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**Decentralised Autonomous Organisations and the Corporate
Form**

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Abstract

It has been suggested that the development of decentralised autonomous organisations (DAOs) will lead to a paradigm shift in the way we perceive businesses. DAOs ostensibly eliminate agency costs due to the absence of a board of directors, automated governance mechanisms and transparency provided by the blockchain upon which the DAO is launched. This paper undertakes a comparative analysis between DAOs and corporations and questions whether DAOs really do improve the corporate form. Using a corporate governance and legal realist lens, this paper suggests that a number of the purported benefits of DAOs are overly simplified. Moreover, there are a number of practical and legal obstacles that technological advancements and improved engineering must overcome before DAOs become a viable, mainstream organisational structure. Balancing the inevitable improvement in technology against these significant obstacles, this paper predicts an incremental integration of DAOs into society through a hybrid approach, involving interim legal solutions and varying degrees of automation and decentralisation.

Keywords

Decentralised Autonomous Organisations—Corporate Governance—Agency Costs—Blockchain—Smart Contracts

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I Introduction

The sixteenth and seventeenth century witnessed a fundamental change in the way businesses operate.¹ Expansive trade operations demanded long-term investment which could not be ascertained through typical partnership structures.² The economic need for the secure investment of capital, without risk of private or public expropriation, was a major driver for the establishment of the corporate form.³ The public listing of the Dutch East India Company in 1602 was influential in the way businesses ran, forming the basis of modern corporate governance.⁴ The development of a corporation's five core structural characteristics—legal personality, limited liability, transferable shares, centralised management under a board structure, and shared ownership by capital contributors—have made the modern corporation “uniquely attractive for organizing [sic] productive activity”.⁵

However, with corporations now being some of the strongest entities in the world, corporate scandals, such as the collapse of Enron, Worldcom and Parmalat, have shown that the corporate form is not infallible.⁶ Corporate governance literature highlights the need for incentive mechanisms and structural safeguards to overcome divergent interests between shareholders, managers and external stakeholders. Despite robust internal processes outlined in company constitutions and the codification of industry best practices

¹ Giuseppe Dari-Mattiacci, Oscar Gelderblom, Joost Jonker and Enrico C Perotti “The Emergence of the Corporate Form” (2017) 33(2) *JLEcon&Org* 193 at 193.

² At 193.

³ At 193.

⁴ At 193.

⁵ John Armour, Henry Hansmann and Reinier Kraakman “The Essential Elements Of Corporate Law: What Is Corporate Law?” in Kraakman et al *The Anatomy of Corporate Law: A Comparative and Functional Approach* (Oxford University Press, 2009) 1 at 6.

⁶ Ana Paula Paulino da Costa “Corporate Governance and Fraud: Evolution and Considerations” in Okechukwu Lawrence Emeagwali *Corporate Governance and Strategic Decision Making* (Girne American University, 2017) 1 at 1.

in legislation,⁷ empirical analyses suggest that modern corporations remain susceptible to failure.⁸

Four hundred years after the Dutch East India Company's public listing, decentralised autonomous organisations (DAOs) purportedly represent a brand new "innovation in the design of organisations".⁹ Built upon a foundation of blockchain technology, DAOs (or DACs: decentralised autonomous corporations) ostensibly circumvent traditional principal-agent relationships, transforming the way we perceive governance.

Proponents and enthusiasts say that DAOs will eventually replace many of the world's corporations. Although this may seem farfetched for most traditionalists, DAOs continue to expand their potential capabilities in conjunction with technological advancements. It is these unknown future capabilities of DAOs which lead so called 'crypto-anarchists' to proclaim that DAOs represent a shift towards a decentralised autonomous society "in which humans are freed from centralized [sic] institutions of power and control".¹⁰

Despite the somewhat seductive features of this decentralised utopia, this paper questions whether a comprehensive uptake of DAOs in our everyday life is truly feasible. For enthusiasts, the fact that DAOs are underpinned by a number of established theories, from game theory to information technology governance, is a source of legitimacy.¹¹ However, by detaching the theoretical benefits from the practical obstacles of DAO proliferation, enthusiasts undermine their arguments for a decentralised future.

Firstly, this paper undertakes a comparative analysis between the corporate form and these new decentralised organisational structures, using both a corporate governance and legal

⁷ See for example New Zealand's Companies Act 1993 which includes a comprehensive list of default rules for companies to adopt, based on market practice.

⁸ Da Costa, above n 6, at 1.

⁹ Usman W Chohan "The Decentralized Autonomous Organization and Governance Issues" (Discussion Paper, University of New South Wales, 2017).

¹⁰ Joel Garrod "The Real World of the Decentralized Autonomous Society" (2016) 14 tripleC 62 at 62.

¹¹ Roman Beck, Christoph Müller-Bloch and John Leslie King "Governance in the Blockchain Economy: A Framework and Research Agenda" (2018) 19(10) JAIS 1 at 2.

realist lens. In doing so, it outlines a number of complexities and costs pertaining to an organisation's decentralised governance structure. The following section of the paper delineates three key obstacles faced by DAOs: legal indeterminacy; a tendency towards centralisation; and incumbent institutions. Finally, wary of the risk tied to dismissing technological innovations, this paper predicts that DAOs will not permeate society in a way envisaged by most crypto-anarchists, but will instead incrementally integrate into society via a hybrid approach.

II Do DAOs Improve the Corporate Form?

The following section canvasses some of the purported benefits of DAOs, when compared to conventional company structures. Part A provides a workable definition of a DAO and explains how they operate with reference to blockchain technology, smart contracts, and their modus operandi. Part B analyses exactly how DAOs transform corporate governance, with reference to specific agency costs so as to provide context regarding the issues DAOs ostensibly overcome. Throughout the analysis, attention is drawn to the complexities of DAO governance. There is undoubtedly merit in the greater use of decentralised systems. However apparent problems with governance, technology and legalistic hurdles hinder the expansion of DAOs in both the business world and society at large.

A Explaining decentralised autonomous organisations

Before outlining how DAOs purportedly overcome conventional corporate issues, it is necessary to get a comprehensive understanding of what we mean by a DAO and how DAOs operate.

1 Defining decentralised autonomous organisations

Like many contemporary developments, decentralised autonomous organisations do not have one accepted definition. Jack du Rose, co-founder of Colony,¹² defines a DAO as:¹³

¹² The Colony Foundation Limited (2019) Colony <<https://colony.io/>>.

¹³ Jack du Rose "Clearmatics, EtherCasts & Colony" (speech to London Ethereum Meetup, London, UK, May 2016).

... a type of decentralised application which incentivises its users to engage in activity which furthers its agreed business objectives by enabling them to work together without requiring them to trust one another.

Du Rose's definition encompasses a range of decentralised applications, from the Ethereum-based venture capitalist fund, *The DAO*, to the world's first cryptocurrency, Bitcoin. This definition hints towards the optimisation proposal process employed by a typical DAO.¹⁴ This process involves users putting forward proposals that will optimise the value of the DAO. A slightly more precise definition labels a DAO "an organization [sic] that is run through rules encoded as computer programs called "smart contracts".¹⁵ This is not mutually exclusive with du Rose's definition, but rather emphasises the role played by smart contracts, deployed on a blockchain, in the operation of a DAO.

In contrast to du Rose, Primavera De Filippi and Aaron Wright distinguish between forms of decentralised organisations where, on the one hand, the ultimate decision making power resides in humans, and DAOs which, on the other hand, are controlled "entirely by code".¹⁶ Both forms of decentralised organisation resemble a fundamental shift in the way organisations operate, and therefore both will be considered within this paper. Rather than classify them as distinct classes of entity, it is preferable to perceive both as DAOs which fall on varying levels of an *autonomous spectrum*.

2 A brief summary of blockchain

Put simply, a blockchain is a decentralised database or ledger that is distributed between nodes in a peer-to-peer network.¹⁷ Each user or "node" in the network can access a replicate

¹⁴ Wulf A Kaal "Blockchain Solutions For Agency Problems In Corporate Governance" in Kashi Balachandran *Economic Information to Facilitate Decision Making* (World Scientific Publishers, 2019) 1 at 19.

¹⁵ Chohan, above n 9, at 1.

¹⁶ Primavera De Filippi and Aaron Wright *Blockchain and the Law: The Rule of Code* (Harvard University Press, Cambridge, Massachusetts, 2018) at 149.

¹⁷ Alex Norta "Creation of Smart-Contracting Collaborations for Decentralized Autonomous Organizations" (2015) 229 LNBIP 3 at 3.

of the ledger, and community validation is used to keep the ledger content synchronised.¹⁸ Blockchains thereby circumvent the need for a trusted third party to validate transactions, as the network instead validates transactions by consensus.¹⁹ This community validation process (or consensus protocol) is a set of formalised, pre-defined governance rules stored on the blockchain's consensus layer.²⁰

Anyone with an Internet connection can view information stored on a blockchain by downloading freely available open source software.²¹ Consequently, as any node in the network can update the ledger, public blockchains are not controlled by any one centralised party. Built on a peer-to-peer network, blockchains encourage disintermediation,²² making them ideal for circumventing central bodies, whether that is a financial intermediary or a board of directors.²³

3 *Smart contracts*

Technically speaking, smart contracts are computerised transaction protocols which, in theory, execute contractual terms.²⁴ Essentially, smart contracts operate as computer programmes which are deployed on a blockchain,²⁵ so that they are non-repudiable and verifiable.²⁶

Before proceeding, it would be remiss not to acknowledge the literature around the limitations of so-called "computable contracts",²⁷ such as smart contracts, outlined by a

¹⁸ Tomaso Aste, Paolo Tasca and Tiziana Di Matteo "Blockchain Technologies: The Foreseeable Impact on Society and Industry" (2017) 50(9) *Computer* 18 at 18.

¹⁹ Shermin Voshmgir "Disrupting governance with blockchains and smart contracts" (2017) 26(5) *Strategic Change* 1 at 1.

²⁰ At 1.

²¹ De Filippi and Wright, above n 16, at 34.

²² At 34.

²³ Marcella Atzori "Blockchain Technology and Decentralized Governance: Is the State Still Necessary?" (PhD, University of Nicosia, Cyprus, 2015) at 15.

²⁴ Norta, above n 17, at 3.

²⁵ Soichiro Takagi "Organizational Impact of Blockchain through Decentralized Autonomous Organizations" (2017) 12(2) *IJEPS* 22 at 25.

²⁶ Norta, above n 17, at 3.

²⁷ Harry Surden "Computable Contracts" (2012) 46 *UC Davis LRev* 629 at 642.

number of academics.²⁸ Simply put, the complexity of contractual terms in computable contracts is limited due to a natural language processing problem, issues of interpreting abstract or subjective concepts, and concerns around areas of contractual uncertainty.²⁹ Conventional legal contracts are written in legalistic language, and may include ambiguous terms such as *reasonable* or *best efforts* which create disputes over interpretation. Surden argues that these limitations can, in certain circumstances, be circumvented by data-oriented contracts, which are contracts "in which the parties have expressed some part of their contractual arrangement as computer-processable data".³⁰ Likewise one can use *computer semantics*, to translate a legal contract into computer-processable rules,³¹ or provide a computer with a database that it can automatically access to check compliance or performance.³² It is logical, therefore, that smart contracts take the form of data-oriented contracts, which can be processed automatically on the blockchain using the underlying blockchain's programming language (for example: Solidity on the Ethereum blockchain).

Ensuring smart contracts, which mimic legal agreements, are properly translated into data-oriented contracts may not solve all issues with complexity. Surden argues that data-oriented contracts are only suitable in standardised scenarios with factual certainty, and for agreements which are able to be decomposed into computer-processable terms.³³ However, since Surden's seminal piece on computable contracts, new technological developments have increased the level of contractual complexity comprehensible by computers.³⁴ Furthermore, the future employment of machine learning technology and artificial intelligence in smart contracts exponentially increases the capability to mirror traditional legal agreements.

²⁸ James Grimmelmann "All Smart Contracts are Ambiguous" (2019) (Cornell Law School research paper No 19-20, 2019) (forthcoming).

²⁹ Surden, above n 27, at 643.

³⁰ At 635-636.

³¹ At 665.

³² At 671.

³³ At 682.

³⁴ See for example: Sudhir Agarwal, Kevin Xu and John Moghtader "Toward Machine-Understandable Contracts" (paper presented at Artificial Intelligence for Justice, the 22nd European Conference on Artificial Intelligence, the Hague, the Netherlands, 2016).

In acknowledgement that the complexity of smart contracts is limited, but ever-increasing, it would be naïve to say that they will not have far-reaching implications in the future. Nevertheless, a smart contract's most important feature is that it is not only defined, but also *executed* by its underlying code.³⁵ Once the contractual parameters (codified in the smart contract) are fulfilled, the contract is automatically enforced “without discretion”, meaning that, all things equal, promisees do not face the risk of losing their end of the bargain.³⁶

Broadly speaking, a smart contract on a public blockchain will go through four distinct stages: creation, acceptance, execution and result confirmation.³⁷ Firstly, users will create the contract using digital signatures to guarantee its authenticity.³⁸ Secondly, users who receive the smart contract will check its validity and mine to include it in a new block, where it will be broadcasted to the blockchain at large.³⁹ Thirdly, users will execute the smart contract, according to its instructions. Once the result is obtained, users will need to mine to include the result in a new block, which is then broadcasted to the blockchain.⁴⁰ Finally, users who receive a block containing the result will verify its correctness (often by re-computing the smart contract and comparing the result with that which is received) and determine whether to accept it or not.⁴¹

The automation of smart contracts involves the deployment of algorithms that can “self-execute, self-enforce, self-verify, and self-constrain the performance of the contracts”.⁴² A smart contract can be coded such that, when it is executed, it triggers another smart

³⁵ Takagi, above n 25, at 25.

³⁶ At 25.

³⁷ Nour Diallo, Weidong Shi, Lei Xu, Zhimin Gao, Lin Chen, Yang Lu, Nolan Shah, Larry Carranco, Ton-Chanh Le, Abraham Bez Surez and Glenn Turner “eGov-DAO: a Better Government using Blockchain based Decentralized Autonomous Organization” (2018) ICEDEG 166 at 167.

³⁸ At 167.

³⁹ At 167.

⁴⁰ At 167.

⁴¹ At 167.

⁴² Aste, Tasca and Di Matteo, above n 18, at 19.

contract, enabling the execution of a chain of smart contracts. It is the automatic self-executing feature of smart contracts which enables the creation of decentralised organisations.⁴³

4 *How DAOs operate*

By engineering more complex smart contracts, organisations can be established, where the rules of governance are defined in code on a blockchain.⁴⁴ With the rules of governance being transparent, and distributed to all nodes in the network, DAOs do not have any single “owner” who can directly force them to act in a particular way.⁴⁵ DAOs therefore enable a form of non-hierarchical governance, where decision making power is spread across the network’s nodes rather than deferring to a centralised body.⁴⁶

A DAO’s duty is to abide by its specific programmatic set of rules,⁴⁷ so in theory, a DAO can be set for any purpose or objective.⁴⁸ A DAO’s architecture may determine whether it is capable of carrying out a “specific and deterministic task”, or something more sophisticated where people or machines interact to achieve a specific purpose.⁴⁹ Ultimately, the way a DAO operates depends on its degree of automation.

At the lower end of the autonomous spectrum, a DAO may act as a platform, where members interact according to a self-enforcing, open source protocol.⁵⁰ Those interested in furthering the objective of the DAO (or at least interested in optimising the value of the DAO) purchase the DAO’s tokens.⁵¹ These tokens give voting rights to members, who can

⁴³ Aste, Tasca and Di Matteo, above n 18, at 19.

⁴⁴ Diallo, Shi, Xu, Gao, Chen, Lu, Shah, Carranco, Le, Surez and Turner, above n 37, at 167.

⁴⁵ De Filippi and Aaron Wright, above n 16, at 149.

⁴⁶ Aste, Tasca and Di Matteo, above n 18, at 23.

⁴⁷ BlockChannel “What Is A “DAO”? How Do They Benefit Consumers?” (22 March 2016) Medium <<https://medium.com>>.

⁴⁸ Diallo, Shi, Xu, Gao, Chen, Lu, Shah, Carranco, Le, Surez and Turner, above n 37, at 167.

⁴⁹ De Filippi and Aaron Wright, above n 16, at 148.

⁵⁰ Shermin Voshmgir “Tokenized Networks: What is a DAO?” in Shermin Voshmgir *Token Economy: How Blockchains and Smart Contracts Revolutionize the Economy* (2019, BlockchainHub Berlin).

⁵¹ Kaal, above n 14, at 19.

then vote on proposals put forward by other DAO members (for instance, to undertake a new project).⁵² It is in the interests of all DAO token holders that only beneficial proposals that will optimise the value of the DAO are approved.⁵³ If the proposal is approved, it will be recorded in the blockchain. Remuneration for fulfilling the proposal will typically be codified in a smart contract, such that compensation will only be rewarded once proposers deliver on their promise.⁵⁴

DAOs with this architecture have the potential to retain a strong human element, as DAO members (who can be humans or machines) still vote on decisions, and put forward their own proposals. Despite this human element, with governance rules codified in smart contracts, relevant governance decisions are still automatically executed without manual intervention, circumventing the need for a central decision making entity.⁵⁵

At the far end of the autonomous spectrum are DAOs which incorporate artificial intelligence to run *entirely* autonomously on a blockchain. Activities of this type of DAO are fully determined by a blockchain's protocol and the DAO's smart contract code.⁵⁶ As a DAO can use digital tokens to trigger smart contracts independently, ultimately, with a sufficient number of digital tokens to pay a blockchain network for the resources it needs, a DAO can operate indefinitely without human control.⁵⁷ Humans may still contribute funds to the DAO in return for digital tokens (and a share in the DAO's profits), or interact with DAOs by paying for its service.⁵⁸

These DAOs can be constructed in two distinct ways. The most direct way is to embed decision making capabilities in the DAO's smart contract code.⁵⁹ The underlying algorithm may interact with environmental inputs (including the needs and desires of people), but no

⁵² Kaal, above n 14, at 20.

⁵³ At 19.

⁵⁴ At 20.

⁵⁵ Diallo, Shi, Xu, Gao, Chen, Lu, Shah, Carranco, Le, Surez and Turner, above n 37, at 167.

⁵⁶ De Filippi and Aaron Wright, above n 16, at 148.

⁵⁷ At 148.

⁵⁸ At 149.

⁵⁹ At 149.

person can exert direct influence over its operations.⁶⁰ In this way, the DAO's underlying code comprises all requirements needed to complete a task.⁶¹

A DAO can also be constructed by the coordinated aggregation of multiple smart contracts, creating "a DAO whose capabilities are much greater than the sum of its parts".⁶² De Filippi and Wright argue that these more sophisticated DAOs benefit from the collective intelligence of a number of independent smart contracts which may purposefully or inadvertently contribute to achieving a common goal.⁶³

B Transforming Governance with DAOs

It should be acknowledged that the corporate form has facilitated the advancement of commerce in a multitude of ways. Principles of agency allow for the efficient delegation of decision making.⁶⁴ Limited liability shields a shareholder's personal assets from company creditors, incentivising positive risk-taking.⁶⁵ Similarly, entity shielding protects company assets from a shareholder's personal creditors, enabling the facilitation of credit.⁶⁶ The 'locking in' of capital ensures that companies have a right to retain their capital and can more securely engage in long-term investment.⁶⁷

However, the characterisation of competing interests between stakeholders, shareholders and managers as principal-agent relationships has uncovered significant costs and inefficiencies inherent in the corporate form.⁶⁸ This is most noticeably characterised by the principal-agent relationship pertaining to the "separation of ownership and control".⁶⁹ Shareholders (the principals) who delegate the decision making responsibility to managers

⁶⁰ De Filippi and Aaron Wright, above n 16, at 149.

⁶¹ Diallo, Shi, Xu, Gao, Chen, Lu, Shah, Carranco, Le, Surez and Turner, above n 37, at 167.

⁶² De Filippi and Aaron Wright, above n 16, at 149.

⁶³ At 150.

⁶⁴ Dari-Mattiacci, Gelderblom, Jonker and Perotti, above n 1, at 1.

⁶⁵ At 1.

⁶⁶ At 1.

⁶⁷ At 1.

⁶⁸ Michael Jensen and William Meckling "Theory of the firm: Managerial behavior, agency costs and ownership structure" (1976) 3(4) JFE 305 at 308.

⁶⁹ At 309.

(the agents) face the risk of the managers taking advantage of asymmetrical information, acting opportunistically, and pursuing their own personal interests rather than promoting the welfare of the shareholders.⁷⁰ Similar agency problems involve the divergent interests of the controlling shareholders and non-controlling shareholders of the firm,⁷¹ and conflicts between a firm itself and external stakeholders, such as creditors, employees, customers and the environment.⁷²

In light of these enduring issues, DAO proponents argue that blockchain technology could reduce the need for businesses to organise as companies altogether.⁷³ Overcoming agency costs, such as those described above, are the predominant justification for the use of DAOs. However, those more sceptical might argue that the governance problems DAOs ostensibly diminish are merely replaced by different ones. This section of the paper explains some of the purported improvements that decentralised systems bring to the governance of organisations, with explicit referral to conventional agency costs. In doing so, it critiques the simplistic nature that these improvements are often canvassed and raises some complexities which necessarily ought to be considered.

1 Company boards, hierarchies and decentralised decision making

The decision making powers of a corporation are typically vested in the board of directors, subject to any constitutional constraints and special resolutions made by shareholders.⁷⁴ This means that decisions pertaining to issues such as a company's strategic direction or employee welfare are made by one internal, central body.⁷⁵ The board therefore has significant power over the future prospects of the company. As mentioned below, the separation of ownership and control—embodied by a principal-agent relationship between

⁷⁰ John Armour, Henry Hansmann and Reinier Kraakman “Agency Problems and Legal Strategies” in Kraakman et al *The Anatomy of Corporate Law: A Comparative and Functional Approach* (Oxford Scholarship Online, 2017) 29 at 30.

⁷¹ At 31.

⁷² At 30.

⁷³ Peter Coy and Olga Kharif “This Is Your Company On Blockchain” *Bloomberg Businessweek* (online ed, New York, 25 August 2016) 8 at 8.

⁷⁴ See for example, s 128(3) of New Zealand's Companies Act 1993.

⁷⁵ Diallo, Shi, Xu, Gao, Chen, Lu, Shah, Carranco, Le, Surez and Turner, above n 37, at 167.

shareholders and managers—creates a number of agency costs.⁷⁶ For efficiency reasons, company shareholders delegate business decisions to the board. Shareholders therefore bear the risk that, due to misaligned interests, managers will make unfavourable decisions. These may be mitigated by the creation of supervisory boards, the mandatory inclusion of independent directors, incentivising remuneration schemes, bonding mechanisms and other methods to align manager and shareholder interests. Each of these comes at a significant managerial agency cost.

Rather than decisions being made by a board of directors, governance rules set out in code typically decentralise the decision making power across DAO token holders. As these token holders are the owners of the DAO,⁷⁷ the division between capital and labour is reduced, and there is, *prima facie*, no agency cost between ownership and control.⁷⁸ DAO proponents argue that DAO token holders do not face the same agency relationship that company shareholders face through delegated decision making.⁷⁹ Instead, token holders contribute to the DAO in a non-hierarchical, “dynamic set of working relationships that continuously and dynamically self-organize [sic] around projects and outcomes”.⁸⁰ Notwithstanding this non-hierarchical structure, as outlined below, although managerial agency problems in the traditional sense may be diminished, new agency issues and similar conflicts may arise instead.

(a) Managerial agency problem

As alluded to above, there is an inherent conflict between a firm’s shareholders (principals) and its managers (agents).⁸¹ When managers are delegated decision making responsibilities regarding the operation of the firm, a combination of both delegated power and asymmetric

⁷⁶ Jensen and Meckling, above n 68, at 309.

⁷⁷ Alex Sims “Decentralised Autonomous Organisations (DAOs) as an emergent institution” (paper presented to The University of Auckland Business School, Auckland, April 2019).

⁷⁸ Voshmgir, above n 19, at 1.

⁷⁹ Kaal, above n 14, at 19.

⁸⁰ At 19.

⁸¹ At 30.

information enables managers to act opportunistically and in a manner inconsistent with the shareholders' interests.

Historically, corporate governance strategies have employed control mechanisms to mitigate these conflicting interests. Many of these mechanisms result in agency costs. For instance, monitoring costs arise when costly audits are conducted; managers are fired and new ones hired; and when periodic reporting is required.⁸² Similarly, bonding costs arise when managers are subjected to schemes which involve compensation to shareholders if the former fail to act in the latter's best interests.

Many of the strategies implemented as a way to align interests between shareholders and managers lack effectiveness in reality.⁸³ For example, the mandated inclusion of independent directors on company boards may be futile in the face of CEOs who dominate board discussions.⁸⁴ Ultimately, existing governance mechanisms are effective in some firms and ineffective in others,⁸⁵ and current frameworks are inadequate to address managerial agency problems across a broad spectrum of firms.⁸⁶

At first glance, the managerial agency costs faced by a company are not incurred by a DAO. There need not be incentive mechanisms for decision-makers to act in the owner's interest because those decision makers *are* the owners (i.e. DAO token holders). Firstly, the use of smart contracts eliminates any prospects for individual opportunistic behaviour. De Filippi and Wright propose: "the distributed and disintermediated nature of the underlying blockchain network further ensures—with a high degree of probability—that all codified

⁸² Kaal, above n 14, at 19.

⁸³ James Cox and Randall Thomas "Curbing Managerial Agency Costs: Private Litigation and Its Substitutes in the US" in Robin Huang and Nicholas Howson *Enforcement of Corporate and Securities Law* (Cambridge University Press, Cambridge, 2017) at 222.

⁸⁴ Kaal, above n 14, at 9.

⁸⁵ For example, differing degrees of the separation of ownership and control do not proportionately reflect the private benefits of control in comparative analyses. See Alessio Paces *Rethinking Corporate Governance: The Law and Economics of Control Powers* (Routledge, Oxfordshire, 2012) at 90.

⁸⁶ Kaal, above n 14, at 13.

clauses will perform as planned”.⁸⁷ The difficulty in altering smart contracts once they are validated in the blockchain decreases the potential for self-dealing or opportunistic behaviour by modifying the smart contract code.⁸⁸ Secondly, in theory, DAO token holders are solely incentivised to perform work that will increase the value of their token. In essence, this means that it is against their interests to act opportunistically given that this could potentially undermine the value of their tokens.

However, the crypto-anarchist view of managerial agency may be overly straightforward. More recent literature has highlighted potential benefits of managerial agency.⁸⁹ As Paccès suggests, there are positive benefits experienced by corporate controllers, such as managers and majority shareholders, which may reduce the share of the surplus to their principals, but nevertheless create value for the firm that would otherwise be non-existent.⁹⁰ These benefits are “idiosyncratic control rents that are needed to motivate the entrepreneur to undertake firm specific investments for the firm's success”.⁹¹ For example, non-pecuniary benefits, such as that of pride or psychic satisfaction, prove to be important for motivating entrepreneurship.⁹² Paccès argues that these idiosyncratic control rents last beyond a corporation's initial stages of development.⁹³ Distributed structures of ownership and control forego these benefits, which cannot therefore be encapsulated in the value of DAO tokens.

Further, although managerial agency undoubtedly results in a number of costs to the firm, it is too simplistic to claim that DAOs eliminate all managerial agency costs. At the heart of a managerial agency problem is the split between ownership and control. This may be removed in the case of a DAO where all token holders are involved in decision making processes, thereby maintaining control. In the case of *The DAO*, DAO token holders had a

⁸⁷ De Filippi and Aaron Wright, above n 16, at 80.

⁸⁸ At 81.

⁸⁹ Paccès, above n 85, at 89.

⁹⁰ At 90-91.

⁹¹ At 93.

⁹² At 94.

⁹³ At 95; but see also Colin Mayer “Firm Control” in J Schwalbach (ed) *Corporate Governance. Publications of the Society for Economics and Management* (Springer-Verlag Berlin, Heidelberg, 2001) 69.

proportionate vote over fundamental investment decisions. Nevertheless, a novel agency cost arises when considering DAOs further along the autonomous spectrum. With fully autonomous DAOs, decision making is entirely left to underlying machine learning technology. Although the smart contract's algorithm is coded by humans, who presumably have intentions to be partial owners of the DAO, there is potential for the DAO to self-manage in a way that fulfils the underlying algorithm but acts against token holder interests.

For example, terra0, a highly autonomous DAO framework created by Paul Kolling, Paul Seidler and Max Hampshire, involves the development of an “augmented forest”, where drones and satellites monitor its growth, determining how much wood can be produced and sold.⁹⁴ Although terra0's aim is to generate enough income to pay back its "initiators" (venture capital investors, developers and/or owners of the DAO), buy itself and continue to operate autonomously, in the interim there is potential for the DAO to operate outside of the initiators' interests. For instance, one could hypothesise a scenario where the DAO chooses to sell its timber for a price undesirable to initiators. An autonomous DAO would not act opportunistically per se, as it is bound to abide by the code underlying it. However with machine learning technology, there is potential for a DAO to make a decision that was never foreseen at the time of coding. It is arguable that, while the traditional managerial agency relationship is eliminated, the delegation of business decision making to artificial intelligence merely creates a new agency relationship.

This argument of course relies heavily on both a DAO's smart contract incorporating highly advanced machine learning algorithms and on the premise that artificial intelligence can be considered independent from its principal. Such discussion can quickly divulge into debate around attributing legal personhood to artificial intelligence, which is itself a topic worth its own analysis and not within the scope of this paper.⁹⁵ Nevertheless, blockchain enthusiasts should be wary of assuming that DAOs will solve all managerial agency issues.

⁹⁴ Martina Raponi “Terra0, the Augmented Self-Owned Forest” (nd) Dicult <<http://dicult.it>>.

⁹⁵ Samir Chopra and Laurence White “Artificial Agents – Personhood in Law and Philosophy” (conference paper, Department of Computer and Information Science, Brooklyn College of the City University of New York, January, 2004).

(b) Decentralising decisions

Proponents of a decentralised society point to a company's hierarchical structure as a major weakness, due to the board amounting to a single point of failure.⁹⁶ It is argued that fraud, incompetence or mere misjudgement by a board of directors will have far reaching consequences, spreading down the hierarchy.⁹⁷ In contrast, distributing decision making powers throughout the community of DAO token holders means that there is no single point of failure, so if one member cannot perform, the DAO will continue to operate.

A tangential issue caused by a hierarchical structure is the inefficient use of company-member intelligence. Simply, when decisions are solely made by a board of directors, the expertise, knowledge and experience of other employees is not utilised, meaning the company is not making use of the full decision making power of its members. In contrast, DAOs have the propensity to engage all token holders who propose ideas and areas for improvement.

Decentralising decisions undoubtedly creates a more robust organisation. But how does it impact business efficiency? On a purely theoretical basis, traditionalists will insist that the delegation of decision making to a board of directors overcomes coordination costs between principals, and thereby promotes efficiency.⁹⁸ For instance, shareholders, especially those of large, listed companies, may face sizeable coordination costs which practically inhibit shareholder decision making, except for significant decisions. By reverting back to a distributed decision making process among token holders, DAOs widen the potential for coordination issues.

⁹⁶ Kelli Alces "Beyond the Board of Directors" (2011) 24 Wake Forest LRev 783 at 784.

⁹⁷ At 784.

⁹⁸ Benjamin Hermalin and Michael Weisbach "The Effects of Board Composition and Direct Incentives on Firm Performance" (1991) 20 FMA International 101 at 103.

The magnitude of this problem will vary significantly from organisation to organisation, determined partly by size and partly by engineering. With smaller organisations, reduced coordination costs resulting from fewer shareholders or token holders make distributed decision making workable. Saying this, a fundamental feature of a DAO is the involvement of many users in the network, spread across a number of different jurisdictions. As it is in the DAO's interests that there are as many users in the organisation as possible, it is unlikely that coordination costs will be mitigated by small numbers.⁹⁹

Nevertheless, many blockchain enthusiasts emphasise the fact that DAO token holders only partake in the organisation because they are there to contribute to the community, such that coordinating token holder engagement will not be an issue. In this way, DAOs resemble cooperative organisations ("cooperatives") where "the purpose of the business is to undertake economic activities in the interest of its worker-members, rather than to make a profit for the [cooperative] itself or external investors".¹⁰⁰ Whereas cooperatives tend to be localised and carry "significant burden for administration and governance", DAOs naturally involve members from around the globe.¹⁰¹ Cognisant of coordination issues, DAOs use incentive mechanisms within their governance structure to encourage member involvement. For example, Horizen, a blockchain platform which provides its own exchange, cryptocurrency and DAO, has implemented an incentive scheme that rewards voters for participating in decision making.¹⁰² A society of decentralised organisations with active member involvement may be the dream of many crypto-anarchists, but the practical reality is that financial incentives will lead to the passive investment in successful DAOs through token ownership. As discussed below, voter apathy will undoubtedly be an issue for engineers to grapple with when writing a DAO's underlying code, and this apathy may lead to coordination costs for many businesses.

⁹⁹ DAOs are characterised by a network effect, where they become more valuable as more people get involved.

¹⁰⁰ Morshed Mannan *Fostering Worker Cooperatives with Blockchain Technology: Lessons from the Colony Project* (2018) 3 ELR 190 at 192.

¹⁰¹ Qayyum Rajan "Ethereum & the Tao of the DAO" (19 August 2017) Hackernoon <<https://hackernoon.com>>.

¹⁰² Zen Blockchain Foundation "DAO – Decentralized Autonomous Organization" (2019) Horizen|AcademyBeta <<https://academy.horizen.global/>>.

On top of the risk of organisational inefficiency, blockchain protocols may cause delays due to inherently cumbersome validation processes. More generally, DAOs are subject to the technological and economic restrictions of the underlying blockchain they are founded upon. For example, as Ethereum inherently involves the expensive task of having every Ethereum node execute smart contract codes per the ‘Ethereum virtual machine’, there are currently limitations on the potential complexity of Ethereum-based DAOs.¹⁰³ Moreover, the value of a DAO will often be determined by the value of the intrinsic token (cryptocurrency) of the blockchain it is built on. For instance, after its initial coin offering (ICO) *The DAO*’s \$150 million USD worth of Ether quickly grew to over \$250 million USD as the cryptocurrency (Ether) grew in value.¹⁰⁴ Of course, a DAO’s underlying cryptocurrency may appreciate in value to its benefit, or it may depreciate to its detriment. Notwithstanding these external risks and limitations, most decentralised applications are still currently run on the Ethereum network.¹⁰⁵ Promisingly, blockchain technology is still in its infancy. As these issues are being tackled by developers across the world, inefficiencies present now should not necessarily be an indication of future prospects of DAO complexity.

(c) The issue of the initiators

The absence of a board of directors is often highlighted as a key distinguishing factor of a DAO; it is said to eliminate managerial agency costs and democratise decision making. However, DAO enthusiasts fail to emphasise that, in reality, DAOs inevitably require a development team to establish their initial framework. Although it is not essential for the development of a DAO—for instance, Tatiana Zalan talks of DAOs which are “born global” due to the globally distributed nature of the blockchain—the collective action required to instigate the development of a DAO in a decentralised manner is extremely

¹⁰³ Alyssa Hertig “How Ethereum Works” (nd) Coindesk <<https://www.coindesk.com>>.

¹⁰⁴ Matthew Leising “The Either Thief” (13 June 2017) Bloomberg <<https://www.bloomberg.com/>>.

¹⁰⁵ As of 31 July 2019, roughly 800 monthly active developers ran on Ethereum, see: Christine Kim “Ethereum: What the Next 4 Years Look Like” (1 August 2019) Coindesk <<https://www.coindesk.com/>>.

difficult in practice.¹⁰⁶ It is simply not efficacious to use a consensus voting mechanism for the myriad decisions made in a DAO's development phase.¹⁰⁷

Rather, it is far more efficient for a *centralised* development team to decide on all preliminary decisions in the build up to producing a "minimum viable product".¹⁰⁸ Not only is decision making more efficient, but it is natural for these initiators to want to retain control in these first stages such that they can best achieve their entrepreneurial goals. Voicing this idea in the negative, Jensen and Meckling argue that a manager's incentive to "devote significant effort to ... searching out new profitable ventures" decreases as that manager's ownership claim decreases.¹⁰⁹ To this date all DAO frameworks have followed this model, including multi-purpose DAO platforms created by Aragon or DAOStack; single purpose DAOs such as *The DAO*; or even arguably the world's most successful DAO: Bitcoin. All of these DAOs were established by a centralised development team or person, including Bitcoin's Satoshi Nakamoto.

The unavoidable consequence is of course that start-up development teams are conferred a considerable amount of power. By making all the fundamental decisions, including those around governance structure and voting mechanisms, the initiators have exclusive control over how they wish to determine the direction, scope and substance of the DAO. Thus, when DAO proponents wax lyrical about the distributed power of a DAO, the role of the initiators is often discounted. It is often said that, by deploying DAOs on a blockchain, DAOs become "trustless".¹¹⁰ When elaborated upon, this "trustlessness" refers not to the elimination of all trust, but the replacement of trust in humans with trust in the underlying code.¹¹¹ Inevitably, the underlying code has been written by the development team.

¹⁰⁶ Tatiana Zalan "Born Global on Blockchain" (2018) 28 RIBS 19 at 20.

¹⁰⁷ Charles Okaforbaha "Governance in a Decentralized Autonomous Organization" (20 February 2019) Medium <<https://medium.com/>>.

¹⁰⁸ Dobrila Rancic Moogk "Minimum Viable Product and the Importance of Experimentation in Technology Startups" (2012) 2 TIM Review 23 at 24.

¹⁰⁹ Jensen and Meckling, above n 68, at 313.

¹¹⁰ Eliza Mik "Blockchains: A Technology for Decentralized Marketplaces?" in *Impact of Technology on International Contract Law: Smart Contracts and Blockchain Technologies* (2018) (forthcoming) 1 at 1.

¹¹¹ At 1.

Therefore, this purported trust in the underlying code is in fact a trust in the competency and good faith of the development team who wrote it. DAO members must trust that the initiators have coded an error-free framework and have established sufficiently decentralised governance mechanisms.

Due to this unique source of control, initiators experience a similar position to a board of directors. Like a board of directors, initiators have the power to set the scope and strategy of the organisation, and therefore they also possess the opportunity to make decisions which may further their own interests, at the expense of others. It may be said that development teams which consciously intend to launch their business as a DAO are likely to be well intentioned, otherwise they would preserve their centralised decision making power for themselves. This notion fails to recognise the potential for nefarious initiators to scam DAO token holders through fraudulent ICOs.¹¹² Even if initiators are well intentioned and willing to forego their future profits by relinquishing decision making rights, DAO token holders must still trust that initiators are competent and that any inherent biases are not carried forward in code. For example, just as unconscious biases regarding ethnicity, sexuality and gender may jeopardise decision making by a board of directors, if these biases are held by the initiators, they may be rooted in the DAO's smart contract code.

DAO proponents will of course argue that these issues are mitigated once a DAO is launched. After launching, decision making power is distributed among token holders, allowing token holders to vote for changes in smart contract code that further their interests. There is no doubt that decision making power is distributed as a result of the launch. However, initiators are likely to retain a considerable proportion of DAO tokens, due to their vested interest in the success of the DAO. Further to this point, the typical requirement of a supermajority for major governance changes on a blockchain means a DAO's underlying framework is difficult to change.¹¹³ Empirical studies have shown that individuals typically display a strong status quo bias, due to both economic and

¹¹² For context, 80 per cent of ICOs were scams in 2017. See: Ana Alexandre "New Study Says 80 Percent of ICOs Conducted in 2017 Were Scams" (13 July 2018) Cointelegraph <<http://cointelegraph.com>>.

¹¹³ Filippi and Wright, above n 16, at 36.

psychological factors.¹¹⁴ Moreover, game theoretical models suggest that there is an “incumbency advantage”, where the slightest “benefit of the doubt” given by voters to incumbents dramatically increases barriers to change.¹¹⁵ Combining this incumbency advantage, status quo bias and the potential for voter apathy (as discussed below), there is a likelihood that the initiators’ founding governance structures may endure for significant periods, even when it is against the interests of token holders. These factors explain how Bitcoin has failed to undergo any significant reform since its inception, despite well-known inefficiencies with its underlying proof of work consensus mechanism.¹¹⁶

One method to diminish the power of this initial development group is to make a number of core decisions provisional, with confirmation requiring ratification from all DAO token holders once the DAO is launched. In some ways this mirrors the incremental on-chain governance process on Tezos, where amendments require four steps of voting before finally being confirmed.¹¹⁷ A provisional approach may be suitable for a limited type of decisions, for example: business decisions around product design and pricing. However, the initiators inescapably must decide upon the appropriate governance system (including rules of voting) to ratify those proposals. Consequently, the very means which the wider DAO community has to alter the initiator’s decisions, is designed by the initiators. As such, a considerable amount of trust will inherently be put on the initiators to ensure that governance rules sufficiently decentralise power.

2 *Shareholders and token holders*

As discussed above, delegated decision making to corporate boards creates an agency problem between shareholders and managers. Although shareholders retain certain

¹¹⁴ William Samuelson and Richard Zeckhauser “Status Quo Bias in Decision Making” (1988) 1 J Risk Uncertain 7 at 47.

¹¹⁵ Scott Feld and Bernard Grofman “Incumbency Advantage, Voter Loyalty and the Benefit of the Doubt” (1991) 3 J Theor Politics 115 at 130.

¹¹⁶ Alex Galea “Bitcoin development: who can change the core protocol?” (31 March 2018) Medium <<https://medium.com/>>.

¹¹⁷ L M Goodman *Tezos – a self-amending crypto-ledger* (White Paper, 2 September 2014) at 3.1.4.

decision making powers, they are far removed from a company's normal operations.¹¹⁸ To overcome agency problems, shareholders are granted appointment rights and certain decision rights. Appointment rights relate to the shareholder's power to appoint and remove members of the board.¹¹⁹ Decision rights are rights which ensure shareholders retain decision making power for particularly pertinent decisions, for instance the decision to dispose of a sizeable company asset.¹²⁰

DAO tokens proffer similar decision making rights to token holders. Depending on the smart contract's code, DAO token holders will be able to vote on decisions ranging from appointing subcontractors to carry out work, to deciding on the remuneration rewarded for completing work.¹²¹ As mentioned, DAOs follow a model similar to a cooperative, with owners (token holders) participating in management, and collectively sharing the DAO's resources.¹²²

However DAO tokens do more than grant rights. Tokens are designed as an integral part of the incentive scheme used to manage the conduct of token holders.¹²³ Just as cryptocurrencies incentivise the accurate mining and updating of the blockchain, DAO tokens act as financial rewards for those who correctly validate transactions.¹²⁴ It is in the interest of all token holders that the value of the DAO token increase, and therefore they will, in theory, endeavour to optimise the DAO through successful projects and accurate validations, and refrain from undermining it through fraud and non-performance. Notwithstanding the unique characteristics of DAO tokens, a number of issues faced by

¹¹⁸ John Armour, Luca Enriques, Henry Hansmann and Reinier Kraakman "The Basic Governance Structure: The Interests of Shareholders as a Class" in Kraakman et al *The Anatomy of Corporate Law: A Comparative and Functional Approach* (Oxford Scholarship Online, 2017) 50 at 51.

¹¹⁹ At 51.

¹²⁰ See for example, in New Zealand s 129 of the Companies Act 1993 requires all "major transactions" to be approved by special resolution or be contingent on approval by special resolution.

¹²¹ Voshmgir, above n 19, at 1.

¹²² Aste, Tasca and Di Matteo, above n 18, at 23.

¹²³ Voshmgir, above n 19, at 1.

¹²⁴ At 1.

shareholders, such as voter apathy, agency problems and vote buying, will also apply to token holders.

(a) Voter apathy

Issues of voter apathy and rational ignorance have been considered in both corporate and political contexts for over half a century.¹²⁵ Due to the unlikely probability of an individual vote altering an electoral outcome, costs of investing time and effort to make an informed vote outweigh the utility gained in voting.¹²⁶ For listed companies, shareholder apathy, caused by the opportunity cost of doing due diligence, is a principle reason why decisions are delegated to management in the first place. Relatedly, Easterbrook and Fischel explain how a collective action problem inhibits shareholders from effectively aggregating their voting rights to control a corporation.¹²⁷ This has resulted in shareholder activism falling squarely to hedge funds and other institutional investors which aggregate voting rights. Similarly, if alterations to a DAO's governance code require a large quorum of eligible token holders to vote, DAOs face the risk of a lack of voter participation and an absence of voter engagement. This may be induced by the labour required by each voter to consider each proposal, as has been the case with the BitShares exchange which has faced low voter engagement.¹²⁸

Marcel Kahan and Edward Rock outline four options for an investor with no economic interest in voting.¹²⁹ She either: (1) does not vote at all; (2) casts a less-informed vote; (3) looks to a voter *with* an economic interest in voting for suggestions; or (4) is influenced by

¹²⁵ Anthony Downs “An Economic Theory of Democracy” (Harper and Row, New York, 1957) as cited in Philip Jones and Peter Dawson “Voter Apathy and ‘Rational’ Ignorance: Perspectives of the UK 2001 General Election” (Department of Economics and International Development, University of Bath, 2003) 1 at 1.

¹²⁶ At 1.

¹²⁷ Frank Easterbrook and Daniel Fischel “Voting in Corporate Law” (1983) 26 JL & Econ 395 at 402.

¹²⁸ Voshmgir, above n 19, at 1.

¹²⁹ Marcel Kahan and Edward Rock “The Hanging Chads of Corporate Voting” (2008) 96 Geo LJ 1227 at 1263.

extrinsic factors (for example, to curry favour with a manager).¹³⁰ In an effort to mitigate option (1) and (2), DAOs may look to engineer a voting system around option (3).

To some success, this has been the case for Tezos. The recent on-chain governance amendments at Tezos saw a voter turnout of over 80 per cent, exemplifying the fact that as governance mechanisms become more sophisticated, issues like voter apathy can potentially be surmounted. One governance system adopted by decentralised systems is *liquid democracy*.¹³¹ Liquid democracy involves a "dynamic hybrid" between representative democracy and direct democracy.¹³² On any given issue, voters can choose to delegate their vote to an expert, to present their views, or they can vote for themselves.¹³³ Unlike a representative democracy, voters can withdraw their delegation at any time, choosing to delegate to someone else or to vote themselves.¹³⁴ This keeps delegates accountable. Tezos involves a system where delegates (so-called "bakers") vote on behalf of participants in the system. Participants need not do the due diligence themselves, but can instead delegate this job to a baker, much like a retail investor delegating investment decisions to a fund manager.¹³⁵

Many DAO enthusiasts consider liquid democracies to be viable solutions to this voter apathy problem. It is hard to argue that giving voters the option to make their vote more informed will not have better outcomes. However in practice, the application of a liquid democracy may create a number of issues. For one, the concentration of votes into the hands of delegates is a major step *away* from the decentralised systems which crypto-anarchists strive for. Arguably, a new agency problem arises, where DAO token holders (principals) risk being exploited by the delegates (agents) entrusted with their vote. In this way, option (4) outlined by Kahan and Rock may occur, as these delegates may use

¹³⁰ At 1264.

¹³¹ Zen Blockchain Foundation, above n 102, at 1.

¹³² At 1.

¹³³ At 1.

¹³⁴ At 1.

¹³⁵ Arthur Breitman "Why Democracy Doesn't Work in Blockchain Governance" (31 July 2019) Blockcrunch <<http://blockcrunch.libsyn.com>>.

extrinsic factors to attract delegation.¹³⁶ A DAO enthusiast may point to the liquidity of the vote which ostensibly ensures that delegates are held accountable, and incentivises them from acting opportunistically. But in practice, the same rational ignorance which causes the token holder to initially delegate her vote will also extend to her decision to withdraw her delegation or not. In other words, a token holder who delegates her vote because she does not fully understand the complexities of the voting matter, will likely also be unable to understand whether her delegate has misused her vote or not (and it is irrational for her to spend the time and money to educate herself enough to find out).

(b) Agency problem between controlling and non-controlling token holders

In traditional corporate governance, company owners with a controlling interest in the firm (agents) and those owners with non-controlling interests (principals) may hold conflicting interests. This arises whenever a subset of owners can make decisions which implicate all owners. The classic example is the decision making power of majority shareholders (agents) over minority shareholders (principals). The imbalance of power, in favour of the majority shareholders, is often reflected in the premium incorporated into “controlling blocks” of tradable shares.¹³⁷ Majority shareholders may benefit from “private benefits of control”,¹³⁸ which arise from the potential for both pecuniary gain, such as influence over self-dealing financial decisions, and non-pecuniary gain,¹³⁹ such as “enhanced social status”.¹⁴⁰ Conversely, if minority shareholders hold a veto right, they can in theory become

¹³⁶ Kahan and Rock, above n 129, at 1264.

¹³⁷ John Armour, Luca Enriques, Henry Hansmann, Reinier Kraakman and Mariana Pargendler “The Basic Governance Structure: Minority Shareholders and Non-Shareholder Constituencies” in Kraakman et al *The Anatomy of Corporate Law: A Comparative and Functional Approach* (Oxford Scholarship Online, 2017) 79 at 79.

¹³⁸ Lucian Bebchuk “A Rent-Protection Theory of Corporate Ownership and Control” (National Bureau of Economic Research, Working Paper No. 7203, 1999) as cited in Alessio Paces, above n 85, at 8.

¹³⁹ Ronald Gilson “Controlling Shareholders and Corporate Governance: Complicating the Comparative Taxonomy” (2006) 119 Harv L Rev 1642 as cited in Alessio Paces, above n 85, at 9.

¹⁴⁰ Zohar Goshen and Assaf Hamdani “Majority Control and Minority Protection” in Jeffrey Gordon and Wolf-Georg Ringe *The Oxford Handbook of Corporate Law and Governance* (Oxford University Press, UK, 2018) 449 at 449.

an agent (with majority shareholders the principal), as their veto right can effectively control the decisions of all shareholders.¹⁴¹

Although awarding voting rights in direct proportion to share ownership (for instance: one share carries one vote) aligns economic exposure and control, it leaves minority shareholders vulnerable to opportunistic behaviour by the majority. Granting minority shareholders the right to appoint one or more directors is one way of protecting minority shareholders. For example, in Italy, board representation for minority shareholders is mandatory for listed companies.¹⁴² More common is the regulation of voting rights, such as those pertaining to dual-class equity structures, circular shareholdings and pyramidal ownership structures.¹⁴³ Similar to the granting of appointment rights, sometimes decision rights, for instance the right to bring legal proceedings on behalf of the company, will be granted to a majority of minority shareholders. Likewise, some jurisdictions will require ex-ante approval by a majority of the minority for certain transactions, such as those that could be perceived as self-dealing.¹⁴⁴ Moreover, the *equal treatment norm* urges controlling shareholders to act in the interests of all shareholders equally, meaning they must consider the interests of minority shareholders.¹⁴⁵

Historically, empirical studies showed that jurisdictions with regulations allowing for large private benefits of control (for majority shareholders) experience highly concentrated share ownership.¹⁴⁶ However, civil law jurisdictions which have since manifested low levels of private benefits, introduced strong equal treatment norms or maintained a relatively higher level of independent directors, continue to exhibit concentrated share ownership.¹⁴⁷

¹⁴¹ Armour, Hansmann and Kraakman, above n 70, at 30.

¹⁴² Testo Unico dell'Intermediazione Finanziaria, art 147(3).

¹⁴³ Shen Junzheng "The Anatomy of Dual Class Share Structures: A Comparative Perspective" (2016) 46 HKLJ 477 at 479.

¹⁴⁴ Enriques, Hansmann, Kraakman and Pargendler, above n 137, at 84.

¹⁴⁵ At 86.

¹⁴⁶ Rafael La Porta, Florencio Lopez-de-Silanes, Andrei Shleifer and Robert Vishny "Law and Finance" (1998) 106 Journ Pol Econo 1113.

¹⁴⁷ See both: Alessio Paces, above n 85, at 7; and Enriques, Hansmann, Kraakman and Pargendler, above n 137, at 103-104.

Enriques et al. propose that ownership structures (whether dispersed or concentrated) and the level of protection of minority shareholders, are *mutually enforcing*: controlling shareholders block the enactment of laws that curb their private benefits, while dispersed owners of shares have sufficient political power to demand minority shareholder protection.¹⁴⁸ It is therefore difficult for ownership structures to change once they are established.

The discussion of majority and minority shareholders becomes particularly pertinent when considering the implications of decentralised governance mechanisms which involve majority and minority token holders. It is arguable that, for DAOs employing a one-token-one vote system, minority token holders face the same risk of exploitation as minority shareholders.

In response, Arthur Breitman (co-founder of Tezos, a public blockchain) argues that shareholders and token holders should be distinguished. He argues that while shareholders have a claim over assets in a company (by virtue of their share), a token is a digital asset itself which only has value because people perceive it as valuable.¹⁴⁹ Majority shareholders are incentivised to take the pecuniary benefit of the company for themselves, at the expense of the minority shareholder. In contrast, a token holder only receives value from the token by virtue of the network effect; the value of a DAO is that there is a large and diverse community of users.¹⁵⁰ Breitman concludes that gaining a large, controlling stake will be self-defeating for a token holder.

It is disputable as to whether Breitman's distinction will hold true in practice. Breitman's emphasis on the value of a dispersed token ownership structure may be justified at the extreme level. In essence, if a majority token holder held 80 per cent of DAO tokens, the DAO would lose many of the benefits of decentralisation. However, until an ownership stake surpasses a level which impinges on the network effect, there are still advantages to

¹⁴⁸ Enriques, Hansmann, Kraakman and Pargendler, above n 137, at 104.

¹⁴⁹ Arthur Breitman, above n 135, at 1.

¹⁵⁰ At 1.

be had by the majority token holder. A majority token holder can have a greater influence over business decisions and ultimately vote in favour of a change which may benefit her position now, at the expense of the DAO itself. For instance, a majority token holder may vote for the distribution of a dividend payment to token holders at the expense of future research and development funding.

Currently, DAO frameworks have not addressed the potential for majority token holders acting against the interests of the minority. This is not to say that sophisticated engineering could not be utilised to mitigate the potential for opportunistic behaviour occurring. For example, sufficiently large quorums encoded into a DAO's voting mechanisms would ensure majority token holders would require significant coordination to push a motion through. Moreover, the societal norms regarding token holder contribution towards a DAO's goal give rise to similar equal treatment norms found in company law. Notably, the full transparency of a blockchain provides a societal safeguard against majority token holders manipulating a decision to the detriment of the DAO as a whole, as majority token holders will be open to scrutiny. Saying that, this scrutiny is limited in the case of systems where the identity of the token holders is kept anonymous or pseudonymous. To protect the interests of minority token holders, DAOs could look at implementing similar voting ceilings to those imposed by some corporate constitutions, such as limiting a token holder from voting over 5 per cent, despite having a larger proportion of tokens. Such a rule would be hardwired into the DAO's smart contract code, prohibiting a token holder from skewing a decision by mere force of numbers. Of course, this potentially creates new issues, such as disproportionate levels of control and risk—the underlying reason for a ban on vote ceilings in some jurisdictions.¹⁵¹

(c) Vote buying

In recognition that private benefits of control still incentivise DAO token holders to gain a controlling stake of tokens, even if this is limited by a DAO's network effect, vote buying

¹⁵¹ Fernando Ruiz “A Little Democract” (2010) 12 Legal Week 19 at 20.

becomes a legitimate issue for DAOs. One imminent means for this occurring is through the aggregation of votes via cryptocurrency exchanges. Many token holders are offered incentives, such as the payment of interest, in return for giving custodian rights to exchanges to hold their tokens. As exchanges aggregate tokens, they in essence become akin to a financial market's institutional investors, forming the potential to engage in token holder activism.

On a more ad hoc level, token holders with specific interests in getting a proposal voted through could enter smart contracts with individual token holders to purchase voting rights. Like many issues already discussed, token holder activism may be an issue that can be mitigated through sophisticated engineering and the establishment of societal norms. In terms of engineering, smart contracts could encode voting restrictions for tokens that have been traded within a certain temporal proximity to the proposal. For instance, tokens that are traded between the time the proposal is broadcasted to the network and the time voting occurs could lose their voting power. In terms of societal norms, the transparency of token transactions could deter vote buyers from entering into obvious vote-buying arrangements for fear of community backlash. Nevertheless, these engineering and societal safeguards are easily circumvented by the availability of off-blockchain deals, which could be made between token holders outside the purview of the DAO community.

3 Permitted activities, constitutions and governance rules

Just as the permitted activities of a company were historically set out in a company's constitution, a DAO's purpose and rules will be set out in code,¹⁵² creating a form of *lex cryptographica* (private regulatory frameworks based in code).¹⁵³ More specifically, a DAO's purpose and rules of governance are set out in its underlying smart contract(s), and constrained by its underlying blockchain's protocol.¹⁵⁴ As referred to earlier, the rules of *The DAO* were outlined in its underlying code, but constrained by the protocol of the Ethereum public blockchain. Governance is therefore two-tiered, analogous to a

¹⁵² Aste, Tasca and Di Matteo, above n 18, at 23.

¹⁵³ De Filippi and Aaron Wright, above n 16, at 6.

¹⁵⁴ Voshmgir, above n 19, at 1.

corporation. Firstly, the DAO's smart contract mandates rules similar to a corporate constitution. Secondly, the underlying blockchain protocol limits the DAO's operations similar to mandatory rules outlined in a jurisdictions' corporate legislation.

(a) Complying with constitutional rules

In the case of companies, constitutional rules will normally hold repercussions for those who breach them. Nevertheless empirical examples of corporate collapses illustrate that enforcement of these rules is still an issue. Professor Alex Sims argues that there are compliance issues inherent in firms that may be potentially removed by DAOs.¹⁵⁵ For instance, people may not agree on company rules; even if they do, they may break them; and even when rules are enforced, people and property cannot easily be restored to their pre-breach state.¹⁵⁶ In theory, governance rules set out in a smart contract do not bear the same risk of non-compliance. As smart contracts are prescriptive in nature, they are only executed once contractual parameters are fulfilled meaning enforcement issues are negligible.¹⁵⁷ The parameters and rules of conduct are broadcasted to stakeholders in the blockchain, meaning they are fully transparent. Because the terms of engagement are known to all parties prior to them joining the DAO, involvement in a project is therefore done using opt-in and opt-out mechanisms.¹⁵⁸

As mentioned, governance rules set out in code technologically limit the capability of people to perform activities beyond what the code allows for. For example, constitutional rules around voting procedure cannot be circumvented as they are hardwired into the code. On its face, this ensures compliance of organisational rules, and in turn promotes a higher standard of legitimacy. Dig a little deeper however and it is apparent that the rigidity of these rules may impinge on organisational efficiency. Sometimes, especially for smaller organisations, there is a practical need to circumvent formal constitutional rules in order to

¹⁵⁵ Sims, above n 77, at 1.

¹⁵⁶ At 1.

¹⁵⁷ At 1.

¹⁵⁸ Voshmgir, above n 19, at 1.

proceed with work. For instance, a company board may be required to reach a 10 person quorum in order to conduct a meeting. Despite notice of a late absentee, the remaining 9 directors may choose to proceed with the meeting. In contrast, the autonomous application of a DAO's rigid underlying code would prevent such a meeting from proceeding, perhaps to the detriment of organisational efficiency and commercial expediency. As De Filippi and Wright suggest:¹⁵⁹

Once the wheels of a smart contract are put into motion, the terms embodied in the code will be executed, and they cannot be stopped unless the parties have incorporated logic in the smart contract to halt the program's execution.

Thus this paper does not say that flexibility could not be coded into a DAO's underlying smart contract. However, to incorporate plasticity into code is complex, and with every combination and permutation there is another chance for error. Although this should not be a deterrent from development, going forward developers must not only be competent software engineers, but also be cognisant of potential governance and business issues.

(b) Changing constitutional rules

Changing the underlying *lex cryptographica* of a DAO is very similar to the changing of constitutional rules. Just as a constitution will typically only be changed by a supermajority vote in a general meeting, a change to the underlying smart contract will need to be successfully approved by a majority of token holders.

Even more difficult is the ability to change the blockchain system upon which the smart contracts are built. Similar to the mandatory legislative rules that constrain a company's activities, a DAO is restrained by the consensus protocols for the underlying blockchain for which it is built. However, unlike a company constitution, which will typically have a legislative backstop in the form of statutory default rules when something is not accounted

¹⁵⁹ Filippi and Wright, above n 16, at 75.

for,¹⁶⁰ governance rules in a smart contract are intended to be a *complete* outline of how the DAO should operate.¹⁶¹ As such, the engineering of the DAO's underlying smart contract has to be comprehensive before it is launched. If the smart contract code fails to address a particular vulnerability, that vulnerability has the potential to be exploited, without the risk of legislative or judicial intervention.

So called "on-chain governance" is an experimental field, and involves the very challenging task of changing the blockchain's underlying code. This may involve the majority of *all* nodes on the network to vote for the desired change, rather than just a majority of DAO token holders. As De Filippi and Wright state: "the technical design of blockchains ... favors [sic] the status quo, making blockchain-based networks highly resistant to change".¹⁶²

In May 2019, Tezos, a public blockchain that involves a unique proof-of-stake consensus algorithm, proposed an amendment to its foundational protocol, in a first for on-chain governance.¹⁶³ The amendment, dubbed "Athens", proposed two changes to the blockchain's protocol in order to make transactions more efficient. Unlike other blockchains, like Ethereum or NEO, where the governance of the blockchain is vested in its creators, Tezos was able to instigate an amendment procedure by having all stakeholders (token holders) vote on Athens. The amendment process is a lengthy, four stage process and required a supermajority of votes (that is 80 per cent out of an 80 per cent quorum of token holders) to pass.¹⁶⁴

Notwithstanding the difficulties of changing something once it is validated on the blockchain, if smart contracts *are* erroneous (in that they do not allow for what was

¹⁶⁰ For example, see the New Zealand Companies Act 1993 which provides for rules which would otherwise be encapsulated by a company constitution.

¹⁶¹ Filippi and Wright, above n 16, at 148.

¹⁶² Filippi and Wright, above n 16, at 36.

¹⁶³ Everstake "Tezos on-chain governance in action" (29 May 2019) Medium <<https://medium.com/>>.

¹⁶⁴ Christine Kim "Welcome to Athens: Tezos Completes 'Historic' First Blockchain Vote" (20 March 2019) CoinDesk <<https://coindesk.com>>.

intended), then the blockchain may have tools at its disposal to correct the problem. An example of this is the hard fork implemented on the Ethereum blockchain after a bug in the code of *The DAO* was exploited. *The DAO*, an unincorporated entity, was the first sophisticated DAO of its kind, and operated as a venture capital fund. *The DAO*'s underlying smart contract enabled token holders to vote on projects (proposed by members) to fund, using tangential smart contracts to remit payments as the proposer's milestones were reached.¹⁶⁵ Any profits from these projects would be redistributed to *The DAO*'s token holders on a pro rate basis.¹⁶⁶ *The DAO*'s ICO raised over \$150 million USD worth of Ether. *The DAO*'s smart contract code had a vulnerability enabling a hacker to siphon off \$50 million USD worth of Ether to a clone of *The DAO* (a "child DAO").¹⁶⁷ With roughly 15 per cent of Ether tied up in *The DAO*, a decision was made to "hard fork" the Ethereum blockchain.¹⁶⁸ The hard fork essentially involved the rewriting and unwinding of the fraud from the blockchain, resulting in two blockchains: one with the Ether returned to each DAO investor (Ethereum); and one with the hack included (Ethereum Classic).¹⁶⁹ Controversy around the use of the hard fork continues to this day, with a number of people equating the hard fork to a 'too big to fail' sentiment, which may create a bad precedent going forward.

4 *Employment, remuneration and work*

There is increasing emphasis on the duties owed to stakeholders by the firm.¹⁷⁰ Although the owners of a firm share many interests with external and internal stakeholders, there are various times where these interests diverge. Shareholders or owners (as agents) may act against the interest of stakeholders (principals) by engaging in opportunistic activities, such as "expropriating creditors, exploiting workers, or misleading consumers".¹⁷¹ There is significant literature which suggests that it is in the corporation's best interests to undertake

¹⁶⁵ Filippi and Wright, above n 16, at 101.

¹⁶⁶ At 101.

¹⁶⁷ David Siegel "Understanding The DAO Hack for Journalists" (20 June 2016) Medium <<https://medium.com/>>.

¹⁶⁸ At 1.

¹⁶⁹ Antonio Madeira "The Dao, the Hack, the Soft Fork and the Hard Fork" (12 March 2019) CryptoCompare <www.cryptocompare.com>.

¹⁷⁰ Business Roundtable Statement on the Purpose of a Corporation (August 2019) at 1.

¹⁷¹ Armour, Hansmann and Kraakman, above n 70, at 30.

labour-friendly corporate practices.¹⁷² However if a firm's investment decision is based solely on shareholder primacy, and a profit-driven criterion, then it will fail to take into account the interests of its other stakeholders, such as employees.¹⁷³ Jurisdictions have attempted to tackle this agency problem by ensuring employees are properly represented. For instance, in Germany, half a corporation's board members are representative of the employees.¹⁷⁴ This is reflective of the fact that, left on its own, a corporation will not be incentivised to act in the interests of its employees.¹⁷⁵

As outlined earlier, a DAO's architecture resembles a cooperative model where token holders receive similar benefits to company shareholders, but also manage and work for the DAO.¹⁷⁶ Unlike companies that organise work by use of defined roles, standardised employment contracts and ongoing human resource efforts, DAOs self-organise around projects,¹⁷⁷ embodying what Frederic Laloux labels "teal organisations".¹⁷⁸ Teal organisations are not unique to DAOs, but DAOs provide an ideal platform for these organisations to be created.

Teal organisations operate on an underlying system of peer relationships where workers retain high autonomy in their domain, and control is spread throughout the organisation, rather than being vested in certain leadership positions.¹⁷⁹ Similarly, in a DAO, work is conducted through member optimisation proposals, where token holders offer to undertake a project in return for a proposed amount of remuneration. All DAO token holders share the desire to optimise the DAO, and in theory will vote and approve member proposals that

¹⁷² Olubunmi Faleye and Emery Trahan "Labor-Friendly Corporate Practices: Is What is Good for Employees Good for Shareholders?" (2011) 101 J Bus Ethics 1 at 24.

¹⁷³ Michael Magill, Martine Quinzii and Jean-Charles Rochet "A Theory of the Stakeholder Corporation (2015) 83 ECTA 1685 at 1686.

¹⁷⁴ At 1707.

¹⁷⁵ At 1708.

¹⁷⁶ Aste, Tasca and Di Matteo, above n 18, at 23.

¹⁷⁷ Kaal, above n 14, at 19.

¹⁷⁸ Coy and Kharif, above n 73, at 10.

¹⁷⁹ Frederic Laloux "The Future of Management is Teal" (6 July 2015) Strategy + Business <<https://www.strategy-business.com/>>.

will increase the value of their tokens.¹⁸⁰ Once approval is granted, proposers have the autonomy to take control of their project, with the caveat that they will only be paid once their proposal is completed, per the smart contract.¹⁸¹ In this way, DAO token holders who undertake projects are often categorised as subcontractors.¹⁸²

Teal organisations also utilise “agile” practices, which aim to sense and adapt to what the market would like, rather than using “plans, budgets, targets, and incentives”.¹⁸³ They are therefore said to have an “evolutionary purpose”, adapting goals and strategies to meet market demand.¹⁸⁴ In a similar way, the strategies of DAOs are not set at the top of a hierarchical system, but are shaped by the decentralised needs and wants proposed by DAO token holders in the network.

Where traditional companies often involve employee appraisals and performance reviews to determine promotions and payments, a DAO worker is evaluated solely by its performance. DAO token holders are typically pseudonymous meaning that there are no discriminatory performance measures, and a DAO token holder will be “remunerated regardless of politics, background or education”.¹⁸⁵ DAOs inherently take on a prima facie, non-discriminatory meritocratic ideology, where a member’s status in the network is based on reputational capital built by consistent performance, that is, by fulfilling proposals which bring value to the DAO.

The removal of directors (and workers—depending on the DAO’s autonomy) ensures that the variable costs incurred day-to-day will be relatively negligible in comparison to that faced by corporations. The use of smart contracts to codify remuneration agreements with subcontractors (DAO token holders proposing to do work for their DAO) also lowers costs

¹⁸⁰ Kaal, above n 14, at 19.

¹⁸¹ At 19.

¹⁸² Voshmgir, above n 19, at 1.

¹⁸³ Laloux, above n 179, at 1.

¹⁸⁴ At 1.

¹⁸⁵ Kaal, above n 14, at 19.

due to the elimination of trusted third parties to both monitor and enforce the agreement.¹⁸⁶ As a DAO's underlying code must both be properly codified to facilitate performance and, to the maximum extent possible, be free from error, the establishment of sophisticated DAOs will incur large setup costs. Notwithstanding this, as software is typically open source, DAOs will be increasingly inexpensive to create.

III Obstacles

Many DAO enthusiasts predict a decentralised future: a future beyond legal rules pertaining to particular jurisdictions; a future adopting a paradigm shift in the very idea of economic organisation—from corporation to DAO. For these crypto-anarchists, *lex cryptographica* is the only form of law necessary to govern society, and society will follow a predominantly decentralised structure.

This paper has endeavoured to insist that these idealistic predictions are not fanciful, but are routinely conveyed in an overly simplistic manner. Not only are there a number of complexities, there are significant obstacles preventing a mainstream uptake of DAOs. Firstly, there has been little discussion by industry experts or academics about the legal status of DAOs. Although blockchain purists may consider this an unnecessary conversation to be had, the reality is that blockchain-based organisations will not gain the recognition required to integrate into society until DAOs obtain a feasible legal status. Secondly, the sustainability of a decentralised organisational model has rarely been questioned. The tendency for online services to move towards centralisation will prove to be an obstacle for a mainstream uptake of DAOs. Finally, the power of incumbent institutions to resist the uptake of DAOs will undoubtedly slow progress towards DAO development.

A Legal indeterminacy

The purely decentralised society envisaged by many crypto-anarchists does not contemplate specific legal rules. It does not need to. In a perfectly decentralised society, jurisdictional laws and regulations are replaced by *lex cryptographica* which, by digital

¹⁸⁶ Chohan, above n 9, at 1.

architecture, forces people to achieve certain outcomes.¹⁸⁷ Many legal rules and boundaries can be coded into the rules of smart contracts (for instance data-oriented contracts can cater for many real-life scenarios).¹⁸⁸ Moreover, although complex rules are difficult to encode, artificial intelligence is increasingly enabling the integration of legal rules into code.

However, DAOs do not operate in a vacuum. Regardless of their level of autonomy, DAOs involve human interaction, whether that is through human workers or contractors, human token holders or human customers. Furthermore, if DAOs are to transition to having a recognisable and reputable status in society, they will require legitimacy in the eyes of incumbent institutions to reach that status. Legal determinacy will be an important stepping stone for DAOs to achieve that legitimacy.

1 *Human stakeholders*

(a) DAO workers

Depending on where a DAO lies on the autonomous spectrum, it will have varying levels of interactions with humans. A DAO with relatively higher human involvement will have human DAO token holders that undertake work for the DAO, and invest capital into the DAO (in exchange for tokens).¹⁸⁹ It is highly likely that jurisdictions would want to ensure that these DAO token holders are treated consistently with other workers in respect to employment law.¹⁹⁰ For instance, DAO token holders should not face discrimination, unfair dismissal or pay equity issues. The rebuttal is of course that, under a pseudonymous optimisation proposal model, DAO token holders propose their own level of remuneration

¹⁸⁷ Lawrence Lessig “The Law of the Horse What Cyberlaw Might Teach” (1999) 113 Harv L Rev 501 at 507.

¹⁸⁸ Surden, above n 27, at 646.

¹⁸⁹ Krzysztof Wojdyto and Jacek Czarnecki *Blockchain, smart contracts and DAO* (Wardyński & Partners, 2016) at 20.

¹⁹⁰ Wojdyto and Czarnecki, above n 189, at 20.

and amount of work, while circumventing the prospect of appearance-based discrimination, so employment law does not apply.

Even so, optimisation proposal models may still need some form of legal rules. By analogy to tender processes used in common law jurisdictions, there could be issues around unfair optimisation proposal processes, such as those that involve biases encoded into the underlying smart contracts. For example, a smart contract's code may arbitrarily prioritise some proposals over others, to the detriment of those who are not seen first by the DAO community. Similarly, there may be opportunities for DAOs to act against the interests of proposers. For instance, some proposal processes (such as that utilised by *The DAO*) require a token deposit for proposers, so as to prevent an influx of vexatious proposals.¹⁹¹ Jurisdictions may want to ensure that DAOs do not exploit potential workers with exorbitant deposits or favour only wealthy token holders who can afford to place deposits. In common law jurisdictions, tender processes are protected by the court's interpretation of a *process contract*, which gives effect to the reasonable expectations of the parties who engage in it.¹⁹² In the case of DAOs, proposers will be strictly bound by the architecture of the proposal process encoded into the smart contract. This provides business certainty, but has the potential to entrench any unfavourable terms for potential workers.

(b) DAO consumers

Regardless of employment rights, all DAOs, including those with minimal human involvement, will likely produce goods and services that humans receive. Nation state governments would aim to ensure that these end products meet certain rules and regulations. For example, the New Zealand government would ensure that any DAO selling to New Zealand customers complies with the Consumer Guarantees Act 1993 and Fair Trading Act 1986. To not comply would be to create an unfair playing field between locally

¹⁹¹ Usha Rodrigues "Law and the Blockchain" (2019) 104 Iowa LRev 679 at 701.

¹⁹² P Devonshire "The Modern Law of Public Tendering: The Principles Defined" (2004) 10 NZBLQ 114 as cited in Jeremy Finn, Stephen Todd and Matthew Barber *Burrows, Finn and Todd on the Law of Contract* (6th ed, Lexis Nexis, Wellington, 2018) at 3.2.7.

regulated corporations and DAOs. Given a DAO's international nature, one could imagine the potential protectionist response by countries who perceive a lack of compliance as a threat to domestic businesses.

(c) Third party corporations

Similarly, throughout the course of business DAOs will interact with businesses below and above them in the supply chain, many of which will (at least initially) be legal corporations. For the sake of business certainty, corporations will not enter into contractual arrangements with a DAO unless they know that a potential dispute will be resolved under known law with reliable case history.¹⁹³ For comparison, a major advantage of the corporate form is the fact that company creditors have priority over shareholders, and their personal creditors, to the company's assets.¹⁹⁴ Asset partitioning allows creditors to refine and streamline monitoring costs over the assets they have claim to.¹⁹⁵ Knowledge of these legal protections is a major factor in facilitating commerce. In contrast, the uncertainty around stakeholder proprietary rights in DAOs may be too large a risk for many third parties to enter business relations with DAOs at this stage.

(d) Is blockchain transparency a solution to legal uncertainty?

There is a strong argument to be made that the transparency of a blockchain mitigates most of the issues listed above. For instance, the true reason a corporation will be hesitant about contracting with a DAO is not the lack of certainty around the applicable jurisdiction, but the lack of predictability around outcomes. Arguably, there is no lack of predictability because the terms of engagement are clearly outlined in the smart contract, publicly broadcasted on the blockchain. As smart contracts are meant to be comprehensive, the

¹⁹³ Aurelien Portuese, Orla Gough and Joseph Tanega "The principle of legal certainty as a principle of economic efficiency" (2017) 44 Eur J Law Econ 131 at 137-138.

¹⁹⁴ John Armour, Gerard Hertig and Hideki Kanda "Transactions with Creditors" in Kraakman, et al *The Anatomy of Corporate Law: A Comparative and Functional Approach* (Oxford Scholarship Online, 2017) at 110.

¹⁹⁵ At 110.

relevant smart contract should outline the remedy for a breach. Crypto-anarchists may go one step further and argue that, the immutability and sophisticated engineering of smart contracts will ensure that non-performance and breach of contractual obligations need not be a worry at all for corporations (such as wholesale suppliers or retailers) when considering dealing with a DAO.

This argument, which essentially relies on a solution of full disclosure, can only be taken so far. Grimmelmann emphasises the reliance on human oracles to implement smart contracts.¹⁹⁶ Oracles are the data feeds necessary to input information into a blockchain that smart contracts require to be executed. As long as oracles are human, data may be erroneously put into a blockchain, so even if information is transparent, it may not be correct. Equally important, while smart contract terms are transparent for all to see, proposers will need to comprehend and digest the terms, outlined in the blockchain's programming language, in full. Just as users of online services generally neglect to read online terms and conditions, every day contractors and consumers will struggle to read the terms or rules included in smart contracts.¹⁹⁷ Analogising with modern financial markets, behavioural economics has shown that increased disclosure does not result in tangible beneficial outcomes for consumers.¹⁹⁸

For corporations, the most effective protection of consumers and suppliers has been through the application of broad, overarching duties and principles, such as duties of care, the duty of loyalty or the principle of good faith.¹⁹⁹ Broad duties and principles encompass a number of issues which may have been unaccounted for in specific contracts.²⁰⁰ It has been argued that the use of principle-based regulation creates more business certainty, as a

¹⁹⁶ Grimmelmann, above n 28, at 14.

¹⁹⁷ Florencia Marotta-Wurgler "Will Increased Disclosure Help? Evaluating the Recommendations of the ALI's 'Principles of the Law of Software Contracts'" (2011) 78 UChiLRev 165 at 186.

¹⁹⁸ Kendall Grant "From Investor Education to Investor Protection: The Limits of Disclosure and the Way Forward" (2016) 31 Banking Finance Law Rev 229 at 237.

¹⁹⁹ See, for example, the New Zealand Companies Act 1993 ss 131 to 137, which impose broad duties on directors.

²⁰⁰ Julia Black "Regulatory Styles and Supervisory Strategies" in Niamh Moloney, Eilis Ferran and Jennifer Payne *The Oxford Handbook of Financial Regulation* (Oxford University Press, United Kingdom, 2015).

principle is more enduring than narrowly defined rules.²⁰¹ As DAOs currently operate outside of specific jurisdictions, DAO stakeholders fail to benefit from the principle-based protections available to company stakeholders. It is unlikely that governments will allow for such an inconsistency to persist in the long run.

2 *Investment in DAOs*

A fundamental element in the establishment process of a DAO is the initial coin offering (ICO). An ICO is a crowdfunding process where DAO token holders transfer funds, in the form of the underlying blockchain's "native" cryptocurrency,²⁰² to the DAO, in return for a proportionate allocation of the DAO's token.²⁰³ Among covering other set up costs, the amount of cryptocurrency raised in the ICO should be enough for the DAO to trigger the necessary smart contracts to operate autonomously. For example, a DAO operating on the Ethereum network requires sufficient Ether to pay for the *gas* required to execute its operations.²⁰⁴

Without sufficient investment, DAOs will be unable to operate. It is therefore imperative that DAO tokens are considered reliable and safe investments. For many blockchain investors, legal indeterminacy of digital assets and even the incidence of ICO scams, has not dampened their popularity. However, if DAOs are to enter mainstream markets such that DAOs can reach the size and scale of incumbent corporations, DAO tokens will have to appeal to everyday investors. For those investors less blasé about the legal status of a DAO token, more certainty and protection will be required.

²⁰¹ John Braithwaite "Rules and Principles: A Theory of Legal Certainty" (2002) 27 AUJILegPhil 47 at 48.

²⁰² Stiftung Ethereum "Beginners" Ethereum <<https://ethereum.org/>>.

²⁰³ Alex Lielacher "What is a DAICO – A Beginner's Guide" (4 April 2018) Cryptonews <<http://cryptonews.com/>>.

²⁰⁴ Gas is a unit measuring the computation effort required to execute transactions on the Ethereum blockchain. As the computational effort is costly, those triggering smart contracts must pay miners a proportionate amount of Ether to match the gas required to validate it. See Ameer Rosic "What is Ethereum Gas? [The Most Comprehensive Step-By-Step Guide Ever!]" (2017) Blockgeeks <<http://blockgeeks.com/>>.

The failure of *The DAO*, which resulted in the temporary loss of over \$50 million USD worth of Ether, turned a number of heads towards the regulation of ICOs. In 2017 after investigating *The DAO* hack, the US Securities and Exchange Commission (SEC) released a report ruling that all digital tokens raised through an ICO must comply with US federal securities laws.²⁰⁵ Furthermore any DAO tokens offered and sold in the US must be registered with the SEC. Notably, the report stated: “The automation of certain functions through this [blockchain] technology, “smart contracts,” or computer code, does not remove conduct from the purview of the US federal securities laws”.²⁰⁶

Although the report was initially perceived by some as an empty threat, recent enforcement action has shown that the SEC will be willing to impose penalties to those who do not comply. In November 2018, the SEC ordered ICO issuers CarrierEQ Inc. and Paragon Coin, Inc. to pay \$250 000 USD in penalties; register their tokens with the SEC; and file periodic reports to the SEC.²⁰⁷ Following the SEC’s report on *The DAO* and subsequent statements, ICO issuers are now on notice and should be wary about proceeding without registering with the SEC.

The legal indeterminacy of DAOs themselves, not just DAO tokens, creates an equally large impediment to mainstream investment in DAOs. Whether it is a result of their innovative nature, their ability to operate and be controlled across jurisdictions, or the difficulty of classifying artificial intelligence, a DAO’s legal status has so far been undetermined. Without legal recognition, the benefits of limited liability cannot extend to investors.²⁰⁸ Instead, DAO token holders may be personally liable, without recourse against the DAO.²⁰⁹ For instance, academics have suggests that, by not registering as a company,

²⁰⁵ United States Securities and Exchange Commission *Report of Investigation Pursuant to Section 21(a) of the Securities Exchange Act of 1934: The DAO* (Release No.81207, 25 July 2017) at 1.

²⁰⁶ At 2.

²⁰⁷ Kevin Aguirre “Cryptocurrency ICO Issuers on Notice After SEC Seminal DAO Report” (25 January 2019) Fordham Journal of Corporate & Financial Law <<http://news.law.fordham.edu>>.

²⁰⁸ Dean Armstrong, Dan Hyde and Sam Thomas *Blockchain and Cryptocurrency: International Legal and Regulatory Challenges* (Bloomsbury Professional, Haywards Heath, 2019) at 11.11.

²⁰⁹ At 11.11.

a DAO may be deemed a general partnership.²¹⁰ Associated fiduciary duties between DAO token holders (as partners) may impose obligations unforeseen when choosing to invest or may put a dampener on investment itself.²¹¹

The SEC's announcements clearly provide the US position on DAO tokens. Although ICOs have been treated differently in different jurisdictions (for instance China and Pakistan have banned ICOs altogether), the US position is highly persuasive considering the magnitude and prominence of the market cap of the US financial markets.²¹² Nevertheless, divergent approaches to determining the legal status of digital tokens may halt investment. Many have hinged the success of blockchain based technologies on the ability of institutional investors to shift capital to digital assets.²¹³ Until there is a comprehensive solution to the legal indeterminacy of both DAO tokens and DAOs themselves, they may fail to attract investment from institutional investors.

3 *Jurisdictional complexity*

An issue faced by a number of online service providers, including DAOs, is an issue of jurisdiction.²¹⁴ An attractive feature of blockchain technology is that nodes are often distributed across the globe. DAOs are therefore potentially subject to any of the rules and regulations of the many jurisdictions that they operate in (or more broadly: that they *have an influence in*).²¹⁵ Lack of harmonisation or unanimity between different jurisdictions creates a large regulatory risk for DAOs.²¹⁶ As mentioned, legal uncertainty can hinder

²¹⁰ Armstrong, Hyde and Thomas, above n 208, at 11.12.

²¹¹ At 11.12.

²¹² The Law Library of Congress "Regulation of Cryptocurrency Around the World" (16 August 2019) Library of Congress <<https://www.loc.gov/>>.

²¹³ Jeffrey Gogo "KPMG: Institutional Investment Key to Cryptoassets Growth" (20 November 2018) Bitcoin News <news.bitcoin.com>.

²¹⁴ Wojdyto and Czarnecki, above n 189, at 21.

²¹⁵ For example, Article 3 of the Regulation (EU) 2016/679 (General Data Protection Regulation) encompasses any business which targets EU citizens, even if its operations are entirely outside the EU. See: Art 3(2)(a) and (b).

²¹⁶ Armstrong, Hyde and Thomas, above n 208, at 11.13.

market efficiency.²¹⁷ In essence, the risk of a major jurisdiction, such as the US, imposing costly regulatory requirements or prohibitive legislation, is a constant factor to be considered and a potential disincentive for investors.

B Tendency towards centralisation

The sustainability of a decentralised economy faces significant practical issues. The main argument is that “no matter how decentralized [sic] a service is to start with, left to itself, things eventually tend towards centralization [sic]”.²¹⁸ A popular example of this tendency is the Internet. In the Internet’s early days, it was completely decentralised with individual nodes connecting directly.²¹⁹ However with the introduction of Internet service providers (ISPs), the Internet began to become commercialised.

The bundling of services within the Internet value chain has eliminated competition in the market.²²⁰ For instance, Microsoft’s bundling of Internet Explorer and its Windows operating system in 1995 eliminated all other Internet browsers from the market for the time being. More recently, online service providers have monopolised control of traffic, personal data, commerce and the flow of information. Take Alphabet, the parent company of Google, which began as a search engine. Among other things, it has expanded into: device and operating systems, with Android and Google phones; internet applications, such as Google Chrome; and enabling technologies, such as Google Wallet, DoubleClick advertising and Google Pay. Although the Internet’s foundational protocol creates the opportunity for individuals to create web content on an equal playing field, now the large majority of traffic goes through Google or Facebook, giving them a so-called “gatekeeper” status as they control what web content users experience.²²¹ As argued by Jonathan Tepper,

²¹⁷ Braithwaite, above n 201, at 48.

²¹⁸ Rahul Matthan “Bitcoin and the law of centralization” (20 December 2017) LiveMint <www.livemint.com/>.

²¹⁹ Vince Tabora “The Evolution of the Internet, From Decentralized to Centralized” (24 March 2018) Hackernoon <<https://hackernoon.com/>>.

²²⁰ Mark Page, Christophe Firth and Colin Rand “The Internet Value Chain: A study on the economics of the internet” (Global System for Mobile Communications Association, May 2016) at 7.

²²¹ Kasper Welbers and Michaël Opgenhaffen “Social media gatekeeping: An analysis of the gatekeeping influence of newspapers’ public Facebook pages” (2018) 20 *New Media & Society* 4728 at 4728.

“the architecture of the internet is still decentralized, the ecosystem of the World Wide Web is not”.²²²

Analogising with the Internet, it can be argued that blockchain-based services, including DAOs, will become increasingly centralised. To some extent this is already the case. Firstly, many start-up DAOs are created with an inherently centralised structure, by virtue of a localised team of initial developers (see the problem of initiators outlined above). Although they purport to shift towards fully decentralised workforces overtime, how they reach this organisational structure is to be seen.²²³ It takes a significant entrepreneurial sacrifice to forego this decision making power. Likewise, there are clear efficiencies with centralised systems which start-up executives may be reluctant to relinquish. For instance, centralised systems can react to issues promptly, as decisions do not need to be run past an entire network of decision makers. In this way, centralised systems do not incur the coordination costs of decentralised systems.

Secondly, centralised cryptocurrency exchanges have become a major means for users to store and trade digital tokens. These exchanges operate as third party intermediaries, in some ways defeating the purpose of a decentralised network. Through the use of smart contracts, decentralised cryptocurrency exchanges are possible, but are far from popular with centralised exchanges holding 99 per cent of total cryptocurrency volume.²²⁴ Moreover, the natural centralisation of miners into mining pools has risked sabotaging the integrity of blockchain systems altogether. For example, in 2014 the mining pool GHash controlled over 50 per cent of the total computational power on the Bitcoin network for over 12 hours, leaving it susceptible to a 51 percent attack.²²⁵

²²² Jonathan Tepper “The Death of the Internet” (8 march 2019) The American Conservative <www.theamericanconservative.com/>.

²²³ Wrapious Marketing Co “DAO Brings a Revolution to Working Style” (28 May 2019) Wrapious <<https://wrapious.hk/>>.

²²⁴ Karthik Shanmugam “Centralized vs Decentralized Cryptocurrency Exchanges-Explained Simply!” (4 May 2019) Hackernoon <https://hackernoon.com>.

²²⁵ Matthan, above n 218, at 1.

Thirdly, centralisation is the preferred means for accumulating both wealth and power.²²⁶ Naturally, profit making organisations will tend towards centralised models. Developers will want to retain power and control over their projects. Similarly, majority DAO token holders will like to ensure decisions are made in their interests and that they receive increasing levels of the organisation's profits.²²⁷ As such, DAOs will likely witness increasingly centralised token holder bases, and moreover, increased power in the hands of controlling token holders.

Undoubtedly, a number of DAOs may be able to persist with their egalitarian and non-hierarchical structures. However these DAOs must be able to successfully compete with corporations and other centralised organisations to be sustainable in the long run.

C Incumbent institutions

Related to both limitations outlined above is the difficulty DAOs will face as a result of centralised, incumbent institutions. DAO proponents often point to the benefits of decentralising society by circumventing expensive and unnecessary third party intermediaries. The proliferation of DAOs is directly against the interests of many governmental institutions, courts and large corporations, in a variety of ways.

DAOs are an immediate threat to governments for various reasons. Their cross-jurisdictional nature makes them difficult to control, and as such they are unlikely to comply with a government's domestic legislation. As such DAOs could provide risks to a nation's citizens, whether it be through financial loss by a failed DAO investment or through an infringement on their human rights. Moreover, DAOs are likely to circumvent government taxes, meaning the proliferation of DAOs will see a reduction in tax revenue. Relatedly, because DAOs operate with cryptocurrencies rather than fiat money they will be unaffected by a government's monetary policy efforts. With a DAO's business operating

²²⁶ Grace Rachmany "What Could a DAO Look Like?" (12 August 2019) Hackernoon <<https://hackernoon.com/>>.

²²⁷ Brady Dale "Everyone's Worst Fears About EOS Are Proving True" (19 September 2019) Coindesk <www.coindesk.com/>.

outside their purview, it is unlikely that governments will allow them to persist without some form of oversight.

Both governments and the courts will be uncomfortable with DAOs operating without a legal status, for the reasons outlined above. As more of a nation's citizens become involved, more pressure will be on governments to integrate a DAO framework into legislation. This will facilitate the development of DAOs in the short term, but may ultimately restrict the ability for a DAO to expand beyond its statutory limitations.

While regulatory controls imposed by the government may create some restrictions, the cross-jurisdictional nature of DAOs may allow them to escape many of these rules, especially if jurisdictions do not harmonise their approaches. Less avoidable is the power of the market. DAOs will have to navigate the responses of powerful multinational corporations, disgruntled by DAO-caused industry disruptions. In this scenario, corporations benefit from being the incumbents. With an existing, loyal customer base incumbent organisations will not have to spend additional funds on building up market share. Moreover, DAOs will have additional costs overcoming the inherent distrust in new unproven innovations, especially those underpinned by artificial intelligence. Similarly, and subject to antitrust laws, incumbent corporations will be able to use anti-competitive practices, such as loss-leading, to drive out competing DAOs.

DAOs do experience advantages which will aid in their competition with corporations. For instance, the ability to draw upon the collective intelligence of their vast member base has potential to aid the organisation in its strategic decision making. Similarly, their current lack of regulation means that they can avoid expensive regulatory costs that corporations may face. However, one can imagine that large multinational corporations, such as Facebook or Google, which are highly centralised, will feel threatened by DAOs. In fact, Facebook's cryptocurrency Libra exemplifies the ability for incumbent institutions to take ideas from DAOs (for instance a digital financial asset) at their expense. A worldwide

uptake of Libra might make Bitcoin redundant for the Facebook group's 2.7 billion monthly users.²²⁸

IV Future Prospects: A “Paradigm Shift” or Something Less?

So far this analysis has emphasised the barriers to a decentralised future. However, this paper recognises that it is naïve to discount the very real prospects of DAOs in the future. A number of the issues mentioned above point to both the complexity of technology and the stubbornness of attitudes as major limitations to the proliferation of DAOs in the coming years. Attitudes are ever-changing and with increasing exposure of the flaws in existing hierarchical structures, DAOs may become the preferred organisational form. Likewise, complex engineering will eventually be able to overcome a number of the practical problems and governance issues DAOs currently face. This will increasingly be the case with the use of artificial intelligence, and by virtue of the large majority of DAOs having open source code.

Nevertheless, there are a number of significant issues that DAOs will need to overcome before they replace all, or even half, of the corporations in the market. As mentioned, legal indeterminacy, a lack of trust from sceptics, backlash from incumbent institutions, alongside myriad governance complications, will prove to be a large barrier to entry.

This paper predicts that, in the foreseeable future, we will see a hybrid approach to the integration of DAOs into society. This hybrid approach will be multifaceted. Firstly, there will be a mixture of DAOs and corporations working alongside each other. Secondly, there will be a hybrid regulatory approach to overcome legal status issues. Thirdly, there will be varying degrees of centralisation within DAOs, with some ultimately resembling corporations and some fully autonomous.

²²⁸ John Pavlus “Facebook’s endgame: Getting inside your wallet” (19 September 2019) Fast Company <www.fastcompany.com/>.

A Hybrid economy: DAOs and corporations to coexist

In many ways the development of E-Commerce has transformed retail markets across the world.²²⁹ However in 2019, E-Commerce amounted to just 14.1 per cent of global retail sales, indicating that there are still strong demand for offline shopping.²³⁰ E-Commerce growth in market share has stayed at roughly 2 per cent consistently over the last 5 years, and is predicted to continue at that rate.²³¹ In the meantime, users experience a hybrid between online and offline purchases.

Similarly, DAOs and corporations will co-exist, with DAOs gaining an incremental market share over time. As mentioned above, incumbent corporations have an advantageous position to ensure that they are still relevant and still profitable. These corporations will have no incentive to shift from their existing, centralised structures. However, the development of DAO platforms, which act as DAO-facilitating technologies, will assist in the growth of the DAO sector.

For example, the Aragon project, backed by non-profit organisation the Aragon Foundation,²³² provides open source technology to assist DAO developers.²³³ Aragon delivers a number of different modules for developers to build their own DAOs and decentralised applications. Aragon purports to create its own “digital jurisdiction”,²³⁴ where the functions of DAOs, such as “identity management, ownership, human resources, payroll, voting rights, and even token generation events are all run through the Aragon DAO”.²³⁵ Another example, DAOStack, also provides a modular smart contract framework

²²⁹ Kenneth Laudon and Carol Traver *E-commerce 2016* (12th ed, Pearson, Harlow, 2016) at 7.

²³⁰ Statista Inc. “E-commerce share of total global retail sales from 2015 to 2023” (2019) Statista <www.statista.com/>.

²³¹ At 1.

²³² Although Aragon ostensibly aims to become a DAO overtime. See: Luis Cuende “Decentralizing Aragon’s development II: Minimum Viable Foundation” (2 May 2018) Aragon <<https://blog.aragon.org/>>.

²³³ Luis Cuende “The Aragon Manifesto” (8 May 2018) Aragon <<https://blog.aragon.org/>>.

²³⁴ Luke Duncan “Aragon Network—On a path towards a digital jurisdiction” (25 May 2018) Aragon <<https://blog.aragon.org/>>.

²³⁵ Lars Schulze “ICO A DAO—Can Decentralized Autonomous Organizations Save ICOs?” (23 March 2019) Medium <<https://medium.com/>>.

(along with other services, like user interface templates), so anyone can create a DAO without technical expertise.²³⁶ DAOStack and Aragon aim to provide a scalable solution for decentralised governance and encourage the creation of DAOs.

With the status quo favouring corporations, but the increasing availability of these DAO-facilitating technologies, the future will witness a hybrid of these two forms of organisation. Those in society who are wary of and have succumbed to the faults of hierarchical institutions will be drawn to DAOs, while less affected persons shall not. For cooperatives, workers in capital intensive sectors, which involve standardised tasks, are relatively indifferent about hierarchical structures compared to workers in knowledge intensive sectors.²³⁷ By analogy, we may see DAOs become more popular in knowledge intensive sectors, with hierarchical companies persisting in capital intensive sectors.

B Interim legal solutions: DAOs to initially integrate with legal systems

Crypto-anarchists envisage a decentralised society that transcends jurisdictions. For DAO enthusiasts, blockchain protocols and DAO governance mechanisms will be sufficient forms of control. In contrast, incumbent institutions will not want large organisations to operate outside of their control. Governments will want to regulate and ensure they do not forego tax revenue, while corporations will want a level playing field. These competing attitudes will result in a hybrid approach where less powerful DAOs succumb to jurisdictional constraints and larger DAOs attempt to form their own jurisdictions.

The majority of DAOs will need to comply with existing legal structures. To not comply will risk both being stamped out by incumbent institutions and deterring engagement from mainstream market participants (like institutional investors). To overcome these issues, many start-up organisations have adopted a hybrid approach, conforming to recognisable legal statuses but publicly announcing their intentions to shift to a DAO over time. A DAO linked to an entity with the legal capacity to enter into contracts will be able to enter into

²³⁶ Josh Zemel “An Explanation of DAOstack in Fairly Simple Terms” (11 April 2018) Medium <<https://medium.com/>>.

²³⁷ Mannan, above n 100, at 2.1.

the business relations required to get off the ground.²³⁸ At least in the short term, linking a DAO with a recognisable legal entity allows its initiators to more accurately estimate the potential legal risks of launching it.²³⁹

An example of a DAO that is ostensibly *temporarily* linked to a legal organisation is, Aragon. As mentioned above, Aragon is organised by the Aragon Foundation, a legally recognised non-profit entity based in Switzerland.²⁴⁰ It proposes to “slowly commence the transition of assets to the Aragon Network”, which will eventually include transferring all intellectual property to the Network.²⁴¹ Similarly, blockchain platform Horizen is run by the Zen Blockchain Foundation which is a Delaware registered non-profit organisation.²⁴² Over time, Horizen aims to transition its foundation to a DAO, starting with decentralising decision making around the allocation of resources.²⁴³

Some jurisdictions are opting to meet DAOs halfway, legislating for viable blockchain-based corporations. In mid-2018, Vermont passed a bill allowing for the creation of “blockchain-based limited liability companies” (BLLCs).²⁴⁴ In 2019, dOrg, a “blockchain development cooperative”, became the first BLLC.²⁴⁵ In doing so, it became the first legal entity that directly references blockchain code (open source code from DAOStack) as its source of governance.²⁴⁶ In 2018, Wyoming passed a series of bills which support blockchain innovation, including HB0070 which has the potential to exempt DAO tokens

²³⁸ Wojdyto and Czarnecki, above n 189, at 20.

²³⁹ At 20.

²⁴⁰ Cuende, above n 232, at 1.

²⁴¹ At 1.

²⁴² Messari Inc. “Zen Blockchain Foundation” Messari <<https://messari.io/>>.

²⁴³ Zen Blockchain Foundation “Horizen Expert” (2019) Horizen|AcademyBeta <<https://academy.horizen.global/>>.

²⁴⁴ Stan Higgins “Vermont Governor Signs Bill Clearing Way for Blockchain Companies” (31 May 2018) Coindesk <www.coindesk.com/>.

²⁴⁵ John Biggs “dOrg Founders Have Created the First Limited Liability DAO” (11 June 2019) Coindesk <www.coindesk.com/>.

²⁴⁶ Vtblockchainlawblog “dOrg Launches First Limited Liability DAO” (11 June 2019) Vermont Blockchain Law <<https://vtblockchainlawblog.com/>>.

from securities regulation.²⁴⁷ While these localised legislative changes undoubtedly encourage blockchain start-ups to base themselves in and boost the local economies, they also provide an avenue for governments to control these new organisations.²⁴⁸ Once a DAO is established in a specific jurisdiction, that jurisdiction's governing body has inherently gained regulatory authority over the DAO.

Cognisant of the benefits provided by legal compliance, DAOs are developing new ways to encourage this hybrid approach. OpenLaw, a New York based company,²⁴⁹ has developed several open source libraries containing so called "legal wrappers", for DAOs to incorporate into their code.²⁵⁰ OpenLaw has created limited liability wrappers, which extend the corporate veil over DAO business activities, encouraging member involvement by those who would otherwise be deterred due to legal indeterminacy.²⁵¹ Development of these facilitative technologies will help the proliferation of DAOs in the short term. However, by incorporating, DAOs inhibit future plans to decentralise functions.

Given crypto-anarchists' wariness of regulatory control, it is clear that for many DAOs incorporation will be an interim step towards becoming fully decentralised. Currently these interim frameworks are framed as the only viable option forward, with the alternative that courts force DAOs into undesirable legal frameworks, such as general partnerships which could expose members considerably.²⁵² However, large online conglomerates have shown that global organisations are not necessarily bound in this way. For instance, Google has outmanoeuvred a number of onerous legal obligations by forum shopping, choosing specific jurisdictions to base the operation of certain services.²⁵³ Powerful DAOs have

²⁴⁷ Amin Rafiee "Wyoming: the Blockchain State (Part I)" (20 December 2018) Medium <<https://medium.com/>>.

²⁴⁸ Karl Baker "Delaware eases off early blockchain zeal after concerns over disruption to business" (1 February 2018) Delaware Online <www.delawareonline.com/>.

²⁴⁹ Crunchbase Inc "OpenLaw" (2019) Crunchbase <www.crunchbase.com/>.

²⁵⁰ OpenLaw "The Era of Legally Compliant DAOs" (27 June 2019) Medium <<https://medium.com/>>.

²⁵¹ At 1.

²⁵² Vtblockchainlawblog "Blockchain Companies Should Be Banging Down the BLLLC Doors" (17 September 2019) Vermont Blockchain Law <<https://vtblockchainlawblog.com/>>.

²⁵³ Pamela Bookman "The Unsung Virtues of Global Forum Shopping" (2016) 92 Notre Dame LRev 579 at 617.

potential to take this regulatory arbitrage one step further. Similar to how Facebook's community creates its own rules through social norms and digital architecture, larger sophisticated DAOs have the potential to create their own jurisdictions. For example, Wardunski proposes "a special 'distributed' jurisdiction, different from jurisdictions as traditionally understood".²⁵⁴ As decentralised systems can operate without many third party intermediaries, by design, DAOs have a greater capability to do this than corporations. However, as the development of an independent online jurisdiction requires a DAO of considerable size and scope, incumbent institutions will be a significant obstacle before we see a DAO capable of achieving this.

C DAOs will embody varying levels of centralisation and automation

Finally, DAOs will be characterised by varying levels of automation and centralisation. As technology improves, processes will continue to be increasingly automated. However, as referred to above, a tendency for online services to trend towards centralisation may restrict the number of organisations that can sustainably maintain a fully decentralised structure.

(a) Automation

DAOs will vary in levels of automation. Certain business objectives are more predisposed to automation, while others necessarily involve inherently human features. In regards to artificial intelligence, sectors involving creativity, human communication and interpersonal skills will be the last to become fully automated. However, with the integration of various disruptive technologies, such as the Internet of Things, artificial intelligence and 5G, the automated capabilities of DAOs are increasing considerably. Filippi and Wright consider automation as a continuing trend, with "code-based systems are increasingly used to manage the activity of humans and machines".²⁵⁵ Varying degrees of automation will depend on numerous factors including technological capabilities; applicability of a decentralised governance structure; and financial limitations.

²⁵⁴ Wojdyto and Czarnecki, above n 189, at 21.

²⁵⁵ Filippi and Wright, above n 16, at 151.

(b) Centralisation

As mentioned earlier, it is almost inevitable that DAOs will begin with a centralised team of developers. The future will see a mixture of blockchain-based organisations, some of which will fully transition to decentralised organisations and some which will decentralise particular functions while maintaining overall control.²⁵⁶ Among other factors, the degree of centralisation will be determined by the founders' desire to maintain entrepreneurial direction; the desire for efficiency and avoidance of coordination costs; and how facilitative the legal environment is in the initiators' jurisdiction.

Full decentralisation will require test-cases in regards to a number of new, experimental scenarios. For instance, the transitioning from private to public intellectual property ownership remains a legal grey area. Likewise, the durability, efficiency and sustainability of governance mechanisms will have to be tested for organisations to decentralise all their capabilities. If it does become apparent that, with large scale networks, coordination costs are too much, we may see a limit in the expansion of the DAO sector.

In regards to the inherent complexity of DAOs, it is predicted that as more laypeople integrate with blockchain-based businesses, technology literacy intermediaries and DAO facilitating technologies, such as Aragon and DAOStack, will gain increasing power. DAO platforms may be a necessary intermediary for non-technical entrepreneurs wanting to create DAOs. Whether these organisations choose to decentralise this new found power or monopolise it, just as Google profits from its monopoly as a search engine, ironically becomes a question of human nature, and remains to be seen.

V Conclusion

Crypto-anarchists and blockchain enthusiasts promulgate the message that DAOs provide innovative, decentralised solutions to century old issues. For those reminded by the

²⁵⁶ Ammous predicts smart contracts to exist “over secured centralized computers operated by trusted third parties with the ability to override them”. See: Saifedean Ammous “Blockchain Technology: What Is It Good For?” (2019) 34 Banking Finance Law Rev 239 at 247.

grandiose corporate failures of multinational companies, which often occurred at the expense of the innocent individual, these innovative solutions are an attractive alternative option to the corporate form. Unfortunately, these solutions are portrayed in an overly simplistic way, such that a number of complexities are either tactfully dismissed or irresponsibly unconsidered. The pragmatic reality is that, for DAOs to become a viable and competitive business structure, they will need to integrate with existing legal systems. Equally important, DAOs will need to closely monitor their relationships with incumbent institutions, such as competing corporations and wary governments. Moreover, to maintain a decentralised structure, DAOs will have to be consciously structured in a way that not only resists natural tendencies towards centralisation, but also shifts power away from the very developers who set it up. This paper does not dismiss these new technological developments as unworkable, but suggests that current academic discourse has not endeavoured to confront these obstacles head on. Ultimately, this paper concludes that, notwithstanding improved technology and more sophisticated engineering, we will struggle to reach the decentralised society envisaged by crypto-anarchists, and will instead reach a hybrid society characterised by the coexistence of conventional, centralised, partly decentralised, and fully decentralised organisations.

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