contributes to mitigating fraudulent activities.

Moreover, as there is no need for a trusted intermediary or central authority to conclude the transactions, such as a bank, transaction costs are lower and reconciliation⁴³ between the transacting parties is faster.⁴⁴

The chain is also permanent and immutable. Its immutability comes from different factors. Firstly, as each block contains the historical record of all preceding blocks, changing one block in the blockchain would mean that one would have to change all the blocks that come after it, or the subsequent blocks would become invalid.⁴⁵ This is nearly impossible. As each block also contains a timestamp indicating when it was added to the change, altering the block would also imply that would have to manipulate its timestamp, which would then alter the chronological order of the blocks on the chain.

⁴⁰ BUTERIN, Vitalik, “The Meaning of Decentralization”, Medium, 2017. Available at: <https://medium.com/@VitalikButerin/the-meaning-of-decentralization-a0c92b76a274>.

⁴¹ IANSITI, Marco., et al., “The truth about blockchain”, p. 2708.

⁴² Ibid.

⁴³ Reconciliation is an accounting process that involves comparing two sets of records to ensure accuracy and agreement of the numbers.

⁴⁴ CHRISTIDIS, Konstantinos, & DEVETSIKIOTIS, Michael, “Blockchains and Smart Contracts for the Internet of Things”. IEEE Access, 4, 2016, p. 2292-2303.

⁴⁵ TAPSCOTT, Dan, & TAPSCOTT, Alex, “Blockchain Revolution: How the Technology Behind Bitcoin is Changing Money, Business, and the World”, Penguin Random House LLC, 2016.

For instance, if one wanted to steal bitcoin, they would have to rewrite its entire history on the blockchain and without any participant noticing, as all the participants have access to all transactions running on the blockchain.⁴⁶

These characteristics prevent the “double spending problem”, as the blockchain network is able to review the transaction history of an electronic coin submitted by a user for payment, a process which ensures the coin has not been previously utilized. This was one of Nakamoto’s main goals when creating bitcoin.⁴⁷

Additionally, changes to the blockchain, including the addition of new blocks, require the consensus of the participants in the blockchain, as it has been mentioned above. Different blockchains have different consensus mechanisms (almost like different types of voting systems).⁴⁸ Through these consensus mechanisms, participants agree on which transactions should be considered valid and added onto the blockchain. This activity is referred to as “mining” and demands substantial resources to carry out highly intricate computational calculations aimed at solving a complex algorithmic challenge.⁴⁹ However, in practice, the validity of these transactions means nothing more than the compliance of the information to be added to the rules established in the blockchain.⁵⁰ If blockchain participants agree that the information is valid, they will authorize the distribution of the information. If, on the other hand, they do not consider it valid, the information will be discarded.

Hence, in essence, a blockchain is an inalterable and decentralized register tool, which simultaneously allows the participants to securely exchange assets.⁵¹

To interact with the chain, participants are assigned a pair of keys, a public key and a private key.⁵² Through the public key they are identified and can engage with the blockchain and the other participants (either by contacting or being contacted, sending

⁴⁶ Ibid.

⁴⁷ Ibid.

⁴⁸ CHRISTIDIS, Konstantinos et al., “Blockchains and Smart Contracts for the Internet of Things”, p. 2293.

⁴⁹ LAFARRE, Anne et al., “Bringing the AGM to the 21st century: Blockchain and Smart Contracting Tech for Shareholder Involvement”, p.13.

⁵⁰ FREIRE, João Pedro, “Blockchain e Smart Contracts: Implicações Jurídicas”, Almedina, 2021, p.31.

⁵¹ MAGNIER, Véronique et al., “The Potential Impact of Blockchains on Corporate Governance: A Survey on Shareholders’ Rights in the Digital Era”, p.192.

⁵² FREIRE, João Pedro, “Blockchain e Smart Contracts: Implicações Jurídicas”, p.27.

information, etc.) The keys used by the participants are an encryption system and therefore also allow users to encrypt messages and confirm their authenticity. A message is encrypted when a user sends a message from their public key to another user's public key. From there, only the user with the corresponding private key can read the message.⁵³

Through the private key, the participants can also sign transactions.⁵⁴ After signing, the other participants ought to confirm if the incoming transaction is valid or if it should be rejected. Upon verification, valid transactions are shared throughout the network and grouped into a block, which is timestamp. Subsequently, participants confirm the integrity of the proposed block, ensuring its transactions are valid and it correctly references the preceding block on the chain. If these conditions are met, the block is incorporated into the chain, leading to an update of the overall blockchain. However, if that is not the case, the proposed block is disregarded. This sequence concludes a round of blockchain activity.⁵⁵

For all these reasons (i.e., decentralization, immutability, transparency, timestamping and encryption), blockchain technology is considered an exceptionally secure system to conduct transactions.

3.1.1. Brief history of Blockchain: from Bitcoin to Ethereum

Blockchain was first introduced as the decentralized peer-to-peer trust protocol operating Bitcoin in October of 2008. It was created after the financial crisis in 2008, as a response to the failures of the banks. As previously stated, the goal was to eliminate third party intervention in transactions and prevent the “double spending” problem.⁵⁶

However, as the technology introduced by Satoshi Nakamoto was studied closer, experts realized that Bitcoin’s underlying protocol could be separated from the digital currency and used for many applications.⁵⁷

⁵³ Ibid.

⁵⁴ CHRISTIDIS, Konstantinos et al. “Blockchains and Smart Contracts for the Internet of Things”, p.2293.

⁵⁵ Ibid.

⁵⁶ TAPSCOTT, Dan et al., “Blockchain Revolution: How the Technology Behind Bitcoin is Changing Money, Business, and the World”.

⁵⁷ GUPTA, Vinay, “A brief history of blockchain”. Harvard Business Review, 28, 2017. Available at: <https://hbr.org/2017/02/a-brief-history-of-blockchain>.

In 2014, smart contracts came into existence in a “second-generation blockchain system”⁵⁸ called Ethereum and changed the game completely.

Ethereum is a software platform built on a public blockchain that allows developers to create decentralized and distributed applications.⁵⁹

Ethereum's potential extends far beyond that of Bitcoin. It serves as a versatile platform capable of accommodating a wide array of services, as it aims at facilitating the execution of diverse computer protocols (e.g., smart contracts). These protocols can be utilized to track money, like the bitcoin blockchain, but they can also be used in electoral, financial and medical domains, among others. For instance, they can also be used for debt collection, real-time tracking of goods within distribution networks, organizational governance, and even political elections.⁶⁰

In sum, while in the Bitcoin blockchain one is simply able to keep track of payments, in Ethereum one can keep track of computer programs.

Due to its decentralized nature, Ethereum also enables public and universal access to its applications, guaranteeing that no user or user group can be denied participation based on approval or permission.⁶¹

Since its launch, there have been more than 4.000 projects built on Ethereum and, in just 2021, creator earnings on Ethereum went up to \$3.5 billion.⁶²

Since 2008, a panoply of blockchains has emerged, each possessing unique features and capabilities. Due to its extensive functionalities and versatile applications, Ethereum reigns as the largest blockchain to date. Conversely, Bitcoin, once a frontrunner in the field, has experienced a shift in its ranking, presently holding the 14th place in this list.⁶³

⁵⁸ Ibid.

⁵⁹ “What is Ethereum”, District0x Educational Portal. Available at: <https://education.district0x.io/general-topics/understanding-ethereum/what-is-ethereum/>.

⁶⁰ Ibid.

⁶¹ Ibid.

⁶² See more at: <https://ethereum.org/en/what-is-ethereum/>.

⁶³ See more at: <https://coinmarketcap.com/chain-ranking/>.

What's more, today, both major companies and startups alike, as well as prominent financial and even governmental institutions, are exploring and embracing blockchain technologies.

The global blockchain technology market size was valued at \$11.14 billion in 2022 and is projected to grow from \$17.57 billion in 2023 to \$469.49 billion by 2030.⁶⁴ These numbers highlight the remarkable potential that blockchain holds as a transformative tool, driving innovation across diverse sectors beyond solely traditional finance.

3.1.2. Public, Private and Permissioned Blockchains

Blockchains can be established as public (permissionless), private or permissioned.

Those driving the development of public blockchain technologies have grand ambitions, aiming to overhaul democracy, end censorship, and revolutionize registration systems. However, there are other types of blockchains to consider: the private and permissioned blockchains.

In contrast to public blockchains, private and permissioned blockchains do not strive to create sweeping new services for the masses. Instead, their focus lies in automating and enhancing complex, inefficient, and largely manual systems within companies and organizations.⁶⁵

Unlike public blockchains like Bitcoin or Ethereum,⁶⁶ where anyone can join and participate, permissioned and private blockchains have more restricted participation.

The access to the blockchain is where these two types differ.

⁶⁴“Market Research Report”, Fortune Business Insights, May 2023. <https://www.fortunebusinessinsights.com/industry-reports/blockchain-market-100072>.

⁶⁵ AGASHE, Aditya., et al., “Bitcoin, Blockchain e Criptomoeas”, Alma dos Livros, 2022., p.139.

⁶⁶ Although, there are private blockchains based on Ethereum Technology built to accommodate private enterprises needs. See more at: <https://ethereum.org/en/enterprise/private-ethereum/>.

Permissioned blockchains are accessible to a trusted group of participants who are granted permission to interact with the network.⁶⁷ They are usually used by multiple organizations, consortiums, institutions, or groups with shared interests and that interact with each other to conduct a service or perform an action, sharing the control of the network.⁶⁸ Therefore, they still allow for some openness and maintain some of the decentralization associated with public blockchains.

Differently, in private blockchains participation is restricted to authorized members within a particular organization, who has the sole control over the network.⁶⁹ Hence, this type of blockchains is typically used internally by companies and organizations. While private blockchains provide improved privacy and customized solutions for corporate requirements,⁷⁰ they relinquish some of the decentralization, independence, and openness that define the core principles of the original public blockchain. In a private blockchain, a central authority holds the power (and obligation) to oversee transactions, unilaterally modify the code of the blockchain, and restrict its access.⁷¹

3.1.2.1. The market for Private and Permissioned Blockchains

Industry-leading companies, such as Walmart and Microsoft X-Box, for example, are already using permissioned blockchains to optimize certain services within their business structures.

In 2018, after reports of E.Coli-tainted lettuce shocked the United States with more than 200 people sickened and 5 deaths,⁷² Walmart announced that it would reform

⁶⁷ LAFARRE, Anne, & VAN DER ELST, Christoph, “The Viability of Blockchain in Corporate Governance. European Corporate Governance”, European Corporate Governance Institute (ECGI) Law Working Paper No. 712, 2023, p.6.

⁶⁸ SETH, Shobhit, “Public, Private, Permissioned Blockchains Compared”, Investopedia, 2022. Available at: <https://www.investopedia.com/news/public-private-permissioned-blockchains-compared/>.

⁶⁹ Ibid.

⁷⁰ BUTERIN, Vitalik, “On public and private blockchains”, Ethereum Blog, 2015. Available at: <https://blog.ethereum.org/2015/08/07/on-public-and-privateblockchains>.

⁷¹ MAGNIER, Véronique, et al., “The Potential Impact of Blockchains on Corporate Governance: A Survey on Shareholders’ Rights in the Digital Era”, p.193.

⁷² MILMAN, O., “Five dead in E coli outbreak linked to Arizona romaine lettuce”, The Guardian, 2018. Available at: <https://www.theguardian.com/world/2018/jun/01/romaine-lettuce-e-coli-outbreak-arizona-deaths>

its supply chain by requiring all companies supplying it with vegetables to register their supply chain on the blockchain. After the bacteria scandal, it realized that no one could trace the contaminated lettuce back to the farm of origin because the entire food supply chain was too opaque and inefficient. Hence, from 2019, each company was obligated to record every movement of every product on a Walmart-owned blockchain, developed in conjunction with IBM, called the IBM Food Trust.⁷³ Each transaction would be encrypted with metadata about the products' batch number, time, date, and the origin and destination of the products.

The effect of this reform was that Walmart started to be able to trace a given shipment of food from one of its service providers to the farm of origin in 2.2 seconds, when before it would take them 7 days.⁷⁴

Walmart could have implemented this solution on a public blockchain, but that would have entailed many disadvantages. Namely, by using a public blockchain, anyone would be able to see the transactions made by the company, Walmart would have to pay the mining fees for each transaction, and it would not be able to change and tailor the rules of the blockchain to serve the company's specific purposes. In contrast, a private blockchain like the IBM Food Trust only stores Walmart's supply chain transactions, which can only be seen by specific people; moreover, the company is able to set strict, customized access control or permissions, determining exactly what information each person can access and at what times.

Walmart could've just used a conventional database and save the costs and troubles of creating a blockchain. However, benefiting from the novelties of a (private) blockchain granted the company many advantages: (i) decentralization is extremely useful when companies need to keep data secure, because, since many different entities retain copies of the blockchain, it is much less prone to security issues than a centralized source; (ii) transparency is paramount for internal and external audits, as certain data may be made available to external auditors such as the FDA in the US, while keeping other data private, due to the design access control of private blockchains; (iii) finally, the

⁷³ "Case Study: How Walmart brought unprecedented transparency to the food supply chain with Hyperledger Fabric", Hyperledger. Available at: <https://www.hyperledger.org/learn/publications/walmart-case-study>.

⁷⁴ Ibid.

immutability of the data is essential in a food supply chain, as fraud or an error could risk the health of the consumers.⁷⁵

In a similar vein, Microsoft X-Box collaborated with Ernst & Young (EY) to develop a blockchain platform that serves as a financial system of record for gaming rights and royalties management. The original system used by Microsoft X-Box to secure and manage royalty processing proved to be cumbersome, requiring 45 days to access verified financial information regarding royalties.⁷⁶ However, with the implementation of the blockchain solution, the processing time was dramatically reduced by 99 percent, and it is now done in minutes.⁷⁷

Furthermore, In Europe, Iberdrola, the Spanish energy company, recently joined forces with the Association of Property and Commercial Registrars of Spain, Deloitte, and the Institute of Compliance Officers to develop a new blockchain-powered platform to publish documentation on compliance systems. The aim of the Spanish company, who is at the forefront of this project, was to promote transparency in the complex due-diligence processes in Spain.⁷⁸

The system will be accessible via the web and managed by the Association of Registrars of Spain. It will enable the secure access to information on the compliance systems of companies opting to publicly disclose this information to the public, thus enhancing the sharing of information between companies during compliance risk due diligence procedures. Moreover, by allowing companies to systematically publish their compliance system documentation, it will replace the current costly and outmoded process of manual information exchange between individual companies.⁷⁹

⁷⁵AGASHE, Aditya., et al., “Bitcoin, Blockchain e Criptoedas”, p.142.

⁷⁶ “How Blockchain Helped a Gaming Platform Become a Game Changer”, EY. Available at: https://www.ey.com/en_gl/consulting/how-blockchain-helped-a-gaming-platform-become-a-game-changer.

⁷⁷ SPADAFORA, Anthony. “Xbox Will Now Use Blockchain for Gaming Rights and Royalties”, Tech Radar, December 2020. Available at: <https://www.techradar.com/news/xbox-will-now-use-blockchain-for-gaming-rights-and-royalties>.

⁷⁸ See more at: <https://www.iberdrola.com/press-room/news/detail/we-are-launching-a-compliance-platform-with-blockchain-technology-jointly-with-the-association-of-registrars-deloitte-and-the-institute-of-compliance-officers>.

⁷⁹ Ibid.

Using blockchain technology also ensures the immutability of the deposited documents, along with its creation and modification dates and enables the traceability of each individual document.

Since the platform operates on a permissioned blockchain, each company will maintain full control over which documents it wishes to disclose. Further, only the company can grant access to certain documents that they uploaded, if such authorization is required, upon receiving a request from another user. And to ensure that users have legitimate authorization to represent a company or organization, the platform will conduct necessary verifications with the Companies Registry.⁸⁰

The use of permissioned and private blockchains is not restricted to private companies. NGO organizations, public institutions and even Stock Exchanges are looking at these solutions.

The United Nations, for one, have been successfully using blockchain technologies to distribute aid more securely and efficiently since 2017.⁸¹

Most Stock Exchanges (e.g., Nasdaq, JPX, Deutsch Börse, etc.) around the globe have also been experimenting with blockchain technologies to fix flaws and inefficiencies in their systems.⁸² In particular, in 2017, the Australian Securities Exchange (ASX) announced plans to implement blockchain technologies for their registry, settlement and clearing system.⁸³ Money and shares would be represented as tokens, and all share sales would be represented as transactions on the blockchain. All transactions would be mediated by a smart contract, which would receive money-tokens from the buyer and token-shares from the seller, perform checks, and then exchange them.⁸⁴ However, in November of 2022, ASX abandoned the project, claiming “dysfunctional management,

⁸⁰ Ibid.

⁸¹ DHAMEJA, Gautam, “UN World Food Programme uses Parity Ethereum to Aid 100,000 Refugees”, Parity, 2019. Available at: <https://www.parity.io/blog/un-world-food-programme-uses-parity-ethereum-to-aid-100-000-refugees/>.

⁸² NASDAQ, “How Stock Exchanges Are Experimenting with Blockchain Technology”, Nasdaq, 2020. Available at: <https://www.nasdaq.com/articles/how-stock-exchanges-are-experimenting-blockchain-technology-2017-06-12>.

⁸³ KAYE, Byron, “Insight: Australian stock exchange's blockchain failure burns market trust”, Reuters, 2022. Available at: <https://www.reuters.com/markets/australian-stock-exchanges-blockchain-failure-burns-market-trust-2022-12-20/>.

⁸⁴ AGASHE, Aditya., et al., “Bitcoin, Blockchain e Criptomodas”, p.144.

concerns about the product's complexity and scalability, and difficulty finding experts to support it”.⁸⁵

Despite the lack of success of the last example, it's clear this type blockchains have performed relatively strongly in the last decade. As mentioned, they have already transformed several sectors: supply chains, clearing houses, duty payments and are moving to sustainable development and human rights, to name a few. By comparison, the only successful public blockchain application is bitcoin.⁸⁶

All kinds of companies can build integrated applications on a permissioned or private blockchain, depending on their specific use-case, now that Microsoft's Azure,⁸⁷ Amazon Web Services,⁸⁸ Oracle,⁸⁹ Google Cloud⁹⁰ and IBM,⁹¹ among other cloud computing services, already offer blockchain-as-a-service cloud solutions (BaaS). BaaS are third-party cloud-managed platforms which allow companies and organizations to build, host and manage blockchain applications easily and quickly.⁹² Using BaaS, companies that want private blockchains can rent them, rather than build them from scratch and having to invest in the underlying infrastructure.⁹³

BoardRoom is another example of these initiatives experimenting with blockchain solutions. BoardRoom is decentralized application which offers companies and organizations instruments and tools to launch an interconnected system of smart contracts tailored to manage corporate voting and decision making.⁹⁴ However, BoardRoom is restricted to companies attempting to manage their smart contract systems on the Ethereum Blockchains.⁹⁵

⁸⁵ KAYE, Byron, “Insight: Australian stock exchange's blockchain failure burns market trust”.

⁸⁶ AGASHE, Aditya., et al., “Bitcoin, Blockchain e Criptoedas”, p.144.

⁸⁷ See more at: <https://azure.microsoft.com/en-au/solutions/web3>.

⁸⁸ See more at: <https://aws.amazon.com/pt/blockchain/>.

⁸⁹ See more at: <https://www.oracle.com/pt/blockchain/>.

⁹⁰ See more at: <https://cloud.google.com/blog/products/infrastructure-modernization/introducing-blockchain-node-engine>.

⁹¹ See more at: <https://www.ibm.com/blockchain>.

⁹² PLETCHER, Scott, “Blockchain cloud comparison: What is blockchain-as-a-service (BaaS)?”, PluralSight, June 2023. Available at: <https://www.pluralsight.com/resources/blog/cloud/blockchain-cloud-comparison-what-is-blockchain-as-a-service-baas>.

⁹³ AGASHE, Aditya., et al., “Bitcoin, Blockchain e Criptoedas”, p.197.

⁹⁴ DE FILIPPI, Primavera et al., “Blockchain and The Law: The Rule of Code”, p.135.

⁹⁵ See more at: <https://boardroom.to>.

3.1.3. Tokens

Tokens are “units of value that an organization creates to self-govern its business model”⁹⁶ on a blockchain (or another DLT). They are purely digital, flexible and can be used for multiple functions. As they do not have a physical reality, they are represented by a number in a ledger, which symbolizes their value.⁹⁷

Tokens are created to be the functional equivalent of existing, off-line, traditional instruments in commerce, business and finance. They can be connected to both rights to online assets/services in the virtual space, or rights to off-line assets/services.⁹⁸

Tokens are not to be confused with electronic documents, which are merely the digital representation of a paper document. Tokens and electronic documents differ primarily in the utilization of cryptography and in the integration within a database of the token, resulting in a significant reduction in the likelihood of forgery.

On Ethereum, any application can issue tokens to its participants. Participants can then send these tokens to each other to get access to services or assets.⁹⁹

Tokens were initially used exclusively for payment/investment purposes, with some central banks even studying the possibility of having tokens operating as their new form of digital money, a process known as “tokenization”.¹⁰⁰

However, today, anything of value can be represented by a token.¹⁰¹

Despite their flexibility, there are a few challenges associated with the lack of legal understanding of these entities, such as (i) the lack of a legal definition and characterization outside of a few financial contexts, which leads to a confusion as to the applicable legal regime,¹⁰² (ii) the need to reassure the connection of the tokens to the off-

⁹⁶ MOUGAYAR, William, “The Business Blockchain: Promise, Practice, and Application of the Next Internet Technology”, John Wiley & Sons, 2016.

⁹⁷ GARRIDO, José M., “Digital Tokens: A Legal Perspective”, International Monetary Fund (IMF) Working Paper No.151, 2023, p.7.

⁹⁸ Ibid. p.5.

⁹⁹ AGASHE, Aditya., et al., “Bitcoin, Blockchain e Criptomoedas”, p.124.

¹⁰⁰ Ibid. p.7.

¹⁰¹ Ibid, p.125.

¹⁰² According to Comissão do Mercado de Valores Mobiliários (CMVM), a token can be considered a security, in the context of an Initial Coin Offering: (i) if it is a document representing one or more legal situations of a private and proprietary nature (i.e. rights and obligations) and (ii) if, in view of the legal situation or situations represented, it is comparable to typical securities. See: https://www.mlgs.pt/xms/files/v1/Publicacoes/Newsletters_Boletins/2018/Comunicado_da_CMVM_as_

line assets they represent and (iii) the regime (or lack thereof) for the transfer of tokens.¹⁰³ As these challenges are not a principal concern of this dissertation, they shall not be further studied, but their mention is noteworthy to a comprehensive understanding of this topic.

3.1.4. Smart Contracts

To understand the goal of the research question raised in this dissertation, it's crucial to understand the concept of a smart contract.

This concept was first introduced to the blockchain community by computer scientist Nick Szabo in the mid nighties.¹⁰⁴ In the context of blockchain, smart contracts are “self-executing contracts with the terms of the agreement directly written into code”,¹⁰⁵ stored on a blockchain-based platform. Their code is programmed to automatically execute and enforce the parties’ agreement when certain objective conditions are met. For instance, if “x” occurs, then execute “y.” They don’t contain any legal language or terms, only code.

There are several blockchain platforms that facilitate smart contracting. The most well-known being Ethereum, as it has been said. Because smart contracts operate across a blockchain network, they inherit its main features: smart contracts are transparent, secure and immutable.¹⁰⁶

Although all participants can view the code and track the smart contract's execution on the blockchain, as they are immutable, after the terms and conditions are recorded in the blockchain, they cannot be amended anymore. Thus, in contrast to traditional contracts, a party is completely unable to renegotiate the contract, alter its terms, or waive enforcement for some reason, even if there is a mutual agreement. Once

entidades envolvidas no lançamento de Initial Coin Offerings -ICOs relativo a qualificação jurídica dos tokens- - Legal Alert.pdf.

¹⁰³ GARRIDO, José M., “Digital Tokens: A Legal Perspective”, p.7.

¹⁰⁴ LEVI, Stuart D., et al., “An Introduction to Smart Contracts and Their Potential and Inherent Limitations”, Harvard Law School Forum on Corporate Governance, 2018, p.2.

¹⁰⁵ FRANKENFIELD, Jake, “What Are Smart Contracts on the Blockchain and How They Work”, Investopedia, 2023. Available at: <https://www.investopedia.com/terms/s/smart-contracts.asp>.

¹⁰⁶ Ibid.

the conditions in the contract are met, the contract automatically executes the actions it is programmed to perform.¹⁰⁷

For this reason, there is no need for intermediaries, third parties or human intervention to enforce the agreement. Consequentially, transactions costs and opportunistic behaviors are substantially lowered when compared to traditional contracts.¹⁰⁸

Smart contracts offer versatile applications due to their ability to automatically execute agreements. One of the straightforward applications involves ensuring smooth transactions between two parties, such as facilitating the purchase and delivery of goods. For instance, a manufacturer can use smart contracts to arrange payments, while the supplier sets up shipments. Depending on the parties' agreement, the payment could be automatically transferred to the supplier upon shipment or delivery of the goods.¹⁰⁹

As their self-execution feature leads to an inevitability of performance, smart contracts provide trust between the parties.¹¹⁰ This is particularly important when the two contracting parties do not know each other. It provides certainty of performance and avoids the use of judicial systems to resolve disputes. A seller of goods is certain that, once the goods arrive, the payment will be transferred.

Nowadays smart contracts are used in numerous areas, including real estate transactions, stock and commodity trading, corporate governance, supply chain management, dispute resolution, etc.¹¹¹

Notwithstanding their designation, smart contracts aren't necessarily smart, nor contracts (in the legal sense).

Firstly, if they were smart, the smart contract's code should be able adapt to unexpected situations. However, smart contracts can only handle situations written in

¹⁰⁷ LEVI, Stuart D., et al., "An Introduction to Smart Contracts and Their Potential and Inherent Limitations", p.1.

¹⁰⁸ Ibid.

¹⁰⁹ KUHN, Daniel, "Vitalik Buterin and the Birth of Ethereum", CoinDesk, 2023. Available at: <https://www.coindesk.com/consensus-magazine/2023/06/02/coindesk-turns-10-2015-vitalik-buterin-and-the-birth-of-ethereum/>.

¹¹⁰ GARCIA ROLO, António, "Challenges in the Legal Qualification of Decentralised Autonomous Organisations (DAOs): The Rise of the Crypto-Partnership?", CIDP Research Paper No.11., 2022, p.42.

¹¹¹ Ibid.

their code, they are not flexible and cannot adapt to setbacks or mis-happens in the real world.

Moreover, legal scholars often debate whether smart contracts can be considered legal contracts. This is because, if there is a *force majeure*, a change of mind, or a mutual agreement between the parties to alter the terms of the contract or terminate it, this would not be possible.¹¹² In fact, smart contract could even self-execute against a Court decision. One cannot change what was included in the chain and the smart contracted cannot be altered, regardless of the will of the parties post contracting.

Still, some authors¹¹³ claim that, despite this factor, smart contracts can be considered, in fact, legal contracts. It is argued that the “true essence of a contract” (i.e., “two or more parties reaching an agreement to alter their rights and duties”¹¹⁴) is still present in smart contracts and the main difference between former and the latter contracts is only the self-executability of the latter.

In Portugal, smart contracts can be held as electronic contracts under Articles 24 of the DL n.º7/2004, as their validity or effectiveness is not impaired by the use of electronic or computerized means.¹¹⁵

3.2. DAOs

In the simplest of terms, DAOs can be defined as “virtual organizations” based on blockchain technology.

Blockchain technology doesn't merely bring gradual and specific improvements to organizations; it empowers the creation of decentralized entities.

DAOs use smart contracts to automate and enforce corporate governance decisions without any human involvement.¹¹⁶ In other words, DAOs are a blockchain-

¹¹² FREIRE, João Pedro, “Blockchain e Smart Contracts: Implicações Jurídicas”, p.97.

¹¹³ GARCIA ROLO, António, “Challenges in the Legal Qualification of Decentralised Autonomous Organisations (DAOs): The Rise of the Crypto-Partnership?”, p.40.

¹¹⁴ Ibid.

¹¹⁵ FREIRE, João Pedro, “Blockchain e Smart Contracts: Implicações Jurídicas”, p.97.

¹¹⁶ MONDOH, Brian Sanya, et al., “Decentralised Autonomous Organisations: The Future Of Corporate Governance or an Illusion?”, 2022, p.1. Available at SSRN: <https://ssrn.com/abstract=4144753>.

based protocol with decision-making capabilities embed in smart contracts.¹¹⁷ In 2014, Vitalik Buterin defined the concept of a DAO as “long-term smart contracts that contain the assets and encode bylaws of an entire organization”.¹¹⁸

Alike other blockchain applications, the governance of DAOs is automated and decentralized. They are automated “organizations” because the decision-making power that is usually attributed to the management of an organization is held by a smart contract. Additionally, they are decentralized because they function without any centralized intermediaries or institutional authorities; DAOs are not governed by a board of directors or a management authority, but rather by their participants.¹¹⁹

Individuals can provide inputs to influence the decisions of a DAO, but direct control over its actions remains beyond their reach, as a smart contract is in charge.

DAOs’ participants, usually referred to as “token-holders”, work collaboratively outside a traditional corporate governance structure and hierarchy and exercise all the control over the rules of a DAO using “governance tokens”,¹²⁰ which enable them to propose and vote on proposed actions. The smart contracts of a DAO then automatically execute the actions that meet the pre-established conditions for execution, such as the necessary number of votes.¹²¹ As this is a blockchain powered application, it is impossible to single-handedly manipulate the rules of the DAO without the consensus of the majority of the token-holders, making a DAO tamper resistant.¹²²

Moreover, all the transactions, proposals and decision-making outcomes are recorded on the underlying blockchain, creating a transparent system.

In a typical DAO setup, two primary types of smart contracts come into play. The first type of smart contracts handles transactions, such as when a participant transfers tokens to another individual. Unlike this first type of smart contract, which is designed

¹¹⁷ DE FILIPPI, Primavera et al., “Blockchain and The Law: The Rule of Code”, p.149.

¹¹⁸ BUTERIN, Vitalik, “A Next-Generation Smart Contract and Decentralized Application Platform”, White Paper, 3(37), 2014.

¹¹⁹ TEIXEIRA, Ana Nunes, “DAOs Under Portuguese Law”, in GRAÇA ROLO, António & OLIVEIRA, Madalena Perestrelo, “Decentralised Autonomous Organisations (DAOs) in Various Jurisdictions: from Old Rules to Innovative Approaches”, AAFDL, 2023, p.12.

¹²⁰ LAFARRE, Anne et al., “The Viability of Blockchain in Corporate Governance. European Corporate Governance”, p.8.

¹²¹ Ibid.

¹²² MONDOH, Brian Sanya, et al., “Decentralised Autonomous Organisations: The Future Of Corporate Governance or an Illusion?”, p.2.

for tamper-resistant execution, the second type of smart contracts used by a DAO will govern the rules of the DAO itself and is subject to changes over time. In truth, by using this “token-based governance”,¹²³ a DAO’s participants can implement changes in their governance rules at any time, as long as there is a community vote.

The second type of smart contracts bears a resemblance to a company's Articles of Association.¹²⁴ Nonetheless, there are no formal contractual agreements, such as the Articles of Association, or By-Laws, in a DAO. The DAO’s participants govern the virtual organization solely using the smart contracts which they agreed on prior.¹²⁵ For this reason, there is also no principal-agent relationship, as a DAO is jointly held by token-holders, with little separation between ownership and control. This makes monitoring costs reduce to nearly zero.

3.2.1. The history of DAOs

The concept of a “DAO” was first used in 2013 by Daniel Larimer.¹²⁶

In April of 2016, an entity named “The DAO” was famously created following the publication of white paper by Christoph Jentzsch on Slock.it UG. Jentzsch wanted to create an organization in which “participants maintain[ed] direct real-time control of contributed funds and governance rules [were] formalized, automated and enforced using standard smart contract code”.¹²⁷ To this goal, a DAO operating as an automated investment fund was set up on the Ethereum blockchain. Participants would transfer cryptocurrency (Ether) into the DAO and in return would receive DAO tokens, which allowed them to vote on the potential funding of projects submitted to the DAO.¹²⁸ If a project was approved, the DAO would transfer Ether units to a smart contract representing

¹²³ GOGEL, David, et al., “Decentralized Autonomous Organizations: Beyond the Hype”, World Economic Forum, 2022., p.8.

¹²⁴ SIMS, Alexandra, “Blockchain and Decentralised Autonomous Organisations (DAOs): The Evolution of Companies?.”, *New Zealand Universities Law Review*, 28, New Zealand, 2019, p.8.

¹²⁵ TEIXEIRA, Ana Nunes, “DAOs Under Portuguese Law”, p.12.

¹²⁶ SIMS, Alexandra, “Blockchain and Decentralised Autonomous Organisations (DAOs): The Evolution of Companies?.”, p.12.

¹²⁷ JENTZSCH, Christoph, “Decentralized Autonomous Organization to Automate Governance”, White paper, 2016. Available at: <https://lawofthelevel.lexblogplatformthree.com/wp-content/uploads/sites/187/2017/07/WhitePaper-1.pdf>.

¹²⁸ SIMS, Alexandra, “Blockchain and Decentralised Autonomous Organisations (DAOs): The Evolution of Companies?.”, p.12.

the project and if that project was successful, the token-holders would receive profits as return on investment.¹²⁹

From April to May, 1.15 billion DAO tokens had been exchanged for close to 12 million Ether units. The estimated value of DAO tokens reached approximately \$150 million at one point.¹³⁰ However, The DAO failed. Before projects were even submitted, a hacker or group of hackers exploited a vulnerability in The DAO's code and transferred an amount of Ether units worth up to \$50 million to a wallet they controlled. The unexpected withdrawal of funds did not breach the rules of either Ethereum or The DAO, and there is no apparent violation of any laws.

The hacking of The DAO in 2016 revealed several risks of DAOs in general, namely security and liability challenges. This led many to believe that this technology, initially called by many to revolutionize corporate governance, would never achieve such goal.

Still, in the past few years, DAOs have experienced an whopping growth. According to DeepDAO,¹³¹ in 2021, the total value of DAO treasuries went from \$400 million to \$16 billion. Not only, in the same year, the number of DAO participants also increased by 130 times, from 13,000 to 1.6 million.¹³²¹³³

In August of 2023, total value of DAO treasuries was up to \$22 billion. Additionally, as of January 2023, the total number of DAOs in existence reached 10992, which was three times the number recorded in 2022, meaning that the numbers keep on growing.¹³⁴

DAOs are currently being developed for an increasingly wide variety of purposes. From grant funding to pool investment, collecting, charitable funding, data and asset management and even legal services.¹³⁵ In fact, advocates of blockchain often assert that

¹²⁹ GARCIA ROLO, António, "Challenges in the Legal Qualification of Decentralised Autonomous Organisations (DAOs): The Rise of the Crypto-Partnership?", p.48.

¹³⁰ Ibid, p.51.

¹³¹ See more at: <https://deepdao.io/organizations>.

¹³² GOGEL, David, et al., "Decentralized Autonomous Organizations: Beyond the Hype", p.4.

¹³³ QUARMBY, Brian, "DAO treasuries surged 40x in 2021: DeepDAO", Cointelegraph, 2021. Available at: <https://cointelegraph.com/news/dao-treasuries-surged-40x-in-2021-deepdao>.

¹³⁴ SEREBRYANTSEVA, Valeria, "How to Create a DAO in 8 Steps", PixelPlex, 2023. Available at: <https://pixelplex.io/blog/how-to-create-a-dao/>.

¹³⁵ GOGEL, David, et al., "Decentralized Autonomous Organizations: Beyond the Hype", p.13.

innovative applications like The DAO's smart contracts will even replace lawyers and revolutionize the legal sector, despite the initial setback.¹³⁶ For example, operating from its headquarters within the dynamic Cryptovoxels metaverse platform, “LexDAO”¹³⁷ is dedicated to forging cutting-edge blockchain tools to automate aspects of legal services, like arbitration.¹³⁸

In Portugal, DAOs are being studied closely by the Lisbon DAO Observatory,¹³⁹ a research project proposed by the Lisbon Centre for Research in Private Law of the Faculty of Law of the University of Lisbon.

3.2.2. DAOs vs Traditional Companies

Thus far, DAOs have mostly been referred to as independent blockchain-powered entities. In truth, most academic papers that delve into this unfamiliar blockchain application only refer to it as an alternative to traditional, centralized companies.

Indeed, DAOs have long been compared to the first stock companies in Renaissance Europe, as they are an inventive way of coordinating resources, including knowledge, capital, and labour, on a significant scale. What’s more, alike the first stock companies in Renaissance Europe, DAOs also serve as a means to distribute profits resulting from the effective allocation of these resources.¹⁴⁰ Yet, DAOs typically have no management or central supervisory bodies, no board of directors, they are not registered in a commercial registry, they have no known members, no external representation, no legal personality or capacity, they don’t obey to any jurisdiction and exist in no physical location.¹⁴¹

¹³⁶ MURCK, Patrick, “Who Controls the Blockchain?”, Harvard Business Review, 19, 2017. Available at: https://hbr.org/2017/04/who-controls-the-blockchain?ab=at_art_art_1x4_s02.

¹³⁷ See more at: <https://www.lexdao.coop>.

¹³⁸ MARR, Bernard. “The Best Examples of DAOs Everyone Should Know About”, Forbes, 2022. Available at: <https://www.forbes.com/sites/bernardmarr/2022/05/25/the-best-examples-of-daos-everyone-should-know-about/>

¹³⁹ See more at: <https://www.google.com/search?client=safari&rls=en&q=Lisbon+DAO+Observatory&ie=UTF-8&oe=UTF-8>.

¹⁴⁰ GARCIA ROLO, António, “Challenges in the Legal Qualification of Decentralised Autonomous Organisations (DAOs): The Rise of the Crypto-Partnership?”, p.62.

¹⁴¹ Ibid., p.63.

These characteristics grant DAOs a lot of additional benefits in comparison to traditional companies. They are easy to constitute, decentralized, immutable, work cross-border and provide both transparency and trust to daily governance operations.

However, they also create few challenges regarding DAO's legal nature.

Although the legal nature of a DAO will not be examined thoroughly in this dissertation, it can be argued that, because of its singular characteristics, in most common law jurisdictions, they are generally regarded as General Partnerships (GP) or akin informal business structures,¹⁴² unless an *ad hoc* legal entity and/or a specific legal framework for DAOs exists, as it is the case in U.S. States Vermont¹⁴³ and Wyoming.¹⁴⁴

On the 27th of March of 2023, in *Sarcuni v. bZx DAO*, a US Federal District Court in Southern California ruled that DAOs should, in fact, be characterized as a GP under State Law.¹⁴⁵ The same protocol in this case was also the subject to a Commodity Futures Trading Commission (CFTC) enforcement action.¹⁴⁶ In December 2021, bZx DAO renamed itself Ooki DAO, but continued operating the same protocol, the Ooki Protocol (formerly the bZx Protocol).¹⁴⁷ In September 2022, the CFTC had charged the now renamed Ooki DAO with various violations of the Commodity Exchange Act (CEA). To be able to pursue enforcement against Ooki DAO for alleged violations of the CEA, the CFTC had to seek a Court's ruling regarding the nature of this DAO. The CFTC argued that the Ooki DAO should be considered as an "unincorporated association" under California Law, akin to GP, "comprised of Ooki token-holders who have voted those tokens to govern the Ooki Protocol"¹⁴⁸ and thus be subject to the regulatory provisions outlined in the CEA. Under this Act, a "person" includes "individuals, associations, partnerships, corporations, and trusts".¹⁴⁹ The CFTC asserted that Ooki DAO, if

¹⁴² Ibid. p.64-68.

¹⁴³ MIENERT, Biyan, "How Can a Decentralized Autonomous Organization (DAO) be Legally Structured?", Legal Revolutionary Journal LRZ, 2021, p.5.

¹⁴⁴ Ibid., p.6.

¹⁴⁵ PASCOE, Lee, "Decentralised Autonomous Organisations and Liability in Litigation – Sarcuni, et al v bZx DAO, et al. International Bar Association", 2023. Available at: <https://www.ibanet.org/decentralised-autonomous-organisations-and-liability-in-litigation>.

¹⁴⁶ *Commodity Futures Trading Commission v. Ooki DAO*, Case No. 3:22-cv-05416-WHO, 2023. <https://www.networklawreview.org/wp-content/uploads/2023/08/ooki-dao.pdf>.

¹⁴⁷ TROMBLY, P. Latham et al., "What's Next for DAOs in the Wake of the Ooki Decision?", JDSUPRA, 2023. Available at: <https://www.jdsupra.com/legalnews/what-s-next-for-daos-in-the-wake-of-the-5580603/>.

¹⁴⁸ Ibid.

¹⁴⁹ Commodity Exchange Act. Available at: <https://www.law.cornell.edu/uscode/text/7/chapter-1>.

categorized as an unincorporated association, would fall in the CEA's classification of a "person", as it explicitly includes the term "association", and thus be subject to its legal provisions. Nevertheless, the defendants argued that Ooki DAO was simply a technology, not an entity, and so it should not be subject to legal action.¹⁵⁰

On the 8th of June, in *Commodity Futures Trading Commission v. Ooki DAO*, another US Federal District Court, now in the Northern District of California, granted the CFTC a default judgment against Ooki DAO. US District Judge William H. Orrick found that Ooki DAO could, indeed, be held as a "person" under the CEA.¹⁵¹ This judgment implicates that Ooki DAO token-holders can be subject to enforcement actions by the CFTC in the U.S. and therefore and can be held personally liable for CFTC penalties if the DAO violates the CEA's rules.

Being classified as a GP or other similar designations, such as an "unincorporated association", is a very undesirable position for all of the DAO's participants, as it would lead to them being considered personally and jointly liable for the DAO's losses.¹⁵²

In Portugal, DAOs would hardly be recognized as legal persons (i.e., persons with rights and obligations). Under Portuguese law, the legal personhood of commercial companies comes from their registration with the Commercial Registry Office.¹⁵³ Since DAOs are decentralized and not dependent on a central entity, they cannot be registered.

Notwithstanding, there is a legal regime in the Portuguese Civil Code (CC) that could possibly accommodate DAOs. There is no mention of this technology in the law. Simply, DAOs could fall under the regime of civil law partnerships ("*sociedade civil*").¹⁵⁴

Following Article 980.º of the CC, there is a civil law partnership when two or more persons undertake to contribute goods or services to the joint exercise of a certain economic activity, other than mere enjoyment, in order to share the profits resulting from that activity. No particular legal form is required for the incorporation documents of this type of partnership and there is no prescribed specific governance structure.

¹⁵⁰ *See supra nota 146.*

¹⁵¹ *Ibid.*

¹⁵² MONDOH, Brian Sanya, et al., "Decentralised Autonomous Organisations: The Future of Corporate Governance or an Illusion?", p.8.

¹⁵³ TEIXEIRA, Ana Nunes, "DAOs Under Portuguese Law", p.14

¹⁵⁴ *Ibid.* p.15.

The consequences of applying this regime to DAOs are diverse.

Firstly, the DAO would not have, or rather, would not be, a separate legal entity from its participants. Therefore, the participants of the DAO would be personally and jointly liable under article 997.º of the CC for any losses taken by the DAO and by the debts it incurs, like in a GP. However, the liability of the participants would operate on a subsidiary basis to that of the DAO's.

Additionally, since the DAO would not be able to be registered under civil (or commercial) law, it would not have legal capacity and, as a result, interaction with third parties, such as suppliers and service providers, would be very complicated. The DAO would not be able to enter into contracts, nor would it be capable of being sued in a Court of Law. As DAOs don't produce products nor render services directly (usually), this is very relevant.¹⁵⁵

If a third party or a token-holder wanted to sue a DAO in a Court of Law, they would have to try to assert their rights against others linked with the DAO, such as other DAO token-holders at a certain moment.¹⁵⁶

Hence, by using a DAO as an alternative to a traditional company, as an independent entity, business owners risk losing very important characteristics of the latter, the most relevant being limited liability.

3.2.3. How a DAO framework could be used to modernize the General Meeting

For the motives delineated above, this dissertation proposes that, rather than constituting a DAO as independent entity to perform an economic activity, it would be more advantageous for business owners to set up a DAO structure/system within their legally incorporated company. Business owners would thus be creating a hybrid entity/body with the goal of solving a particular corporate problem.¹⁵⁷ In this case: the flaws of the General Meeting.

¹⁵⁵ Ibid. p.21.

¹⁵⁶ BELLAVITIS, Cristiano, et al., "The Rise of Decentralized Autonomous Organizations (DAOs): a First Empirical Glimpse," *Venture Capital*, 25(2), 187-203, 2022, p.4.

¹⁵⁷ STEINBERG, Rayne, "Enhancing Traditional Corporate Governance with DAOs", *Forbes*, 2022. Available at: <https://www.forbes.com/sites/forbesfinancecouncil/2022/03/31/enhancing-traditional-corporate-governance-with-daos/?sh=6b2ee0bc6256>.

The Articles of Association of the company would assume the role of a “master agreement”, as proposed by French Professors Véronique Magnier and Patrick Barban,¹⁵⁸ and would still be articulated in prose, while the DAO would accommodate intricate technical clauses.

While most major decisions held by the General Meeting can be easily coded and automatized, as explained later on in this chapter, some parts of the organization of the company cannot be written into code. In consequence, human input inside the system would be required. The master agreement (i.e., the Articles of Association), in some instances, would draw upon the blockchain for specific automatization, while still relying on traditional prose for others.¹⁵⁹

Hence, creating this hybrid body would allow shareholders to benefit from the novelties brought forth by a DAO and blockchain technology, without losing the biggest advantage of being a shareholder in a traditional legally incorporated company (i.e., limited liability).

3.2.3.1. Benefits of adopting a DAO structure within a commercial company

There is a panoply of practical corporate governance advantages of instituting a DAO structure within a legally incorporated commercial company.

The transparent and non-hierarchical architecture of DAOs has the potential to enhance existing governance practices and foster a more inclusive and collaborative approach to corporate governance.¹⁶⁰

Firstly, access to the system would be managed by the company. Access would most likely be restricted to shareholders of the company and certain management members. Some third parties, such as external auditors, could also be granted access to selected documents, facilitating their certification. Internal access within the DAO could be further restricted, and permission/authorization based.

¹⁵⁸ MAGNIER, Véronique et al., “The Potential Impact of Blockchains on Corporate Governance: A Survey on Shareholders’ Rights in the Digital Era”, p. 213.

¹⁵⁹ Ibid.

¹⁶⁰ Ibid.

Using a private or permissionless blockchain platform, the company would be able to design the DAO's set of rules or governance mechanisms that outline how proposals can be submitted and voted in the General Meeting, in accordance with legal requirements.

As it will be further explored in Chapter 4, the rules governing this technology could be defined both through on-chain smart contracts and/or off-chain governance frameworks, namely the Articles of Association or Resolutions of the board of directors, if competent. Conversely, the information that is in the Company's Articles of Association, in the law and in applicable stock exchange rules would have to be translated into code, whenever possible.¹⁶¹

These rules contained in the blockchain would be able to be amended or updated through a collective decision-making process within the company, which was explained in the section on blockchain. The company would be able to add, alter and adopt certain procedural conditions.¹⁶²

Because of smart contracting, breach of these operational and procedural rules would be prevented. The use of smart contracts thus minimizes the potential for opportunistic actions, mitigating the principal-agent problem.¹⁶³

Some of proposals voted in the General Meeting, depending on their nature, could then automatically and transparently be put into motion by the smart contracts on which the DAO is built. This would ensure that the decisions reached by the shareholders in the General Meeting are not tampered with and are executed just as they were voted.

For example, using a DAO structure, the decision on dividend distribution (Article 31.º of the CCA) can be collectively determined and automatically put into motion. Shareholders would participate in a vote in a General Meeting to choose between allocating the net income to a reserve account or distributing it as dividends. If the latter option is selected, the DAO could automatically distribute the dividends among the shareholders.¹⁶⁴

¹⁶¹ LAFARRE, Anne et al., "Bringing the AGM to the 21st century: Blockchain and Smart Contracting Tech for Shareholder Involvement", p.22.

¹⁶² Ibid.

¹⁶³ DE FILIPPI, Primavera et al., "Blockchain and The Law: The Rule of Code", p.151.

¹⁶⁴ MAGNIER, Véronique, et al., "The Potential Impact of Blockchains on Corporate Governance: A Survey on Shareholders' Rights in the Digital Era", p.211-213

Moreover, this technology can play a vital role in ensuring effective control over remuneration decisions. During a General Meeting, shareholders need to reach a consensus on directors' compensation (Article 399.º of the CCA). Utilizing smart contracts, the agreed-upon payment can be automatically withheld if the vote results in a negative outcome, for instance, or automatically distributed if the vote results are positive.¹⁶⁵

More complex operations can similarly be resolved within a DAO framework. As way of illustration, in a scenario where the General Meeting proposes the election of a new board member, a positive vote could simply and automatically grant the voted candidate access to board-exclusive information stored on the blockchain and award them a token for participating in future board votes.¹⁶⁶

Nonetheless, certain aspects of a company's structure are difficult to turn into code, particularly in cases where the authority vested in shareholders or directors is overly vague and subjective, or when definitions lack clarity, leaving room for many interpretations. In these cases, the company's prose-written Articles of Association would have to rule over the tech.

Regarding the flaws of the forum function of the General Meeting, the adoption of this novel technology could increase shareholder participation by offering a digital discussion forum/platform for shareholders and board members alike to raise questions and debate.¹⁶⁷

DAOs can additionally provide an autonomous, permanent and time-stamped record of information, because of their underlying blockchain system which serves as an immutable database register, further improving the information dissemination function of the General Meeting. Major events in the life of the company, which usually the board of directors would have to report to shareholders, could be registered in the blockchain.¹⁶⁸

Whilst in a traditional company documents such as the minutes of the General Meeting, business reports, finance documents, etc., require human intervention to be registered, which is prone to both error and fraud and costs the company time and money,

¹⁶⁵ Ibid.

¹⁶⁶ Ibid.

¹⁶⁷ LAFARRE, Anne et al., "Bringing the AGM to the 21st century: Blockchain and Smart Contracting Tech for Shareholder Involvement", p.23.

¹⁶⁸ Ibid.

a DAO could securely and permanently record all automated transactions on a blockchain in a costless and automatic way.

Further, authorized participants accessing the system would have the ability to retrieve company related information automatically, without going through bureaucratic processes and limitations.¹⁶⁹

Moreover, because of DAOs' inherent transparency features, everything surrounding the General Meeting, from the decision-making process to the voting results, to the record of the documents to the allocation of resources resulting from the decisions taken, would be recorded and visible to shareholders, contributing to better shareholder-democracy.

By harnessing the array of possibilities enabled by DAOs in this way, the expenses associated with shareholder monitoring and decision-making significantly decrease, which benefits both companies and shareholders alike. From the corporate perspective, streamlined decision-making naturally leads to reduced costs. Furthermore, the necessity to hold organized, costly and in-person General Meetings could be somewhat eliminated, further contributing to reduced expenditures.¹⁷⁰ On the shareholders' front, the reduction in monitoring costs would stem from the blockchain's capacity to record transactions and company-specific information, which would be transparently accessible to shareholders. As explained in the initial chapter, high monitoring costs are at the root of the free-rider problem, which could thus be attenuated. Additionally, as it will be studied in the subsequent section, blockchain would also diminish the costs to shareholders associated with the voting process.

3.3. Blockchain-Enabled E-Voting (BEV)

Once it has been explored how a DAO structure could put into motion some of the decisions taken in the General Meeting, it's imperative to analyze how exactly those decisions could be taken by making use of blockchain technologies and how that would benefit the company.

¹⁶⁹ MAGNIER, Véronique et al., "The Potential Impact of Blockchains on Corporate Governance: A Survey on Shareholders' Rights in the Digital Era", p. 200.

¹⁷⁰ LAFARRE, Anne et al., "Bringing the AGM to the 21st century: Blockchain and Smart Contracting Tech for Shareholder Involvement", p.24.

3.3.1. Use cases around the globe

BEV refers to the use of blockchain technology to facilitate and secure voting procedures.¹⁷¹

Many companies, public organizations and even governments have already been using BEV systems within their internal network to allow for a better participant democracy. In fact, the use cases for BEV software are diverse and are being trialed all over the world.

For instance, in 2014, to beat corruption allegations, Moscow's officials announced that the city's "Active Citizen" project would start using BEV to allow citizens of the city to vote on municipal proposals, such as setting speed limits, the construction of bike lanes and the expansion of pedestrian zones. It gathered millions of users across the city and increased trust in the government. The results were publicly audited by PwC.¹⁷² Furthermore, in 2018, in Switzerland, the small town of Zug, which had been issuing its residents with digital identities for a year prior, also held a municipal vote based on BEV, which allowed citizens to vote using their mobile devices.¹⁷³ The system was declared a success. In the year 2018, another noteworthy development occurred. Thailand's historic political entity, the Thai Democrat Party, embraced innovation by organizing a primary election based on BEV to designate their new party leader. This event marked the pioneering employment of BEV in a substantial political election.¹⁷⁴

Recognizing the progress and benefits associated with BEV, many private technology firms and emerging startups are actively designing online platforms that aim to streamline extensive political elections by harnessing the potential of this technology. As an example, the blockchain e-voting app created by the Boston startup Voatz¹⁷⁵ has

¹⁷¹ KSHETRI, Nir, & VOAS, Jeffrey, "Blockchain-enabled E-voting", *IEEE Software*, 35(4), 95-99, 2018.

¹⁷² HOLDER, Sarah, "Can the Blockchain Tame Moscow's Wild Politics?", *Bloomberg*, 2017. Available at: <https://www.bloomberg.com/news/articles/2017-12-22/moscow-s-active-citizen-app-goes-on-the-blockchain>.

¹⁷³ "Switzerland's first municipal blockchain vote hailed a success", *Swissinfo.ch*, 2018. Available at: https://www.swissinfo.ch/eng/business/crypto-valley_-_switzerland-s-first-municipal-blockchain-vote-hailed-a-success/44230928.

¹⁷⁴ See more at: <https://zcoin.io/worlds-first-large-scale-blockchain-based-political-election-held-on-zcoins-blockchain/>.

¹⁷⁵ See more at: <https://voatz.com/security-and-technology/>.

been developing smart biometrics and real-time ID verification to allow citizens to vote in elections and has already been used in a number of minor elections in the U.S.¹⁷⁶

As a matter of fact, BEV has even already been used as a system to allow shareholders of publicly held companies to vote on General Meetings.

The first instance of this utilization emerged in 2016 through a collaborative effort between Nasdaq and Estonia, resulting in the development of an innovative BEV system.¹⁷⁷ Integrated into Estonia's pioneering e-Residency program,¹⁷⁸ this transformative system was specifically devised to allow Estonian e-Residents and stakeholders of Estonian companies to participate in General Meetings of shareholders more effectively, introducing a new dimension of accessibility and security to the Tallinn Stock Exchange (now referred to as Nasdaq Tallinn AS). Shareholders with an Estonian national online ID that use this novel protocol are able to “(i) view information about meetings and vote before or during the meeting; (ii) use the system to transfer their voting rights to a proxy; (iii) monitor how the proxy voted on their behalf and, if needed, recall the proxy; (iv) and review previous meetings and transactions based on the indelible record the system creates”.¹⁷⁹

In Europe, the Spanish energy company Iberdrola, which largely operates in the Portuguese energy market, is also using blockchain technology for holding its General Meetings, as of 2022.¹⁸⁰ The company created a “Participation Portal” using blockchain technology to allow the shareholders to both accredit themselves and participate in the General Meeting. It also allows shareholders to verify, up to one month after the Meeting, that their or their proxy’s vote was correctly registered in the blockchain network.¹⁸¹ The company argued that this is “another step forward in making its board more transparent, accessible, digital and participatory”.¹⁸²

¹⁷⁶ “How Boston Tech Companies Are Trying to Improve Our Elections”, WBUR Local Coverage, 2018. Available at: <https://www.wbur.org/news/2018/11/05/election-security-boston-companies>.

¹⁷⁷ NASDAQ, “Is Blockchain the Answer to E-voting? Nasdaq Believes So”.

¹⁷⁸ See more at: <https://e-estonia.com/briefing-centre/about-us/>.

¹⁷⁹ Ibid.

¹⁸⁰ See more at: <https://www.iberdrola.com/press-room/news/detail/iberdrola-first-company-to-use-blockchain-to-certify-shareholdings-general-shareholders-meeting>.

¹⁸¹ Ibid.

¹⁸² Ibid.

3.3.2. The voting process

While each BEV system is inherently unique, tailored to address specific purposes or challenges of different companies or organizations, it is still possible to outline a conceptual technological framework illustrating its potential implementation within a corporate context.

By adopting BEV for enhanced participation in General Meetings, a company's authorized shareholders or their proxy would be assigned a unique digital blockchain identity, which would ensure that voting rights associated to certain shares correspond with the correct shareholder/proxy.¹⁸³ This improved authentication/verification process may involve Know Your Customer (KYC)¹⁸⁴ procedures to establish the shareholder's identity and eligibility to vote.¹⁸⁵ Similar procedures were used in the e-voting project in Estonia led by Nasdaq, for example.¹⁸⁶

Following, the shareholders or their proxy would be given their voting right tokens. When the time comes to cast the votes, shareholders or their proxy would cast their token-votes, also referred to as "votecoins",¹⁸⁷ electronically through a secure platform using a computer, or a mobile device.

Once a token-vote were cast, it would undergo verification and encryption to ensure its authenticity and security.¹⁸⁸ Cryptographic techniques are used to protect the privacy and integrity of the votes, preventing voter tampering and promoting secure

¹⁸³ LAFARRE, Anne et al., "The Viability of Blockchain in Corporate Governance. European Corporate Governance", p.17.

¹⁸⁴ In broad, KYC is "a standard in the investment industry that ensures advisors can verify a client's identity and know their client's investment knowledge and financial profile". See more at: <https://www.investopedia.com/terms/k/knowyourclient.asp>. In this case, KYC procedures are undertaken by the company to identify and verify the profile of each voting shareholder. This is meant verify that the shareholder is who they say they are, and whether they are eligible to vote under the law and the articles of association of the company.

¹⁸⁵ LAFARRE, Anne et al., "The Viability of Blockchain in Corporate Governance. European Corporate Governance", p.17.

¹⁸⁶ PANISI, Federico et al., "Blockchain and Public Companies: A revolution in Share Ownership Transparency, Proxy Voting and Corporate Governance?", p.12.

¹⁸⁷ MAGNIER, Véronique et al., "The Potential Impact of Blockchains on Corporate Governance: A Survey on Shareholders' Rights in the Digital Era", p.205.

¹⁸⁸ ABUALY, Sydney Lauren, "Estonia's Gift to the World": The Implementation of a Blockchain Protocol for Corporate Governance in New York", *Brook. J. Corp. Fin. & Com. L.*, 14(2), 2020, p.291.

voting records.¹⁸⁹ Techniques like zero-knowledge proofs (ZKP),¹⁹⁰ for instance, can be used to separate the voting choices from the identities of the shareholders, ensuring confidentiality.

The token-votes would then be grouped into blocks, and a consensus mechanism would be employed to validate and add the blocks to the blockchain. This mechanism ensures that the voting results are agreed upon by the network participants and prevents manipulation, as explained in the section on blockchain technology.¹⁹¹

After encryption and verification, the voting choices and instructions would be recorded as transactions on the blockchain, creating a permanent and transparent record of the General Meeting's results.¹⁹²

3.3.3. The benefits of BEV to corporate voting

BEV provides the foundation for an improved voting mechanism, offering various advantages to a commercial company in comparison to remote voting by email, for example, which is the prevailing approach to voting during General Meetings, as showcased in Chapter 2.

Namely, the use of BEV could (i) increase access and the participation of individual shareholders in the General Meeting, (ii) ensure higher accuracy in ballot counts and strengthen the legitimacy of decisions made through the voting process and (iii) increase fairness and transparency in voting.¹⁹³

Firstly, because of an improved blockchain-powered identity and verification system, BEV would simplify the intricacies associated with identifying voting shareholders, increasing legitimacy and access to the General Meeting. Additionally, if shares were able to be registered on the blockchain prior to this moment, this process would be expedited.

¹⁸⁹ KSHETRI, Nir et al., “Blockchain-enabled E-voting”.

¹⁹⁰ A ZKP is a way of proving the validity of a statement without revealing the statement itself. See more at: <https://ethereum.org/en/zero-knowledge-proofs/>.

¹⁹¹ KSHETRI, Nir et al., “Blockchain-enabled E-voting”.

¹⁹² Ibid.

¹⁹³ PANISI, Federico, et al., “Blockchain and Public Companies: A revolution in Share Ownership Transparency, Proxy Voting and Corporate Governance?”, p.12.

Secondly, by leveraging blockchain technology, the vote counting process would be significantly enhanced, ensuring greater accuracy in the final tally of votes.¹⁹⁴ As it has been explained, BEV would create an immutable and transparent ledger that records all voting transactions. Once a token-vote were cast, it would be registered and become a permanent record of the blockchain, which could not be able to be altered or tampered with. Hence, the potential for vote miscalculation, fraud or manipulation by intermediaries counting the votes would be minimal.¹⁹⁵

This would ensure that the voting process and results were transparent, fair and could be independently verified by shareholders or their proxy, as to confirm their voting options. Shareholders could also have real-time access to voting information – they would be able to track the voting progress, view the current vote counts, and monitor the results as they are recorded on the blockchain.

BEV's transparency and reliability would consequentially eliminate the need for intermediaries in the voting process, such as proxy institutions, which largely contribute to the problems outlined in the first chapter (e.g., inexact voter lists, lack of transparency, non-receipt or delay in receiving proxy materials, etc.). As the proxy appointment would be recorded directly on the blockchain and linked to the voting shareholder, the risk of beneficial shareholders being deprived of their voting rights due to errors or delays would lessen.¹⁹⁶

Historically, eliminating the need for intermediaries also eliminates several transaction costs to shareholders.¹⁹⁷ Therefore, this enhancement serves to further motivate shareholders to engage in decision making, as empirical research has demonstrated time and time again that reducing the turnout costs for minority shareholders increases their participation.¹⁹⁸

¹⁹⁴ Ibid.

¹⁹⁵ DE FILIPPI, Primavera et al., "Blockchain and The Law: The Rule of Code", p. 134.

¹⁹⁶ See more at: <https://www.iberdrola.com/corporate-governance/general-shareholders-meeting/participation-meeting/participation-portal/blockchain>.

¹⁹⁷ LAFARRE, Anne, & VAN DER ELST, Christoph, "Blockchain Technology for Corporate Governance and Shareholder Activism", European Corporate Governance Institute (ECGI) Law Working Paper No. 390., 2018, p.18.

¹⁹⁸ LAFARRE, Anne et al., "Bringing the AGM to the 21st century: Blockchain and Smart Contracting Tech For Shareholder Involvement", p.24.

What's more, the transparent and immutable nature of the blockchain would certify that the entire voting process could be easily audited by qualified and authorized third parties, enhancing trust and confidence in the company's governance practices.¹⁹⁹

With all of this taken into account, it seems clear that, at least in theory, BEV would promote more voter participation, as it enables secure, cost-effective voting to facilitate shareholder participation and voting from a distance.²⁰⁰

4. THE LAW

Some academics have argued that the current legal framework is “sufficiently flexible” to sustain the introduction of blockchain technologies in commercial companies in Europe.²⁰¹ This argument is mostly based on the flexibility and openness allowed by the SRD.

One major goal of the SRD, revised in 2017,²⁰² is to reinforce shareholders' engagement. One way it sets forth that goal is by facilitating forms of remote participation by electronic means and electronic voting. Namely, Article 8(1) of the SRD mandates that Member-States (MS) “shall permit companies to offer to their shareholders any form of participation in the general meeting by electronic means, notably any or all of the following forms of participation: (a) real-time transmission of the General Meeting; (b) real-time two-way communication enabling shareholders to address the general meeting from a remote location; (c) a mechanism for casting votes, whether before or during the General Meeting, without the need to appoint a proxy holder who is physically present at the meeting”.²⁰³

Paragraph 2 of Article 8 further states that electronic participation shall only be made subject to constraints when those are “necessary to ensure the identification of

¹⁹⁹ ABUALY, Sydney Lauren, “Estonia’s Gift to the World: The Implementation of a Blockchain Protocol for Corporate Governance in New York”, p.291.

²⁰⁰ MAGNIER, Véronique et. al, “The Potential Impact of Blockchains on Corporate Governance: A Survey on Shareholders’ Rights in the Digital Era”, p. 205.

²⁰¹ LAFARRE, Anne et al., “Bringing the AGM to the 21st century: Blockchain and Smart Contracting Tech For Shareholder Involvement”, p.20.

²⁰² Consolidated version available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02007L0036-20220812>.

²⁰³ Ibid.

shareholders and the security of electronic communication”,²⁰⁴ and such constraints must be proportionate to their purposes.

From all that has been considered thus far, it seems intelligible that blockchain technology unquestionably enables the identification of shareholders and enhances secure electronic participation.

Because of Article 8 of the SRD, all MS offer some form of electronic participation in General Meeting.²⁰⁵ However, as the SRD is a European directive, a thorough analysis of the Portuguese law focused on the use case of blockchain technology studied in this dissertation is still very much called for, as each MS has established its own legal requirements and limitations. What’s more, the SRD does not cover all the queries that this use-case poses.

The analysis of the Portuguese law must be divided in two parts, as there are two questions to be answered: (i) could a Portuguese publicly listed company legally adopt BEV and set up a DAO structure within the company’s organization? And (ii) is the legal procedure of the General Meeting in publicly listed companies compatible with the adoption of these technologies?

As this dissertation focuses on commercial companies that issue shares admitted to trading on a regulated market, both the CCA and the Portuguese Securities Code (PSC)²⁰⁶ are applicable. While the CCA is applicable to all SA, the PSC has a few special rules concerning SAs which have shares admitted to trading on a regulated market. Therefore, this analysis will focus on both these legal documents.

4.1. Could a Portuguese publicly listed company legally set up a DAO structure within the company’s organization and adopt BEV?

There are various levels of company organization, namely, the legal rules (the law), the Articles of Association (*Contrato de Sociedade*) and the Bylaws (*Estatutos*

²⁰⁴ Ibid.

²⁰⁵ In Portugal, this is mainly established in articles 377.º, n.º.6, b) of the CCA and 22º-A of the PSC.

²⁰⁶ Available in English at: https://www.cmvm.pt/en/Legislacao/National_legislation/Securities%20Code/Documents/CdVM.Inglês.09.10.2019.pdf.

Sociais), the Shareholder's Agreements (*Acordos Parassociais*), the Shareholder's Resolutions (*Deliberações dos Sócios*) and the Resolutions of the Board of Directors (*Deliberações do Conselho de Administração*).²⁰⁷

As the distinction between the Articles of Association and the Bylaws has no direct legal relevance under Portuguese law, being the same document, this set of rules shall hereinafter be referred to as just "Articles of Association".²⁰⁸

In matters where the law is silent, the Articles of the Association set the main organizational rules of a company. They govern the birth and identity of the company, its organization, its internal and external relations, as well as its eventual dissolution.

Being the *magna carta* of the company, the clauses established in the Articles of Association have *erga omnes* efficacy and are enforceable against all shareholders, current or future, as well as against the company itself and third parties.²⁰⁹ Hence, they stand as the optimal framework to navigate a venture as ambitious as creating a hybrid body by incorporating a DAO structure and blockchain technology into the fabric a company's organization.

One could also question if the establishment of a DAO structure within the company could be facilitated by a Shareholder's Agreement, given that these mechanisms are designed to align the pre-determined legal structure of companies with shareholders' interests.²¹⁰ Nevertheless, the practicality of this approach is questionable for two main reasons. On the one hand, gathering signatures from all current shareholders would be a complex challenge in its own right; on the other hand, such an agreement would only be relevant and legally binding among the involved parties, as Shareholder's Agreements have merely *inter partes* efficacy,²¹¹ failing to extend their influence to future shareholders who become part of the company. As such, this option might not be the most

²⁰⁷ These translations are in accordance with the translation to English of the "Código das Sociedades Comerciais" (Commercial Companies Act), published on the official website of the Comissão do Mercado dos Valores Mobiliários (CMVM). Available at: <https://www.cmvm.pt/pt/Comunicados/Comunicados/Pages/20191010s.aspx>

²⁰⁸ ANTUNES, José Engrácia, "Os Estatutos Sociais: Noção, Elementos e Regime Jurídico". Universidade Católica Portuguesa, Direito E Justiça (Especial), 255-272, 2012, p. 255-272.

²⁰⁹ Ibid.

²¹⁰ SANTOS, Mário Leite, "Contratos Parassociais e Acordos de Voto nas Sociedades Anónimas", Edições Cosmos, 1996, p.11.

²¹¹ COUTINHO DE ABREU, Jorge Manuel, "Curso de Direito Comercial V.II", Almedina, 2021, pp. 156-157.

convenient strategy for ensuring the successful integration of this technology within the company.

Prior to delving into the nuances of Portuguese law concerning the adoption of these technologies and drawing any conclusions, it is of utmost importance to understand the legal framework governing the substance of the Articles of Association of a Portuguese publicly held company. This understanding will enable one to assess the feasibility of incorporating these technologies in the first place.

4.1.1. The Articles of Association

Under Article 9.º of the CCA, there are some mandatory clauses that need to be included in the Articles of Association, regardless of the type of company being incorporated. These include (a) the names of the founding partners and other data that identifies them; (b) the type of the company being incorporated; (c) the business name (i.e., “firma”); (d), the purpose of the company (i.e., “objeto social”); (e) the company’s headquarters; (f) the social capital; (g) the capital quota held by each founding partner of the company and they type of initial capital contribution of each partner, as against each quota; (h) in the event of an initial capital contribution comprising assets other than money, a description of these assets and specific information pertaining to their value; and (i) in cases where the financial year differs from the calendar year, the date on which it closes, which must coincide with the last day of the calendar month, notwithstanding the provisions of Article 7.º of the Portuguese Corporate Income Tax Code.

Moreover, there are some mandatory clauses which are specific to the type of company being incorporated. In the case of a SA, the type of commercial company being studying in this dissertation, under Article 272.º of the CCA, the articles of association must include: (a) the par value of each share and the number of shares; (b) the particular conditions to which the assignment of shares shall be subject, if any such conditions exist; (c) any categories of shares which may be created, with an express indication of the number of shares and the rights conferred by each category; (d) the nominative nature of the shares; (e) the value of capital paid-up and the deadlines for paying up capital which has merely been subscribed; (f) the authorisation for the issue of bonds, if granted; and (g) the structure adopted for the management and supervision of the company, according to the options underlined in article 278.º.

There are also additional, voluntary clauses that the parties can include in the Articles of Association. These include clauses granting special advantages to one or more shareholders under Article 16.º, and clauses included in application of a legal rule which expressly empowers the shareholders to establish the regime applicable to a given situation (e.g., the obligations to make supplementary and accessory payments of capital under Articles 209.º, 210.º e 287.º of the CCA).

Beyond the mandatory and voluntary clauses, there is another category of clauses inherently ingrained in the fabric of commercial companies' Articles of Association: the legal corporate rules of imperative nature. These rules cannot be waived or derogated, not even by the unanimous will of the shareholders.²¹² For example, these clauses include the duty to share in losses and participate in profits (Article 22.º, n.º3 of the CCA), the duty to hold an AGM within three months of the close of the financial year or within five months of the same date, in the case of companies required to present consolidated accounts or applying the equity method (Article 376.º, n.º1 of the CCA), etc.

The following Articles of the CCA include some of these imperative legal corporate rules: Article 22.º, n.º 3 and 4; Article 25.º, n.º1; Article 27.º, n.º1; Article 32.º, n.º1; Article 33.º, n.º1; Article 74.º, n.º1; Article 85.º, n.º1; Article 131.º, n.º1; Article 210º, n.º3, a) and n.º4; Article 220.º, n.º1, 2 and 3; Article 233.º, n.º1; Article 246.º, n.º1; Article 248.º, n.º3; Article 265.º, n.º1 and 3; Article 316.º, n.º1; Article 318.º; Article 376.º, n.º1; Article 377.º, n.º4; Article 384.º, n.º5; and Article 391.º, n.º2.

These rules are a vital component of the Articles of Association, persisting as such even in the absence of explicit clauses or in the presence of conflicting clauses within the document.

Ultimately, in instances where the CCA is silent and no imperative legal rules stand in opposition, the will of the shareholders is sovereign over the configuration of the company's organization and structure. Consequently, it can be argued that the Articles of Association have the flexibility to encompass elements and aspects pertaining to the genesis, existence, or dissolution of a company that have not been subject to regulation by the CCA or distinct corporate legislation.²¹³ Examples of this situation may be found,

²¹² ANTUNES, José Engrácia, “Os Estatutos Sociais: Noção, Elementos e Regime Jurídico”.

²¹³ *Ibid.*

for example, in the provision, in the Articles of Incorporation, of certain atypical corporate "bodies" (e.g., committees, working groups, advisory boards).²¹⁴

The clauses in the Articles of Association can only be altered by deliberation of the shareholders, as per Article 85.º, n.º1 of the CCA. This deliberation requires a qualified majority of shareholders, as per Article 383.º, n.º2 of the CCA.

4.1.2. Adopting a DAO structure within a legally incorporated company under Portuguese Law

A DAO is novel technology, largely unregulated. Adopting such a system within a legally incorporated company, creating a corporate hybrid entity/body, is a completely new venture. Hence, there is no mention of such an endeavour in the CCA, nor in the legal regime of the Articles of Association, nor in any other set of laws in Portugal.

However, there is also an absence of both direct and indirect imperative legal rules opposing this course. Among the aforementioned imperative rules, the subsequent pertain to voting procedures and shareholders' resolutions ratified during General Meetings: Article 376.º, paragraph 1; Article 377.º, paragraph 4; Article 384.º, paragraph 5; and Article 391.º, paragraph 2. Notably, none of these provisions would be impacted by this undertaking. It would also not hinder the inclusion of any of the mandatory clauses in the Articles of Association, nor the addition of the voluntary clauses.

Thus, aligned with the preceding argument, a compelling case can be made for the sovereignty of shareholders' private autonomy and will in this scenario. Given their consent, it becomes plausible for the choice to integrate a DAO structure into the company's internal framework to be legally embodied within the Articles of Association.

The technology's complex processes and functionalities need not be exhaustively detailed in the Articles of Association. While being a legal limit to the powers of this technology, this document ought to also serve as an open door, offering a broad avenue for the potential realization of such an initiative within the company. Rather than delving into the technological intricacies of a DAO, the focus should be on articulating the overarching objective of its adoption within the company.

²¹⁴ Ibid.

The Articles of Association should also empower the board of directors to determine the terms in which this technological solution would operate within the company. As per Article 406.^o paragraph i) of the CCA, “important modifications to the organisation of the company” are a competence of the board of directors. Therefore, it would be within their powers, in gross, to establish these terms, which could then be approved by the shareholders in the General Meeting.

4.1.2.1. Legal reservations

While incorporating a DAO structure into the company's organization offers significant advantages, such as establishing an immutable record of General Meeting resolutions and enabling the automatic execution of shareholder-approved actions, it is essential to acknowledge that these benefits also come with potential legal implications.

Although this venture doesn't inherently violate any imperative legal rules, it's crucial to ensure that the operations conducted through the smart contracts governing the DAO remain within the limits set by these rules. This preventive action is paramount to prevent shareholders, stakeholders and the management of the company from exploiting the immutability feature of DAOs and their capacity to automate the execution of resolutions as a means to circumvent legal obligations.

This pre-emptive necessity stems from the fact that, after its deployment, illicit or fraudulent code will execute actions as planned, even if it's violating legal provisions or going against their fundamental purposes.

For example, Article 316.^o, n.^o1 contains an imperative legal rule, which states that “a company may not subscribe its own shares”. In theory, the shareholders could cast their votes in favor of subscribing the company's own shares, prompting the smart contracts to execute this action automatically. This execution would be perpetually and immutably documented on the network. For this reason, the DAO's protocol should be embedded with objective safeguards and limitations regarding some of these imperative rules, as to diminish the opportunistic behavior of the parties. As it has been said prior, the rules stated in the company's Articles of Association, in the law and in applicable stock exchange rules would need to be translated into the blockchain to prevent these situations.

Further, these characteristics could threaten legality in situations where the resolution of the shareholders could be deemed null or voidable for one of the reasons framed in Article 56.^o and Article 58.^o, respectively.

Firstly, under Article 56.^o, resolutions shall be deemed null when (i) adopted at a General Meeting which was not convened; (ii) adopted through a written vote without all partners having voting rights being invited to exercise said right, unless all partners submitted their votes in writing; (iii) the contents of the resolution were not, by their nature, subject to resolution by the shareholders; or when (iv) the content of the resolutions, either directly or through acts of other bodies determined or permitted thereby, constitutes an immoral offence or an offence against morality or against legal rules which cannot be derogated, not even with the unanimous agreement of the partners.

Scenario (i) and (iii) can be effectively protected by integrating safeguards into the DAO's protocol. Smart contracts could be meticulously designed to prevent these scenarios from arising. On the other hand, addressing scenario (iv) presents a challenge to this technology, as terms like "immoral offence" and "offence against morality" lack objectivity and cannot be encoded within smart contracts. Therefore, human input inside of the system might be necessary.

It's worth noting that scenario (iii) isn't relevant to this particular use-case, as it mentions a distinct way of voting in the General Meeting than the one under examination here, the "written vote".²¹⁵

Secondly, resolutions shall be deemed voidable under Article 58.^o when (i) they violate the law, or the Articles of Association; (ii) are likely to satisfy the will of one of the shareholders of obtaining, through the exercise of their voting rights, special benefits for themselves or for third parties, resulting in a loss for the company or other shareholders, or simply placing the company or other shareholders at risk, unless it is proven that the resolutions would have been adopted even without the abusive votes, or (iii) was not preceded by the submission of the minimum required information to the shareholder.

In this instance, it seems likely that a DAO's protocol holds the potential to mitigate most scenarios, as their objective nature is easily incorporated into smart

²¹⁵ See: Article 54.^o of the CCA.

contracts. However, scenario (ii) might also require human inputs, as the “abusive will of the shareholders”, “special benefits for themselves or third parties” and “risk to other shareholders or the company” are hardly objectively described.

4.1.3. Adopting BEV for casting and recording the votes under Portuguese Law

From the conjoint reading of the CCA and the PSC, it's defensible that the use of BEV for casting and recording the votes at General Meetings is already admissible and somewhat recognized under Portuguese Law.

Firstly, the CCA, in Article 384.º, n.º8, claims that "the manner of exercising the vote may be determined by the Articles of Association, by Resolution of the Shareholders, or by Decision of the Chairman of the Board". The interpretation of this legal provision has led doctrine to state that this is a statutory matter by nature and that any form of voting agreed on by the shareholders, be it voting by "standing and sitting", by electronic vote, by roll-call voting, should be admissible.²¹⁶

Secondly, the admissibility of absentee votes within General Meetings of publicly held companies is anchored both in the CCA, under article 384.º, n.º9, and in the PSC, under Articles 22.º and 22.º-A, with the latter specifically referring to the possibility of electronic voting.

Further, in Article 384.º, n.º 9, the law demands that the company's Articles of Association shall regulate the exercise of absentee postal voting, establishing namely how to verify the authenticity of the vote and how to ensure, until the moment of the vote, its confidentiality, opting for one of the hypotheses prescribed in article 384.º, n.º9. By analogy, it appears that the company's responsibility would extend to the regulation of electronic voting within the Articles of Association as well. In preparation for the General Meeting, the notification calling the Meeting must describe this process, as per article 377, n.º. 5, al. f) of the CCA. It's important to highlight that this paragraph pertains to both physical and electronic addresses as viable avenues for receiving votes, contributing to the analogy made supra, even though Article 384º, n.º9 only refers to postal voting.

²¹⁶ DINIS, Marisa Catarina da Conceição, “Da Admissibilidade da Aplicação do Sistema de Videoconferência às Assembleias Gerais das Sociedades Anónimas”, *Revista De Ciências Empresariais E Jurídicas*, (8), 177–219, 2006, p.186–187.

In line with these legal provisions, it has also been publicly recommended by the CMVM that, “should electronic voting be accepted in the formation of resolutions of members, it is important to ensure that the company possesses the necessary technical resources for verifying the authenticity of such votes and for guaranteeing its integrity as well as to ensure confidentiality of the contents of the communications so received”.²¹⁷

Until now, electronic voting has primarily been centered around casting votes through email. Indeed, as highlighted in the initial chapter, research has demonstrated that the predominant approach to voting during General Meetings has become voting by email. However, the concept of “electronic voting”,²¹⁸ in a broader sense, encompasses various methods of casting and recording votes through electronic devices. Therefore, electronic voting inherently includes the possibility BEV. This alignment with the existing definition renders any conceptual modifications to current laws unnecessary to accommodate this prospect.

The Articles of Association of Iberdrola, who, as mentioned supra, has adopted a form of blockchain technology to certify shareholder participation in the General Meetings, include a broad authorization of means to the board of directors with regards to establishing the specific rules and methods of voting, absentee voting, and remote attendance.

As way of example, with regards to “Deliberation and Voting”, Article 26.º, n. º3 of Iberdrola’s Articles of Association, states that “proposed resolutions shall be voted upon by the shareholders at the General Shareholders’ Meeting pursuant to the provisions of the following articles and the Regulations for the General Shareholders’ Meeting”. The “Regulations for the General Shareholders’ Meeting” then empower the board of directors to “develop the rules, means and procedures adjusted to current techniques in order to organize the casting of votes”; and specifically, to “establish rules for the use of personal passwords and other safeguards other than electronic signatures, and the instant

²¹⁷ See https://www.cmvm.pt/en/Legislacao/National_legislation/RecCorporate%20Governance/Pages/Absentee-Votes-Submitted-by-Mail-in-Public-Companies.aspx?v= more at:

²¹⁸ See more at: <https://www.britannica.com/topic/electronic-voting>.

authentication system for the grant of proxies by electronic correspondence or by other valid remote means of communication (...).²¹⁹

Additionally, regarding Proxy Representation, Article 19.º, n.º2 of the mentioned Regulations states that the proxy may be granted by various means, determined by the board of directors, such as “through the proxy form available on the Company’s corporate website, using the instant authentication systems implemented by the Company, recognized electronic signature of the shareholder or other type of guarantee that the Company deems proper to ensure the authenticity and identification of the shareholder granting the proxy”.²²⁰

The “instant authentication systems” mentioned in both of these provisions uses blockchain technology to recognize the identity of the shareholders or their proxy.²²¹

4.1.4. The use of a Private or Permissioned Blockchain

As it has been said in Chapter 3, private and permissioned blockchains are commonly deployed to streamline and enhance intricate, inefficient, and predominantly manual operational processes within organizations. These blockchains maintain limited access, exclusively permitting authorized participants to join, and stand out for their ability to guarantee privacy and tailored solutions to corporate challenges.

For these reasons, private and permissioned blockchains, rather than infamous public blockchains archetypes, are typically adopted within companies. They are also the optimal options for the use-case being studied in this dissertation.

To further support this argument, it is recognized that General Meetings, traditionally, are private by nature. This is corroborated by the CCA, in which every Article referring to the resolutions of the shareholders and General Meetings is addressed only to the shareholders. In fact, to participate in General Meeting is a right attributed by law to the shareholders and not to strangers to the company (article 21.º CCA). In addition, the law does not foresee the presence of strangers to the company at its General

²¹⁹ Article 40.º, n.º8 of the “Regulations for the General Shareholder’s Meeting”, Available at: https://www.iberdrola.com/documents/20125/41980/regulations_shareholders_meeting.pdf.

²²⁰ Ibid.

²²¹ See more at: <https://www.iberdrola.com/press-room/news/detail/iberdrola-first-company-to-use-blockchain-to-certify-shareholdings-general-shareholders-meeting>.

Meetings, unless their presence is authorized by the Chairman of the Board, under article 379.º, n.º6 CCA. This authorization must only be granted when, in addition, the President of the Board of the General Meeting understands that the presence of a stranger to the company does not conflict with the company's interests or, even more so, when it is useful to the company's interest.²²² Moreover, Article 517.º of the CCA sanctions the fraudulent participation in the company's General Meetings. Clearly, this was a topic that the legislator did not want to leave to statutory freedom.

Although the company would lose some of the decentralization that characterizes blockchains (i.e., “public blockchains”), it would still be able to streamline some of the legal formalities of traditional companies. What's more, decentralization is not the main feature sought after in this case. Rather, transparency, autonomy, accuracy, privacy, the minimization of the potential for fraud or manipulation, and more efficient voting systems are the biggest upsides of using this technology in this context.

For instance, unlike in a public blockchain, where false information is extremely difficult to correct it after stored, a private blockchain that relies on a somewhat central authority which oversees the faithfulness of the data allows the correction of the database if an error occurred.²²³ This is crucial.

Yet, employing a private or permissioned blockchain carries certain inherent risks, as there is still, at least, a central governing body that retains authority over transaction oversight, code alterations within the blockchain, and access limitations. Therefore, it is imperative to create safeguards against any potential algorithmic actions that prioritize the interests of this central entity over those of the company itself.²²⁴

²²² DINIS, Marisa Catarina da Conceição, “Da Admissibilidade da Aplicação do Sistema de Videoconferência às Assembleias Gerais das Sociedades Anónimas”, p.195.

²²³ MAGNIER, Véronique et al., “The Potential Impact of Blockchains on Corporate Governance: A Survey on Shareholders' Rights in the Digital Era”, p. 222.

²²⁴ LAFARRE, Anne et al., “The Viability of Blockchain in Corporate Governance. European Corporate Governance”, p.8.

4.2. The legal procedures of the General Meeting: combining law & tech

4.2.1. Call to the Meeting

Under Article 375.º, n.º1 of the CCA, a General Meeting must take place whenever stipulated by law or by the board of directors, or when the audit committee, the executive board of directors, the supervisory board or the general and supervisory council shall see fit to call it. According to Article 23.º-A of the PSC, on par with Article 375.º, n.º2 of the CCA, it can also take place when one or more of the shareholders owning shares corresponding to at least 2% of the share capital request it and the chairman of the board approves such request.²²⁵

General Meetings shall be called by the Chairman of the Board at the General Meeting, who ought to ensure the publication of the notice of the Meeting within 15 days of receipt of the request.²²⁶ The Meeting shall take place within 21 days of the date of publication of the notice of Meeting, as per Article 21.º-I, n.º1 of the PSC.²²⁷ In special cases, under Article 377.º, the General Meeting can also be called by the audit committee, the general and supervisory council, the supervisory board or the courts.

If the General Meeting in question is the AGM, the responsibility to call it lies with the board of directors or the executive board of directors and the AGM shall take place within three months of the close of the financial year or within five months of the same date, in the case of companies required to present consolidated accounts or applying the equity method (Article 376.º of the CCA).

The competence to call the Meeting shall not change if the Meeting were to operate through a DAO structure, using blockchain. There is no technical, nor legal obstacle that would compromise the competence of these parties to call the Meeting. The process could start, for instance, with the Chairman of the Board giving notice of the Meeting and setting its date and other timelines on the blockchain.

Article 167.º of the CCA establishes that the notice of the call of Meeting must be published on an Internet site accessible to the general public and/or should be sent to the

²²⁵ This is a special provision in relation to article 375.º, n.º2 of the CCA, which sets this rule at 5% of the share capital owned.

²²⁶ Article 377º, n.º1 and 375.º, n.º4 of the CCA.

²²⁷ This is a special provision in relation to article 375.º, n.º4 of the CCA.

shareholders, either by post or by electronic mail with viewing receipt, as per Article 377.º, n.º3 and 5.

While the notice of the Meeting could still be published in an Internet site accessible to the general public, the company can take a step further in the digitalization of this process.

As Article 377.º, n.º3 allows the Articles of Association of the company to set other ways of notifying the shareholders, it seems possible that the shareholders could establish the possibility of receiving an automatic blockchain notification in their email calling the General Meeting after its date is set on the blockchain, streamlining and modernizing this process.

4.2.2. Place of the Meeting

According to article 377.º, n.º.6, a) of the CCA, Meetings shall be held at the at the headquarters of the company or another location within the national territory, to be chosen by the Chairman of the Board at the Meeting, if the company's facilities do not allow for the Meeting to be held in satisfactory conditions.

However, in b), the legislator allows for the Meeting to take place through telematic means, as long as the Articles of Association don't prohibit this practice and granted that the company vouches for the authenticity of the declarations made and the security of communications and registers the content of the Meeting and anyone intervening in it.

Further, law 1-A/2020, from the 19th of March,²²⁸ in its 5th article, states that “the choice of telematic means, namely video or teleconference of members of collegiate bodies of public or private entities in the respective meetings, does not hinder the regular functioning of the body, namely in what concerns quorum and resolutions”. This law enacted exceptional and temporary measures in response to the epidemiological situation caused by the SARS-CoV-2 coronavirus and COVID-19 disease. Besides complementing article 377.º, n.º.6, b) of the CCA, it also determined that its provisions would prevail over

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legal, general, and special norms that provide to the contrary of what it stated. Hence, for the time period that it was applicable, it prevailed in relation to a company's articles of association, and it allowed for its meetings to take place through telematic means, even if the company's articles of association prohibited them.²²⁹

If the use of telematic means in a General Meeting did not "hinder the regular functioning of the body, namely in what concerns quorum and resolutions" during the Pandemic of COVID-19, as stated in Law 1-A/2020, then there is no reason to believe that it would be inadequate to hold the General Meeting in digital form today.

Therefore, it seems acceptable that Meetings could occur in virtual spaces, such as an online forum or an online community, which could be provided under the DAO, with shareholders participating remotely.²³⁰ As suggested by the Consortium in the CSD Working Paper,²³¹ General Meetings held online could be live streamed to the shareholders and have chat facilities to allow their participation.

Holding remote/virtual Meetings goes one step further than BEV and would not be necessary to set up a DAO structure within the company, nor to use blockchain technology *per se*. However, it would be especially useful for shareholders who choose to cast their token-votes remotely (via BEV) and potentially prior to the Meeting. This is also according to the standard set by the SRD in its Article 8 already back in 2007.²³²

If the company doesn't find reasons that would make it advisable to hold the Meeting exclusively by remote means, the Meeting could still occur in hybrid format, with the shareholders being able to participate either in person or remotely. Considering the current shape of the forum function of the Meeting, discussed supra, this would be highly beneficial.

If the Meeting were to occur both remotely and digitally, the company would be need design and publish a few steps and procedures to be followed by shareholders (or

²²⁹ GODINHO, Inês Fernandes & CASTRO, Miguel Osório. "Covid 19 e o Direito", Edições Universitárias Lusófonas, 2020, p.95.

²³⁰ PARK, Su-Yeon et al., "Understanding Decentralized Autonomous Organizations (DAOs) As a Reaction to Corporate Governance Problems", Digital Strategy Review, 2022.

²³¹ CSD WORKING GROUP, "General Meeting Proxy Voting on Distributed Ledger: Product Requirements".

²³² See Directive 2007/36/EC Of The European Parliament And Of The Council Of 11 July 2007 On The Exercise Of Certain Rights Of Shareholders In Listed Companies, Article 8.º, n.º1. Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32007L0036>.

their proxy representatives) to enable their identification and registration and the correct way to exercise of their rights, along with the proper conduct of the Meeting. For example, shareholders and proxy holders who wish to attend the Meeting remotely would have register via blockchain in a pre-determined time period prior to the Meeting, to facilitate shareholder identification and verification.

Iberdrola, for instance, which has already been talked about in previous sections, has created a channel to broadcast the Meeting, allowing shareholders to watch it remotely.²³³ It also created a “Participation Portal”, which uses blockchain technology, for the shareholders or their proxy representatives to pre-register to participate in the Meeting and be able to then vote remotely.

4.2.3. Casting the Votes: tokens and the law

In the General Meeting, shareholder resolutions are formed by the manifestations of will (i.e., votes) of the plenary of the shareholders of the Meeting which hold voting rights.²³⁴ Hence, the legal effect of the resolution is achieved by the agreement of a certain percentage of votes.

In a Portuguese SA, each share is worth one vote, as per article 384.º, n.º1 of the CCA. Exceptionality, and as a special right, n.º2 of Article 384.º allows the Articles of Association to stipulate (i) that a single vote can correspond to a certain number of shares, provided that all shares issued by the company are included and that one vote corresponds to at least 1,000 Euro of capital; (ii) that votes over and above a certain number shall not be counted, when issued by a single shareholder, on their own behalf or as a representative for another shareholder.

In the use-case being analyzed in this dissertation, token-votes, which were already explained in the Chapter on Blockchain, should be considered as the “digital twin” or “digital representation” of the share. Digital twins are the cornerstone of the digital transformation, being a “virtual copy or model of any physical entity, both of

²³³ See more at: <https://www.iberdrola.com/corporate-governance/general-shareholders-meeting/viewing-results>.

²³⁴ COELHO, Eduardo de Melo Lucas, “Direito de Voto dos Acionistas nas Assembleias Gerais das Sociedades Anónimas”, *Rei dos Livros*, 1987, p. 24.

which are interconnected via exchange of data in real time”.²³⁵ A digital twin, in this case the token, mirrors the condition of its physical twin in real time, the share, and vice versa.

As each share is worth one vote, each token-vote would also be worth one vote.

Prior to the Meeting, blockchain could issue tokenized voting rights to all authenticated shareholders who are eligible for voting.²³⁶ The software would then automatically aggregate, register and count the votes expressed by the shareholders through the tokens. This would be possible under Article 384º., n.º8, discussed supra.

Nevertheless, treating these tokens as the digital counterparts of traditional shares gives rise to pertinent legal complexities, namely regarding the nature of these “token-votes” and the regime of their transfer.²³⁷ Shares carry voting rights, while fundamentally serving as investments (i.e., a security). In contrast, token-votes would primarily represent the shareholder’s voting and governance rights, enabling them to make collective decisions within the company, but they do not intent to represent the economic and investment dimensions inherently associated with the underlying shares.²³⁸ From this reasoning, a few crucial questions arise: How could these token-votes be legally qualified? Would the transfer of the share in the physical world entail the transfer of the token-vote in the blockchain? If so, would this process be automated? Moreover, could a shareholder potentially transfer their token-vote, without transferring the underlying share?

While these inquiries about tokens are indeed relevant to this topic, they do not constitute the primary focus of this dissertation and warrant a separate analysis to be addressed comprehensively.

²³⁵ SINGH, Maulshree et al., “Digital Twin: Origin to Future”, *Applied System Innovation*, 4(2), 36, 2021.

²³⁶ CSD WORKING GROUP, “General Meeting Proxy Voting on Distributed Ledger: Product Requirements”.

²³⁷ BORGOGNO, Oscar, “Making Decentralized Autonomous Organizations (DAOs) Fit for Legal Life: Mind the Gap”, *Bank of Italy Occasional Paper No. 718*, 2022, p. 14.

²³⁸ HACKER, Philipp & THOMALE, Chris, “Crypto-securities regulation: ICOs, token sales and cryptocurrencies under EU financial law”, *European Company and Financial Law Review*, 15(4), 645-696, 2018.

4.2.4. Timing of the votes

As analyzed previously, absentee votes are admissible under article 384.º, n.9, and in the PSC, under Articles 22.º and 22.º, and can be sent either by post, or using electronic voting.

With postal voting, the votes cannot be cast simultaneously with the occurrence of the General Meeting because the company must verify the authenticity of the votes prior to counting them. Since postal voting is a highly sensitive activity, as the votes can be easily adulterated, the votes shall be kept safe and confidential until the moment of voting.

Notwithstanding, when it comes to electronic voting, these limitations don't apply. BEV uses cryptographic methods that allow to verify the authenticity of the votes automatically and instantly. The result is that the slowness that occurs in the verification of the authenticity of the postal vote does not occur in the electronic vote, making it safer and more efficient. Hence, there seems to be no reason as to why the shareholders would not be able to cast their electronic token-vote simultaneously with the General Meeting taking place remotely, in a digital space.

Thus, the shareholders or their proxy representatives attending the Meeting remotely, and who would have previously registered in a blockchain platform to be able to participate, should be able to cast their token-votes simultaneously with the General Meeting, and they could be automatically and instantly verified by the blockchain software.²³⁹

4.2.5. Quorums

In Portuguese Law, in what regards general meetings in SA, the existence of quorums, both deliberative and constitutive, is exceptional. By application of article 383.º of the CCA, resolutions shall be approved by the simple majority (50%+1) of the votes cast. In a DAO structure, using blockchain, an identical token-based quorum could be reached.

²³⁹ BORGOGNO, Oscar, "Making Decentralized Autonomous Organizations (DAOs) Fit for Legal Life: Mind the Gap", p.10.

4.2.6. Minutes

The General Meeting's minutes serve various purposes. The minutes shall, under Article 37.º Portuguese Commercial Code, state the (i) date on which it was held, (ii) the names of the participants or reference to the attendance list authenticated by the board, (iii) the votes cast, (iv) the resolutions adopted and (v) anything else that may serve to make these known and substantiate them.

Minutes thus enclose a comprehensive record of all the discussions and resolutions that transpired during a particular Meeting. They establish the occurrence of the Meeting itself and the accompanying resolutions that were made during it. They also serve as a valuable resource for subsequent Meetings, enabling the tracking of progress regarding prior topics.²⁴⁰

Moreover, in the event of an absence from a particular Meeting, shareholders can read the minutes to gain insights into the topics discussed and the resolutions adopted.

Finally, they can also be of use as a recourse in scenarios involving disputes over previous decision-based agreements and they provide legal protection, since they stand as official records of the actions of the shareholders and the board at a particular Meeting.²⁴¹

For of these reasons, their record and authenticity are of paramount importance.

According to Article 388.º, the minutes of General Meetings must be typed and signed by the persons acting as Chairman and Secretary of the Board at the Meeting. However, the shareholders might decide that the minutes ought to be submitted by their approval in the Meeting before being signed. If the company has a Secretary, then they shall be the one typing and signing the meetings, together with the members of the board of directors and the Chairman of the Board, as per article 446.º-B of the CCA.

Traditionally, after the signature, the resulting minutes from the General Meeting were recorded in “Minute Books” (Articles 31.º, nº1 and 37.º of the Portuguese

²⁴⁰ SHEIKHI, Amir Salar Hajv et al, “SmartMinutes – A Blockchain-Based Framework for Automated, Reliable, and Transparent Meeting Minutes Management”, *Big Data and Cognitive Computing*, 6(4), 133, 2022, p. 133.

²⁴¹ *Ibid.*

Commercial Code). Notwithstanding, today it is also possible to use “Electronic Minute Books” (Article 39.º, n.º1 of the Portuguese Commercial Code).

As has been explained thoroughly throughout this dissertation, blockchain serves primarily as an immutable record of information. This technology could streamline several General Meeting minutes’ tasks and aggregate them into a reliable, transparent, and tamper-proof system that would provide a permanent record of every vote and resolution of the shareholders. This would both reduce costs, as well as errors and fraud, while increasing transparency and access.

To this point, there are already blockchain systems and applications being built to automatize the process of managing Meeting minutes. “SmartMinutes”,²⁴² as way of example, is the “first blockchain-based platform for meeting minutes management”. This platform created a framework that “supports the specification of meeting minutes items as voting or non-voting, allows members to know when a vote is cast, simplifies the management of different deadlines of voting items, and creates an immutable record of every vote”.²⁴³

²⁴² Ibid.

²⁴³ Ibid.

5. CONCLUSION

It is widely recognized in both literature and in practice that Corporate Governance is a constant evolving and dynamic endeavor. It is also acknowledged that the current framework governing the proceedings of General Meetings of publicly held companies is in dire need of refinement as to address existing flaws that contribute to suboptimal shareholder participation.

In the last few years, prominent legal and tech scholars have been vocal proponents of the idea that emerging blockchain applications, specifically DAOs and BEV, offer promising solutions to address corporate challenges. Academic discourse indicates that these technologies have the capacity to increase fairness and transparency in shareholder voting and decision-making, while also ensuring precision and enabling end-to-end verification of votes. Furthermore, these technologies also promise to improve shareholder engagement by lowering the costs associated with participation and monitoring.

It is also clear that companies are manifestly accepting of tech innovation, as exemplified by the surge in participation rates following SRD I, in 2007, with voting by mail/remote voting and remote participation emerging as the most common methods for casting votes and engaging in General Meetings. Furthermore, it was found that companies are already actively integrating blockchain solutions into their internal networks and operations to optimize specific services or functions. Notably, some are even leveraging blockchain technology to enhance the efficiency and intricacies of their General Meetings already.

Most importantly, it was concluded that, in theory, it would be possible for a Portuguese publicly held company to adopt these technologies within the bounds of the Portuguese law, given the absence of any explicit or implicit imperative legal prohibitions and the sovereignty of shareholders' will. The conclusion reached was that opting for a private or permissionless blockchain would be the most suitable choice, as it offers the company a combination of flexibility and privacy, while still maintaining most the novelties associated with the public blockchains.

Nonetheless, in practice, many shortcomings were also pointed out. These limitations primarily stem from the absence of a comprehensive legal framework to

govern these technologies and the lack of explicit mention of them in existing legal frameworks, despite their active adoption by companies worldwide.

Firstly, challenges and uncertainties continue to surround the legal classification of DAOs. While it has been determined that integrating a DAO structure into a legally established company could offer advantages over establishing a standalone DAO entity and confronting these uncertainties directly, the fundamental question regarding this technology's legal status and regulatory framework remains a relevant concern.

Similarly, the nature of the "token-votes" which would be used for voting within the DAO is still up for the debate, as is the important regime regarding their transfer and the transfer of their corresponding company shares in this scenario.

Further, the practical application of a DAO structure may uncover instances of centralization and opportunistic behavior by the parties, even when the aim is to decentralize decision-making and ownership. Consequently, it is essential to establish protective and preventive measures, both on and off-chain, that guard against possible algorithmic optimizations that could prioritize the interests of a central entity over those of the company. What's more, human inputs will also be necessary to safeguard rules and practices that cannot be translated into code.

Lastly, in practice, the adoption of these organizational technologies would create a need for the company to establish plenty of internal structures aside from the DAO system itself. The company must ensure that it possesses the fundamental technical resources and infrastructure for the success of this undertaking.

The primary objective of this dissertation was to examine the feasibility and potential procedures by which Portuguese commercial companies could harness the potential emerging blockchain applications to address the specific challenges associated with the conventional General Meeting model. In terms of feasibility ('whether'), it was determined that the adoption of these technologies under Portuguese law is theoretically possible and offers numerous advantages, despite some shortcomings. In terms of methodology ('how'), a potential adoption model was succinctly proposed.

The main challenges associated with the practical employment of these technologies (e.g., security issues, adoption and operational costs, political challenges, etc.) in a corporate setting were not covered in this dissertation. Hence, it is still worth

noting that, while this endeavor seems theoretically possible and certain blockchain projects have achieved remarkable success, others have encountered failures that incurred significant financial and temporal costs for their proponents. Consequently, a critical question remains unanswered and calls for a comprehensive analysis: when weighing the opportunities and challenges of adopting these technologies in corporate settings, is their adoption ultimately justifiable?

To conclude, the progressive adoption of blockchain applications in corporate governance certainly presents a dynamic, ever-evolving landscape. As showcased, the experimental phase with these technologies is quickly reaching its tipping point. Instead of confining companies to traditional centralized models, it is prudent and urgent to comprehend and, if defensible, embrace these innovative organizational developments within legal frameworks. As currently drafted, for these novel technological organizational structures to achieve widespread adoption and fully realize their potential in corporate governance, it is believed that they will need to overcome various legal challenges and architectural constraints which could possibly hinder their implementation.

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