



Decentralised Autonomous Organisations: Governance, Dispute Resolution and Regulation

A thesis submitted
in fulfilment of the requirements for the degree of
Doctor of Philosophy

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Abstract

This thesis critically evaluates the governance, resolution of disputes and regulation of decentralised autonomous organisations (DAOs) through the lens of institutional cryptoeconomics (IC). DAOs, which use smart contracts, and therefore blockchain, are a new type of organisation, which can take many forms, including for-profit and not-for-profit. The primary data used in the thesis are the scholarly and grey literature triangulated with semi-structured interviews from founders and consultants for DAOs, people carrying out work for DAOs and regulators.

Governance is vital to DAOs. Given DAOs cannot act outside their rules and because their smart contracts may contain errors or unforeseen events may occur, rule changes are necessary if DAOs are to remain operational. Nor can DAOs act unless they are expressly authorised to do so by their smart contracts. Proposals for rule changes and actions, such as agreeing for work to be done for the DAO, are proposed and voted upon by DAO token holders. A key finding is the complex governance arrangements DAOs use to overcome the challenges of decentralised governance if any token holder can make proposals to the DAO. Those challenges include a lack of strategic oversight and the vetting of proposals. Voting on proposals also varies amongst DAOs. While some DAOs use a traditional one token—one voting scheme, others wary of concentrating power use a range of novel schemes, including reputation-based systems and conviction voting.

Despite the use of smart contracts, dispute resolution remains necessary. Traditional dispute resolution institutions are not fit for purpose for most disputes arising within DAOs and people dealing with DAOs. Instead DAOs can use dispute resolution services from emerging online third-party decentralised dispute resolution services (DDRSs). These DDSs employ various innovative mechanisms, including allowing anyone to appeal a decision, not merely the parties themselves. In cases where the parties have agreed to using a DDS, the thesis finds that DDSs' rulings should not be subject to judicial oversight because of the time and cost involved in court proceedings and the need for finality of decisions.

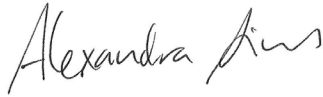
DAOs pose challenges for legal regulation: the default laws of partnership and unincorporated associations are an ill fit. The thesis examines the use of legal wrappers by DAOs. It also explores the

attempts to incorporate DAOs into existing legal frameworks through amendments to legislation and the creation of sui generis legislation. The thesis finds that the United States' limited liability company structures (LLCs) are the best fit for for-profit DAOs and registered unincorporated nonprofit associations for not-for-profit DAOs.

This thesis contributes to the literature by critically evaluating three interlinked themes through the lens of IC: DAO governance models, dispute resolution and legal structures for DAOs. It provides greater insight into DAOs as a nascent organisational form and recommendations for reform.

Statement of Originality

This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.



28 May 2021

(Signed) _____

Date: _____

Alexandra Sims

Macquarie University's Ethics Committee Reference No: 5201950429217, Project ID: 5042

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Thank you to the interviewees who gave up their timing willingly and generously. I cannot identify any of the interviewees due to confidentiality requirements.

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List of Abbreviations

AI	Artificial intelligence
ADR	Alternative dispute resolution
AI DAO	Decentralised autonomous organisation (DAO) operated through algorithms
AML	Anti-money laundering
ANJ	Cryptocurrency used in Aragon Court
ASA	Advertising Standards Authority (New Zealand)
BBLLC	Blockchain Based Limited Liability Company
B-corp	Benefit corporation
C-corp	C corporation
DAC	Decentralised autonomous corporation/ Decentralised autonomous company/ Decentralised autonomous community/ Decentralised autonomous cooperative
DAI	Cryptocurrency (stablecoin pegged to the US dollar)
DAO	Decentralised autonomous organisation
dApp	Decentralised application
DBVN	Decentralized borderless voluntary nation
DCG	Dash Core Group
DDRS	Decentralised Dispute Resolution Service
DLT	Decentralised ledger technology
DO	Decentralised organisation
ECAF	EOS Core Arbitration Forum
ETH	Ether, cryptocurrency, native to the Ethereum blockchain
IC	Institutional cryptoeconomics
ICANN	Internet Corporation for Assigned Names and Numbers
ICO	Initial coin offering
IoT	Internet of things
ITA	Innovative technical arrangement (Malta)
JaaS	Justice as a Service
JRS	Token used by the Jur DDRRs
KYC	Know Your Customer
LAO	Limited liability autonomous organisation
LLC	Limited liability company (United States)
LLP	Limited liability partnership
LP	Limited partnership
MCV	MetaCartel Ventures
NAV	Cryptocurrency, native to the NAV blockchain
NFT	Non-fungible token
NIE	New institutional economics
ODR	Online dispute resolution
SCL	UK Society for Computers and Law
SLLC	Series limited liability partnership (United States)
UDRP	Uniform Domain Name Dispute Resolution Policy
UKJT Rules	Digital Dispute Resolution Rules from the UK Jurisdiction Taskforce, 'Digital Dispute Resolution Rules' Version1.0 (2021)

Chapter One: Introduction

[T]he DAO is that genuine rarity: a new thing upon the Earth, something that really could not have been conceptualized before the technologies underlying it were in place.¹

1.1 Introduction

Decentralised autonomous organisations (DAOs) are a new organisational form,² and promise to be ‘transparent, efficient, fair and democratic’.³ Decentralised organisations are not new,⁴ and neither are virtual organisations,⁵ but DAOs are different to what has gone before.⁶ DAOs use computer code (smart contracts), maintained on a blockchain,⁷ to lower their transaction costs,⁸

¹ Adam Greenfield, *Radical Technologies: The Design of Everyday Life* (Verso, 2017) 161, 162.

² Bitshares, the first operational DAO, was created in 2014, see Madhusudan Singh and Shiho Kim, ‘Blockchain Technology for Decentralized Autonomous Organizations’ (2019) 115 *Advances in Computers* 115, 121 and Daniel Larimer, ‘Is The DAO going to be DOA’, *Teknoids News* (25 May 2016) <<http://www.teknoids.com/2016/05/25/is-the-dao-going-to-be-doa/>>.

³ Quinn DuPont, ‘Experiments in Algorithmic Governance: A History and Ethnography of “The DAO”, a Failed Decentralized Autonomous Organization’ in Malcolm Campbell-Verduyn (ed), *Bitcoin and Beyond: Cryptocurrencies, Blockchains and Global Governance* (Routledge, 2017) 157, 157. The very concept of DAOs, however, has been questioned, see Izabella Kaminska, ‘More Decentralised Autonomous Organisation (DAO) Mysticism’, *Alphaville (Financial Times)*, 17 May 2016 <<https://ftalphaville.ft.com/2016/05/17/2162084/more-decentralised-autonomous-organisation-dao-mysticism/>>.

⁴ Benjamin Matthews, ‘Anti-hierarchical Culture in Media-Based Creative Collectives: Sketching Orinary Analyses’ (2017) 22 *Anthropoetics* 1–17. In addition, the term ‘decentralised organisation’ has been co-opted to refer to units that have some autonomy within a bigger whole, Timothy W Ruefli, ‘Behavioral Externalities in Decentralized Organizations’ (1971) 17(10) *Management Science* 649. There are also relatively recently developed organisational structures, such as Holacracy and Teal, which are designed to foster more decentralised decision-making, see Brian J Robertson, *Holacracy: The New Management System for a Rapidly Changing World* (Henry Holt, 2015) and Frédéric Laloux, *Reinventing Organizations: A Guide to Creating Organizations Inspired by the Next Stage of Human Consciousness* (Nelson Parker, 2014).

⁵ Helen Walker, ‘The Virtual Organisation: A New Organisational Form’ (2006) 3(1) *International Journal of Networking and Virtual Organisations* 25, 37.

⁶ Greenfield (n 1) 162. One interviewee for this thesis described DAOs as ‘ethereal’, interviewee 1 (DAO founder).

⁷ The term ‘blockchain’ is used instead of the more accurate term ‘distributed ledger technology’ (DLT), Karen Yeung, ‘Regulation by Blockchain: The Emerging Battle for Supremacy Between the Code of Law and Code as Law’ (2019) 82(2) *Modern Law Review* 207, 207. Blockchain is just one example of DLT, see Kevin Werbach, ‘Trust, but Verify: Why the Blockchain Needs the Law’ (2018) 33 *Berkeley Technology Law Journal* 487, 489. It may be possible to use other technology yet to be invented that is decentralised and cryptographically secure, thus DAOs in the future may not necessarily be reliant on blockchain, Maciej Olpinski, “Forking Systems” as a Governance Mechanism for DAOs’, *Medium* (14 April 2016) <<https://medium.com/@maciejolpinski/forking-as-a-governance-mechanism-for-daos-510d4129efa3>>.

⁸ Sinclair Davidson, Primavera De Filippi and Jason Potts, ‘Blockchains and the Economic Institutions of Capitalism’ (2018) 14 *Journal of Institutional Economics* 639, 643 and Luis Cuende, ‘Rethinking the Justice System: A Digital Jurisdiction for Decentralized Organizations’, *Epicenter* (Podcast, December 2020) <<https://epicenter.tv/episodes/371/>> one intent of DAOs is to ‘collapse the costs of creating and running a firm ... [through using] smart contracts’ 8.43–9.00min.

automate their transactions and as their governance mechanism.⁹ While in places the literature treats DAOs as autonomous entities that make their own decisions through algorithms,¹⁰ the more common formulation, and the one this thesis uses, is of people using DAOs as a coordination mechanism.¹¹ DAOs, as an organisational form, have several unresolved issues, many of which have been raised in the literature but not yet explored in detail. Those issues include governance, dispute resolution and legal regulation and are the subject of this thesis. Notwithstanding the treatment in some of the literature of DAOs as a homogenous group,¹² there are different categories. DAOs can be for-profit¹³ or not-for-profit,¹⁴ and while most DAOs operate on top of a third-party blockchain, such as Ethereum,¹⁵ others are used to operate a blockchain.¹⁶ The common feature of DAOs is their use of

⁹ Robbie Morrison, Natasha CHL Mazey and Stephen C Wingreen, 'The DAO Controversy: The Case for a New Species of Corporate Governance?' (2020) 3 *Frontiers in Blockchain* <<https://doi.org/10.3389/fbloc.2020.00025>>.

¹⁰ Primavera De Filippi and Aaron Wright, *Blockchain and the Law: The Rule of Code* (Harvard University Press, 2018) 146. De Filippi and Wright describe the DAOs examined in this thesis as decentralised organisations. See also Laila Metjahic, 'Deconstructing the DAO: The Need for Legal Recognition and the Application of Securities Laws to Decentralized Organizations' (2018) 39(4) *Cardozo Law Review* 1533, 1543–1545 and Lawrence E Driver, 'Digisprudence: The Affordance of Legitimacy in Code-as-Law' (PhD Thesis, University of Edinburgh, 2019) 48.

¹¹ Rafael Ziolkowski, Gianluca Miscione and Gerhard Schwabe, 'Exploring Decentralized Autonomous Organizations: Towards Shared Interests and "Code is Constitution"' (Conference Paper, Forty-First International Conference on Information Systems (ICIS), 13–16 December 2020) and DuPont (n 3) 171.

¹² Galia Kondova and Renato Barba, 'Governance of Decentralized Autonomous Organizations' (2019) 15(8) *Journal of Modern Accounting and Auditing* 406 and Florian Glaser and Luis Bezenberger, 'Beyond Cryptocurrencies: A Taxonomy of Decentralized Consensus Systems' (Conference Paper, European Conference on Information Systems (ECIS), 2015) <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2605803>.

¹³ The DAO launched in 2016 was intended to be a decentralised venture capitalist fund, Randolph A Robinson, 'The New Digital Wild West: Regulating the Explosion of Initial Coin Offerings' (2018) 85(4) *Tennessee Law Review* 897, 899.

¹⁴ Moloch DAO is one example of a not-for-profit DAO, Ameen Soleimani et al, 'The Moloch DAO: Beating the Tragedy of the Commons Using Decentralised Autonomous Organizations' (White Paper, v1.0) <<https://github.com/MolochVentures/Whitepaper/blob/master/Whitepaper.pdf>> and see Fraser Brown, 'Five Ways Moloch's DAO Could Fix Giving', *Medium* (18 January 2019) <<https://medium.com/daoact/five-ways-molochs-dao-could-fix-giving-261d4cba90d5>>.

¹⁵ DAOs that use a third-party blockchain such as The DAO, which launched in 2016, are sometimes called dApps, see, eg, Robinson, 'The New Digital Wild West' (n 13) 930 and Markos Zachariadis, Garrick Hileman and Susan V Scott, 'Governance and Control in Distributed Ledgers: Understanding the Challenges Facing Blockchain Technology in Financial Services' (2019) 29(2) *Information and Organization* 105, 106. There is no settled definition of a dApp, indeed in 2014 Bitcoin was described as a dApp, David Johnston et al, 'The General Theory of Decentralized Applications, Dapps' *GitHub* (9 June 2014) <<https://github.com/DavidJohnstonCEO/DecentralizedApplications>>. Now a dApp is best conceptualised as a decentralised app, that is, an app an entity releases for others to use, '[a] decentralized application (dapp) is an application built on a decentralized network that combines a smart contract and a frontend user interface', 'Introduction to Dapps', *Ethereum* (19 August 2021) <[https://ethereum.org/en/developers/docs/dapps/#:~:text=A%20decentralized%20application%20\(dapp\)%20is,that%20someone%20else%20has%20written](https://ethereum.org/en/developers/docs/dapps/#:~:text=A%20decentralized%20application%20(dapp)%20is,that%20someone%20else%20has%20written)>. Thus a DAO could create a dApp or a series of dApps. This thesis, therefore, does not use the term 'dApp' and instead uses the term 'DAO'.

¹⁶ The Dash DAO runs the Dash blockchain, Stephen Di Rose and Mo Mansouri, 'Comparison and Analysis of Governance Mechanisms Employed by Blockchain-Based Distributed Autonomous (Conference Paper, Annual

blockchain to facilitate new forms of governance. As Vitalik Buterin, a co-founder of Ethereum observed:¹⁷

One of the more interesting long-term practical benefits of the technology and concept behind decentralized autonomous organizations is that DAOs allow us to very quickly prototype and experiment with an aspect of our social interactions that is so far arguably falling behind our rapid advancements in information and social technology elsewhere: organizational governance. Although our modern communications technology is drastically augmenting individuals' naturally limited ability to both interact and gather and process information, the governance processes we have today are still dependent on what may now be seen as centralized crutches and arbitrary distinctions such as "member", "(a) employee", "customer" and "investor" - features that were arguably originally necessary because of the inherent difficulties of managing large numbers of people up to this point, but perhaps no longer. Now, it may be possible to create systems that are more fluid and generalized that take advantage of the full power law curve of people's ability and desire to contribute.

Buterin's quote makes clear that governance and experimentation lie at the heart of DAOs,¹⁸ and experimentation was a common theme amongst some interviewees for this thesis.¹⁹ Yet, literature on the governance of DAOs is limited. Existing literature has focused on single DAOs,²⁰ in particular The DAO,²¹ or compared the governance of two to three DAOs.²² However, there has been no systematic treatment of the governance systems of DAOs in the literature.²³

Conference on System of Systems Engineering (SoSE), 2018) 195 and Carla L Reyes, 'Autonomous Business Reality' (2021) 21(2) *Nevada Law Journal* 437.

¹⁷ Vitalik Buterin, 'An Introduction to Futarchy', *Ethereum Blog* (Blog Post, 21 August 2014) <<https://blog.ethereum.org/2014/08/21/introduction-futarchy/>>.

¹⁸ Governance is also the most important challenge for blockchain generally, Zachariadis, Hileman and Scott (n 15) 106.

¹⁹ Interviewees 2 (DAO founder), 3 (DAO founder, not yet in operation), 5 (consultant), 6 (consultant) and 7 (consultant). See also Andrew Thurman, 'Dictators turn Delegates: Former CEOs Grapple with DAO Governance', *Cointelegraph* (17 December 2020) <<https://cointelegraph.com/magazine/2020/12/17/dictators-turn-delegates-former-ceos-grapple-with-dao-governance>> and Cuende (n 8) 4.50–5.02min.

²⁰ Lawrence Mosley et al, 'Towards a Systematic Understanding of Blockchain Governance in Proposal Voting: A Dash Case Study' (8 July 2019) <<http://dx.doi.org/10.2139/ssrn.3416564>>.

²¹ Morrison, Mazey and Wingreen (n 9) and DuPont (n 3).

²² Ziolkowski, Miscione and Schwabe (n 11) who looked at three DAOs and Di Rose and Mansouri (n 16) where Bitcoin and the Dash DAO are looked at. However, as discussed below in 3.3.3, this thesis treats Bitcoin as a proto DAO.

²³ There has been some work on DAO governance looking at a broader range of DAOs; however, the analysis has not been detailed, see Grace Rebecca Rachmany, 'DAO Case Study Research' (2019) <<https://daoresearch.dgov.foundation/network-governance/dao-case-study-research>> and Eric Arsenault, 'Voting Options in DAOs', *Medium* (16 December 2020) <<https://medium.com/daostack/voting-options-in-daos-b86e5c69a3e3>>.

The large variation in DAO governance is not fully reflected in the literature, for example, some recent literature continues to state that DAOs are fully decentralised, for example, that any actor within a DAO can submit a proposal that will be voted upon.²⁴ While that was true for The DAO²⁵ and for some other DAOs,²⁶ it is not true for all DAOs.²⁷ The creators of many DAOs have realised that full decentralisation can create significant problems and thus they are attempting to create governance mechanisms designed to harness the benefits of decentralised human decision-making while mitigating its disadvantages.

Dispute resolution will also be needed for DAOs. Smart contracts, while efficient, are also narrow:²⁸ they cannot be coded for every eventuality, and coding errors may occur.²⁹ DAO governance mechanisms provide limited means of resolving disputes: token holders can exit³⁰ the DAO by selling their tokens;³¹ they can put forward a proposal, which if successfully voted on may resolve the dispute;³² or the DAO can be forked to create a new DAO.³³ These mechanisms, however, are not sufficient to resolve all disputes involving DAOs.³⁴

²⁴ See, eg, Andrej Zwitter and Jilles Hazenberg, 'Decentralized Network Governance: Blockchain Technology and the Future of Regulation' (2020) 3 *Frontiers in Blockchain* <<https://doi.org/10.3389/fbloc.2020.00012>> and Grace (Rebecca) Rachmnay, 'DAO: Mismatch of Technology and Objectives' in Jonathan Bone and Christopher Haley (eds), *Decentralised Futures: How Digital Technologies will Change the Shape of Organisations to Come* (Nesta, 2020) 23, 27, 'DAOs today allow anyone to propose anything.'

²⁵ The DAO enabled any token holder to make a proposal and for all token holders to vote, Christoph Jentzsch, 'Decentralized Autonomous Organization to Automate Governance' (White Paper, 2016) <<https://lawofthelevel.lexblogplatformthree.com/wp-content/uploads/sites/187/2017/07/WhitePaper-1.pdf>> 2.

²⁶ The Dash DAO allows anyone to put forward a proposal, provided a fee of five Dash is paid, Mosley et al (n 20) 4–5.

²⁷ In Colony, a potential proposer must have a minimum amount of reputation to put forward a proposal for funding Alex Rea et al, 'Colony Technical White Paper' (White Paper, 2 October 2020) <<https://colony.io/whitepaper.pdf>> 23.

²⁸ Cuende (n 8) 11.40–11.40 min.

²⁹ DuPont (n 3) and see Zachariadis, Hileman and Scott (n 15) 106, 113–114 and Thomas Claburn, 'Single-Line Software Bug Causes Fledgling YAM Cryptocurrency to Implode Just Two Days After Launch', *The Register* (13 August 2020) <https://www.theregister.com/2020/08/13/yam_cryptocurrency_bug_governance/>.

³⁰ Albert O Hirshman, *Exit, Voice, and Loyalty: Responses to Decline in Firms, Organizations, and States* (Harvard University Press, 1970).

³¹ Interviewee 7 (consultant).

³² Interviewees 1 (DAO founder), 2 (DAO founder), 3 (DAO founder, not yet in operation), 4 (working for a DAO), 5 (consultant) and 6 (consultant).

³³ Interviewee 3 (DAO founder, not yet in operation) and see Philipp Hacker, 'Corporate Governance for Complex Cryptocurrencies' in Philipp Hacker et al (eds), *Regulating Blockchain: Techno-social and Legal Challenges* (Oxford University Press, 2019) 140, 152.

³⁴ Morrison, Mazey and Wingreen (n 9) 2 describing DAOs has having weak or non-existent mechanisms for dispute resolution.

Recent literature on blockchain and dispute resolution focuses on the need for dispute resolution for smart contracts and describes the emerging dispute resolution services offering dispute resolution.³⁵ The literature, which is explored in Chapter Five, has yet to look specifically at resolving disputes within DAOs and whether the findings of those dispute resolution services are final or whether the courts can hear appeals from them.

While governance appears to be the crucial issue for DAOs,³⁶ how the law regulates DAOs is also important. Some DAO creators have attempted to create DAOs with no legal structure,³⁷ or have not even turned their mind to whether a legal structure is required,³⁸ yet the courts in most jurisdictions are likely to impose legal structures on DAOs if a valid one has not already been chosen. For-profit DAOs are likely to be treated as a partnership, thus the token holders are partners.³⁹ Yet partnership law is an ill fit for many reasons.⁴⁰ Not-for-profit DAOs are likely to be treated as unincorporated societies or associations. Partnerships, unincorporated societies or associations are not separate legal entities and in law cannot hold and own assets and are unable to enter into contracts.⁴¹ For DAOs to reach their full potential it is likely that legal structures other than partnerships are required.⁴² Indeed, lawyers are beginning to structure DAOs creatively, for example,

³⁵ See, eg, Orna Rabinovich-Einy and Ethan Katsh, 'Blockchain and the Inevitability of Disputes: The Role for Online Dispute Resolution' (2019) *Journal of Dispute Resolution* 47; Amy J Schmitz and Colin Rule, 'Online Dispute Resolution for Smart Contracts' (2019) *Journal of Dispute Resolution* 103, 105; Darcy W E Allen, Aaron M Lane and Marta Poblet, 'The Governance of Blockchain Dispute Resolution' (2019) 25 *Harvard Negotiation Law Review* 75; and James Metzger, 'The Current Landscape of Blockchain-Based, Crowdsourced Arbitration' (2019) 19 *Macquarie Law Journal* 81.

³⁶ Buterin, 'An Introduction to Futarchy' (n 17) and Ivan Thinking, 'The Human Side of DAOs', *Noteworthy* (12 December 2020) <<https://blog.usejournal.com/the-human-side-of-daos-ca6f2e729a82/>>.

³⁷ Jentzsch (n 25).

³⁸ Interviewee 1 (DAO founder).

³⁹ Dirk A Zetsche, Ross P Buckley and Douglas W Arner, 'The Distributed Liability of Distributed Ledgers: Legal Risks of Blockchain' (2018) *University of Illinois Law Review* 1361, 1400, and De Filippi and Wright (n 10) 141–142. See also Metjahic (n 10) 1548. Technically partners form a firm; the partnership is the relationship between the partners, Partnership Law Act 2019 (NZ) s 10; however, the term 'partnership' is used rather than the term 'firm' because most disciplines treat corporations as firms.

⁴⁰ Metjahic (n 10) 1543–1545 and see below 6.2.

⁴¹ Coala, 'The DAO Model Law', *Medium* (19 December 2019) <<https://medium.com/coala/the-dao-model-law-68e5360971ea>>. For the difficulties faced by unincorporated charities (a form of unincorporated society), see generally Carolyn J Cordery, Carolyn J Fowler and Gareth G Morgan, 'The Development of Incorporated Structures for Charities: A 100-Year Comparison of England and New Zealand' (2016) 21 *Accounting History* 281, 285.

⁴² Coala (n 41).

as foundations,⁴³ limited liability companies (LLCs)⁴⁴ in some US states,⁴⁵ and even trusts.⁴⁶ The legal regulation of DAOs has been identified as an area requiring attention.⁴⁷

This thesis, which is situated within the legal discipline and draws upon literature from different disciplines, aims to critically evaluate DAOs using institutional cryptoeconomics (IC) as its methodological framework to understand the effectiveness of existing and proposed governance models, dispute resolution processes and the fit of DAOs within existing legal frameworks. The research questions are:

1. How effective are the governance frameworks used by DAOs?
2. What are the dispute resolution mechanisms for resolving disputes between members and third parties of a DAO?
3. Can existing legal institutions that govern organisational forms regulate DAOs or are changes to those legal institutions necessary?

Thus the thesis critically evaluates three interlinked themes through the lens of IC: DAO governance models, dispute resolution and legal structures for DAOs

The next sections provide a background on organisational forms and the regulatory environment, DAOs and facilitating technologies, and DAOs and the regulatory environment.

⁴³ See below 6.3.2.

⁴⁴ Notwithstanding that companies in New Zealand (and elsewhere) are occasionally called LLCs, Jane Horan et al, 'Structuring for Impact: Evolving Legal Structures for Business in New Zealand (2019) *The Impact Initiative* <<https://www.theimpactinitiative.org.nz/publications/structuring-for-impact>> 9. LLCs are a particular entity registered in US states. LLCs are different to companies in New Zealand and Australia and corporations in the United States, see below 6.3.5. To avoid confusion between LLCs and companies, this thesis will use the term 'corporation' instead of 'company'.

⁴⁵ See below 6.3.5.

⁴⁶ Ryan Taylor, 'Dash Core Group Legal Structure Details', *Dash* (Web Page, 2 August 2018) <<https://www.dash.org/2018/08/02/legal/>>.

⁴⁷ Wulf Kaal, 'Decentralized Autonomous Organizations: Internal Governance and External Legal Design' (2021) *Annals of Corporate Governance, U of St. Thomas (Minnesota) Legal Studies Research Paper* No. 20-14 <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3652481> 6.

1.2 Background

1.2.1 Facilitating Technologies, Governance and Dispute Resolution

DAOs are built upon computer code, specifically blockchain.⁴⁸ The cryptocurrency Bitcoin⁴⁹ was the first and is the most well-known blockchain. Blockchain, however, is one form of a wider technology: distributed ledger technology (DLT). While Bitcoin and other DLTs such as Ethereum can be described as a blockchain — literally, a chain of blocks of information sealed cryptographically and attached to one another — some newer DLTs are structured differently.⁵⁰ DLT is, therefore, wider than blockchain.⁵¹ However, because there is not yet a settled terminology⁵² and DLT is commonly called ‘blockchain’,⁵³ this thesis uses blockchain instead of DLT.

The computer code used by DAOs is in the form of smart contracts, which are used to both create and as a governance mechanism for DAOs.⁵⁴ Smart contracts, while not unique to DAOs or blockchain,⁵⁵ are a key feature of DAOs and were theorised prior to blockchain’s invention, with the term ‘smart contract’ coined in 1994 by Nick Szabo.⁵⁶ Szabo defined smart contracts as:

⁴⁸ Voshmgir Shermin, ‘Disrupting Governance with Blockchains and Smart Contracts’ (2017) 26(5) *Strategic Change* 449, 500.

⁴⁹ Satoshi Nakamoto, ‘Bitcoin: A Peer-to-Peer Electronic Cash System’ (2008) <<https://bitcoin.org/bitcoin.pdf>>.

⁵⁰ Examples of newer DLTs that do not use a blockchain include IOTA, a blockchain designed for use by IoT (Internet of things) devices and micro payments, which uses a Tangle rather than a series of linear blocks, see Serguei Popov, ‘On the Tangle, White Papers, Proofs, Airplanes, and Local Modifiers’, *Iota Blog* (Blog Post, 29 June 2018) <<https://blog.iota.org/on-the-tangle-white-papers-proofs-airplanes-and-local-modifiers-44683aff8fea/>> and Hashgraph, Leemon Baird, ‘The Swirlds Hashgraph Consensus Algorithm: Fair, Fast, Byzantine Fault Tolerance’ (Web Page, 31 May 2016) <<http://www.swirlds.com/downloads/SWIRLDS-TR-2016-01.pdf>>. See also, Patrick Schueffel, ‘10 Years Blockchain. The Race Is On: Blockchain vs. Tangle vs. Hashgraph’, *Fintech News Singapore* (19 February 2018) <<http://fintechnews.sg/16989/blockchain/10-years-blockchain-the-race-is-on-blockchain-vs-tangle-vs-hashgraph/>>.

⁵¹ Zachariadis, Hileman and Scott (n 15) 109–110.

⁵² See Angela Walch, ‘The Path of the Blockchain Lexicon (and the Law)’ (2017) 36 *Review of Banking and Financial Law* 713, 719–720.

⁵³ Paco Garcia, ‘Biometrics on the Blockchain’ (2018) 2018(5) *Biometric Technology Today* 5, 5. On 30 November 2020, a Google Scholar search for ‘blockchain’ provided about 300,000 results. In contrast, ‘distributed ledger technology’ returned about 14,900 results. The same search on Scopus returned 15,726 results for ‘blockchain’ and 930 results for ‘distributed ledger technology’.

⁵⁴ Morrison, Mazey and Wingreen (n 9) 2.

⁵⁵ Kevin Werbach and Nicolas Cornell, ‘Contracts Ex Machina’ (2017) 67 *Duke Law Journal* 313, 319. Blockchain is a technology that enables the creation and use of smart contracts, James Grimmelman, ‘All Smart Contracts Are Ambiguous’ (2019) 2(1) *Journal of Law and Innovation* 1, 8–9.

⁵⁶ Nick Szabo, ‘Smart Contracts’ (1994) <<https://www.fon.hum.uva.nl/rob/Courses/InformationInSpeech/CDROM/Literature/LOTwinterschool2006/szabo.best.vwh.net/smart.contracts.html>> and see Nick Szabo, ‘Smart

a computerized transaction protocol that executes the terms of a contract. The general objectives of smart-contract design are to satisfy common contractual conditions (such as payment terms, liens, confidentiality, and even enforcement), minimise exceptions both malicious and accidental, and minimise the need for trusted intermediaries. Related economic goals include lowering fraud loss, arbitration and enforcement costs, and other transaction costs.⁵⁷

While Szabo's original conception of a smart contract executing the terms of a contract may occur in some instances, it will not always be the case as the meaning of a smart contract, has evolved over the intervening decades.⁵⁸ That is, while smart contracts can be legal contracts, they are not always legal contracts.⁵⁹ The term 'smart' means that computers can read and enforce the smart contract's terms when specified conditions are met, without the need for human involvement.⁶⁰ Smart contracts do not need a blockchain to operate and are already in use,⁶¹ and they are often called 'electronic contracts'.⁶² A common example of a smart contract is the hiring of an electric scooter through downloading an app, creating an account and linking a credit or debit card to the hirer's account, which is automatically debited when the scooter is hired.⁶³

Smart contracts when used on a blockchain, however, have certain features, not all of which are present in other smart contracts. First, smart contracts when used on a blockchain are visible to the parties, thus they can be inspected.⁶⁴ In contrast, in the electric scooter example, while the hirer can see the terms and conditions presented to them, they cannot see the software code underlying

Contracts: Building Blocks for Digital Markets' (1996) 16 *Entropy* 1 and Nick Szabo, 'Formalizing and Securing Relationships on Public Networks' (1997) *First Monday* <<https://doi.org/10.5210/fm.v2i9.548>>.

⁵⁷ Nick Szabo, 'Smart Contracts' (1994) <<https://www.fon.hum.uva.nl/rob/Courses/InformationInSpeech/CDROM/Literature/LOTwinterschool2006/szabo.best.vwh.net/smart.contracts.html>> quoted by Maria G Vigliotti, 'What Do We Mean by Smart Contracts? Open Challenges in Smart Contracts' (2021) 3 *Frontiers in Blockchain* <<https://doi.org/10.3389/fbloc.2020.553671>> 2.

⁵⁸ Vigliotti (n 57) 3.

⁵⁹ Grimmelmann (n 55) 2.

⁶⁰ Morrison, Mazey and Wingreen (n 9) 3.

⁶¹ Vigliotti (n 57) 3.

⁶² Ibid citing *Directive 2000/31/EC of 8 June 2000 on Certain Legal Aspects of Information Society Services, in Particular Electronic Commerce, in the Internal Market (Directive on Electronic Commerce)* [2000] OJ L 178/1.

⁶³ Vigliotti (n 57) 2.

⁶⁴ Ibid 3.

the smart contract. Second, rather than the traditional method of using the law to enforce agreements,⁶⁵ smart contracts are used as a mechanism to enforce agreements.⁶⁶ The use of smart contracts by DAOs enables the creation and enforcement of *ex-ante* limitations, rather than the traditional *ex-post* monitoring and enforcement.⁶⁷ In the electric scooter example, the entity supplying the scooter is not guaranteed of receiving the payment, for example, if the hirer uses stolen credit card details. The use of *ex-ante* limitations means the DAO's pre-set rules cannot be broken.⁶⁸ This inability to break a DAO's rules is in contrast to traditional organisations where people make decisions that may or may not comply with the organisation's rules and the law.⁶⁹

Third, smart contracts are rigid; once a smart contract is deployed it cannot be changed,⁷⁰ unless the smart contract includes a back door which allows the parties to change it.⁷¹ DAOs typically use the ability to change smart contracts, which is central to DAOs' governance. However, unlike many contracts, including some smart contracts, the changes to smart contracts used by DAOs cannot be made unilaterally by one person or party. Conversely, with the electric scooter example, if the entity hiring out the scooters decides to raise the cost of hiring the scooter it could do so unilaterally. Granted, there are often consumer laws that prevent entities engaged in businesses from unilaterally raising prices in consumer contracts,⁷² but the law does not physically prevent one party changing the smart contract.

⁶⁵ Philip Paech, 'The Governance of Blockchain Financial Networks' (2017) 80(6) *Modern Law Review* 1073, 1081.

⁶⁶ Grimmelmann (n 55) 2.

⁶⁷ Jonathan Rohr and Aaron Wright, 'Blockchains, Private Ordering, and the Future of Governance' in Philipp Hacker et al (eds), *Regulating Blockchain: Techno-Social and Legal Challenges* (Oxford University Press, 2019) 43, 49 and Grimmelmann (n 55) 4. Alternatively the current model has been described as '*ex-ante* regulation-induced trust and *ex-post* review by the courts', Paech (n 65) 1081.

⁶⁸ For example, in The DAO hack, the hacker was not able to gain control of the funds it had drained from The DAO as The DAO's code contained a 28-day waiting period, Moritz Hütten, 'The Soft Spot of Hard Code: Blockchain Technology Network Governance and Pitfalls of Technological Utopianism' (2019) 19(3) *Global Networks* 329, 338.

⁶⁹ Robert Tillman, 'Making the Rules and Breaking the Rules: The Political Origins of Corporate Corruption in the New Economy' (2009) 51 *Crime, Law and Social Change* 73.

⁷⁰ Wesley Dingman et al, 'Defects and Vulnerabilities in Smart Contracts: A Classification Using the NIST Bugs Framework' (2019) 7(3) *International Journal of Networked and Distributed Computing* 121, 122.

⁷¹ 'Concerns Rise Over Backdoored Smart Contracts', *TrustNodes* (10 November 2018) <<https://www.trustnodes.com/2018/11/10/concerns-rise-over-backdoored-smart-contracts>>.

⁷² Many jurisdictions have consumer legislation that protects consumers against unfair contract terms, such as unilateral variation terms. See, for example, Fair Trading Act 1986 s 46M(d) (New Zealand); Australian Consumer Law s 25(1)(d) and Consumer Rights Act 2015 sch 2, pt 1, cl 11 (United Kingdom).

Fourth, while the rigidity of smart contracts can be beneficial (for example, parties cannot refuse to comply with the smart contract), the rigidity means that if there is an error in the smart contract, or if unforeseen circumstances arise, substantial sums of money may be lost.⁷³ Depending on the error, a DAO may even become ungovernable, and its token holders may be unable to retrieve its assets.⁷⁴ Fourth, if the smart contracts are on a public blockchain,⁷⁵ anyone can see them; thus they are transparent.⁷⁶

Therefore, using smart contracts in DAOs has advantages and disadvantages. On the one hand, people can agree on how the DAO will operate and that agreement will be recorded and enforced in a series of smart contracts.⁷⁷ Thus there is no need for managers and directors to check transactions to assess whether they comply with the DAO's rules or to monitor compliance. On the other hand, in addition to the problems associated with the rigidity of the code and the risk of error, using smart contracts to run an organisation raises the question of how decisions are made within the DAO. Two types of decisions are therefore needed in organisations: operational decisions, such as deciding what projects the DAO should engage in and who should do that work (approving requests for funding); and governance issues, such as deciding to wind up the DAO and distribute its assets.⁷⁸

⁷³ An error in The DAO's code saw the draining of millions of dollars' worth of DAO tokens, Morrison, Mazey and Wingreen (n 9) 6. An error in the Genesis Alpha DAO saw USD15,000 drained from it, Adam Levi, 'A Technical Analysis of the Genesis Alpha Hack', *Medium* (9 February 2019) <<https://medium.com/daostack/a-technical-analysis-of-the-genesis-alpha-hack-f8e34433c14b>>. However, interviewee 5 (consultant) noted that the Genesis Alpha DAO hack was part of the learning exercise as that DAO had been designed to have limited funds: 'they [DAOstack] just saw that as a bounty. Someone smart stole the money, but now at least we know where the hole is, so it won't happen next time. So you can trickle funds in and control risk in a better way.' See also, Cathey Barrera, 'MakerDAO's Problems Are a Textbook Case of Governance Failure', *CoinDesk* (17 March 2020) <<https://www.coindesk.com/makerdaos-problems-are-a-textbook-case-of-governance-failure>>.

⁷⁴ See Yam Finance, 'YAM Post-Rescue Attempt Update', *Medium* (13 August 2020) <<https://medium.com/yam-finance/yam-post-rescue-attempt-update-c9c90c05953f>>.

⁷⁵ Public blockchains are blockchains such as Bitcoin (and Ethereum) where no approval or authorisation is required to view or access the blockchain, Roy Lai and David Lee Kuo Chuen, 'Blockchain: From Public to Private' in David Lee Kuo Cheun and Robert Deng (eds), *Handbook of Blockchain, Digital Finance, and Inclusion, Volume 2: ChinaTech, Mobile Security, and Distributed Ledger* (Academic Press, 2017) 147.

⁷⁶ Morrison, Mazey and Wingreen (n 9) 3.

⁷⁷ Smart contracts in DAOs can therefore implement code as law, see Lawrence Lessig, *Code Version 2.0* (Basic Books, 2006) and Lawrence Lessig, 'Code is Law', *Harvard Magazine* (2010) <<https://harvardmagazine.com/2000/01/code-is-law.html>>.

⁷⁸ Sead Fadilpašić, 'Some DigixDAO Investors Doubled Their Funds by Killing DAO', *Cryptonews* (31 January 2020) <<https://cryptonews.com/news/some-digixdao-investors-doubled-their-funds-by-killing-dao-5657.htm>>; Andrew Munro, 'How Do You Program a Democracy? Crypto Decentralisation Isn't Easy', *Finder* (7 February 2018) <<https://www.finder.com.au/how-do-you-program-a-democracy-crypto-decentralisation-0x-zrx>>; and Oliver

Notwithstanding the use of the terms ‘operational’ and ‘governance’ in the preceding paragraph, the distinction between operational and governance decision-making does not apply to DAOs. DAOs break down the distinction between operational and governance decision-making because they do not use managers to make operational decisions as traditional hierarchical organisations would. Token holders vote for what are traditionally considered governance decisions as well as organisational decisions. DAOs, however, can provide different procedures for different decisions.⁷⁹ For example, a higher majority could be required to wind up the DAO than for operational decisions such as whether to fund a small project.⁸⁰ Thus a DAO’s governance includes both operational and governance decisions.

DAOs use a variety of different governance mechanisms and hence governance frameworks.⁸¹ There have been calls for research into DAOs’ governance frameworks,⁸² however, that research is only just beginning to appear.⁸³ The thesis’ first research question, therefore, is: How effective are the governance frameworks used by DAOs?

In addition, notwithstanding the use of smart contracts, disputes that require resolution will still arise.⁸⁴ Indeed, owing to the fragility of using smart contracts, for example, errors in the smart contract’s code or events not coded for, DAOs can use written documentation, such as manifestos, constitutions and bylaws.⁸⁵ Actions that may potentially breach such documentation can be challenged.⁸⁶ The use of traditional dispute resolution institutions, with their high costs and lengthy

Rikken, Marijn Janssen and Zelin Kwee, ‘Governance Challenges of Blockchain and Decentralized Autonomous Organizations’ (2019) 24(4) *Information Polity* 397, 412, 414 and 415.

⁷⁹ See below nn 909–912 and accompanying text.

⁸⁰ See generally Chapter Four.

⁸¹ Ibid.

⁸² Roman Beck, C Müller-Bloch and J L King, ‘Governance in the Blockchain Economy: A Framework and Research Agenda’ (2018) 19(10) *Journal of the Association for Information Systems* 1020 and Matti Rossi et al, ‘Blockchain Research in Information Systems: Current Trends and an Inclusive Future Research Agenda’ (2019) 20 *Journal of the Association for Information Systems* 1390.

⁸³ Ziolkowski, Miscione and Schwabe (n 11).

⁸⁴ Schmitz and Rule, ‘Online Dispute Resolution for Smart Contracts’ (n 35) 105 and Allen, Lane and Poblet (n 35) 76.

⁸⁵ Cuende (n 8) 11.25–12.20min.

⁸⁶ Ibid.

resolution times, has been identified as not fit for purpose for current disputes,⁸⁷ let alone for blockchain-related disputes⁸⁸ and disputes within DAOs.⁸⁹ The second research question is: What are the dispute resolution mechanisms for resolving disputes between members and third parties of a DAO? Decentralised dispute resolution schemes (DDRSs) are being created, which, once mature, could be used to resolve such disputes.

1.2.2 Organisational Forms and the Regulatory Environment

There are two main types of traditional organisation, for-profit and not-for-profit, and within those two types there are myriad different organisations, depending on the jurisdiction. For-profits include sole traders, corporations,⁹⁰ LLCs⁹¹ and partnerships. Not-for-profits include companies limited by guarantee, incorporated societies and associations, and unincorporated societies and associations. Organisations such as trusts can be used for both for-profit purposes (trading trusts)⁹² and not-for-profit purposes (charitable trusts).⁹³ Hybrid organisations⁹⁴ can have for-profit and not-for-profit

⁸⁷ Ivor Richardson, 'The Courts and Access to Justice' 2000) 31 *Victoria University of Wellington Law Review* 163, 171 and Amy J Schmitz and Colin Rule, 'The New Handshake: Where We Are Now' (2016) 3(2) *International Journal of Dispute Resolution* 84, 88 noting that in a European study only 7 percent of consumer disputes were resolved.

⁸⁸ See the recently released Digital Dispute Resolution Rules from the UK Jurisdiction Taskforce for resolving blockchain-related disputes, UK Jurisdiction Taskforce, 'Digital Dispute Resolution Rules' Version 1.0 (2021) <https://35z8e83m1ih83drye280o9d1-wpengine.netdna-ssl.com/wp-content/uploads/2021/04/Lawtech_DDDR_Final.pdf> 10 and Neil Rose, 'Rapid Arbitration at Heart of New Rules for Digital Disputes', *Litigation Futures* (22 April 2021) <<https://www.litigationfutures.com/news/rapid-arbitration-at-heart-of-new-rules-for-digital-disputes>>.

⁸⁹ Kyung Taeck Minn, 'Towards Enhanced Oversight of "Self-Governing" Decentralized Autonomous Organizations: Case Study of the DAO and Its Shortcomings' (2019) 9(1) *New York University Journal of Intellectual Property and Entertainment Law* 139, 160–161.

⁹⁰ As discussed above in 4.4, the term 'corporations' is used to refer to companies registered in New Zealand and other jurisdictions such as Australia and the United Kingdom.

⁹¹ Notwithstanding that companies in New Zealand are occasionally called LLCs, Horan et al (n 44) 9, an LLC is a particular entity registered in US states. See below 6.3.5.

⁹² *Levin v Ikiua* [2010] 1 NZLR 400 (HC) [97], affirmed [2010] NZCA 509, *Octavo Investments Pty Ltd v Knight* [1979] HCA 61; 144 CLR 360. See also New Zealand Law Commission, 'Court Jurisdiction, Trading Trusts and Other Issues' (Issues Paper 28, December 2011).

⁹³ Charitable Trusts Act 1957 (NZ) and Charities Act 2006 (UK).

⁹⁴ Sonia J Toson, 'Renewed Hope for the Low-Profit Limited Liability Company' (2018) 13(1) *Society and Business Review* 100, 102.

elements, such as B corporations (B-Corps),⁹⁵ low-profit limited liability companies (L3Cs)⁹⁶ and social enterprises.⁹⁷ There are also public sector organisations, including hospitals, schools, councils and public universities. The regulation of organisations is not consistent across jurisdictions: while legislation regulates most organisations, others, such as unincorporated societies or associations, are regulated by the common law.⁹⁸

Organisational forms have developed over time. For example, the modern corporation emerged in the mid-19th century.⁹⁹ Other organisational forms, such as B-corps in the United States,¹⁰⁰ a type of corporation,¹⁰¹ and LLCs, a development of partnership law, are more recent.¹⁰² The regulatory environment, therefore, has evolved when change has been required.¹⁰³

Creating a regulatory framework for DAOs is an example of an application of technology that poses a dilemma for regulators.¹⁰⁴ For example, the lack of named directors or committee members in

⁹⁵ B-Corps can be registered in some US states. At the end of 2020, 37 states had B-Corp legislation, B Lab, 'State by State Status of Legislation' (Web Page) <<https://benefitcorp.net/policymakers/state-by-state-status>>. In New Zealand, while there is no legal recognition of B-corps, organisations can register as a company and obtain third-party certification to become a B-corp. In 2019 there were fewer than 15 certified B-corps in New Zealand, Horan et al (n 44) 18.

⁹⁶ L3Cs have been criticised Daniel S Kleinberger, 'A Myth Deconstructed: The "Emperor's New Clothes" on the Low-Profit Limited Liability Company' (2010) 35(3) *Delaware Journal of Corporate Law* 879; however, there are signs that they are growing in popularity, Toson (n 96) 102.

⁹⁷ In New Zealand and Australia social enterprises are not recognised by the law, but are normally registered as corporations, see, eg, Horan et al (n 44) and Jo Barraket, Chris Mason and Blake Blain, 'Finding Australia's Social Enterprise Section' (2016) Swinburne University of Technology: Centre for Social Impact <<https://www.socialtraders.com.au/wp-content/uploads/2016/07/FASES-2016-full-report-final.pdf>>.

⁹⁸ See, eg, Stephen Awylward, *The Law of Unincorporated Associations in Canada* (LexisNexis, 2020) and K Fletcher, *The Law Relating to Non-profit Associations in Australia and New Zealand* (Law Book Co, 1986).

⁹⁹ Joint Stock Companies Registration and Regulation Act 1844 (UK) and Limited Liability Act 1855 (UK) and see generally, Ron Harris, 'The Private Origins of the Private Company: Britain 1862–1907' (2013) 33 *Oxford Journal of Legal Studies* 339.

¹⁰⁰ New Zealand and Australia do not have the equivalent legal framework of B-corps, Horan et al (n 44) 29.

¹⁰¹ Michael R Deskins, 'Benefit Corporation Legislation, Version 1.0: A Breakthrough in Stakeholder Rights' (2011) 15 *Lewis & Clark Law Review* 1047.

¹⁰² Susan Pace Hamill, 'The Story of LLCs: Combining the Best Features of a Flawed Business Tax Structure' in Steven Bank (ed), *Business Tax Stories: An In-Depth Look at Ten Leading Developments in Corporate and Partnership Taxation* (Foundation Press, 2005) 29.

¹⁰³ Larry E Ribstein, 'The Evolving Partnership' (2006) *Illinois Law and Economics Working Papers Series Working Paper No LE06-025* <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=940653>.

¹⁰⁴ David Collingridge, *The Social Control of Technology* (Frances Pinter, 1980) cited by Daniel Sarewitz, 'Anticipatory Governance of Emerging Technologies' in Gary E Marchant, Braden R Allenby and Joseph R Herkert (eds), *The Growing Gap Between Emerging Technologies and Legal-Ethical Oversight: The Pacing Problem* (Springer, 2011) 95, 96.

DAOs is problematic for regulators. In contrast to traditional organisations, there is no one person or group of people to hold accountable.¹⁰⁵

Unfettered freedom to develop emerging technologies may cause a calamity that stops the use of the technology entirely.¹⁰⁶ Yet caution is required so that new technologies are not feared unduly.¹⁰⁷ On the one hand, if regulation occurs too early it may prevent valuable uses of that technology or undermine the benefits of innovation.¹⁰⁸ On the other hand, if regulation is delayed, regulation may become difficult due to technological lock-in and the concentration of power in vested interests.¹⁰⁹ The more promising the technology and the riskier it is, the more exacerbated the dilemma.¹¹⁰ While it may appear counter-intuitive, people in the DAO industry, including investors, are not averse to regulation if it provides legal certainty.¹¹¹

In this thesis, a key question is whether DAOs are simply a variant of existing organisational forms or a new organisational form, which legislatures and the courts should recognise and accommodate. There are three possible ways of regulating DAOs if regulation is deemed necessary: legislation and regulatory frameworks may be applied with no change in wording;¹¹² legislation can be amended to expressly include DAOs;¹¹³ or new legislation and regulatory frameworks can be created.¹¹⁴ Thus, the third research question is: Can existing legal institutions that govern organisational forms regulate DAOs or are changes to those legal institutions necessary?

The next part explains the thesis' outline.

¹⁰⁵ Interviewees 9 (regulator) and 10 (regulator) and see Morrison, Mazey and Wingreen (n 9) 8 and Kevin Werbach, 'People Don't Trust Blockchain Systems: Is Regulation a Way to Help?', *The Conversation* (5 February 2019) <<https://theconversation.com/people-dont-trust-blockchain-systems-is-regulation-a-way-to-help-110007>>. See also, Yeung (n 7) 214.

¹⁰⁶ Gregory N Mandel, 'Regulating Emerging Technologies' (2009) 1 *Law, Innovation and Technology* 75, 75.

¹⁰⁷ Emilio Mordini, 'Technology and Fear: Is Wonder the Key?' (2007) 25(12) *Trends in Biotechnology* 544.

¹⁰⁸ Evangeline Ducas and Alex Wilner, 'The Security and Financial Implications of Blockchain Technologies: Regulating Emerging Technologies in Canada' (2017) 72(4) *International Journal* 538, 540.

¹⁰⁹ Collingridge (n 104) cited by Sarewitz (n 104) 96.

¹¹⁰ Mandel (n 106) 75.

¹¹¹ Interviewees 4 (working for a DAO) and 6 (consultant). See Joshua Ellul et al, 'Regulating Blockchain, DLT and Smart Contracts: A Technology Regulator's Perspective' (2020) 21 *ERA Forum* 209, 210.

¹¹² For example, some DAOs have been registered as LLCs, Kaal (n 47) 40 and see below 6.3.5.

¹¹³ Vermont has allowed the registration of Blockchain Based Limited Liability Companies, 11 VSA § 4173 and Stan Higgins, 'Vermont Governor Signs Bill Clearing Way for Blockchain Companies', *CoinDesk* (1 June 2018) <<https://www.coindesk.com/vermontdao-state-governor-signs-bill-clearing-way-blockchain-companies>>.

¹¹⁴ Innovative Technology Arrangements and Services Act 2018 (Malta) sch 1, see also Ellul et al (n 111).

1.3 Thesis Outline

This thesis contains seven chapters, which include an introductory chapter, a methodology and research design chapter, a background chapter on the different types of DAO, a chapter each on governance, dispute resolution and the legal structures for DAOs and a concluding chapter, in addition to a separate list of references and appendices. The thesis is organised as follows.

1.3.1 Chapter One: Introduction

Chapter One provides an overview of the thesis. It sets out the research aims and presents a brief background to organisational forms and the regulatory environment, distributed autonomous organisations and facilitating technologies, and DAOs and the regulatory environment. It also provides an overview of each of the chapters.

1.3.2 Chapter Two: Theory and Research Design

Chapter Two outlines the methodological framework, which is IC, a new methodology, first raised in 2017.¹¹⁵ IC applies ‘the transaction cost economics of Ronald Coase, James Buchanan, Oliver Williamson, and Elinor Ostrom to blockchains’.¹¹⁶ In particular, IC is:¹¹⁷

the study of how blockchains interact with our existing and future social institutions, from the nature of contracts, to the shape of the firm, to the structures of global trade, all the way to the dynamics of capitalism and geopolitics.

This thesis applies IC to DAOs: the use of blockchain to create new social institutions in the form of DAOs.

¹¹⁵ Chris Berg, Sinclair Davidson and Jason Potts, ‘Institutional Cryptoeconomics: A New Model for a New Century’, *CoinDesk* (16 September 2017) <<https://www.coindesk.com/institutional-cryptoeconomics/>>.

¹¹⁶ Chris Berg, Sinclair Davidson and Jason Potts, *Understanding the Blockchain Economy: An Introduction to Institutional Cryptoeconomics* (Edward Elgar, 2019).

¹¹⁷ *Ibid* 1.

Chapter Two also sets out the thesis' research design. In addition to literature in the form of peer-reviewed journal articles, grey literature was used. Small, individual case studies of DAOs have been used as there are not yet sufficient DAOs to study using large sample methods.¹¹⁸ Semi-structured interviews were conducted with 10 people involved with DAOs, whether as consultants, founders, people providing services to a DAO or regulators. The interviews were used to triangulate the data from the literature. For the DDRS Kleros, which has resolved hundreds of disputes, a randomised selection of disputes was analysed.

1.3.3 Chapter Three: DAO Categories

Chapter Three defines DAOs and outlines their characteristics. It distinguishes DAOs from other entities and finds that not all entities called DAOs are in fact DAOs. The chapter differentiates pseudo DAOs and proto DAOs from DAOs.

There is no one form of DAO. Indeed, DAOs can take many forms beyond simply for-profit and not-for-profit organisations, although as the chapter explains, what is considered not-for-profit in the DAO context may not accord with current notions of not-for-profit in organisations. DAOs can be formed to run a specific project,¹¹⁹ a blockchain¹²⁰ and even potentially a nation state.¹²¹ The chapter identifies that there are currently nine main types of DAOs.

1.3.4 Chapter Four: Governance of DAOs

The need for research into governance models for DAOs has been identified, because the governance of DAOs is fundamentally different to traditional hierarchical organisations.¹²² For-profit DAOs, for example, do not have CEOs with their 'dictatorial' power.¹²³

This chapter addresses the first research question regarding the effectiveness of the governance frameworks used by DAOs for decision-making. It looks at the complexity of DAO

¹¹⁸ Morrison, Mazey and Wingreen (n 9) 12.

¹¹⁹ David Passiak, 'DAOs and the Future of Work' *Hackernoon* (14 October 2019) <<https://hackernoon.com/daos-and-the-future-of-work-97b4c076f288>>.

¹²⁰ Di Rose and Mansour (n 16).

¹²¹ Ralph Merkle, 'DAOs, Democracy and Governance' (2016) 37(4) *Cryonics* 28.

¹²² See Zachariadis, Hileman and Scott (n 15) 106.

¹²³ Thurman (n 19).

governance — the decentralised governance of DAOs in the absence of managers and directors or a small committee — by analysing a representative sample of DAOs. The original intent of DAOs was to use direct democracy — anyone could make proposal, which was voted upon by the token holders¹²⁴ — but the reality has proven to be more complicated and some DAOs have elements of representative democracy.¹²⁵ There are, however, significant differences between DAOs and current institutions in their use of direct and representative democracy. A citizen or a small shareholder in a corporation has no ability to put forward a referendum or resolution for others to vote upon: minimum thresholds of support or shareholdings are required.¹²⁶ In contrast, some DAOs allow token holder to put forward a proposal that is voted upon. Yet this has its risks: if there is no vetting of proposals, DAO members may be swamped with proposals. While some DAOs are content to allow anyone to put forward proposals, others use various mechanisms to limit the number of proposals and increase their quality. Even for DAOs that have resorted to using centralised entities, such as councils, to vet proposals,¹²⁷ and even make proposals,¹²⁸ mechanisms have been employed to limit the centralisation effects, for example, by allowing DAO members to remove council members easily.¹²⁹

DAO voting schemes are equally important. The traditional scheme of one token—one vote, while simple, may fuel plutocracy,¹³⁰ where the wealthy have too much power. Plutocracy runs counter to a strong undercurrent of blockchain, which DAOs replicate — the desire to prevent a

¹²⁴ For example, The DAO, DuPont (n 3) 159.

¹²⁵ Some DAOs use councils, see, eg, Polkadot, ‘Governance’, *Polkadot Wiki* <<https://wiki.polkadot.network/docs/en/learn-governance#council>> and Decentraland, ‘Introducing the Decentraland Security Advisory Board’, *Decentraland Blog* (Blog Post, 11 December 2019) <<https://decentraland.org/blog/announcements/security-council/>>.

¹²⁶ In Switzerland 100,000 signatures are required for referenda to change the constitution, Klaus Armingeon and Philipp Lutz, ‘Muddling Between Responsiveness and Responsibility: The Swiss Case of a Non-implementation of a Constitutional Rule’ (2020) 18 *Comparative European Politics* 245, 258. For corporations, see 17 CFR § 240.14a-8, which requires a shareholder who wishes to propose a resolution to hold at least USD2,000 or one percent of a corporation’s shares for at least one year. The Securities and Exchange Commission is attempting to change these requirements to make them stricter, Securities and Exchange Commission, ‘SEC Proposes Amendments to Modernize Shareholder Proposal Rule’ (Press Release, 5 November 2019) <<https://www.sec.gov/news/press-release/2019-232>>.

¹²⁷ Commonwealth Labs, ‘Edgeware: An Adaptive Smart-Contract Blockchain’ (White Paper, 16 July 2019) <<https://arena-attachments.s3.amazonaws.com/4643268/c8d128724f36b716660e4bf21823e760.pdf?1563310093>> 14.

¹²⁸ Decentraland (n 125).

¹²⁹ Ibid, and see below 4.3.2.2.

¹³⁰ Arsenault, ‘Voting Options in DAOs’ (n 23) ‘[p]lutocracies aren’t great’.

concentration of power, and therefore wealth, in a small group of people.¹³¹ Chapter Four analyses the ways in which DAOs are exploring many different voting schemes from one token–one vote,¹³² including futarchy,¹³³ liquid democracy,¹³⁴ conviction voting¹³⁵ and reputation to weight votes.¹³⁶

1.3.5 Chapter Five: Dispute Resolution for DAOs

Chapter Five addresses the second research question: What are the dispute resolution mechanisms for resolving disputes between members and third parties of a DAO? While there are likely to be fewer disputes associated with DAOs than with other organisations because of the application of smart contracts, the use of smart contracts will not eliminate all disputes.¹³⁷ DAOs have weak or no mechanisms to resolve disputes.¹³⁸ While dispute resolution is a necessary part of a DAO's governance structure, dispute resolution is dealt with in a separate chapter because it is likely to be provided by third party DDRs.

While there is a range of traditional dispute resolution services, including mediators, arbitrators, industry bodies, tribunals and the courts, determining and settling disputes via traditional

¹³¹ Haseeb Qureshi, 'Blockchains Should Not Be Democracies', *Hackernoon* (24 April 2018) <<https://hackernoon.com/blockchains-should-not-be-democracies-14379e0e23ad>> '[p]lutoocracy explicitly privileges the financially powerful and lets them exploit those with fewer resources.' See also Vlad Zamfir, 'Against On-Chain Governance: Refuting (and Rebuking) Fred Ehrsam's Governance Blog', *Medium* (1 December 2017) <https://medium.com/@Vlad_Zamfir/against-on-chain-governance-a4ceacd040ca> '[b]lockchain governance is too important for us to let a small handful of [people with large amounts of cryptocurrency] make arbitrary decisions.'

¹³² Michael Abramowicz, 'The Very Brief History of Decentralized Blockchain Governance' (2020) 22(2) *Vanderbilt Journal of Entertainment & Technology Law* 273, 276.

¹³³ Singh and Kim (n 2) 121 and see below 4.4.1.5.

¹³⁴ See below 4.4.1.4.

¹³⁵ Jeff Emmett, 'Continuous Decision Making Alternative to Governance', *Medium* (4 July 2019) <<https://medium.com/giveth/conviction-voting-a-novel-continuous-decision-making-alternative-to-governance-aa746cfb9475>> and see Michael Zargham, 'A Brief History of Conviction Voting', *Medium* (26 December 2020) <<https://michaelzargham.medium.com/a-brief-history-of-conviction-voting-ad4ca4eb4aee>> and see below 4.4.3.4.1.

¹³⁶ Rea et al (n 27) [2.5.2] and [3.4.3].

¹³⁷ Rabinovich-Einy and Katsh, 'Blockchain and the Inevitability of Disputes' (n 25) 72.

¹³⁸ Morrison, Mazey and Wingreen (n 9) 2.

methods is usually measured in months and often years, not to mention cost. The deficiencies of the current dispute resolution institutions have long been acknowledged.¹³⁹

The need for dispute resolution for blockchain, and therefore DAOs, has led to proposals to create DDRSs,¹⁴⁰ with some proposals moving beyond the planning stage, such as the decentralised courts of Aragon Court¹⁴¹ and Kleros.¹⁴² While the utility of DDRSs has been questioned by some,¹⁴³ others see more promise in their use.¹⁴⁴ Indeed the recently released Digital Dispute Resolution Rules from the UK Jurisdiction Taskforce (UKJT)¹⁴⁵ expressly acknowledged that an ‘automatic dispute resolution process’, which includes ‘peer-to-peer or other voting by a community’ can be used for the resolution of smart contract disputes.¹⁴⁶

DDRSs use myriad mechanisms to resolve disputes, including selecting a set number of jurors at random¹⁴⁷ or allowing anyone to decide the dispute.¹⁴⁸ Some require jurors to have ‘skin in the game’ with jurors in the minority losing their staked tokens¹⁴⁹ to those jurors who vote in the

¹³⁹ See Colin Rule, *Online Dispute Resolution for Business: B2B, Ecommerce, Consumer, Employment, Insurance, and Other Commercial Conflicts* (Jossey-Bass, 2002).

¹⁴⁰ See, eg, Tatu Kärki, ‘Aragon Network Jurisdiction Part 1: Decentralized Court’, *Aragon Blog* (Blog Post 18 July 2017) <<https://aragon.org/blog/aragon-network-jurisdiction-part-1-decentralized-court-c8ab2a675e82>>; Vinay Gupta, ‘The First Mattereum Briefing’, *Medium* (16 December 2017) <<https://medium.com/humanizing-the-singularity/the-first-mattereum-briefing-11a67c75d840>>; and Andreas Antonopoulos and Pamela Morgan, ‘Decentralised Arbitration and Mediation Network (DAMN): Research and Project Proposal, submitted to The DAO’, *GitHub* (2016) <<https://github.com/thirdkey-solutions/damn/blob/master/proposal.asciidoc>>.

¹⁴¹ <<https://anj.aragon.org/>> and see below 5.3.2.1.

¹⁴² <<https://kleros.io/>> and see below 5.3.2.2.

¹⁴³ Jeremy M Sklaroff, ‘Smart Contracts and the Cost of Inflexibility’ (2018) 166 *University of Pennsylvania Law Review* 263, 300–301.

¹⁴⁴ Allen, Lane and Poblet (n 35) and Metzger (n 35).

¹⁴⁵ UK Jurisdiction Taskforce (n 88) and Rose (n 88).

¹⁴⁶ UK Jurisdiction Taskforce (n 88) 12. However, technically the acknowledgement of peer-to-peer or other voting by a community constituting an automatic dispute resolution process comes under the further guidance part of the rules, rather than the rules themselves.

¹⁴⁷ Aragon, ‘Juror Pre-Activation Guide’, *Aragon* (Blog Post, 7 January 2020) <<https://aragon.org/blog/juror-pre-activation-guide>> and Kleros, ‘The Kleros Juror Starter Kit’, *Kleros Blog* (Blog Post) <<https://blog.kleros.io/the-kleros-juror-starter-kit/>>.

¹⁴⁸ For example, the Open Layer in Jur, Jur, ‘Whitepaper, V.2.0.2’, *Jur* (July 2019) <<https://jur.io/wpcontent/uploads/2019/05/jur-whitepaper-v.2.0.2.pdf>>.

¹⁴⁹ Staking is where the tokens are in effect frozen for a period so that the owner cannot sell or transfer those tokens during the time they are staked.

majority.¹⁵⁰ Some have appeals;¹⁵¹ others do not.¹⁵² Appeals can differ from those in traditional courts — for example, Aragon Court and Kleros allow up to four rounds of appeal¹⁵³ — and appeals may be taken by anyone, not just the parties to the dispute.¹⁵⁴ Alternatively, some DDRSs attempt to work within existing structures by using arbitrators.¹⁵⁵ While useful for high-value transactions, arbitration is simply not workable for most disputes due to its cost.¹⁵⁶

DDRSs are in a nascent phase. To gain insights into the decision-making process, a randomised selection of 30 disputes using Kleros was analysed. While none of the disputes involved a DAO, the analysis provided information on the success rates of applicants, whether jurors decided cases unanimously and whether appeals occurred, in addition to the outcome of those appeals.

An important issue raised in the literature is whether disputes involving smart contracts (and therefore DAOs) can be resolved within the contract law framework, which includes alternative dispute resolution, or the creation of a new legal system or new *Lex Cryptographia* is required.¹⁵⁷ While it has been argued that the courts are the final arbiter in code-based orders,¹⁵⁸ which encompass DAOs,¹⁵⁹ the chapter finds that participants in DAOs should have the ability to choose between the existing contract law framework and a nascent new legal system in the form of DDRSs. If

¹⁵⁰ Aragon, 'Dispute Lifecycle', *Aragon* (Web Page, 2 September 2020) <<https://help.aragon.org/article/43-dispute-lifecycle>> and Aragon, 'Aragon Court Glossary', *Aragon* (Web Page, 10 June 2020) <<https://help.aragon.org/article/50-aragon-court-glossary>>.

¹⁵¹ For example, Aragon Court (see below 5.3.2.1) and Kleros (see below 5.3.2.2).

¹⁵² For example, Open Court (see below 5.3.2.5).

¹⁵³ Aragon, 'Dispute Lifecycle' (n 150).

¹⁵⁴ *Ibid.*

¹⁵⁵ Jur (n 148) 12. Under the *Convention on the Recognition and Enforcement of Foreign Arbitral Awards* ('*New York Convention*') opened for signature 10 June 1958, 330 UNTS 38 (entered into force 7 June 1959) and the *UNCITRAL Model Law on International Commercial Arbitration* (Model Law, UN GAOR, 40th sess, Supp No 17, UN Doc A/40/17 (21 June 1985) annex I, as amended by UN GAOR, 61st sess, Supp No 17, UN Doc A/61/17 (7 July 2006) annex I. For most purposes and intents an arbitrator's decision is final and cannot be only rarely appealed to the courts and is enforceable in almost all jurisdictions.

¹⁵⁶ Schmitz and Rule, 'The New Handshake' (n 87) 91–93.

¹⁵⁷ Allen, Lane and Poblet (n 35) 82–83 and see Aaron Wright and Primevera De Filippi, 'Decentralized Blockchain Technology and the Rise of Lex Cryptographia' (20 March 2015, revised 25 July 2017) <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2580664>.

¹⁵⁸ Driver (n 10) 212.

¹⁵⁹ *Ibid* 48–50. Driver describes DAOs as 'decentralised organisations (DOs)' and reserves the use of the term 'DAO' for fully autonomous organisations.

participants agree to the use of a DDRS, its ruling should be binding on the participants, with no recourse to traditional dispute resolution institutions, such as the courts.

1.3.6 Chapter Six: Legal Structures for DAOs

Chapter Six addresses the third research question: Can existing legal institutions that govern organisational forms regulate DAOs or are changes to those legal institutions necessary? The chapter begins by explaining how the law recognises many different types of organisation.¹⁶⁰ If existing legal structures were applied to for-profit DAOs their members are likely to be treated as though they were in a partnership.¹⁶¹ For those DAOs designed as a pure vehicle for personal profit, such as The DAO, such a categorisation does not seem exceptional; however, it creates a number of problems. First, each time a person or entity who had no tokens in a DAO purchased or was even given a DAO's tokens, for example, through an airdrop¹⁶² or as payment for providing goods or services to the DAO, that person or entity would become a partner and a new partnership would be formed.¹⁶³ Likewise a person divesting themselves of all their DAO tokens would cease to be a partner and a new partnership would form between the remaining token holders.¹⁶⁴ The entry and exit of token holders, and thus partners, could occur on a daily basis, rendering partnership law impracticable. Second, partnerships are normally between people who know and trust each other,¹⁶⁵ and the partners owe fiduciary duties to each other and the partnership.¹⁶⁶ Third, because partners are treated as agents of each other and the partnership,¹⁶⁷ they can bind their fellow partners and the partnership.¹⁶⁸ Fourth, because a partnership is not a separate legal entity it cannot hold and own assets or enter into contracts, and

¹⁶⁰ For example, companies or corporations, partnerships, trusts, charitable trusts, incorporated societies or associations and unincorporated societies or associations.

¹⁶¹ Interviewees 8 (consultant) and 10 (regulator) and see Metjahic (n 10) 1554; Zetzsche, Buckley and Arner (n 39) 1400; and De Filippi and Wright (n 10) 141–142.

¹⁶² See below 2.2.2.8 for a description of airdrops.

¹⁶³ *Hadlee v Commissioner of Inland Revenue* [1989] 2 NZLR 447, 455.

¹⁶⁴ *Ibid.*

¹⁶⁵ Stephen D Palley, 'How to Sue a Decentralized Autonomous Organization', *CoinDesk* (21 March 2016) <<https://www.coindesk.com/how-to-sue-a-decentralized-autonomous-organization>>.

¹⁶⁶ *Helmore v Smith* (1886) 35 Ch D 436, 444 and see James Edelman, 'When Do Fiduciary Duties Arise'? (2010) 126 *Law Quarterly Review* 302, 305.

¹⁶⁷ Partnership Law Act 2019 (NZ) s 17.

¹⁶⁸ *Ibid* s 18.

other organisations may be reluctant to enter into contracts with the DAO because of its lack of legal capacity to contract.¹⁶⁹ Fifth, partners are jointly and severally liable for the debts, liabilities and wrongs of the DAO.¹⁷⁰ A further challenge, as Chapter Three explains, is the varied nature of DAOs: some are designed to coordinate a community's actions and look like online versions of unincorporated societies, rather than for-profit entities. Thus, there is no single DAO organisational form.

The chapter looks at the different legal structures utilised by DAOs. It concludes by recommending that DAOs be recognised as fitting within existing legal frameworks, such as LLCs in the United States, with modification to those frameworks when required to accommodate the decentralised nature of decision-making within DAOs. Albeit in jurisdictions that do not recognise LLCs, including New Zealand and Australia, it may well be best for DAO creators to register as an LLC in a US state, such as Wyoming, as the LLC would be recognised in New Zealand and Australia. Because there is no one type of DAO, to create *sui generis* legal organisational forms for different types of DAO at this stage in their development would not be feasible or prudent.

1.3.7 Chapter Seven: Conclusion

The final chapter provides an overall conclusion to the thesis. It sets out the key findings, contributions to the literature, practical implications and policy recommendations as well as the thesis' limitations and avenues for future research. The thesis' key findings include that DAOs take various forms and are not all for-profit, and that governance frameworks are often, but not always, complex. Using IC as its methodological framework, the contribution of the thesis is the examination of the interrelationships between three themes central to DAOs: governance, dispute resolution and legal structures.

Owing to the rapid growth and experimentation in DAOs, this thesis uses more grey literature than would be usual in a PhD. Another limitation is that the thesis looks at the evolution and legal

¹⁶⁹ For the difficulties faced by unincorporated charities (a form of unincorporated society), see generally Cordery, Fowler and Morgan (n 41) 285.

¹⁷⁰ Partnership Law Act 2019 (NZ) s 22.

treatment of DAOs up to 28 April 2021. Avenues for future research include continued research on governance models to evaluate whether decentralised governance mechanisms can be designed or whether centralised bodies such as councils will be required. The effectiveness of the different dispute resolution mechanisms of DDRSs will require evaluation and analysis. For example, can disputes be resolved through crowdsourcing or are vetted adjudicators required? Continued research on the most appropriate legal frameworks for DAOs is required.

The thesis also contains the following appendices: Appendix A: Ethics Approval Letter; Appendix B: List of interviewees; Appendix C: Semi-Structured Interview Questions; and Appendix D: Analysis of 30 Kleros disputes.

The next chapter explains the thesis' methodology and research design.

Chapter Two: Theory and Research Design

2.1 Introduction

This chapter sets out the justification for the theoretical framework and the research design of the thesis. The thesis uses Institutional Cryptoeconomics (IC) as its theoretical methodology.¹⁷¹ This chapter also explains new institutional economics (NIE) because that methodology was used first in relation to blockchain; however, because the use of blockchain technology — an institutional technology¹⁷² — is profound, it requires an evolution of NIE to IC to better explain blockchain's effect upon institutions and organisations, such as DAOs.¹⁷³ Institution has a broad meaning in NIE and IC because institution refers to many different things, from types of entities, which can include organisations, and the law, rules, customs, norms and strategies which structure interactions both within and between organisations.¹⁷⁴

This chapter explains the thesis' theoretical framework in Part 2. Part 3 sets out the research design, how the data was collected and how it was analysed. Part 4 concludes.

2.2 Theoretical Framework

IC, which is a development of New Institutional Economics (NIE), is the main theoretical framework used in this thesis. Prior to the development of IC, NIE was used by Sinclair Davidson, Primavera De Filippi and Jason Potts in 'Disrupting Governance: The New Institutional Economics of Distributed Ledger Technology' as a theoretical framework for blockchain (and DAOs):¹⁷⁵

New institutional economics furnishes an analytic framework to consider how the mass

¹⁷¹ Berg, Davidson and Potts, *Understanding the Blockchain Economy* (n 116).

¹⁷² Darcy WE Allen et al, 'Cryptodemocracy and Its Institutional Possibilities' (2020) 33 *Review of Austrian Economics* 363, 372, notwithstanding the 2020 date the article was published online in July 2018 and see Daniil Frolov, 'Blockchain and Institutional Complexity: An Extended Institutional Approach' (2021) 17(1) *Journal of Institutional Economics* 21.

¹⁷³ Berg, Davidson and Potts, *Understanding the Blockchain Economy* (n 116) 56.

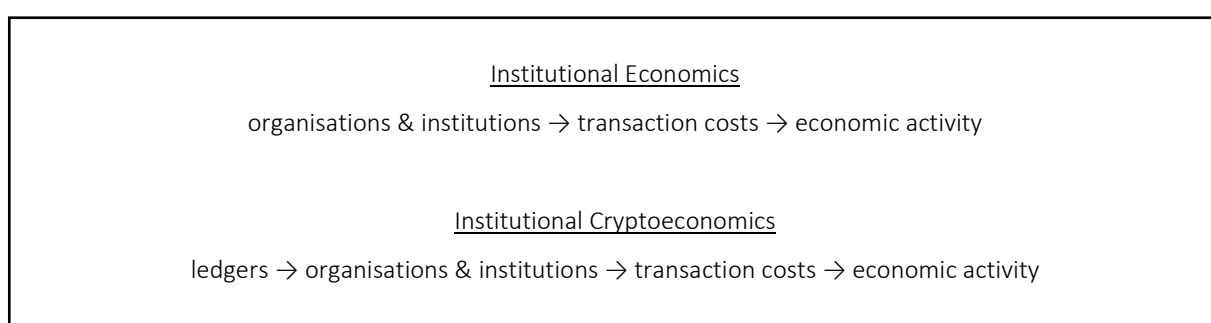
¹⁷⁴ Elinor Ostrom, 'Doing Institutional Analysis: Digging Deeper than Markets and Hierarchies' in Claude Ménard and Mary M Shirley (eds), *Handbook of New Institutional Economics* (Springer, 2008) 819, 822.

¹⁷⁵ Sinclair Davidson, Primavera De Filippi and Jason Potts, 'Disrupting Governance: The New Institutional Economics of Distributed Ledger Technology' (19 July 2016) <<https://ssrn.com/abstract=2811995>>.

adoption of this new technology [blockchain] might shape the evolution of, as Williamson (1985) [*The Economic Institutions of Capitalism* (New York: Free Press)] framed it, the economic institutions of capitalism.

Notwithstanding the initial use of NIE, Berg, Davidson and Potts later developed IC as a specific theoretical framework for blockchain to better understand blockchain's impact.¹⁷⁶ NIE remains important as it is a building block for IC; Figure 2.1 from Berg, Davidson and Potts shows the development of the two theories.

Figure 2.1: Institutional Economics and Institutional Cryptoeconomics¹⁷⁷



Despite the use of the term 'institutional economics' in Figure 2.1, institutional economics refers to NIE because transaction costs are not a significant component of original institutional economics.¹⁷⁸ Moreover, the term 'ledgers' is used instead of 'blockchain'.

Because of the importance of NIE to IC — as Figure 2.1 shows, the use of ledgers is the defining difference between the two, thus NIE is the main building block of IC — the next section explains NIE and the role of the transaction costs that shape organisations.

¹⁷⁶ Berg, Davidson and Potts, 'Institutional Cryptoeconomics' (n 115), Chris Berg, Sinclair Davidson and Jason Potts, 'Ledgers' (6 April 2018) <<https://ssrn.com/abstract=3157421>> and Berg, Davidson and Potts, *Understanding the Blockchain Economy* (n 116).

¹⁷⁷ Chris Berg, Sinclair Davidson and Jason Potts, *Understanding the Blockchain Economy* (n 116) 56.

¹⁷⁸ Gonzalo Caballero and David Soto-Oñate, 'The Diversity and Rapprochement of Theories of Institutional Change: Original Institutionalism and New Institutional Economics' (2015) 49(4) *Journal of Economic Issues* 947, 960.

2.2.1 New Institutional Economics

NIE is important for explaining the ability of technology to affect organisations. Technology has allowed firms to become more efficient and has disrupted entire industries — Uber for taxis and Airbnb for accommodation are two prominent examples.¹⁷⁹

NIE is as an interdisciplinary methodology, which combines ‘economics, law, organisation theory, political science, sociology and anthropology’.¹⁸⁰ More concretely NIE builds upon and integrates many different theories which include ‘transaction costs, property rights, and public choice’,¹⁸¹ law and economics, relational contracts, comparative economic systems and constitutional economics.¹⁸² Indeed, Ronald Coase, one of the founders of NIE,¹⁸³ observed that early in NIE’s development it was not a new economic theory as such because it ‘modified the existing theory in various ways’.¹⁸⁴ NIE has a wide scope as it operates on both the micro and macro levels.¹⁸⁵ At the micro level are the way which transactions are organised,¹⁸⁶ that is the institutional arrangement, such

¹⁷⁹ Michael Munger, ‘Coase and the ‘Sharing Economy’ in Cento Veljanovski (ed), *Forever Contemporary: The Economics of Ronald Coase* (Institute of Economic Affairs, 2015) 187.

¹⁸⁰ Peter G Klein, ‘New Institutional Economics’ (1998) <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=115811>.

¹⁸¹ Douglas C North, ‘The New Institutional Economics’ (1986) 142(1) *Journal of Institutional and Theoretical Economics* 230, 235.

¹⁸² Eirik G Furubotn and Rudolf Richter, ‘The New Institutional Economics – A Different Approach to Economic Analysis’ (2008) 28(3) *Economic Affairs* 15, 15.

¹⁸³ In particular, Coase’s articles, Ronald Coase, ‘The Nature of the Firm’ (1937) *Economica* 386 and Ronald Coase, ‘The Problem of Social Cost’ (1960) 3 *Journal of Law and Economics* 1. The term ‘New Institutional Economics’ was not coined, however, until 1975 by Oliver Williamson, see Oliver Williamson, *Markets and Hierarchies: Analysis and Antitrust Implications* (Free Press, 1975). For a discussion about the origins of NIE see Rudolf Richter, ‘The New Institutional Economics: Its Start, Its Meaning, Its Prospects’ (2005) 6(2) *European Business Organization Law Review* 161.

¹⁸⁴ Ronald Coase, ‘The New Institutional Economics’ (1984) 140 *Journal of Institutional and Theoretical Economics* 229, 230 quoted by Furubotn and Richter (182) 15.

¹⁸⁵ Claude Ménard, ‘Research Frontiers of New Institutional Economics’ (2018) 53 *RAUSP Management Journal* 3, 4.

¹⁸⁶ Ibid 4 and Mylène Kherallah and Johann F Kirsten, ‘The New Institutional Economics: Applications for Agricultural Policy Research in Developing Countries’ (2002) 41 *Agrekon* 110, 112.

as organisational forms.¹⁸⁷ The macro level is the institutional environment, the political, judicial and administrative institutions that shape the rules of the game.¹⁸⁸

Notwithstanding NIE's diverse threads, at its core NIE is an institutional theory, which analyses how people construct institutions, how institutions function including how they change, how institutions interact and the effects of such interaction upon people and society in general. Institutions are not necessarily entities such as businesses or community organisations, instead institutions include 'humanly devised constraints that structure political, economic and social interaction.'¹⁸⁹

Coase's *The Nature of the Firm*¹⁹⁰ is premised on the notion that people join together and create firms when the transaction costs of acquiring goods and services through the market are too high,¹⁹¹ and firms replace the market with hierarchy and control.¹⁹² As Douglas North observes, '[i]nformation processing by actors as a result of the costliness of transacting underlies the formation of institutions'.¹⁹³ Transaction costs, therefore, are crucial to NIE.¹⁹⁴ Although as we are seen already, NIE's central concepts are not limited merely to transaction costs.

Transaction costs are also linked with what are viewed as the 'soft' social sciences — sociology, anthropology and psychology.¹⁹⁵ NIE does not use conventional economic models where individuals are treated as only buying what they can pay for, and not embezzling funds or robbing banks.¹⁹⁶ This is because another central concept of NIE is that it also takes bounded rationality into account. Bounded rationality is where people's decision-making ability is limited by the information

¹⁸⁷ Kherallah and Kirsten (n 186) 112, citing Oliver E Williamson, 'The New Institutional Economics: Taking Stock, Looking Ahead' (2000) 38 *Journal of Economic Literature* 595, 598.

¹⁸⁸ Kherallah and Kirsten (n 186) 112, citing Williamson, 'The New Institutional Economics' (n 187) 598.

¹⁸⁹ Douglass C North, 'Institutions' (1991) 5(1) *Journal of Economic Perspectives* 97.

¹⁹⁰ Coase, 'The Nature of the Firm' (n 183).

¹⁹¹ *Ibid.*

¹⁹² Guido Calabresi, 'The Pointlessness of Pareto: Carrying Coase Further' (1991) 100 *Yale Law Journal* 1211.

¹⁹³ North, *Institutions, Institutional Change, and Economic Performance* (Cambridge University Press, 1991) 107.

¹⁹⁴ Claude Menard, 'Methodological Issues in New Institutional Economics' (2001) 8(1) *Journal of Economic Methodology* 85, 86.

¹⁹⁵ Edward L Rubin, 'The New Legal Process, the Synthesis of Discourse, and the Microanalysis of Institutions' (1996) 109 *Harvard Law Review* 1393, 1416.

¹⁹⁶ P Diamond, 'Political and Economic Evaluation of Social Effects and Externalities' in Michael D Intrilligator (ed), *Frontiers of Quantitative Economics* (North-Holland Publishing Company, 1971) cited by Williamson, *Markets and Hierarchies* (n 183) 7. See also, Coase, 'The New Institutional Economics' (n 184) 231.

they have, their ability to understand it and the time they have to arrive at their decision.¹⁹⁷ Oliver Williamson argues that firms allow parties to deal with uncertainty and complexity without incurring the dangers of opportunism had they been contracting in the market.¹⁹⁸

Transaction costs have traditionally been high. For example, in 1970 transaction costs in the US economy were estimated to consume over 45 percent of national income.¹⁹⁹ Transaction costs, however, have reduced through the growing use of IT and changes in business models.²⁰⁰ Some of the use of technology and changes in ways of doing business include outsourcing work to external providers whether in the same country or overseas,²⁰¹ and the use of cloud computing,²⁰² crowdsourcing and IT-based platforms such as Amazon and Alibaba.²⁰³ For example, Amazon allows third parties to sell their goods online without requiring them to maintain their own website,²⁰⁴ or even storing the goods, packing and handling deliveries and returns.²⁰⁵ Yet despite the reduction in transaction costs and changes in business models, organisations such as Amazon and Alibaba are structurally similar to corporations of old, with shareholders, managers and directors.²⁰⁶ Thus the reduction in transaction costs and changes in business models have not necessarily transformed the

¹⁹⁷ Herbert A Simon, 'A Behavioural Model of Rational Choice' (1955) 69(1) *The Quarterly Journal of Economics* 99.

¹⁹⁸ Williamson, *Markets and Hierarchies* (n 183) 25.

¹⁹⁹ John J Wallis and Douglass North, 'Measuring the Transaction Sector in the American Economy, 1870-1970' in SL Engerman and RE Gallman (eds), *Long-Term Factors in American Economic Growth* (University of Chicago Press, 1984) 105, 113 and 120, cited by North, 'Institutions, Institutional Change, and Economic Performance' (n 193) 28.

²⁰⁰ Niels Bjørn-Andersen and Benoit Raymond, 'The Impact of IT Over Five Decades - Towards the Ambient Organization' (2014) 45(2) *Applied Ergonomics* 188.

²⁰¹ Ibid 193.

²⁰² Ibid 192.

²⁰³ Ibid.

²⁰⁴ Ibid.

²⁰⁵ Amazon Services, 'Fulfilment by Amazon', Amazon <https://services.amazon.com/fulfillment-by-amazon/benefits.htm/ref=asus_soa_gs_fba>.

²⁰⁶ Alibaba governance is even more concentrated than Amazon as the Alibaba Partnership has the exclusive right to nominate directors for a majority of the board seats, and if shareholders do not accept the nominations the Partnership can appoint directors unilaterally, Alibaba Group, 'Nomination and Election of Partners' <https://www.alibabagroup.com/en/ir/governance_9> see also Yu-Hsin Lin and Thomas Mehaffy, 'Open Sesame: The Myth of Alibaba's Extreme Corporate Governance and Control' (2016) 10(2) *Brooklyn Journal of Corporate, Financial and Commercial Law* 437 and Lucian A Bebchuk, 'Alibaba's Governance Leaves Investors at a Disadvantage', *The New York Times* (16 September 2014) <<http://www.law.harvard.edu/faculty/bebchuk/opeds/Dealbook-09-16-2014.pdf>>.

shape and governance of organisations.

The tech companies have adopted elements of their predecessors' trappings.²⁰⁷ '[T]he most striking feature of business today is not the overturning of the established order. It is the entrenchment of a group of superstar companies at the heart of the global economy.'²⁰⁸ As *The Economist* notes, tech company upstarts are becoming more like old corporations as they employ armies of lobbyists and give senior jobs to Washington insiders.²⁰⁹

North also explains that 'an essential part of the functioning of institutions is the costliness of ascertaining violations and the severity of punishment'.²¹⁰ Coase also notes that carrying out a market transaction included making sure the terms of the contract were enforced, which was extremely costly.²¹¹

North makes a distinction between institutions and organisations.²¹² For North, institutions are not defined bodies, but are a guide to human interaction and 'reduce uncertainty by providing a structure to everyday life'.²¹³ Institutions can be formal or informal and created at a specific point in time, such as the US Constitution, or evolve, such as the common law.²¹⁴ North equates institutions with the rules of a game that consist of formal written rules and unwritten rules by which people abide.²¹⁵ Organisations also provide a structure for human interaction, but in an organisation people

²⁰⁷ See generally George Orwell, *Animal Farm: A Fairy Story* (New York, Signet Classics, 1996).

²⁰⁸ Irving Wladawsky-Berger, 'Blockchain and the Future of the Firm', *Irving Wladawsky-Berger Blog* (Blog Post, 25 September 2017) <<http://blog.irvingwb.com/blog/2017/09/blockchain-and-the-future-of-the-firm.html>>.

²⁰⁹ 'The Rise of the Superstars', *The Economist* (17 September 2016) <<https://www.economist.com/special-report/2016/09/17/the-rise-of-the-superstars>>. Although there are differences, the tech giants, unlike their predecessors, do not employ as many employees. In 1990 the top three Detroit car makers had nominal reserves of USD250 billion, a market capitalisation of USD36 billion and 1.2 million employees. In 2014 Silicon Valley's top three companies had revenues of USD247 billion and a market capitalisation of over USD1 trillion, but only just over one-tenth of the employees, 137,000.

²¹⁰ North, *Institutions, Institutional Change, and Economic Performance* (n 193) 4.

²¹¹ Coase, 'The Problem of Social Cost' (n 183) 15.

²¹² North, *Institutions, Institutional Change, and Economic Performance* (n 193) 7.

²¹³ *Ibid* 3.

²¹⁴ *Ibid*. Of course, institutions such as the US Constitution do not remain in their original form and can change. The US Constitution has, for example, been amended over the years. However, the US Constitution is unnecessarily difficult to change and combined with other features of US constitutional law and practice is arguably not fit for purpose.

²¹⁵ *Ibid* 4.

combine ‘to win the game — by a combination of skills, strategy, and coordination; by fair means and sometimes by foul means’.²¹⁶ Organisations therefore include: economic bodies such as firms, trade unions, cooperatives and family farms; political bodies such as political parties, city councils and regulatory agencies; social bodies such sports clubs and churches; and educational bodies such as schools and tertiary establishments.²¹⁷ As North explains, ‘[i]nstitutions, together with the standard constraints of economic theory, determine the opportunities in a society. Organisations are created to take advantage of those opportunities, and, as the organisations evolve, they alter the institutions.’²¹⁸

The work of Elinor Ostrom too is vital to NIE.²¹⁹ Ostrom demonstrated that contrary to the then prevailing thought that property rights or government regulation were necessary to protect common pool resources (CPR),²²⁰ including natural resources, people could create CPR groups to govern those resources effectively.²²¹ The groups that were successful adhered to Ostrom’s eight design principles.²²² Ostrom’s design principles are:²²³

1. The group has clearly defined boundaries, both of the members and the shared resources
2. Local needs and conditions are taken into account
3. The members can participate in modifying the group’s rules
4. Outside authorities recognize the group’s right to self-govern
5. Monitoring of the group’s rules

²¹⁶ Ibid 4–5.

²¹⁷ Ibid 5.

²¹⁸ Ibid 7.

²¹⁹ See generally, Claude Ménard and Mary M Shirley, ‘The Future of New Institutional Economics: From Early Intuitions to a New Paradigm’ (2014) 10(4) *Journal of Institutional Economics* 541.

²²⁰ See, Elinor Ostrom, ‘Institutional Arrangements for Resolving the Commons Dilemma: Some Contending Approaches’ (Conference Paper, National Conference of the American Society for Public Administration, 23–27 March 1985) <<http://hdl.handle.net/10535/2274>> quoting W P Welch, ‘The Political Feasibility of Full Ownership Property Rights: The Cases of Pollution and Fisheries’ (1983) 16(2) *Policy Sciences* 165, 171 and see Garrett Hardin, ‘The Tragedy of the Commons’ (1968) 162 (3859) *Science* 1243, 1244. Hardin was not the first to make the argument about the tragedy of the commons. Hardin acknowledges William Foster Lloyd made it 1883, republished in William Foster Lloyd, ‘W. F. Lloyd on the Checks to Population’ (1980) 6(3) *Population and Development Review* 473. See also below nn 478–480.

²²¹ Elinor Ostrom, ‘Institutional Arrangements for Resolving the Commons Dilemma’ (n 220) 14.

²²² See generally, Claude Ménard and Mary M Shirley, ‘The Future of New Institutional Economics: From Early Intuitions to a New Paradigm’ (2014) 10(4) *Journal of Institutional Economics* 541.

²²³ Elinor Ostrom, *Governing the Commons: The Evolution of Institutions for Collective Action* (Cambridge University Press, 1990).

6. Graduated sanctions for breaches of the rules
7. Conflict resolution mechanisms are available
8. Nested groups can be used

While as we have seen, the use of technology and reduction of transaction costs (NIE) has not necessarily translated to a transformation of organisations, the use of blockchain (ledgers) may transform organisations, as the next section shows; thus there is a need for an enhanced theoretical framework to better understand the impact of DAOs.

2.2.2 Institutional Cryptoeconomics

Two of the authors of ‘Some Public Economics of Blockchain Technology’,²²⁴ in which NIE is used as the framework to analyse blockchain (and DAOs), went on to argue that a new framework, ‘Institutional Cryptoeconomics’²²⁵ was required because NIE was limited in its ability to explain the effect of blockchain across a range of institutions and organisations.²²⁶ Berg, Davidson and Potts, in *Understanding the Blockchain Economy: An Introduction to Institutional Cryptoeconomics*,²²⁷ went on to explain IC and its evolution. Table 2.1 shows the evolution of the economic theories and associated analytical frameworks.

Economic School	Analytic Framework
Classical economics	Resource-centred view of the economy
Neoclassical economics	Commodity and market-centred view of the economy
Evolutionary economics	Knowledge-centred view of the economy
New institutional economics	Transaction and contract-centred view of the economy
Institutional cryptoeconomics	Ledger-centred view of the economy

²²⁴ Chris Berg, Sinclair Davidson and Jason Potts, ‘Some Public Economics of Blockchain Technology’ (March 2, 2018) <<https://ssrn.com/abstract=3132857>>.

²²⁵ Berg, Davidson and Potts, ‘Institutional Cryptoeconomics’ (n 115).

²²⁶ For example, IC has been used in relation to democracy, in particular the decision-making process within democracies, Allen et al, ‘Cryptodemocracy and Its Institutional Possibilities’ (n 172), notwithstanding the 2020 date the article was published online in July 2018.

²²⁷ Berg, Davidson and Potts, *Understanding the Blockchain Economy* (n 116).

Table 2.1: The Evolution of Economic Thought²²⁸

Berg, Davidson and Potts define IC as applying ‘the transaction cost economics of Ronald Coase, James Buchanan, Oliver Williamson, and Elinor Ostrom to blockchains’.²²⁹ Furthermore, IC is:²³⁰

the study of how blockchains interact with our existing and future social institutions, from the nature of contracts, to the shape of the firm, to the structures of global trade, all the way to the dynamics of capitalism and geopolitics.

Alistair Berg, Brendan Markey-Towler and Mikayla Novak take a slightly narrower view of IC, observing that IC’s central finding is that blockchain is more than simply a general purpose technology: it is an ‘institutional technology of governance which competes with the other economic institutions of capitalism’.²³¹ For Berg, Markey-Towler and Novak, blockchain provides the infrastructure for platforms upon which institutions that govern behaviour can be created.²³² Those institutions can be used to coordinate a group’s actions by ‘aggregating perspectives within that group on how action ought to be coordinated’.²³³ According to that view then, blockchain can be used to create governance structures that attempt to solve group decision-making.²³⁴ Thus, notwithstanding the transaction cost focus of Berg, Davidson and Potts, IC has its basis in NIE thus it can draw upon all of NIE within the specific context of blockchain.

Combining the definitions of Berg, Davidson and Potts and Berg, Markey-Towler and Novak, IC in relation to DAOs is the study of how blockchain creates and shapes DAOs and facilitates the coordination of group decision-making. This thesis, therefore, uses IC to better understand DAOs.

²²⁸ Table taken from Berg, Davidson and Potts, *Understanding the Blockchain Economy* (n 116) 56.

²²⁹ Ibid 1.

²³⁰ Ibid. See also Darcy WE Allen, Chris Berg and Aaron M Lane, *Cryptodemocracy: How Blockchain Can Radically Expand Democratic Choice* (Lexington Books, 2019) ix.

²³¹ Alistair Berg, Brendan Markey-Towler and Mikayla Novak, ‘Blockchains: Less Government, More Market’ (2020) 35(2) *Journal of Private Enterprise* 1.

²³² Ibid 10.

²³³ Ibid.

²³⁴ Ibid.

Blockchain has been described as an institutional technology.²³⁵ In particular, that blockchain is an institutional technology of governance.²³⁶ In addition, DAOs have been described as a new kind of institution.²³⁷ It could be argued, therefore, that DAOs are institutions. However, as we saw above, organisations provide a structure for human interaction. Indeed, the article describing DAOs as a new kind of institution, also described DAOs as organisations.²³⁸ This thesis therefore treats DAOs as organisations, rather than institutions, although they harness institutional technology.

The remainder of this section shows how IC has been applied in this thesis by explaining how blockchain enables the creation of DAOs and how DAOs differ from conventional hierarchical organisations.

2.2.2.1 *Reduction in Transaction Costs*

DAOs may reduce transaction costs, especially the cost of monitoring and enforcing rules.²³⁹ Yet, with DAOs the promise is not merely to lower the cost of ascertaining violations, but to remove the ability to break the rules. Thus, a key part of an organisation's functioning and purpose under NIE — removing the opportunism that occurs in market exchanges, which includes breaking agreements²⁴⁰ — would be reduced significantly if not removed entirely.²⁴¹

One way of envisaging the difference between DAOs and traditional organisations is as the difference between playing most computer games and a board game. When playing a board game

²³⁵ Sinclair Davidson, Primavera de Filippi and Jason Potts, 'Economics of Blockchain' (Conference Paper, Public Choice Conference, May 2016) 11 <<https://hal.archives-ouvertes.fr/hal-01382002/file/SSRN-id2744751.pdf>> and Darcy WE Allen et al, 'Blockchain and the Evolution of Institutional Technologies: Implications for Innovation Policy' (2020) 49(1) *Research Policy* 3 103865

²³⁶ Berg, Markey-Towler and Novak (n 231) 1.

²³⁷ Joshua Tan, 'Exploring DAOs as a New Kind of Institution' *Medium* (20 May 2020) <<https://medium.com/commonsstack/exploring-daos-as-a-new-kind-of-institution-8103e6b156d4>>.

²³⁸ *Ibid.*

²³⁹ Davidson, De Filippi and Potts, 'Blockchains and the Economic Institutions of Capitalism' (n 8) 643.

²⁴⁰ Williamson, *Markets and Hierarchies* (n 183) 25.

²⁴¹ Berg, Davidson and Potts, 'Some Public Economics of Blockchain Technology' (n 224) 8, '[b]lockchains reduce opportunism and therefore economise on disorder costs.' However, in practice, for the foreseeable future, it may not be possible to code for every eventuality, nor be able to code for every contractual obligation, Eliza Mik, 'Smart Contracts: Terminology, Technical Limitations and Real World Complexity' (2017) 9(2) *Law, Innovation and Technology* 269, 293–294 and see generally Karen E C Levy, 'Book-Smart, Not Street Smart: Blockchain-Based Smart Contracts and the Social Workings of Law' (2017) 3 *Engaging Science, Technology and Society* 1.

there are occasionally, or frequently — depending who is playing — disagreements about the game's rules that must be worked through by the players, which takes time and interrupts the game's flow. Even when the rules are agreed upon the players must monitor each other to ensure the rules are followed. Thus *ex-post* monitoring and enforcement is used.²⁴² In contrast, with most computer games, the rules are programmed, and players have no option but to follow them, and so cannot physically break the rules. For computer games, where rules can be broken, for example, in Minecraft players that break rules can be expelled from the server.²⁴³ However, such actions requires a person to make a judgment call whether a player should be expelled, thus *ex-post* monitoring and enforcement is used as the expulsion is not automatic.

While there are arguments that it is economically efficient to allow people to break contracts if they are willing to pay the price of doing so,²⁴⁴ the impact of ensuring rules are enforced and contracts are not breached cannot be overstated and goes beyond simply high transaction costs. As North observes:²⁴⁵

[O]ne cannot take enforcement for granted. It is (and always has been) the critical obstacle to increasing specialization and division of labor ... without institutional constraints, self-interested behavior will foreclose complex exchange, because of the uncertainty that the other party will find it in his or her interest to live up to the agreement. The transaction cost will reflect the uncertainty by including a risk premium, the magnitude of which will turn on the likelihood of defection by the other party and the consequent cost to the first party. Throughout history the size of this premium has largely foreclosed complex exchange and therefore limited the possibility of economic growth.

Thus the use of smart contracts and their ability to reduce transaction costs may increase economic

²⁴² See Rohr and Wright (n 67).

²⁴³ Louis Rolfes and Kathrin Passig, 'The Proto-Governance of Minecraft Servers' (2019) 12(3) *Journal of Virtual Worlds Research* 1, 9.

²⁴⁴ For a discussion refuting the concept of efficient breach, see Alexandra Sims, 'Blockchain and Decentralised Autonomous Organisations (DAOs): The Evolution of Companies?' (2019) 28 *New Zealand Universities Law Review* 423, 444–445.

²⁴⁵ North, *Institutions, Institutional Change, and Economic Performance* (n 193) 33.

activity as the uncertainty surrounding whether other parties will honour their agreements is reduced.

2.2.2.2 DAOs Allow for Significant Changes in Informal Constraints

North identifies two types of constraint: formal rules and informal constraints.²⁴⁶ Formal rules are relatively easy to change: new laws can be created, a corporation's constitution can be changed or new policies can be adopted.²⁴⁷ In contrast, informal constraints, which include 'sanctions, taboos, customs, traditions, and codes of conduct',²⁴⁸ 'have great survival tenacity because they still resolve basic exchange problems among the participants, be they social, political, or economic'.²⁴⁹

Informal constraints can also affect whether new laws and other formal rules are followed, or whether the now unlawful behaviour continues. For example, a series of studies analyses whether the passing of a well-publicised law against unfair contract terms in New Zealand²⁵⁰ had the desired effect of substantially reducing, if not eliminating, unfair contract terms in consumer contracts.²⁵¹ The first study found that unfair contract terms had reduced by only 11 percent and all the consumer contracts analysed contained at least one unfair contract term.²⁵² The relatively slight reduction in unfair contract terms was hypothesised to be because lawyers were not able to free themselves from years, if not decades, of writing contracts that contained unfair contract terms,²⁵³ for example, a term that enabled a business to change any term at any time.²⁵⁴ Indeed, so strong was the tradition of unfettered freedom of contract that the second study, conducted two years after the first, found a

²⁴⁶ Ibid 83.

²⁴⁷ Ibid 91.

²⁴⁸ North, 'Institutions' (1991) 5(1) *The Journal of Economic Perspectives* 97, 97.

²⁴⁹ North, *Institutions, Institutional Change, and Economic Performance* (n 193) 91.

²⁵⁰ The unfair contract terms law is contained in the Fair Trading Act 1986 (NZ) (FTA) ss 26A and 46H–46M (the FTA was amended by the Fair Trading Amendment Act 2013 (NZ)).

²⁵¹ See, Alexandra Sims and Louise Mara, 'Unfair Online Contract Terms in New Zealand: Evaluating the Effect of Regulatory Change' (2016) 24 *Competition & Consumer Law Journal* 128 and Victoria Stace, Emily Chan and Alexandra Sims, 'New Zealand's Unfair Contract Terms Law Fails to Incentivise Businesses to Remove Potentially Unfair Terms from Standard Form Contracts' (2020) 27(3) *Competition and Consumer Law Journal* 235.

²⁵² Sims and Mara (n 251) 141.

²⁵³ Ibid 134.

²⁵⁴ A statement such as 'We reserve the right to change these terms at any time' would be unfair because it gives one party the ability to unilaterally vary the terms of the contract, Fair Trading Act 1986 (NZ) s 46M(d).

slight increase in the number of unfair contract terms.²⁵⁵

Change in informal constraints is slow; revolutionary change is difficult.²⁵⁶ A DAO's smart contracts, however, are its rules, including its token holders' agreement of how basic exchange problems are to be resolved. The ability to change a DAO's smart contracts means DAOs are not subject to the limitations of informal constraints as traditional organisations are. Some DAOs, however, may also use off-chain agreements in addition to the DAO's smart contracts,²⁵⁷ in which case informal constraints are likely to arise. Off-chain agreements are not, however, necessary for a DAO to operate and are therefore not a core feature of DAOs.

2.2.2.3 Governance of DAOs

The governance of DAOs is examined in Chapter Four. The governance of DAOs is different from the governance of traditional organisations. For example, employees in a corporation in New Zealand, Australia or the United Kingdom, unless they are shareholders, normally have no say in its governance. If employees do have a say in a corporation's governance it is because the corporation's rules allow them to have a say. Shareholders in turn have a limited say as the decisions reserved for shareholders are limited.²⁵⁸ Directors and thus the board make most of the governance decisions. Even organisations such as John Lewis²⁵⁹ and Mondragon,²⁶⁰ which do allow for employee involvement in decision-making, still limit the role of their employees' decision-making. John Lewis' employees —

²⁵⁵ Stace, Chan and Sims (n 231).

²⁵⁶ North, *Institutions, Institutional Change, and Economic Performance* (n 193) 91.

²⁵⁷ See eg MetaCartel Ventures' (MCV) Operating Agreement, which it calls its Grimoire, MetaCartel Ventures DAO, 'Official Grimoire Setting Forth the Sacred & Inviolable Pact of The MetaCartel Ventures DAO', *GitHub* (14 February 2020) <<https://github.com/metacartel/MCV/blob/master/Legal/Grimoire%20and%20Exhibits/MCV-Grimoire-Final-All-Exhibits.pdf>>.

²⁵⁸ The rights reserved to shareholders include adopting, altering and revoking a constitution, Companies Act 1993 (NZ) s 32, which requires a special resolution (a resolution approved by a 75 percent majority, or higher if required by the constitution, s 2). Another shareholder right is permitting the company/corporation to enter into a major transaction, s 129 (a major transaction is when the company/corporation will acquire or dispose of assets or acquire rights or incur obligations or liabilities that are worth more than half of the value of the company/corporation's assets (again a special resolution is required)).

²⁵⁹ Hugh Willmott and Bernard Paraque, 'Cooperatives—Saviours or Gravediggers of Capitalism? Critical Performativity and the John Lewis Partnership' (2014) 21(5) *Organisation* 604.

²⁶⁰ For the governance of Mondragon Corporación Cooperativa see Balaren Bakaikoa, Anjel Errasti and Agurtzane Begiristain, 'Governance of the Corporación Cooperativa' (2004) 75(1) *Annals of Public Cooperative Economics* 61.

who are called partners — do not vote directly, but rather elect members to the Partnership Council,²⁶¹ which is one of three decision-making bodies, but is not responsible for the formulation of major policy or for allocating or monitoring the business' resources.²⁶²

While governance in DAOs is designed to be decentralised, and thus there is no small group of people making governance decisions, some DAOs use centralised bodies for some of their decision-making.²⁶³ Even for DAOs that have not implemented elements of centralised decision-making, this does not mean that all their tokens holders will have the same rights in regards to governance. Bounded rationality²⁶⁴ dictates that not all token holders are in a position to make informed decisions and this has been borne out in practice. Bitshares, the first DAO, resorted to proxy voting because token holders did not have the time or the skills to make decisions.²⁶⁵ Traditional organisations mitigate bounded rationality by, for example, assisting managers and directors in their decisions by making available a support network of people and other resources that provide information and advice.²⁶⁶ A DAO's governance can design for bounded rationality, for example, by limiting voting to token holders who have gained a reputation through their actions in the DAO.²⁶⁷ Liquid democracy, a more sophisticated version of proxy voting, could be used to assist token holders to vote.²⁶⁸ Alternatively, decentralised predicative markets (holographic consensus) can be used, where predictors bet on how token holders vote and the token holders in turn see the predictor's predictions.²⁶⁹

²⁶¹ John Lewis, 'John Lewis Partnership Constitution' (October 2019) <<https://www.johnlewispartnership.co.uk/content/dam/cws/pdfs/Juniper/john-lewis-partnership-constitution-october-2019.pdf>> [12].

²⁶² Willmott and Paraque (n 259) 610.

²⁶³ See below 4.3.2.2.

²⁶⁴ Simon (n 197) 99.

²⁶⁵ Larimer, 'Is The DAO going to Be DOA?' (n 2).

²⁶⁶ Wallis and North (199) 105.

²⁶⁷ 'For example, a new token holder may have diminished voting power until they have been a member of a community for a while, similar to not being able to vote until you are a full citizen of a country', Fred Ehrsam, 'Blockchain Governance: Programming Our Future', *Fred Ehrsam's Blog* (Blog Post, 27 November 2017) <<https://www.fehrsam.xyz/blog/blockchain-governance-programming-our-future>>.

²⁶⁸ See below 4.4.1.4.

²⁶⁹ See below 4.4.1.5.

Other governance mechanisms are also possible; a DAO may require token holders to stake²⁷⁰ a certain number of tokens before they can vote.²⁷¹ As an incentive to vote the token holder may be paid for each vote they make.²⁷² Another incentive to ensure that good decisions are made is to restrict token holders from selling their tokens, for example, a three-month minimum period for the return of tokens after their return has been requested.²⁷³ If poor decisions are made, the theory is that the tokens' value would fall during that period, thus incentivising good decisions.²⁷⁴

2.2.2.4 *Managers No Longer Required to Manage*

Traditional organisations, including organisations such as John Lewis²⁷⁵ and Mondragon,²⁷⁶ require managers to make operational decisions and ensure those decisions are carried out.²⁷⁷ In DAOs the token holders are the decision-makers and when agreement is reached if on-chain governance is used the DAO's smart contracts are changed automatically, thus there is no need for managers to oversee the implementation and enforcement of those decisions. On-chain means that proposals for changes to the operation of the DAO and funding requests are proposed and voted on by token holders, with the outcome of those decisions executed automatically.²⁷⁸ Alternatively, off-chain governance is where decisions are made by the DAO members through discussions, which can be on social media or

²⁷⁰ See above n 149.

²⁷¹ The Dash DAO requires the staking of 1,000 Dash tokens before the token holder can vote, Joël Valenzuela, 'Dash: The First DAO', *Dash News* (14 December 2017) <<https://dashnews.org/dash-first-dao/>>. A token holder who can vote in the Dash DAO is called a masternode. For an alternative staking system, see Dominic Williams, 'The DFINITY "Blockchain Nervous System"', *Medium* (5 January 2017) <<https://medium.com/dfinity/the-dfinity-blockchain-nervous-system-a5dd1783288e>>.

²⁷² Williams (n 271). Masternodes in Dash receive a share of the Dash DAO's block reward regardless of whether they vote or not.

²⁷³ *Ibid.*

²⁷⁴ *Ibid.*

²⁷⁵ See generally, Willmott and Paraque (n 259).

²⁷⁶ See generally, Bakaikoa, Errasti and Begiristain (n 260).

²⁷⁷ Wallis and North (n 199) 105.

²⁷⁸ Wessel Reijers et al, 'Now the Code Runs Itself: On-chain and Off-chain Governance of Blockchain Technology' (2018) 37(17) *TOPOL: International Review of Philosophy* <<https://doi.org/10.1007/s11245-018-9626-5>> and Ehrtam (n 267).

community forums²⁷⁹ or via signalling polls²⁸⁰ and those decisions are executed later or a formal proposal is put to an on-chain vote.

2.2.2.5 Ability to Exit the DAO Easily

Traditionally people within firms, including employees, members, managers and shareholders, and other organisations have the choice of voice or exit.²⁸¹ Voice is where a member can attempt to agitate and exert influence from within the institution, which may or may not be effective. Exit is where the member switches to a competing product. For example, a shareholder can, depending on the corporation, sell their shares if they are not happy with the corporation's performance. Although shares in publicly listed companies are easy to sell, shares in privately held corporations may be more difficult to sell as there may be a shareholders' agreement preventing such a sale.²⁸² Even if shares can be sold, others may not want to purchase them, especially if they will be a minority shareholder. In contrast, most tokens are listed on exchanges and can be sold easily.

Exit is more nuanced with DAOs. There is the ability to sell tokens, a weak exit, and the possibility of a strong exit, forking.²⁸³

2.2.2.6 Ability to Fork

The ethos of blockchain, upon which DAOs are built, is that blockchain can fork to create an identical and competing 'separate, backwards-compatible platform'.²⁸⁴ Indeed forking has been described as

²⁷⁹ DistrictOx, 'Off-Chain Governance', *DistrictOx* (Web Page) <<https://education.district0x.io/general-topics/what-is-governance/off-chain-governance/>>.

²⁸⁰ For example, Snapshot is used by DAOs such as Yam for off-chain polls, DeFi News, 'Snapshot Applies Off-Chain for Multi-governance Without Third-Party', DeFi.cx (17 September 2020) <<https://defi.cx/snapshot/>> and Yam, 'Governance' Yam <<https://docs.yam.finance/governance>>.

²⁸¹ See generally, Hirshman (n 30).

²⁸² John Quinn, 'An Analysis of the Restrictions on Share Transfers in Private Companies' (2018) 3(1) *Irish Business Law Review* 1.

²⁸³ Ehrsam (n 267).

²⁸⁴ Christian Catalini and Joshua S Gans, 'Some Simple Economics of the Blockchain' (MIT Sloan Research Paper No 5191-16, 20 April 2019) <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2874598> 16–17. The creation of a new ledger is called a hard fork. Forking, however, is not unique to DAOs and blockchain: forking is a feature of open source software, see generally, Linus Nyman and Juho Lindman, 'Code Forking, Governance, and Sustainability in Open Source Software' (2013) *Technology Innovation Management Review* 7 and Bruce Kogut and Anca Metiu, 'Open-Source Software Development and Distributed Innovation' (2001) 17(2) *Oxford Review of Economic Policy* 248.

‘endemic to blockchains’.²⁸⁵ DAOs can fork, which means they can effectively split in two with the result that there will be two DAOs in operation. As Ehrsam notes:²⁸⁶

forking is the equivalent of Facebook allowing any competitor to take their entire database and codebase to a competitor. Don’t like how Facebook is operating it’s [sic] newsfeed? Create a fork with all the same code, social connections, and photos.

Forks are not merely theoretical. There have been many high-profile forks of blockchains, the most prominent to date the forking of the Ethereum blockchain after The DAO hack to create Ethereum and Ethereum Classic.²⁸⁷ On the one hand, the threat of forking a DAO may reduce the perceived value of a DAO.²⁸⁸ As one interviewee noted, forking is ‘the nuclear option of governance’.²⁸⁹ On the other hand, the threat of forking may encourage better forms of governance because it forces token holders to act responsibly.²⁹⁰

While more traditional organisations can divide in two, in practice, this occurs rarely. Minority shareholders are often locked in and cannot exit from the corporation with the value of their shareholding.²⁹¹ Even if minority shareholders are bought out, they will find it hard to compete with the corporation and certainly would not be able to use the corporation's name and resources such as its operating manuals. It is inconceivable that Facebook would allow a clone of itself to operate.

2.2.2.7 *Payment by DAOs Are Often in Its Tokens*

Payment to actors within the DAO and others who engage with the DAO will normally be in the DAO’s

²⁸⁵ Berg, Davidson and Potts, *Understanding the Blockchain Economy* (n 116) 47.

²⁸⁶ Ehrsam (n 267).

²⁸⁷ See, generally, DuPont (n 3). Another fork occurred when Bitcoin forked to create Bitcoin Cash and following that Bitcoin was forked again to create Bitcoin Gold and Bitcoin Diamond, Paul de Havilland, ‘Bitcoin Forks Explained, Which Ones Are Worth Claiming?’, *Crypto Briefing* (2 April 2020) <<https://cryptobriefing.com/bitcoin-forks-explained-which-ones-are-worth-claiming/>>.

²⁸⁸ See Vili Lehdonvirta, ‘The Blockchain Paradox: Why Distributed Ledger Technologies May Do Little to Transform the Economy’, *Oxford Internet Institute* (Blog Post, 21 November 2016) <<https://www.oii.ox.ac.uk/blog/the-blockchain-paradox-why-distributed-ledger-technologies-may-do-little-to-transform-the-economy/>>.

²⁸⁹ Interviewee 3 (DAO founder, not yet in operation).

²⁹⁰ Catalini and Gans (n 284) 17 and Ehrsam (n 267). For the benefits of the threat of forking to encourage better governance in open source software, see Kogut and Metiu (n 284) 257.

²⁹¹ In New Zealand shareholders have minority buy-out rights in only limited situations, see Companies Act 1993 (NZ) ss 110–115.

tokens.²⁹² While there are parallels with corporations, for example, a corporation may give shares to employees or grant them share options to allow employees to purchase shares at a later date,²⁹³ the practice is not universal.²⁹⁴ The payment of tokens by DAOs to their employees, contractors, suppliers and creditors presupposes exchanges where the recipients of tokens can exchange them for other tokens or, if necessary, fiat currency.

2.2.2.8 Airdrops

Airdrops are a mechanism that DAOs can use to distribute some of their tokens to a wide range of people for free; airdrops can also serve as marketing mechanisms.²⁹⁵ The purpose of airdrops is to create a network effect. The more people in a network, the more valuable it is to people within the network and the more likely they are to use the network and therefore the DAO.²⁹⁶ In contrast, shares in a corporation are not normally given away,²⁹⁷ except in some circumstances to employees.²⁹⁸ There are different ways of distributing tokens via airdrops. Some airdrops will send a set number of tokens to certain wallets, and the person or entity that controls that wallet will own those tokens. Others may send DAO tokens in proportion to a wallet's current balance of a referenced token, for example, for each ether a wallet holds that wallet receives 10 DAO tokens.²⁹⁹ For both methods a person may hold

²⁹² Not all DAOs will have tokens, however. For example, charity DAOs will often accept and distribute a cryptocurrency such as ether. Moloch DAO also has no token and collects and pays out ether <molochdao.com>.

²⁹³ See generally, Lesley Baddon et al, *People's Capitalism? A Critical Analysis of Profit-Sharing and Employee Share Ownership* (Routledge, 2018).

²⁹⁴ 'Small Business: Employee Share Schemes' *New Zealand Herald* (6 August 2014) <https://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=11304277>.

²⁹⁵ Airdrops are not unique to DAOs and are also used by other blockchain projects, Bridgett S Bauer, 'Airdrops: "Free" Tokens Are Not Free from Regulatory Compliance' (2020) 28(2) *University of Miami Business Law Review* 311, 321.

²⁹⁶ Nickolas Economides, 'The Economics of Networks' in Raghu Garud, Arun Kumaraswamy and Richard Langlois (eds), *Managing in the Modular Age: Architectures, Networks, and Organizations* (Wiley, 2002) 217 and Zenu Sharma and Yun Zhu, 'Platform Building in Initial Coin Offering Market: Empirical Evidence' (2020) 61 *Pacific-Basin Finance Journal* 1013182, 2.

²⁹⁷ There have been examples of shares given away, but normally the recipient has been required to do something in return, Bauer (n 295) 346–349.

²⁹⁸ See, eg, 'Small Business: Employee Share Schemes' (n 294) and David McConville, John Arnold and Alison Smith, 'What do People Think Employee Share Ownership Schemes do for Them? A Qualitative Study of Participants' Experiences in Three UK Share Schemes' (2020) 31(18) *International Journal of Human Resource Management* 2340.

²⁹⁹ Laurin Arnold, 'Blockchain and Initial Coin Offerings: Blockchain's Implications for Crowdfunding' in Horst Treiblmaier and Roman Beck (eds), *Business Transformation Through Blockchain, Volume 1* (Palgrave MacMillan, 2019) 233, 241.

multiple wallets and receive tokens in each wallet.³⁰⁰ Another distribution method for airdrops is to require people to apply for tokens and often a KYC (Know Your Customer) and AML (Anti-money Laundering) process is used.³⁰¹

2.2.2.9 Funding of DAOs

The funding of DAOs varies according to the DAO. Some DAOs require minimal to no funding and can even be self-funding. The Dash DAO, for example, funds itself by creating Dash tokens, which can be exchanged for fiat currency.³⁰²

Some DAOs use initial coin offerings (ICOs).³⁰³ The high profile, and ultimately unsuccessful, The DAO, for example, ran an ICO.³⁰⁴ ICOs have been likened to a Kickstarter-style crowdfunding campaign. The public can participate in an early stage project; however, unlike a normal Kickstarter crowdfunding process where Kickstarter purchases are not generally tradeable, blockchain tokens are normally tradeable.³⁰⁵ In contrast, traditional companies in their early stages rely on various funding models, from founders who use their own resources to finance the corporation, or borrow from banks and other lenders or both, through to professional venture capitalist (VC) funders and angel investors.³⁰⁶ For DAOs that hold ICOs, the ICOs may potentially democratise capital raising as the

³⁰⁰ Morit Zwang, 'Detecting Bot Activity in the Ethereum Blockchain Network' (3 October 2018) <<https://arxiv.org/abs/1810.01591>> 3, noting 'one entity can collect a large number of tokens' by creating many wallets and participating in an airdrop.

³⁰¹ Michael Hunte, 'Liftoff! The DFINITY Community Airdrop is Here', *Medium* (30 May 2018) <<https://medium.com/dfinity/liftoff-the-dfinity-community-airdrop-is-here-5a11b94a2d03>>.

³⁰² Forty-five percent of the Dash DAO's block reward goes to its miners, 45 percent goes to the masternodes, which assist with running the Dash blockchain and vote on proposals, and the remaining 10 percent is used to fund work to upgrade and support the Dash blockchain, Dash, 'Understanding Dash Governance', *Dash* (Web Page) <<https://docs.dash.org/en/stable/governance/understanding.html>>. See also Eric Sammons, 'The 'DAO' Nobody Knows: Now Distributing \$1.2 Million Per Month', *Medium* (22 June 2017) <<https://medium.com/@EricSammons/the-dao-nobody-knows-now-distributing-1-2-million-per-month-b8af9a5586da>>. At 31 March 2021 Dash tokens were trading at USD208.51 each.

³⁰³ ICOs are also sometimes called token generation events. ICOs are a form of crowdfunding which are often used by start ups to avoid the standard regulated capital-raising process. A percentage of the DAO's tokens are sold to backers of the project, normally for either ether or bitcoin or both, and sometimes fiat currency. See also John P Conley, 'Blockchain and the Economics of Crypto-Tokens and Initial Coin Offerings' (Working Papers No 17-00008, Vanderbilt University Department of Economics, June 2017) <<http://www.accessecon.com/Pubs/VUECON/VUECON-17-00008.pdf>>.

³⁰⁴ Mark Anson, 'Initial Coin Offerings: Economic Reality of Virtual Economics' (2018) 21(4) *Journal of Private Equity* 41.

³⁰⁵ Yan Chen, 'Blockchain Tokens and the Potential Democratization of Entrepreneurship and Innovation' (2018) 61(4) *Business Horizons* 567, 570.

³⁰⁶ Catalini and Gans (n 284) 17.

funding is distributed amongst a wider range of people, many of whom would not usually have access to such an investment, than in an IPO.³⁰⁷

The changed funding model also alters the dynamics of the DAO. Founders of companies are the main shareholders and normally the directors as well as the decision-makers. In return for funding, VCs normally require equity — a share of the ownership in the corporation and often a degree of control over decision-making.³⁰⁸ With DAOs the intention is that the decision-making is distributed amongst the token holders.³⁰⁹ The process of governance and decision-making is dealt with in depth in Chapter Four.

2.3 Research Design

This section explains the data collected in the thesis and how they were analysed.

2.3.1 Data Collection and Analysis

The thesis is qualitative with data collection methods used to triangulate the findings.³¹⁰ The data include literature (both scholarly and grey), semi-structured interviews and an analysis of disputes decided by the decentralised dispute resolution service (DDRS) Kleros.

³⁰⁷ Ibid. Catalini and Gans talk about 'equity' being distributed, but often equity is not distributed. However, there is some concern that the majority of tokens are sold in private and pre sales, before the ICO (crowdsale or public sale), which means that the public are not able to access the full number of tokens Kai Sedgwick, 'ICOs Have Raised \$2 Billion this Year – Mostly from Private Sales', *Bitcoin.com* (20 February 2018) <<https://news.bitcoin.com/icos-raised-2-billion-year-mostly-private-sales/>> estimating that 84 percent went to private investors, that is, through pre sales before the ICO, Justina Lee, 'ICOs are Turning Exclusive as Wealthy Investors Snatch up Deals', *Bloomberg* (8 August 2018) <<https://www.bloomberg.com/news/articles/2018-08-08/token-sales-turn-exclusive-as-private-investors-s snatch-up-deals>> and Karim Dabbouz, 'ICOs: The Community Does the Marketing, Large Investors Grab the Tokens', *Hackernoon* (2 March 2018) <<https://hackernoon.com/icos-the-community-does-the-marketing-large-investors-grab-the-tokens-2551bba51e1f>>. Often the private and pre sales are sold at considerable discounts to the crowdsale, Gilbert Fridgen et al, 'Don't Sip on the ICO – A Taxonomy for a Blockchain-Enabled Form of Crowdfunding' (Conference Paper, Twenty-Sixth European Conference on Information Systems (ECIS2018), 2018) <https://aisel.aisnet.org/ecis2018_rp/83> 10.

³⁰⁸ See generally G Tyge Payne et al, 'The Deal Structuring Stage of the Venture Capitalist Decision-Making Process: Exploring Confidence and Control' (2009) 47(2) *Journal of Small Business Management* 154.

³⁰⁹ There can be different types of tokens with not all tokens allowing the holders to take part in governance decisions, see Chapter Four.

³¹⁰ Large sample methods of DAOs were not used because there are not yet sufficient DAOs to study, see Morrison, Mazey and Wingreen (n 9) 12.

2.3.1.1 Literature

The primary data for this thesis are literature in the form of peer-reviewed journal articles. DAOs straddle many disciplines, and as such the thesis draws upon literature from a range of disciplines. Those disciplines include: information systems: DAOs can provide IT governance frameworks;³¹¹ management: DAOs can transform organisational management forms;³¹² finance: DAOs may facilitate the execution of financial transactions;³¹³ economics: DAOs are an example of how blockchain can disintermediate transactions, resulting in lower transaction costs;³¹⁴ philosophy: DAOs, as an application of blockchain, are an example of a narrative technology;³¹⁵ psychology: whether blockchain and therefore DAOs are adopted is as much a psychological challenge as a technological challenge;³¹⁶ sociology: DAOs may be the precursor to a decentralised autonomous society ‘in which humans are ‘freed’ from centralised institutions of power and control’;³¹⁷ history: the development and recognition of new legal entities is not a new phenomenon;³¹⁸ and domestic public

³¹¹ Rowan van Pelt et al, ‘Defining Blockchain Governance: A Framework for Analysis and Comparison’ (2021) 38(1) *Information Systems Management* 21 and Zachariadis, Hileman and Scott (n 15).

³¹² Rui Qin et al, ‘Blockchain-Based Knowledge Automation for CPSS-Orientated Parallel Management’ (2020) 7(5) *IEEE Transactions on Computational Social Systems* 1180 and Julia A Fehrer et al, ‘Future Scenarios of the Collaborative Economy: Centrally Orchestrated, Social Bubbles or Decentralized Autonomous?’ (2018) *Journal of Service Management* 859.

³¹³ For banking and finance, see Reggie O’Shields, ‘Smart Contracts: Legal Agreements for the Blockchain’ (2017) 21 *North Carolina Banking Institute* 177.

³¹⁴ Davidson, De Filippi and Potts, ‘Blockchains and the Economic Institutions of Capitalism’ (n 8).

³¹⁵ Wessel Reijers and Mark Coeckelbergh, ‘The Blockchain as a Narrative Technology: Investigating the Social Ontology and Normative Configurations of Cryptocurrencies’ (2018) 31(1) *Philosophy and Technology* 103; Wessel Reijers, Fiachra O’Brolcháin and Paul Haynes, ‘Governance in Blockchain Technologies & Social Contract Theories’ (2016) 1 *Ledger* 134; and John Danaher, ‘Blockchains and DAOs as the Modern Leviathan’, *Philosophical Disquisitions Blog* (Blog Post, 24 March 2016) <<https://philosophicaldisquisitions.blogspot.com/2016/03/blockchains-and-daos-as-modern-leviathan.html>>.

³¹⁶ Andrea Gaggioli, ‘The Middleman Is Dead, Long Live the Middleman: The “Trust Factor” and the Psycho-Social Implications of Blockchain’ (2019) 2 *Frontiers in Blockchain* <<https://doi.org/10.3389/fbloc.2019.00020>> 6, see also Q Dupont and B Maurer, ‘Ledgers and Law in the Blockchain’, *Kings Review* (Blog Post, 23 June 2015) <<https://escholarship.org/uc/item/6k65w4h3>> ‘the smart contract replaces the difficult social and psychological work of contracting with self-executing code.’

³¹⁷ J Z Garrod, ‘The Real World of the Decentralized Autonomous Society’ (2016) 14(1) *tripleC* 62 <<https://doi.org/10.31269/triplec.v14i1.692>> 62, 62.

³¹⁸ For example, the development of the private company, see, eg, Paddy Ireland, ‘Capitalism Without the Capitalist: The Joint Stock Company Share and the Emergence of the Modern Doctrine of Separate Corporate Personality’ (1996) 17(1) *Journal of Legal History* 41; Ron Harris, ‘The Private Origins of the Private Company’ (n 99); and Paul G Mahoney, ‘Contract or Concession? An Essay on the History of Corporate Law’ (2000) 34(2) *Georgia Law Review* 873.

policy: DAOs may require a reassessment of law's fundamental foundations and there is a need for lawyers, regulators and policymakers to learn new technology skills.³¹⁹

Primary sources, cases, legislation, regulations and constitutions, which are typically used in legal research,³²⁰ were not used as frequently due to the lack of cases and legislation relating to DAOs. Grey literature was used to supplement the scholarly literature. Grey literature is difficult to define,³²¹ and there is no settled definition.³²² A narrow definition of grey literature is scholarly work that has not been the subject of formal peer-review and includes preprints and working papers.³²³ In contrast, other definitions of grey literature take a wider view of grey literature and include such disparate works such as white papers, blog posts, bulletins and tweets.³²⁴ This thesis prefers the wider view and the grey literature used in this thesis includes blog posts, white papers, unpublished articles, conference papers, recorded conference presentations, theses, newspaper and magazine articles, and podcasts.

Grey literature, however, has its limitations. The first limitation is that the quality of grey literature may not be as high due to a lack of peer review.³²⁵ While much grey literature is not peer reviewed, some is.³²⁶ Another limitation is that most grey literature emphasises its conclusions, rather than its process, which is in contrast to the express description and application of methodology in peer

³¹⁹ Javier Sebastian Cermeño, 'Blockchain in Financial Services: Regulatory Landscape and Future Challenges for its Commercial Application', *BBVA Research* (21 December 2016) <http://www.smallake.kr/wpcontent/uploads/2017/01/WP_16-20.pdf>.

³²⁰ Carol M Bast and Ransford C Pyle, 'Legal Research in the Computer Age: A Paradigm Shift' (2001) 93(2) *Law Library Journal* 285, 299.

³²¹ David N Wood and A W Smith (1993). 'SIGLE: A Model for International Co-operation' (1993) 21(1) *Interlending & Document Supply* 18, 18 quoted in Joachim Schöpfel, 'Towards a Prague Definition of Grey Literature' (Conference Paper, International Conference on Grey Literature, 6–7 December 2010) 5.

³²² Cleo Pappas and Irene Williams, 'Grey Literature: Its Emerging Importance' (2011) 11(3) *Journal of Hospital Librarianship* 228, 229.

³²³ Schöpfel (n 321) 14.

³²⁴ Taryn L Rucinski, 'The Elephant in the Room: Toward a Definition of Grey Legal Literature' (2015) 107(4) *Law Library Journal* 543, 544.

³²⁵ Richard J Adams, Palie Smart and Anne Sigismund Huff, 'Shades of Grey: Guidelines for Working with the Grey Literature in Systematic Reviews for Management and Organizational Studies' (2017) 19 *International Journal of Management Reviews* 432, 434 and Richard T Corlett, 'Trouble with the Gray Literature' (2011) 43(1) *Biotropica* 3, 3. Although the system of peer-review often criticised, see Jonathan P Tennant and Tony Ross-Hellauer, 'Open Access: The Limitations to our Understanding of Peer Review' (2020) 5(5) *Research Integrity and Peer Review* 1 <<https://doi.org/10.1186/s41073-020-00092-1>>.

³²⁶ Schöpfel (n 321) 14–15 and Karen M Benzies, 'State-of-the-Evidence Reviews: Advantages and Challenges of Including Grey Literature' (2006) 3(2) *Worldviews on Evidence-Based Nursing* 55, 56.

reviewed work.³²⁷ Discovery can be difficult, unlike scholarly literature, there is no systematic archiving of grey literature,³²⁸ and most grey literature lacks an abstract, hindering the ability to determine relevance without reading the entire work.³²⁹

Notwithstanding the limitations of grey literature, its use is increasing in law³³⁰ and other disciplines,³³¹ and is essential for research on DAOs. First, DAOs were first theorised by people in the blockchain industry, including Vitalik Buterin,³³² not by academics.³³³ The founding documents outlining the concept of DAOs include a blog post by Daniel Larimer in 2013 titled 'The Hidden Costs of Bitcoin', and a series of three articles in the *Bitcoin Magazine* by Buterin on 'Bootstrapping a Decentralized Autonomous Corporation'.³³⁴ Buterin followed this work with a blog post on 'DAOs, DACs, DAs and More: An Incomplete Terminology Guide'.³³⁵ The infamous The DAO was also set out in a white paper.³³⁶ Academics too are utilising grey literature. IC was first theorised by researchers at

³²⁷ Adams, Smart and Huff (n 325) 434.

³²⁸ Richard T Corlett, 'Trouble with the Gray Literature' (2011) 43(1) *Biotropica* 3, 4.

³²⁹ Adams, Smart and Huff (n 325) 434.

³³⁰ Rucinski (n 324) 544.

³³¹ See generally Adams, Smart and Huff (n 325).

³³² Vitalik Buterin, 'Bootstrapping a Decentralized Autonomous Corporation: Part I', *Bitcoin Magazine* (2013) <<https://bitcoinmagazine.com/articles/bootstrapping-a-decentralized-autonomous-corporation-part-i-1379644274/>>; Vitalik Buterin, 'Bootstrapping an Autonomous Decentralized Corporation, Part 2: Interacting with the World', *Bitcoin Magazine* (2013) <<https://bitcoinmagazine.com/articles/bootstrapping-an-autonomous-decentralized-corporation-part-2-interacting-with-the-world-1379808279/>>; Vitalik Buterin, 'Bootstrapping a Decentralized Autonomous Corporation, Part 3: Identity Corp', *Bitcoin Magazine* (2013) <<https://bitcoinmagazine.com/articles/bootstrapping-a-decentralized-autonomous-corporation-part-3-identity-corp-1380073003/>>; and Vitalik Buterin, 'DAOs, DACs, DAs and More: An Incomplete Terminology Guide', *Ethereum Blog* (Blog Post, 6 May 2014) <<https://blog.ethereum.org/2014/05/06/daos-dacs-das-and-more-an-incomplete-terminology-guide/>>.

³³³ Buterin, however, has worked with academic researchers, Vitalik Buterin, Zoë Hitzig and E Glen Weyl, 'Liberal Radicalism: A Flexible Design for Philanthropic Matching Funds' (2018) <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3243656> and Thibault Schrepel and Vitalik Buterin, 'Blockchain Code as Antitrust' (2020) <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3597399> (forthcoming *Berkeley Technology Law Journal*). Also, Buterin was awarded an Honorary Doctorate by the University of Basel for 'outstanding achievements in fields of cryptocurrencies, smart contracts, and the design of institutions', Helen Partz, 'Oldest Swiss University Awards Honorary Doctorate to Ethereum Co-Founder Vitalik Buterin', *Cointelegraph* (20 November 2018) <<https://cointelegraph.com/news/oldest-swiss-university-awards-honorary-doctorate-to-ethereum-co-founder-vitalik-buterin>>.

³³⁴ Daniel Larimer, 'The Hidden Costs of Bitcoin', *LTB Network* (7 September 2013) <<https://letstalkbitcoin.com/is-bitcoin-overpaying-for-false-security#.UjtiUt9xy0w>>.

³³⁵ Buterin, 'DAOs, DACs, DAs and More' (n 332).

³³⁶ Jentzsch (n 25).

RMIT on CoinDesk,³³⁷ an online platform.³³⁸ Grey literature can therefore carry considerable weight.³³⁹ When analysing the grey literature for this thesis, it was important to exclude any literature that could be considered marketing material designed to attract investors.³⁴⁰

Second, the fast-paced development of DAOs means that many DAO developments have yet to appear in peer-reviewed literature.³⁴¹ There can often be a wait of 18 months from submission to publication in a peer-reviewed journal.³⁴² An 18-month period is too long for DAOs and blockchain, and the information may be out of date by the time the article is published.³⁴³ Long delays in publication are a cause of concern generally in academia.³⁴⁴ In an attempt to speed up the publication process, the peer-reviewed journal Ledger³⁴⁵ was formed in 2015 with the aim of completing reviews

³³⁷ Berg, Davidson and Potts, 'Institutional Cryptoeconomics' (n 115).

³³⁸ CoinDesk describes itself as 'the media platform for the next generation of investors exploring how cryptocurrencies and digital assets are contributing to the evolution of the global financial system. Its mandate is to inform, educate, and connect the global investment community through news, data, events and education' <<https://www.coindesk.com/about>>.

³³⁹ For example, Vitalik Buterin began a blog post with: '[w]arning: this post contains crazy ideas. Myself describing a crazy idea should NOT be construed as implying that (i) I am certain that the idea is correct/viable, (ii) I have an even >50% probability estimate that the idea is correct/viable, or that (iii) "Ethereum" endorses any of this in any way', Vitalik Buterin, 'Superrationality and DAOs', *Ethereum Blog* (Blog Post, 23 January 2015) <<https://blog.ethereum.org/2015/01/23/superrationality-daos/>>.

³⁴⁰ Eric Kintner, 'Do Write a White Paper. Don't Write a Prospectus', *The Blockchain Law Blog* (Blog Post, 26 February 2018) <<https://www.swlaw.com/blog/blockchain-digital-currency/2018/02/26/do-write-a-white-paper-dont-write-a-prospectus/>> '[s]ometimes, the white paper is a deeply technical document. Many times, however, it reads more like a marketing brochure to hype a future ICO.'

³⁴¹ Not all peer-reviewed literature is accurate, for example, take this curious passage: 'Bitcoin is no [sic] subject to regulations, so that no other financial authority can influence its value on transactions made by the system. But this has a disadvantage, since, at a time, anyone can illegally enter in the system and generate a lot of Bitcoins', Octav Neguriță, 'Bitcoin – Between Legal and Financial Performance' (2014) *Contemporary Readings in Law and Social Justice* 242, 247. Bitcoin has been designed and operates so that the only way a person can generate Bitcoin is through mining, which is a valued aspect of the Bitcoin system.

³⁴² Bo-Christer Björk and David Solomon, 'The Publishing Delay in Scholarly Peer-Reviewed Journal' (2013) 7(4) *Journal of Informetrics* 914 where the average delay between submission and publication was 18 months, with an average delay across all journals of 12 months. See also Glenn Ellison, 'The Slowdown of the Economics Publishing Process' (2002) 110(5) *Journal of Political Economy* 947.

³⁴³ For example, some DDRs that are described in the literature no longer exist or have changed significantly, Mattereum, for example, began with the bold intention of creating a 'supreme court of the internet', but has since narrowed its focus to providing dispute resolution for its smart property register, Vinay Gupta, 'The Mattereum Manifesto: Green Capitalism, Product Information Markets, and the Blockchain', *Medium* (14 September 2019) <<https://medium.com/humanizing-the-singularity/how-post-industrial-capitalism-and-a-new-type-of-big-data-will-save-the-planet-6574b1d75bf6>>. Because Mattereum has been narrowed considerably it is not considered in this analysis.

³⁴⁴ Michael E Rose and Willem H Boshoff, 'The Peer-Review System for Academic Papers is Badly in Need of Repair', *The Conversation* (27 February 2017) <<http://theconversation.com/the-peer-review-system-for-academic-papers-is-badly-in-need-of-repair-72669>>.

³⁴⁵ See Ledger <<http://ledgerjournal.org>>. Interestingly the peer reviewers' comments and the responses of the author or authors are also provided.

within six weeks of submission.³⁴⁶ Outside academia, people wanting to learn about blockchain are advised that the technology is moving so fast that blogs, and not books, are worth reading.³⁴⁷

Third, some seminal articles on blockchain have not been published in peer-reviewed journals, but have been published online on SSRN as working papers.³⁴⁸

In addition to the time factor for peer-reviewed journals, some people are reluctant to publish in such journals because the journals are not always at the cutting edge of research. Ralph Merkle, who invented Merkle Trees, which are used widely in blockchain,³⁴⁹ and has proposed running a democracy as a DAO,³⁵⁰ was the first to propose a scheme for public key cryptography.³⁵¹ His paper, written when he was an undergraduate, was rejected by *Communications of the ACM* because it was not in the mainstream of cryptography thinking.³⁵² Undeterred, Merkle revised the paper and when it was published,³⁵³ almost three years later, other work on the area had been published.³⁵⁴

Podcasts are another rich source of information as a number of podcasts have interviewed founders and others working on projects. In these interviews, which mostly range from 20 minutes to well over an hour, knowledgeable interviewers who specialise in blockchain are able to draw out information about not only what is being worked on and what future plans are, but most importantly why certain decisions were made.

³⁴⁶ Giulio Prisco, 'First Peer-Reviewed Academic Bitcoin Journal, Ledger, Launches and Issues Call for Papers', *Bitcoin Magazine* (16 September 2015) <<https://bitcoinmagazine.com/articles/first-peer-reviewed-academic-bitcoin-journal-ledger-launches-issues-call-papers-1442439097/>>.

³⁴⁷ Haseeb Qureshi, 'The Authoritative Guide to Blockchain Development: Navigating the Blockchain Conundrum' *Techspot* (21 March 2018) <<https://www.techspot.com/article/1594-blockchain-development/>> 'the most important figures seldom have the time to write books, and books are often outdated by the time they're released.' In addition, individually maintained blogs are decreasing in importance with the rise of more centralised blogs such as Medium (<<https://medium.com>>) and Hackernoon (<hackernoon.com>) where people contribute posts rather than maintaining their own separate blog sites.

³⁴⁸ Wright and De Filippi (n 157).

³⁴⁹ Ralph C Merkle, 'US Patent 4309569A, Method of Providing Digital Signatures', *Google Patents* (5 January 1982) <<https://patents.google.com/patent/US4309569A/en>>.

³⁵⁰ Merkle, 'DAOs, Democracy and Governance' (n 121).

³⁵¹ See Craig P Bauer, *Secret History: The Story of Cryptology* (CRC Press, 2013) 475–479 and see 'Ralph Merkle: Revolutionizing Democracy Using DAOs', *Epicentre* (Podcast, 25 July 2016) <<https://epicenter.tv/episode/141/>>.

³⁵² Bauer, *Secret History* (n 351) 476 and the editor 'was particularly bothered by the fact that there are no references to the literature' at 477. Given that the idea was novel the lack of references to the literature was not surprising.

³⁵³ Ralph Merkle, 'Secure Communications over Insecure Channels' (1978) 21 *Communications of the ACM* 294.

³⁵⁴ Bauer, *Secret History* (n 351) 478, most notably Whitfield Diffie and Whitfield Diffie and Martin Hellman, 'New Directions in Cryptography' (1976) 22(6) *IEEE Transactions on Information Theory* 644.

One interviewee commented on the need to use grey literature, and drew attention to the paucity of work in peer-reviewed journals. The interviewee stated, in relation to the wider concept of decentralisation, 'I have had a look at the academic work, but I just don't see quality yet in this space'.³⁵⁵ They went on to observe that 'there's some interesting stuff on Medium, but that's not the most authoritative source. You basically have to use evidence of multiple attestations, read everything and look at everything.'³⁵⁶

In summary, for this thesis, the scholarly literature was augmented with the grey literature to ensure that the analysis of DAOs was current and relevant. To triangulate the data, semi-structured interviews were used to augment the findings.

2.3.1.2 *Semi-structured Interviews*

Semi-structured interviews³⁵⁷ were used to triangulate data from the literature.³⁵⁸ Empirical research, including interviews are often used in organisation studies,³⁵⁹ with organisation studies, also called organisation theory, being one of the theories upon which IC is built.³⁶⁰ In addition, semi-structured interviews have been used in studies on emerging technologies.³⁶¹ For example, semi-structured interviews have been used to help understand the challenges faced by tech start-ups in complying with data protection laws.³⁶²

³⁵⁵ Interviewee 10 (regulator).

³⁵⁶ Ibid.

³⁵⁷ Lioness Ayres, 'Semi-structured Interview' in Lisa M Given (ed), *The Sage Encyclopaedia of Qualitative Research Methods* (Sage, 2012) 811.

³⁵⁸ Jan Recker, *Scientific Research in Information Systems: A Beginner's Guide* (Springer, 2013) 104.

³⁵⁹ Antonio Strati, *Theory and Method in Organization Studies: Paradigms and Choices* (Sage Publications, 2000), cited in John Selby, 'A New Institutional Economics Analysis of the History of the Regulation of the .au country-code Top-Level Domain' (PhD Thesis, University of New South Wales, 2013) 31.

³⁶⁰ See above n 189 and accompanying text.

³⁶¹ Aurélie Tricoire, 'Uncertainty, Vision and the Vitality of the Emerging Smart Grid' (2015) 9 *Energy Research & Social Science* 21; Áine Regan, 'Smart Farming' in Ireland: A Risk Perception Study with Key Governance Actors' (2019) 90-91 *NJAS – Wageningen Journal of Life Sciences* 100292 and Eugen Octav Popa et al, 'The Use of Digital Twins in Healthcare: Socio-Ethical Benefits and Socio-Ethical Risks' (2021) 17(6) *Life Sciences, Society and Policy*.

³⁶² Chris Norval et al, 'Data Protection and Tech Startups: The Need for Attention, Support, and Scrutiny' (2021) 13 *Policy Internet* 278.

The semi-structured interviews used a pre-set list of questions (see Appendix C) in an organised order and provided some flexibility for participants to provide additional observations and information.³⁶³ The questions were designed from the literature to elicit the interviewees' knowledge of DAOs, decentralisation, governance dispute resolution and legal frameworks. Because people with different experiences in and of DAOs were interviewed, the questions varied slightly depending on which group the interviewee fell into.

The participants comprised people from four groups: founders of DAOs; consultants for DAOs; people who worked for DAOs; and regulators. Although DAOs are global, the participants were based in New Zealand or Australia or they or the DAO had strong ties to New Zealand or Australia. The reason for limiting the participants to New Zealand and Australia or those with strong ties to those two jurisdictions was due to the legal frameworks in the two jurisdictions being broadly similar for data analysis. Owing to the relatively recent creation of DAOs, finding regulators who had experience of DAOs, or even knew about them, was challenging.

After receiving ethics approval, 13 participants were interviewed individually during the period July to October 2019.³⁶⁴ Three interviews, however, were excluded from the analysis because it transpired that the projects in which the interviewees were involved were not DAOs. Two were pseudo DAOs³⁶⁵ and one was an organisation that did not use smart contracts and was controlled by a single person. The questions were provided to the participants at least one day before the interview, which allowed them to understand the nature of the questions before the interviews took place. Providing the questions ahead of time enabled participants to provide more specific answers as they were able to double check information before providing it. The semi-structured interviews, which lasted between 50 and 80 minutes, were conducted face-to-face or via Zoom; the method depended on the locations of the author and participant. The interviews were conducted in English, audio-taped with the participant's permission, and transcribed verbatim for data analysis.

³⁶³ Recker (n 358) 90.

³⁶⁴ Guest et al, 'How Many Interviews are Enough? An Experiment with Data Saturation and Variability' (2006) 18(1) *Field Methods* 59 found that the data saturation point for interviews was 12.

³⁶⁵ See below 3.3.2 for a discussion about pseudo DAOs.

The process of identifying and approaching potential participants to take part in the voluntary interviews³⁶⁶ was three-fold: first, I approached my connections in the blockchain industry whom I knew were involved in DAOs; second, I identified people involved in DAOs through postings on social media and other websites written by them or others; third, I used snowballing as DAOs are relatively niche and participants were likely to know others involved in DAOs. While snowballing has been criticised because the participants can be from the same geographical area and may have similar socioeconomic statuses and backgrounds,³⁶⁷ DAOs are new and the number of people with sufficient knowledge and experience in them is limited.

Common themes were identified and data reduction, the process of 'selecting, focusing, simplifying, abstracting, and transforming the data'³⁶⁸ was used, thus a thematic analysis was used. The interviews produced valuable data, which have been used in the thesis. While there were common themes, such as the experimentation that was occurring with DAOs, there were also divergent views amongst the interviewees. For example, some interviewees thought that for a DAO to be a true or proper DAO it required all on-chain governance.³⁶⁹ Others realised, through their experience of DAOs, that while on-chain governance was the goal, because of the state of the technology, the developing nature of DAO governance and token holders' understanding of governance, DAOs could not be limited to only those using entirely on-chain governance.³⁷⁰

³⁶⁶ The use of voluntary participation is typical in studies of human subjects, Recker (n 358) 144.

³⁶⁷ Robert Wall Emerson, 'Convenience Sampling, Random Sampling, and Snowball Sampling: How Does Sampling Affect the Validity of Research?' (2015) March-April *Journal of Visual Impairment & Blindness* 164, 166.

³⁶⁸ Mathew B Miles and A M Huberman, *Qualitative Data Analysis: An Expanded Sourcebook* (Sage Publications, 1994) 10.

³⁶⁹ Interviewees 4 (working for a DAO), 8 (consultant) and 9 (regulator).

³⁷⁰ Interviewees 3 (DAO founder, not yet in operation), 5 (consultant), 6 (consultant) and 7 (consultant).

2.3.1.3 Analysis of Disputes Decided Using Kleros

Chapter Five deals with the resolution of disputes within DAOs, and DDRSs. As noted previously, Kleros is a DDRS and as at 31 March 2021 had heard over 500 disputes.

DDRSs are designed to hear a range of disputes. Depending on the DDRS, they can hear disputes involving smart contracts, internal disputes with a DAO, disputes between a DAO and third parties, as well as general disputes unconnected to smart contracts or even blockchain. Aragon Court was specifically designed to provide a DDRS for DAOs.³⁷¹

The common feature of DDRSs is that people adjudicate the disputes — artificial intelligence (AI) is not used to resolve disputes. DDRSs vary considerably and use divergent mechanisms to resolve disputes: some will use verified adjudicators, while others have no requirements as to who can be an adjudicator.³⁷² Adjudicators may be paid a fee regardless of their decision or they may gain or lose tokens depending on how they vote (or fail to vote). Adjudicators may consult each other when arriving at a decision, or give their decision via a vote without consulting the other adjudicators. Moreover, some DDRSs have internal appeals, others do not.

Simple random sampling,³⁷³ a form of probability sampling,³⁷⁴ was used to generate a randomised selection of 30 Kleros disputes to analyse the decision-making process of a DDRS.³⁷⁵ All the information jurors see,³⁷⁶ including the evidence provided by parties, is accessible online, as are the voting results and any justifications provided by jurors.³⁷⁷ While it would have been desirable to

³⁷¹ Cuende (n 8) 11.25–12.20min.

³⁷² Although DDRSs require people to purchase tokens to be eligible for selection as an adjudicator.

³⁷³ Steven K Thompson, *Sampling* (Wiley, 3rd ed) 11.

³⁷⁴ Mohamed Elfil and Ahmed Negida, 'Sampling methods in Clinical Research; an Educational Review' (2017) 5(1) *Emergency (Tehran, Iran)* e52.

³⁷⁵ Kleros uses a numbering system for its disputes, starting with one, which enables the use of an online random generator to randomly select disputes to analyse <random.org>.

³⁷⁶ A minimum of three jurors is assigned to hear each dispute. Notwithstanding the term 'juror', the jurors are not the same as traditional jurors in a court, see below 5.3.1.3. For example, jurors in Kleros are required to purchase tokens and are assigned disputes at random. They are required to stake tokens and if they vote in the minority or fail to vote they lose their staked tokens.

³⁷⁷ However, one detail that was not always provided was the type of court that heard the dispute. Of the 30 disputes analysed the court details were not provided for eight disputes. Of those that were provided, two were in the General Court and the remainder were in the TCR Court.

have analysed disputes under a range of DDRSs, at the time of analysis Kleros was the only DDRS that had dealt with more than a handful of disputes.

Notwithstanding that none of the 30 Kleros disputes dealt with a dispute relating to a DAO, the analysis was useful. The analysis provided data on the percentage of disputes applicants won; whether the adjudicators decided the disputes unanimously; whether adjudicators provided justifications; the percentage of disputes where an adjudicator failed to vote; whether appeals occurred; and the outcome of those appeals.

2.4 Conclusion

This chapter has explained NIE as it is the main building block of IC, the methodological framework used for this thesis. In the literature, IC has been broadly defined as ‘the study of how blockchains interact with our existing and social institutions’,³⁷⁸ yet another formulation narrows IC to providing the infrastructure for platforms that can create institutions that govern behaviour.³⁷⁹ The formulation used for this thesis for IC is the study of how blockchain can be used to create and shape DAOs and coordinate group decision-making.

The thesis’ research design has been explained. The thesis has used data from the literature, including scholarly and grey literature, semi-structured interviews, and an analysis of disputes decided by the DDRS Kleros. The semi-structured interviews were used to triangulate data from the literature.

³⁷⁸ Berg, Davidson and Potts, *Understanding the Blockchain Economy* (n 116) 1.

³⁷⁹ Berg, Markey-Towler and Novak (n 231) 10.

Chapter Three: DAO Categories

3.1 Introduction

Just as organisations take many forms, including partnerships,³⁸⁰ trusts,³⁸¹ co-operatives,³⁸² companies,³⁸³ unincorporated and incorporated societies,³⁸⁴ charitable trusts,³⁸⁵ and others,³⁸⁶ DAOs also have a wide variety of forms. For example, DAOs can be for-profit or not-for-profit, and they can be used to coordinate people's actions, for example, to protect land and other resources, and to potentially run a democracy.³⁸⁷

Defining what a DAO is, and what it is not, and the different forms DAOs can take, is the focus of this chapter. The DAO categories are important as the differences between DAOs highlight issues that need to be resolved in terms of governance, dispute resolution and the legal structure of DAOs. This chapter, therefore, links directly to the three chapters that follow it: Chapter Four deals with governance, Chapter Five focuses on dispute resolution and Chapter Six is concerned with legal structures.

The chapter explains the terminology relating to DAOs, provides a definition of a DAO, and sets out the characteristics of DAOs in Part 2. Part 3 explains what is and what is not a DAO; despite some entities being described as DAOs, or even using DAO as part of their name, such entities are not DAOs. Part 4 sets out a classification of DAOs. Part 5 contains the chapter's conclusion.

³⁸⁰ Partnership Law Act 2019 (NZ).

³⁸¹ Trusts Act 2019 (NZ).

³⁸² Co-operative Companies Act 1996 (NZ).

³⁸³ Companies Act 1993 (NZ).

³⁸⁴ Incorporated Societies Act 1908 (NZ) and see generally Mark von Dadelszen, *Law of Societies* (LexisNexis, 2013, 3rd ed).

³⁸⁵ Charitable Trusts Act 1957 (NZ).

³⁸⁶ For example, Friendly Societies and Credit Unions Act 1982 (NZ).

³⁸⁷ Merkle, 'DAOs, Democracy and Governance' (n 121).

3.2 DAOs and Their Characteristics

3.2.1 Evolution of Terminology

DAOs were first called decentralised autonomous corporations (DACs).³⁸⁸ The term ‘decentralised autonomous organisation’ was coined in 2014.³⁸⁹ However, the use of DAC has fallen by the wayside and is now used rarely;³⁹⁰ indeed, Daniel Larimer, who coined the term DAC, conceded it was changed to DAO ‘to avoid unnecessary legal entanglements, but the concept remains the same’.³⁹¹

The meaning of ‘DAO’ has changed over the years. Initially, and still to some purists, inclusion of the word ‘autonomous’ indicated that a DAO made decisions for itself.³⁹² Following that reasoning, DAOs are fully autonomous organisations free from human intervention (‘they not need (nor heed) their original creator’³⁹³) and can include AI to rewriting their code.³⁹⁴ However, as the next section shows, this thesis uses a more nuanced definition to better encapsulate the variety of DAOs because DAO members will make governance and other decisions in a DAO. An autonomous entity, which is free from human involvement and makes its own decisions, is more accurately termed an AI DAO.³⁹⁵ Despite the common use of the term ‘DAO’, some DAOs or proposed DAOs prefer to use different

³⁸⁸ Larimer, ‘The Hidden Costs of Bitcoin’ (n 334) and see also J M P Montevideo, ‘Computer Corporations: DAC Attack’, *The Economist* (28 January 2014) <<https://www.economist.com/babbage/2014/01/28/dac-attack>>.

³⁸⁹ The first known use of the term ‘DAO’ was by Vitalik Buterin, ‘DAOs are Not Scary, Part 1: Self-Enforcing Contracts and Factum Law’, *Bitcoin Magazine* (25 February 2014) <<https://bitcoinmagazine.com/articles/daos-scary-part-1-self-enforcing-contracts-factum-law-1393297672>>.

³⁹⁰ One exception is the use of DAC (decentralised autonomous community) for DAOs that are built on the blockchain EOS, Alredo de Candia, ‘How to Create a DAC on EOS’, *Cryptoeconomist* (6 September 2020) <<https://en.cryptonemist.ch/2020/09/06/how-to-create-a-dac-on-eos/>>. Binance, a large cryptocurrency exchange defines a DAC as a decentralised autonomous cooperative, Binance, ‘Decentralized Autonomous Cooperative (DAC)’, *Binance* (Web Page) <<https://www.binance.vision/glossary/decentralized-autonomous-cooperative>>.

³⁹¹ Larimer, ‘Is The DAO Going to be DOA?’ (n 2). For example, by late 2014 DAC and DAO were being used interchangeably by some, Dean Walsh, ‘DACs vs the Corporation’, *Bitcoin Magazine* (18 November 2014) <<https://bitcoinmagazine.com/articles/dacs-vs-the-corporation-1416342363>>.

³⁹² Buterin, ‘DAOs, DACs, DAs and More’ (n 332).

³⁹³ Primavera De Filippi and Samer Hassan, ‘Blockchain Technology as a Regulatory Technology: From Code is Law to Law is Code’ (2016) 21(12) *First Monday* <<https://doi.org/10.5210/fm.v21i12.7113>>.

³⁹⁴ Buterin, ‘DAOs, DACs, DAs and More’ (n 332); Glaser and Bezenberger (n 12); De Filippi and Wright (n 10) 146; and Carl Gardsell, ‘The Organizations of the New World’, *Medium* (2 December 2017) <<https://medium.com/@sacricarl/the-new-world-of-consensus-based-organizations-9673be366bb7>>.

³⁹⁵ Gardsell (n 395).

terms, including decentralized borderless voluntary nation (DBVN),³⁹⁶ distributed human organization (DHO),³⁹⁷ and distributed cooperative organisation (DisCO).³⁹⁸

The next section sets out the definition of a DAO this thesis uses as well as the characteristics of DAOs.

3.2.2 Definition and Characteristics of DAOs

Before looking at the definition and characteristics of a DAO it must be noted that there is no model DAO, despite the creation of a standard DAO framework in 2016 by Slock.it.³⁹⁹ The Slock.it framework⁴⁰⁰ — code written in the computer programming language Solidity — was designed for DAOs running on the Ethereum blockchain and allows any Ethereum user to interact with a DAO, including creating new DAO tokens, through participating exchanges.⁴⁰¹ A significant problem with the Slock.it framework emerged when a DAO (called The DAO)⁴⁰² was hacked, which led to an inability to change The DAO's rules after it had deployed.⁴⁰³ Therefore, the Slock.it framework has not been adopted widely.⁴⁰⁴

³⁹⁶ Bitnation, 'Frequently Asked Questions', *Bitnation* (Web Page) <<https://tse.bitnation.co/faq/>> 'DBVN's are autonomous organizations formed as smart contracts on the Ethereum blockchain under any code of law or set of rules. They are the governance service equivalent of Decentralised Autonomous Organisations (DAO).'

³⁹⁷ Rieki Cordon, 'Welcoming Hypha's Decentralized Human Organisation', *Medium* (13 August 2019) <<https://medium.com/joinseeds/the-dao-the-way-welcoming-hyphas-dao-f5a3346b4f67>> 'the DHO seeks to automate the majority of tasks to empower humans to more effectively and joyfully collaborate.'

³⁹⁸ DisCO, 'If I Only Had a Heart: A DisCO Manifesto' (2019) <https://disco.coop/wpcontent/uploads/2019/11/DisCO_Manifesto-v1-1.pdf>.

³⁹⁹ 'Decentralized Autonomous Organization (DAO) Framework', *GitHub* <<https://github.com/blockchainsllc/DAO>> and see Ellie Rennie and Jason Potts, 'The DAO: A Radical Experiment that Could be the Future of Decentralised Governance', *The Conversation* (11 May 2016) <<https://theconversation.com/the-dao-a-radical-experiment-that-could-be-the-future-of-decentralised-governance-59082>>.

⁴⁰⁰ 'Decentralized Autonomous Organization (DAO) Framework' (n 399).

⁴⁰¹ JP Buntinx, 'Ethereum Standard DAO Framework Gains Support from Major Exchanges', *Bitcoinist* (23 April 2016) <<https://bitcoinist.com/ethereum-standard-dao-framework-gains-support-from-major-exchanges/>>.

⁴⁰² Rennie and Potts (n 399).

⁴⁰³ There was no ability to change The DAO's rules once it had been deployed, Usha R Rodrigues, 'Law and the Blockchain' (2019) 104 *Iowa Law Review* 679, 701.

⁴⁰⁴ The Slock.it framework has been used, for example, by Siemens to create its Hutten-DDO (decentralised digital organisation), Kirsten D Sandberg et al, 'Blockchain and the Chief Strategy Officer: How Distributed Ledger Technology Will Change Strategy Design and Delivery' (14 July 2019) <https://papers.ssrn.com/sol3/Data_Integrity_Notice.cfm?abid=3438062> 62.

Because there are many different categories of DAO, designing and implementing a universal framework or standard is difficult. Also, while many DAOs have been built on the Ethereum blockchain, DAOs are not exclusive to Ethereum. DAOs can be built on other blockchains, such as EOS.⁴⁰⁵ Thus the programming language will not necessarily be the same across all DAOs. Second, as Section 3.4 shows, because there are many different types of DAO, and as Chapter Four explains, many different governance models, one framework is not suitable for even the majority of DAOs.

Creating a DAO from scratch is difficult.⁴⁰⁶ Even forking an existing DAO and modifying its code is complicated because an error in one of the DAO's smart contracts could be exploited by a hacker or the DAO could become ungovernable.⁴⁰⁷ To assist with the creation of DAOs that are unlikely to contain bugs, different entities offer services to create DAOs easily, hence DAOs-as-a-service.⁴⁰⁸ Those services include Aragon,⁴⁰⁹ DAOstack,⁴¹⁰ DAOhaus⁴¹¹ and Colony.⁴¹² The DAOs created using these services have different features.⁴¹³ For example, DAOs created in DAOstack use a relatively complicated reputation system, holographic consensus,⁴¹⁴ to aid decision-making and scalability. In

⁴⁰⁵ Onessus, 'How the Average Person Can Create A DAO on The EOS Blockchain Using Onessus', *Medium* (6 February 2019) <<https://onessus.medium.com/how-the-average-person-can-create-dao-on-the-eos-blockchain-using-onessus-cc5a4d4359a3>>.

⁴⁰⁶ María-Cruz Valiente, Samer Hassan and Juan Pavón, 'Results and Experiences from Developing DAOs with Aragon: A Case Study' (2017) <<https://core.ac.uk/download/pdf/334606407.pdf>> 9.

⁴⁰⁷ Blake West, '\$600M in 10 Days: How Crypto Project YAM Shows the Future of Finance', *Medium* (29 August 2020) <<https://medium.com/@bwest87/600m-in-10-days-the-incredible-story-of-a-crypto-project-named-yam-and-what-it-means-for-the-61be031888a6>>. Yam was a combination of forked code from four blockchain projects.

⁴⁰⁸ Youssef El Faqir, Javier Arroyo and Samer Hassan, 'An Overview of Decentralized Autonomous Organizations on the Blockchain' (Proceedings of the 16th International Symposium on Open Collaboration (*OpenSym 2020*), 25-27 August 2020) <<https://doi.org/10.1145/3412569.3412579>> 2. See also Daniel Kronovet, 'Aragon, DAOstack, Colony, Moloch', *Kronosapiens* (16 June 2019) <<https://kronosapiens.github.io/blog/2019/06/16/aragon-daostack-colony-moloch.html>>.

⁴⁰⁹ <<https://aragon.org/>>.

⁴¹⁰ <<http://daostack.io>>.

⁴¹¹ <<http://daohaus.club>>.

⁴¹² <<http://colony.io>>. In 2020, Colony, which operates on the Ethereum blockchain and offers DAOs-as-a-service, disabled the ability to create new DAOs using its service until it transitioned to the xDAI chain (an Ethereum-based sidechain) because of high fees, Grace Rebecca Rachmany, 'The Good, the Bad and the DAOs Only a Founder Could Love in 2020', *CoinDesk* (19 December 2020) <<https://www.coindesk.com/daos-2020-good-bad-ugly>>.

⁴¹³ El Faqir, Arroyo and Hassan (n 408) 3–4.

⁴¹⁴ Matan Field, 'Holographic Consensus—Part 1', *Medium* (12 November 2018) <<https://medium.com/daostack/holographic-consensus-part-1-116a73ba1e1c>> and see below 4.4.1.5 and Matan Field and Ezra Weller, 'Holographic Consensus — Part 2', *Medium* (19 June 2019) <<https://medium.com/daostack/holographic-consensus-part-2-4fd461e8dcde>>.

contrast, DAOs created in DAOhaus use a relatively simple decision-making process,⁴¹⁵ while Aragon allows for the creation a range of different DAOs, with different governance templates, which can be further customised.⁴¹⁶ Notwithstanding the different features, DAOs created using these services are identifiable as DAOs. The next section defines a DAO.

3.2.2.1 Definition of a DAO

There is no agreed definition of a DAO.⁴¹⁷ However, there is a fundamental split between those who define DAOs as fully autonomous entities free from human intervention⁴¹⁸ and those who define DAOs as governed by people.⁴¹⁹ As discussed in 3.2.1, an autonomous entity, which is free from human involvement and makes its own decisions, is more accurately termed an AI DAO⁴²⁰ and is not considered a DAO for the purposes of this thesis. With regard to those who define DAOs as governed by people, definitions of DAOs include:

‘people with common goals that join under a blockchain infrastructure that enforces a set of shared rules’;⁴²¹

‘software-based mechanisms for aligning economic incentives over the internet by distributing risks & rewards among people that share a common economic goal but don’t know each other’;⁴²²

‘a blockchain-based system that enables people to co-ordinate and self-govern themselves mediated by a set of self-executing rules deployed on a public blockchain, and whose governance is decentralised (ie independent from central control)’;⁴²³

⁴¹⁵ El Faqir, Arroyo and Hassan (n 408) 3–4.

⁴¹⁶ Joel Monegro, ‘Aragon DAOs’, *Placeholder* (7 May 2020) <<https://www.placeholder.vc/blog/2020/5/7/aragon-daos>>.

⁴¹⁷ El Faqir, Arroyo and Hassan (n 408) 2 and Samer Hassan and Primavera De Filippi, ‘Decentralized Autonomous Organization’ (2021) 10(2) *Internet Policy Review* <<https://doi.org/10.14763/2021.2.1556>>.

⁴¹⁸ Buterin, ‘DAOs, DACs, DAs and More’ (n 332).

⁴¹⁹ El Faqir, Arroyo and Hassan (n 408) 2.

⁴²⁰ Gardsell (n 395).

⁴²¹ El Faqir, Arroyo and Hassan (n 408) 2.

⁴²² Maciej Olpinski, ‘On Risks, Rewards and The Evolution of DAOs’, *Medium* (12 April 2016) <<https://medium.com/@maciejolpinski/on-risks-rewards-and-the-evolution-of-daos-c82db87a60a8>>.

⁴²³ Hassan and De Filippi (n 417). Hasan and Primavera also provide several other definitions from the literature.

‘a particular kind of organisation that, unlike conventional companies, is based on open source code and is operated entirely by its community’.⁴²⁴

This thesis does not adopt any of these definitions for following reasons. First, in relation to the term ‘blockchain’, other technology yet to be invented that is decentralised and cryptographically secure could be used as well.⁴²⁵ Thus while DAOs currently use blockchain, there is no reason to limit them too narrowly to just using blockchain. Second, ‘people’ also is limited because membership of DAOs need not be confined to natural people, for example, a DAO could be a member of another DAO.⁴²⁶ Third, while most DAOs will consist of people that do not know each other, some DAOs will comprise people that do know one another. Fourth, self-enforcing rules is an essential aspect of a DAO, which is used in most but not all the definitions. Finally, as this chapter explains, not all DAOs, such as charity and other not-for-profit DAOs, are concerned with distributing rewards (and risks) amongst their members. There are, however, useful elements in the definitions. The use of computer code or the use of blockchain or the internet is common. With the exception of the last definition, all envisage a DAO as operating online. They also contemplate the DAO having members, whether this is people or a community. Decentralisation and governance are only expressly mentioned once in the definitions, but both are alluded to in the definitions.

Of the definitions, the third definition is the closest to encompassing the definition a DAO which this thesis will use. For the purposes of this thesis a DAO is defined as an online-native decentralised organisation with self-enforcing rules, governed by its members.

The next section looks at the characteristics of DAOs.

⁴²⁴ Binance, ‘Decentralized Autonomous Organization (DAO)’, *Binance* (Web Page) <<https://www.binance.vision/glossary/decentralized-autonomous-organization>>.

⁴²⁵ Olipinksi, ‘On Risks, Rewards and the Evolution of DAOs’ (n 422).

⁴²⁶ Aaron Wright, ‘The DAO – DAOs from a Legal Perspective’, *Epicenter* (Podcast, 27 January 2021) <<https://epicenter.tv/episodes/376>>.

3.2.2.2 Characteristics of DAOs

Despite the broad range of DAOs, certain features are common to all. Yet, while DAOs are currently being built on public (permissionless) blockchains, DAOs are not necessarily permissionless, permission may be required to join a DAO. As one interviewee stated: ‘with DAO Stack you need to be voted in. DAOs are not permissionless like blockchains.’⁴²⁷

3.2.2.2.1 *Online-Native*

The first characteristic of DAOs is that they are online-native. At present DAOs run on the internet, but they are not limited to using the internet and could, for example, use a mesh network.⁴²⁸ The current technology used for DAOs is blockchain, but there is no reason why another cryptographically secure decentralised technology could not be used.⁴²⁹

3.2.2.2.2 *Decentralised*

Shermin Voshmgir argues that no DAO can be fully decentralised; there will always be some element of centralisation and, indeed, the DAO’s code is a form of centralisation.⁴³⁰ ‘Decentralised’ means that the DAO is not controlled by one person or entity. Although decentralised organisations⁴³¹ and virtual organisations are not new,⁴³² it is the combination of decentralisation and strict automatically enforced rules (which is looked at in the next section) that defines a DAO.

⁴²⁷ Interviewee 6 (consultant).

⁴²⁸ Aniruddh Rao Kabbinala et al, ‘Blockchain for Economically Sustainable Wireless Mesh Networks’ (2020) 32(12) *Concurrency and Computation Practice and Experience* <<https://doi.org/10.1002/cpe.5349>>.

⁴²⁹ Trent McConaghy, ‘AI DAOs, and Three Paths to get There’, *Medium* (18 June 2016) <<https://medium.com/@trentmc0/ai-daos-and-three-paths-to-get-there-cfa0a4cc37b8>>, who describes DAOs as ‘computational processes that run autonomously, on decentralized infrastructure, with resource manipulation’.

⁴³⁰ Shermin Voshmgir, ‘Tokenized Networks: What is a DAO?’, *Blockchainhub* (July 2019) <<https://blockchainhub.net/dao-decentralized-autonomous-organization>> cited by Minn (n 89) 161.

⁴³¹ See, for example, Matthews (n 4).

⁴³² See, for example, Matthews (n 4) and WH Davidow and MS Malone, *The Virtual Corporation: Structuring and Revitalizing the Corporation of the 21st Century* (Harper Collins, 1992) cited by Walker (n 5) 26.

There is a continuum between decentralisation and centralisation.⁴³³ Thus, while the ideal of decentralisation for a DAO may be that any token holder can propose a rule change or request funding and all token holders can vote on the rule change or funding request,⁴³⁴ in practice, this may not work. For example, there could be too many proposals or malicious proposals that would harm or even destroy the DAO if implemented.⁴³⁵ Even innocent proposals may harm the DAO as they may contain code with errors. Therefore, some DAOs have introduced elements of centralisation, including councils, and often allow token holders to delegate their votes to other members. Notwithstanding the seeming centralisation through the use of councils, mechanisms have been designed so that power is not concentrated,⁴³⁶ for example, enabling DAO members to remove and replace council members at will⁴³⁷ and requiring that members still make proposals and vote upon those proposals.⁴³⁸

Other DAOs take the pragmatic approach of decentralising some aspects, but not all. As Nexus Mutual, which provides insurance by holding members' funds in a common pool to pay claims to its members,⁴³⁹ states in response to the question 'How decentralised is Nexus Mutual?':⁴⁴⁰

We believe that pragmatic trade-offs are OK to start with. Therefore, in the interest of launching a viable product — as well as ensuring the security of the smart contracts — Nexus Mutual will launch with some aspects which are not fully decentralised. These will be reduced over time as the system becomes battle-tested and gains scale.

⁴³³ The continuum between decentralisation and centralisation was a theme raised by interviewees, specifically interviewee 4 (working for a DAO) and interviewee 5 (consultant).

⁴³⁴ Greg Hall, 'Welcome to the Jungle: Gorilla DAO', *Bitcoin Association* (Web Page, 22 April 2021) <<https://bitcoinassociation.net/welcome-to-the-jungle-gorilla-dao/>>.

⁴³⁵ Vu Gaba Vineb, 'The State of the DAOs', *Hackernoon* (18 April 2019) <<https://hackernoon.com/the-state-of-the-daos-b7cba318460b>>.

⁴³⁶ See below 4.3.2.2.

⁴³⁷ Decentraland (n 125).

⁴³⁸ Polkadot, 'Governance' (n 125).

⁴³⁹ Hugh Karp, 'DAO Governance: A Pragmatic Approach', *Medium* (15 June 2018) <<https://medium.com/nexus-mutual/dao-governance-a-pragmatic-approach-27d529ad0819>>.

⁴⁴⁰ Nexus Mutual, 'FAQ' <<https://nexusmutual.gitbook.io/docs/welcome/faq>>.

While elements of decentralisation are necessary for a DAO, the creation of a DAO does not always conform to the ideal of a community working together in a decentralised way to create it. Rather, a small team often conceptualises and builds what later becomes the DAO.⁴⁴¹ The DAO does not come into existence until it is turned over to the network. That is, until the person or group behind the project enables others to participate in the DAO's governance.⁴⁴² In particular, the DAO's creators or another entity cannot have sufficient tokens in the DAO to control its actions. An exception to a small team building what becomes a DAO are DAOs built using the services that offer DAOs-as-a-service.⁴⁴³ Simple DAOs using these services can be created within minutes.⁴⁴⁴

3.2.2.2.3 Self-Enforcing Rules

DAOs use smart contracts, which are self-enforcing computer programs.⁴⁴⁵ The DAO's smart contracts are its rules, in effect its constitution.⁴⁴⁶ The use of smart contracts, with their self-enforcing rules, means that a DAO's rules are strict and the DAO has no option but to follow them, thus they serve as pre-commitment devices.⁴⁴⁷

⁴⁴¹ Darcy W E Allen and Chris Berg, 'Blockchain Governance: What We Can Learn from the Economics of Corporate Governance' (2020) 3(1) *Journal of the British Blockchain Association* 1, 6 and Max Kuck, Victor Zscharnt and Johann Barbie, 'DEORA.earth | LeapDAO', *DAOCast* (Podcast, 18 March 2020) <<https://daocast.io/s04e03>> 15.23 to 15.30min.

⁴⁴² See Chapter Four for governance of DAOs.

⁴⁴³ See above nn 408–413 and accompanying text.

⁴⁴⁴ Monegro (n 416).

⁴⁴⁵ Minn (n 89) 146.

⁴⁴⁶ Chris Berg, Sinclair Davidson and Jason Potts, 'Blockchains as Constitutional Orders' in Richard E Wagner (ed), *James M. Buchanan: A Theorist of Political Economy and Social Philosophy* (Palgrave Macmillan, 2018) 383, 384. There are no templates for a DAO's rules. In contrast, traditional organisations have settled structures; indeed, templates and rules for organisations are available. In New Zealand there is an online constitution builder for incorporated societies, New Zealand Companies Office, 'Constitution Builder' <<https://isb.companiesoffice.govt.nz/constitutionbuilder/startscreen/>>. As DAOs increase in number, entities such as Aragon are providing tools that allow people to create DAOs and their rules relatively easily, see Aragon, 'Getting Started', *Aragon Developer Portal* (20 February 2020) <<https://hack.aragon.org/docs/getting-started.html>> 'You can think of Aragon as providing the Lego pieces to allow people (like you) to build the next generation of human organizations.'

⁴⁴⁷ Max Gulker, 'Smart Contracts as Pre-Commitment Devices on a Blockchain', *American Institute for Economic Research* (18 August 2017) <<https://www.aier.org/article/smart-contracts-as-pre-commitment-devices-on-a-blockchain/>>; Kevin Werbach, 'The Siren Song: Algorithmic Governance by Blockchain' in Kevin Werbach (ed), *After the Digital Tornado: Networks, Algorithms, Humanity* (Cambridge University Press, 2020) 215, 224–226; and Max Raskin, 'The Law and Legality of Smart Contracts' (2017) 1(2) *Georgetown Law Technology Review* 305, 309.

There is a key difference between a DAO's self-enforcing rules and the enforcement of rules in traditional organisations. In traditional organisations and institutions, the presence of rules, policies and procedures does not prevent unauthorised acts, and even if the wrongdoer is caught and punished, it is of little use to those who have suffered harm.⁴⁴⁸ A DAO's use of smart contracts, therefore, imposes *ex-ante* limitations and is a departure from the costly practice of *ex-post* monitoring and enforcement of traditional institutions.⁴⁴⁹ However, the initial costs of designing the *ex-ante* limitations may be higher than those needed to create traditional contracts.⁴⁵⁰

Another aspect of self-enforcing rules is that the rules a DAO imposes may, on occasion, not be limited to actions within the DAO itself. An important issue organisations face, particularly charities, is the transaction costs of ensuring that the money they distribute goes to the person to whom it was intended. Even then there is no guarantee that the efforts will be successful.⁴⁵¹ Through the use of smart contracts, programmable money can assist, for example, in foreign aid.⁴⁵² If a DAO sends cryptocurrency to a local entity or any person, it can specify who can accept it, not just for the initial transfer but for any period of time.⁴⁵³ This feature, the ability to programme money is not limited to DAOs, it could be used by other organisations.⁴⁵⁴

The rigidity of DAOs can create another set of issues that is not present in traditional organisations: DAOs can act only according to their code.⁴⁵⁵ If there is an error in a smart contract, or a smart contract does not permit a DAO to do something it needs to do to protect the DAO, the DAO

⁴⁴⁸ Jentzsch (n 25) 1.

⁴⁴⁹ Rohr and Wright (n 67) 49 and Werbach, 'The Siren Song' (n 447) 232.

⁴⁵⁰ Fabrice Lumineau, Wenqian Wang and Oliver Schilke, 'Blockchain Governance—A New Way of Organizing Collaborations?' (2021) 32(2) *Organization Science* 257, 269.

⁴⁵¹ See generally in relation to Africa, Dambisa Moyo, *Dead Aid: Why Aid is Not Working and How There is a Better Way for Africa* (Farrar, Straus and Giroux, 2009).

⁴⁵² For an early description of how blockchain can be used for foreign aid see Manisha Patel, 'Foreign Aid Blockchain. The £14Billion Game Changer for UK Tech', *The Fintech Times* (1 February 2017) <<https://thefintechtimes.com/foreign-aid-blockchain/>>.

⁴⁵³ Andrew Singer, 'Programmable Money: How Crypto Tokens Could Change our Entire Experience of Value Transfer', *Cointelegraph* (16 September 2020 <<https://cointelegraph.com/magazine/2020/09/16/programmable-money-crypto-tokens>>).

⁴⁵⁴ Ibid.

⁴⁵⁵ DuPont (n 3).

can be harmed and even cease operating. DAOs, however, are designed so that their rules can be changed, thus governance by DAO members, which is looked at next, is an essential feature of a DAO.

3.2.2.2.4 *Governance by DAO Members*

An essential element of a DAO is its members' ability to govern it, which includes their ability to change the DAO's rules. Governance for DAOs is wider than governance for traditional hierarchical organisations. In the latter, decisions about which people to employ, which contractors to use and how much to pay them are not considered as part of governance as they are operational decisions and thus carried out by management.⁴⁵⁶ Because a DAO has no managers or equivalent, token holders perform decision-making at the governance and operational levels. Thus, governance for a DAO includes decisions that would normally be called operational.

Vitalik Buterin argues that the token holders' role of governing DAOs can be seen as similar to democracies because DAO members can decide what they want to do and execute that choice,⁴⁵⁷ although DAOs mostly use direct democracy rather than delegative democracy.⁴⁵⁸ Just how the rules are changed will depend on the DAO as DAOs use a variety of governance mechanisms.⁴⁵⁹ For example, DAOs can choose to use all on-chain governance.⁴⁶⁰ In addition, DAOs can use a mix of on-chain and off-chain governance.⁴⁶¹ While some interviewees thought that for a DAO to be a true or proper DAO it required all on-chain governance,⁴⁶² the other interviewees were not of the same

⁴⁵⁶ Barry S Bader, 'Distinguishing Governance from Management' (2008) 8(3) *Great Boards* 1.

⁴⁵⁷ Buterin, 'DAOs, DACs, DAs and More' (n 332). Although Buterin was referring to decentralised organisations (DO) rather than DAOs, Buterin's definition of a DO is close to this thesis' definition of a DAO, as Buterin defines a DO as: 'a set of humans interacting with each other according to a protocol specified in code and enforced on the blockchain.'

⁴⁵⁸ Chapter Four discusses the differences between direct and delegative democracy and that some DAOs use elements of delegative democracy with councils.

⁴⁵⁹ See Chapter Four.

⁴⁶⁰ See above 2.2.2.4 for a discussion of on-chain governance.

⁴⁶¹ See above 2.2.2.4 for a discussion of off-chain governance. Maker DAO uses both on-chain and off-chain governance, MakerDAO, 'On-Chain Governance', *MakerDAO* (Web Page) <<https://community-development.makerdao.com/en/learn/governance/on-chain-gov/>> and MakerDAO, 'Off-Chain Governance', *MakerDAO* (Web Page) <<https://community-development.makerdao.com/en/learn/governance/off-chain-gov/>>.

⁴⁶² Interviewees 4 (working for a DAO), 8 (consultant) and 9 (regulator).

opinion and a combination was often required. One interviewee commented that the reasons why not all decisions were being made on-chain was due to:⁴⁶³

the extra inertia, the time required [for it to be on-chain]. You don't want to have to make every small decision like, are we going to buy these paper clips on-chain, it wastes time. You need a threshold, I think, to make it realistic. But that could change later on, I guess, if the technology becomes faster and more mature.

Another interviewee echoed with a similar sentiment, noting that 'the experience of [participating in DAO governance] is currently really clunky'.⁴⁶⁴ The same interviewee⁴⁶⁵ identified one way of developing governance, which would also assist with the time consuming, slow and wasteful nature of making small decisions on-chain, that is, to use different proposal and voting channels depending on the nature of the proposal:⁴⁶⁶

you would have a faster route to ask for up to one ETH grant funding, and slower if you are asking up to 10 [ETH], for example. So you would know that if you are asking up to one [ETH] you don't need to wait for a full week, you can do it in a matter of a day. Just like I'm asking for reimbursement for something, right, no big deal. Or if I'm asking for a budget that is more significant then I would want to have a bit more time for a discussion.

⁴⁶³ Interviewee 5 (consultant).

⁴⁶⁴ Interviewee 6 (consultant). See also, Arseneault, 'Voting Options in DAOs' (n 23) where a person involved with DXDao noted that when holographic consensus (see below 4.4.1.5) was used it 'adds more complexity to the governance process. The biggest drawback is probably that it is hard to understand the exact details of how the system works, especially if one is new to the DAO and system. Because of this, it takes time and energy for people to become familiar with the governance process and how to most effectively govern with it'.

⁴⁶⁵ Interviewee 6 (consultant).

⁴⁶⁶ Ibid.

Thus while on-chain governance is possible,⁴⁶⁷ and the goal of DAOs, given the development of the governance structures of DAOs and the technology, pragmatically it is not yet possible to categorise only those that use entirely on-chain governance as DAOs.

Another feature of the governance of DAOs arises through their use of open-source software⁴⁶⁸ and the norms associated open-source software. Anyone can access the code,⁴⁶⁹ and fork (copy) it to create a new DAO.⁴⁷⁰ MetaCartel DAO is a fork of Moloch, and was formed when Moloch did not admit a person as a member.⁴⁷¹ Forking to create a new DAO is a governance mechanism⁴⁷² and can occur for many reasons, including when members are dissatisfied with the DAO's governance.⁴⁷³ PIVX DAO⁴⁷⁴ is a fork of the Dash DAO.⁴⁷⁵

The assets and resources a DAO can control are broad and not merely limited to digital assets. DAOs can also be used to govern and protect physical assets, not just for the use of the members, but

⁴⁶⁷ Both the Dash DAO and NavCoin use on-chain governance, see Mosley et al (n 20) 2 and NavCoin, 'A Reintroduction to NavCoin', *NavCoin Collective* (23 December 2020) <<https://medium.com/nav-coin/a-reintroduction-to-navcoin-d3d4d683ecb5>>.

⁴⁶⁸ Previous concepts include: open source software (*Aahit Gaba and Heather Meeker, 'Open Source Money: Bitcoin, Blockchain, and Free Software', opensource.com (4 July 2018) <<https://opensource.com/article/18/7/bitcoin-blockchain-and-open-source>>*); commons literature (Elinor Ostrom, *Governing the Commons* (n 223); and decentralisation in political theory (Reijers, O'Brolcháin and Haynes (n 315) 146). Specific technologies include: public key cryptography (Diffie and Hellman (n 354); time stamping of electronic content (Stuart Haber and W Scott Stornetta, 'How to Time-Stamp a Digital Document' (1991) 3(2) *Journal of Cryptology* 99); proof of work, which was invented to combat spam (Cynthia Dwork and Moni Naor, 'Pricing via Processing, Or, Combatting Junk Mail, Advances in Cryptology' (1993) *CRYPTO'92: Lecture Notes in Computer Science No. 740* (Springer) 139); merkle trees (Ralph Merkle, US Patent 4309569A, 'Method of Providing Digital Signatures' (n 349)); and distributed computing (Maurice Herlihy, 'Blockchains from a Distributed Computing Perspective' January 2018 <<https://cs.brown.edu/courses/csci2952-a/papers/perspective.pdf>>).

⁴⁶⁹ Kogut and Metiu (n 284) 250.

⁴⁷⁰ Dash, for example, was a fork of Bitcoin, see Mosley et al (n 20) 3.

⁴⁷¹ Peter 'pet3rpan', 'Forking Moloch DAO' *Medium*, 8 May 2019 <<https://medium.com/metacartel/forking-moloch-dao-d140a37d6649>> (most DAOs do not have restrictions on who can become a member).

⁴⁷² Olpinski, "'Forking Systems' as a Governance Mechanism for DAOs' (n 7).

⁴⁷³ While Bitcoin is not a DAO, Bitcoin was forked to create Bitcoin Cash because some people were frustrated that Bitcoin would not increase its block size, David Glance, 'Bitcoin Splits and Bitcoin Cash is Created. Explaining Why and What Happens Now', *The Conversation* (2 August 2017) <<https://theconversation.com/bitcoin-splits-and-bitcoin-cash-is-created-explaining-why-and-what-happens-now-81943>>.

⁴⁷⁴ PIVX, 'Decentralized Governance', *PIVX* <<https://pivx.org/governance>>.

⁴⁷⁵ Gilles Hilary, 'Blockchain and Other Distributed Ledger Technologies, An Advanced Primer' (30 November 2020) <<http://dx.doi.org/10.2139/ssrn.3740067>> 22 and PIVX, 'PIVX Forks Dash to Provide Private Instant Verified Transactions and Community Designed Governance' *Cointelegraph* (Press Release, 19 March 2017) <<https://cointelegraph.com/press-releases/pivx-forks-dash-to-provide-private-instant-verified-transactions-and-community-designed-governance>>.

also as a commons.⁴⁷⁶ Thus DAOs are not simply limited to recreating traditional hierarchical corporations, which was a path foreseen by some earlier in their development.⁴⁷⁷

The ability to protect resources in a commons has long been controversial. Garrett Hardin argues that if a resource, such as a pasture for grazing animals, were free for all to use and take it would be plundered; everyone would be poorer as a result because farmers would attempt to keep as many of their cattle on the pasture.⁴⁷⁸ It would be rational for each farmer to continue to add cattle as they would capture all the value of the additional cattle. While overgrazing would mean a reduction in that farmer's return, and the cattle would not grow as fast or to the same weight, the loss to that farmer would not be as great as the return they would gain from the additional cattle because other farmers whose cattle grazed the pasture, would share the loss. Hardin believes that each farmer would continue to add more cattle until the pasture could no longer support the cattle, bringing ruin to all.⁴⁷⁹ Hardin's solution is for a central actor to control the commons and enact rules limiting the use of resources.⁴⁸⁰

In contrast to 'Hardin's shepherds' parable',⁴⁸¹ Elinor Ostrom and others conducted empirical research on the governance of common-based pool resources (managed commons).⁴⁸² One example was a pasture in a Swiss village where farmers grazed their cows on a communal meadow.⁴⁸³ There was no overgrazing: the villagers had agreed for hundreds of years to a set of rules.⁴⁸⁴ Contrary to

⁴⁷⁶ David Rozas et al, 'When Ostrom Meets Blockchain: Exploring the Potentials of Blockchain for Commons Governance' (30 July 2018, last revised 29 March 2021) <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3272329>.

⁴⁷⁷ Contrast, Robert Leonhard, 'Corporate Governance on Ethereum's Blockchain' (30 May 2017) <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2977522>.

⁴⁷⁸ Hardin (n 220) 1244. Hardin was not the first to make the argument about the tragedy of the commons. Hardin acknowledges William Foster Lloyd made it 1883, republished in William Foster Lloyd, 'W. F. Lloyd on the Checks to Population' (1980) 6(3) *Population and Development Review* 473.

⁴⁷⁹ Hardin (n 220) 1244.

⁴⁸⁰ Ibid 1245–1246.

⁴⁸¹ Mark Moritz et al, 'Open Access, Open Systems: Pastoral Management of Common-Pool Resources in the Chad Basin' (2013) 41(3) *Human Ecology* 351, 352.

⁴⁸² Ostrom, *Governing the Commons* (n 223), Ostrom was a political scientist, who would later win a Nobel Prize in economic sciences for her work on common-pool resources

⁴⁸³ Ostrom, 'Institutional Arrangements for Resolving the Commons Dilemma' (n 220) 11, citing Robert McC Netting, 'Of Ken and Meadows: Strategies of Alpine Land Use' (1972) 45(3) *Anthropological Quarterly* 132.

⁴⁸⁴ Ibid.

arguments that private ownership would promote more efficient use of common-pool resources,⁴⁸⁵ or granting an external authority full control of use allocation,⁴⁸⁶ keeping resources in the commons and thus available for communal use was more efficient than private ownership.⁴⁸⁷ As will be seen below in 3.4.8, DAOs could be used to manage a commons.

Ostrom derived eight design principles from her work on sustainably managing a commons,⁴⁸⁸ and properly designed DAOs that manage commons can meet all of Ostrom's principles.⁴⁸⁹ First, a DAO can have clearly defined boundaries.⁴⁹⁰ Second, local needs and conditions can be taken into account.⁴⁹¹ Third, a DAO's members can participate in modifying its rules.⁴⁹² Fourth, outside authorities can recognise a DAO's members' right to self-govern.⁴⁹³ Fifth, the ability to monitor and enforce the DAO's rules is enhanced due to the self-enforcement of smart contracts, and the transparency of actions may enable more accountability and increased forms of peer-to-peer monitoring.⁴⁹⁴ Sixth, there will be increased transparency and fewer breaches of rules due to the self-enforcement of smart contracts, and smart contracts can be used to regulate.⁴⁹⁵ Seventh, increased transparency and self-enforcement of smart contracts will aid in the resolution of disputes and low-cost dispute resolution can be provided by third parties.⁴⁹⁶ Finally, it is possible for DAOs to form multiple nested layers of organisations if DAOs interoperate between themselves.⁴⁹⁷

⁴⁸⁵ Ostrom, 'Institutional Arrangements for Resolving the Commons Dilemma' (n 220) quoting W P Welch, 'The Political Feasibility of Full Ownership Property Rights: The Cases of Pollution and Fisheries' (1983) 16(2) *Policy Sciences* 165, 171.

⁴⁸⁶ Ostrom, 'Institutional Arrangements for Resolving the Commons Dilemma' (n 220) 3, quoting Ian Carruthers and Roy Stoner, 'Economic Aspects and Policy Issues in Groundwater Development' (World Bank Staff Working Paper No 496, 1981) 29.

⁴⁸⁷ Elinor Ostrom, 'Institutional Arrangements for Resolving the Commons Dilemma' (n 220) 14.

⁴⁸⁸ Ostrom, *Governing the Commons* (n 223).

⁴⁸⁹ Rozas et al (n 476) and David Rozas, Antonio Tenorio-Fornés and Samer Hassan, 'Analysis of the Potentials of Blockchain for the Governance of Global Digital Commons' (2021) 4 *Frontiers in Blockchain* <<https://doi.org/10.3389/fbloc.2021.577680>>.

⁴⁹⁰ Rozas, Tenorio-Fornés and Hassan (n 489) 8–9.

⁴⁹¹ *Ibid* 9.

⁴⁹² *Ibid* 9–11.

⁴⁹³ *Ibid* 14–15 and see Chapter Seven for a discussion of the legal regulation of DAOs.

⁴⁹⁴ *Ibid* 11–12.

⁴⁹⁵ *Ibid* 12–13.

⁴⁹⁶ *Ibid* 13–14 and see Chapter Five which examines the provision of dispute resolution by third parties.

⁴⁹⁷ *Ibid* 15–16.

Owing to people's ingenuity in evading rules, Ostrom also makes it clear that rules need to evolve, thus adaptive governance is required.⁴⁹⁸ The need for adaptive governance is important for traditional organisations and is even more important for DAOs for two reasons. First, a DAO can do only that for which it is coded; it is impossible to foresee every eventuality and errors in its smart contracts are possible.⁴⁹⁹ The effect of an error and the inability to change rules was highlighted in The DAO hack when it became apparent that if a coding error was permitted to stand, it would enable a person to extract millions of dollars' worth of value.⁵⁰⁰ The inability to amend The DAO's rules to thwart the exploitation of the coding error led to the demise of The DAO.⁵⁰¹

Second, DAOs are evolving quickly and the mechanism for the evolution of rules is also important. If it is extremely difficult and time-consuming to change a DAO's rules, members frustrated by the process can not only leave, they can also fork the DAO and in effect set up a competing DAO.⁵⁰² An example of forking occurred in Bitcoin. While Bitcoin is not a DAO (see below 3.3.3), the issue of whether to increase its block size was debated for over two years,⁵⁰³ and the inaction saw the forking of Bitcoin, which led to the creation of Bitcoin Cash.⁵⁰⁴

3.2.2.2.5 *Challenging the Notion of the Firm*

The disruption of the notion of the firm that DAOs potentially enable is a deliberate act,⁵⁰⁵ as the white paper for Colony makes clear.⁵⁰⁶

⁴⁹⁸ Thomas Dietz, Elinor Ostrom and Paul C Stern, 'The Struggle to Govern the Commons' (2003) 302(5652) *Science* 1907, 1908.

⁴⁹⁹ The DAO hack serves as an example of what can go wrong, see generally, DuPont (n 3).

⁵⁰⁰ DuPont (n 3).

⁵⁰¹ Ibid.

⁵⁰² Olpinski, "'Forking Systems' as a Governance Mechanism for DAOs' (n 7).

⁵⁰³ Samuel Haig, 'Bitcoin Block Size, Explained', *Cointelegraph* (24 July 2019) <<https://cointelegraph.com/explained/bitcoin-block-size-explained>> and Di Rose and Mansouri (n 16) 199.

⁵⁰⁴ Glance (n 473).

⁵⁰⁵ Simon de la Rouviere, 'The Moloch DAO: Collapsing the Firm', *Medium* (17 January 2019) <<https://medium.com/@simondlr/the-moloch-dao-collapsing-the-firm-2a800b3aa2e7>>.

⁵⁰⁶ Alex Rea, Aron Fischer and Jack du Rose, 'Colony' white paper, 31 October 2019 <<https://colony.io/whitepaper.pdf>> 1. (The quoted material, however, does not appear in Colony's most recent white paper, Rea et al (n 27)).

Colony brings about a new “Nature of the Firm” by significantly reducing both the transaction costs of the market exchange mechanism for labour, and trust required for people to work together. This innovation makes pseudonymous, peer-to-peer organisations possible. Rather than centralised ownership and hierarchical management, smart contracts distribute ownership according to the value each individual contributes, and influence emerges from the bottom up through systematic peer review of contributed work.

An example of disruption could be an insurance business run by a DAO that uses DAO members as risk and claim assessors.⁵⁰⁷ It could be argued that the members who provide such services are external to the DAO as they are paid to provide those services; thus the DAO as a firm is buying rather than making.⁵⁰⁸ Indeed, the very nature of a person providing services to a DAO is to use a smart contract for each transaction, and as Coase observes, the use of ‘a separate contract for each exchange transaction’ can be seen as the very definition of a market transaction, and thus external to the firm.⁵⁰⁹ This point is one of the areas in which DAOs challenge the notion of a firm. Those members providing the services are part of the DAO because as token holders they are decision-makers in the DAO and are also subject to the financial performance of the DAO as part-owners. In contrast, a traditional provider of services and goods plays no role in its creditors’ governance. Nor will the payments it receives fluctuate depending on the creditor’s financial performance.⁵¹⁰

The next section distinguishes DAOs from entities that contain the name DAO or are described by some as DAOs.

⁵⁰⁷ Nexus Mutual, ‘FAQ’ (n 440).

⁵⁰⁸ See Steven Tadelis, ‘Complexity, Flexibility, and the Make-or-Buy Decision’ (2002) 92(2) *The American Economic Review* 433 who notes that Ronald Coase’s question (in Coase, ‘The Nature of the Firm’ (n 183)) of what determines whether an entrepreneur acquires goods or services from the market or directs their production, has since been called the ‘make-or-buy’ decision.

⁵⁰⁹ Coase, ‘The Nature of the Firm’ (n 183) 391.

⁵¹⁰ Certainly, those external to a firm run the risk of non-payment for services and goods and the loss of future contracts, but unless they are also a shareholder in the firm to which they provided the services and goods they would suffer no further loss.

3.3 Entities That Are Not DAOs

This section looks at entities that call themselves DAOs but do not operate as DAOs. In addition, there are pseudo DAOs and proto DAOs, that is, entities that have some DAO-like characteristics, but do not meet the definition of a DAO as set out in this thesis. Explaining why these entities are not DAOs is important because they have been portrayed as DAOs,⁵¹¹ and it is necessary clarify why this thesis does not consider them to be DAOs. Therefore, the entities discussed below will be excluded from the analysis and any recommendations relating to the governance of DAOs.

3.3.1 The Use of 'DAO' in a Name is Not Sufficient

The use of the term 'DAO' in an entity's name does not make it a DAO. Some entities appear to use the term DAO as a marketing ploy,⁵¹² much as 'blockchain' was used as a term by non-blockchain entities.⁵¹³ For example, DataBroker DAO, which intends to create a peer-to-peer marketplace for IoT (Internet of things) sensor owners to monetise that data, conceded that it was not operating as a DAO:⁵¹⁴

Since agility and flexibility are crucial in the early stages we decided that, since best practices and adoption of this model are still a moving target, Databroker DAO will be run using a traditional company structure, until such a time we, in active collaboration with the community and industry, can determine a governance model that works for all parties involved.

⁵¹¹ Passiak (n 119).

⁵¹² DAOs featured on the Gartner Hype Cycle for Emerging Technologies 2019, David Smith and Brian Burke, 'Hype Cycle for Emerging Technologies, 2019', *Gartner Research* (6 August 2019) <<https://www.gartner.com/en/documents/3956015/hype-cycle-for-emerging-technologies-2019>>.

⁵¹³ For example, in 2017 the Long Island Iced Tea Corp changed its name to Long Blockchain Corp and saw its shares rise by 289 percent: Arie Shapira and Kailey Leinz, 'Long Island Iced Tea Soars After Changing Its Name to Long Blockchain', *Bloomberg* (22 December 2017) <<https://www.bloomberg.com/news/articles/2017-12-21/crypto-craze-sees-long-island-iced-tea-rename-as-long-blockchain>>.

⁵¹⁴ Matthew Van Niekerk and Roderik van der Veera, 'Databroker DAO Whitepaper' (White Paper, 2017) <https://firebasestorage.googleapis.com/v0/b/databrokerdao-presale.appspot.com/o/WHITEPAPER_DataBrokerDAO_ENG_v1.2.pdf?alt=media&token=444bb292-d86b-4698-9cd9-06d434459eaa> 24–25.

The intention of the founders of entities such as DataBroker is that they transition to a DAO in due course. For an entity to be a DAO it must meet the definition of a DAO: an internet-native decentralised organisation with self-enforcing rules, governed by its members with the characteristics set out above in part 3.2.2.2.

At first glance, the next category of pseudo DAOs looks closer to DAOs, but for the reasons explained in the next section, they are not DAOs.

3.3.2 Pseudo DAOs

Pseudo DAOs are entities in which the members do not have full governance autonomy because another entity controls the entity's governance, although the pseudo DAO's members may have limited decision-making ability.⁵¹⁵ There are two types of pseudo DAO. First, a corporation or other entity may create a DAO-like entity as an internal way of organising a part of it, for example, for a team designing a new product.⁵¹⁶ Such a pseudo DAO could, for example, allow people to have their peers assess their work and be rewarded with reputation and other tokens that could be exchanged for fiat currency or other valuable consideration, thereby creating a bonus structure.⁵¹⁷ The reputation could be used to propose changes and also for voting on proposals made by others: the more reputation a person has, the more their vote is worth.⁵¹⁸ Or employees could have a low baseline salary with a larger amount tied to their pseudo DAO participation, including contributions to its decision-making.⁵¹⁹ In addition, customers and others could also participate in its decision-making.⁵²⁰ However, the token holders of such pseudo DAOs could not, for example, decide to take that new product and sell it in competition to the organisation.

⁵¹⁵ Bingen and Aragon One, 'Riding the EVM with Aragon Agent and EVM Scripts', *Aragon One* (Blog Post, 24 January 2020) <<https://blog.aragon.one/riding-the-evm-with-agent-and-evm-scripts/>>.

⁵¹⁶ Interviewee 10 (regulator).

⁵¹⁷ Colony uses a similar system, Rea et al (n 27) [2.3.1].

⁵¹⁸ *Ibid* [1.3].

⁵¹⁹ Passiak (n 119).

⁵²⁰ *Ibid*.

Second, an organisation, including a DAO, could create a pseudo DAO to provide a platform for its customers or members to use.⁵²¹ The customers may be called members and may even have some limited decision-making ability, but ultimate control would remain with the organisation that created the pseudo DAO.

Other DAO-like entities are possible where members may have more of a decision-making role, but for the reasons outlined below, such entities are proto DAOs, rather than DAOs.

3.3.3 Proto DAOs

An understanding of proto DAOs is necessary as the entities discussed in this section, Bitcoin and The DAO, are often described as DAOs,⁵²² particularly The DAO.⁵²³ A proto DAO is an entity in which, despite having most of the features of a DAO, its members cannot govern effectively or have no ability to govern it.

While Bitcoin has called a DAO, it has also been described as a proto DAO⁵²⁴ and ‘the first prototype for a DAO’.⁵²⁵ The ability, however, to change Bitcoin’s code, and hence its rules, is a slow, cumbersome process⁵²⁶ and subject to much debate.⁵²⁷ The ultimate decision as to whether to change Bitcoin’s code is done by miners and those running nodes, not by token holders voting.⁵²⁸ A proposed rule change in Bitcoin to increase the size of its blocks and increase the number of transactions it

⁵²¹ Bingen and Aragon One (n 515).

⁵²² Ying-Ying Hsieh et al, ‘Bitcoin and the Rise of Decentralised Autonomous Organizations’ (2018) 7(1) *Journal of Organization Design* 1, 3 in which Bitcoin is described as a DAO. See also Justin O’Connell, ‘Bitcoin is the Original DAO’, *The Bitcoinist* (17 May 2016) <<http://bitcoinist.com/bitcoin-original-dao/>>.

⁵²³ DuPont (n 3).

⁵²⁴ Olpinski, ‘On Risks, Rewards and the Evolution of DAOs’ (n 422).

⁵²⁵ Merkle, ‘DAOs, Democracy and Governance’ (n 121) 32.

⁵²⁶ Alex Galea, ‘Bitcoin Development: Who can Change the Core Protocol?’, *Medium* (31 March 2018) <<https://medium.com/@galea/bitcoin-development-who-can-change-the-core-protocol-478b8ac5fe43>>.

⁵²⁷ George Gerro, ‘The SegWit Forks: An Exit/Voice Account by George Gerro and Jeffery Atik’, *Medium* (17 February 2018) <<https://medium.com/blockchain-law/the-segwit-forks-an-exit-voice-account-b5cf01cbee97>> cited by Jeffery Atik and George Gerro, ‘Hard Forks on the Bitcoin Blockchain: Reversible Exit, Continuing Voice’ (2018) 1(1) *Stanford Journal of Blockchain Law and Policy* 24, fn 1.

⁵²⁸ Galea (n 526).

could process was argued over for years.⁵²⁹ In contrast, in the Dash DAO a proposal to increase the block size was voted on and passed within 24 hours.⁵³⁰

Ethereum, while arguably a more sophisticated platform than Bitcoin, as it allows for smart contracts to be created relatively easily,⁵³¹ also suffers from the drawback that while people in the Ethereum ecosystem can contribute their views, the core developers make the final decision on changes.⁵³² Another criticism of Ethereum is that Vitalik Buterin, one of Ethereum's founders, exercises a disproportionate level of influence,⁵³³ and has been described as Ethereum's 'charismatic leader'.⁵³⁴ However, because founders can retain a level of influence, 'soft power' can also occur in DAOs.⁵³⁵ Ethereum is important to DAOs; at the time of writing it was the most common blockchain upon which to build DAOs.⁵³⁶

The DAO, a venture capital fund, is another example of a proto DAO. The intention was that The DAO's assets would be used to fund projects and if those projects were successful the token holders would receive a share of the profits.⁵³⁷ The DAO was designed so that no changes to its rules

⁵²⁹ Kyle Torpey, 'This Solution to Bitcoin's Scaling Drama Has Been Available for Over Two Years', *Forbes* (31 August 2017) <<https://www.forbes.com/sites/ktorpey/2017/08/31/this-solution-to-bitcoins-scaling-drama-has-been-available-for-over-two-years/#7edf173a8673>> explaining how it took two years to increase the block size limit from 1 MB to 4 MB. In addition, while Bitcoin was cutting-edge technology when it was released in 2009, it has been argued that the difficulty in making changes has resulted in it falling behind newer blockchains, Max Gulker, 'Bitcoin: Decentralized Governance Put to the Test', *American Institute for Economic Research* (16 May 2017) <<https://www.aier.org/research/bitcoin-decentralized-governance-put-to-the-test/>>.

⁵³⁰ Di Rose and Mansouri (n 16) 199.

⁵³¹ Kate Timmerman and Molly Thomas, 'Ethereum: More Than "the New Bitcoin"' (2017) 37(5) *The Proctor* 26. Bitcoin does allow for simple smart contracts, although work is underway to enable Bitcoin to support more complex smart contracts, see Alyssa Hertig, 'Writing Bitcoin Smart Contracts Is About to Get Easier with New Coding Language', *CoinDesk* (13 August 2020) <<https://www.coindesk.com/bitcoin-smart-contracts-minsc-easier-new-coding-language/>>.

⁵³² Shiva Jairam, 'A Decentralized Fair Governance Model for Permissionless Blockchain Systems' (2021) <<http://ceur-ws.org/Vol-2835/paper3.pdf>>; Zachariadis, Hileman and Scott (n 15) 111; and see Bogdan Rancea, 'What is Ethereum Governance? Complete Beginner's Guide', *Unblock* (7 January 2019) <<https://unblock.net/what-is-ethereum-governance/>>.

⁵³³ For example, the decision to hard fork Ethereum due to The DAO hack was led by Vitalik Buterin and the Ethereum Foundation, see DuPont (n 3) 165 referring to the 'political clout of Buterin'.

⁵³⁴ Matt Godshall, 'Monero: A Model for Decentralised Governance', *Unhashed* (19 June 2018) <<https://unhashed.com/cryptocurrency-news/monero-model-decentralized-governance/>>.

⁵³⁵ Thurman (n 19).

⁵³⁶ Cooper Turley, 'An Overview of the Industry's Top DAOs', *DeFi Rate* (31 October 2019) <<https://defirate.com/top-daos/>>. A recent overview of DAOs looked only at DAOs built upon Ethereum, El Faqir, Arroyo and Hassan (n 408) 3–4.

⁵³⁷ Jordi Baylina, 'Understanding the DAO Accounting', *GitHub* (13 May 2016) <<https://github.com/slockit/DAO/wiki/Understanding-the-DAO-accounting>>.

could be made once it was deployed.⁵³⁸ Token holders were limited to voting on proposals to fund projects submitted to The DAO and paying DAO tokens to those who had submitted successful proposals.⁵³⁹

A DAO, as defined by this thesis, would allow token holders to put forward proposals to change its rules and token holders would be able to vote on whether the changes would be made or not. Indeed, a flaw in The DAO's code was exploited and tens of millions of dollars' worth of ether were siphoned off to an account under the hacker's control.⁵⁴⁰ The hacker's actions were ultimately thwarted, not by a rule change in The DAO, but because the underlying Ethereum blockchain was forked.⁵⁴¹ In contrast, Yam Finance (Yam),⁵⁴² a more recent DAO, which allowed its token holders to participate in governance, also contained a bug.⁵⁴³ However, because Yam allowed members to change its rules, Yam was able to continue operating.⁵⁴⁴

The next section outlines the different DAO categories.

3.4 DAO Categories

This section outlines nine different categories of DAO. While the specific DAOs mentioned below are not an exhaustive list of every DAO or potential DAO within each category, the classification of DAOs will help better understand the implications for governance, dispute resolution and legal regulation, which are covered in later chapters. For example, the governance of a not-for-profit DAO will be different in a simple not-for-profit charitable DAO, which distributes money collected from its members, to a DAO running an organisation and purchasing services. In addition, various legal structures may well be required depending on the category of DAO.

⁵³⁸ Rodrigues, 'Law and the Blockchain' (n 403) 701.

⁵³⁹ Jentzsch (n 25).

⁵⁴⁰ DuPont (n 3).

⁵⁴¹ Rodrigues, 'Law and the Blockchain' (n 403) 705–706 and Yeung (n 7) 234.

⁵⁴² <<https://yam.finance/>>.

⁵⁴³ Yam Finance, 'YAM Post-rescue Attempt Update' (n 74).

⁵⁴⁴ Doncho Karaivanov, 'The Full Story: Yam Finance's Rise & Fall & Rise Again', *The Chain Bulletin* (24 August 2020) <<https://chainbulletin.com/the-full-story-yam-finances-rise-fall-rise-again/>> and West (n 407).

3.4.1 Blockchain Platform

The first category of DAO is one that operates on a blockchain platform. These DAOs will not be the most common form as most DAOs will use a third-party blockchain platform, such as Ethereum.⁵⁴⁵ The reason why operating a DAO on a third-party blockchain is more common is due to the task of creating and maintaining a blockchain.

There are two main types of blockchain platform: public (permissionless) blockchains and permissioned blockchains. Bitcoin and Ethereum are examples of public blockchains, which anyone can use, that is, no permission is required.⁵⁴⁶ Indeed, Ethereum, in particular, has been described as a public good.⁵⁴⁷ In contrast, permission is needed to access and use a permissioned blockchain.⁵⁴⁸ Blockchain platforms are general purpose and can be used for many different things, including creating DAOs.

Currently the two most prominent public blockchains are Bitcoin and Ethereum, which as identified previously, are proto DAOs.⁵⁴⁹ It is possible, however, for a DAO to run a blockchain platform.⁵⁵⁰ While there are no examples of a DAO running a permissioned blockchain, it may be possible for a DAO to operate one because permissioned blockchains are often operated and thus

⁵⁴⁵ See El Faqir, Arroyo and Hassan (n 408).

⁵⁴⁶ P Sajana, M Sindhu and M Sethumadhavan, 'On Blockchain Applications: Hyperledger Fabric and Ethereum' (2018) 118(18) *International Journal of Pure and Applied Mathematics* 2965, 2966 and Paech (n 65) 1081.

⁵⁴⁷ Angela Walch, 'In Code(rs) We Trust: Software Developers as Fiduciaries in Public Blockchains' in Philipp Hacker et al (eds), *Regulating Blockchain: Techno-Social and Legal Challenges* (Oxford University Press, 2019) 58 n 51, citing Binary District Journal, 'Ethereum Researcher Explains Why Sharding is the Only True Blockchain Scaling Solution', *The Next Web* (21 March 2018) <<https://thenextweb.com/syndication/2018/03/20/ethereum-researcher-explains-sharding-true-blockchain-scaling-solution/>>.

⁵⁴⁸ Mohammad Dabbagh, 'A Survey of Empirical Performance Evaluation of Permissioned Platforms: Challenges and Opportunities' (2021) 100 *Computer & Security* (102078) 7 and Paech (n 65) 1081–1082.

⁵⁴⁹ See above 3.3.3.

⁵⁵⁰ The Dash DAO could be described as operating a blockchain platform, although its main use at the time of writing was to operate a cryptocurrency, see, eg, Kirill, 'Building dApps on Dash: An Interview with README', *Hackernoon* (9 January 2021) <<https://hackernoon.com/building-dapps-on-dash-an-interview-with-readme-ay3a342g>>. EOS has been described as a DAO, Singh and Kim (n 2) 121 and Myles Snider, 'EOS is a DAO', *The Block Crypto* (21 December 2018) <<https://www.theblockcrypto.com/post/5724/eos-is-a-dao>>. However, it has been questioned whether EOS is a DAO, Arjun Balaji, 'Why Do We Take EOS Seriously When It's Clearly a Plutocracy?', *The Block Crypto* (7 December 2018) <<https://www.theblockcrypto.com/daily/4427/why-do-we-take-eos-seriously-when-its-clearly-a-plutocracy>> given its relatively centralised nature of 21 block producers, Armin Krishnan, 'Blockchain Empowers Social Resistance and Terrorism Through Decentralized Autonomous Organizations' (2020) 13(1) *Journal of Strategic Security* 41, 54.

governed by a consortium of entities.⁵⁵¹ Those entities could form a DAO to operate the permissioned blockchain; there is no requirement that the DAO members must be natural persons.⁵⁵²

3.4.2 Creating a Cryptocurrency or Other Tokens (Including Non-fungible Tokens)

The second category is DAOs that create and maintain a cryptocurrency or a non-fungible token (NFT).⁵⁵³ The difference between this category and the first is that notwithstanding that a DAO in the first category may create and maintain a cryptocurrency, as Bitcoin and Ethereum do, those blockchains can also be used by many different people and entities for many different things.⁵⁵⁴ In contrast, a DAO that creates a cryptocurrency or other tokens is specialised and is used for the sole purpose of creating and maintaining that cryptocurrency or other token.

There are two types of DAO that create and maintain a cryptocurrency and other tokens. The first, and rarest, is the DAO that has created its own blockchain platform and is not using a third party's blockchain. Dash, which is a fork of Bitcoin, and is the cryptocurrency of the Dash DAO is a cryptocurrency in this category.⁵⁵⁵ Second is the DAO that uses a third-party blockchain, such as Ethereum, to create its cryptocurrency. Creating and maintaining a secure blockchain is a challenging and expensive task; thus, it is usually easier to use an existing blockchain upon which to build the DAO.

⁵⁵¹ Joseph Abadi and Markus Brunnermeier, 'Blockchain Economics' (31 August 2019) <https://scholar.princeton.edu/sites/default/files/markus/files/blockchain_paper_v7a.pdf> 8.

⁵⁵² Wright, 'The DAO – DAOs from a Legal Perspective' (n 426). Also, while it may be argued that there is no need for a consortium to use a DAO for its governance, a DAO may still be useful in consortiums with low trust levels as using a DAO would prevent one or two members from making unilateral decisions.

⁵⁵³ A NFT differs from a cryptocurrency as each NFT is unique and unlike with a cryptocurrency, it is not possible to send a fraction of a NFT to another person unless the NFT has been fractionalised, Proskauer, 'NFTs Are Interesting but Fractionalized Non-Fungible Tokens (F-NFTs) May Present Even More Challenging Legal Issues', *JD Supra* (Web Page, 23 April 2021) <<https://www.jdsupra.com/legalnews/nfts-are-interesting-but-fractionalized-9904209/>>. NFTs are tokenised versions of a digital or physical asset, for example, artwork, collectables and even real estate, António Madeira, 'NFTs Take on DeFi? Nonfungible Tokens Push to Be the Next Crypto Craze', *Cointelegraph* (8 October 2020) <<https://cointelegraph.com/news/nfts-take-on-defi-nonfungible-tokens-push-to-be-the-next-crypto-craze>> and see Dan Chirtoaca, Joshua Ellul and George Azzopardi, 'A Framework for Creating Deployable Smart Contracts for Non-fungible Tokens on the Ethereum Blockchain' (Conference Paper, 2020 IEEE International Conference on Decentralized Applications and Infrastructures (DAPPS), 3–6 August 2020) <<https://ieeexplore.ieee.org/abstract/document/9126027>>.

⁵⁵⁴ Sajana, Sindhu and Sethumadhavan (n 546) 2966.

⁵⁵⁵ Mosley et al (n 20) 3. NavCoin is also an example of a cryptocurrency that runs its own blockchain, <<https://www.navexplorer.com/dao>>.

MakerDAO,⁵⁵⁶ which operates the DAI cryptocurrency,⁵⁵⁷ is an example of such a DAO. MakerDAO uses the MKR token to govern its platform: MKR holders can vote on changes to MakerDAO.⁵⁵⁸ Yam Finance is another example of a DAO that has created its own cryptocurrency on Ethereum.⁵⁵⁹

3.4.3 Providing a Specialised Platform

The third category of DAO is that which creates and operates specialised platforms for others to use. Current examples include: social media platforms;⁵⁶⁰ cryptocurrency exchanges;⁵⁶¹ and platforms to enable others to create their own DAOs, thus DAOs-as-a-service.⁵⁶² Given this thesis is on DAOs, this section will examine DAOs as-a-service.

There are two types of platform — DAOs-as-a-service — that can be used to enable others to create and operate DAOs. The first is where the DAO uses another blockchain.⁵⁶³ For example,

⁵⁵⁶ <<https://makerdao.com/en/>>.

⁵⁵⁷ Dai, an ERC20 token running on the Ethereum blockchain, is a stablecoin: its purpose is to remain stable and pegged to the US dollar so that it does not fluctuate wildly in value, James Seibel, 'The Dai Stablecoin is a Game Changer for Ethereum and the Entire Cryptocurrency Ecosystem', *Medium* (12 April 2018) <https://medium.com/@james_3093/the-dai-stablecoin-is-a-game-changer-for-ethereum-and-the-entire-cryptocurrency-ecosystem-13fb412d1e75>. Stablecoins are considered desirable because they are designed to avoid the price volatility of cryptocurrencies, especially Bitcoin, Aleksander Berentsen and Fabian Schär, 'Stablecoins: The Quest for a Low-volatility Cryptocurrency' in Antonio Fatás (ed), *The Economics of Fintech and Digital Currencies* (CEPR Press, 2019) 65. See also Bank for International Settlements, 'Investigating the Impact of Global Stablecoins' (October 2019) <<https://www.bis.org/cpmi/publ/d187.pdf>>.

⁵⁵⁸ MakerDAO, 'What is MKR?' (Web Page, 11 September 2015) <<https://medium.com/makerdao/what-is-mkr-e6915d5ca1b3>>. The DigixDAO, which offered a stablecoin backed by gold, was also built upon Ethereum, Shi Chen et al, 'Econometric Analysis of a Cryptocurrency Index for Portfolio Investment' in David Lee Kuo Chuen and Robert Deng (eds), *Handbook of Blockchain, Digital Finance, and Inclusion, Vol 1* (Academic Press, 2017) 177. DigixDAO, however, was wound up following a vote of its token holders, see Andrew Munro, 'What We Learnt from the Rise and Fall of the DigixDAO Autonomous Organisation', *Finder* (28 January 2020) <<https://www.finder.com.au/what-we-learnt-from-the-rise-and-fall-of-the-digixdao-autonomous-organisation>>.

⁵⁵⁹ West (n 407).

⁵⁶⁰ Hive DAO has created a social media platform, <<https://hive.blog/>>, but it is just one application running on top of Hive's blockchain, see <<https://hive.io/eco>>. And see, Sacrosanct, 'How does Hive DAO Work', *Hive Blog* (Blog Post, April 2020) <<https://hive.blog/hivequora/@sacrosanct/how-does-hive-dao-work-any-simple-way-to-understand-it-answering-in-quora>>.

⁵⁶¹ See, the Bisq DAO, Liam Hickey and Martin Harrigan, 'The Bisq DAO: On the Privacy Cost of Participation' (14 July 2020) <<https://arxiv.org/abs/2007.07048>>.

⁵⁶² El Faqir, Arroyo and Hassan (n 408) 2.

⁵⁶³ Colony, which is built on Ethereum, is an example of a platform that enables the creation of DAOs, Rea et al (n 27).

Aragon⁵⁶⁴ uses the Ethereum blockchain,⁵⁶⁵ and is designed to provide the tools for the creation of other DAOs.⁵⁶⁶ A significant part of Aragon is the creation of Aragon Court, a decentralised dispute resolution service (DDRS), which is analysed in Chapter Five. DAOstack is another example of a DAO creation platform, although at the time of writing it was not yet operating as a DAO.⁵⁶⁷ DAOstack has been described as:⁵⁶⁸

a platform for decentralized governance that enables collectives to self-organize around shared goals or values, easily and efficiently. DAOstack is sometimes called an operating system for collective intelligence, or a WordPress for DAOs.

Another even more specialised DAOs-as-a-service is Giveth, which attempts to provide a platform that will enable the creation of charitable DAOs.⁵⁶⁹ Bitnation is also a platform that enables people to create their own decentralised DBVN, which is a form of DAO.⁵⁷⁰

The second type of DAOs-as-a-service platform is where the DAO creation platform creates and operates its own blockchain. While it is easier initially to use a third-party blockchain, such as Ethereum, because the third party is responsible for running and securing the blockchain, there are disadvantages. First, changes to the blockchain, such as breaking smart contracts, could affect the DAO or other DAOs using that platform, which has occurred with Aragon's use of Ethereum.⁵⁷¹

⁵⁶⁴ <<https://aragon.org/>>. Aragon takes its name from an anarchist community in Spain that lasted for six years without centralised government, Mariia Rousey, 'What is Aragon Network and its Ecosystem: ANT, ANJ, and ARA Cryptocurrencies', *Changelly* (Blog Post, September 3, 2020) <<https://changelly.com/blog/aragon-ant-review/>>.

⁵⁶⁵ Aragon, however, is working on creating its own blockchain rather than using Ethereum, Aragon, 'Aragon Chain: A Proof of Stake Blockchain for the Aragon Community', *Aragon One* (Blog Post, 11 October 2019) <<https://blog.aragon.one/aragon-chain/>>.

⁵⁶⁶ Gaurav Agrawal, 'Building DAOs with Aragon', *Medium* (25 July 2019) <<https://medium.com/quiknode/building-daos-with-aragon-c8b95956a405>>.

⁵⁶⁷ DAOstack intends on transitioning to a DAO in 2021, Eric Arsenault, 'DAOstack in 2021', *Medium* (26 January 2021) <<https://medium.com/daostack/daostack-in-2021-2f0ba049e064>>.

⁵⁶⁸ Josh Zemel, 'An Explanation of DAOstack in Fairly Simple Terms', *Medium* (11 April 2018) <<https://medium.com/daostack/an-explanation-of-daostack-in-fairly-simple-terms-d0e034739c5a>>.

⁵⁶⁹ <<https://giveth.io/>>.

⁵⁷⁰ See 3.4.9 below for a discussion on DBVNs. ArisTaufik16, 'BITNATION: In Bitnation's World, You can Become a Citizen of any Nation Through a Smartphone Application', *Medium* (23 April 2018) <<https://medium.com/@arditfixni16/bitnation-in-bitnations-world-you-can-become-a-citizen-of-any-nation-through-a-smartphone-4e49b20ca9dc>>.

⁵⁷¹ Christine Kim, 'Ethereum's Istanbul Upgrade Will Break 680 Smart Contracts on Aragon', *CoinDesk* (30 September 2019) <<https://www.coindesk.com/ethereums-istanbul-upgrade-will-break-680-smart-contracts-on-aragon>>.

Second, there may be high fees for transactions,⁵⁷² which means that voting becomes costly, thereby decreasing the number of people willing to vote.⁵⁷³ LexDAO, for example, changed its voting scheme as a result of people's reluctance to vote due to the costs of voting.⁵⁷⁴ Finally, there may be congestion on the network, which means the ability to vote and conduct other actions becomes difficult.⁵⁷⁵ To resolve these limitations, Aragon is working on creating its own blockchain, instead of using Ethereum.⁵⁷⁶

3.4.4 Distribute Funds for Projects (For-Profit)

The fourth category of DAO is those that operate as a vehicle to distribute funds for projects. Such DAOs do no work themselves, apart from collecting money, deciding which projects to fund and, if the DAO is for-profit, remitting profits back to the DAO's token holders.

The DAO was the first high-profile DAO-like entity (as discussed above, The DAO was a proto DAO as it did not allow its members to change its code).⁵⁷⁷ The DAO operated as a decentralised venture capital fund and amassed over USD150 million.⁵⁷⁸ The intention was that people would make proposals for their projects to be funded and the token holders would vote upon which proposals to accept.⁵⁷⁹ A share in the funded projects' profits would be remitted back to the DAO and distributed amongst the token holders.⁵⁸⁰

⁵⁷² For example, a transaction on Ethereum in January 2021 was above USD9 for all but two days in that month, peaking at USD17.41 on 4 January 2021, Terence Zimwara, 'ETH Fees Surge to All Time High After the Crypto Passed the \$1,000 Mark', *Bitcoin.com* (10 January 2021) <<https://news.bitcoin.com/eth-fees-surge-to-all-time-high-after-the-crypto-passed-the-1000-mark/>>.

⁵⁷³ In 2020, Colony, which operates on the Ethereum blockchain and offers DAOs-as-a-service, disabled the ability to create new DAOs using its service because of high fees until it transitioned to the xDAI chain (an Ethereum-based sidechain), Rachmany, 'The Good, the Bad and the DAOs Only a Founder Could Love in 2020' (n 367). Even a fee of 25 cents to vote on DAOs running on Ethereum was seen by one interviewee as being too high, interviewee 5 (consultant). Since that time Ethereum fees have increased considerably; on 31 March 2021 the transaction fee was USD24.40.

⁵⁷⁴ 'Plutocracies aren't great', Arsenault, 'Voting Options in DAOs' (n 23).

⁵⁷⁵ See, 'CryptoKitties Craze Slows Down Transactions on Ethereum', *BBC News* (5 December 2017) <<https://www.bbc.com/news/technology-42237162>>.

⁵⁷⁶ Aragon, 'Aragon Chain' (n 565).

⁵⁷⁷ See above 3.3.3.

⁵⁷⁸ Minn (n 89) 141.

⁵⁷⁹ *Ibid* 150.

⁵⁸⁰ Baylina (n 537).

There is an attempt to create a more sophisticated version of The DAO,⁵⁸¹ which is also somewhat confusingly called 'The DAO', with the tag line of '[a] next-generation decentralized organization that co-ordinates the resources of a community (human and capital) to sustainably deliver value for members'.⁵⁸²

3.4.5 Not-for-Profits

The fifth category of DAO is not-for-profit DAOs. Not all traditional organisations are designed to return profits to their participants,⁵⁸³ for example, the purpose of charities is to benefit society.⁵⁸⁴ Proposals have been made for charitable DAOs, such as the 'Charity DAO',⁵⁸⁵ which promised that donors could 'stay in full control of the funds and vote on which projects will get funded, either directly or via a nominated delegate'.⁵⁸⁶ Under this model, a group of trustee curators would approve the projects and the projects would be paid via smart contracts as they met their agreed deliverables.⁵⁸⁷ A purported advantage of the Charity DAO was full transparency: all transactions would be visible on the Ethereum blockchain. The Charity DAO was proposed by Christoph Jentzsch who wrote the white paper for the ill-fated The DAO,⁵⁸⁸ which did not work as expected.⁵⁸⁹ Not

⁵⁸¹ Brady Dale, 'Former Polychain Partner Ryan Zurrer Is Leaving Web3 to Start a DAO', *CoinDesk* (5 August 2019) <<https://www.coindesk.com/former-polychain-partner-ryan-zurrer-is-leaving-web3-to-start-his-own-dao>>.

⁵⁸² DAO Community and Friends, 'The DAO', *GitHub* (White Paper, August 2019) <<https://github.com/the-dao/whitepaper>>.

⁵⁸³ For example, in New Zealand, the Red Cross, a humanitarian organisation, is a registered charity with the New Zealand Charities Commission (CC21860). Red Cross' activities in New Zealand include running Red Cross opportunity shops where donated goods are sold to the public <<https://www.redcross.org.nz/shop-with-us/>>.

⁵⁸⁴ The Preamble to the Charitable Uses Act 1601 (UK) sets out a list of charitable purposes, which are the relief of poverty, the advancement of education and religion, and any other purposes beneficial to the community that do not fall under the preceding heads.

⁵⁸⁵ The original proposal for the Charity DAO by Christoph Jentzsch in a *Medium* article on 19 November 2016 has been removed, but for information on the proposal see, Robert McGrath, "'Charity DAO': Improving Trust by Eliminating Trust", *Robert McGrath's Blog* (Blog Post, 24 November 2016) <<https://robertmcgrath.wordpress.com/2016/11/24/charity-dao-improving-trust-by-eliminating-trust/>>.

⁵⁸⁶ *Ibid.*

⁵⁸⁷ See Gavin Wood, 'Why I've Resigned as a Curator of the DAO', *Medium* (14 May 2016) <<https://medium.com/@gavofyork/why-ive-resigned-as-a-curator-of-the-dao-238528fbd447>>.

⁵⁸⁸ Jentzsch (n 25).

⁵⁸⁹ See generally DuPont (n 3).

surprisingly some viewed the Charity DAO with scepticism⁵⁹⁰ and it does not appear to be active at the time of writing.⁵⁹¹ Other projects are attempting to create charitable DAOs.⁵⁹²

Not-for-profit organisations include charities, but not all not-for-profits are charities—charities are simply one type of not-for-profit.⁵⁹³ A charity must have broader purposes beyond providing services for its members and it must meet one of a list of charitable purposes.⁵⁹⁴ In this classification, charities have not been separated into a separate category and are included within the not-for-profit general category. Not-for-profit DAOs can take two forms: those that funnel money to worthy causes and those that perform the work themselves.

3.4.5.1 *Funnel for Money for Not-for-Profit Causes*

A not-for-profit DAO can direct funds to worthy causes. For example, the DAO can be created to send funds when certain conditions have been met.⁵⁹⁵ Thus, if a location suffers an earthquake above a certain Richter scale, the funds are sent to a designated local entity to assist with earthquake recovery.⁵⁹⁶ The information about the earthquake would be gathered from ‘oracles’, that is, trusted

⁵⁹⁰ ‘Charity DAO Suffering from The Same Mistakes as The Original DAO’, *Newsbtc* (2016) <<https://www.newsbtc.com/2016/11/20/charity-dao-suffering-mistakes-original-dao/>>.

⁵⁹¹ The last tweet on the Twitter account ‘charity DAO’ was in 2016, @charityDAO (Charity DAO) (Twitter, 19 November 2016) <https://twitter.com/charity_DAO/status/799679362069131264>.

⁵⁹² See also <<http://charitydao.org/>> and Chris W, ‘A Charity DAO Structure’, *Medium* (10 October 2019) <<https://medium.com/@chriswjnr/a-charity-dao-structure-226e7dc9aaf6>>; Griff Green, ‘Giveth - Creating the New Economic Model of Giving’, *Epicenter* (Podcast, 24 April 2019) <<https://epicenter.tv/episode/284/>>; and Tomas Vrba, ‘Decentralized Governance, Reputation and Mechanism Design for a Global Social Impact Funding Platform on a Public Blockchain’ (April 2018) <http://live-riskinnovation.ws.asu.edu/wp-content/uploads/2018/05/Vrba_RIL_Blockchain_FinalProject_Part1.pdf>.

⁵⁹³ Donald Poirier, *Charity Law in New Zealand* (2013) 68. There is no requirement to register as a charity in New Zealand under the Charities Act 2005 (NZ), Charities Services, ‘Is Being Registered with Charities Services Still Right for Your Organisation?’, *Charities Services* (2 June 2017) <<https://www.charities.govt.nz/news-and-events/blog/is-being-registered-with-charities-services-still-right-for-your-organisation/>>, ‘[m]any registered charities aren’t aware they don’t have to be a registered charity to receive similar benefits to those above [income tax exemption, done status and receiving funding from funders]. Your charity might be eligible for some similar benefits that registered charities are entitled to without it being registered’, although it is generally easier for registered charities to be granted income tax-free status and donee status.

⁵⁹⁴ See above n 584.

⁵⁹⁵ For example, with insurance, if the wind rises above a predefined speed, Norton Rose Fulbright, ‘The Future of Smart Contracts in Insurance’ (September 2018) <<https://www.nortonrosefulbright.com/en/knowledge/publications/88244592/the-future-of-smart-contracts-in-insurance>>.

⁵⁹⁶ Alex Sims, ‘Forget Bitcoin, Blockchain Technology is Much Bigger’, *Stuff* (17 December 2017) <<https://www.stuff.co.nz/business/opinion-analysis/99905784/forget-bitcoin-blockchain-technology-is-much-bigger>>.

sources of information.⁵⁹⁷ For smart contracts that require interaction with the real world, for example, whether an earthquake has occurred in a geographic area and its strength, oracles serve as the interface between the smart contract and the real world.⁵⁹⁸ In the case of an earthquake, the oracles could be news reports from pre-specified media outlets and earthquake sensors in specified areas.⁵⁹⁹ The funds could have been accumulated or an appeal made, and the funds received remitted to a local entity. In addition, once digital identity is ubiquitous,⁶⁰⁰ it may be possible after a natural disaster for money to be sent to all those who reside in a specified area.

DAOs can be created to channel resources to those a community believes are performing valuable work yet are not compensated for it. For example, Moloch DAO funds developments in the Ethereum blockchain,⁶⁰¹ and is 'designed to tackle collective action problems'.⁶⁰² Moloch members contribute ether to the Moloch DAO and the members decide to which development projects within the Ethereum ecosystem it will provide grants.⁶⁰³

3.4.5.2 Not-for-Profit That Coordinates the Work Itself

Instead of a not-for-profit DAO contributing to others to perform work or coordinate the performance of the work, a not-for-profit DAO could itself engage in work, such as helping the homeless.⁶⁰⁴ The

⁵⁹⁷ For a general discussion about the gathering of information from oracles for automatic payments, for example, insurance, see Alan Cohn, Travis West and Chelsea Parker, 'Smart After All: Blockchain, Smart Contracts, Parametric Insurance, and Smart Energy Grids' (2017) *Georgetown Law Technology Review* 273. For a wider discussion about oracles and blockchain, see Marta Poblet et al, 'From Athens to the Blockchain: Oracles for Digital Democracy' (2020) 3 *Frontiers in Blockchain* <<https://doi.org/10.3389/fbloc.2020.575662>>.

⁵⁹⁸ Giulio Caldarelli, 'Understanding the Blockchain Oracle Problem: A Call for Action' (2020) 11(11) *Information* 509.

⁵⁹⁹ While in theory contracting parties using a smart contract could attempt to manipulate the oracles, Jens Frankenreiter, 'The Limits of Smart Contracts' (2019) 175(1) *Journal of Institutional and Theoretical Economics* 149, 155, this is unlikely to occur with insurance contracts.

⁶⁰⁰ See, World Economic Forum, 'Digital Identity – Why It Matters and Why It's Important We Get It Right', *World Economic Forum* (25 January 2018) <<https://www.weforum.org/press/2018/01/digital-identity-why-it-matters-and-why-it-s-important-we-get-it-right/>>.

⁶⁰¹ Soleimani et al (n 14).

⁶⁰² Kaal (n 47) 12. For collection action problems generally see Mancur Olson, *The Logic of Collective Action: Public Goods and the Theory of Groups* (Harvard University Press, 1965) 21.

⁶⁰³ Richard Red, 'Moloch DAO', *Crypto Commons* (11 September 2019) <<https://cryptocommons.cc/daos/moloch/>>.

⁶⁰⁴ See Kris Decoodt, 'The Future of Giving is Realizing Incentives', *Medium* (28 March 2019) <<https://medium.com/giveth/the-future-of-giving-is-crowdfunding-the-commons-ac265e3010b8>>.

DAO pays people who carry out specified activities,⁶⁰⁵ for example, securing accommodation for a homeless person.⁶⁰⁶

3.4.6 Co-ordinating a Project

The sixth category of DAOs is DAOs established to coordinate a project. Such DAOs would be wound up upon the project's completion. There are overlaps with this category and not-for-profit DAOs. For example, a DAO could be created to, for example, fundraise and build a playground for a community centre. Such a DAO could also be classified as a not-for-profit DAO and would come within that category rather than a DAO to complete a project.

DAOs could also coordinate large, complex projects, such as space exploration, which can take thousands, if not hundreds of thousands, of people.⁶⁰⁷ Space Decentral,⁶⁰⁸ which uses Aragon,⁶⁰⁹ is a DAO attempting to create a space agency to connect 'engineers, scientists, and future astronauts to devise and fund next-generation space initiatives'.⁶¹⁰ Another complex and ambitious DAO is one proposed to save the planet.⁶¹¹

3.4.7 Running a For-Profit Organisation

The seventh category of DAO is for-profit DAOs, which provide the same or similar services as traditional hierarchical organisations, and which some proponents of DAOs envisage replacing

⁶⁰⁵ Ibid.

⁶⁰⁶ The incentives would have to be calibrated carefully, for example, while some payment could be made for the initial accommodation provision, the bulk of the payment would be later, for example, for the person remaining in that accommodation for three months and then six months.

⁶⁰⁷ For example, the Apollo programme's moon landings required over 400,000 workers to allow people to set foot on the moon, C Thimmes, *Team Moon: How 400,000 People Landed Apollo 11 on the Moon* (Houghton Mifflin Company, 2006).

⁶⁰⁸ <<https://spacedecentral.net/>>.

⁶⁰⁹ Aditya Das and Christopher Brookins, 'Aragon Price Analysis: Robust DAO Infrastructure Waiting for Users', *Brave New Coin* (23 May 2019) <<https://bravenewcoin.com/insights/aragon-price-analysis-robust-dao-infrastructure-remains-waiting-for-users>>.

⁶¹⁰ Bowen Sanders, 'Space Decentral: The DAO for Space Exploration', *Medium* (9 May 2018) <<https://medium.com/giveth/space-decentral-the-dao-for-space-exploration-2af372d310af>>.

⁶¹¹ Jens Duccée, 'Blockchain for Organizing Effective Grass-Roots Actions on a Global Commons: Saving the Planet' (2020) 3 *Frontiers in Blockchain* <<https://doi.org/10.3389/fbloc.2020.00033>>.

traditional DAOs.⁶¹² One potential example is a DAO as a ride-sharing entity: Uber as a DAO.⁶¹³ While Uber could be seen as simply providing software that connects drivers to passengers and facilitates payment, Uber as an organisation has done more than simply provide software for drivers and users to coordinate. A significant part of Uber's activities has been negotiating with regulators.⁶¹⁴ However, new ride-sharing services do not face the same hurdles. For other functions, such as reuniting passengers with items left in cars,⁶¹⁵ and the vetting of drivers, the DAO could pay people who perform those services.

Providing insurance is complicated as insurance corporations' operations encompass a wide range of activities,⁶¹⁶ and they operate in a regulated environment.⁶¹⁷ Therefore, Nexus Mutual, a DAO that offers insurance, has incorporated a registered entity in the United Kingdom.⁶¹⁸ Its first product was a fixed-sum insurance policy for smart contracts that have been hacked, and have experienced a material loss of funds.⁶¹⁹ The Capital Pool is formed through members paying a nominal fee for membership and purchasing smart contract cover. In addition, members can purchase NexusMutual tokens (NXM) to contribute directly to the Capital Pool.⁶²⁰ The assets in the Capital Pool are held in

⁶¹² See, eg, Jentzsch (n 25); Philippe Honigman, 'Who Owns My DAO?', *Medium* (14 May 2019) <<https://hackernoon.com/who-owns-my-dao-93cb87a24561>>; and Alyssa Hertig, 'Rebranding The DAO: The Contentious Blockchain Concept is Back', *CoinDesk* (20 February 2017) <<https://www.coindesk.com/rebranding-dao-controversial-blockchain-concept-back>>.

⁶¹³ Petros Leandros, 'What are Smart Contracts? DAOs and the Case of Uber', *Medium* (5 March 2018) <<https://medium.com/datadriveninvestor/what-are-smart-contracts-daos-and-the-case-of-uber-71287b862cdc>>.

⁶¹⁴ Amit Tzur, 'Uber Über Regulation? Regulatory Change Following the Emergence of New Technologies in the Taxi Market' (2019) 13(3) *Regulation and Governance* 340.

⁶¹⁵ Jamal Robinson, 'How Uber Organizes Around Machine Learning', *Medium* (4 February 2019) <<https://medium.com/@jamal.robinson/how-uber-organizes-around-artificial-intelligence-machine-learning-665cdeb946bc>>.

⁶¹⁶ Those activities include investment, hedging, reinsuring, marketing, sales, investigations, litigation and lobbying.

⁶¹⁷ For example, in New Zealand, insurers are regulated by both the Reserve Bank of New Zealand, which exercises licensing and prudential supervision, and the Financial Markets Authority, which is concerned with conduct supervision.

⁶¹⁸ Nexus Mutual Ltd Registered as a private company limited by guarantee without share capital in the United Kingdom. Company number 109117763.

⁶¹⁹ See Nexus Mutual, 'Smart Contract Cover' *Nexus Mutual* (Web Page) <<https://nexusmutual.io/pages/SmartContractCoverWordingv1.2.pdf>>, see also Kayleigh Petrie, 'Smart Contract Cover is Now Live!', *Medium* (13 July 2019) <<https://medium.com/nexus-mutual/smart-contract-cover-is-now-live-91b3015f99eb>> and Hugh Karp, 'Nexus Mutual: A Peer-to-Peer Discretionary Mutual Entity on the Ethereum Blockchain' (White Paper) <https://nexusmutual.io/assets/docs/nmx_white_paperv2_3.pdf> 10.

⁶²⁰ Kayleigh Petrie, 'Understanding Nexus Mutual', *Nexus Mutual* (9 March 2020) <<https://medium.com/nexus-mutual/understanding-nexus-mutual-bb2946dad919>>.

smart contracts and are used to pay out claims.⁶²¹ Nexus Mutual members act as assessors in that they vote upon claims made by their fellow members.⁶²²

DAOs are not limited to a collection of natural persons. A group of organisations could create a DAO. Diem, formally known as Libra,⁶²³ could be run as a DAO.⁶²⁴

3.4.8 Managing a Commons

The eighth category of DAOs is the protection and management of a commons.⁶²⁵ Commons are shared resources, which are not in private ownership, in which each stakeholder has an equal interest.⁶²⁶ As discussed above,⁶²⁷ DAOs can satisfy Ostrom's eight principles for sustainably managing a commons. The difference between this category and the previous one of managing a project, is that physical commons are intended to exist in perpetuity.⁶²⁸ In contrast, a project has a defined life.

A DAO may be formed to govern private property, for example, to operate a body corporate in strata apartments, where the owners of individual apartments share in the joint ownership of common property, most often the building, grounds and land.⁶²⁹ In addition, a DAO may be formed to manage real estate, such as an apartment block, on behalf of investors.⁶³⁰ However, such DAOs would

⁶²¹ Ibid. It is intended that, just as with traditional insurance companies, the assets will be invested to provide returns, Hugh Karp, 'Nexus Mutual NXM Token Explainer', *Medium* (5 June 2019) <<https://medium.com/nexus-mutual/nexus-mutual-nxm-token-explainer-b468bc537543>>.

⁶²² Petrie, 'Smart Contract Cover is Now Live!' (n 619).

⁶²³ Jacob Kastrenakes, 'Libra Cryptocurrency Project Changes Name to Diem to Distance Itself from Facebook', *The Verge* (1 December 2020) <<https://www.theverge.com/2020/12/1/21755078/libra-diem-name-change-cryptocurrency-facebook>>.

⁶²⁴ Interviewee 5 (consultant).

⁶²⁵ Rozas et al (n 476). See also Paul Seidler, Paul Kolling and Max Hampshire, 'Terra0: Can an Augmented Forest Own and Utilise Itself' (May 2016) <https://www.terra0.org/assets/pdf/terra0_white_paper_2016.pdf>.

⁶²⁶ Sofia Costanza, 'Public Goods and Commons, Some Preliminary Reflections' (2014) <<https://www.hetecon.net/wp-content/uploads/2019/12/CostanzaAHE2014PublicGoods-1.pdf>>.

⁶²⁷ See above nn 487–497 and accompanying text.

⁶²⁸ Jean-Marie Baland and Patrick Francois, 'Commons as Insurance and the Welfare Impact of Privatization' (2005) 89 *Journal of Public Economics* 211, 225.

⁶²⁹ Simon Plummer, 'An Autonomous Body Corporate – the Future of Strata?', *Strata Ratings* (18 December 2017) <<https://www.strataratings.com.au/blog/2017/12/18/an-autonomous-body-corporate-the-future-of-strata>>.

⁶³⁰ Blockimmo, 'Facilitating an Accessible & Streamlined Real-Estate Market' (White Paper v5.5, 12 November 2018) <https://s3.eu-central-1.amazonaws.com/assets-prod-protected-jm01tirz25y4/blockimmo_whitepaper_web_201811.pdf>.

be not-for-profit (for a body corporate) and running a for-profit organisation (for managing real estate on behalf of investors) rather than managing a commons. The members of such DAOs would acquire ownership rights over the DAO's property, in contrast the members of a DAO managing a commons, who would not obtain ownership rights over the DAO's property.

3.4.9 Nation State

The ninth DAO category is a DAO that runs a nation state. Ralph Merkle argues that a democracy, and thus a nation, could be operated as a DAO.⁶³¹ While operating a nation state as a DAO may appear far-fetched, there are and have been attempts to create DAOs as nation states. For example, in 2018 the intention of founders of The Government Network project⁶³² was to create a DAO in the aftermath of the overthrow of a government.⁶³³ Not surprisingly, given the extreme difficulties of replacing a nation state with a DAO, The Government Network project appears to be no longer active.⁶³⁴

Bitnation,⁶³⁵ which describes itself as a DBVN, a form of a DAO,⁶³⁶ wishes to be recognised as a sovereign entity.⁶³⁷ In contrast to The Government Network, which was to operate within an existing nation state, Bitnation is not located within a specific geographical region. Rather Bitnation's intent is to create a borderless nation and as part of that offer jurisdiction as a service and enable others to create their own DBVN.⁶³⁸ Bitnation has yet to be recognised as a nation state.⁶³⁹ It is unlikely that it

⁶³¹ Merkle, 'DAOs, Democracy and Governance' (n 121) 28. Merkle invented merkle trees (Ralph Merkle, US Patent 4309569A, 'Method of Providing Digital Signatures' (n 349), which are a data structure used widely, including in blockchains.

⁶³² Nate Waczinski, 'The Government Network is Your New Nation on Blockchain', *LinkedIn* (27 November 2018) <<https://www.linkedin.com/pulse/government-network-your-new-nation-blockchain-nate-waczinski/>>.

⁶³³ Hackernoon, 'DAO Nation', *Hackernoon* (4 December 2018) <<https://hackernoon.com/hackernoon-com-borderless-dao-nation-blockchain-6fd237223b48>>.

⁶³⁴ The Government Network's website is now a 'blog about security, blockchains, censorship and technology' <<https://thegovernment.network/>> and the white paper for The Government Network has been removed from its website. The last mention on Twitter of the Government Network was on 20 December 2018, @Vlad_Khegay (Twitter, 30 December 2018) <https://twitter.com/Vlad_Khegay/status/1079029011077042177>.

⁶³⁵ <<https://tse.bitnation.co>>.

⁶³⁶ See above (n 396).

⁶³⁷ Clare Sullivan and Eric Burger, 'E-residency and Blockchain' (2017) 33(4) *Computer Law and Security Review* 470.

⁶³⁸ Susanne Tarkowski Tempelhof et al, 'The Internet of Sovereignty' (April 2017) <https://www.academia.edu/34590282/Pangea_Jurisdiction_and_Pangea_Arbitration_Token_PAT_The_Internet_of_Sovereignty> 3.

⁶³⁹ *Ibid.*

and the other DBVN which uses its platform will be recognised as nation states by traditional nation states for some time. Bitnation's intent to allow others to create their own DBVNs, however, is more practical and could come to pass. Bitnation envisages Special Economic Zones or Startup Cities to create DBVNs, as well as "refugee camps/refugee cities, self-sustainable communities [and] Seasteads".⁶⁴⁰ The desire to create autonomous nation states is not new and there is a rich literature on the creation of libertarian nation states.⁶⁴¹

One interviewee, in response to the question of what they thought the future of DAOs was, thought that nation states would operate as DAOs: 'I think the future of DAOs is the future foundation of societies/civilisations. Where people have a direct say in the governance systems in which they inhabit and they are getting value in participating in every layer of governance and system they inhabit from the nation state on down.'⁶⁴² That interviewee's view of DAOs replacing existing institutions was not shared amongst the other interviewees. As another interviewee observed, it is 'naïve to say we should replace all corporations with DAOs.'⁶⁴³

3.5 Conclusion

This chapter has defined the term 'DAO' as it is used in this thesis, in addition to describing the characteristics of DAOs. It has differentiated DAOs from entities that are not DAOs, despite the fact they have 'DAO' in their names, and entities referred to by some as DAOs, including pseudo and proto DAOs. The nine most common DAO categories or potential DAOs were also outlined. A DAO can take many forms, from a DAO created to complete a simple project or a venture capital fund, through to DAOs offering DAOs-as-a-service and even DAOs as nation states. Understanding that DAOs are not simply for-profit VC funds or not-for-profit entities is important in terms of governance, dispute

⁶⁴⁰ Tarkowski Tempelhof et al (n 638).

⁶⁴¹ Casey R Lynch, "'Vote with Your Feet': Neoliberalism, the Democratic Nation-State, and Utopian Enclave Libertarianism' (2017) 59 *Political Geography* 82; Miles Davis and David Bertrand Monk, *Evil Paradises: Dreamworlds of Neoliberalism* (New Press, 2008); and Alastair Bonnett, 'Capitalist Utopias: Forever Out of Reach, Always in Your Face' (2001) 5 *Transgressions* 75.

⁶⁴² Interviewee 2 (DAO founder).

⁶⁴³ Interviewee 1 (DAO founder).

resolution and legal regulation. Governance mechanisms will vary depending on the type of DAO. For example, a DAO running a complex organisation with considerable assets will need a different governance structure and be regulated differently than a charitable DAO with few assets.

The next chapter analyses the governance of DAOs.

Chapter Four: Governance

*We have Palaeolithic emotions; medieval institutions; and god-like technology.*⁶⁴⁴

*We would do well to invest some of our effort so as to prevent important knowledge and insight from remaining lost in the archive.*⁶⁴⁵

4.1 Introduction

This chapter shows that no one governance model for DAOs can be applied universally, and technology alone does not solve the complex problem of organising people.⁶⁴⁶ DAOs are grappling with an old issue: How does an organisation operate when there is no small group or groups of people making its decisions? As organisations grow, it becomes easier and more efficient to centralise decision-making in the hands of a small group or groups of people, with the wider membership on occasion required to vote on certain issues. Political scientists have long questioned whether it is possible, for example, for a democracy to operate a ‘genuine “government by the people”’.⁶⁴⁷ Thus for democracies, the election of representatives (representative democracy) is a pragmatic device to facilitate decision-making.⁶⁴⁸ It is not surprising, therefore, that Marcella Atzori, in 2015, shortly after the first DAO, Bitshares, was created,⁶⁴⁹ doubted it was possible to create blockchain services, which would include DAOs, that did not concentrate power in the hands of a few elites.⁶⁵⁰ Atzori’s opinion was based on the experience of Bitcoin and Ethereum and the work of organisational theorists,⁶⁵¹ and

⁶⁴⁴ E O Wilson, from a public discussion between Wilson and James Watson moderated by Robert Krulwich, reported in ‘An Intellectual Entente’, *Harvard Magazine* (9 October 2009) <www.harvardmagazine.com/breaking-news/james-watson-edward-o-wilson-intellectual-entente>.

⁶⁴⁵ William W Nazaroff, ‘Lost in the Archive’ (2016) 26(2) *Indoor Air* 155, 156.

⁶⁴⁶ Werbach, ‘The Siren Song’ (n 447) 234 and Seth Bannon, ‘The Tao of “The DAO” or: How the Autonomous Corporation is Already Here’, *TechCrunch* (17 May 2016) <<https://techcrunch.com/2016/05/16/the-tao-of-the-dao-or-how-the-autonomous-corporation-is-already-here/>>.

⁶⁴⁷ Josiah Ober, *Democracy and Knowledge: Innovation and Learning in Classical Athens* (Princeton University Press, 2008) 99, quoting Robert Alan Dahl, *After the Revolution? Authority in a Good Society* (Yale University Press, 1970) 67-71 and 143-147.

⁶⁴⁸ Nadia Urbinati, ‘Condorcet’s Democratic Theory of Representative Government’ (2004) 3(1) *European Journal of Political Theory* 53, 53.

⁶⁴⁹ Bitshares was created in 2014, Singh and Kim (n 2) 121 and Larimer, ‘Is The DAO Going to Be DOA?’ (n 2).

⁶⁵⁰ Marcella Atzori, ‘Blockchain Technology and Decentralized Governance: Is the State Still Necessary?’ (2015) <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2709713> 27–30.

⁶⁵¹ *Ibid.*

it was borne out in Bitshares. Prior to Bitshares winding up, the decision-making power was concentrated in the hands of a small group of people.⁶⁵² However, Bitshares concentration of power occurred only after decisions were not being made by the Bitshares membership: fewer than 10 percent engaged in voting, thus a change was required to keep Bitshares operational.⁶⁵³ While, as this chapter demonstrates, designing a DAO's rules, norms, incentives and technical architecture is a complex task,⁶⁵⁴ contrary to Atzori's views, attempts to create DAOs with decentralised governance models may well be successful. In particular, when Ostrom's design principles⁶⁵⁵ for the effective governance of common-based pool resources are used.⁶⁵⁶ The relevant design principle being that the members of the group, here the DAO, can participate in modifying the group's rules. Ostrom's design features play a large part in IC as NIE is the key building block of IC.

DAOs are an example of what Yochai Benkler describes as common-based peer production communities,⁶⁵⁷ an 'emergent model of socio-economic production in which a group of individuals cooperate with each other to produce shared resources without a traditional hierarchical organization'.⁶⁵⁸ However, DAOs face the issue of decision-making becoming more difficult as the number of people increases. As membership of a DAO grows, it becomes more challenging to agree on simple, let alone fundamental, issues, such as formulating the organisation's goals.⁶⁵⁹

This chapter looks at the governance of DAOs through the lens of IC.⁶⁶⁰ IC would predict that a DAOs' use of blockchain and its cryptographically enforced limitations on actions⁶⁶¹ allows for a new

⁶⁵² Larimer, 'Is The DAO Going to Be DOA?' (n 2), 'BitShares 2.0 introduced proxy voting which centralized decision making into about a dozen elected proxies.'

⁶⁵³ Ibid.

⁶⁵⁴ Kevin Werbach, 'Trust, but Verify' (n 7) 495, Werbach's use of rules, norms, incentives and technical architecture refers to Lessig (n 77).

⁶⁵⁵ See above n 223.

⁶⁵⁶ See above nn 488–497.

⁶⁵⁷ Yochai Benkler, 'Coase's Penguin, or, Linux and "The Nature of the Firm"' (2002) 112(3) *Yale Law Journal* 369 and Rozas et al (n 476).

⁶⁵⁸ Rozas et al (n 476) 2, quoted by Del Wright Jr, 'Quadratic Voting and Blockchain Governance' (2019) 88 *UMKC Law Review* 475, 475–476.

⁶⁵⁹ Primavera de Filippi and Greg McMullen, 'Governance of Blockchain Systems: Governance of and by Distributed Infrastructure', *Blockchain Research Institute and COALA* (2018) <<https://hal.archives-ouvertes.fr/hal-02046787/document>>.

⁶⁶⁰ Berg, Davidson and Potts, *Understanding the Blockchain Economy* (n 116).

⁶⁶¹ Werbach, 'The Siren Song' (n 447) 231.

‘institutionally distinct coordination mechanism, competing with firms, markets, commons, clubs, relational contracting, and governments’.⁶⁶² Moreover, because of the reduction of transaction costs in creating and enforcing governance complexity in DAOs, considerable and rapid experimentation would occur between DAOs, thus governance mechanisms would vary between DAOs.

DAOs potentially overcome the tensions and limitations of the governance of traditional organisations,⁶⁶³ for example, they are intended to be ‘less hierarchical and more transparent than traditional organizations’.⁶⁶⁴ Most organisations are centralised as they have expediated the governance process through a form of representative democracy by nominating board members and executives to make decisions.⁶⁶⁵ In contrast, DAOs intend to use direct democracy by enabling token holders to make the decisions and thus govern the DAO.⁶⁶⁶

However, while the intention is for DAOs to be ‘less hierarchical and more transparent than traditional organizations’,⁶⁶⁷ full decentralisation can cause problems, including too many proposals, lack of vetting of proposals and lack of strategic oversight. The task of designing governance mechanisms to accommodate human nature by harnessing the benefits of decentralised human decision-making, whilst limiting its potentially destructive effects, cannot be underestimated. As the Bitshares example shows, when people were given the opportunity to vote, most did not.⁶⁶⁸ As one interviewee observed, ‘decentralisation is an important element, but do you jump off the deep end straight away and end up drowning in the pool or do you take baby steps?’.⁶⁶⁹ Thus while IC predicts a new coordination mechanism, it is likely to evolve over time and will not emerge fully formed. Owing

⁶⁶² Allen, Berg and Lane, *Cryptodemocracy* (n 230) 8.

⁶⁶³ George Samman and David Freuden, ‘DAO: A Decentralized Governance Layer for the Internet of Value’ (May 2020) <<http://www.monsterplay.com.au/wp-content/uploads/2020/05/DAO-A-Decentralized-Governance-Layer-for-the-Internet-of-Value.pdf>> 6.

⁶⁶⁴ Primavera De Filippi, ‘Blockchain Technology and Decentralized Governance: The Pitfalls of a Trustless Dream’, *Decentralized Thriving: Governance and Community on the Web 3.0* (2019) <<https://hal.archives-ouvertes.fr/hal-02445179/document>>. Indeed, DAOs have even been proposed to run democracies, Merkle, ‘DAOs, Democracy and Governance’ (n 121) 28–40.

⁶⁶⁵ MakerDAO, ‘Introducing Governance’, *MakerDAO* (Web Page) <<https://community-development.makerdao.com/en/learn/governance>>.

⁶⁶⁶ *Ibid.*

⁶⁶⁷ See above n 663.

⁶⁶⁸ Larimer, ‘Is The DAO Going to Be DOA?’ (n 2).

⁶⁶⁹ Interviewee 7 (consultant).

to the difficulties posed by full decentralisation, DAOs are using a variety of governance mechanisms, which results in DAOs ranging across a continuum from fully decentralised to partially centralised. This chapter explores the decentralisation continuum.

In regards to transparency, some DAOs are transparent; for example, anyone, not just token holders, can see proposals, the discussions on those proposals and whether the proposals were successful.⁶⁷⁰ Two of the interviewees were at pains to state the transparency of the DAOs they were involved in: ‘all our stuff is completely public ... everything is completely public and transparent’⁶⁷¹ and ‘everything is fully transparent’.⁶⁷² Transparency is another feature of the new coordination mechanism that IC predicts, as it is rare for traditional organisations to embrace such transparency. Although such transparency is not the case for all DAOs. Moloch DAO, for example, uses a closed Discord group for its discussions.⁶⁷³

The use of blockchain means that DAOs can use more ‘governance complexity’ than traditional organisations.⁶⁷⁴ Depending on the design of a DAO’s governance structure, it may be possible to move past the voting schemes of ‘one person–one vote’ or ‘one share/token–one vote’ and allow members to vote according to the intensity of their preferences⁶⁷⁵ or be weighted according to their contributions to the DAO and the intensity of their preferences.⁶⁷⁶

The use of direct democracy in DAOs,⁶⁷⁷ where members make proposals for rule changes and funding requests, which members vote for, is a specific type of collective decision-making process as it is dependent on its members voting. DAOs, therefore, use voting as a tool to coordinate human

⁶⁷⁰ See, proposal for the ‘Exchange ETH to sUSD for DXdao Treasury #12’, *dxDAO* (Web Page, 31 March 2021) <<https://v1.alchemy.do/dao/0x519b70055af55a007110b4ff99b0ea33071c720a/proposal/0x474322ce5d2dd42e6340152331362fec5800c98f121b06b1b3f3dd3c5503c42d>>.

⁶⁷¹ Interviewee 1 (DAO founder).

⁶⁷² Interviewee 2 (DAO founder).

⁶⁷³ Interviewee 6 (consultant).

⁶⁷⁴ Joshua Tan, ‘Metagovernance Project’, *DAOCast* (Podcast, 20 January 2020) <<https://daocast.io/s04e02>> 23.28–24.00 min and 25.03–30.15 min.

⁶⁷⁵ See below 4.4.3.4.

⁶⁷⁶ Jeff Emmett, ‘Automating Ostrom for Effective DAO Management’ *Medium* (24 December 2019) <<https://medium.com/commonsstack/automating-ostrom-for-effective-dao-management-cfe7a7aea138>>. For votes weighted differently depending on the reputation of the voter, see Vrba (n 592) 19.

⁶⁷⁷ Ilya Kokorin, ‘Contracting Around Insolvency Jurisdiction: Private Ordering in European Insolvency Rules and Practices’ in Vesna Lazić and Steven Stuij (eds), *Recasting the Insolvency Regulation: Improvements and Missed Opportunities* (TMC Asser Press, 2020) 21, 39.

activity and are different to what has gone before.⁶⁷⁸ However, owing to the limitations of direct democracy, which are explored in this chapter, DAOs are increasingly using elements of representative democracy to aid their governance, including liquid democracy,⁶⁷⁹ proxy voting,⁶⁸⁰ futarchy,⁶⁸¹ quadratic voting⁶⁸² and central bodies such as councils.⁶⁸³

Despite the novelty of DAOs — the first DAO, Bitshares, was formed in 2014⁶⁸⁴ — the governance of DAOs has evolved quickly. Initially, the focus was on removing hierarchy and increasing transparency. Token holders in The DAO, one of the earliest DAOs, were not able to change its rules when an error in its code was identified.⁶⁸⁵ The Dash DAO, which preceded The DAO,⁶⁸⁶ while allowing any token holder to put forward a proposal,⁶⁸⁷ requires tokens holders who wish to vote to hold a substantial number of tokens and contribute other resources.⁶⁸⁸ Thus voting in the Dash DAO is not fully decentralised. As this chapter demonstrates, more recent DAOs have more sophisticated governance systems as their creators are cognisant of the governance challenges of DAOs and are attempting to navigate a fine line between the harnessing benefits of decentralisation while limiting its disadvantages.

This chapter proceeds as follows. Part 2 explores what is meant by governance and provides the definition of governance that is relevant to this thesis. Corporate governance is discussed;

⁶⁷⁸Allen, Berg and Lane, *Cryptodemocracy* (n 230) ix.

⁶⁷⁹ Bingsheng Zhang, Roman Oliynykov and Hamed Balogun, 'A Treasury System for Cryptocurrencies: Enabling Better Collaborative Intelligence' (2019) <<https://eprint.iacr.org/2018/435>> 14.

⁶⁸⁰ Polkadot, 'Participate in Democracy', *Polkadot Wiki* <<https://wiki.polkadot.network/docs/en/maintain-guides-democracy>> and Commonwealth Labs (n 127) 13.

⁶⁸¹ Robin Hanson, 'Shall We Vote on Values, But Bet on Beliefs' (2013) 21(2) *The Journal of Political Philosophy* 151. See also Michael Abramowicz, *Predictocracy: Market Mechanisms for Public and Private Decision Making* (Yale University Press, 2007).

⁶⁸² Steven Lalley and E Glen Weyl, 'Quadratic Voting: How Mechanism Design Can Radicalize Democracy' (2018) 108 *American Economic Association Papers and Proceedings* 33, see also Wright, 'Quadratic Voting and Blockchain Governance' (n 658) and Brian Eason, '\$120 Million in Requests and \$40 Million in the Bank. How an Obscure Theory Helped Prioritize the Colorado Budget', *The Colorado Sun* (28 May 2019) <<https://coloradosun.com/2019/05/28/quadratic-voting-colorado-house-budget/>>.

⁶⁸³ For example, some DAOs are using councils to make proposals, see below 4.3.2.2.

⁶⁸⁴ Singh and Kim (n 2) 121 and see Larimer, 'Is The DAO Going to Be DOA?' (n 2).

⁶⁸⁵ Rodrigues, 'Law and the Blockchain' (n 403) 701.

⁶⁸⁶ DuPont (n 3) 157.

⁶⁸⁷ As long as the proposer pays the prescribed fee, which at the time of writing was five Dash, Mosley et al (n 20) 4–5.

⁶⁸⁸ See *ibid*.

however, corporate governance is not the same as DAO governance. Representative and direct democracy are explored, and the advantages and disadvantages are analysed. While DAOs predominately use direct democracy, some use elements of representative democracy. Part 3 considers agenda setting: the process of who decides what is voted upon, and thus who controls the decision-making process and the governance of the DAO. As voting lies at the heart of a DAO's collective decision-making, Part 4 explains DAOs' voting schemes: how voting takes place and the mechanisms that could be used to facilitate dynamic governance that moves beyond the binary of one person—one vote and one token—one vote. Part 5 contains the conclusion.

4.2 Governance

This section explores, first, what is meant by governance for DAOs, and includes a definition of governance for DAOs. Second, both direct democracy and representative democracy are analysed because many DAOs use elements of both in their governance.

4.2.1 What is Meant by Governance?

There is no single definition of the term 'governance'.⁶⁸⁹ The definition of governance depends on the type of organisation or institution in question.⁶⁹⁰ Corporate governance is a set of mechanisms, including law, through which one group of people — investors — protect themselves against expropriation from another group — insiders — who are the managers and controlling shareholders.⁶⁹¹ Corporate governance also 'encompasses the mechanisms by which companies, and

⁶⁸⁹ Robert I Rotberg, 'Good Governance Means Performance and Results' (2014) 27(3) *Governance* 511 and Wright, 'Quadratic Voting and Blockchain Governance' (n 658) 480–481.

⁶⁹⁰ See, eg, Gowher Rizvi and Guido Bertucci, 'Foreword' in G Shabbir Cheema and Dennis A Rondinelli (eds), *Decentralizing Governance: Emerging Concepts and Practices* (Brookings Institution Press, 2007) ix and Bob Jessop, 'Governance and Meta-Governance: On Reflectivity, Requisite Variety and Requisite Irony' in Henrik Bang (ed), *Governance as Social and Political Communication* (Manchester University Press, 2009) 101.

⁶⁹¹ Rafael La Porta et al, 'Investor Protection and Corporate Governance' (2000) 58 *Journal of Financial Economics* 3, 4, cited by Wan Fauziah Wan Yusoff and Idris Adamu Alhaji, 'Insight of Corporate Governance Theories' (2012) 1(1) *Journal of Business & Management* 52.

those in control, are held to account'.⁶⁹² Corporate governance also provides the structure through which a corporate's objectives are set, the means for achieving those objectives and how performance is monitored.⁶⁹³ Those definitions of corporate governance, however, do not map directly onto DAOs because within a DAO it will not be a case of insiders who manage the organisation on behalf of others and much of the monitoring is not required as the DAO has no choice but to act in accordance with its smart contracts. There is no need, for example, to monitor that unauthorised payments are not made using the DAO's funds because unauthorised payments cannot be made.

There are definitions in the literature that could potentially be used to define governance for DAOs. Oliver Williamson, one of the economists on whose work IC is based,⁶⁹⁴ has a wide definition of governance, of 'good order and workable arrangements',⁶⁹⁵ which Kevin Werbach reformulated in relation to blockchain as the framework for 'establishing accountability, roles and decision-making authority in an organization'.⁶⁹⁶

Governance has been explicitly defined in relation to DAOs. DuPont, in analysing The DAO, an early and short-lived DAO, defines governance as the 'code of conduct' through the plurality of independent (human and non-human) actors that lack the power or authority to unilaterally and directly decide and enact solutions⁶⁹⁷ and policies.⁶⁹⁸ DuPont was not using 'code of conduct' in its traditional sense as an instrument to govern employee behaviour.⁶⁹⁹ Rather, for DuPont no human or non-human actors had the ability to unilaterally decide and put those decisions into effect, thus consensus was required to agree to any action undertaken by the DAO. Another definition of DAO

⁶⁹² Neville Owen, *Royal Commission into the Failure of HIH Insurance, Volume 1: A Corporate Collapse and Its Lessons, vol 1* (Report, April 2003) xxxiv cited by ASX Corporate Governance Council, 'Corporate Governance Principles and Recommendations' (February 2019, 4th ed) <<https://www.asx.com.au/documents/asx-compliance/cgc-principles-and-recommendations-fourth-edn.pdf>> 1.

⁶⁹³ OECD, 'G20/OECD Principles of Corporate Governance', OECD (2015) <https://www.oecd-ilibrary.org/governance/g20-oecd-principles-of-corporate-governance-2015_9789264236882-en> 9.

⁶⁹⁴ Berg, Davidson and Potts, *Understanding the Blockchain Economy* (n 116) 1.

⁶⁹⁵ Oliver E Williamson, 'The Economics of Governance' (2005) 95(2) *American Economic Review* 1, 1 quoted by Werbach, 'The Siren Song' (n 447) 231.

⁶⁹⁶ Werbach, 'The Siren Song' (n 447) 231.

⁶⁹⁷ DuPont (n 3) 158–159. Citing Lucas D Introna, 'Algorithms, Governance, and Governmentality: On Governing Academic Writing' (2015) 41(1) *Science, Technology and Human Values* 17, 19.

⁶⁹⁸ Introna (n 697) 19.

⁶⁹⁹ Patrick M Erwin, 'Corporate Codes of Conduct: The Effects of Code Content and Quality on Ethical Performance' (2011) 99 *Journal of Business Ethics* 535.

governance is that it is 'essentially the question of who's in charge of a decentralized public network and how to imbue a network with a practical sense of direction and keep development going, without sacrificing decentralization and handing any one entity the keys to the castle'.⁷⁰⁰

DAO governance is defined in this thesis as a set of mechanisms used to control an organisation, facilitated by smart contracts, the control of which is decentralised.

The next section explains direct and representative democracy in the context of DAOs.

4.2.2 Direct and Representative Democracy

The use of a mix of direct democracy and increasingly representative democracy is not unique to DAOs. A mix of elements can be seen in corporations and other traditional organisations and institutions. Representative democracy is when members of a group elect representatives who make decisions concerning the use of the group's resources.⁷⁰¹ Thus representative democracy occurs, for example, when shareholders choose representatives on the board of directors to make many of the corporation's decisions.⁷⁰² One of the advantages of representative democracy is that a small group of people can make decisions quickly.⁷⁰³ Direct democracy includes shareholders voting to approve certain issues, including the corporation's sale or the stock options plans for the executives.⁷⁰⁴ However, such direct democracy is limited: the corporation's board sets the agenda, that is, it decides what shareholders will vote upon. While shareholders can put forward resolutions to be voted upon in annual general meetings,⁷⁰⁵ such resolutions are generally non-binding and the proposer must have a minimum number or percentage of shares and may need to have held them for a certain period.⁷⁰⁶

⁷⁰⁰ Munro, 'What We Learnt from the Rise and Fall of the DigixDAO Autonomous Organisation' (n 558).

⁷⁰¹ Tim R Sass, 'Constitutional Choice in Representative Democracies' (1992) 74 *Public Choice* 405.

⁷⁰² Yair Listokin, 'Management Always Wins the Close Ones' (2008) 10(2) *American Law and Economics Review* 159, 160.

⁷⁰³ Giovanni Sartori, 'Will Democracy Kill Democracy? Decision-Making by Majorities and by Committees' (1975) 10(2) *Government and Opposition* 131, 145.

⁷⁰⁴ Listokin (n 702) 160.

⁷⁰⁵ For Australia, see generally, Stephen Bottomley, 'Rethinking the Law on Shareholder-Initiated Resolutions at Company General Meetings' (2019) 43(1) *Melbourne University Law Review* 93.

⁷⁰⁶ For example, 17 CFR § 240.14a-8 requires a shareholder in the United States who wishes to propose a resolution to hold at least USD2,000 or 1 percent of a corporation's shares for at least one year. The Securities and Exchange Commission has proposed changing these requirements to make them stricter, Securities and Exchange Commission, 'SEC Proposes Amendments to Modernize Shareholder Proposal Rule' (n 126).

Similarly, representative democracy is used in political democracies as people vote to elect representatives.⁷⁰⁷ Democracies too can have elements of direct democracy: some jurisdictions allow citizens and those entitled to vote⁷⁰⁸ to vote directly in referenda.⁷⁰⁹ As with corporations, the referenda are either set by the representatives⁷¹⁰ or citizens propose referenda: citizen-initiated referenda.⁷¹¹ The latter require high thresholds for referenda to be put before voters.⁷¹² Depending on the jurisdiction, the outcomes of citizen-initiated referenda are non-binding,⁷¹³ or binding.⁷¹⁴ Its use of referenda has been credited with transforming Switzerland from ‘the most strife-torn and poverty-stricken country in Western Europe to ... the most stable and prosperous nation in the world’.⁷¹⁵

DAOs can use direct democracy by allowing any token holder to put forward a proposal, which token holders can vote upon.⁷¹⁶ However, due to the disadvantages of direct democracy, which are explored below in 4.2.2.2, some DAOs use mechanisms to attempt to mitigate against those disadvantages.

The next sections look at the advantages and disadvantages of direct democracy for DAOs.

4.2.2.1 *Advantages of Direct Democracy*

There are several reasons for direct democracy’s alleged advantages, and they apply to DAOs as well as to traditional organisations and institutions. First, more voters means a better range of views, or as

⁷⁰⁷ Jonathan Macey, ‘Representative Democracy’ (1993) 16 *Harvard Journal of Law and Public Policy* 49.

⁷⁰⁸ In New Zealand permanent residents as well as citizens are entitled to vote.

⁷⁰⁹ For example, in Switzerland, see Armingeon and Lutz (n 126) 258.

⁷¹⁰ Geoffrey de Q Walker, ‘Let the People Make the Laws’ (1991) 9 *Australia and World Affairs* 39, cited by Harry Evans, ‘Citizens’ Initiative Versus Constitutional Government’ (1992) 7 *Legislative Studies* 53.

⁷¹¹ Jeffrey Karp and Peter Aimer, ‘Direct Democracy on Trial: The Citizens-Initiated Referendums’ in Jack Vowles et al (eds), *Proportional Representation on Trial: The 1999 New Zealand General Election and the Fate of MMP* (Auckland University Press, 2002) 146.

⁷¹² For example, in New Zealand 10 percent of all registered voters must sign the petition asking for a referendum, Citizen Initiated Referenda Act 1993 (NZ) s 18.

⁷¹³ Referenda in New Zealand are non-binding, Citizen Initiated Referenda Act 1993 (NZ), short title ‘An Act to provide for the holding, on specific questions, of citizens initiated referenda, the results of which referenda will indicate the views held by the people of New Zealand on specific questions but will not be binding on the New Zealand Government.’

⁷¹⁴ In Switzerland referenda are binding, Armingeon and Lutz (n 126).

⁷¹⁵ Geoffrey de Q Walker, *The Rule of Law* (Melbourne University Press, 1988) 390, cited by Evans (n 710).

⁷¹⁶ The DAO enabled any token holder to make a proposal and for all token holders to vote, Jentzsch (n 25) 2.

it is more colloquially known, harnessing the wisdom of the crowds.⁷¹⁷ Second, decisions may be perceived as legitimate because the community voted for them.⁷¹⁸ Third, it is difficult to buy votes because the choices individual voters make are not known publicly,⁷¹⁹ although, in theory, it may be possible to buy votes in DAOs.⁷²⁰ Fourth, representative democracy is subject to lobbying.⁷²¹ While it has been argued that lobbying can provide representatives with industry-specific expertise and valuable information, which the representatives may not have been in a position to ascertain,⁷²² the positive role is diminished because not all groups in society 'have the same collective action capabilities'.⁷²³ If the decision-making power in DAOs is decentralised through a broad voter base,⁷²⁴ the ability to lobby is reduced.

In theory, the advantages of direct democracy should be magnified in DAOs because DAOs can extend direct democracy by decision-making occurring entirely through token holders making proposals, which are voted on by the other token holders.⁷²⁵ Thus token holders are not relegated to voting on proposals put forward by their representatives. However, even if token holders were to vote only on proposals formulated by a central body, direct democracy has its disadvantages, which are

⁷¹⁷ Thomas W Merrill, 'Direct Voting by Property Owners' (2010) 77(1) *University Chicago Law Review* 275, 277 citing Cass R Sunstein, *Infotopia: How Many Minds Produce Knowledge* (Oxford, 2006) 195–203 and James Surowiecki, *The Wisdom of Crowds* (Doubleday, 2004) 22, 36–39, 41–43, 70–72.

⁷¹⁸ Merrill (n 717) 278 and Peter Esaiasson, Mikael Gilljam & Mikael Persson, 'Which Decision-Making Arrangements Generate the Strongest Legitimacy Beliefs? Evidence from a Randomised Field Experiment' (2012) 51(6) *European Journal of Political Research* 785, 798.

⁷¹⁹ Merrill (n 717) 279.

⁷²⁰ Philip Daian et al, 'On-Chain Vote Buying and the Rise of Dark DAOs', *Hacking Distributed* (2 July 2018) <<https://hackingdistributed.com/2018/07/02/on-chain-vote-buying/>> and Jenna Zenk, 'Introduction to the Melon Governance System', *Medium* (2 November 2018) <<https://medium.com/melonprotocol/introduction-to-the-melon-governance-system-f6ff73c70eb0>>.

⁷²¹ Timothy Besley and Stephen Coate, 'Lobbying and Welfare in a Representative Democracy' (2001) 68(1) *Review of Economic Studies* 67 and Arye L Hillman, Ngo Van Long and Anotoine Soubeyran, 'Protection, Lobbying, and Market Structure' (2001) 54(2) *Journal of International Economics* 383.

⁷²² Nathalie Giger and Heike Klüver, 'Voting Against Your Constituents? How Lobbying Affects Representation' (2016) 60(1) *American Journal of Political Science* 190, 193.

⁷²³ Ibid 202. However, the ability for people to engage in citizen lobbying is increasing, Alberto Alemanno, *Lobbying for Change: Find Your Voice to Create a Better Society* (Icon Books, 2017) and Alberto Alemanno, 'The World Needs a New Generation of Citizen Lobbyists', *The Conversation* (26 September 2017) <<https://theconversation.com/the-world-needs-a-new-generation-of-citizen-lobbyists-84354>>.

⁷²⁴ While the aim of DAOs is to have a broad voter base without a concentration of voting power, this does not always occur in practice, Vitalik Buterin, 'Notes on Blockchain Governance', *Vitalik* (17 December 2017) <<https://vitalik.ca/general/2017/12/17/voting.html>> where one person cast nearly a quarter of the votes on whether to fork Ethereum after The DAO hack.

⁷²⁵ For example, The DAO enabled any token holder to make a proposal and for all token holders to vote, Jentzsch (n 25) 2.

looked at in the next section. Indeed, as is explored below in 4.3.2, not all DAOs use direct democracy due to the problems that it poses for DAOs.

4.2.2.2 Disadvantages of Direct Democracy for DAOs

When DAOs use direct democracy, for example, by allowing all token holders to vote for proposals, there can be disadvantages, just as traditional organisations and institutions face challenges in their use of direct democracy.⁷²⁶ First, there is voter ignorance or rational ignorance. The voter may not have the information necessary to make an informed vote;⁷²⁷ directors, for example, are likely to be better informed⁷²⁸ and it is not rational for voters to devote too much time to acquiring the information to make an informed vote if their vote is unlikely to have any effect on the outcome,⁷²⁹ although the lack of information does not stop them from forming definite conclusions and vote accordingly.⁷³⁰ Second, there is voter apathy, that is, if a voter has only one vote or a small token holding they will play such a small part in the outcome that it is not rational for them to vote and they do not vote.⁷³¹

Third, voters in a DAO may not want to take any risks, so they will not vote to change the status quo,⁷³² thereby creating a deadlock.⁷³³ The first DAO, Bitshares, suffered from this fate.⁷³⁴

Fourth, voters are more likely to vote in favour of proposals that benefit themselves, rather than those

⁷²⁶ Direct democracy has other disadvantages but they are not directly relevant to DAOs, for example, needing to raise money to spend on advertising citizen-initiated referenda, which favours the wealthy, Ari Weisbard, 'Buying and Audience: Justifying the Regulation of Campaign Expenditures That Buy Access to Voters' (2008) 118 *Yale Law Journal* 379.

⁷²⁷ Merrill (n 717) 281.

⁷²⁸ Lisa M Fairfax, 'From Apathy to Activism: The Emergence, Impact, and Future of Shareholder Activism as the New Corporate Governance Norm' (2019) 99(3) *Boston University Law Review* 1301, 1304.

⁷²⁹ Ilya Somin, 'Voter Ignorance and the Democratic Ideal' (1998) 12(4) *Critical Review* 413, 436 and Buterin, 'An Introduction to Futarchy' (n 17).

⁷³⁰ Bryan Caplan, 'Rational Ignorance versus Rational Irrationality' (2001) 54(1) *Kyklos* 1, 9 and Buterin, 'An Introduction to Futarchy' (n 17).

⁷³¹ Bernard S Black, 'Shareholder Passivity Reexamined' (1990) 89 *Michigan Law Review* 520, 521 and Merrill (n 717) 285–287.

⁷³² Larimer, 'Is The DAO Going to Be DOA?' (n 2).

⁷³³ Helen F McCreery et al, 'Consensus or Deadlock? Consequences of Simple Behavioral Rules for Coordination in Group Decisions' (2016) 11(9) *PloS One*: e0162768.

⁷³⁴ Larimer, 'Is The DAO Going to Be DOA?' (n 2).

for the greater good.⁷³⁵ It is worth noting that representative democracy suffers from the same problem: representatives may not vote for something that advances the greater good if it is seen to detrimentally affect their constituents and thus their re-election chances.⁷³⁶

Fifth, direct democracy has been criticised in political democracies because peoples' votes on a given issue can be captured and manipulated by the elite.⁷³⁷ DAOs, if they use a one token–one vote voting scheme are even more susceptible of capture by those with high token holdings. DAOs may also be prone to capture and manipulation by the elite due to their reputation with the DAO.⁷³⁸ Sixth, even if the elite do not deliberately engage in activity that leads to capture and manipulation, the majority can still exploit the minority.⁷³⁹ Indeed, mechanisms such as quadratic voting have been suggested as a way of protecting minorities.⁷⁴⁰ The position of minorities in DAOs, however, is different from traditional organisations and the protection against oppression in corporate law⁷⁴¹ is not as necessary. Aggrieved token holders — the minority — can exit by selling their tokens,⁷⁴² or by forking the DAO to create a new DAO.⁷⁴³ The sale of tokens can be seen as a weak exit⁷⁴⁴ because the selling of DAO tokens will do little to affect the DAO, unless a significant percentage of the tokens is sold, which can

⁷³⁵ This can be seen as a form of NIMBYism ('not in my backyard'), Merrill (n 717) 283–285.

⁷³⁶ K Sapru, *Public Policy: Art and Craft of Policy Analysis* (PHI Learning, 2nd ed, 2011) 110. An example is not increasing the retirement age, John Rawls, 'The Idea of Public Reason Revisited' (1997) 64(3) *University of Chicago Law Review* 765, 773.

⁷³⁷ Ober, *Democracy and Knowledge* (n 647) 99.

⁷³⁸ See above nn 533–535 for a discussion of the influence of Vitalik Buterin on the Ethereum community.

⁷³⁹ Merrill (n 717) 279 and Daniel Moeckli, 'Referendums: Tyranny of the Majority?' (2018) 24(3) *Swiss Political Science Review* 335.

⁷⁴⁰ Lalley and Weyl, 'Quadratic Voting' (n 682) and Eric A Posner and E Glen Weyl, 'Voting Squared: Quadratic Voting in Democratic Politics' (2015) 68(2) *Vanderbilt Law Review* 441. For a discussion of the use of quadratic voting in DAOs, see below 4.4.3.4.2.

⁷⁴¹ Companies Act 1993 (NZ) s 174.

⁷⁴² Hacker (n 33) 152. Selling tokens is akin to exit, as explained by Hirshman (n 30). While most DAO tokens can be sold through exchanges or by private sale, DAOs that have adopted the ragequit feature of the Moloch DAO allow members who vote 'no' to a proposal to exit the DAO within a grace period and the DAO repays the funds the member has paid into the DAO, Soleimani et al (n 14) 5 and Gabriel Shapiro, Peter 'pet3rpan' and Ameen Soleimani, 'MetaCartel Ventures' v 1.0 (White Paper v 1.0, December 2019) <<https://raw.githubusercontent.com/metacartel/MCV/master/Whitepaper.pdf>> 22, members in MetaCartel Ventures (MCV) can do a partial ragequit, thus leaving in some funds with a grace period of one week.

⁷⁴³ Hacker (n 33) 152, Ehksam (n 267) and Daniel M Ryan, 'The DAO: An Experiment in Responsibility', *Enter Stage Right* (23 May 2016) <<http://enterstageright.com/archive/articles/0516/dao.htm>>.

⁷⁴⁴ Ehksam (n 267).

affect the token price.⁷⁴⁵ Forking to create a new competing DAO,⁷⁴⁶ something which does not occur in traditional corporations,⁷⁴⁷ is a strong exit.⁷⁴⁸

Seventh, an argument can be made that referenda bypass constitutional checks and balances.⁷⁴⁹ DAOs, however, are based on the premise that members can make proposals,⁷⁵⁰ thus direct democracy in DAOs is not the exception: it is the norm; however, the allocation of funding may be inappropriate, leaving insufficient funds for much-needed projects.⁷⁵¹

In summary, DAOs, as with other organisations and institutions, face a number of challenges in their use of direct democracy. Those challenges are voter ignorance, the voters do not have sufficient information to make an informed vote. Voter apathy, because their vote or votes — if it is not one member-one vote — will have such a small effect it is not rational for them to vote. Voters can refrain from voting if it is perceived as risky to vote, thus the status quo cannot be changed. Elites can capture or manipulate the decision making, through either large token holdings, or their reputation in the DAO means that other token holders will follow their voting pattern. Finally, if all members can make proposals which require funding, the allocation of funding may not be appropriate, with insufficient funds remaining for essential projects. Innovative governance mechanisms, therefore, are required to ensure that they overcome the inherent limitations of direct democracy.

Another and particularly pressing challenge for DAOs, the setting of the agenda — who decides what decisions are to be voted upon — is the opposite side of the coin to voting. Agenda setting is explored in the next part because it is essential for the governance of DAOs and it can be used to mitigate some of the disadvantages of direct democracy for DAOs.

⁷⁴⁵ Hacker (n 33) 152.

⁷⁴⁶ Hacker (n 33) 152 and Ehrtam (n 267).

⁷⁴⁷ Hacker (n 33) 152.

⁷⁴⁸ Ehrtam (n 267).

⁷⁴⁹ Evans (n 710).

⁷⁵⁰ Grace Rachmany, 'Proposal Making in DAOs: The Limitations of "Anyone Proposes Anything"', *Hackernoon* (31 August 2019) <<https://hackernoon.com/proposal-making-in-daos-the-limitations-of-anyone-can-propose-anything-gn3lh35w1>> 'too often, the focus [in DAOs] is on the voting mechanisms, with an assumption that "anyone can propose anything."'

⁷⁵¹ 'The Perils of Extreme Democracy: Lessons from California', *The Economist* (20 April 2011) <<https://www.economist.com/leaders/2011/04/20/the-perils-of-extreme-democracy>>.

4.3 Agenda Setting

Agenda setting is critical for DAO governance, just as it is for any organisation.⁷⁵² A decision-making board may collectively decide what question it will decide; thus it sets its own agenda. Alternatively, before a decision-making body, such as a board, is required to make a decision, most organisations use a small group, or even one person, to act as gatekeeper. This group or person chooses and formulates the question or questions to be decided by a larger group. The people responsible for deciding what is placed on the agenda, therefore, wield significant power.⁷⁵³ The effects of concentrating power in the hands of a few have long been recognised and some institutions have implemented mechanisms to prevent the concentration of power. For example, in Ancient Greece the Council of 500⁷⁵⁴ set the agenda for the Assembly, which comprised all male Athenian citizens, to vote upon.⁷⁵⁵ Josiah Ober attributes to the Council of 500 some of innovation in Ancient Greece, which led to the latter's remarkable growth.⁷⁵⁶

DAOs are mindful of the concentration of power and some allow any token holder to put forward a proposal without any checks upon it.⁷⁵⁷ However, while the ability of token holders to put forward proposals accords with the decentralised nature of DAOs, there are potentially significant disadvantages. This part explores those disadvantages and the mechanisms DAOs use to mitigate them.

⁷⁵² Ober, *Democracy and Knowledge* (n 647) 142.

⁷⁵³ Peter Bachrach, *Political Elites in a Democracy* (Aldine Transaction, 2010) 6 'an elite not only wields an inordinate amount of power in making decision [sic] to initiate, approve, or veto policies within the scope of his influence, but he also exercises a great amount of power by preventing issues from being publicly considered that might threaten his interests.' Quoted by Josiah Ober, *Mass and Elite in Democratic Athens: Rhetoric, Ideology, and the Power of the People* (Princeton University Press, 1989) 78.

⁷⁵⁴ The Council of 500 comprised 50 citizens (free adult men) from each of the 10 tribes, who served for one year, Christopher W Blackwell, 'Athenian Democracy: A Brief Overview' in Adriaan Lanni, Athenian Law in Its Democratic Context (Center for Hellenic Studies On-line Discussion Series) <http://www.stoa.org/demos/article_democracy_overview@page=6&greekEncoding=UnicodeC.html> and Ober, *Democracy and Knowledge* (n 647) 142–151

⁷⁵⁵ Ober, *Democracy and Knowledge* (n 647) 78.

⁷⁵⁶ Ibid 142.

⁷⁵⁷ Although a fee may be charged for each proposal put forward. The Dash DAO, for example, requires a fee of five Dash per proposal, Mosley et al (n 20) 4–5.

4.3.1 The Challenges of Direct Democracy for DAOs

In addition to the general limitations of direct democracy that all organisations encounter, DAOs face additional challenges because a typical DAO cannot undertake an activity without a member proposing the activity, which other members agree to by voting for it.⁷⁵⁸

4.3.1.1 *Lack of Strategic Oversight and Vetting*

If any DAO token holder can put forward a proposal that is automatically voted upon, there will be no gatekeeper exercising strategic oversight and vetting. Even if a proposal appears to be in accord with the DAO's intent it may be voted in, despite it not being the ideal proposal.⁷⁵⁹

In a DAO, instead of representatives investing time and exercising skill and judgment when setting the agenda, if there are no checks and balances on the submission of proposals, the token holders are required to undertake that role when they vote on proposals.⁷⁶⁰ However, as one DAO has already demonstrated in practice, token holders will not always use the necessary time, skill and judgment required when voting. Bitshares, the earliest DAO, struggled with low voting rates and token holders' lack of skills and resorted to proxy voting, which centralised decision-making in Bitshares to around 12 elected proxies.⁷⁶¹ Even more recent and more important DAOs struggle with low voter turnout.⁷⁶² One interviewee observed that for MakerDAO, which operates the DAI stablecoin, 'voting is proving to be a huge challenge, because not many people are actively voting or even holding MKR ... [the MKR token holders] are pretty passive'.⁷⁶³

There is also the danger that a 'free for all' may allow short-term thinking to prevail over long-

⁷⁵⁸ Rachmany, 'Proposal Making in DAOs' (n 750).

⁷⁵⁹ Ibid. The ability of any member to propose anything 'is a bit like looking for a restaurant in a foreign city with no data connection. As you walk down the main street, you vote yes or no based on the menu at each restaurant, without knowing if the next one is better, and blind to the options that aren't on the main street'.

⁷⁶⁰ Larimer, 'Is The DAO Going to Be DOA?' (n 2).

⁷⁶¹ Ibid.

⁷⁶² Arsenault, 'Voting Options in DAOs' (n 23). See also DeepDAO, 'DAO Ecosystem Overview' <<http://deepdao.world/#/deepdao/dashboard>> which tracks voter participation.

⁷⁶³ Interviewee 6 (consultant). MKR is the governance token for MakerDAO, see MakerDAO, 'Introducing Governance' (n 665).

term thinking in DAOs.⁷⁶⁴ The untimely dissolution of the DigixDAO exemplifies the perils of short-term thinking.⁷⁶⁵ Digix, a corporation, created a stablecoin, DGX. In 2016, Digix created the DigixDAO to foster a community around DGX, with the intent that the community would decide which projects to fund to promote and maintain DGX.⁷⁶⁶ To fund the DigixDAO and to provide for its members, Digix ran an initial coin offering (ICO),⁷⁶⁷ and DigixDAO amassed a treasury worth over USD64 million.⁷⁶⁸ Some DigixDAO holders wanted to leave the DigixDAO and take out their share of DigixDAO's assets.⁷⁶⁹ DigixDAO, conscious that 'participation in DigixDAO platform may not be for everyone, especially for those who cannot put aside time to actively vote and/or create Projects on DigixDAO', proposed Project Ragnarok:⁷⁷⁰ there would be a proposal at the beginning of each quarter to dissolve the DigixDAO. Not surprisingly, given the size of the treasury, the proposal to dissolve DigixDAO was successful the first time it was voted upon and DigixDAO was subsequently wound up.⁷⁷¹

The demise of DigixDAO due to the short-term thinking of its token holders demonstrates the dangers of proposals that do not further the DAO's strategic intent, which for DigixDAO was to continue operating. On the other hand, Andrew Munro argues that DigixDAO's demise is a demonstration of a DAO working well, because its token holders were able to decide its fate.⁷⁷²

⁷⁶⁴ Fadilpašić (n 78) and Munro, 'How Do You Program a Democracy?' (n 78). Although short-term thinking is not unique to DAOs and can also be seen in corporations, Chartered Accountants in England and Wales, *Future Enterprise: Assessing Forms of Business* (2016) <www.icaew.com/-/media/corporate/files/technical/ethics/future-enterprise.ashx?la=en> [3.3].

⁷⁶⁵ Fadilpašić (n 78) and Munro (n 78).

⁷⁶⁶ Munro, 'What We Learnt from the Rise and Fall of the DigixDAO Autonomous Organisation' (n 558). DigixDAO members were also incentivised to contribute to the DAO by voting and other actions, Laura Zhang, 'DigixDAO User Guide: Rewards', *Medium* (24 March 2019) <<https://medium.com/digix/digixdao-user-guide-rewards-87f8c64707fc>>.

⁷⁶⁷ 'DigixDAO', *ICO Pulse* (22 June 2018) <<https://icopulse.com/ico/digixdao>>.

⁷⁶⁸ Fadilpašić (n 78).

⁷⁶⁹ Kai Cheng Chng, 'Proposal Announcement: Project Ragnarok (Integrating a Dissolution Mechanism for DigixDAO)', *Medium* (29 November 2019) <<https://medium.com/digix/proposal-announcement-project-ragnarok-integrating-a-dissolution-mechanism-for-digixdao-354fd871e3e0>>. The arguments were spurious, however, because DGD holders could sell their DGD tokens on cryptocurrency exchanges.

⁷⁷⁰ Ibid. The word Ragnarok would have been chosen carefully and it turns out to be apt: it comes from Norse mythology and is the battle of the gods at the end of the world.

⁷⁷¹ 670,000 DGD in favour to 20,000 DGD against, Munro, 'What We Learnt from the Rise and Fall of the DigixDAO Autonomous Organisation' (n 558). While the DigixDAO was wound up, DGX, the cryptocurrency, still exists and is managed by Digix, the entity that created DigixDAO.

⁷⁷² Munro, 'What We Learnt from the Rise and Fall of the DigixDAO Autonomous Organisation' (n 558).

In contrast, the Dash DAO has a clear vision and has supported a future direction⁷⁷³ for two reasons. First, its governance structure allows only masternodes, not all token holders, to vote. Any person or entity can be a masternode if they hold 1,000 Dash tokens and run expensive computer equipment.⁷⁷⁴ Second, the Dash DAO's treasury, despite its name, does not hold assets. Dash tokens are generated each month and paid out immediately to successful proposals; any surplus Dash is destroyed.⁷⁷⁵ Thus voting to wind up the Dash DAO would be killing the golden goose.

A related issue is the need for technical expertise to decide upon more technical and complex problems in DAOs.⁷⁷⁶ For example, while most proposals will not contain code, some will and they may contain an error, or the code could be deliberately malicious.

Alternatively, the code may be correct, but it would harm the DAO if it were adopted, for example, a proposal to transfer some or even all the DAO's assets to the proposer.⁷⁷⁷ If a one token—one vote voting scheme was used a proposer with more than 50 percent of the DAO's tokens would succeed.⁷⁷⁸ Moreover, most DAOs do not require an absolute majority (where the owners of the majority of tokens in circulation vote in favour of a proposal) because it is hard to achieve.⁷⁷⁹ Voting in the offline world is low,⁷⁸⁰ and DAOs are no different: votes in some DAOs and proto DAOs have been at 3 percent and even lower.⁷⁸¹ Owing to the difficulty in reaching an absolute majority, relative

⁷⁷³ Mosley et al (n 20) 14.

⁷⁷⁴ Valenzuela (n 271). However, the price of Dash has risen considerably since the Dash DAO was created, see below n 806 and therefore it is difficult to become a masternode as the cost of purchasing tokens to become a masternode is, at the time of writing, in the hundreds of thousands of dollars.

⁷⁷⁵ Richard Red, 'Observations of the Dash Treasury DAO', *Medium* (17 May 2018) <<https://medium.com/@richardred/observations-of-the-dash-treasury-dao-c94231b2b5c4>>.

⁷⁷⁶ AmaZix, 'A New System for Blockchain Governance: An Interview with Dr Bingsheng Zhang', *Medium* (14 May 2019) <<https://medium.com/amazix/a-new-system-for-blockchain-governance-an-interview-with-dr-bingsheng-zhang-67313ccc8c20>>.

⁷⁷⁷ Timothy Nielsen, 'Cryptocorporations: A Proposal for Legitimizing Decentralized Autonomous Organizations Autonomous Organizations' (2019) 5 *Utah Law Review* 1105, 1110.

⁷⁷⁸ Ibid. The attack of a blockchain in such a way can be seen as a type of 51% attack, see Suhyeon Lee and Seungjoo Kim, 'Short Selling Attack: A Self-Destructive but Profitable 51% Attack on PoS Blockchains', *Cryptology ePrint Archive* (2020) <<https://eprint.iacr.org/2020/019>>.

⁷⁷⁹ An absolute majority is where the owners of the majority of tokens in circulation vote in favour of a proposal.

⁷⁸⁰ See, eg, Lisa Hill, 'Low Voter Turnout in the United States: Is Compulsory Voting a Viable Solution?' (2006) 18(2) *Journal of Theoretical Politics* 207; Jacky Zvulun, 'Postal Voting and Voting Turnout in Local Elections: Lessons from New Zealand and Australia' (2010) 8(2) *Lex Localis – Journal of Local Self-Government* 115; and Phil Parvin, 'Democracy Without Participation: A New Politics for a Disengaged Era' (2018) 24(1) *Res Publica* 31, 34.

⁷⁸¹ Wave Financial, 'Blockchain Voter Apathy, Wave Financial', *Wave Financial* (Web Page, 29 March 2019) <<https://wavegp.com/blockchain-voter-apathy/>>.

majority is more commonly used.⁷⁸² Because it is unlikely that all DAO token holders will vote,⁷⁸³ a token holder with considerably less than 50 percent of the tokens is likely to be successful.⁷⁸⁴ Indeed, a relative majority has been described as not being a ‘viable governance option for DAOs’⁷⁸⁵ because of the ability of one token holder to drain the DAO’s funds if the other token holders are not paying careful attention.⁷⁸⁶ Stripping a DAO of its assets is unlikely to be in the interests of the DAO or the other token holders. However, it is possible to counter low voter turnout, for example, by requiring a large supermajority when votes are low and as the turnout increases, a simple majority will suffice.⁷⁸⁷

The need for vetting was recognised early in blockchain. Bitcoin, which uses ‘informal governance’,⁷⁸⁸ has a process for changing its code, which includes vetting by the community and the BIP editor.⁷⁸⁹ In theory the BIP editor’s power to reject proposals is limited to ‘duplication of effort, disregard for formatting rules, being too unfocused or too broad, being technically unsound, not providing proper motivation or addressing backwards compatibility, or not in keeping with the Bitcoin philosophy’.⁷⁹⁰ In practice, the BIP editor and other core developers exercise considerable power.⁷⁹¹ However, if the BIP editor refuses to accept a proposal, others can take that proposal and fork Bitcoin to create a competing blockchain.⁷⁹² Alternatively, a ‘soft fork’ can be created, which amends the blockchain according to the changes in the proposed BIP proposal.⁷⁹³ DAOs can implement a similar

⁷⁸² Relative majority is the majority of the votes cast, Shapiro, Peter ‘pet3rpan’ and Soleimani (n 742) 15.

⁷⁸³ Werbach, ‘The Siren Song’ (n 447) 233. In Bitshares, the first DAO, over 90 percent of token holders did not participate in voting, Larimer, ‘Is The DAO Going to Be DOA?’ (n 2).

⁷⁸⁴ For example, a person may hold 35 percent of a DAO’s tokens. If 65 percent of the DAO token holders (including the holder of the 35 percent) vote on a proposal to transfer all the tokens to the proposer, even if all the other 30 percent are against the proposal, the person holding the 35 percent will win.

⁷⁸⁵ Arsenault, ‘Voting Options in DAOs’ (n 23).

⁷⁸⁶ Ibid.

⁷⁸⁷ Burak Arikan, ‘Accountability in Decentralized Networks: The MolochDAO Case’, *Graph Commons* (18 August 2019) <<https://medium.com/graph-commons/accountability-in-decentralized-networks-the-molochdao-case-c28a0b3dd942>>.

⁷⁸⁸ Buterin, ‘Notes on Blockchain Governance’ (n 724).

⁷⁸⁹ Luke Dashjr, ‘BIP 2, BIP Process Revised’, *GitHub* (3 February 2016) <https://github.com/bitcoin/bips/blob/master/bip-0002.mediawiki#BIP_Editors>.

⁷⁹⁰ ‘BIP 0002’, *Bitcoin Wiki* (Web Page, 24 September 2019) <https://en.bitcoin.it/wiki/BIP_0002>.

⁷⁹¹ Atzori (n 650) 27–28.

⁷⁹² Raina S Haque et al, ‘Blockchain Development and Fiduciary Duty’ (2019) 2(2) *Stanford Journal of Blockchain Law and Policy* 139, 160–161. Such a fork is called a hard fork.

⁷⁹³ Ibid 161 and 162–164.

type of transparent censorship.⁷⁹⁴ For example, in the Decred DAO, a member who believes they have had a proposal censored unjustly can show their provably censored proposal to the Decred community, gather support and resubmit it.⁷⁹⁵

Therefore, as this section has shown, for a DAO decentralisation may not mean full decentralisation in the sense that anyone is able to make a proposal. Indeed, as this section demonstrates, DAOs can suffer from a lack of strategic oversight and vetting if any token holder can submit a proposal by right, which is automatically voted up by the token holders.

4.3.1.2 *Too Many Proposals*

If there were no barriers to the submission of proposals, a bad actor could flood the DAO with hundreds, thousands, or even millions of proposals.⁷⁹⁶ Spam emails are an example of bad actors taking advantage of systems that require no or little cost to exploit.⁷⁹⁷ Alternatively, while token holders individually may not make many proposals, if the DAO has a substantial number of token holders, the number of proposals may be large.⁷⁹⁸ If a DAO receives too many proposals it would waste token holders' time and attention⁷⁹⁹ and make it difficult, if not impossible, for people to detect proposals designed to harm the DAO.⁸⁰⁰ If relative majority were used,⁸⁰¹ which is common in DAOs, and there were no minimum requirements for the number of token holders or the percentage of tokens cast, the proposer could succeed in the vote with relatively few tokens.

⁷⁹⁴ Decred, 'Politeia', *Decred* (Web Page) <<https://docs.decred.org/governance/politeia/overview/>>.

⁷⁹⁵ Decred, 'Politeia Censorship', *Decred* (Web Page) <<https://docs.decred.org/governance/politeia/politeia-censorship/>>.

⁷⁹⁶ However, DAOs using Ethereum currently face costs in submitting proposals due to the requirement to pay gas fees, Ezra Weller, 'The Gas Price Struggle (May, 2020)', *Medium* (29 May 2020) <<https://medium.com/daostack/the-gas-price-struggle-may-2020-3f019dc286a1>>.

⁷⁹⁷ Spammers have taken advantage of the ability to send virtually free emails, with costly consequences for the recipients and their organisations, see generally, Justin M Rao and David H Reiley, 'The Economics of Spam' (2012) 26(3) *Journal of Economic Perspectives* 87. The cost of US businesses in terms of lost productivity caused by spam was estimated at almost USD22 billion in 2004, Justin Fielding, 'True Cost of Spam to Business', *Tech Republic* (13 February 2006) <<https://www.techrepublic.com/blog/data-center/true-cost-of-spam-to-business/>>.

⁷⁹⁸ Rachmany, 'Proposal Making in DAOs' (n 750).

⁷⁹⁹ Decred, 'Politeia Censorship' (n 795).

⁸⁰⁰ Field, 'Holographic Consensus—Part 1' (n 414) and Field and Weller (n 414).

⁸⁰¹ See above (n 782).

One way to limit the number of proposals could be to restrict the number of proposals a DAO member can make. However, it is not easy to distinguish between members as most DAOs do not use a KYC (know your customer) process.⁸⁰² For DAOs that do not use a KYC process, there is nothing to prevent a bad actor from engaging in Sybil behaviour and creating multiple addresses (accounts)⁸⁰³ and sending multiple proposals from each one to the DAO. Some DAOs have instituted their own forms of KYC, for example, DAOstack uses social proof: people can prove who they are by using a social media handle, for example, by tweeting a link to the proposal.⁸⁰⁴

DAOs have resorted to various mechanisms to avoid the problems of strategic oversight, vetting and too many proposals. The next part looks at those mechanisms.

4.3.2. Potential Solutions

4.3.2.1 *Decentralised Mechanisms*

DAOs have used various mechanisms, or mechanisms have been proposed in the literature, to foster decentralisation so that DAO members can make proposals without gatekeepers, while at the same time protecting the DAO and its members. Alternatively, if there are gatekeepers, those gatekeepers are decentralised. The final mechanism in this section is a short case study of DigixDAO, which attempted to use a sophisticated process to enable decentralised editing and vetting of proposals; the case study illustrates one possible decentralised solution.

⁸⁰² See Douglas W Arner, 'The Identity Challenge in Finance: From Analogue Identity to Digitized Identification to Digital KYC Utilities' (2019) 20 *European Business Organization Law Review* 55. However, some DAOs are proposing to use a type of KYC system, for example, Edgeware proposes to use certified GitHub accounts, Commonwealth Labs (n 127) 13.

⁸⁰³ The creation of multiple addresses is known as a Sybil attack, see generally P Swathi, Chirag Modi and Dhiren Patel, 'Preventing Sybil Attack in Blockchain using Distributed Behavior Monitoring of Miners' (Conference Paper, International Conference on Computing, Communication and Networking Technologies (ICCCNT), 2019).

⁸⁰⁴ Daniel Bar, 'How to Onboard Yourself to a DAO', *Medium* (22 April 2019) <<https://medium.com/bitfwd/how-to-onboard-yourself-to-a-dao-5bc4859d7768>>. Social proof is not therefore the same as social proof theory.

4.3.2.1.1 Charging for Proposals

Fees can be charged to limit the number of proposals. For the Dash DAO, the fee at the time of writing is five Dash.⁸⁰⁵ The relatively high price of Dash may deter people from putting forward too many proposals.⁸⁰⁶ However, if a DAO's token price is low,⁸⁰⁷ the utility of the fee in discouraging frivolous and even harmful proposals may be reduced.⁸⁰⁸

Charging a fee, however, could be seen as an unnecessary hurdle for those who wish to make important and necessary changes to the DAO's rules.⁸⁰⁹ The effect of charging a fee can be mitigated by refunding the fee if the proposal is successful,⁸¹⁰ or allowing the proposer to include the fee in its proposal.⁸¹¹ An alternative mechanism to mitigate the effects of fees on genuine proposers is to use non-binding polls to reveal token holders' sentiment before submitting proposals.⁸¹²

It is possible to charge different fees depending on the nature and value of the proposal. Polkadot, a DAO that operates a relay chain, a type of blockchain designed to allow blockchains to connect, thus providing interoperability,⁸¹³ has no uniform proposal fee. In Polkadot a bond in tokens is required for a proposal to change code (public referenda).⁸¹⁴ If the proposal is tabled (brought to a vote), the bond is returned.⁸¹⁵ For funding requests (treasury proposals) there is a fee of 5 percent of

⁸⁰⁵ Mosley et al (n 20) 4–5.

⁸⁰⁶ On 31 March 2021 Dash was worth USD217.95 per Dash (<https://www.coingecko.com/en/coins/dash>). Thus, the cost of putting forward a proposal at that time was USD1,089.75.

⁸⁰⁷ While Dash was trading at USD217.95, NavCoin was USD0.75 per Navcoin (NAV) (<https://www.coingecko.com/en/coins/navcoin/>).

⁸⁰⁸ Fifty NAV are required to put forward a proposal for NavCoin, Siflu, 'The History, The Current State and the Future of NavCoin', *Medium* (25 January 2019) <<https://medium.com/@siflu/the-history-the-current-state-and-the-future-of-navcoin-3390d3455313>>. A possible work around of denominating the fee in fiat currency, but paid in the DAO's tokens, or payment in a stablecoin, while it would remove large price fluctuations would introduce unnecessary complexity.

⁸⁰⁹ Xkcd, 'Pre-Proposal Reduce the Proposal Fee to 1 Dash', *Dash Forum* (12 February 2021) <<https://www.dash.org/forum/threads/pre-proposal-reduce-the-proposal-fee-to-1-dash.51329/>>.

⁸¹⁰ Polkadot, 'Treasury', *Polkadot Wiki* <<https://wiki.polkadot.network/docs/en/learn-treasury>>; Jentzsch (n 25) 2; and Williams (n 271).

⁸¹¹ John Darby, 'A Guide to the NavCoin Community Fund', *NavHub* (18 September 2018) <<https://navhub.org/news/2018-09-18-a-guide-to-the-navcoin-community-fund/>>.

⁸¹² Commonwealth Labs (n 127) 10.

⁸¹³ <<https://polkadot.network/>>.

⁸¹⁴ Polkadot, 'Participate in Democracy' (n 617).

⁸¹⁵ *Ibid.*

the requested amount or 100 DOT, whichever is the higher.⁸¹⁶ The proposer loses that fee if the proposal is rejected; if it is successful the fee is refunded.⁸¹⁷

Charging people to make proposals is a rudimentary mechanism of attempting to limit proposals and it will create some friction and make people think twice before submitting a proposal. Reasonably high fees do appear to foster reasonable proposals; for example, in the Dash DAO over a five-year period 79 percent of proposals succeeded.⁸¹⁸ Charging for proposals, however, does not address the issues of lack of strategic oversight and vetting.

4.3.2.1.2 *Minimum Number of Tokens Staked*

One interviewee described Sybil resistance as a continuum:⁸¹⁹ it need not be a case of all or nothing. It would be possible to increase Sybil resistance without requiring KYC measures, for example, requiring minimum staking requirements.⁸²⁰ Therefore, a 25-token minimum for an address would mean that instead of one person or entity with 100 tokens creating 100 addresses (or accounts), that person could create a maximum of four accounts.⁸²¹

4.3.2.1.3 *Reputation*

The number of proposals may be decreased if the ability to submit them is limited to those who have gained a certain level of reputation within the DAO.⁸²² DAO members may gain reputation by contributing to the DAO⁸²³ or by other reputation holders granting it to them.⁸²⁴ At first it would

⁸¹⁶ Polkadot, 'Treasury' (n 810).

⁸¹⁷ Ibid.

⁸¹⁸ Mosley et al (n 20) 9. The cost per proposal (five Dash) varied over this time from USD15.15 to over USD5,000, see 'Dash Price Index', *Cointelegraph* <<https://cointelegraph.com/dash-price-index>>.

⁸¹⁹ Interviewee 3 (DAO founder, not yet in operation).

⁸²⁰ Ibid.

⁸²¹ Ibid.

⁸²² Rea et al (n 27) [3.2].

⁸²³ Ibid [3.3].

⁸²⁴ Erza Weller, 'A Guide to DAOstack's Initial Reputation Protocol', *Medium* (12 February 2019) <<https://medium.com/daostack/a-guide-to-daostacks-initial-reputation-protocol-f8365f157f7a>>.

appear that a reputation system would require a KYC process to ascertain identity.⁸²⁵ However, not all reputation systems require a strict KYC process: DAOstack, for example, uses social proof.⁸²⁶

Unlike tokens, reputation is non-transferable. In DAOstack, reputation can be gained by putting forward a proposal asking for reputation and can also be gained and lost through voting.⁸²⁷ Reputation is gained if the reputation holder votes the same way as the majority, but is lost if they vote with the minority.⁸²⁸ Colony also uses a reputation system.⁸²⁹ In Colony, not only do users gain and lose reputation due to their contributions and actions, their reputation also decays over time.⁸³⁰ The decay feature means that users' reputation scores represent their recent contributions to the DAO.⁸³¹ One interviewee described decaying reputation as an 'elegant technique to ensure engagement'⁸³² and it is sensible as people's recent contributions should be as important if not more so than reputation gained in the preceding years.

Alternatively, as one interviewee identified, it may be possible to nudge token holders into holding a single address, rather than splitting their tokens amongst multiple addresses, without those token holders revealing who they are.⁸³³ This could be done by people giving reputation to each other for the contributions. That reputation then increases the token holders' voting strength, thus there is no benefit in a person using multiple identities.⁸³⁴

⁸²⁵ Digix Writer, 'DigixDAO Governance Model – Update #1', *Medium* (24 April 2018) <<https://medium.com/@Digix/digixdao-governance-model-update-1-e61021718c9e>> and Solar DAO where potential token holders were required to prove their identity by providing copies of various documents, Solar DAO, 'The Beginning of KYC Procedure', *Medium* (6 March 2018) <<https://medium.com/solardao/the-beginning-of-kyc-procedure-706af7d21a58>>.

⁸²⁶ Social proof is not the same as social proof theory: people prove who they are by using a social media handle, for example, by tweeting a link to the proposal, Bar (n 737).

⁸²⁷ Weller, 'A Guide to DAOstack's Initial Reputation Protocol' (n 824).

⁸²⁸ Ibid.

⁸²⁹ Rea et al (n 27) [2.5]–[2.5.4]. Colony's solution to the problem that no one will have reputation when the DAO first begins is to assign reputation to each user according to the tokens they acquire, [2.5.2].

⁸³⁰ Ibid [2.5.2], '[a] user's reputation in every domain or skill decays by a factor of 2. This decay occurs every 1 hour, rather than being a step change every 90 days.'

⁸³¹ Ibid.

⁸³² Interviewee 5 (consultant).

⁸³³ Interviewee 2 (DAO founder).

⁸³⁴ Ibid.

Reputation by itself, however, will not necessarily prevent faulty or even malicious proposals. Nor is reputation fool proof as it is exercised by the holder of the private key to that reputation.⁸³⁵ A reputation holder could allow a third party to use that reputation by giving or selling the private key to the third party.⁸³⁶ Mechanisms could be used to prevent reputation trading, such as removing reputation from that private key if the transfer is discovered.⁸³⁷ Those that transfer private keys could be rewarded for disclosing the transfer, which may discourage people from attempting to buy reputation as there would be a high chance that the buyer's actions would be disclosed.⁸³⁸

4.3.2.1.4 *Seconding*

Seconding is a common procedural requirement in meetings in traditional hierarchical organisations. If a motion is moved, a second is often required for it to be debated. Seconding can be used in DAOs as a way of signalling that someone apart from the proposer believes that a proposal is worthy of voting upon. However, it is relatively easy to convince another person to second,⁸³⁹ thus seconding by itself is not a particularly strong mechanism to ensure fewer and better-quality proposals.

Polkadot uses a sophisticated system of seconding proposals for rule changes. Seconding in Polkadot differs from conventional seconding and is not so easily gamed. Seconding works in Polkadot by a token holder staking the same number of tokens as the proposer.⁸⁴⁰ However, to limit the number of proposals that members vote upon, mere seconding is not sufficient for the proposal to progress further. Only the most seconded proposal in value of tokens becomes a referendum and goes forward for members to vote upon. Thus, for a proposal to be voted upon, it will need to be 'seconded' many times.⁸⁴¹ This is an elegant way of filtering proposals and it provides a solution for

⁸³⁵ A private key is a long string of letters and numbers and is similar to a password. However, unlike a password, there is no central party to reset it if a person loses their private key.

⁸³⁶ Adam Levi, 'Reputation vs Tokens', Medium (26 March 2019) <<https://medium.com/daostack/reputation-vs-tokens-6d7642c7a538>>.

⁸³⁷ Ibid.

⁸³⁸ Ibid.

⁸³⁹ Also, if no KYC is done, the proposer could game the system by creating a new address and second their own proposal.

⁸⁴⁰ Polkadot, 'Participate in Democracy' (n 617).

⁸⁴¹ There is no limit on how many times the proposal is seconded, even by the same token holder, Polkadot, 'Participate in Democracy' (n 617).

the weakness in DAOstack's Holographic Consensus that the seconders are not betting on the outcome of the vote as they do not receive a windfall if the proposal passes.⁸⁴² Indeed, in Polkadot the tokens seconded are staked until the proposal becomes a referendum, thus seconders are taking a risk because the proposal may never become a referendum.⁸⁴³

4.3.2.1.5 *DigixDAO*

This section looks at DigixDAO's complicated endorsement and draft phases for proposals. It demonstrates the potential complexity of a DAO's governance; the ability for DAO members to use decentralised vetting; the use of seconding (which DigixDAO called 'endorsement'); how the community can contribute and craft proposals before members vote on them; and the evolution of governance mechanisms.

To participate in the DigixDAO's governance and become a 'participant', DigixDAO token holders were required to stake at least the minimum threshold for that quarter.⁸⁴⁴ In the endorsement phase, a participant could put forward a proposal (a pre-proposal) if they met KYC requirements, designed expressly 'to prevent malicious proposals from being submitted'.⁸⁴⁵ Next, a badge-holding participant needed to endorse the pre-proposal.⁸⁴⁶ Three-hundred and eighty-five transferrable badges were issued⁸⁴⁷ to people who pledged over USD15,000 in the DigixDAO ICO.⁸⁴⁸ An endorsement meant the pre-proposal became an initial proposal,⁸⁴⁹ and participants were able to

⁸⁴² Ibid.

⁸⁴³ Ibid.

⁸⁴⁴ Digix Writer, 'DigixDAO Governance Model: Update #1' (n 825). The minimum threshold was dynamic and depended on several factors, although the term 'lock-up' was used instead of 'staking'.

⁸⁴⁵ Ibid.

⁸⁴⁶ Ibid.

⁸⁴⁷ Ibid and u/mascatarasca, 'DigixDAO Badge for Sale in Cryptoderivatives Market', 2017, Reddit, <https://www.reddit.com/r/digix/comments/65wwc8/digixdao_badge_for_sale_in_cryptoderivativesmarket/> where badges were selling for between USD700 and USD1,400.

⁸⁴⁸ Paul Andrew, 'What is DigixDAO? – Beginner's Guide' (21 February 2018) <<https://coincentral.com/digixdao-beginners-guide/>> and see Digix Writer, 'DigixDAO Governance Model — Update #4', *Medium* (5 June 2018) <<https://medium.com/@Digix/digixdao-governance-model-update-4-2f92798242bd>>.

⁸⁴⁹ Digix Writer, 'DigixDAO Governance Model: Update #1' (n 825).

comment and suggest improvements and modifications.⁸⁵⁰ To move to an actual proposal the badge-holding participants had to vote in favour.⁸⁵¹

The undue power of the badge holders was an obvious weak point and it generated considerable discussion.⁸⁵² At best there were only 385 badge holders and there were likely to be fewer involved in decision-making as badge holders needed to stake tokens to become participants. There was tension, however, between not casting adrift the badge holders who had invested in DigixDAO on the promise of a role in its governance and people who were active in the DigixDAO but were not badge holders. In a compromise, moderators replaced badge holders.⁸⁵³ Moderator status was dependent on a person's reputation; any person could become a moderator if they did sufficient work for the DigixDAO.⁸⁵⁴ Badge holders could redeem their badges, giving them exactly enough reputation to become a moderator.⁸⁵⁵ If the former badge holder's reputation fell they would lose their moderator status.⁸⁵⁶

DigixDAO was an example of a sophisticated governance model that allowed for decentralised vetting and community input into proposals. It was more sophisticated than many previous DAOs. For example, in the Dash DAO, a pre-proposal can be posted on the Dash DAO's forum for feedback, but seeking feedback is not a requirement and there is no gatekeeping mechanism for a pre-proposal to move to a proposal.⁸⁵⁷ Yet, despite the sophistication of DigixDAO's governance, token holders voted to wind up DigixDAO.⁸⁵⁸ That DigixDAO ultimately did not succeed does not mean that decentralised governance is not possible. Modern corporations have had well over 150 years to evolve.⁸⁵⁹

⁸⁵⁰ Ibid.

⁸⁵¹ Ibid. The minimum threshold was dynamic and depended on several factors. If the proposal was edited after the vote, the badge holders were required to vote again.

⁸⁵² Digix Writer, 'DigixDAO Governance Model — Update #5', *Medium* (22 June 2018) <<https://medium.com/@Digix/digixdao-governance-model-update-5-2802b6ae936c>>.

⁸⁵³ Ibid.

⁸⁵⁴ Ibid.

⁸⁵⁵ Ibid. Only one badge could be redeemed per Ethereum address.

⁸⁵⁶ Ibid.

⁸⁵⁷ Mosley et al (n 20) 6.

⁸⁵⁸ Munro, 'What We Learnt from the Rise and Fall of the DigixDAO Autonomous Organisation' (n 558).

⁸⁵⁹ Modern corporations emerged in the mid-19th century, see generally Adolf A Berle and Gardiner C Means, *The Modern Corporation & Private Property* (Macmillan, 1932). In the United Kingdom, a series of Acts paved the way for the modern corporation, namely the Joint Stock Companies Registration and Regulation Act 1844 (UK)

Democracies have had hundreds, if not thousands of years, upon which to draw lessons for governance,⁸⁶⁰ although electoral systems have not changed significantly in recent years.⁸⁶¹ As Kevin Werbach notes in relation to DAOs, '[t]here is no shortcut to designing governance mechanisms, watching how they operate in practice, and iterating based on their shortcomings'.⁸⁶²

4.3.2.1.6 *Summary of Decentralised Mechanisms*

The decentralised mechanisms employed in DAOs have had varying levels of success. The charging of fees may not be effective if the fee is too low. Alternatively, if the fee is too high, due to the high cost of the DAO's tokens, token holders may be hesitant to put forward proposals. Attempts are being made to differentiate between different types of proposals, where the amount of the fee depends on the nature of the proposal. Another way to limit proposals is to require a token holder to stake a minimum number of tokens before they are eligible to submit a proposal. However, neither fees or requiring a minimum number of tokens before putting forward a proposal addresses the lack of strategic oversight and vetting. Requiring reputation for token holders to be eligible to submit proposals goes some way to attempting to ensure that the proposals are put forward by those who are active in the DAO, but that does not guarantee the quality of the proposals. The use of seconding, where the seconder must stake tokens, provides a rudimentary version of vetting, but it is not by itself sufficient to ensure proper strategic oversight and vetting, because the seconder could collude with the proposer or the seconder may not fully understand the nature and quality of the proposal. Finally, DigixDAO, while appearing robust on its face, failed at its first hurdle. Indeed, due to the limitations of

(which allowed joint stock companies to incorporate with Royal Charter or a private Act of Parliament), and the Limited Liability Act 1855 (UK) (which granted shareholders limited liability).

⁸⁶⁰ Ancient Greece is normally credited with the first democracy, Victor Ehrenberg, 'Origins of Democracy' (1950) 1(4) *Historia: Zeitschrift Für Alte Geschichte* 515.

⁸⁶¹ Jack Nagel argues the lack of change in democracies is because politicians who have won under the existing rules are unlikely to agree to change as there is a risk that the new order may work against them, Jack N Nagel, 'What Political Scientists Can Learn from the 1993 Electoral Reform in New Zealand' (1994) 27(3) *PS: Political Science & Politics* 525. There are, of course, exceptions. As Nagel explains, New Zealand replaced its first past-the-post (FPP) with a mixed-member proportional (MMP) system in 1993. Arguments have been made that mechanisms such as sortition used in Ancient Greece should be used in modern democracies, Terrill G Bouricius, 'Democracy Through Multi-Body Sortition: Athenian Lessons for the Modern Day' (2013) 9(1) *Journal of Public Deliberation* 1. But see Yves Sintomer, 'From Deliberative to Radical Democracy? Sortition and Politics in the Twenty-First Century' (2008) 46(3) *Politics and Society* 337.

⁸⁶² Werbach, 'The Siren Song' (n 447) 239.

decentralised mechanisms in terms of strategic oversight and vetting many DAOs use a combination of both decentralised and centralised mechanisms in their governance. Polkadot, for example, uses a combination of seconding and centralised mechanisms. The next section examines and explains centralised mechanisms.

4.3.2.2 Centralised Entities

Centralised structures have been used by and proposed in some DAOs as part of their governance systems to mitigate the limitations of direct democracy.

4.3.2.2.1 Centralised Entity That Gives an Indicative Vote

A council, or similar body, could have oversight of proposals submitted by token holders. In the Edgware DAO, token holders make the proposals, with the Edgware Council voting on each proposal before the token holders vote.⁸⁶³ If the Council members vote unanimously in favour of a proposal, a lower majority of votes from token holders is required to pass the proposal. Alternatively, a higher majority of votes from token holders is required if the Council is not unanimous.⁸⁶⁴

While the Council members serve 12-month terms,⁸⁶⁵ token holders in the Edgware DAO play a significant role in the DAO's governance because token holders make the proposals and even if the Council is not in favour of the proposal, the token holders are able to override that decision.⁸⁶⁶

⁸⁶³ Each Council member has one vote, Commonwealth Labs (n 127) 14.

⁸⁶⁴ Ibid.

⁸⁶⁵ Ibid.

⁸⁶⁶ The supermajority rule in the US Senate is somewhat similar. If filibustering (an attempt to block or delay a vote by extending the debate) occurs, three-fifths of the senators can vote to close the debate and force a vote, US Senate Rule XXII, and see Burt Neuborne, 'One-State/Two-Votes: Do Supermajority Senate Voting Rules Violate the Article v Guaranty of Equal States Suffrage' (2014) 10 *Stanford Journal of Civil Rights and Civil Liberties* 27, 27–29.

4.3.2.2.2 *Centralised Entity That Makes the Proposals*

An alternative to a council that receives token holders' proposals and gives an indicative vote before token holders vote is a council that generates its own proposals. Decentraland, which, just before launching as a DAO,⁸⁶⁷ sold nearly USD600,000 worth of virtual assets,⁸⁶⁸ was conscious of the inherent risks of faulty code or other errors and the need to fix errors quickly. Decentraland DAO uses a security advisory board, which puts forward proposals for token holders to vote on.⁸⁶⁹ Unlike a corporation, where a small committee chooses the potential new executives and the voting for executives by shareholders occurs at AGMs, any token holder can put forward a proposal at any time to remove a member of the security advisory board and replace that person.⁸⁷⁰

4.3.2.2.3 *Centralised Entity That Makes the Decisions*

DAOs may use a centralised entity to make decisions. Melonport, which manages digital assets, uses its Melon Council, an express attempt to mitigate against many issues that plague organisations, including DAOs.⁸⁷¹ Issues identified by Melonport include: an actor purchasing large numbers of tokens or buying votes or bribing voters; decisions made by people without domain expertise; the time it takes to make decisions through voting and securing a sufficiently large turnout so the vote is considered legitimate; and token holders voting in favour of their interests, which may not be in the project's interests in terms of longevity and growth.⁸⁷² In contrast to Edgeware and Decentraland, where the token holders take part in voting, token holders in Melonport do not vote.

The Melon Council comprises the Melon Technical Council (MTC) and representatives of the Melon Exposed Businesses (MEB). The MEB represents Melonport's users and checks the MTC's

⁸⁶⁷ It is usual for a project to begin centralised and then to be transformed into a DAO, Allen and Berg, 'Blockchain Governance' (n 441) 6.

⁸⁶⁸ William M Peaster, 'Decentraland: A Virtual World on Ethereum Hits Mainnet This Week', *Blockonomi* (18 February 2020) <<https://blockonomi.com/decentraland-virtual-world-ethereum-mainnet/>>.

⁸⁶⁹ Decentraland (n 125).

⁸⁷⁰ Ibid.

⁸⁷¹ Zenk (n 720).

⁸⁷² Ibid.

decisions.⁸⁷³ In terms of agenda setting, an MEB representative can request the Melon Council's chairperson to include a specific agenda item if more than 10 percent of the MEB have voted in favour.⁸⁷⁴ Also, if a majority of the MEB votes in favour, the MEB can request that a Council member is removed for non-compliance with the 'behavioural rules' in Melonport's statutes.⁸⁷⁵

Melonport's highly centralised Council is arguably not a re-creation of representative democracy as fund managers⁸⁷⁶ must agree to run the new code decided upon by the Council.⁸⁷⁷ Thus, the fund managers have a veto over the Melon Council's decisions. In turn, even if the fund managers do run the new code, their investors (and thus Melonport token holders), can exist by selling their tokens or forking Melonport.⁸⁷⁸

4.3.2.2.4 *More Sophisticated Central Entity*

Polkadot's Council is more sophisticated than the others discussed above. The Council's members, currently 13,⁸⁷⁹ are elected by token holders,⁸⁸⁰ using a sequential Phragmén method.⁸⁸¹ Any token holder can apply for candidacy, which requires a bond.⁸⁸² The Council⁸⁸³ can put forward proposals for token holders to vote upon.⁸⁸⁴ Such proposals are in addition to those that are automatically put to

⁸⁷³ Ibid.

⁸⁷⁴ Melon, 'Melon Council Statute' <<https://docs.google.com/document/d/1tLEa2rM-mmzHQkv41i0E9o0g4aHGrEyYvMfNjEPid2s/edit>>.

⁸⁷⁵ Ibid art 6. The majority, however, may be a two-thirds majority, see Zenk (n 720).

⁸⁷⁶ Fund managers set their own parameters for trading, including fees they charge investors, Hansen Wang, 'What is Melon (2018 Edition)', *Medium* (31 July 2018) <<https://medium.com/melonprotocol/what-is-melon-2018-edition-3437f3d064d8>> and John Othwein, 'Management and Performance Fees in a Melon Fund', *Medium* (30 November 2018) <<https://medium.com/melonprotocol/management-and-performance-fees-in-a-melon-fund-f1df2a26abd9>>.

⁸⁷⁷ Zenk (n 720).

⁸⁷⁸ Ibid.

⁸⁷⁹ Which is expected to rise to 24, Polkadot, 'Governance' (n 125).

⁸⁸⁰ Polkadot, 'Join the Council', *Polkadot Wiki* <<https://wiki.polkadot.network/docs/en/maintain-guides-how-to-join-council>>. At the time of writing the bond was 100 DOT, which at USD33.71 per DOT (on 28 April 2021) amounted to USD3,371. It is likely for this number of DOT to be reduced as the bond is meant to be 'small'. The bond is lost if the candidate does not win a place on Council but will be returned if the candidate renounces their candidacy before losing.

⁸⁸¹ Lars Edvard Phragmén, 'Till Frågan om en Proportionell Valmetod' (1899) 2(2) *Statsvetenskaplig Tidskrift* 297 and Polkadot, 'Join the Council' (n 880). See also, Polkadot, 'Voting for Polkadot or Kusama Council' (YouTube, 23 September 2020) <<https://www.youtube.com/watch?v=837Vv3gdRzI>>.

⁸⁸² Polkadot, 'Join the Council' (n 880).

⁸⁸³ The Council comprises 13 members and will rise to 24, Polkadot, 'Governance' (n 125).

⁸⁸⁴ Ibid.

token holders as the most seconded proposals (publicly submitted proposals).⁸⁸⁵ The Council also has oversight of the publicly submitted proposals: it can cancel dangerous or malicious proposals if it votes unanimously to do so.⁸⁸⁶ To ensure that Council proposals do not take precedence over token holders' proposals, the proposals voted upon by token holders alternate between publicly submitted proposals and Council-submitted proposals.⁸⁸⁷ For the Council proposals, if the Council does not unanimously agree on a proposal but a majority does, the token holders require a simple majority to vote in favour for it to succeed;⁸⁸⁸ if the Council unanimously agrees on a proposal the voting requirement of token holders is lower.⁸⁸⁹

Polkadot also has a Technical Committee, the members of which are added or removed by a majority vote of the Council.⁸⁹⁰ The Technical Committee can produce emergency proposals, which are fast tracked for voting and implementation.⁸⁹¹

4.3.2.2.5 *Critique of Central Entities*

Centralised entities centralise power, which is the antithesis of decentralisation. However, a one token—one vote voting scheme is not decentralised if a single person or a small group controls sufficient tokens.⁸⁹² In an appropriately designed governance system, a council can mitigate against a single large token holder, thereby drowning out the views of 'potentially thousands of engaged and enthusiastic community members'.⁸⁹³

If centralised bodies are used, care must be taken so that the central body is not too powerful and it does not unintentionally re-create representative democracy, such as people seeking re-

⁸⁸⁵ Polkadot, 'Participate in Democracy' (n 617).

⁸⁸⁶ Polkadot, 'An Updated Overview of Polkadot', *Polkadot* (Web Page, 3 June 2020) <<https://polkadot.network/an-updated-overview-of-polkadot/>>.

⁸⁸⁷ If there is no proposal to be voted upon in a queue, for example, there are no Council-submitted proposals, but there is a publicly submitted proposal, the publicly submitted proposal will be voted upon, Polkadot, 'Governance' (n 125).

⁸⁸⁸ Ibid.

⁸⁸⁹ Ibid.

⁸⁹⁰ Ibid.

⁸⁹¹ Ibid.

⁸⁹² Ibid.

⁸⁹³ Kain Warwick, 'The Spartan Council', *Synthetix Blog* (Blog Post, 11 November 2020) <<https://blog.synthetix.io/spartan-council-proposal/>>.

election or attempting to ensure that like-minded people are elected to replace them. One advantage of Edgeware is that the Council provides a vetting and strategic oversight role, yet the token holders still vote. The issue of too many proposals, however, is not solved by Edgeware. Decentraland's security advisory board provides strategic oversight and addresses the issue of too many proposals because only it can put forward proposals. The lack of the ability of token holders to put forward proposals is mitigated because token holders are the ultimate decision-makers as they must vote on the board's proposals and they can vote to replace board members at any time. Polkadot's Council strikes the middle ground: it allows for both token-holder proposals as well as Council proposals and allows oversight as the Council can strike out dangerous or malicious proposals. Polkadot's Technical Committee is also able to act quickly to introduce proposals necessary to ensure the health of the DAO.

The use of elections to councils, however, still raises the spectre of people vying for election and re-creating representative democracy. One possible solution is to use sortition.

4.3.2.2.6 *Sortition*

Sortition is another potential solution to avoid the limits of centralisation.⁸⁹⁴ Sortition is where people are chosen by lottery to perform a role, rather than standing and campaigning for election.⁸⁹⁵ No DAO has used or proposed using sortition, yet there is no reason why it could not be used.⁸⁹⁶ A central body could be formed from a random selection of token holders who are willing to serve.⁸⁹⁷ The voting could be one person–one vote, or it could even be combined with quadratic voting.⁸⁹⁸ Despite

⁸⁹⁴ See generally Sintomer (n 861) and Peter Stone, 'Sortition, Voting and Democratic Equality' (2016) 19(3) *Critical Review of International Social and Political Philosophy* 339.

⁸⁹⁵ Sintomer (n 861) and Stone (n 894).

⁸⁹⁶ Samman and Freuden (n 663) 24.

⁸⁹⁷ An alternative form of sortition combined with quadratic voting has been suggested, vbuterin, 'Quadratic Voting with Sortition' (2 September 2019) <<https://ethresear.ch/t/quadratic-voting-with-sortition/6065>>.

⁸⁹⁸ Ibid. For a discussion of quadratic voting, see below 4.4.3.4.2.

criticisms of sortition,⁸⁹⁹ using lotteries to choose representatives, rather than using traditional methods of electing people, has been used in other settings with promising results.⁹⁰⁰

The next section addresses voting because voting is at the heart of a DAO's governance. It looks at who is entitled to vote, how they vote and whether they will vote.

4.4 Voting Schemes

Voting schemes differ markedly across organisations and institutions. Corporations typically use one share—one vote,⁹⁰¹ whereas political democracies use one vote per eligible voter.⁹⁰² Other organisations, such as cooperatives, use a membership model of one member—one vote.⁹⁰³ Traditional voting schemes normally work with simple majorities and on occasion super-majorities.⁹⁰⁴ While DAOs can replicate the traditional simple majority for most proposals and super-majority for extraordinary ones,⁹⁰⁵ many other thresholds and mechanisms are possible. For example, for a proposal in the Dash DAO to succeed there must be a net total of 'yes' votes of more than 10 percent of the masternodes.⁹⁰⁶ More onerous is Tezos, which requires an 80 percent super-majority for all changes

⁸⁹⁹ Simon Pek, 'Drawing Out Democracy: The Role of Sortition in Preventing and Overcoming Organizational Degeneration in Worker-Owned Firms' (2021) 30(2) *Journal of Management Inquiry* 193.

⁹⁰⁰ Jean-Sébastien Blais, 'Public Consultation Design: The Use of a Random Selection Method for Selecting Political Officers', *University of Bristol Law School* (Blog Post, 16 March 2017) <<https://www.bristol.ac.uk/law/dbe/blog/2017/16/>>; Ariel Procaccia, 'Lotteries Instead of Elections? Not So Arbitrary', *Bloomberg* (7 September 2019) <<https://www.bloomberg.com/opinion/articles/2019-09-06/what-if-politicians-were-chosen-at-random-by-lottery>>; and Malcom Gladwell, 'The Powerball Revolution', *Revisionist History* (Podcast, 2020) <<http://revisionisthistory.com/episodes/44-the-powerball-revolution>> where student councils in Bolivia were chosen through a lottery.

⁹⁰¹ Not all shares in a corporation have voting rights; it will depend on the class of share. For an argument that one share—one vote is optimal for corporations, see Sanford J Grossman and Oliver D Hart, 'One Share—One Vote and the Market for Corporate Control' (1988) 20 *Journal of Financial Economics* 175.

⁹⁰² Stephen Stohler, 'One Person, One Vote, One Dollar? Campaign Finance, Elections, and Elite Democratic Theory' (2010) 12(4) *Journal of Constitutional Law* 1257.

⁹⁰³ Bruce J Reynolds, 'The One Member—One Vote Rule in Cooperatives' (2000) 15 *Journal of Cooperatives* 1.

⁹⁰⁴ In New Zealand if a special resolution from shareholders is necessary it requires 'a majority of 75% or, if a higher majority is required by the constitution, that higher majority, of the votes of those shareholders entitled to vote and voting on the question', Companies Act 1993 (NZ) s 2.

⁹⁰⁵ Shapiro, Peter 'pet3rpan' and Soleimani (n 742) 15. Extraordinary proposals, which include selling more than 50 percent of the DAO's assets to a third party, acquiring the majority of another business' assets, or commencing or participating in legal proceedings, require a super-majority of 69 percent of all tokens.

⁹⁰⁶ Mosley et al (n 20) 6. This is based on a voting system where each voter has one vote.

to its rules.⁹⁰⁷ In addition, in Tezos the 80 percent super-majority is required twice, once for the code to enter the test period and again after it has gone through the test period.⁹⁰⁸

This section looks at who is entitled to vote and how they vote, in addition to the mechanisms that ensure that voting is decentralised and takes voters' preferences into account. It is important to note, however, that with voting (and indeed any aspect of a DAO's governance), a DAO need not use the one voting mechanism for all its decisions; the voting mechanisms can vary depending on the nature of the decision.⁹⁰⁹ A person involved with Prime DAO, in response to a question by an interviewer about whether they would switch the voting mechanism of Prime DAO if they could do so easily, responded that they would use three different mechanisms: holographic consensus for changes to the base layer;⁹¹⁰ conviction voting for budgetary decisions;⁹¹¹ and one token—one vote for all other decisions.⁹¹²

The next section analyses the steps taken to encourage voting, because whether votes are cast is also important; all of a DAO's token holders are permitted to vote, but few may.⁹¹³ In contrast, as with Dash, while only masternodes can vote, a high proportion of masternodes vote.⁹¹⁴

4.4.1 Encouraging Voting

For decisions to be considered legitimate a large voter turnout is necessary.⁹¹⁵ Some DAOs have recorded votes as low as 3 percent and even lower.⁹¹⁶ Thus encouragement of voting is required. Voter apathy combined with the need to vote on a significant number of proposals may explain such

⁹⁰⁷ Jacob Arluck, 'Amending Tezos; Traversing the Amendment Process', *Medium* (30 November 2018) <<https://medium.com/tezos/amending-tezos-b77949d97e1e>>.

⁹⁰⁸ Ibid.

⁹⁰⁹ Arsenault, 'Voting Options in DAOs' (n 23)

⁹¹⁰ See below 4.4.1.5.

⁹¹¹ See below 4.4.3.4.1.

⁹¹² Arsenault, 'Voting Options in DAOs' (n 23)

⁹¹³ Wave Financial (n 781).

⁹¹⁴ Red, 'Observations of the Dash Treasury DAO' (n 775).

⁹¹⁵ Zenk (n 720).

⁹¹⁶ Wave Financial (n 781).

results. In one vote only 25 addresses out of 20,000 voted.⁹¹⁷ A vote on a minor issue could explain such a low turnout; however, that vote concerned the transfer of over USD4 million of Aragon's assets from one address to another.⁹¹⁸ Yet DAOs are not doomed to low voting turnout: one DAO recorded a vote representing 86 percent of tokens in circulation.⁹¹⁹

The next sections look at mechanisms DAOs use to encourage token holders to vote.

4.4.1.1 *Paying People to Vote or Offering a Prize for Those Who Vote*

A relatively simple way of encouraging token holders to vote is to pay them.⁹²⁰ However, if a one token—one vote voting scheme is used, payment will reward those with the most tokens. People with few tokens will receive so little that if they were voting purely to receive a reward it would not be worth voting. To accommodate those with few tokens, a lottery could be used so that one voter drawn at random receives a substantial prize.⁹²¹ However, paying people to vote or offering a prize has its critics.⁹²² People who would not have otherwise voted may be incentivised to vote, but that does not solve the problem of voter ignorance.⁹²³ Also, for DAOs that do not use a KYC or reputation system, it would be easy for a person to create multiple accounts and thus increase their chance of winning.⁹²⁴

⁹¹⁷ Ibid.

⁹¹⁸ 'AGP-5: Aragon Flock Proposal for Aragon One', *GitHub* (2019) <<https://github.com/aragon/AGPs/blob/master/AGPs/AGP-5.md>>.

⁹¹⁹ For Decred Lightning (DCP-0002 and DCP-0003), Wave Financial (n 781).

⁹²⁰ Kyber Network, 'Katalyst and KyberDAO are now LIVE!', *Medium* (7 July 2020) <<https://blog.kyber.network/katalyst-and-kyberdao-are-now-live-19ee6a6eb77e>> and Zhang, Oliynykov and Balogun (n 679). A DAO creating tokens to pay for voting may be inflationary because the supply of the DAO's tokens increases over time.

⁹²¹ In Philadelphia, the 2015 Philadelphia Municipal Election Voting Lottery was to give USD10,000 to one Philadelphia voter who cast a vote in a mayoral election, Roxanne Patel Shepelavy, 'It Pays to Vote', *The Philadelphia Citizen* (22 October 2015) <<https://thephiladelphiacitizen.org/it-pays-to-vote/>>, Ben Branstetter, 'Why we Can't Just Pay People to Vote', *The Week* (8 November 2015) <<https://theweek.com/articles/586623/why-cant-just-pay-people-vote>>.

⁹²² 'Vote, and Win \$25,000: It's a Losing Idea', *Los Angeles Times* (21 April 2015) <<https://www.latimes.com/opinion/editorials/la-ed-voteria-vote-to-win-cash-lottery-20150421-story.html>> and Branstetter (n 921).

⁹²³ Branstetter (n 921) and Ash Kelly, 'MEC Faces Allegations of Election Rigging Amid Annual Campaign', *City News* (20 May 2020) <<https://www.citynews1130.com/2020/05/20/mec-allegations-election-rigging/>>.

⁹²⁴ For example, instead of one entity with 1,000 tokens casting one vote, that entity could divide those tokens amongst 100 addresses (10 tokens per address) and therefore have 100 chances of winning the prize.

Dfinity, although it is not yet operating as a DAO, has proposed a more nuanced way of encouraging people to vote.⁹²⁵ Dfinity's token holders who wish to participate in voting need to deposit Dfinity tokens into a 'neuron',⁹²⁶ and they are unable to withdraw those tokens for at least three months from the date of requesting their release.⁹²⁷ The token holders are rewarded with tokens according to the number of tokens they deposited and the percentage of votes in which they participated.⁹²⁸

Payment does not need to be limited to tokens, however. In the DAOstack ecosystem, voters gain reputation if they vote with the majority, and lose reputation if they vote with the minority.⁹²⁹ Reputation is important in the DAOstack ecosystem as a person's reputation score is their voting power.⁹³⁰ Therefore, if people want to take part in the governance of such a DAO they are gently nudged into voting for proposals.

4.4.1.2 *Loss of Tokens if Token Holders Fail to Vote*

Token holders could lose tokens if they fail to vote. People are loss averse: they do not like losing things they own⁹³¹ and may be prompted to act, in this case, by voting, to preserve their tokens. Sia, a decentralised online file storage network, uses a similar concept, although not for voting.⁹³² Hosts can sell their spare computer storage space to the Sia network, and Sia keeps the renter's data intact and

⁹²⁵ Williams (n 271).

⁹²⁶ A neuron is akin to a voting entity that is owned and controlled by the token holder who created it. It can be programmed to follow the voting patterns of people the token holder believes will make reasoned decisions, for example, certain core developers and respected theorists.

⁹²⁷ Williams (n 271).

⁹²⁸ If the voter reward is set, for example, at 1 percent, a neuron that had deposited 100 DFN and taken part in every vote would receive 1 DFN. In contrast, another neuron, which had also deposited 100 DFN, but participated in 50 percent of the decisions, would receive .5 DFN, see Wave Financial (n 781).

⁹²⁹ Weller, 'A Guide to DAOstack's Initial Reputation Protocol' (n 824).

⁹³⁰ Ibid.

⁹³¹ Daniel Kahneman, Jack L Knetsch and Richard H Thaler, 'Anomalies: The Endowment Effect, Loss Aversion, and Status Quo Bias' (1991) 5(1) *Journal of Economic Perspectives* 193 and Amos Tversky and Daniel Kahneman, 'Loss Aversion in Riskless Choice: A Reference Dependence Model' (1991) 106(4) *The Quarterly Journal of Economics* 1039.

⁹³² Sia, 'Hosting on the Sia Network', *SiaSetup* (Web Page, 6 November 2020) <https://siasetup.info/learn/hosting#host_score_collateral>.

available until the renter requests it. The hosts are required to purchase Siacoin as collateral. If the host goes offline for too long or if they lose the renter's data, they start to lose their collateral.⁹³³

4.4.1.3 Good User Design

NavCoin does not expressly pay people to vote; instead, it makes it easy for them to vote. NavCoin uses proof-of-stake as its consensus mechanism rather than proof-of-work.⁹³⁴ With proof-of-stake people are chosen at random, instead of competing with proof-of-work,⁹³⁵ and they receive a share of the mining rewards.⁹³⁶ When token holders in NavCoin stake their tokens they are presented with proposals and can vote on those proposals.⁹³⁷

4.4.1.4 Liquid Democracy

The concept of liquid democracy is not new;⁹³⁸ however, its use in practice, rather than theory, is relatively recent.⁹³⁹ Proxy voting in organisations, which is similar to liquid democracy, is commonly

⁹³³ Ibid.

⁹³⁴ 'Navigating NavCoin', *NavCoin* (20 June 2020) <<https://medium.com/nav-coin/navigating-navcoin-7fdb366a9c0c>>. Bitcoin uses proof-of-work. In Navcoin each block takes 30 seconds, thus transactions are significantly faster in Navcoin than they are in Bitcoin.

⁹³⁵ An advantage of proof-of-stake over proof-of-work is that the former does not require large amounts of electricity and computing power, Harald Vranken, 'Sustainability of Bitcoin and Blockchains' (2017) 28 *Current Opinion in Environmental Sustainability* 1, 7.

⁹³⁶ Siflu (n 808). In 2019, the return for staking NavCoin was estimated at between 8 and 10 percent of the value of a person's staked tokens.

⁹³⁷ NavPool, 'NavCoin Staking Pool', *NavPool* <<https://www.navpool.org/>>. Decred uses a slightly different system whereby token holders can stake tokens to purchase tickets. Five tickets are selected at random for each block, which allows the winners to mine blocks and vote on rule changes. Decred, 'Consensus Rule Voting', *Decred* (Web Page) <<https://docs.decred.org/governance/consensus-rule-voting/overview/>>.

⁹³⁸ The first proposal for a liquid type of voting was by Lewis Carroll, in Charles L Dodgson, *The Principles of Parliamentary Representation* (Harrison and Sons, 1884) 41–42. Other contributors to what has become liquid democracy include James C Miller, 'A Program for Direct and Proxy Voting in the Legislative Process' (1960) 7 *Public Choice* 107; Gordon Tullock, *Toward a Mathematics of Politics* (University of Michigan Press, 1970) and Bryan Ford, 'Delegative Democracy' (15 May 2002) <<https://bford.info/deleg/deleg.pdf>>. See generally Jan Behrens, 'The Origins of Liquid Democracy' (2007) (5) *Liquid Democracy Journal* 7 for a history of the initial development of liquid democracy.

⁹³⁹ Daan Bloembergen, Davide Grossi and Martin Lackner, 'On Rational Delegations in Liquid Democracy' (2019) *Thirty-Third AAAI Conference on Artificial Intelligence* <<https://arxiv.org/abs/1802.08020>>.

used in corporations.⁹⁴⁰

Liquid democracy allows four types of voting.⁹⁴¹ First, a voter can vote directly.⁹⁴² Second, the voter can delegate their votes to a representative who can vote: on one policy issue; on all policy areas in some, but not all, policy areas; or on all policy issues for all policy areas.⁹⁴³ Third, those who have received votes through delegation can delegate those votes to another representative.⁹⁴⁴ Fourth, at any stage the voter can terminate the delegation of their votes.⁹⁴⁵ Liquid democracy therefore allows token holders to delegate their vote or votes on all issues to one person or split their delegation between different people or groups of people. Liquid democracy differs from proxy voting because liquid democracy allows the person who has been delegated to delegate that vote to another and so on.⁹⁴⁶ Notwithstanding the compelling logic of liquid voting, it proved difficult to use such a dynamic decision-making process until the advent of the internet and now blockchain,⁹⁴⁷ and it has the potential to be used in DAOs.⁹⁴⁸

Liquid democracy occupies the middle ground between direct and representative democracy.⁹⁴⁹ Liquid democracy means that people do not need to make as many decisions. Liquid democracy is not the same as representative democracy; however, as those delegating their vote can change their delegations at any time and they are not bound to delegate their votes on all issues to one person or one group of people, they may be able to split their delegations amongst different people or groups of people.

⁹⁴⁰ Federico Panisi, Ross P Buckley and Douglas Arner, 'Blockchain and Public Companies: A Revolution in Share Ownership Transparency, Proxy Voting and Corporate Governance?' (2019) 2(2) *Stanford Journal of Blockchain Law & Policy* 189.

⁹⁴¹ See Christian Blum and Christina Isabel Zuber, 'Liquid Democracy: Potentials, Problems, and Perspectives' (2016) 24(2) *Journal of Political Philosophy* 162, 165.

⁹⁴² Ibid.

⁹⁴³ Ibid.

⁹⁴⁴ Ibid.

⁹⁴⁵ Ibid.

⁹⁴⁶ Anson Kahng, Simon Mackenzie and Ariel D Procaccia, 'Liquid Democracy: An Algorithmic Perspective' (2018) *Thirty Second AAAI Conference on Artificial Intelligence* 1095.

⁹⁴⁷ Melanie Swan, *Blockchain: Blueprint for a New Economy* (O'Reilly, 2015) 49–50.

⁹⁴⁸ Arsenault, 'Voting Options in DAOs' (n 23).

⁹⁴⁹ Polkadot, 'Participate in Democracy' (n 617) and Commonwealth Labs (n 127) 13.

Notwithstanding the use of the term ‘liquid democracy’ by some DAOs, they are in fact using or proposing proxy voting because the delegate is not able to delegate the vote that has been given to them. For this reason, some DAOs prefer the term ‘delegated voting’.⁹⁵⁰ Despite the fact that most DAOs will use proxy voting, the term liquid democracy is used more frequently in relation to DAOs than proxy voting or delegated voting.

Dfinity is proposing a form of proxy voting, which it describes as liquid democracy.⁹⁵¹ Token holders can set up their ‘neuron’⁹⁵² to automatically cast their votes in the same way as owners of other neurons they think will make good decisions, for example, the neurons of core developers and respected theorists.⁹⁵³ The system could be designed so that a token holder chooses to follow a group of core developers and respected theorists — for example, if three of five vote one way, the token holder will also vote that way — thus aggregating the wisdom of those core developers and respected theorists.

A potential limitation of liquid democracy is that while it may increase the number of votes cast, it also decreases the number of decision-makers. However, the quality of voting may be improved as people with knowledge and time are casting the votes. Another limitation is that people could solicit vote delegation, which may result in a move towards representative democracy. Indeed, an entity is already soliciting KyberDAO token holders to delegate their votes to it.⁹⁵⁴

⁹⁵⁰ Commonwealth Labs (n 127) 13.

⁹⁵¹ Williams (n 271), although Dfinity describes it as liquid democracy.

⁹⁵² See above n 926.

⁹⁵³ Williams (n 271).

⁹⁵⁴ StakeWith.US, ‘StakeWith.US partners Kyber Network as KyberDAO Pool Master’, *stakewith.us* (5 May 2020) <<https://medium.com/stakewithus/stakewith-us-partners-kyber-network-as-kyberdao-pool-master-8b92afc2a9e1>>.

4.4.1.5 Prediction Markets (*Holographic Consensus*)

Prediction markets use game theory⁹⁵⁵ by allowing people to bet on the outcome of events and harness the wisdom of the crowd to arrive at accurate forecasts.⁹⁵⁶ Financial markets use prediction markets⁹⁵⁷ and they have been used for betting on political events.⁹⁵⁸ Another term for prediction markets is ‘futarchy’.⁹⁵⁹

The application of prediction markets to DAOs was identified early.⁹⁶⁰ The theory is that people who are knowledgeable about the subject matter and the sentiment of the token holders can bet on whether proposals pass or fail.⁹⁶¹ Thus, people who are informed can benefit from that knowledge by winning from the bets they are placing on the outcome of the vote,⁹⁶² and over time weaker predictors should improve their predictions by imitating more successful ones.⁹⁶³ In turn, the voters can use the predictor’s predictions to influence their vote. It is argued that prediction markets solve the ‘voter apathy’ and ‘rational irrationality’ problems where people do not have sufficient incentives to even learn about policies as their vote is unlikely to have any effect.⁹⁶⁴ The market may evolve as individuals who are good at predicting outcomes will gain money and influence, whereas in theory those who are not good at prediction will lose money and their influence will decrease.⁹⁶⁵

⁹⁵⁵ Richard P Mann and Dirk Helbing, ‘Optimal Incentives for Collective Intelligence’ (2017) 114(20) *PNAS* 5077.

⁹⁵⁶ Kenneth J Arrow et al, ‘The Promise of Prediction Markets’ (2008) 320 *Science* 877, cited by Werbach, ‘Trust, but Verify’ (n 7) 524.

⁹⁵⁷ Russ Ray, ‘Prediction Markets and the Financial “Wisdom of the Crowds”’ (2006) 7(1) *Journal of Behavioural Finance* 2.

⁹⁵⁸ For example, PredictIt (<www.predictit.org>) has run a prediction market for federal elections in the United States. However, the New Zealand corporation behind PredictIt had a similar service shut down in New Zealand because there was a concern that it could be used for money laundering, Hamish Rutherford, ‘iPredict to Close after Govt Refuses Anti-Money Laundering Law Exemption’, *Stuff* (26 November 2015) <<https://www.stuff.co.nz/business/74438852/ipredict-to-close-after-govt-refuses-anti-money-laundering-law-exemption>>.

⁹⁵⁹ Hanson (n 681). See also Abramowicz, *Predictocracy* (n 681).

⁹⁶⁰ Buterin, ‘An Introduction to Futarchy’ (n 17).

⁹⁶¹ *Ibid.*

⁹⁶² *Ibid.*

⁹⁶³ Mann and Helbing (n 955) 5078.

⁹⁶⁴ Buterin, ‘An Introduction to Futarchy’ (n 17).

⁹⁶⁵ *Ibid.*

DAOstack uses a prediction market, which it calls ‘holographic consensus’.⁹⁶⁶ There are no barriers on token holders submitting proposals in DAOstack: people, called predictors, can place a bet on the outcome of the vote by staking tokens.⁹⁶⁷ If predictors vote in favour of the proposal passing and it passes, they share on a pro-rata basis the tokens of predictors betting against it passing and vice versa. Token holders can see how the predictors have betted on each proposal before casting their votes.⁹⁶⁸ Thus, holographic consensus serves as a decentralised vetting process as token holders who wish to vote can see the predictions.

A potential disadvantage of prediction markets is that predictors may base their votes on what decision they think token holders will make, not whether the predictors think the proposal is good for the DAO.⁹⁶⁹ However, there is not yet sufficient data to assess whether prediction markets result in distorted decision-making. In addition, in practice it has been difficult in DAOs that use holographic consensus for some token holders, particularly those new to the DAO, to understand how prediction markets operate.⁹⁷⁰

4.4.1.6 *Separate Governance Token*

One way to increase participation is to use a separate governance token, which can help differentiate between those who genuinely want to be engaged in governance and those who have acquired tokens for other purposes. MakerDAO, which runs the stablecoin DAI, has a governance token called MKR.⁹⁷¹

The next sections look at the different types of voting schemes used by DAOs. First are those in which all the members of the DAO can vote, followed by those that restrict which token holders can vote.

⁹⁶⁶ Field, ‘Holographic Consensus—Part 1’ (n 414) and Field and Weller (n 414).

⁹⁶⁷ Ibid and see above n 141.

⁹⁶⁸ Alejandro Santander, ‘My First Aragon App: Voting Supercharged with DAOstack’s Holographic Consensus (Part 1)’, *Aragon* (Blog Post, 21 August 2019) <<https://blog.aragon.one/first-aragon-app-holographic-consensus-part-1/>>.

⁹⁶⁹ Paddy Baker, ‘DAO Projects at Risk After Digix’s Latest Update’, *Crypto Briefing* (May 9, 2018) <<https://cryptobriefing.com/dao-projects-risk-digix/>>.

⁹⁷⁰ Arsenault, ‘Voting Options in DAOs’ (n 23).

⁹⁷¹ MakerDAO, ‘Introducing Governance’ (n 665).

4.4.2 Voting Schemes Where All Members of the DAO Can Vote

4.4.2.1 One Person–One Vote

Some traditional organisations, such as cooperatives, typically give each member one vote.⁹⁷² While some DAOs use one person–one vote,⁹⁷³ it is not common as some form of KYC is required to prevent people from creating multiple identities,⁹⁷⁴ and most DAOs do not require people to prove their identity to join.⁹⁷⁵ There are exceptions, however, for those DAOs that use reputation.⁹⁷⁶ It is possible to require people and entities to reveal their identity and assign them one vote each.⁹⁷⁷

4.4.2.2 One Token–One Vote

The most common voting scheme in DAOs is one token–one vote.⁹⁷⁸ Also, just as corporations can have classes of shares with different voting rights,⁹⁷⁹ DAOs could grant different voting rights to certain classes of tokens.⁹⁸⁰ Using one token–one vote, or different classes of tokens, can result in plutarchy if ownership is concentrated in the hands of a few, as they will have an undue influence on the DAO and therefore the decision-making process will not be decentralised. As Vlad Zamfir has observed, '[b]lockchain governance is too important for us to let a small handful of [people with large

⁹⁷² Oliver Hart and John Moore, 'The Governance of Exchanges: Members' Cooperatives versus Outside Ownership' (1996) 14(4) *Oxford Review of Economic Policy* 53, 56.

⁹⁷³ BrightID, 'How BrightID Grows and Governs a Public Good Using Aragon' (8 May 2020) <<https://aragon.org/studies/brightid>>.

⁹⁷⁴ The creation of multiple identities is a form of a Sybil attack, see above n 736.

⁹⁷⁵ See Sebastian Gajek, '2019 is the Year of DAOs—Now we Urgently Need Robust Consensus Protocols for the People', *Hackernoon* (13 April 2019) <<https://hackernoon.com/2019-is-the-year-of-daos-9728618873f5>> who describes one person–one vote as unsuitable for voting schemes due to the permissionless nature of blockchain. Indeed, DAOs have been described expressly as using 'one [token]–one vote, not one person–one vote', Ehud Shapiro, 'Democracy and E-Democracy' (2018) 61(8) *Communications of the ACM* 31, 33.

⁹⁷⁶ See Bar (n 804).

⁹⁷⁷ For example, Solar DAO required people to go through a full KYC process before they could acquire tokens, Solar DAO (n 825).

⁹⁷⁸ Examples include DigixDAO and MakerDAO.

⁹⁷⁹ Jason W Howell, 'The Survival of the U.S. Dual Class Share Structure' (2017) 44(C) *Journal of Corporate Finance* 440.

⁹⁸⁰ Shapiro, Peter 'pet3rpan' and Soleimani (n 742) 16.

amounts of cryptocurrency] make arbitrary decisions.’⁹⁸¹ The concern over a few people controlling a DAO through their token holdings is not hypothetical. For the Moloch DAO, at one point two people had 1,000 ‘shares’, the next highest was 250, and most had only 100.⁹⁸² More stark, was the vote to dissolve the DigixDAO, where four voters controlled the outcome of the vote.⁹⁸³ Indeed, only 0.52 percent of addresses voted.⁹⁸⁴ As will be seen below, in an attempt to limit power concentrating in the hands of a few, not all DAOs use one token-one vote. As one interviewee noted, the DAO he founded was designed so that ‘control of the organisation and governance isn’t dictated by how much wealth a person has.’⁹⁸⁵ However, despite the expressed concerns of some within the blockchain industry of the concentration of power in the use of one token-one vote,⁹⁸⁶ it is currently the most popular voting scheme. It is possible, however, to mitigate against some of the undue influence of token holders by requiring super-majorities for proposals that could be considered extraordinary, for example, transferring more than 50 percent of the DAO’s assets.⁹⁸⁷

Allowing one token—one vote with no restrictions can raise similar issues to proxy voting through mutual funds.⁹⁸⁸ People who are merely holding tokens may be able to vote despite not owning the tokens.⁹⁸⁹ For example, it is common for token holders to keep their tokens on cryptocurrency exchanges⁹⁹⁰ and exchanges could use those tokens to vote in the exchanges’

⁹⁸¹ Zamfir (n 131), ‘Blockchain governance is too important for us to let a small handful of [people with large amounts of cryptocurrency] make arbitrary decisions.’

⁹⁸² Arikan (n 787).

⁹⁸³ Ryan Youngjoon Yi, ‘DigixDAO: A Divorce Story: A Case Study for Voting Systems and Cryptonative Arbitrage’, *Coinfund* (4 February 2020) <<https://blog.coinfund.io/digixdao-divorce-story-6ed74b00e2bd?gi=1309dc4b2dc3>>.

⁹⁸⁴ The numbers were 58 addresses out of 11,000, Munro, ‘What We Learnt from the Rise and Fall of the DigixDAO Autonomous Organisation’ (n 558). And for the Moloch DAO, at one point two people had 1,000 ‘shares’, the next highest was 250, and most had only 100 shares, Arikan (n 787).

⁹⁸⁵ Interviewee 2 (DAO founder).

⁹⁸⁶ Zamfir (n 131), Arseneault, ‘Voting Options in DAOs’ (n 23), Qureshi, ‘Blockchains Should Not Be Democracies’ (n 131).

⁹⁸⁷ Shapiro, Peter ‘pet3rpan’ and Soleimani (n 742) 15.

⁹⁸⁸ Gerald F Davis and E Han Kim, ‘Business Ties and Proxy Voting by Mutual Funds’ (2007) 85(2) *Journal of Financial Economics* 552.

⁹⁸⁹ Cem Paya, ‘Voting with Other People’s Wallets: Plutocracy, Blockchain Style’, *Random Oracle* (23 March 2019) <<https://randomoracle.wordpress.com/2019/03/23/voting-with-other-peoples-wallets-plutocracy-blockchain-style/>>.

⁹⁹⁰ Cryptocurrency exchanges that provide custody of tokens will not provide custody of all tokens.

interests.⁹⁹¹ To prevent such behaviour, the DAO would have to block known exchange addresses from voting.⁹⁹² The token holders, however, would have to agree to the creation of a blocked list, which is unlikely if cryptocurrency exchanges hold a substantial number of tokens.⁹⁹³

The use of one token—one vote has also been criticised because people who contribute to the DAO, for example, those who contribute computer power (by operating a node), but do not have tokens, have no say in governance.⁹⁹⁴ However, there are two counterarguments: the first stems from off-chain governance where entities that run full nodes are the final decision-makers and token holders have little say in governance;⁹⁹⁵ and the second states that most DAOs will not be running a blockchain, but instead will be running on top of a third-party blockchain, thus for those DAOs, there is no need for people participating in such DAOs to run a node.

4.4.2.3 Token Holders Are Required to Stake Tokens

DAOs can require token holders to stake tokens to vote.⁹⁹⁶ Staking means locking tokens up for a period of time.⁹⁹⁷ Staking can be required when proof-of-stake is used instead of expensive and resource-hungry proof-of-work.⁹⁹⁸ Some DAOs require a minimum stake,⁹⁹⁹ others do not.¹⁰⁰⁰ Staking normally operates on the number of tokens staked on a one token—one vote basis, thus the more tokens staked the higher the voting power and rewards for voting if there are any.¹⁰⁰¹ It may be

⁹⁹¹ Buterin, 'Notes on Blockchain Governance' (n 724).

⁹⁹² Ibid.

⁹⁹³ Ibid.

⁹⁹⁴ Zamfir (n 131) cited by Wright, 'Quadratic Voting and Blockchain Governance' (n 658) 491.

⁹⁹⁵ Just how much a role token holders have, for example, in Ethereum, is not clear, as Zamfir (n 131), notes: 'Ethereum governance process [sic] are not very well documented, and it's hard to understand them without actively participating in them.'

⁹⁹⁶ Kyber Network (n 920); Williams (n 271); and Digix Writer, 'DigixDAO Governance Model: Update #1' (n 825).

⁹⁹⁷ See above n 149.

⁹⁹⁸ Binance Academy, 'What is Staking?', *Binance* (Web Page) <<https://academy.binance.com/blockchain/what-is-staking>>. Using proof-of-stake is considerably cheaper to operate from an energy perspective than using proof-of-work as people are not competing to mine blocks and therefore secure the network; instead they are drawn at random to mine the blocks, Vranken (n 935).

⁹⁹⁹ Mosley et al (n 20) 5.

¹⁰⁰⁰ Kyber Network (n 920).

¹⁰⁰¹ Ibid.

possible to increase the voting power the longer the tokens are staked. In Edgeware a two-week staking period corresponds with a doubling of the voting power.¹⁰⁰²

As the Edgeware example shows, it may be possible to ameliorate some of the disadvantages of concentration of power with one token–one vote voting schemes, because the voting strength of tokens can increase if the owner is prepared to stake tokens. Indeed, Polkadot also uses time-lock voting, which enables token holders to increase the weight of their vote depending on how long they stake their tokens.¹⁰⁰³ If no staking occurs, a token holder’s vote counts for only 10 percent of the tokens it holds; if the maximum staking period is chosen the vote will count for 600 percent of the tokens staked.¹⁰⁰⁴

At first, it may appear that the staking requirement would limit the ability of exchanges to use their customers’ tokens to vote. However, it is unlikely that all the customers would want their tokens back at the same time, so exchanges could still use a portion of their customers’ tokens for staking. On the other hand, allowing token holders to participate in voting whilst keeping their tokens on an exchange would be an attractive prospect for some token holders. Binance, one of the largest exchanges, allows people holding certain tokens on its platform to stake tokens.¹⁰⁰⁵

The next section looks at voting schemes that restrict who can vote.

4.4.3 Restricted Voting Schemes

While restricting who can vote may appear to go against the ethos of decentralisation, restrictive voting schemes, which restrict who amongst the members are entitled to vote, are designed to foster better decision-making.

¹⁰⁰² Commonwealth Labs (n 127) 13, see also Williams (n 271).

¹⁰⁰³ Arian (n 787).

¹⁰⁰⁴ Polkadot, ‘Participate in Democracy’ (n 617).

¹⁰⁰⁵ Binance Academy (n 998).

4.4.3.1 Minimum Number of Tokens Required

The Dash DAO requires a minimum of 1,000 tokens to be staked before a person can become a masternode and therefore entitled to vote.¹⁰⁰⁶ In addition, masternodes must provide and run specialised equipment to help run the Dash network.¹⁰⁰⁷ Each masternode has one vote.¹⁰⁰⁸ In contrast, NavCoin, which also requires tokens to be staked before a token holder is eligible to vote, does not have a minimum staking number; however, the more NavCoin tokens staked, the higher the token holder's voting power.¹⁰⁰⁹ With the Dash DAO, each masternode has one vote,¹⁰¹⁰ although one person or entity can own multiple masternodes.¹⁰¹¹ The 1,000 Dash token minimum and the specialised equipment can be likened to restricting the franchise to property owners.¹⁰¹² However, unlike the property franchise where each eligible voter has one vote, a person can own more than one Dash masternode,¹⁰¹³ and smaller token holders can pool their tokens to acquire fractional ownership of a Dash masternode.¹⁰¹⁴

¹⁰⁰⁶ Valenzuela (n 271).

¹⁰⁰⁷ Ibid.

¹⁰⁰⁸ Ibid.

¹⁰⁰⁹ Oliver Dale, 'The Best Proof of Stake Coins for Earning Passive Income', *Blockonomi* (17 October 2018) <<https://blockonomi.com/proof-of-stake-coins/>> and Siflu (n 808).

¹⁰¹⁰ Dash, 'Understanding Masternodes', *Dash* (Web Page) <<https://docs.dash.org/en/stable/masternodes/understanding.html>>.

¹⁰¹¹ Red, 'Observations of the Dash Treasury DAO' (n 775) and see Mosley et al (n 20) 19.

¹⁰¹² See generally Donald Ratcliffe, 'The Right to Vote and the Rise of Democracy, 1787–1828' (2013) 33(2) *Journal of the Early Republic* 219, 220.

¹⁰¹³ Red, 'Observations of the Dash Treasury DAO' (n 775) and see Mosley et al (n 20) 19.

¹⁰¹⁴ Justin Szilard, 'Gentarium Integrates Dash into Masternode Hosting and Shared Masternode Services', *Dash News* (7 October 2019) <<https://dashnews.org/gentarium-integrates-dash-into-masternode-hosting-and-shared-masternode-services/>> and Dash News, 'CrowdNode Offers Fractional Masternode Voting, Giving Small Dash Holders Voting Rights', *Dash News* (5 March 2019) <<https://medium.com/@DashNews/crowdnode-offers-fractional-masternode-voting-giving-small-dash-holders-voting-rights-a0450e1f55b>>.

4.4.3.2 Reputation Holders Only

The ability to vote can be limited to DAO members who have reputation,¹⁰¹⁵ and it may be possible to weight a token holder's vote according to their level of reputation.¹⁰¹⁶ Using reputation for voting, therefore, is not the same as one person—one vote, because people can have different levels of reputation.¹⁰¹⁷ While reputation is designed to be non-transferable, attempts could be made to transfer it.¹⁰¹⁸ Even if reputation were transferred, the recipient could not add that reputation to their existing reputation or any other reputation.

Because limiting voting to reputation holders restricts voting to people who are active in the DAO, people with significant reputation in the beginning are unlikely to retain that level of reputation and thus influence over decision-making. Even if they remain active in the DAO, their reputation will be diluted as more people join and gain reputation in the DAO.

Using reputation may be criticised for swinging the pendulum from those with capital when one token—one vote is used, to capital having no say in decision-making unless the capital holders contribute to DAO and build reputation. However, a halfway house can be achieved by granting some reputation to those who inject capital into the DAO, although the percentage of the reputation granted should be lower than the percentage of the capital injection.¹⁰¹⁹

4.4.3.3 Holders of Governance Tokens

Normally a DAO's tokens operate as governance tokens; depending on a variety of factors addressed in this chapter, the token holder may or may not play a role in the DAO's governance. Instead of using the one token, which in addition to possible governance rights can also be bought and sold and even used as a currency, it is possible to create a specific governance token. MakerDAO, which runs the

¹⁰¹⁵ Field and Weller (n 414) and Rea et al (n 27) [3.4.3].

¹⁰¹⁶ Thus while one token—one vote is used, reputation can affect the weighting, so a token holder with few tokens but a high reputation may have a higher weighted vote than a token holder with a substantial number of tokens but no or low reputation.

¹⁰¹⁷ Vrba (n 592) 19.

¹⁰¹⁸ See above nn 835–836 and accompanying text.

¹⁰¹⁹ Interviewee 2 (DAO founder).

stablecoin DAI, has a governance token called MKR.¹⁰²⁰ Thus MakerDAO uses two tokens. Holders of DAI therefore have no say in the operation of MakerDAO unless they also acquire MKR. Using a specific governance token means that only those who are interested in governance would acquire such tokens, thus they would be more likely to take an interest in governance, including voting for proposals.

4.4.3.4 New Voting Schemes

The preceding sections have demonstrated a wide variety of voting schemes. Those voting schemes, however, are limited as a person can vote only 'yes' or 'no', and depending on the voting scheme, 'abstain'.¹⁰²¹ The strong and weak preferences of the voter are not taken into account.¹⁰²² For example, a voter may wish for proposals A through P to succeed, but their strong preference is for proposal B to succeed. The voter could simply vote for proposal B and not the others, but there is a chance that the remaining proposals will not succeed and if they vote for proposal B only, that vote carries no greater weight. Preferential voting schemes are not new; they have been used in some political contexts.¹⁰²³

There are two types of voting scheme that DAOs use or could use to accommodate token holders' preferences: conviction voting and quadratic voting.

4.4.3.4.1 *Conviction Voting*

Conviction voting was created specifically for the governance of DAOs.¹⁰²⁴ Conviction voting enables preferences to be expressed and is designed to address many of the problems inherent in decision-

¹⁰²⁰ MakerDAO, 'Introducing Governance' (n 665).

¹⁰²¹ The Dash DAO uses 'yes', 'no' and 'abstain', Mosley et al (n 20) 6.

¹⁰²² Emmett, 'Automating Ostrom for Effective DAO Management' (n 676).

¹⁰²³ Benjamin Reilly, 'The Global Spread of Preferential Voting: Australian Institutional Imperialism? (2004) 39(2) *Australian Journal of Political Science* 253, 255.

¹⁰²⁴ Emmett, 'Continuous Decision Making Alternative to Governance' (n 135) and see Zargham (n 135).

making, particularly when attempting to manage shared resources.¹⁰²⁵ Those problems include: first, the difficulty in deciding how scarce resources, such as the DAO's assets, should be allocated; second, the undue influence of large token holders if one token—one vote is used; third, if voting occurs over longer periods of four to six weeks, if one token—one vote is used, large token holders can vote at the end of the voting period and skew the results;¹⁰²⁶ fourth, if one person—one vote is used, unless KYC is also used, one person could create multiple addresses.¹⁰²⁷ Also, even if no one created multiple accounts, the majority can dictate what occurs, which may not be ideal. For example, a proposal to create a service that would be extremely beneficial to a minority of token holders could be rejected by the majority, thus enabling the 'tyranny of the majority'.¹⁰²⁸

Conviction voting works by voters apportioning their preferences between the options or proposals.¹⁰²⁹ If there were five proposals the voter may allocate 5 percent to A, 0 percent to B, 20 percent to C, 30 percent to D and 45 percent to E. The longer the preference is held, the greater the conviction and the weight of the vote. If the preference changes, a decay function is used. For example, if the voter decides to move the 45 percent allocated to E to B, the conviction drains out of E according to a decay function. Thus, if the voter made the change on the last day of voting, the remaining preference would be high in E. While B would register 45 percent, it will not have risen, and it would be lower than C despite C starting with only 20 percent.

Conviction voting is designed so small token holders are not outweighed by those with larger holdings who decide to vote at the last moment. However, if large token holders vote at or near the beginning of the voting period their views will still triumph.

¹⁰²⁵ Emmett, 'Continuous Decision Making Alternative to Governance' (n 135) and see Zargham (n 135). Determining the allocation of scarce resources has been a hard issue for many years, David Quarfoot et al, 'Quadratic Voting in the Wild: Real People, Real Votes' (2017) 172 *Public Choice* 283.

¹⁰²⁶ Emmett, 'Continuous Decision Making Alternative to Governance' (n 135).

¹⁰²⁷ Rich McAteer, 'Introducing Humanity DAO', *Medium* (10 May 2019) <<https://medium.com/marbleorg/introducing-humanity-90ddf9ead235>>.

¹⁰²⁸ Emmett, 'Continuous Decision Making Alternative to Governance' (n 135) and Posner and Weyl, 'Voting Squared' (n 740) 442–443 where the example of a community determining whether money collected from taxes should be used to create a park was used. A minority, including the elderly and families with young children, would benefit. The majority, however, does not have strong views either way but would rather not pay for the park and could therefore vote to block its creation. Quadratic voting, another attempted solution to the coordination problem, is addressed below, see below 4.4.3.4.2.

¹⁰²⁹ The following description is taken from Emmett, 'Continuous Decision Making Alternative to Governance' (n 135).

While conviction is not yet widely used, in a series of interviews with a number of DAO founders and others involved in DAOs, when asked if they would switch the voting mechanisms of their DAOs if it was easy to do so, a number said they were interested in or favoured a switch to conviction voting for some decisions.¹⁰³⁰

An alternative form of voting, which is similar to conviction voting, was suggested by one interviewee.¹⁰³¹ The interviewee suggested that instead of the typical binary mechanism of asking token holders to vote yes or no to individual proposals, token holders could be given options or they could rank the options.¹⁰³² While this would not be as sophisticated as conviction voting it could be useful for DAOs. In particular, instead of a person or entity putting forward a proposal for a set amount, which is either accepted or rejected, the options for that proposal would be for a range of amounts; thus token holders may agree to fund that proposal, but at a low rate, or conversely they may agree to fund it at a rate higher than what the proposer would have specified if only a set amount had been permitted.¹⁰³³

4.4.3.4.2 Quadratic Voting

Quadratic voting — first proposed in 2012¹⁰³⁴ and later expanded in *Radical Markets*¹⁰³⁵ — was designed to overcome the effect of one person—one vote on minorities in political democracies.¹⁰³⁶ Minorities can be oppressed by the majority unless the majority takes pity on them and casts their votes to benefit the minority or the oppressed minority convinces the judicial system to intervene.¹⁰³⁷

¹⁰³⁰ Arsenault, 'Voting Options in DAOs' (n 23).

¹⁰³¹ Interviewee 1 (DAO founder).

¹⁰³² Ibid.

¹⁰³³ Ibid.

¹⁰³⁴ Lalley and Weyl, 'Quadratic Voting' (n 682).

¹⁰³⁵ Eric A Posner and E Glen Weyl, *Radical Markets: Uprooting Capitalism and Democracy for a Just Society* (Princeton University Press, 2018).

¹⁰³⁶ This assumes the minority has voting rights, which is not always the case. For example, in Switzerland women were not allowed to vote in national elections until 1971, Robert W Jackman, 'Political Institutions and Voter Turnout in the Industrial Democracies' (1987) 81(2) *The American Political Science Review* 405, 409.

¹⁰³⁷ Vitalik Buterin and Glen Weyl, 'Liberation Through Radical Decentralization', *Medium* (22 May 2018) <<https://medium.com/@VitalikButerin/liberation-through-radical-decentralization-22fc4bedc2ac>>. In New Zealand, however, the courts have no ability to strike down legislation.

Quadratic voting can also be used to allocated funding within a DAO,¹⁰³⁸ and it could be used for other types of decision-making.¹⁰³⁹ In a series of interviews with a number of DAO founders and others involved in DAOs, quadratic voting was identified as a voting mechanism they would consider if they could easily switch.¹⁰⁴⁰

Quadratic voting, like conviction voting, utilises preferences, but the former does not take time into account. Quadratic voting uses a combination of one token—one vote and one person—one vote. For example, each voter could be given 20 credits to last a set period, such as the electoral cycle. If a voter casts one credit for an issue it is worth one vote. Casting two credits is worth four votes, three credits nine votes, and so on. If one person casts their entire 20 credits that would be worth 400 votes, which will prevail over 100 other voters who are not as passionate about the issue and cast only one or two credits each, which will be between 100 and 200 votes.

Quadratic voting could be used in DAOs if robust KYC was done on each DAO member. As, E Glen Weyl, one of the creators of quadratic voting¹⁰⁴¹ is reported as saying that quadratic voting would work 'only if voters are pegged to identities'.¹⁰⁴² If identity was not used quadratic voting could be manipulated.¹⁰⁴³ To avoid the potential drawback of people using up their credits too early, or holding onto credits in the fear that they would not have sufficient credits to vote on important proposals, the credits could be given at the beginning of each voting round, with all credits expiring at the end of the round. That way the DAO members see all the proposals when they are voting.¹⁰⁴⁴

¹⁰³⁸ For example, quadratic voting was used to allocated funding in the Colorado House of Representatives, Eason (n 682).

¹⁰³⁹ While Pickle is not a DAO it is using quadratic voting, @picklefinance (Pickle Finance) (Twitter, 13 September 2020) <<https://twitter.com/picklefinance/status/1305047832639004672>>.

¹⁰⁴⁰ Arsenaault, 'Voting Options in DAOs' (n 23), where an interviewee is reported as saying, 'Quadratic voting line of thought seems to be interesting. Possibly requiring the locking up of tokens to accrue voting power.'

¹⁰⁴¹ Lalley and Weyl, 'Quadratic Voting' (n 682) and Posner and Weyl, *Radical Markets* (n 1035).

¹⁰⁴² Rachel-Rose O'Leary, 'Experimental Voting Effort Aims to Break Ethereum Governance Gridlock', *CoinDesk* (24 May 2018) <<https://www.coindesk.com/experimental-voting-effort-aims-break-ethereum-governance-gridlock>>.

¹⁰⁴³ Ibid.

¹⁰⁴⁴ If new proposals were introduced during the voting round, the DAO token holders would be entitled to change their votes.

Other forms of quadratic voting could be used,¹⁰⁴⁵ for example, allowing people to purchase additional credits. While voting would get very expensive — very fast — those with resources would be able to purchase credits. Alternatively, to mitigate against favouring the wealthy, the credits available for voting could be limited.¹⁰⁴⁶ Quadratic voting is a malleable mechanism that is used needs to be tailored to the needs of the DAO.¹⁰⁴⁷

4.5 Conclusion

DAOs have the potential to enable decentralised organisations that do not succumb to the tyranny of structurelessness,¹⁰⁴⁸ as their rules are laid out clearly and their rules cannot be broken. Yet, at first glance, DAOs may not have been successful in removing another aspect of the tyranny of structurelessness — the power of elites — whether hidden or flaunted.¹⁰⁴⁹ The founders of DAOs often retain ‘soft power’ so, despite a decentralised structure, their voices are louder and more pervasive than others.¹⁰⁵⁰ However, DAOs are more transparent than structureless organisations and DAOs can harness the human frailty of listening more and following those they know and respect, for example, by enabling token holders to follow the voting patterns of core developers and respected theorists, which in turn may overcome the issue that occurred in Bitshares where token holders did not vote because of lack of time and skills in accessing proposals.

As the use of governance mechanisms to harness the benefits of decentralised decision-making and limiting its disadvantages shows, the use of direct democracy, where there are no gatekeepers and all DAO token holders can both propose and vote on rule changes and funding, is not widely used within DAOs. While direct democracy can solve some of the issues that affect representative democracy, such as the effect of lobbying, it creates other governance issues. Those

¹⁰⁴⁵ Wright, 'Quadratic Voting and Blockchain Governance' (n 658). Synthetix has implemented quadratic weighting 'to reduce the influence of large [token] holders', Warwick, 'The Spartan Council' (n 893).

¹⁰⁴⁶ Wright, 'Quadratic Voting and Blockchain Governance' (n 658) 494.

¹⁰⁴⁷ Ibid.

¹⁰⁴⁸ Jo Freeman, 'The Tyranny of Structurelessness' (1972–73) 17 *Berkeley Journal of Sociology* 151.

¹⁰⁴⁹ Ibid.

¹⁰⁵⁰ Thurman (n 19). The same observation was made by interviewee 1 (DAO founder).

problems include: a lack of strategic oversight; low voting turnout if all actions within a DAO require a vote of token holders; and the tyranny of the majority if one token—one vote is used or even plutarchy if the tokens are controlled by one actor or a small group of actors. Therefore, the mere use of technology is not sufficient to coordinate people's actions. Thus, DAOs' governance issues are proving more difficult than building the technology.¹⁰⁵¹ IC, with its blockchain-focused view of shaping firms, must take human behaviour into account. The use of blockchain by itself is not sufficient to reshape firms and create sustainable DAOs.

The creators of DAOs are cognisant of the limitations of blockchain and are implementing many different governance mechanisms, which this chapter has examined; thus, there is no one governance model for DAOs. Therefore, IC has explained that the use of blockchain and the reduction of transaction costs is enabling DAOs to explore a variety of governance mechanisms. The different mechanisms include granting reputation to individuals. Unlike traditional one person—one vote schemes, a person's reputation and thus voting strength, can both be increased and decreased through that person's actions in the DAO. Other DAOs are using a blend of representative and direct democracy, for example, the use of centralised bodies, such as councils, which vet proposals from token holders, which token holders in turn vote upon. In other formulations, the council makes the proposals for the token holders to vote upon. While at first glance the use of centralised bodies would appear to be an admission that true decentralisation is not possible, and traditional governance models retain their pre-eminence, the governance models of such DAOs are not simply replicating traditional governance models. For example, council members can be replaced at any stage. More sophisticated DAOs, however, have devised mechanisms to provide decentralised vetting of proposals.

The types of governance mechanisms that a DAO uses depend on a number of factors including: the time at which the DAO was created — while DAOs can evolve their governance mechanisms, older DAOs typically have less sophisticated governance mechanisms; whether the DAO controls significant resources; the number of token holders; whether membership is by application

¹⁰⁵¹ Ashwin Ramachandran and Haseeb Qureshi, 'Decentralized Governance: Innovation or Imitation?', *Medium* (6 August 2020) <<https://medium.com/dragonfly-research/decentralized-governance-innovation-or-imitation-ad872f37b1ea>>.

only; whether the founding team retains a significant element of control, for example, by owning a large percentage of the DAO's tokens; and whether on-chain governance is used.

DAOs use pre-existing solutions that stretch back to Ancient Greece (and the occasional new solution such as conviction voting) to solve known governance issues. An argument could be made that, because existing solutions are being used, there is nothing novel in the governance of DAOs. A similar argument was made about the first blockchain, Bitcoin: 'that bitcoin is a bunch of pre-existing technologies assembled together to achieve a single objective: the creation of a clearing system which runs independently of the banks.'¹⁰⁵² However, Bitcoin's combination of pre-existing technologies created more than the sum of its parts. Blockchain has been described as an extraordinary breakthrough¹⁰⁵³ and a general-purpose technology and thus on par with other transformational general-purpose technologies such as electricity and computers.¹⁰⁵⁴ Similarly, the combination of new technology (blockchain) with a blend of old and new governance mechanisms is enabling the creation of a new form of organisation that has not been seen before.¹⁰⁵⁵ Moreover, the experiences and lessons learned in DAOs are being looked at to improve traditional organisations.¹⁰⁵⁶

Owing to complexity, some entities that wish to operate as DAOs are using traditional organisational structures such as companies as a temporary measure until they can formulate better suited governance models.¹⁰⁵⁷

¹⁰⁵² Izabella Kaminska, 'Truth and Fiction in Blockchain's Brave New World', *Financial Times* (3 January 2018) <<https://www.ft.com/content/1858c8a0-efa7-11e7-ac08-07c3086a2625>>. See also Werbach, 'The Siren Song' (n 447) 217 'there were virtually no technical advances in the [Bitcoin white] paper.'

¹⁰⁵³ Werbach, 'The Siren Song' (n 447) 217.

¹⁰⁵⁴ Davidson, De Filippi and Potts, 'Blockchains and the Economic Institutions of Capitalism' (n 8) 646. See also Werbach, 'The Siren Song' (n 447) 218, '[blockchain technology] represents an immature but foundational development whose impacts will unfold over time.'

¹⁰⁵⁵ Greenfield (n 1) 162, '[T]he DAO is that genuine rarity: a new thing upon the Earth, something that really could not have been conceptualized before the technologies underlying it were in place.'

¹⁰⁵⁶ See Morshed Mannan, 'Fostering Worker Cooperatives with Blockchain Technology: Lessons from the Colony Project' (2018) 11 *Erasmus Law Review* 190, 191, applying lessons from decentralised governance to labour-managed firms.

¹⁰⁵⁷ Van Niekerk and van der Veer (n 514)

Chapter Five: Dispute Resolution

*You never change things by fighting the existing reality. To change something, build a new model that makes the existing model obsolete.*¹⁰⁵⁸

5.1 Introduction

The literature to date suggests that smart contracts are likely to lower the number of disputes because of their self-enforcing nature; however, they will not remove all disputes.¹⁰⁵⁹ The use of smart contracts by DAOs will not, therefore, remove the need for dispute resolution. For example, disputes may still arise within a DAO because of a bug in the code,¹⁰⁶⁰ or between DAOs and third parties as a result of poorly written code.¹⁰⁶¹ The smart contract may not function as expected,¹⁰⁶² or events for which the smart contract does not provide a solution may occur.¹⁰⁶³ Other disputes may arise; for example, there may be a dispute about the quality of work done for a DAO.¹⁰⁶⁴ The need for dispute resolution for governance within DAOs is likely to be low because governance issues would usually be resolved by consensus,¹⁰⁶⁵ by members proposing and voting for a proposal.¹⁰⁶⁶ If members are dissatisfied with the result, they can sell their tokens and leave the DAO¹⁰⁶⁷ or fork it and create a new

¹⁰⁵⁸ Richard Buckminster Fuller.

¹⁰⁵⁹ Schmitz and Rule, 'Online Dispute Resolution for Smart Contracts' (n 35); Wulf A Kaal and Craig Calcaterra, 'Crypto Transaction Dispute Resolution' (2018) 73 *Business Lawyer* 1, 5; and Wulf A Kaal and Craig Calcaterra, 'Smart Contract Dispute Resolution — The Need for an Open Source Blockchain Platform Ecosystem', *Medium* (27 June 2017) <<https://medium.com/semadaresearch/smart-contract-dispute-resolution-the-need-for-an-open-source-blockchain-platform-ecosystem-e6318610fdef>> '[b]ecause of automated execution, contractual breach and damages are less likely to occur in smart contracts, especially as compared to traditional contracts.'

¹⁰⁶⁰ Interviewee 5 (consultant).

¹⁰⁶¹ Mik, 'Smart Contracts' (n 241) 281.

¹⁰⁶² Ibid 282.

¹⁰⁶³ Bronwyn E Howell and Petrus H Potgieter, 'Uncertainty and Dispute Resolution for Blockchain and Smart Contract Institutions' (2021) *Journal of Institutional Economics* 1, 2.

¹⁰⁶⁴ The Defiant, 'On-Chain DAO Idealists take Aragon Legal Dispute to "Meatspace" Court', *Decrypt* (29 May 2020) <<https://decrypt.co/30413/on-chain-dao-idealists-take-aragon-legal-dispute-to-meatspace-court>>.

¹⁰⁶⁵ Nadia Hewett, Jenny Cieplak and Shella Warren, 'Bridging the Governance Gap: Dispute Resolution for Blockchain-Based Transactions' December 2020, World Economic Forum, 7 <http://www3.weforum.org/docs/WEF_WP_Dispute_Resolution_for_Blockchain_2020.pdf> while the World Economic Forum dealt with permissioned blockchain platforms, rather than DAOs, the same point holds true.

¹⁰⁶⁶ This point was made by interviewees 2 (DAO founder), 4 (person for working for a DAO) and 6 (consultant).

¹⁰⁶⁷ This point was made by interviewee 7 (consultant).

DAO.¹⁰⁶⁸ However, for errors within a DAO's smart contract or if the code has unintended consequences, that DAO may prefer to resolve the dispute through a dispute resolution institution rather than via a proposal that is voted upon.¹⁰⁶⁹ In addition, a DAO might have a constitution, and proposals that appear to contradict the constitution could be challenged in a DDRS and overturned if found to be unconstitutional.¹⁰⁷⁰ Dispute resolution is therefore not separate from governance, rather it is a vital part of any governance structure. Moreover, dispute resolution is Ostrom's sixth design principle for common-pool resources: 'access [is required] to rapid low-cost, local arenas to resolve conflict among users or between users and officials'.¹⁰⁷¹

In recognition of the need for dispute resolution for DAOs and the use of smart contracts generally,¹⁰⁷² there have been proposals for DDRSs to resolve disputes. Some DDRSs have been built and are operational, for example, Aragon Court and Kleros; others are still being developed.¹⁰⁷³ The use of DDRSs by DAOs are an express way of embedding Ostrom's design principle of conflict resolution.¹⁰⁷⁴ In addition, IC is an appropriate methodology for analysing dispute resolution and the creation of DDRSs as a new economic institution, as this is not the first scholarly work to use such methodology for the analysis of DDRSs¹⁰⁷⁵

This chapter has three aims. First, it critically examines existing dispute resolution institutions and assesses whether they are suitable to resolve disputes concerning DAOs. Second it aims to understand how DDRSs resolve disputes relating to DAOs and evaluates their effectiveness. Third, it investigates the extent to which the state can intervene in disputes decided by DDRSs.

¹⁰⁶⁸ Hacker (n 33) 152. This point was also made by interviewee 3 (DAO founder, not yet in operation).

¹⁰⁶⁹ This point was made by interviewee 7 (consultant).

¹⁰⁷⁰ Yann Aouidef, Federico Ast and Bruno Deffains, 'Decentralized Justice: A Comparative Analysis of Blockchain Online Dispute Resolution Projects' (2021) 4 *Frontiers in Blockchain* <<https://doi.org/10.3389/fbloc.2021.564551>> 3, citing Aragon, 'Aragon Whitepaper' (2020) <<https://github.com/aragon/whitepaper>>.

¹⁰⁷¹ Elinor Ostrom, 'Collective Action and the Evolution of Social Norms' (2000) 14(3) *The Journal of Economic Perspectives* 137, 152 and see Lisa Blomgren Amsler, 'The Evolution of Social Norms in Conflict Resolution' (2014) 6(4) *Journal of Natural Resources Policy Research* 285, 288.

¹⁰⁷² Cuende (n 8) and Antonopoulos and Morgan (n 140). For the recognised need for dispute resolution for 'disputes arising in the context of digital assets, smart contracts, blockchain and other new technologies', in April 2021 the UK Jurisdiction Taskforce (UKJT) published its Digital Dispute Resolution Rules (n 80).

¹⁰⁷³ See below 5.3.

¹⁰⁷⁴ Emmett, 'Automating Ostrom for Effective DAO Management' (n 676).

¹⁰⁷⁵ Allen, Lane and Poblet (n 35) 77, although the term 'blockchain dispute resolution start-ups' was used to refer to DDRSs at 84.

The chapter is structured as follows. Part 2 critically evaluates the limitations of traditional dispute resolution institutions for resolving disputes in general and those involving DAOs. The traditional dispute resolution institutions are either provided or sanctioned by the state, and include courts, tribunals, industry schemes, international arbitration bodies, mediation and arbitration. The exemplar used to illustrate existing dispute resolution institutions is primarily New Zealand law because it provides a context for how a jurisdiction resolves disputes and New Zealand law is similar to comparable jurisdictions, including Australia and the United Kingdom. Part 3 evaluates the effectiveness of DDRs for dispute resolution for DAOs. It uses case studies of the DDRs that are operating and under development. Part IV examines and evaluates the existing and proposed DDRs. Part analyses the extent to which DDRs can exclude the operation of the state. Part 5 concludes.

5.2 Existing Dispute Resolution Institutions

This section examines existing dispute resolution institutions and their effectiveness for DAOs. The institutions include the state provision of courts, tribunals and other bodies; private dispute resolution schemes created by industry bodies; and private actors who provide mediation or arbitration.

5.2.1 Courts

People and organisations have traditionally used courts to resolve disputes.¹⁰⁷⁶ Litigation to resolve disputes offers certain benefits. First, an impartially trained judge, or judges, if the case reaches appellate courts that use multiple judges, hears the case. Second, if a party or both parties believe that the court at first instance has decided the case incorrectly, that party or parties can appeal the decision to a higher court.¹⁰⁷⁷ This right of appeal produces better decisions as it enables new and

¹⁰⁷⁶ The courts are also used to enforce promises and regulation, Paech (n 65) 1081.

¹⁰⁷⁷ See generally, Richard Nobles and David Schiff, 'The Right to Appeal and Workable Systems of Justice' (2002) 65(2) *Modern Law Review* 676.

superior judges to hear the case to rectify errors and bias, and diffuses the power of the court of first instance.¹⁰⁷⁸

Third, the courts can enforce their decisions against recalcitrant parties. For example, if a court finds in favour of party B and orders party A to pay B a sum of money, if A refuses to pay, the court can issue warrants for A's property to be seized and sold to satisfy the debt.¹⁰⁷⁹ Even if A has no assets in the court's jurisdiction, it may be possible to enforce a court order in a jurisdiction in which A does have assets. However, the ability to enforce court orders in another jurisdiction is not guaranteed as rules on foreign judgments' enforceability vary between jurisdictions.¹⁰⁸⁰ Arbitral awards — awards made by arbitrators — have traditionally been easier to enforce in foreign jurisdictions due to the widespread adoption of the *New York Convention*.¹⁰⁸¹

Notwithstanding the benefits of the courts, the courts hear a tiny fraction of disputes.¹⁰⁸² Using courts to resolve disputes and thus access justice has two main problems: the cost and the length of time it takes to resolve disputes.¹⁰⁸³ The cost of litigation is one reason why many disputes never reach a court;¹⁰⁸⁴ access to justice has been a perennial issue.¹⁰⁸⁵ Even if a party in a court case

¹⁰⁷⁸ Judith Resnik, 'Precluding Appeals' (1984–1985) 70(4) *Cornell Law Review* 603, 607.

¹⁰⁷⁹ In Australia, Australian Law Review Committee, *Legal Risk in International Transactions* (Report No 80, 8 October 1996) [7] and in New Zealand, for District Court orders, District Court Act 2016 (NZ) s 167.

¹⁰⁸⁰ Bélig Elbalti, 'Reciprocity and the Recognition and Enforcement of Foreign Judgments: A Lot of Bark but not Much Bite' (2017) 13(1) *Journal of Private International Law* 184.

¹⁰⁸¹ *New York Convention* (n 155) and see Emily Jennings, 'Levelling the Playing Field – Enforcement of Arbitral Awards vs Foreign Court Judgments', *Moulis Legal* (Web Page, 30 September 2016) <<https://www.lexology.com/library/detail.aspx?g=4d3f9ee0-8a3c-48fd-bcda-ace177663521>>. The advantages of enforcing arbitral awards over court judgments has led to the recent Hague Judgments Convention (*Hague Judgments Convention* (Hague Convention on July 2019 on the Recognition and Enforcement of Foreign Judgments in Civil or Commercial Matters), which is not yet in force).

¹⁰⁸² Marc Galanter, 'Justice in Many Rooms: Courts, Private Ordering, and Indigenous Law' (1981) 19(19) *Journal of Legal Pluralism* 1, 3.

¹⁰⁸³ Robert E Litan, 'Speeding Up Civil Justice' (1989) 73 *Judicature* 162, 162 and Saskia Righarts and Mark Henaghan, 'Public Perceptions of the New Zealand Court System: An Empirical Approach to Law Reform' (2010) 12 *Otago Law Review* 329. In New Zealand people are routinely advised not to go to court with claims of less than NZD50,000, 'Frustrated Public Gives up on Courts', *Stuff* (31 January 2009) <<http://www.stuff.co.nz/business/328221/Frustrated-public-gives-up-on-courts>>.

¹⁰⁸⁴ Richardson (n 87) 171, '[t]he criticism is often made that the courts provide a Rolls Royce system and that the only people who can indulge in litigation, apart from those who have to, are the rich and the legally aided.' See also Deborah L Rhode, 'Access to Justice: Connecting Principles to Practice' (2004) 17(3) *Georgetown Journal of Legal Ethics* 369, 371.

¹⁰⁸⁵ Orna Rabinovich-Einy and Ethan Katsh, 'The New New Courts' (2018) *American University Law Review* 165, 177.

is successful, it is unusual for it to be compensated in full for its legal costs.¹⁰⁸⁶ The length of time for litigation is long.¹⁰⁸⁷ Typically the process stretches out to many years if appeals occur.¹⁰⁸⁸ While the ability to appeal court decisions is taken for granted, this has not always been the case. For example, early in the United States courts' development, there was no right to appeal if the disputed amount was below a certain level.¹⁰⁸⁹

Some jurisdictions are attempting to reduce the cost and time of resolving disputes through the courts by creating online courts. For example, the United Kingdom is creating its Online Solutions Court.¹⁰⁹⁰ Notwithstanding that there has been some use of online procedures in the United Kingdom,¹⁰⁹¹ the Online Solutions Court has been described as a 'radical and important structure change' because '[i]t provides the opportunity to use modern IT to create for the first time a court which will enable civil disputes of modest value and complexity to be justly resolved without the incurring of the disproportionate cost of legal representation'.¹⁰⁹² Other jurisdictions have created tribunals to deal with disputes more quickly and more cheaply.

¹⁰⁸⁶ The 'American Rule' in the United States means that, with some exceptions, each party covers its own costs, whether they win or lose. Under the 'British Rule' the successful party is awarded costs, which the unsuccessful party or parties must pay, Maxwell Terhar, 'American v British Rule: The Impact of *James G Davis Construction Corp v HRGM Corp* on Fee-Shifting Provisions in the Maryland and DC Area' (2019) 8(1) *American University Business Law Review* 67, 68 and 74–75. In New Zealand and some other jurisdictions a middle ground is used where the successful party gets a contribution towards their cost. In New Zealand the costs are awarded based on set scales for each court to provide a level of certainty, High Court Rules 2016, sch 2 (NZ).

¹⁰⁸⁷ For example, in New Zealand, the aim for cases filed in the High Court is for the court date to be set within 12 months of filing, 'How to Make the Civil Justice System More Accessible, Discussed by a Panel of Experts', *RNZ* (6 October 2019) <<https://www.rnz.co.nz/programmes/otago-university-panel-discussions/story/2018714651/how-to-make-the-civil-justice-system-more-accessible-discussed-by-a-panel-of-experts>> and delays are common, see Kim Economides, Alfred A Haug and Joe McIntyre, 'Are Courts Slow? Exposing and Measuring the Invisible Determinants of Case Disposition Time', *University of Otago* (Discussion Papers No 1317, November 2013) <<https://www.otago.ac.nz/economics/otago111196.pdf>>.

¹⁰⁸⁸ Edward Stringham, *Private Governance: Creating Order in Economic and Social Life* (Oxford University Press, 2015) 152.

¹⁰⁸⁹ Resnik (n 1078) 606.

¹⁰⁹⁰ Joe McIntyre, Anna Olijnyk and Kieran Pender, 'Civil Courts and COVID-19: Challenges and Opportunities in Australia' (2020) 45(3) *Alternative Law Journal* 195, 197.

¹⁰⁹¹ In the United Kingdom a money claim can be made online, 'Make a Money Claim Online' *Gov.UK* <<https://www.gov.uk/make-money-claim>>, as can a possession claim, 'Possession Claim Online', *HM Courts & Tribunals Service* <<https://www.possessionclaim.gov.uk/pcol/>>, see also Giampiero Lupo, 'Law, Technology and System Architectures: Critical Design Factors for Money Claim and Possession Claim Online in England and Wales' in Francesco Contini and Francesco Lanzara (eds), *The Circulation of Agency in E-Justice* (Springer, 2014) 83.

¹⁰⁹² Lord Hodge, 'Law and Technological Change' (Speech, British Irish Commercial Bar Association in Signet Library, Edinburgh, 4 April 2019) <<https://newjurist.com/law-and-technological-change.html>> and see Rabinovich-Einy and Katsh, 'The New New Courts' (n 1085) 194.

If a high-value complicated dispute arises with a DAO, it may be advantageous for a court to hear that dispute. For example, at the time of writing, Aragon, one of the providers of DAOs-as-a-service and a DRS, was involved in a dispute of more than USD800,000, which will be heard by the courts.¹⁰⁹³ However, the resolution of disputes by the courts for most DAO disputes will be ineffective because of the cost and time involved.

In addition, there are other factors that reduce the efficiency and relevance of using courts to resolve disputes in relation to DAOs.¹⁰⁹⁴ First, one or more of the parties may be anonymous or pseudonymous, thus their identities may not be known.¹⁰⁹⁵ If the dispute concerns a smart contract, a court cannot stop or change the smart contract once it has been deployed¹⁰⁹⁶ although, if the parties' identities were known, it may be possible for the courts to require the parties to execute another smart contract, or the court could award damages or other remedies¹⁰⁹⁷ if, for example, a court held that a party had breached a contract.¹⁰⁹⁸ However, if the party against whom judgment was made, was in a foreign jurisdiction, that judgment may not be enforceable in that jurisdiction.¹⁰⁹⁹

Even if it could intervene, a court, which is an offline dispute resolution system, defeats the efficiency of using smart contracts.¹¹⁰⁰ Smart contracts are also highly specialised. Judges may struggle to understand the technology and may be unable to read the smart contract, which will be in

¹⁰⁹³ Rozas, Tenorio-Fornés and Hassan (n 438) and The Defiant (n 1064).

¹⁰⁹⁴ See generally, Metzger (n 35). Metzger was dealing with smart contracts; however, as DAOs use smart contracts the principle is the same.

¹⁰⁹⁵ Kaal and Calcaterra, 'Smart Contract Dispute Resolution' (n 1059) and Samman and Freuden (n 663) 8.

¹⁰⁹⁶ Schmitz and Rule, 'Online Dispute Resolution for Smart Contracts' (n 35) 105 and Kaal and Calcaterra, 'Smart Contract Dispute Resolution' (n 1059).

¹⁰⁹⁷ Kaal and Craig Calcaterra, 'Smart Contract Dispute Resolution' (n 1059).

¹⁰⁹⁸ See also Schmitz and Rule, 'Online Dispute Resolution for Smart Contracts' (n 35) 105, who argue that it is not clear whether or how contract law should be applied in the context of smart contracts.

¹⁰⁹⁹ Elbalti (n 1080).

¹¹⁰⁰ Schmitz and Rule, 'Online Dispute Resolution for Smart Contracts' (n 35) 105 and Michael Buchwald, 'Smart Contract Dispute Resolution: The Inescapable Flaws of Blockchain-Based Arbitration' (2020) 168 *University of Pennsylvania Law Review* 1369, 1372.

computer code.¹¹⁰¹ The use of a human-readable contract would assist judges; however, there may be a discrepancy between the smart contract's code and the human readable contract.¹¹⁰²

Problems with accessing justice through the courts are not new and are not unique to DAOs.¹¹⁰³ The courts are not appropriate for many disputes,¹¹⁰⁴ including many disputes relating to DAOs. While using the courts to resolve disputes concerning DAOs may be warranted if the dispute is of high value¹¹⁰⁵ and the parties can be identified and a court decision can be enforced,¹¹⁰⁶ for most disputes the courts are not the appropriate forum. This may be due to the value of the disputes, which will normally be low and the identity of one or more of the parties not being known. Even if the identity of all the parties is known, they may be in different jurisdictions and enforcing judgments against people or organisations that reside or are based overseas is not always possible.

Because the courts are not suitable for all disputes, various alternative dispute resolution mechanisms have been developed as an alternative to the court system. For example, in New Zealand and other jurisdictions, many disputes have been removed from the courts' jurisdiction and placed in specialist tribunals or small claims courts.

5.2.2 Tribunals and Other Bodies Provided by the State

Owing to the cost and time involved in litigation, many jurisdictions have created tribunals and other similar mechanisms to deal with disputes. Tribunals are designed to be more informal, and cheaper

¹¹⁰¹ Schmitz and Rule, 'Online Dispute Resolution for Smart Contracts' (n 35) 111, although it has been argued that expert witnesses can assist judges and training can be provided to them. There is also the possibility that if smart contract disputes become more prevalent, specialised courts could be formed, Minn (n 89) 169. However, for smaller jurisdictions, such as New Zealand, it is unlikely that a specialised court would be created.

¹¹⁰² Mik (n 223) 288–289.

¹¹⁰³ In the United States, Austin Sarat, 'The Litigation Explosion, Access to Justice, and Court Reform: Examining the Critical Assumptions' (1985) 37(2) *Rutgers Law Review* 319.

¹¹⁰⁴ Galanter (n 1082) 3.

¹¹⁰⁵ The Defiant (n 993).

¹¹⁰⁶ Pietro Ortolani, 'The Judicialization of the Blockchain', in Philipp Hacker et al (eds), *Regulating Blockchain: Techno-Social and Legal Challenges* (Oxford University Press, 2019) 289, 302.

and faster to use than the courts.¹¹⁰⁷ New Zealand has 23 specialised tribunals,¹¹⁰⁸ including tribunals that deal with disputes over tenancy,¹¹⁰⁹ employment¹¹¹⁰ and even purchases of vehicles from licenced motor vehicle dealers.¹¹¹¹ Other jurisdictions, such as Australia¹¹¹² and Canada,¹¹¹³ have a larger number of tribunals as they have tribunals at the federal level and at state, province or territory levels. In contrast, others, such as the United Kingdom, have slightly fewer tribunals.¹¹¹⁴

In addition to specialist tribunals that focus on narrow areas, it is common for a jurisdiction to have a more generalist tribunal, often called a small claims court, to hear low-value claims. For example, in New Zealand, the Disputes Tribunal can hear most disputes that fall outside the specialised tribunals,¹¹¹⁵ up to a value of NZD30,000.¹¹¹⁶ Other jurisdictions have a similar generalist tribunal; for example, Australian states have similar tribunals,¹¹¹⁷ as do Canadian provinces and territories.¹¹¹⁸ Alternatively, a jurisdiction, such as the United Kingdom, may have a dedicated court

¹¹⁰⁷ Ministry of Justice, 'Tribunal Guidelines', *Ministry of Justice* (Web Page, 2019) <<https://www.justice.govt.nz/assets/Documents/Publications/Tribunal-Guidelines-201904.pdf>> 6. Also, New Zealand, in common with other jurisdictions, has specialised courts.

¹¹⁰⁸ *Ibid.*

¹¹⁰⁹ The Tenancy Tribunal (Residential Tenancies Act 1986 (NZ)).

¹¹¹⁰ The Employment Relations Authority (Employment Relations Act 2000 (NZ)).

¹¹¹¹ The Motor Vehicle Disputes Tribunal hears disputes involving motor vehicle traders for claims up to NZD100,000, or higher if both parties agree, Motor Vehicle Sales Act 2003 (NZ) s 90. For decisions see <<http://www.nzlii.org/nz/cases/NZMVD/>>.

¹¹¹² Productivity Commission, *Access to Justice Arrangements, Vol 2* (Report No 72, 5 September 2014) <<https://www.pc.gov.au/inquiries/completed/access-justice/report/access-justice-appendixd.pdf>>.

¹¹¹³ Wikipedia, 'List of Canadian Tribunals' <https://en.wikipedia.org/wiki/List_of_Canadian_tribunals> (Wikipedia has been used as there is no one list of Canadian tribunals.)

¹¹¹⁴ HM Courts & Tribunal Service, 'Our Tribunals' <<https://www.gov.uk/government/organisations/hm-courts-and-tribunals-service/about#our-tribunals>>. For a discussion on the reform of the United Kingdom's tribunals, which reduced their numbers, see Lorne Sossin, 'Reflections on the UK Tribunal Reform: A Canadian Perspective' (2011) 24 *Canadian Journal of Administrative Law & Practice* 17.

¹¹¹⁵ Exceptions include trades secrets and intellectual property, choses in action, recovery of land or any estate or interest in land, Disputes Tribunal Act 1988 (NZ) s 11.

¹¹¹⁶ Disputes Tribunal Act 1988 (NZ) s 19(5).

¹¹¹⁷ Australian Capital Territory (ACT Civil and Administrative Tribunal); New South Wales (New South Wales Civil and Administrative Tribunal); Northern Territory (Northern Territory Civil and Administrative Tribunal); Queensland (Queensland Civil and Administrative Tribunal); South Australia (South Australia Magistrates Court and Victoria (Victorian Civil and Administrative Tribunal).

¹¹¹⁸ For example, Ontario has its Small Claims Court as does British Columbia, which also has its online Civil Resolution Tribunal, which hears small-value claims, up to the value of CAD5,000.

track for hearing small claims.¹¹¹⁹ While such tribunals usually resolve disputes faster than the courts, it still takes a few weeks to a few months for a tribunal to hear a dispute.¹¹²⁰

Generalist tribunals, such as the New Zealand Disputes Tribunal, and small claims courts may be suitable to resolve some low-value DAO disputes; however, they are not ideal for most low-value DAO disputes. If the parties' identities are known, some parties may not be located in the tribunal's jurisdiction. Even if a tribunal can hear a dispute where one of the parties is not resident in the jurisdiction,¹¹²¹ a tribunal may refuse to hear that dispute if the law of another jurisdiction needs to be applied.¹¹²²

Appeals from a tribunal's decision are normally possible.¹¹²³ The tribunal may have its own appeal body,¹¹²⁴ or the courts hear appeals.¹¹²⁵ However, appeals are not encouraged because Tribunals are 'designed to resolve large numbers of low-value claims quickly and cheaply ... [t]here is a trade-off between speed and finality, and the benefits of error correction and scrutiny that an appeal might offer'.¹¹²⁶ Therefore, there is a trade-off between the cost, speed and finality of decisions. As a disincentive to appeals, a jurisdiction may provide that penalties are awarded against a party wrongly appealing a decision. For example, a party dissatisfied with a decision in the Civil Resolution Tribunal in British Columbia can file a Notice of Objection, which is equivalent to an appeal. If the filing party does not receive a better outcome in the Provincial Court, that court may order that party to pay a penalty to the other party.¹¹²⁷

¹¹¹⁹ The Civil Procedure Rules 1988, r 26.6 (UK) and Citizens Advice, 'Deciding Whether to Make a Small Claim' (Web Page) <<https://www.citizensadvice.org.uk/law-and-courts/legal-system/small-claims/deciding-whether-to-make-a-small-claim/>>.

¹¹²⁰ For example, Employment Relations Authority, 'Steps in the Authority Process' (Web Page) <<https://www.era.govt.nz/steps-in-the-authority-process/>>.

¹¹²¹ *Fabrics One Pty Ltd v Cha Cha Clothing Company Ltd* [1999] DCR 9, where the District Court held that the Disputes Tribunal had jurisdiction to hear a dispute where the claimant was based outside New Zealand.

¹¹²² *AAP v ZMZ* [2012] NZDT 38.

¹¹²³ Ministry of Justice, 'Tribunal Guidelines' (n 1107) 31.

¹¹²⁴ For example, the New South Wales (Australia) Appeal Panel for decisions from the New South Wales Civil and Administrative Tribunal (Civil and Administrative Tribunal Act 2013 (NSW) s 32).

¹¹²⁵ For example, in Victoria (Australia) the Supreme Court hears appeals from the Victorian Civil and Administrative Tribunal (Victorian Civil and Administrative Tribunal Act 1998 (Vic) s 148). In New Zealand the District Court hears appeals from the Disputes Tribunal (Disputes Tribunal Act 1988 (NZ) s 50).

¹¹²⁶ Ministry of Justice, 'Tribunal Guidelines' (n 1107) 31.

¹¹²⁷ Civil Resolution Tribunal, 'After a CRT Decision' (Web Page) <<https://civilresolutionbc.ca/how-the-crt-works/how-the-process-ends/#what-if-i-dont-agree-with-a-final-decision>>.

Despite the state provision of tribunals, industry groups have recognised an unmet need for dispute resolution between their members and their members' customers and have created industry schemes to hear disputes.

5.2.3 Industry Schemes

In New Zealand, as in other jurisdictions,¹¹²⁸ some industries have decided to self-regulate and have created dispute resolution schemes to hear disputes between their members and customers.¹¹²⁹ In common with tribunals and small claims courts, there is usually a limit on the value of the disputes heard.¹¹³⁰ If a dispute is above the limit, the parties must use the courts or a tribunal.

Industry schemes have some advantages over tribunals and courts. First, in contrast to the costs that parties incur with tribunals and courts, most tribunals are free for consumers,¹¹³¹ because the industry members pay for the schemes' operations.¹¹³² Second, unlike the courts, and some tribunals, whose judges and adjudicators are often generalists, industry schemes use experts in their specific industries to resolve complaints. Third, industry schemes do not normally require the parties to attend a hearing or instruct a lawyer. The adjudicator contacts the parties separately and they do not usually meet in person. Fourth, industry schemes' enforcement of decisions is often better than that of tribunals and courts.¹¹³³ Scheme members usually abide by the industry bodies' rulings. For

¹¹²⁸ See generally, Neil Gunningham and Joseph Rees, 'Industry Self-Regulation: An Institutional Perspective' (1997) 19(4) *Law & Policy* 363; Taskforce on Industry Self-Regulation, *Industry Self-Regulation in Consumer Markets* (Australian Treasury, August 2000) <https://cdn.treasury.gov.au/uploads/sites/1/2017/06/final_report.pdf>; and Alexandra Sims, 'Industry-Specific Regulation' in Kate Tokeley (ed), *Consumer Law in New Zealand* (LexisNexis, 2nd ed, 2014) 241.

¹¹²⁹ *Ibid.*

¹¹³⁰ For example, for the Telecommunications Dispute Resolution in New Zealand the maximum value of the dispute it can hear is NZD15,000. While it can hear disputes with a maximum value of AUD100,000, the Australian equivalent, the Telecommunications Industry Ombudsman, can make binding decisions up to the value of AUD50,000.

¹¹³¹ Sims, 'Industry-Specific Regulation' (n 1128) 241.

¹¹³² While the costs for industry members can be relatively high, especially for large organisations, they can save money as there is no need for their employees to appear in person in the Disputes Tribunal. In addition, effective self-regulation keeps the government away from regulating the industry, Debra Harker, Glen Wiggs and Michael Harker, 'Responsive Advertising Regulation: A Case Study from New Zealand' (2005) 40(4) *Australian Journal of Political Science* 541, 543.

¹¹³³ Despite the Disputes Tribunal issuing binding orders, it is common for those orders not to be followed, Alexandra Sims, 'Reforming the Consumer Guarantees Act 1993 and its Enforcement: Time for Action' (2010) 16 *New Zealand Business Law Quarterly* 145, 159 and Harrison Christian, 'Disputes Tribunal Process "Distressing" –

example, in New Zealand, The Advertising Standards Authority (ASA) has a near 100 percent compliance rate with its rulings, despite it having no enforcement powers.¹¹³⁴ The high rate of compliance is to avoid government regulation.¹¹³⁵ Fifth, industry schemes usually provide case summaries and notes, whereas tribunals may not always provide information about their cases. For example, the Disputes Tribunal publishes only a handful of cases each year.¹¹³⁶ The intention of providing case summaries and notes is to signal to consumers and industry members the industry scheme's likely approach to resolving particular types of dispute.¹¹³⁷ Such signalling is important for consumers and industry members as it gives guidance on how disputes are likely to be resolved. Finally, an industry scheme's rules can provide that the adjudicating body's decision is final for the industry member¹¹³⁸ or both the industry member and the consumer.¹¹³⁹ Such industry schemes use a 'single judge/finality model'.¹¹⁴⁰

Law Expert', *Stuff* (7 June 2019) <<https://www.stuff.co.nz/business/113269590/disputes-tribunal-process-distressing--law-expert>>. To enforce a Disputes Tribunal order when the other party does not voluntarily abide by it is a relatively complicated process through the District Court, for which the party seeking to enforce the order must pay.

¹¹³⁴ See Harker, Wiggs and Harker (n 1132) 551, which reports a 100 percent enforcement rate. However, since that article was written one trader, Wicked Campers, refused to abide by the ASA's rulings to change certain slogans and pictures on its campervans, Chloe Winter, 'Wicked Campers Van Depicting Gun Violence Deemed "Threatening" by ASA', *Stuff* (14 November 2017) <<https://www.stuff.co.nz/business/98878302/wicked-campers-van-depicting-gun-violence-deemed-threatening-by-asa>>.

¹¹³⁵ Harker, Wiggs and Harker (n 1132) 543.

¹¹³⁶ The Disputes Tribunal hears an average of 18,000 disputes a year, Warren Fraser, 'Regulatory Impact Statement – Increasing the Maximum Claims Level in Disputes Tribunal' (Web Page, 27 November 2013) <<https://www.justice.govt.nz/assets/Documents/Publications/regulatory-impact-statement-increasing-maximum-claims-level-in-disputes-tribunals.pdf>>. Yet in 2016 only 28 cases were published and in 2017 the number was a mere 14 cases, see Ministry of Justice, 'Decisions', *Ministry of Justice* (Web Page) <https://www.disputes Tribunal.govt.nz/disputes-decision-finder/?Filter_Jurisdiction=26>. See also Sims, 'Reforming the Consumer Guarantees Act 1993 and Its Enforcement' (n 1133) 173 – 174.

¹¹³⁷ See, eg, Financial Services Complaints, 'Case Studies', *Financial Services Complaints* (Web Page) <<http://www.fscl.org.nz/case-studies>>; Telecommunication Dispute Resolution, 'Case Studies', *Telecommunications Dispute Resolution* (Web Page) <<https://www.tdr.org.nz/about-tdr/case-studies>>; and Utilities Disputes, 'Case Notes', *Utilities Disputes* (Web Page) <https://www.utilitiesdisputes.co.nz/UD/Resources/Case_notes/UD/Resources/Case_notes.aspx>.

¹¹³⁸ For Telecommunication Disputes Resolution (TDR), if the consumer agrees to the TDR's final decision, the industry member must follow the TDR's decision; however, if the consumer does not agree with the final decision it can go to the Disputes Tribunal or the courts, New Zealand Telecommunications Forum, 'Customer Complaints Code', *New Zealand Telecommunications Forum* (Web Page) <<https://www.tcf.org.nz/industry/standards-compliance/customer-experience/customer-complaints/customer-complaints-code.pdf>>.

¹¹³⁹ For example, Insurance & Financial Services Ombudsman Scheme, 'Terms of Reference' (Web Page, 1 July 2015) <<https://s3.ap-southeast-2.amazonaws.com/ifso-files/docs/terms-of-reference-1-July-2015.pdf?mtime=20191121120840&focal=none>>.

¹¹⁴⁰ Resnik (n 1078) 606.

However, the traditional industry schemes are not appropriate for many disputes concerning DAOs. The industry schemes are jurisdiction-specific, that is, they regulate organisations and consumers based in their jurisdiction, for example, an Australian consumer who has a mobile phone contract with an Australian telecommunications corporation. While it may be possible for a DAO that provides services (or goods) to consumers in a particular jurisdiction to join a relevant industry scheme, many DAOs will operate internationally and will not be tied to specific jurisdictions. Also, the industry schemes are designed to resolve disputes between their scheme members and their scheme members' consumers, rather than their scheme members' internal disputes.

While not in the mould of a traditional industry scheme, in April 2021 the UK Jurisdiction Taskforce (UKJT), which comes under the auspices of the Law Society of England and Wales,¹¹⁴¹ published its Digital Dispute Resolution Rules ('the UKJT Rules'), to resolve disputes arising from 'digital assets, smart contracts, blockchain and other new technologies'.¹¹⁴² The UKJT Rules will be administered by the UK Society for Computers and Law (SCL), who will appoint the arbitrators and experts and publish anonymised decisions where appropriate.¹¹⁴³ Thus the Law Society of England and Wales is attempting to create an industry scheme to resolve smart contract disputes, which could involve DAOs.

While the UKJT Rules are discussed below,¹¹⁴⁴ the major part of its dispute resolution process is arbitration. The use of arbitration (and mediation) to resolve disputes is common and is looked at next.

¹¹⁴¹ The Law Society, 'LawTech Delivery Panel', *The Law Society* (Web Page, 11 October 2018) <<https://www.lawsociety.org.uk/campaigns/lawtech/guides/lawtech-delivery-panel>>.

¹¹⁴² UK Jurisdiction Taskforce (n 88) 10.

¹¹⁴³ *Ibid* 12.

¹¹⁴⁴ See below 5.5.

5.2.4 Alternative Dispute Resolution

5.2.4.1 Mediation

In mediation, a neutral third party assists the parties to resolve the dispute.¹¹⁴⁵ Mediation can be used to supplement court procedures; for example, some US states can require the parties to attempt to resolve their dispute through mediation first.¹¹⁴⁶ In New Zealand, for employment disputes, the Ministry of Business, Innovation and Employment provides free mediation in an attempt to resolve disputes before it is escalated to the Employment Relations Authority.¹¹⁴⁷

The most common reasons for using mediation are cost and time,¹¹⁴⁸ although if the parties need to bear the cost of mediation themselves, mediation remains expensive and is not something used for low-value disputes.¹¹⁴⁹ The use of a mediator does not, however, mean that the dispute will be resolved because mediation could break down. And even if the parties resolve their dispute, that resolution is not binding on the parties. The parties could attempt to make the resolution binding by entering into a contractual agreement. However, if one party breaches or threatens to breach the contract, the parties can agree to another round of mediation or take the matter to court.

Mediation may be suitable for some disputes concerning DAOs where the parties' identity is known, the dispute is of sufficiently high value and the parties are likely to agree to honour the outcome of the mediation. However, it is likely that most disputes will not have those three characteristics.

¹¹⁴⁵ Grant Morris, 'From Anecdote to Evidence: The New Zealand Commercial Mediation Market' (2016) 22(1) *New Zealand Business Law Quarterly* 10.

¹¹⁴⁶ Dorcas Quek, 'Mandatory Mediation: An Oxymoron? Examining the Feasibility of Implementing a Court-Mandated Mediation Program' (2010) 11(2) *Cardozo Journal of Conflict Resolution* 479.

¹¹⁴⁷ Gaye Greenwood and Erling Rasmussen, 'Transforming New Zealand Employment Relations: At the Intersection of Institutional Dispute Resolution and Workplace Conflict Management' (Conference Paper, Lipsky Conflict Resolution Conference, 11 – 12 November 2017) 6 and see Grant Morris, 'Eclecticism versus Purity: Mediation Styles Used in New Zealand Employment Disputes' (2015) 33(2) *Conflict Resolution Quarterly* 203.

¹¹⁴⁸ Morris, 'From Anecdote to Evidence' (n 1145) 27 and S I Strong, 'Use and Perception of International Commercial Mediation and Conciliation: A Preliminary Report on Issues Relating to the Proposed UNCITRAL Convention on International Commercial Mediation and Conciliation' (University of Missouri School of Law Legal Studies Research Paper Series 2014-28, 17 November 2014) <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2526302> 22.

¹¹⁴⁹ In New Zealand, the majority of mediators use a one-day mediation model and the typical fee is between NZD2,500 to NZD7,500, Morris 'From Anecdote to Evidence' (n 1145) 23.

5.2.4.2 Arbitration

Arbitration is similar to a judicial hearing. Unlike mediation, where the mediator works with the parties to help them reach an agreed outcome, the arbitrator hears the dispute and provides a ruling (arbitral award). The arbitral award is binding on the parties and can be enforced by courts in different jurisdictions.¹¹⁵⁰ The costs of arbitration can be high,¹¹⁵¹ and adjudicators usually are lawyers and former judges.¹¹⁵² In contrast to mediation, rules apply to the arbitration. For example, In New Zealand, the Arbitration Act 1996 applies, and in Australia, each state has a Commercial Arbitration Act¹¹⁵³ for domestic arbitration and the International Arbitration Act 1974 for international arbitration.¹¹⁵⁴

Arbitration has increased in popularity in recent decades.¹¹⁵⁵ There are several possible reasons for this. First, arbitration may be cheaper than court proceedings.¹¹⁵⁶ Second, the parties can craft the arbitration terms and choose which jurisdiction's law to apply or decide that no law is required.¹¹⁵⁷ Third, unlike civil court cases which are normally heard in public, arbitration is confidential; thus the parties' identity, the nature of the dispute and the arbitral award are not public

¹¹⁵⁰ *New York Convention* (n 155). However, using the *New York Convention* incurs further costs, Pietro Ortolani, 'Self-Enforcing Online Dispute Resolution: Lessons from Bitcoin' (2016) 36 *Oxford Journal of Legal Studies* 595, 603.

¹¹⁵¹ Christopher R Drahozal, 'Is Arbitration Lawless?' (2006) 40 *Loyola of Los Angeles Law Review* 187, 188.

¹¹⁵² 'Disputes Settled Without Going to Court', *New Zealand Herald* (9 March 2012) <https://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=10790835>.

¹¹⁵³ Commercial Arbitration Act 2010 (NSW); Commercial Arbitration (National Uniform Legislation) Act 2011 (NT); Commercial Arbitration Act 2013 (QLD); Commercial Arbitration Act 2011 (SA); Commercial Arbitration Act 2011 (TAS); Commercial Arbitration Act 2011 (VIC); Commercial Arbitration Act 2012 (WA); and Commercial Arbitration Act 2017 (ACT).

¹¹⁵⁴ In addition, on occasion, the rules of international bodies can be used. An 'Arbitral Tribunal may have regard to, but is not bound to apply, the International Bar Association Rules on the Taking of Evidence in International Commercial Arbitration current at the Commencement Date', New Zealand International Arbitration Centre, 'Standard Arbitration Rules' (8 February 2018) <<https://www.nziac.com/arbitration/arbitration-rules/standard-arbitration-rules/>> [26.3].

¹¹⁵⁵ Thomas J Stipanowich, 'ADR and the "Vanishing Trial": The Growth and Impact of "Alternative Dispute Resolution"' (2004) 1 *Journal of Empirical Legal Studies* 843.

¹¹⁵⁶ Christopher R Drahozal, 'Arbitration Costs and Form Accessibility: Empirical Evidence' (2008) 41(4) *University of Michigan Journal of Law Reform* 813.

¹¹⁵⁷ *Ex aequo et bono* and see generally Leon Trakman, 'Ex Aequo et Bono: Demystifying an Ancient Concept' (2008) 8(2) *Chicago Journal of International Law* 621.

knowledge. However, arbitration has been criticised for its secrecy and its lack of precedents.¹¹⁵⁸

Fourth, unlike court decisions where appeals are an integral part of the court process, the arbitral award usually is final: the ability to appeal to a court is limited. For example, in New Zealand and in most Australian states, unless the parties agree that an appeal is permitted, there is no right of appeal; a court is required to grant leave for an appeal to occur.¹¹⁵⁹ Notwithstanding the restrictions on the ability to appeal to the courts, arbitrators in New Zealand have in effect created their own industry scheme, the Arbitration Appeals Tribunal.¹¹⁶⁰

In addition to individual domestic arbitration, large international bodies, such as the International Chamber of Commerce,¹¹⁶¹ offer general dispute resolution services. More specialised arbitration is also available, such as the World Intellectual Property Office (WIPO) Arbitration and Mediation Centre for intellectual property disputes.¹¹⁶² There is also the Uniform Domain Name Dispute Resolution Policy (UDRP),¹¹⁶³ developed by the International Corporation for Assigned Names and Numbers (ICANN), to which people and organisations registering certain domain names agree to be bound.¹¹⁶⁴ ICANN does not resolve disputes itself; rather accredited providers compete to hear

¹¹⁵⁸ See generally, Jill I Gross, 'Bargaining in the (Murky) Shadow of Arbitration' (2019) 24 *Harvard Negotiation Law Journal* 185.

¹¹⁵⁹ Arbitration Act 1996 (NZ) sch 2 cl 5(1)(a)–(b). For a discussion on whether appeals should be permitted from an arbitral award see Amokura Kawharu, 'Arbitration Appeals' (2012) *New Zealand Law Journal* 137. The New Zealand International Arbitration Centre, which provides arbitration, provides a template agreement for the parties using its service to exclude their rules of appeal under the Arbitration Act 1996 and agree that the Arbitration Appeals Tribunal hear any appeal from the arbitral award, New Zealand International Arbitration Centre, 'Supplemental Agreement to Appeal to AMINZ Arbitration Appeal Tribunal from Award Made under NZIAC Arbitration Rules' <<https://www.nziac.com/resources/arbitration-resources/supplemental-agreement-appeal-aminz-arbitration-appeal-tribunal-award-made-nziac-arbitration-rules/>>. For Australia, see Julie Granger, 'The Right to Appeal an Arbitral Award: Express May be Best', *Clayton Utz* (Web Page, 2 July 2012) <<https://www.claytonutz.com/knowledge/2012/july/the-right-to-appeal-an-arbitral-award-express-may-be-best>>.

¹¹⁶⁰ Kawharu (n 1159) 138.

¹¹⁶¹ International Chamber of Commerce, 'Dispute Resolution Services' <<https://iccwbo.org/dispute-resolution-services/>>.

¹¹⁶² See World Intellectual Property Organization, 'Alternative Dispute Resolution' <<https://www.wipo.int/amc/en/>>.

¹¹⁶³ Internet Corporation for Assigned Names and Numbers, 'Uniform Domain Name Dispute Resolution Policy' <<https://www.icann.org/resources/pages/policy-2012-02-25-en>>. The UDRP was developed by the ICANN.

¹¹⁶⁴ Ibid cl 4. There are exceptions, however. If the domain name is a .nz domain name, the Dispute Resolution Service Policy applies, Domain Name Commission, 'Dispute Resolution Service Policy', *Domain Name Commission NZ* (Web Page) <<https://dnc.org.nz/nz-policies/dispute-resolution-service-policy/>>.

disputes.¹¹⁶⁵ The UDRP was designed to solve the problems that state-based laws faced with the resolution of domain disputes, which were often cross-border disputes,¹¹⁶⁶ although not all designated managers of certain country codes have ceded sovereignty for the resolution of disputes concerning their country codes. For example, for the .nz country code the UDRP is not used; instead the Dispute Resolution Service Policy is used.¹¹⁶⁷

The UKJT Rules,¹¹⁶⁸ while formulated and administered in England and Wales, are intended to be used internationally for the resolution of disputes involving digital assets, smart contracts and blockchain.¹¹⁶⁹ The UKJT Rules, which are looked at below, differ from standard arbitration because, for example, the arbitrator or arbitrators may have the power to control the smart contract.¹¹⁷⁰

As with mediation, arbitration, due to its cost, will not be suitable for most DAO disputes. The DAO disputes for which arbitration will be suitable are similar to those suitable for the courts to hear: high-value claims where the parties are known. Arbitration has the additional advantage that the parties do not need to be based in the same jurisdiction because arbitration awards are more easily enforced in foreign jurisdictions than court orders.

5.2.5 Online Dispute Resolution

There has been considerable work on online dispute resolution (ODR),¹¹⁷¹ which is designed to offer cheaper, faster and more efficient dispute resolution than the existing dispute mechanisms outlined in

¹¹⁶⁵ John Selby, 'Competitive Justice? The Role of Dispute Resolution Providers Under ICANN's UDRP?' (2004) 1 *Macquarie Journal of Business Law* 23.

¹¹⁶⁶ Ortolani, 'The Judicialization of the Blockchain' (n 1106) 293–294.

¹¹⁶⁷ Domain Name Commission (n 1088).

¹¹⁶⁸ UK Jurisdiction Taskforce (n 88).

¹¹⁶⁹ Ibid 11 and Rose (n 88).

¹¹⁷⁰ See below nn 1393–1394 and accompanying text for a discussion about the arbitrator's or arbitrators' power. While the UKJT Rules state "'shall" have the power...'", this is not clear cut.

¹¹⁷¹ Almost 20 years ago there was sufficient activity in online dispute resolution to warrant a book on that area, Rule, *Online Dispute Resolution for Business* (n 139).

the previous section. Despite a slow uptake of ODR,¹¹⁷² it is becoming more popular.¹¹⁷³ Two examples, eBay and Alibaba, have created successful, sophisticated dispute resolution mechanisms. eBay's ODR handles more than 60 million disputes a year.¹¹⁷⁴ Alibaba has created a User Dispute Resolution System, which uses jury members, who are volunteers, to hear disputes and cast their votes.¹¹⁷⁵ Jurors are not paid; instead, they receive reputation-based credit according to their participation, which can be used within Alibaba itself and also converted into donations for public causes for which Alibaba pays.¹¹⁷⁶ Alibaba also uses algorithms to ensure fair decisions are reached.¹¹⁷⁷ In March 2016, there were 920,000 active jury members who had provided 150 million votes, thus creating a quick and effective dispute resolution system.¹¹⁷⁸

However, eBay's and Alibaba's dispute resolution schemes are available for use only by the organisations and people who transact on their platforms. Therefore, eBay's and Alibaba's dispute resolution schemes are not suitable as a dispute resolution service for people contracting with DAOs and disputes between DAO members. They do, however, demonstrate that ODR that uses volunteer jurors is used successfully to resolve disputes.

The next section explains and analyses DDRs. One of the earliest proposed DDRs, Aragon Court,¹¹⁷⁹ was designed to resolve disputes concerning the DAOs created on Aragon's DAOs-as-a-service platform.¹¹⁸⁰

¹¹⁷² In 2007 it was reported that the uptake of ODR was poor, Lilian Edwards and Caroline Wilson, 'Redress and Alternative Dispute Resolution in Cross-Border E-Commerce Transactions' (2007) 21(3) *International Review of Law, Computers and Technology* 31 and see Pablo Cortés, 'A New Regulatory Framework for Extra-Judicial Consumer Redress: Where We are and How to Move Forward' (2015) 35(1) *Legal Studies* 114, 115.

¹¹⁷³ Robert J Condlin, 'Online Dispute Resolution: Sticky, Repugnant, or Drab' (2017) 18 *Cardozo Journal of Conflict Resolution* 717, 721.

¹¹⁷⁴ Colin Rule, 'Designing a Global Online Dispute Resolution Service: Lessons Learned from eBay' (2017) 13(2) *University of St Thomas Law Journal* 354. For a discussion about how eBay decides disputes see Orna Rabinovich-Einy and Ethan Katsh, 'Technology and the Future of Dispute Systems Design' (2012) 17 *Harvard Negotiation Law Review* 151, 169–175 and Colin Rule, 'Making Peace on eBay: Resolving Disputes in the World's Largest Marketplace', *AC Resolution Magazine* (Fall, 2008) <<http://colinrule.com/writing/acr2008.pdf>>.

¹¹⁷⁵ Ethan Katsh and Orna Rabinovich-Einy, *Digital Justice: Technology and the Internet of Disputes* (Oxford University Press, 2017) 66.

¹¹⁷⁶ Ibid.

¹¹⁷⁷ Ibid.

¹¹⁷⁸ Ibid.

¹¹⁷⁹ <<https://anj.aragon.org/>>.

¹¹⁸⁰ <<https://aragon.org/>> and see Valiente, Hassan and Pavón (n 406).

5.3 Decentralised Dispute Resolution Services

Aragon, which offers DAOs-as-a-service,¹¹⁸¹ believes that disputes will arise within DAOs and that the existing dispute resolution institutions are not adequate to resolve them.¹¹⁸² To remedy this situation, and to provide dispute resolution for other disputes, Aragon has created Aragon Court, which is just one of the DDRSs in operation. The limitations of existing dispute resolution institutions include time, cost, the requirement that parties' identities be known, and the difficulties associated with parties located in different jurisdictions. There is also the issue of the lack of finality as there is often the ability to appeal decisions of traditional dispute resolution institutions, which adds to time and cost. Appeals, however, do play a valuable role in ensuring that errors in reasoning are corrected. Thus, due to the valuable role that appeals can play, most DDRSs contain internal appeal processes.

This section begins by analysing the characteristics of DDRSs and their differences and similarities to traditional dispute resolution institutions and their dispute resolution mechanisms. However, just as DAOs use a range of governance mechanisms, DDRSs use a range of dispute resolution mechanisms; there is no one model for a DDRS. Next, because of the wide range of DDRSs, case studies of DDRSs in operation or proposed are analysed to determine their potential effectiveness.

5.3.1 Characteristics of DDRSs

While DDRSs do have some common characteristics they also have differences, which are touched on below. One significant difference amongst DDRSs is that some are designed to operate outside of the legal system, for example, Aragon Court¹¹⁸³ and Kleros.¹¹⁸⁴ This means that the parties cannot request a court to enforce the outcome of the DDRSs ruling. Others, such as Jur,¹¹⁸⁵ are designed to be an

¹¹⁸¹ See above n 562 and accompanying text.

¹¹⁸² Cuende (n 8).

¹¹⁸³ See below 5.3.2.1.

¹¹⁸⁴ See below 5.3.2.2.

¹¹⁸⁵ See below 5.3.2.3.

alternative form of arbitration and provide an arbitral award that can be enforced by the courts if coercive enforcement is required.¹¹⁸⁶

5.3.1.1 DDRS' Use of Blockchain and level of decentralisation

The first characteristic of DDRSs is that they use blockchain to facilitate the resolution of disputes. However, the extent to which DDRSs use blockchain and their level of decentralisation varies. Some, such as Aragon Court and Kleros provide a platform that is decentralised as the jurors are selected at random and not assigned by the DDRS or an entity associated with the DDRS. In contrast, others, such as Open Court allow the parties to select an arbitrator.

5.3.1.2 DDRSs Are Not Limited to Disputes Involving DAOs

DDRSs are not limited to solely resolving disputes concerning DAOs. For example, in addition to Aragon Court resolving disputes involving the DAOs created on its platform,¹¹⁸⁷ it can be used by any person or organisation, including for non-blockchain-related disputes.¹¹⁸⁸ Other DDRSs, while not designed expressly to resolve disputes concerning DAOs, could be used by people or organisations that deal with DAOs, for example, purchasing goods or services from DAOs. One interviewee identified the need for DDRSs to resolve such disputes:¹¹⁸⁹

I think these systems will create faster [dispute resolution], but it will never be as fast as fully on-chain smart contract which just makes the call, but I think it can be made a whole lot faster than the current court system. Use reputation and incentive systems with real world judges and people and I would imagine you could do something pretty cool.

¹¹⁸⁶ See Ortolani (n 1030) 303.

¹¹⁸⁷ Aouidef, Ast and Deffains (n 1070) 3 and Dan Saada, 'Aragon (ANT) Cryptocurrency Envisions to Create a Digital Jurisdiction with a Legal System Equivalent for DAOs', *The Currency Analytics* (Web Page, 12 March 2020) <<https://thecurrencyanalytics.com/12386/aragon-ant-cryptocurrency-envisions-to-create-a-digital-jurisdiction-with-a-legal-system-equivalent-for-daos/>>.

¹¹⁸⁸ Amy Castor, 'Aragon Court: Judge Judy on Blockchain', *Modern Consensus* (Web Page, 9 January 2020) <<https://modernconsensus.com/cryptocurrencies/aragon-court-judge-judy-on-blockchain/>>.

¹¹⁸⁹ Interviewee 5 (consultant).

5.3.1.3 DDRSs' Use of Human Judgment

DDRSs do not currently use algorithms to decide disputes; instead, people are used as adjudicators. There is no consistent terminology for adjudicators in DDRSs. Two prominent DDRSs, Aragon Court and Kleros, use the term 'juror'. The term 'adjudicator' is used in this section because a juror's role in a DDRS bears little relation to that of a conventional juror.

The type of adjudication depends on the design of the DDRS. For example, adjudication can be by one person;¹¹⁹⁰ by a group of three or more who each vote without knowing the vote of the others;¹¹⁹¹ by a group of three or more who confer before reaching a decision;¹¹⁹² or by many people who vote on the decision and thus arrive at a crowdsourced decision.¹¹⁹³

Crowdsourcing justice using peers to decide disputes is not unique to DDRSs. Courts use juries to harness the "wisdom of the crowd" to reach fair and judicious verdicts'.¹¹⁹⁴ Alibaba's User Dispute Resolution System also successfully uses members of the public as jurors and at scale.¹¹⁹⁵ However, there are differences between peers deciding disputes in a court and peers deciding disputes in DDRSs. First, judges control the information that jurors hear. In a DDRS, there is no filter on the information reaching adjudicators. Second, with traditional courts, juries are drawn from the general population.¹¹⁹⁶ In DDRSs, adjudicators are drawn from people who have applied to be adjudicators. Third, jurors are vetted in courts and can be excluded for conflict of interest and other reasons.¹¹⁹⁷ While some DDRSs do vet adjudicators, most do not.¹¹⁹⁸ To prevent adjudicators from choosing disputes to hear, DDRSs select adjudicators at random, thus while there is a risk that the adjudicator

¹¹⁹⁰ For example, OpenBazaar and Jur's Court Layer if only one adjudicator is used.

¹¹⁹¹ Aragon Court and Kleros Court.

¹¹⁹² Jur's Court Layer if a panel of three adjudicators is used, see below 5.3.2.3.1.

¹¹⁹³ For example, Jur's Community Layer, see below 5.3.2.3.3.

¹¹⁹⁴ Jae-Young Son, Apoorva Bhandari and Oriel FeldmanHall, 'Crowdsourcing Punishment: Individuals Reference Group Preferences to Inform their own Punitive Decisions' (2019) 9(1) *Scientific Reports* 11625, 1, 11.

¹¹⁹⁵ Katsh and Rabinovich-Einy, *Digital Justice* (n 1099) 66.

¹¹⁹⁶ Buchwald (n 1024) 1389.

¹¹⁹⁷ Martin Van der Linden, 'Bounded Rationality and the Choice of Jury Selection Procedures' (2018) 61(4) *Journal of Law & Economics* 711.

¹¹⁹⁸ Jur vets adjudicators at its Court Layer and Community Layer, but not at its Open Layer, see below 5.3.2.3. Kleros and Aragon do not vet adjudicators.

may know one or more of the parties, that risk is reduced. Third, in traditional juries, the jurors' identities are known. In DDRSs, it ranges from the arbitrators' identities not being known between themselves or to the parties, to being known. Fourth, juries in traditional courts confer between themselves to reach a verdict. In DDRSs, the adjudicators often do not confer between themselves before voting.

Juries are used predominately for criminal cases and not so often for civil cases.¹¹⁹⁹ Disputes relating to DAOs will be civil rather than criminal. Juries in civil courts debate their decision to reach a decision, and some jurisdictions require unanimous decisions.¹²⁰⁰ Other jurisdictions require a majority verdict. What constitutes a majority verdict in a civil case varies widely between jurisdictions, but it requires more than a bare majority. A majority verdict can be three-quarters of the jurors,¹²⁰¹ all but one of the jurors,¹²⁰² or around two-thirds of the jurors.¹²⁰³ In contrast, if a DDRS has more than one arbitrator and uses a mechanism where each adjudicator has one vote, a bare majority is required. Not all DDRSs, however, use one adjudicator, one vote. Jur, for example, uses a token-weighted model in both its open layer and community layer: the more tokens an adjudicator uses, the stronger is their vote.¹²⁰⁴

Jurors in traditional court cases commonly hear cases for days, weeks and occasionally months. In contrast, in DDRSs, the time it takes jurors to decide cases depends on the type of dispute. From one adjudicator's experience in the Kleros Court of being involved in the adjudication of 35

¹¹⁹⁹ Department of Justice, 'The Role of the Public', *Government of Canada* (Web Page) <<https://www.justice.gc.ca/eng/csj-sjc/just/12.html>>.

¹²⁰⁰ For example, in the United States, unless the parties otherwise agree, the verdict for federal civil cases must be unanimous, Federal Rules of Civil Procedure, r 48.

¹²⁰¹ New Zealand (Juries Act 1981 (NZ) s 29D(1)).

¹²⁰² Victoria (Juries Act 2000 (Vic) s 47(1)); United Kingdom (Juries Act 1974 (UK) s 17(1)); and Department of Justice, 'The Role of the Public' (n 1123).

¹²⁰³ In New South Wales, if the jury has four jurors a majority verdict is the decision of three jurors. If the jury has 12 jurors, nine jurors can constitute a majority verdict. For juries of 11 jurors only eight jurors are required, Jury Act 1977 (NSW) s 57(1).

¹²⁰⁴ Jur (n 148).

disputes, which was well over 10 percent of disputes decided at that time, most took no longer than five minutes, whereas others took days.¹²⁰⁵

In traditional civil court cases, jurors decide whether the plaintiff succeeds in their case or not. In contrast, some DDRSs allow the parties to provide options for adjudicators to vote upon.¹²⁰⁶

Jurors normally receive a nominal payment for their services¹²⁰⁷ and the amount they receive does not depend on the way they vote.¹²⁰⁸ In contrast, most DDRSs use game theory to incentivise adjudicators. Depending on the DDRS, not only can an adjudicator be rewarded for voting in the majority, they can be penalised financially if they vote in the minority. Some DDRSs require adjudicators to stake tokens and if they vote in the minority, they will lose some or all of their staked tokens. It has been argued that incentivising jurors to vote the way they believe the majority will vote results in conformity¹²⁰⁹ and populism, not justice.¹²¹⁰ However, populism must be traded against the provision of an efficient way to settle disputes that are not worth going to court to resolve.¹²¹¹ Moreover, the risk of populism is reduced because the adjudicators do not see the other adjudicators' votes; thus, the adjudicators' decisions will not be influenced by the votes of others. However, the risk of populism will not be removed entirely because the adjudicators may be influenced by what they perceive to be the most popular outcome and align their vote accordingly.

¹²⁰⁵ Andrew Fenton, 'Blockchain Startups Think Justice Can Be Decentralized, but the Jury Is Still Out', *Cointelegraph* (23 December 2019) <<https://cointelegraph.com/magazine/2019/12/23/blockchain-startups-think-justice-can-be-decentralized-but-the-jury-is-still-out>>.

¹²⁰⁶ Sam Vitello and Damjan Malbašić, 'Kleros Court Update: On New Ruling Types, Justifications and More', *Kleros* (Blog Post, 18 June 2019) <<https://blog.kleros.io/kleros-court-update/>>.

¹²⁰⁷ See, eg, Wenlei Ma, 'What Does Jury Duty Pay in NSW, QLD, WA, VIC, ACT, NT, TAS and SA?', *News.Dom.AU* (12 June 2014) <<https://www.news.com.au/finance/money/budgeting/what-does-jury-duty-pay-in-nsw-qld-wa-vic-act-nt-tas-and-sa/news-story/6bab84ec521e43db46200eba524861da>> and Ministry of Justice, 'Jury Service: Payment and Support to Help you Attend Jury Service', *Ministry of Justice* (Web Page) <<https://www.justice.govt.nz/courts/jury-service/payment-and-support/>>.

¹²⁰⁸ Buchwald (n 1024) 1405.

¹²⁰⁹ Howell and Potgieter (n 1063) 12.

¹²¹⁰ Gareth Jenkinson, 'Digital Courts Trial Decentralised Justice, Real World Weighs Verdicts', *Cointelegraph* (26 January 2020) <<https://cointelegraph.com/news/digital-courts-trial-decentralized-justice-real-world-weighs-verdict>>.

¹²¹¹ *Ibid.*

5.3.1.4 DDRS' Use of Law and Procedures in Decision-Making

Most DDRSs will not apply the law of the jurisdiction in which they are based or the laws of the jurisdictions in which one or both of the parties are located.¹²¹² Nor will most DDRSs use the rules of evidence. In addition, unlike traditional dispute resolution institutions where time limits, if they are used, can often be waived if the circumstances justify doing so, DDRSs impose strict time limits, which cannot be extended. For example, in Aragon Court, the parties to the dispute have seven days to submit their arguments from the time the dispute is raised,¹²¹³ while adjudicators (jurors) are given two days to vote and applications to appeal must be made within two days.¹²¹⁴

For DDRSs that offer appeals, the appeals process can be quite different to appeals in the current legal system. Parties in a civil court case usually have one appeal as of right, that is the decision of the court of first instance can be appealed once without the need to ask leave of a court to hear the appeal.¹²¹⁵ If one or both parties wish to appeal a case beyond that they must apply to the court for leave to appeal. In contrast, some DDRSs allow more than one appeal round as of right,¹²¹⁶ although the costs of appeal rise substantially with each appeal.¹²¹⁷ Also, the ability to appeal in a DDRS may not be limited to the parties to the dispute; any other person or organisation may be entitled to appeal the decision. The ability of any person or entity to appeal a decision is an innovative step, which may prevent incorrect decisions from standing. Because the costs of appeal rise substantially with each appeal this should prevent frivolous appeals.

The next section evaluates DDRSs that are open to any person or organisation, including DAOs and those dealing with DAOs, that is, they are not confined to the users of a specific DAO or other

¹²¹² Jur (n 148) 30–31. Which is more akin to arbitration, and in addition to the parties being able to choose the law that applies to their dispute, they have the case decided based on fairness (*ex aequo et bono*) and see above n 1157.

¹²¹³ Aragon, 'Aragon Court FAQ', *Aragon* (Web Page, 21 October 2020) <<https://help.aragon.org/article/48-aragon-court-faq>>.

¹²¹⁴ Aragon, 'Dispute Lifecycle' (n 150).

¹²¹⁵ See, eg, in the United States, Federal Rules of Appellate Procedure, r 4; and Murray Gleeson, 'Finality' (2013) *Journal of the NSW Bar Association* 33, 35.

¹²¹⁶ Both Aragon Court and Kleros allow four rounds of appeal, see below 5.3.2.1 and 5.3.2.2.

¹²¹⁷ See below 5.3.2.1 and 5.3.2.2.

organisation. DAOs are faced with a make-or-buy decision,¹²¹⁸ and it is easier and more efficient to buy the services of an existing DDERS.¹²¹⁹ A DAO is unlikely to create an internal dispute resolution mechanism, because of the complexity of creating one.¹²²⁰ Therefore DAOs that are open to all are the most common type of DDERS.

5.3.2 DDERSs Open to All

Dispute resolution services that are open for anyone to use are offering Justice-as-a-Service (JaaS). For example, Kleros describes itself on its home page as offering 'Justice as a Service'.¹²²¹ More conventional JaaS entities¹²²² do not resolve disputes themselves: they act as intermediaries between the consumer and the organisation against which a consumer has a complaint.¹²²³ They use high levels of automation to assist consumers and others enforce their rights and charge fees for their services.¹²²⁴ DoNotPay uses a subscription model.¹²²⁵ The first example of a DDERS is Aragon Court.

¹²¹⁸ See generally, Regina C McNally and Abbie Griffin, 'Firm and Individual Choice Drivers in Make-or-Buy Decisions: A Diminishing Role for Transaction Cost Economics' (2004) 40(1) *Journal of Supply Chain Management* 4 and Tadelis (n 457).

¹²¹⁹ The EOS Arbitration Forum (ECAAF) created by EOS to resolve disputes on its platform, see Xinxin Fan, Qi Chai and Zhi Zhong, 'MULTAV: A Multi-chain Token Backed Voting Framework for Decentralized Blockchain Governance' (Conference Paper, International Conference on Blockchain 2020) <https://link.springer.com/chapter/10.1007/978-3-030-59638-5_3> 33, 45 was discontinued, Binance Research, 'Decentralisation, Governance and EOS - A Lost Case?', *Binance Research* (Web Page, 18 February 2020) <<https://research.binance.com/en/analysis/eos-governance>>.

¹²²⁰ Interviewee 2 (DAO founder) believed that creating an internal disputes resolution scheme for a DAO would not be too difficult; however, that DAO does not yet appear to have created an internal dispute resolution scheme.

¹²²¹ 'You send your cases. Kleros sends back a decision' <<https://kleros.io>>.

¹²²² See, eg, Bérénic Magistretti, 'Forget Customer-Service Teams, These Automated Systems will get you that Refund', *Wired* (29 March 2017) <<https://www.wired.co.uk/article/startups-reduce-bills-train-flight-delays>>; Henrik Zillmer, 'Justice-as-a-Service', *Henrik Zillmer* (23 March 2016) <<https://henrikzillmer.com/justice-as-a-service>>; and WPP Stream, 'Justice-as-a-Service: The Trillion Dollar Cure to Bad Customer Services', *WPP Stream* (Web Page, 4 November 2016) <<https://medium.com/@WPPStream/justice-as-a-service-the-trillion-dollar-cure-to-bad-customer-service-897d18064b6a>>.

¹²²³ For example, 71lbs helps businesses recover money from UPS and FedEx for delayed, lost or damaged goods, see Zillmer (n 1146) and Agnieszka McPeak, 'Disruptive Technology and the Ethical Lawyer' (2019) 50 *University of Toledo Law Review* 457, 463.

¹²²⁴ For example, AirHelp can assist with recovering money from airlines for delayed or cancelled flights. A fee is charged only if money is recovered. 71lbs helps businesses recover money from UPS and FedEx for delayed, lost and damaged goods, see Zillmer (n 1146), which they send to businesses and other organisations for refunds and challenging parking tickets, see DoNotPay <donotpay.com> and McPeak (n 1147) 463.

¹²²⁵ DoNotPay, 'Billing FAQ', *DoNotPay* (Web Page) <<https://donotpay.com/learn/billing-faq/>>.

5.3.2.1 Aragon Court

Aragon,¹²²⁶ which provides DAOs-as-a-service for people to create and run DAOs, first described its version of a decentralised court in 2017¹²²⁷ and launched its court in 2020.¹²²⁸ Aragon Court is not limited to disputes from the DAOs that use its platform.¹²²⁹ To lodge a dispute a person or entity must be subscribed to the Aragon Court and pay the juror and other fees in the DAI stablecoin.¹²³⁰ Next, three jurors are selected at random.¹²³¹ People wishing to be jurors need to hold a minimum amount of Aragon's ANJ cryptocurrency and the more a person holds the more likely they will be selected as a juror,¹²³² thus there is no vetting of jurors. If a person is chosen as a juror, 30 percent of their active ANJ are locked.¹²³³ If a juror fails to vote, they lose all the locked ANJ.¹²³⁴ Jurors have the option of blocking the action, which is not classed as failing to vote, and can be used, for example, if the evidence was weak or the description did not make sense. The rules of evidence are not used, although it is likely (drawing upon the experience of Kleros, which is discussed below) for people to provide sources for their statements, for example, hyperlinks to websites.

The use of jurors in Aragon Court is substantially different to the use of jurors in traditional courts in the following ways. First, jurors offer to become jurors: they are not drawn from the general population. Second, Aragon Court jurors are not challenged on their suitability as they are in

¹²²⁶ Aragon <aragon.org>.

¹²²⁷ Kärki (n 132).

¹²²⁸ Ana Alexandre, 'Aragon Court is Now in Session for Global Decentralized Judgements', *Cointelegraph* (12 February 2020) <<https://cointelegraph.com/news/aragon-court-is-now-in-session-for-global-decentralized-judgements>>. The code for the court is available at Aragon, 'Aragon-Network-Deploy', *GitHub* <<https://github.com/aragon/aragon-network-deploy/blob/master/data/input/court.mainnet.js#L50>>.

¹²²⁹ Where an example of a contract between a freelance website designer and a customer was used as an example of the type of dispute the Aragon court could be used for, Alexandre (n 1152).

¹²³⁰ DAI is a stablecoin that is designed to be pegged to the US dollar, thus 1 DAI equals USD1. Jurors cost 30 DAI (10 DAI times three jurors), plus drafting fees and settlement fees which come to just under 1 DAI, Aragon, 'Aragon Court FAQ' (n 1137).

¹²³¹ Initially the number of jurors was to be weighted by active stake for Sybil resistance and could have been one, or three or more, Aragon, 'Juror Pre-activation Guide' (n 147).

¹²³² A minimum of 10,000 ANJ is required, Cooper Turley, 'Aragon Court and ANJ Pre-Activation', *DeFi Rate* (8 January 2020) <<https://defirate.com/aragon-court/>> which, on 13 March 2021, was worth USD0.075 (approximately USD750).

¹²³³ Turley, 'Aragon Court and ANJ Pre-activation' (n 1156). A person can be drafted more than once for the same dispute. If a juror is selected twice the juror will have two lots of ANJ locked.

¹²³⁴ Aragon, 'Dispute Lifecycle' (n 150).

traditional juries. Third, strict time limits are used: jurors are given two days to vote. Fourth, the outcome of the vote is kept secret until the end of the voting period to prevent influencing other jurors' votes. Fifth, game theory is employed¹²³⁵ and jurors vote on how they think the majority¹²³⁶ will vote, not what they think should be the outcome.¹²³⁷ Finally, jurors make money if they vote with the majority and lose money if they vote in the minority or fail to vote.¹²³⁸

Appeals are a feature of Aragon Court; up to four appeals are possible.¹²³⁹ To discourage appeals, the cost rises sharply because the number of jurors trebles with each round.¹²⁴⁰ Appeals can be made for any reason and by any user, not just the parties to the dispute, so long as the person or entity appealing locks up a set number of the stablecoin DAI¹²⁴¹ per juror. The appeal proceeds only if a second user confirms the appeal (confirming party) and also locks DAI based on the number of jurors.¹²⁴² If no entity confirms the appeal, the appealing party wins.¹²⁴³ The confirming party is essentially betting against the appealing party. Thus, if there is an application to appeal and the losing party or anyone else thinks the decision was decided correctly, they have an incentive to challenge that appeal. This is because if the appeal goes in favour of the confirming party, the confirming party receives the appealing party's collateral.¹²⁴⁴ In contrast, if the appealing party is successful, it receives

¹²³⁵ Fenton (n 1129).

¹²³⁶ Aragon prefers the term 'plurality' rather than the term 'majority'. Plurality is defined as '[w]hen the winning outcome of a vote is determined by the option that has the most votes, as opposed to majority rule where the winning outcome is determined by the option that has the majority of votes', 'Aragon Court Glossary' (n 150).

¹²³⁷ Aragon, 'Dispute Lifecycle' (n 150) and Aragon, 'Juror Pre-activation Guide' (n 147).

¹²³⁸ Aragon, 'Dispute Lifecycle' (n 150); Aragon, 'Aragon Court Glossary' (n 150); and Jorge, 'Aragon Court v1', *Aragon* (Web Page, March 2019) <<https://forum.aragon.org/t/aragon-court-v1/691>>. Those who voted in the majority receive a share of the fees of the jurors who voted in the minority, as well a share of the fees of those who failed to vote.

¹²³⁹ Aragon, 'Dispute Lifecycle' (n 150).

¹²⁴⁰ The first round uses three jurors, the second round (first appeal) nine, the third round (second appeal) 27, the fourth round (third appeal) 81, with a final possible round (fourth appeal) of all the jurors. To keep the costs down for the final round, the appealing and confirming parties pay a discounted rate of 50 percent of the jurors' fees, Aragon, 'Aragon Court FAQ' (n 1137).

¹²⁴¹ The current amount is 30.87 DAI per juror.

¹²⁴² The current amount is 20.58 DAI per juror. This process is very different to a traditional appeal process. For example, in New Zealand the parties have an automatic right to appeal against the decision of the court of first instance, which is either the District Court or the High Court and there is a 20-working-day period in which to apply for the appeal.

¹²⁴³ Aragon, 'Dispute Lifecycle' (n 150).

¹²⁴⁴ *Ibid.*

the confirming party's collateral.¹²⁴⁵ The ability of any person or entity to appeal a decision is an innovative step, which may prevent incorrect decisions from standing. The ability to appeal decisions within Aragon Court would give people dealing with DAOs more confidence in using it as their nominated dispute resolution method.

While Aragon Court had launched, it had dealt primarily with test disputes at the time of writing. In contrast, Kleros, which is examined next and can be used by DAOs, had dealt with over 300 disputes at the time of writing.

5.3.2.2 Kleros

In 2015, Federico Ast laid down an outline of what was to become Kleros,¹²⁴⁶ named after the kleroterion used in the Ancient Athenian court system.¹²⁴⁷ The kleroterion was a machine used to ensure that a purely random selection of 201 jurors was selected.¹²⁴⁸ The random selection of such a large number of jurors meant it would be very hard to bribe the jurors.¹²⁴⁹

Kleros' system is similar in many respects to that of Aragon Court.¹²⁵⁰ Jurors stake a cryptocurrency, PNK, and the more they stake, the higher the chances of being selected as a juror.¹²⁵¹ There are a minimum of three jurors per round, although unlike in Aragon Court, the complainant can

¹²⁴⁵ Ibid. If the appeal does not go in either party's favour, both get their collateral back, minus a fee to the jurors who voted in the majority, in addition to some drafting and settling penalties, Aragon, 'Aragon Court FAQ' (n 1137).

¹²⁴⁶ Federico Ast, 'The Crowdjury, a Crowdsourced Judicial System for the Collaboration Era', *Medium* (11 November 2015) <<https://medium.com/the-crowdjury/the-crowdjury-a-crowdsourced-court-system-for-the-collaboration-era-66da002750d8>>.

¹²⁴⁷ Federico Ast, 'Kleros, a Protocol for a Decentralized Justice System', *Medium* (12 September 2017) <<https://medium.com/kleros/kleros-a-decentralized-justice-protocol-for-the-internet-38d596a6300d>>.

¹²⁴⁸ *The Cambridge Ancient History: Plates to Volumes V and VI* (Cambridge University Press, 1994) 117.

¹²⁴⁹ Ibid 117. The jurors met in the ekklesiasterion, a large building that allowed each juror to see one another. Because of the large number of jurors the answer and thus the court system was crowdsourced, Ast, 'The Crowdjury, a Crowdsourced Judicial System for the Collaboration Era' (n 1170).

¹²⁵⁰ Federico Ast and Clément Lesaëge, 'Kleros, a Protocol for Decentralized Justice' in *Dispute Resolution: The Kleros Handbook of Decentralized Justice* <<https://ipfs.kleros.io/ipfs/QmZeV32S2VoyUnqJsRRCh75F1fP2AeomVq2Ury2fTt9V4z/Dispute-Resolution-Kleros.pdf>> 27 and Clément Lesaëge, Federico Ast and William George, 'Kleros: Short Paper' (v1.0.7, September 2019) <<https://kleros.io/whitepaper.pdf>>.

¹²⁵¹ Kleros, 'Kleros Juror Starter Kit' (n 139).

use more jurors if they are willing to pay the increased fees.¹²⁵² Again, as with Aragon Court, jurors who vote in the majority receive jurors' fees and a share of the tokens staked by those voting in the minority.¹²⁵³

Appeals are also possible and are similar to those in Aragon Court.¹²⁵⁴ The key difference is that Kleros also provides a service which allows people to crowdfund appeal fees.¹²⁵⁵ The ability to crowdsource appeal fees is a deliberate attempt to increase access to justice. It protects parties who cannot afford the appeal fees against those with more resources.¹²⁵⁶ Crowdsourcing of fees is also a way of enabling people to participate in Kleros, because the random selection of jurors in Kleros may mean that a keen juror is not selected to hear as many disputes as they may wish.¹²⁵⁷

In addition to the difference in appeals, there are two other key differences between Kleros and Aragon Court. First, there are several specialist sub courts in Kleros; thus jurors can specialise.¹²⁵⁸ Second, in Kleros jurors' fees are payable in the cryptocurrency — ether — which means that the price of using Kleros will fluctuate.¹²⁵⁹ In comparison, Aragon Court uses DAI, a stablecoin, which means its fees remain constant. The fluctuating price of ether, especially rapid increases in its price, is likely to affect Kleros' usability because it could become too expensive for low-value disputes.¹²⁶⁰

¹²⁵² See Appendix D, where four of the 30 Kleros disputes analysed had more than three jurors in the first round. Using more than three jurors in the first round is not common as the parties pay for each juror, see below 5.3.2.2.

¹²⁵³ Stuart James, '3 Things to Know About Becoming a Kleros Juror', *Kleros Blog* (Blog Post, 24 January 2019) <<https://blog.kleros.io/become-a-juror-blockchain-dispute-resolution-on-ethereum/>>.

¹²⁵⁴ See generally, William George, 'The Kleros TCR Appeal System, or the Third Way of Participating in Kleros', *Kleros Blog* (Blog Post, 26 March 2019) <<https://blog.kleros.io/kleros-decentralized-token-listing-appeal-fees/>>.

¹²⁵⁵ Crowdfunders contributing to the party that lost the previous round but won the appeal would receive their contribution back, plus 33 percent. Those who contributed to a party that won the previous round and went on to win the appeal would receive twice what they contributed, George (n 1178).

¹²⁵⁶ Ibid.

¹²⁵⁷ Ibid.

¹²⁵⁸ Kleros, 'Courts', *Kleros* (Web Page) <<https://court.kleros.io/courts>>. Currently those courts are: blockchain (divided into non-technical and technical); marketing services (quality of paid marketing services including sponsored articles, social media production and PR writing); English language (quality of written content, including grammar and text logic); video production (editing quality, resolution and final deliverable format); onboarding (allow new jurors to have a feel for Kleros, allow projects considering Kleros to use it to resolve disputes to compare Kleros to other methods); and curation (solving micro-tasks relating to curation or content moderation). The intention is to extend the number of sub-courts to include, for example, e-commerce, freelancing and insurance, Kleros, 'Decentralized Courts', *Kleros* (Web Page) <<https://kleros.io/en/>>.

¹²⁵⁹ For example, the price of ether increased from USD110.60 on 13 March 2020 to USD2,760 on 30 April 2021, a more than 20-fold increase.

¹²⁶⁰ William George, 'Ethereum Scalability and Kleros', *Kleros Blog* (Blog Post, 11 September 2020) <<https://blog.kleros.io/ethereum-scalability-and-kleros/>>.

By March 2021, two years since its first dispute in March 2019, Kleros had been used to resolve over 550 disputes¹²⁶¹ and there were 560 active jurors.¹²⁶² While there have been studies on the different types of DDRSs,¹²⁶³ at the time of writing, there had not been an analysis on the disputes heard by DDRSs. The lack of literature on the resolution of disputes heard by DDRS was because, with the exception of Kleros, not all were in operation or if there were in operation, they had not decided more than a handful of disputes. All the disputes, which includes information that jurors see, including the evidence provided by parties, is accessible online, as are the voting results and any justifications provided,¹²⁶⁴ thus it was hypothesised that the disputes would provide a rich data source. However, while the voting patterns and appeals could be seen, the juror's justifications for the early cases had not been captured.¹²⁶⁵

In August 2020, simple random sampling,¹²⁶⁶ a form of probability sampling,¹²⁶⁷ was used to generate a randomised selection of 30 disputes to analyse.¹²⁶⁸ The analysis of the Kleros decisions provides an insight into the operations of a low-cost conflict resolution mechanism¹²⁶⁹ that, amongst other things, can be used to resolve disputes associated with DAOs. IC would predict that the use of ledgers (blockchain), would have a material effect on the resolution of disputes within Kleros compared to more traditional dispute resolution schemes.

¹²⁶¹ Some of the disputes are likely to have been ones used to test Kleros' system and voters' behaviour, Fenton (n 1129).

¹²⁶² The number of disputes and other statistics can be found at <<http://klerosboard.com/>>. Disputes can be accessed through <<http://klerosboard.com/dispute/>>, however, a MetaMask wallet is required to view the details of each dispute.

¹²⁶³ Aouidef, Ast and Deffains (n 1070); James Metzger (n 35); Allen, Lane and Poblet (n 35) and Howell and Potgieter (n 1063).

¹²⁶⁴ However, one detail that was not always provided was the court that heard the dispute. Of the 30 disputes analysed the court details were not provided for eight. Of those provided, two were in the General Court and the remainder were in the TCR Court.

¹²⁶⁵ However, it transpired that for the early disputes the justifications were not captured, Vitello and Malbašić (n 1206).

¹²⁶⁶ Steven K Thompson, *Sampling* (Wiley, 3rd ed) 11.

¹²⁶⁷ Mohamed Elfil and Ahmed Negida, 'Sampling methods in Clinical Research; an Educational Review' (2017) 5(1) *Emergency (Tehran, Iran)* e52.

¹²⁶⁸ For details of the cases analysed see Appendix D. Kleros uses a numbering system, starting from 1 for its disputes. A random generator tool on a website, <random.org>, was used to generate 30 numbers which corresponded with 30 disputes. Those disputes were: 6, 27, 29, 37, 48, 57, 70, 76, 88, 100, 112, 114, 122, 128, 154, 161, 174, 180, 211, 212, 217, 233, 244, 255, 257, 260, 293, 301, 316 and 322. Cases that were still in progress were excluded from the analysis.

¹²⁶⁹ Emmett, 'Automating Ostrom for Effective DAO Management' (n 676).

The 30 disputes were first analysed to determine whether they involved a DAO, that is, whether they were between a token holder and a DAO or between token holders in a DAO. If a dispute had involved a DAO the name of the DAO would have been referred to in the dispute, but none of the disputes did so. Therefore in the analysis the disputes were treated as not involving DAOs. Instead the disputes concerned a range of different subject matters and largely involved parties challenging the veracity or quality of information provided to a website, whether information provided by websites was accurate and even if a news outlet was a reliance news source. The disputes heard are likely to be an accurate sample of the nature of disputes because the low cost of using Kleros means it can deal with that disputes that would not have been heard by a traditional court.¹²⁷⁰ Because none of the analysed disputes dealt with DAOs, Appendix D contains a detailed breakdown of the types of disputes.

Notwithstanding that the disputes did not involve DAOs, the analysis provides some relevant information. The disputes were relatively trivial, and none were of high value. Given the relative newness of Kleros and decentralised courts, it would not be expected for Kleros to hear high value claims early in its development and that one of its purposes to hear low-value disputes is being borne out. Of the 30 disputes, nearly half — 14 — were decided unanimously by the three jurors. In eight disputes (27 percent), one of the jurors failed to vote.¹²⁷¹ That a quarter of jurors failed to vote would appear to be a relatively high number, given that jurors who failed to vote forfeited the tokens they had staked. Because of the penalty imposed on non-jurors, forfeiture of tokens, it would have been expected that fewer jurors would have disengaged in the adjudication process. Thus the hypothesis that IC would predict that the use of blockchain (ledgers) enabled a design that incentivised jurors to vote was not borne out in this instance.

¹²⁷⁰ See Donald Wittman, 'Dispute Resolution, Bargaining and the Selection of Cases for Trial: A Study of the Generation of Biased and Unbiased Data' (1988) 17(2) *Journal of Legal Studies* 313, 314, who notes that cases claiming large awards are more likely to be litigated in court, than ones where the potential award is lower.

¹²⁷¹ Kleros uses the term 'pending vote', rather than 'failed to vote'. In one of these eight disputes, two jurors failed to vote.

Where there was a winner or loser,¹²⁷² the applicant lost in 17 out of 24 (70.8 percent) of the disputes and only won in six out of 24 (25 percent).¹²⁷³ The high loss rate could be seen as demonstrating that the jurors examine evidence before making a decision.

The analysis also provides useful information on appeals. Three (10 percent) of the 30 disputes were appealed: one to a second round and two to a third round. As with Aragon Court, anyone can bring an appeal and this occurred in one dispute, with a third party appealing a first-round decision.¹²⁷⁴ While the sample size is small, a 10 percent appeal rate would appear to be low, compared with conventional court cases. For example, in the United States it has been estimated that approximately 20 percent of civil court cases between 1988 and 2000, for which there was a definitive finding for the plaintiff or defendant, were appealed.¹²⁷⁵ However, a high appeal rate within a DRS does not mean the DRS is operating optimally as the purpose of a DRS is to provide a low cost and timely dispute resolution service: a high percentage of appeals would thwart that purpose. Thus on this basis Kleros' modest appeal rate would appear appropriate and may indicate that as IC predicted, the use of blockchain is having a material effect on the resolution of disputes.

More striking was that of the disputes analysed in Kleros no appeal was successful, with the initial decisions being upheld on appeal.¹²⁷⁶ This is in contrast to appeals in traditional courts where often a substantial minority of appeals are successful.¹²⁷⁷ The numbers of successful appeals range between the level of the appellate courts and the jurisdiction. In the United States one study showed that of 20 participating states, intermediate appellate courts allowed appeals in 30 percent of

¹²⁷² The disputes involving whether something was fake news, a reliable news source or copyright infringement were excluded.

¹²⁷³ In one dispute there was no winner or loser because one juror voted for, one voted against and one did not cast a vote (case 114). Kleros described the decision as 'refused to arbitrate'.

¹²⁷⁴ Kleros (case 57).

¹²⁷⁵ Theodore Eisenberg, 'Appeal Rates and Outcomes in Tried and Nontried Cases: Further Exploration of Anti-Plaintiff Appellate Outcomes' (2004) 1(3) *Journal of Empirical Legal Studies* 659, 685.

¹²⁷⁶ In Kleros (case 122), to add a token, the first round had only two votes: one for and one against adding; the third juror did not vote. Despite a tie between the vote for and the vote against, the voting showed that the jurors in the first round voted in favour of adding the token. In the second round six out of seven voted in favour and in the third round 12 out of 15 voted in favour.

¹²⁷⁷ Mark Henaghan, 'The Changes to Final Appeals in New Zealand since the Creation of the New Zealand Supreme Court' (2011) 12(3) *Otago Law Review* 579, 582.

cases.¹²⁷⁸ On the lower end is the High Court of Australia where over the period between May 2012 to May 2021 nearly seven percent of appeals were successful.¹²⁷⁹ The fact that no appeals were successful in Kleros may indicate that the appeal process is not working as intended, because based on the experience of the traditional courts, it would be expected that at least one appeal to have been successful. However, in time appeals may evolve so that if disputes are incorrectly decided appeals will be upheld. There are signs of this already in Kleros. In the disputes that were analysed, if the disputes were decided unanimously in the first round, they were not decided unanimously in the second or third rounds.¹²⁸⁰

While it is relatively early in its development, Kleros would appear to be a viable DDRS to resolve low-value disputes concerning DAOs. The next DDRS examined in this section, Jur, is significantly different to Aragon Court and Kleros and uses distinctly different mechanisms to resolve disputes.

5.3.2.3 Jur

Unlike Aragon Court and Kleros, which uses the same process regardless of the value of the dispute, Jur¹²⁸¹ offers three different modes or layers depending on the dispute's value.¹²⁸² The first layer, the Court Layer, is for the highest-value disputes.

¹²⁷⁸ Nicole L Waters, *Civil Trials on Appeal Part—Caseload Highlights* (National Center for State Courts, 2007) 3.

¹²⁷⁹ The Australian High Court accepted on average 11.8 percent of leave to appeals and of those approximately 57 percent were successful, see Tim Jones, Luke Furness and Adam Rose, 'Appeals to the High Court: The Statistics, a Guide to the Process and some Practical Tips' *Clayton Utz* (Web Page, 24 July 2021) <<https://www.claytonutz.com/knowledge/2021/june/appeals-to-the-high-court-the-statistics-a-guide-to-the-process-and-some-practical-tips>>.

¹²⁸⁰ In Kleros (case 57), the first round was three out of three against adding a token to the token curated registry of tokens and the second round was six out of seven against adding it. In case 293, three out of three were against adding a story to DeversiFi Storytelling. In the second round, five out of seven were against adding it and in the third round, 10 out of 15 were against adding it.

¹²⁸¹ <<https://jur.io/>>.

¹²⁸² Jur (n 148) 12.

5.3.2.3.1 *The Court Layer*

Jur's Court Layer harnesses existing institutions because it allows arbitral organisations that wish to offer services to register as a Hub Admin.¹²⁸³ The Hub Admin in turn establishes an Arbitration Hub, which uses Jur and conforms to the Court Layer's basic principles, and deposits JUR tokens as its Performance Bond.¹²⁸⁴ Thus Jur uses third parties (Hub Admins) to supply it with arbitrators and the third parties manage those arbitrators.¹²⁸⁵ The Court Layer, then, can be seen as similar to arbitration with traces of the UDRP process with different providers. The Hub Admins can select their arbitrators, or they can delegate the selection process to the Open Layer or the Community Layer, which are examined below.¹²⁸⁶

One arbitrator is recommended for disputes below USD150,000, and for higher-value disputes an arbitral tribunal of three arbitrators is used.¹²⁸⁷ While users select the Arbitration Hub and pay its fees (which include the arbitrator(s) fees), the arbitrators within the Hub are chosen at random.¹²⁸⁸ Thus Jur differs from the UDRP process for domain name disputes where the majority of disputes appear to be given to 'complainant-friendly panellists'.¹²⁸⁹

The Court Layer is designed to ensure that the parties have a right to a defence; the parties are cross-examined and the arbitrators are impartial.¹²⁹⁰ The arbitral awards are claimed to be enforceable under the *New York Convention*.¹²⁹¹ While each Arbitration Hub can set its procedures,

¹²⁸³ Ibid 28.

¹²⁸⁴ Ibid. The amount required for the performance bond is proportional to the maximum dispute value the Arbitration Hub accepts.

¹²⁸⁵ Ibid 28.

¹²⁸⁶ Ibid 28–9.

¹²⁸⁷ Ibid 28.

¹²⁸⁸ Ibid 35–6 the “randomized appointment” ... should not be corruptible, in the sense that it should not be possible for any of the counterparties to influence or change the appointment of an arbitrator that was truly randomly selected’.

¹²⁸⁹ Colm Brannigan, ‘The UDRP: How Do You Spell Success?’ (2004) 5(1) *Digital Technology Law Journal* 2 [13], citing Michael Geist, ‘Fair.com? An Examination of the Allegations of Systemic Unfairness in the ICANN UDRP’ (2002) 27(3) *Brooklyn Journal of International Law* 903, 912, see also Selby, ‘Competitive Justice?’ (n 1165) 42.

¹²⁹⁰ Ibid 29.

¹²⁹¹ Ibid 12.

the arbitration is carried out online and Jur anticipates three basic types of arbitration:

documentary,¹²⁹² ordinary¹²⁹³ and quick.¹²⁹⁴

As with arbitration, Jur's Court Layer allows the parties' arbitration clause to determine which national law will cover a dispute or whether disputes will be decided based on fairness.¹²⁹⁵ The novel feature of the Court Layer is a built-in decentralised peer-review system. Three randomly selected peer reviewers evaluate the arbitral award's provisional draft and assign it a score.¹²⁹⁶ (That score is fed into a reputation system for the arbitrators.¹²⁹⁷) A positive score renders the draft the final and binding arbitral award. A negative score reassigns the dispute to new arbitrators, and the Arbitration Hub's Performance Bond is used to pay the new arbitrators' fees.¹²⁹⁸ While the reassigned dispute is also subject to peer review, the reassigned dispute cannot be reassigned.¹²⁹⁹

Jur is attempting to avoid corruption with its Performance Bond. If the arbitration is reassigned the Performance Bond decreases, which in turn lowers the value of the disputes that the Arbitration Hub can accept.¹³⁰⁰ Also, if any alleged attempts at bribery by the arbitrator are found to be valid,¹³⁰¹ the person reporting the attempted bribery will be paid from the Performance Bond.¹³⁰²

To overcome the perceived problems of lack of precedents in arbitration, Jur allows Hub Admins to view the arbitral awards to 'draw maxims' and 'create a framework of rules or at least a

¹²⁹² No hearings or witnesses are used for minor complexity disputes estimated less than two months in the worst-case scenario. For a €10,000-value dispute, the total cost of arbitration is estimated at €700 to €800 for a single arbitrator. For a €25,000-value dispute, the total cost of arbitration is estimated at between €800 and €1,300, Jur (n 148) 29–30.

¹²⁹³ Depending on witnesses and hearings it will take up to three to four months. For a dispute over €150,000 estimated costs for a panel of three arbitrators starts at €6,000, Jur (n 148) 29.

¹²⁹⁴ A time limit of around three months, and a maximum of two hearings and two witnesses per party. Around 30% cheaper than Jur's ordinary arbitration, Jur (n 148) 29–30.

¹²⁹⁵ Jur (n 148) 30–31. The ability to allow the parties to have the dispute resolved on the basis of fairness is known as *ex aequo et bono*, and see above n 1157.

¹²⁹⁶ Ibid 31–32.

¹²⁹⁷ Ibid 32.

¹²⁹⁸ Ibid.

¹²⁹⁹ Ibid. The peer reviewers earn or lose JUR tokens based on how closely their score matches that of other peer reviewers.

¹³⁰⁰ Ibid 34.

¹³⁰¹ If the allegations are accepted, the person or entity making the allegations will receive the remaining Performance Bond, Jur (n 148) 34.

¹³⁰² Ibid 34 and corrupt arbitrators are reported to the relevant government authorities.

collection of maxims', which can be made viewable to anyone.¹³⁰³ It is in the Hub Admin's interest to release such material as parties to a dispute prefer a dispute resolution institution that is predictable.¹³⁰⁴

Jur's Court Layer would be of use to disputes concerning DAOs if those disputes were complex and of high value. The decentralised peer-review system would serve as an appeal against a rogue decision.

5.3.2.3.2 *The Open Layer*

Jur's Open Layer aims to resolve small disputes up to the value of USD500 in 24 hours.¹³⁰⁵ It does not use vetted arbitrators, there is no ability to appeal, and each Open Layer party proposes a resolution.¹³⁰⁶ Rational actors make proposals they believe will be seen as the fairest of two choices, not necessarily what they think is fair.¹³⁰⁷ This contrasts with traditional court cases where parties ask for the highest sum possible, knowing the court is likely to reduce the sum if the party succeeds.¹³⁰⁸

The Open Layer is likely to be cheaper for parties than Aragon Court and Kleros as the parties to the dispute do not need to pay voters' fees. However, the party initiating the dispute must pay 1 percent of the contract value.¹³⁰⁹ There is no set number of jurors as there are in Aragon Court and Kleros. For payment, voters in Open Layer receive only the tokens lost by those who vote in the minority. Early voting is incentivised because only those voters in Jur who vote early in what becomes the majority receive the tokens of those who vote in the minority.¹³¹⁰

¹³⁰³ Ibid 47.

¹³⁰⁴ Ibid 47.

¹³⁰⁵ Ibid 41.

¹³⁰⁶ Ibid 37.

¹³⁰⁷ Ibid. For example, in a dispute between Bob and Alice over work done by Bob for Alice, where the funds are sitting in escrow pending the outcome of the dispute, Bob may think a 50/50 split is fair, but if he thinks Alice will propose 90 percent for her and 10 percent for him, it is rational for Bob to propose 20 percent for him and 80 percent for Alice.

¹³⁰⁸ Ibid 37–38.

¹³⁰⁹ Ibid 39.

¹³¹⁰ Ibid 38.

Voting is not based on one person—one vote, but on one token—one vote: the more tokens voters use, the stronger their votes. Jur has attempted to prevent one person from skewing the results by voting with a large number of tokens.¹³¹¹ There is also a ‘Safety Clause’ in the Open Layer where the dispute is referred automatically to the Court Layer if a token holder with a substantial percentage of tokens, ‘a whale’, attempts to corrupt the voting.¹³¹²

Unlike Aragon Court and Kleros, where the full details of the dispute are available for anyone to view, and even the Court Layer, where some details of disputes may be published, it does not appear that information relating to disputes decided in the Open Layer will be publicly accessible.

5.3.2.3.3 *The Community Layer*

The Community Layer is aimed at disputes of medium complexity and value.¹³¹³ It issues decisions between approximately 24 hours and one week and attempts to blend features of both the Open Layer and the Court Layer. As with the Open Layer there is no appeal process. The Community Layer uses a ‘stake-weighted incentive-based voting system’ with authorised experts making the decisions.¹³¹⁴ The use of authorised experts contrasts with the Open Layer, which allows any JUR token holder to participate.

Community Creators play a similar role to the Hub Admin and Arbitration Hubs in the Court Layer as each Community Creator creates criteria to assess who they will accept as Community Members and who is able to vote.¹³¹⁵

Community Creators have more latitude than the Court Layer over how they will decide disputes. They are required to set parameters such as the minimum and maximum number of voters

¹³¹¹ Ibid 40. This is done by not allowing a proposition to gain more than a 100 percent lead, thus if B’s proposal has 100 votes and A’s proposal has 199 votes, only one vote can be cast in favour of A, until B receives more votes.

¹³¹² Ibid.

¹³¹³ Jur expects the Community Layer to work for disputes between USD500 and USD5000, although it could be used for disputes up to USD50,000, Jur (n 148) 42.

¹³¹⁴ Ibid 42.

¹³¹⁵ Ibid 42–43. The Community Creators can use that criteria to assess who to admit as a member or the Community Creators can allow the Open Layer to use that criteria to evaluate voter applications.

per dispute; the minimum and maximum number of JUR tokens permitted in each voter's wallet; and the maximum ratio between the value of the tokens held within the Community and the value of the dispute.¹³¹⁶

Community Creators can choose whether to charge fees and, if fees are charged, whether to allocate part or all of the fees as rewards to voters.¹³¹⁷ The voting system is the same as in the Open Layer. In common with the Open Layer, it does not appear that the full documentation of the disputes in the Community Layer will be accessible.

The Community Layer would be appropriate for the resolution of disputes concerning DAOs for disputes of medium value because authorised experts would be adjudicating the dispute. The lack of an appeal process may be seen as desirable because it could cut down on the time and cost of resolving disputes.

The next DDRS, Juris, is closer to Jur than Aragon Court or Kleros.

5.3.2.4 *Juris*

At the time of writing Juris was not yet in operation, but it is included because it is a DDRS with multiple layers and provides an alternative to Jur. A key difference between Jur and Juris is that the parties must have agreed to use Juris by including Juris' arbitration code in their smart contract and attaching Jurist tokens (JRS) to it.¹³¹⁸ If a dispute arises, the Juris Protocol freezes the smart contract and the Juris processes begin.¹³¹⁹ There are three different procedures, which is similar to Jur and its layers, but unlike Jur, the parties cannot choose which procedure to use and must begin with the first procedure, SELF Mediation.¹³²⁰ Therefore, a DAO could use Juris in all the smart contracts it enters into with third parties. If a DAO is operating a platform it may insert Juris' arbitration code into all the smart contracts created on its platform. The requirement of attaching JRS tokens to the smart

¹³¹⁶ Ibid 43–44.

¹³¹⁷ Ibid 44.

¹³¹⁸ Juris, 'Juris White Paper, Version 2.0', *Juris* (18 September 2018) <<https://drive.google.com/file/d/1318klGEYL4g02VudL-C-BCnvpKujTnbF/view>> 16. If the smart contract concludes without a dispute, or the time for a challenge expires, the attached JRS tokens are returned to the parties.

¹³¹⁹ Ibid 16.

¹³²⁰ See 5.3.2.4.1 below.

contract, however, may be an impediment as it would raise the initial cost of entering the smart contract (the JRS tokens are returned if no dispute arises). It would also require the parties to source JRS tokens, thus further increasing transaction costs. Jur, therefore, would be more appropriate for mid- to high-value transactions than low ones.

The decision-makers in Juris (Jurists) can move between levels based on their performance. People wishing to become Jurists must provide proof of identity at a minimum,¹³²¹ thus it is unlike the DDRSs looked at, except for the arbitrators in Jur's Court Layer.¹³²² There are three levels of Jurists. The highest, the High Jurists, are pre-certified and vetted by the Juris Foundation. They are arbitration professionals or would have gained and maintained sufficient standing by acting as Jurists in lower-level disputes.¹³²³ Good Standing Jurists can vote and the outcome of their votes is included in case files and reports to the parties.¹³²⁴ A person can become a Good Standing Jurist if they have a law degree or equivalent certification, or they can earn sufficient reputation at the lowest layer.¹³²⁵ Good Standing Jurists can progress to High Jurists if they gain sufficient reputation whilst acting as a Good Standing Jurist. Finally, for the lowest level, Novice Jurists, no prior experience is necessary. Novice Jurists are permitted to vote and discuss and earn reputation to move to Good Standing, but their votes are not included in the case files or reports provided to the parties,¹³²⁶ nor can they gain a share of any JRS tokens.¹³²⁷ Therefore, while Juris gives preference to legally qualified people, it enables people to advance through its ranks. Reputation decays over time, and can also be lost for bad behaviour, thus Jurists can be demoted. Therefore, Jurists need to take an active part in Juris to maintain their ability to hear disputes. The different levels of Jurists and Jurists' experience would enable parties that have disputes concerning DAOs to have a high level of confidence in Juris' decision-making.

¹³²¹ Juris (n 1318) 17.

¹³²² See above 5.3.2.3.1.

¹³²³ Juris (n 1318) 18.

¹³²⁴ Ibid.

¹³²⁵ Ibid.

¹³²⁶ Ibid 18.

¹³²⁷ Ibid 30 where it states that the Jurists in good standing share the JRS in a SNAP judgment.

5.3.2.4.1 *SELF Mediation*

Juris provides a range of mediation tools for parties to resolve disputes themselves.¹³²⁸ If that step is not successful, the parties can escalate the dispute to the next level. It does not matter if one party's or the parties' identity is unknown because the smart contract's freezing forces the parties to negotiate with one another. Thus, it may be useful for some mid- to high-value disputes concerning DAOs.

If SELF mediation does not work, the next step is SNAP judgment.

5.3.2.4.2 *SNAP Judgment*

Simple Neutral Arbitrator Poll (SNAP) judgment uses the JRS attached to the contract. In addition, the parties can add more to incentivise Jurists to participate.¹³²⁹ All Jurists can contribute through polling and discussion, which is time-bound.¹³³⁰ Jurists must provide justification from materials provided to them¹³³¹ and a summary of their opinion.¹³³² The Jurists receive a tally of votes and the summary opinions and enter a deliberation phase, where they can make general comments, find citations of case histories and ask questions of other Jurists.¹³³³ At the end of the deliberation phase, each Jurist casts a final vote, selects one or more pieces of supporting evidence and writes a summary of their opinion.¹³³⁴ Once the discussion phase ends, Jurist are divided into groups based on which party they found in favour of and are given time to confer and write a Final Opinion on their ruling.¹³³⁵

¹³²⁸ Ibid 17.

¹³²⁹ Ibid.

¹³³⁰ Ibid.

¹³³¹ The materials that must be cited from are 'at least one of (a) an item of Hard Evidence, (b) an item of a Formal Complaint, or (c) an item of Supplementary Evidence', 'Juris (n 1318) 31.

¹³³² 255 characters or fewer, Juris (n 1318) 31.

¹³³³ Ibid.

¹³³⁴ The summary is short; it must be under 500 characters, Juris (n 1318) 31.

¹³³⁵ The Final Opinion is written by the Jurist with the highest reputation within each group, who is also the group's leader, Juris (n 1318) 32, the leader can appoint another Jurist within the group to write a Final Opinion.

The parties receive a breakdown of the poll results, and the Final Opinions.¹³³⁶ The JRS fees are split between all the Good Standing Jurists who take part in the SNAP process,¹³³⁷ not just those who vote in the majority. Because the JRS tokens are shared amongst the Jurists, the main purpose of participating in a SNAP judgment is to gain reputation. In addition, all the voting data, opinions and discussion records are attached to the contract if the dispute is escalated to the next level.¹³³⁸ The parties can use the information gained from the SNAP judgment to resolve the dispute using SELF Mediation, and if that fails the parties can escalate it to the next process. The limitation of the SNAP judgment is that it is not binding on the parties, which limits its utility for DAOs, unless the dispute is of high value. This is because the costs of the SNAP judgment are likely to be high.

5.3.2.4.3 *Binding PANEL Judgment*

The Peremptory Agreement for Neutral Expert Litigation) (PANEL) is an online arbitration panel with three High Jurists deciding the dispute, which if necessary could be enforced through the courts.¹³³⁹ It uses the JRS tokens attached to the contract and potentially additional fees, which are paid out equally to the High Jurists.¹³⁴⁰ While there is no requirement to pay additional fees, it is unlikely that skilled Jurists will take on the dispute without such additional payment,¹³⁴¹ so using the PANEL process may be expensive and will be a limitation to its use, particularly for low value disputes.

‘UN-mandated rules’ are used to select the panel’s members, and those rules set out the panel’s procedures.¹³⁴² The panel’s presiding High Jurist has the power to execute the panel’s decision by running the modified smart contract.¹³⁴³ The panel members rate each other’s performance, which contributes to their reputation scores.¹³⁴⁴ The PANEL judgment would be effective for high-value

¹³³⁶ Ibid.

¹³³⁷ Ibid 17.

¹³³⁸ Ibid 32.

¹³³⁹ Ibid 14.

¹³⁴⁰ Ibid 17–18.

¹³⁴¹ Ibid 33, where it is noted that from the parties’ perspective it is worth paying for a PANEL judgment.

¹³⁴² Ibid 17 and see 34.

¹³⁴³ Ibid 17–18.

¹³⁴⁴ Ibid 24.

disputes concerning DAOs because it would be binding on the parties and could be enforced through courts, thereby combining the benefits of a DDRSs with traditional mechanisms.

5.3.2.5 *OpenCourt*

OpenCourt also proposes using a process similar to arbitration, which the parties agree to by inserting code into the smart contract to that effect.¹³⁴⁵ However, unlike Juris, OpenCourt does not provide the arbitrators; it provides a platform for independent arbitrators. If a party believes there is a dispute, they enter their statement of facts and nominate an arbitrator from any arbitration service.¹³⁴⁶ The other party enters its statement of facts and can accept the arbitrator or propose a different one.¹³⁴⁷ The smart contract funds are transferred to the OpenCourt dispute resolution smart contract awaiting the arbitrator's decision. The arbitrator is provided with the parties' statements and decides who gets what percentage of the funds and can give reasons for their decision. The funds are then distributed according to the arbitrator's decision. Currently, there is no method for paying the arbitrator. OpenCourt may be suitable for DAOs for low- to medium-value disputes as it does not require additional upfront payment and the funds in the smart contract are frozen until the arbitrator makes their decision and executes it. OpenCourt, as with Juris, does not deal with disputes that arise after the smart contract has been fully executed.

5.3.3 Dispute Resolution for a Specific Platform

Unlike the DDRSs analysed in the previous section, which are designed for broad application, including by DAOs, a DDRSs could be designed specifically to hear disputes arising from one blockchain platform. For example, OpenBazaar, a decentralised version of eBay,¹³⁴⁸ has created a DDRS for its

¹³⁴⁵ OpenCourt, 'OpenCourt: Legally Enforceable Blockchain-Based Arbitration', *Consensus* (Web Page, 19 October 2018) <<https://media.consensus.net/opencourt-legally-enforceable-blockchain-based-arbitration-3d7147dbb56f>> and OpenLaw, 'Open Court: Legally Enforceable Blockchain-Based Arbitration' (YouTube, 19 October 2018) <<https://youtu.be/oVfjy43YgnY>>.

¹³⁴⁶ The arbitrator will require a blockchain address to be nominated and to take part in the arbitration.

¹³⁴⁷ No explanation is given about the process if the seller wishes to use a different arbitrator.

¹³⁴⁸ OpenBazaar has been described as an anarchist version of eBay, Thomas Brewster, 'OpenBazaar is Not the Next Silk Road—It's an Anarchist eBay of Acid', *Forbes* (16 March 2016) <<https://www.forbes.com/sites/thomasbrewster/2016/03/16/openbazaar-silk-road-dark-web-drugs-ebay/?sh=624dbccf5ab4>>.

customers to use, which is a simple internal dispute resolution mechanism.¹³⁴⁹ Thus a DAO could create its own DDRS for hearing disputes between its members or third parties transacting with its members. However, it is likely to be more efficient for a DAO to outsource dispute resolution to a specialist DDRS. Creating and maintaining a DDRS is a challenging task. For example, the EOS Arbitration Forum (ECAAF) created for EOS was discontinued.¹³⁵⁰ One reason cited for ECAAF's closure was that it was inundated with claims related to lost passwords.¹³⁵¹ OpenBazaar's dispute resolution scheme has also had its difficulties¹³⁵² and self-reported experiences of OpenBazaar mediators have not been positive due to the low number of transactions and the low value of disputes.¹³⁵³

Another limitation of a DAO creating its own dispute resolution scheme is that if the DAO used its dispute resolution service to resolve disputes between it and third parties, the impartiality of that dispute resolution service could be questioned.

5.3.4 Summary of DDRSs

While some DDRSs are similar, for example, Aragon Court and Kleros, others such as Jur and Juris differ markedly. Notwithstanding the differences, the similarity is that DDRSs use humans to decide disputes.

¹³⁴⁹ OpenBazaar, 'OpenBazaar Dispute Resolution Guidelines', *OpenBazaar* <<https://openbazaar.org/openbazaar-dispute-resolution-guidelines/>>; Washington Sanchez, 'Dispute Resolution in *OpenBazaar*', *GitHub Gist* <<https://gist.github.com/drwasho/405d51bd1b1a32e38145>>; and see Max Gulker, 'Smart Contracts Provide an Alternative to Legal Enforcement', *American Institute for Economic Research* (14 November 2017) <<https://www.aier.org/article/smart-contracts-provide-an-alternative-to-legal-enforcement/>>.

¹³⁵⁰ Fan, Chai and Zhong (n 1219) 45 and Binance Research (n 1443).

¹³⁵¹ Hewett, Cieplak and Warren (n 1065) 26.

¹³⁵² Owing to concerns about lack of trust in the moderators and examples of the seller and moderator being the same person, Eliza Mik, 'Blockchains: A Technology for Decentralized Marketplaces' in Larry A DiMatteo (ed), *The Cambridge Handbook of Smart Contracts, Blockchain Technology and Digital Platforms* (Cambridge University Press, 2019) 160, 179; Sam Patterson, 'OB1 Announces Verified Moderators on OpenBazaar', *Medium* (14 March 2018) <<https://medium.com/openbazaarproject/ob1-announces-verified-moderators-on-openbazaar-ff881d3b892d>>; and OpenBazaar, 'Verified Moderators', *Medium* (12 January 2018) <<https://medium.com/openbazaarproject/verified-moderators-c83ea2f2c7f3>>.

¹³⁵³ One moderator earned only USD4 for moderating three disputes, u/lunokhod 2, 'My Experience as an OpenBazaar Moderator', *Reddit* (Web page, 2018) <https://www.reddit.com/r/OpenBazaar/comments/7sfwnz/my_experience_as_an_openbazaar_moderator/> and in 2017, of the 158 moderators offering their services, 127 charged a percentage fee, 14 charged a fixed charged with the remainder charging a fixed fee, plus a percentage, u/Midiva, 'OpenBazaar by the Numbers', *Reddit* (2017) <https://www.reddit.com/r/OpenBazaar/comments/79aqcl/openbazaar_by_the_numbers/>.

The next issue is whether the decision of a DDRS is binding on the parties. Alternatively, can one or more of the parties, if they are dissatisfied with the ruling of a DDRS, revert to the existing legal system and appeal against the DDRS ruling in a national court?

5.4 Exclusion of the Courts and Therefore the State?

DDRSs are a potential alternative for resolving disputes without involving the legal system. Thus a DDRS can create an independent contracting environment and not a complement to existing dispute resolution mechanisms.¹³⁵⁴ For non-lawyers it is not considered exceptional that disputes concerning DAOs could be adjudicated through an agreed framework for dispute resolution, such as a DDRS, and not by existing dispute resolution institutions.¹³⁵⁵ According to this view, the courts would respect that the rulings of DDRSs are binding and the courts cannot review them. Thus, if one or more of the parties to a dispute concerning a DAO were dissatisfied with the outcome, a national court could not hear the dispute. Indeed, when interviewees were asked whether they thought it was important for the parties to retain the ability to go to national courts if there are disputes concerning DAOs, only two interviewees were able to answer the question.¹³⁵⁶ The remaining interviewees had not even turned their mind to the issue as it was self-evident to them that the parties could agree on the dispute resolution format and their agreement would be respected.

The ability to exclude courts from hearing disputes, decided according to the parties' agreed framework, such as a DDRS, is contentious.¹³⁵⁷ As the Supreme Court of Canada has observed in relation to arbitration, notwithstanding the problems created by a slow judicial process, the Court is

¹³⁵⁴ Howell and Potgieter (n 1063) 11.

¹³⁵⁵ Greenfield (n 1) 178, 'whether [Emin Gün Sirer's interpretation of The DAO's code] would prevail is something that would ordinarily be adjudicated in a court of law, in a process of binding arbitration, or via some agreed framework of conflict resolution'. See also Hewett, Cieplak and Warren (n 1065).

¹³⁵⁶ Interviewees 9 (regulator) and 10 (regulator).

¹³⁵⁷ Izabella Kaminska, 'Decentralised Courts and Blockchains', *Alphaville (Financial Times)*, 30 April 2016 <<https://ftalphaville.ft.com/2016/04/29/2160502/decentralised-courts-and-blockchains/>> describing 'a Wild West framework, complete with bounty hunters, mercenaries, guns, the threat of being run out of town or shunned, death threats and on-the-spot Judge Dredd-style judgments' and Jamie Bartlett, 'Forget Far-Right Populism – Crypto-Anarchists are the New Masters', *The Guardian* (4 June 2017) <<https://www.theguardian.com/technology/2017/jun/04/forget-far-right-populism-crypto-anarchists-are-the-new-masters-internet-politics>>.

clear that arbitration's growth is not the solution because it does not provide an accessible public forum to adjudicate disputes, it threatens the rule of law and undermines the common law's development.¹³⁵⁸

The difficulty in excluding the courts' jurisdiction was confirmed by the regulators. The response of one regulator to the question of whether they thought it was important for the parties to retain the ability to go to national courts, was that while the Courts should recognise an agreement between parties that they will use a particular DRS and not hear appeals from it, 'the challenge, of course, as you know, as a legal academic, is that if you take away the jurisdiction of the court. They will not respond well'.¹³⁵⁹ The other regulator also believed that 'any kind of contract that you have in a jurisdiction can ultimately be tested in the highest court of that jurisdiction.'¹³⁶⁰

It has been argued that courts are necessary to enforce parties' obligations.¹³⁶¹ Yet, as Edward Stringham documents, institutions have been formed and systems designed so that cheating does not occur.¹³⁶² Amsterdam's first stock market flourished despite its participants being unable to enforce many of the agreements they entered into in the courts.¹³⁶³ Another pillar of the establishment, the London Stock Exchange, has its origins in rules that brokers agreed between themselves when Parliament attempted to limit brokers' activities.¹³⁶⁴ The London Stock Exchange was, for example, able to ban people from operating as brokers on its premises if they refused to settle a trade.¹³⁶⁵ Other organisations that facilitate illegal activity, such as online drug markets, can also work well by providing high-quality drugs and good service.¹³⁶⁶ The mechanism for ensuring the high rate of

¹³⁵⁸ *Hryniak v Mauldin* 2014 SCC 7 (CanLII), [2014] 1 SCR 87 [26]–[27].

¹³⁵⁹ Interviewee 10 (regulator).

¹³⁶⁰ Interviewee 9 (regulator).

¹³⁶¹ Kaminska, 'Decentralised Courts and Blockchains' (n 1357), '[g]ame theory dictates the costs of not cheating the system must be substantial if the system is to be kept in check and operational. But someone has to enforce those costs and penalties as well. The bigger and meaner the cheater, the bigger and meaner the enforcer needs to be: hence the state, the armies, the police forces and the prisons.'

¹³⁶² Stringham (n 1088) 1 and see 41–58 for how the rules for the stock market in Amsterdam work.

¹³⁶³ *Ibid* 41–58.

¹³⁶⁴ *Ibid* 61–78 and see Federico Ast, 'Kleros – Compliance for the World of Decentralized Finance', *Kleros* (Blog Post, 6 July 2020) <<https://blog.kleros.io/kleros-a-compliance-tool-for-decentralized-finance/>>.

¹³⁶⁵ Stringham (n 1088) 68–9, 75.

¹³⁶⁶ V Bhaskar, Robin Linacre and Stephen Machin, 'The Economic Functioning of Online Drugs Markets' (2019) 159 *March Journal of Economic Behaviour & Organisation* 426, 434; James Martin et al, 'Selling Drugs on Darkweb Cryptomarkets: Differentiated Pathways, Risks and Rewards' (2020) 60 *British Journal of Criminology*

positive reviews, for example, 97.8 percent positive for the now-closed Silk Road, was through a rating system.¹³⁶⁷ It is not surprising that people and organisations can cooperate to create rules and follow them in the absence of state enforcement. Indeed, as Elinor Ostrom has found, ‘self-organized regimes’ can outperform government regimes with formal externally enforced rules.¹³⁶⁸ Thus there is nothing exceptional in allowing DAOs to use DDRs to reach finality for their disputes.

States have a mixed history of allowing organisations outside their control to resolve disputes. For example, in England, many courts used to compete against each other; they included the ‘local, hundred, manorial, county, ecclesiastical, law merchant, chancery, and common-law courts’.¹³⁶⁹ The courts were required to compete between themselves by being fast and fair.¹³⁷⁰ Litigants chose the courts depending on the remedy they sought; for example, if a debtor refused to appear in one court, the creditor would choose another that had the jurisdiction to compel the debtor to appear.¹³⁷¹ As the administrative power of the state increased, the competitive private courts were slowly restricted.¹³⁷² In particular, the medieval law merchant courts, which merchants developed to resolve their disputes, were dismantled as the king’s courts took over their jurisdiction.¹³⁷³ The state, therefore, whittled away the competition in dispute resolution. While there is no suggestion that states will force DDRs to close, permitting the courts to allow appeals from DDRs will weaken the DDRs and thus the resolution of disputes concerning DAOs. This is because if a party to dispute involving a DAO believes

559; and Rachel Botsman, ‘How Darknet Sellers Build Trust’, *Nautilus* (21 December 2017) <<http://nautilus.us/issue/55/trust/how-darknet-sellers-build-trust>>.

¹³⁶⁷ Bhaskar, Linacre and Machin (n 1366) 434 and Botsman (n 1366).

¹³⁶⁸ Elinor Ostrom, ‘Collective Action and the Evolution of Social Norms’ (2000) 14(3) *The Journal of Economic Perspectives* 137, 149, cited by Lisa Blomgren Amsler, ‘The Evolution of Social Norms in Conflict Resolution’ (2014) 6(4) *Journal of Natural Resources Policy Research* 285, 288.

¹³⁶⁹ Stringham (n 1088) 150.

¹³⁷⁰ *Ibid.*

¹³⁷¹ Emily Kadens, ‘The Medieval Law Merchant: The Tyranny of a Construct’ (2015) 7(2) *Journal of Legal Analysis* 251, 279.

¹³⁷² Stringham (n 1088) 201. The process of the state closing the courts was, however, slow for some courts. As Thomas Falconer, *On County Courts, Local Courts of Records, and on the Changes Proposed to be Made in Such Court in the Second Report of the Judicature Commissioners* (Stevens and Sons, 1873) 8 observed, it took the County Court Acts of 1846 and 1867 to practically close all Hundred and Manor Courts in relation to the recovery of debts. Those courts were seen as ‘petty and mischievous’.

¹³⁷³ Robert D Cooter, ‘Decentralized Law for a Complex Economy: The Structural Approach to Adjudicating the New Law Merchant’ (1996) 144(5) *University of Pennsylvania Law Review* 1643, 1647–1648. See also Roy Goode, ‘The Role of the Lex Loci Arbitri in International Commercial Arbitration’ (2001) 17(1) *Arbitration International* 19, who argues it was the common law courts themselves that usurped other courts.

the other party or parties will appeal the decision of the DDRS to a national court, that party will take the matter straight to court and bypass the DDRS. If too many disputes bypass the DDRSs the number of disputes DDRSs will hear may reduce and the DDRSs attraction to adjudicators will reduce due to fewer disputes being heard by DDRSs.

An argument in favour of allowing appeals against DDRS rulings is that states have demonstrated a keen propensity to regulate online activities.¹³⁷⁴ There may be attempts to transfer money to known terrorists, or a DAO may be laundering knowingly stolen funds,¹³⁷⁵ and a party to an agreement may attempt to enforce the agreement through a DDRS. A court would not uphold an illegal contract.¹³⁷⁶ A requirement of a DDRS that its adjudicators do not enforce agreements that would uphold an illegal act¹³⁷⁷ may not be effective as the adjudicators may ignore that rule. However, to allow appeals from DDRSs because of the risk of upholding an otherwise illegal activity in connection with a DAO is not proportionate to the use of DDRSs to resolve disputes in a cost-effective, fast and fair method.

5.5 UKJT Digital Dispute Resolution Rules

On 22 April 2021 the UKJT published the UKJT Rules,¹³⁷⁸ which ‘are intended to facilitate the rapid and cost effective resolution of disputes arising in the context of digital assets, smart contracts, blockchain and other new technologies, and to foster industry confidence in their use’.¹³⁷⁹ Sir Geoffrey Vos, Master of the Rules,¹³⁸⁰ described the UKJT Rules in its Foreword as ‘ground-breaking in that they

¹³⁷⁴ Werbach, ‘Trust, but Verify’ (n 7) 520–526.

¹³⁷⁵ *Ibid* 523.

¹³⁷⁶ Juliet P Kostritsky, ‘Illegal Contacts and Efficient Deterrence: A Study in Modern Contract Theory’ (1998) 74 *Iowa Law Review* 115, 116–117.

¹³⁷⁷ OpenBazaar makes it clear that if a transaction does not comply ‘with the laws of the buyer, seller, and moderator, it will be considered void and no actions will be taken from the moderator’, Tyler Smith, ‘OpenBazaar Moderation Agreement’, *GitHub Gist* (version 0.1.0, 18 April 2016) <<https://gist.github.com/tyler-smith/44a1165975fdb670ba69041f02c986f5>>.

¹³⁷⁸ UK Jurisdiction Taskforce (n 88) and Rose (n 88).

¹³⁷⁹ UK Jurisdiction Taskforce (n 88) 10 and Rose (n 88).

¹³⁸⁰ The Master of the Rolls is the President of the Court of Appeal of England and Wales.

allow for: [a]rbitral or expert dispute resolution in very short periods, [a]rbitrators to implement decisions directly on-chain using a private key [, and o]ptional anonymity of the parties'.¹³⁸¹

The UKJT Rules are akin to an industry scheme, controlled by the UK SCL, with the intent that they are used internationally. For example, while parties can choose the law to apply, the UKJT Rules attempt to gently persuade parties that English law should apply.¹³⁸² The SCL appoints the arbitrator(s) and expert(s) for each dispute (who form a tribunal).¹³⁸³ In addition, as will be seen below, the UKJT Rules allow for the use of DDRSs.¹³⁸⁴

The UKJT Rules allow for three main types of dispute resolution. The first is where the dispute is heard by an arbitrator or a panel of arbitrators (tribunal).¹³⁸⁵ This arbitration is designed to be a rapid procedure where the parties have strict time limits; for example, once a party submits a claim the other party or parties must respond within three days and the tribunal uses its best endeavours to resolve the dispute within 30 days.¹³⁸⁶ Thus the UKJT Rules provide an expediated form of arbitration. Because arbitrators are used the arbitral award can be enforced under the *New York Convention*.¹³⁸⁷ In addition, because they are arbitral awards the awards can be appealed in narrow circumstances under the UK's Arbitration Act 1996.¹³⁸⁸ The second type of dispute resolution is where expert determination is used. Because arbitrators are not used, the *New York Convention* does not apply¹³⁸⁹ and the expert determination cannot be appealed to the courts under the UK's Arbitration Act 1996.¹³⁹⁰

¹³⁸¹ UK Jurisdiction Taskforce (n 88) 3.

¹³⁸² English law is 'well able to deal with technological developments and has an impressive track record of doing so', UK Jurisdiction Taskforce (n 88) 11.

¹³⁸³ Ibid 12.

¹³⁸⁴ See below nn 1397 and accompanying text.

¹³⁸⁵ The tribunal comprises 'the arbitrator or expert (or panel of arbitrators or experts)', UK Jurisdiction Taskforce (n 88) 5.

¹³⁸⁶ UK Jurisdiction Taskforce (n 88) 13.

¹³⁸⁷ Ibid.

¹³⁸⁸ The tribunal comprises 'the arbitrator or expert (or panel of arbitrators or experts)', UK Jurisdiction Taskforce (n 88) 8.

¹³⁸⁹ Ibid 11.

¹³⁹⁰ Provided the expert makes it clear that they are not an arbitrator and see UK Jurisdiction Taskforce (n 88) 8.

The parties may incorporate the UKJT Rules in a contract, smart contract, or the digital environment or platform in which the smart contract or cryptoasset exists.¹³⁹¹ The parties can also specify a number of factors, including preferences as to the number, identity and qualifications of people to be appointed as arbitrators or experts, preferences for the procedure of the resolution of the dispute and any modifications to the results.¹³⁹²

The UKJT Rules state that '[t]he tribunal shall have the power at any time to operate, modify, sign or cancel any digital asset relevant to the dispute using any digital signature, cryptographic key, password or other digital access or control mechanism available to it'.¹³⁹³ This appears to require the parties to give control to the tribunal to operate the smart contract and is something that Juris, one of the DDRSs, is attempting to do.¹³⁹⁴ In Juris, if a dispute arises, the Juris Protocol freezes the smart contract and the Juris processes begin.¹³⁹⁵ The ability of the arbitrators to intervene in the smart contract is no doubt that which Sir Geoffrey Vos, Master of the Rolls, referred to as allowing '[a]rbitrators to implement decisions directly on-chain using a private key'. Presumably if a dispute arose, 'the private key' would have to be provided to the SCL who would then pass it on to the relevant arbitrator(s) or expert(s), as the tribunal is not chosen until a dispute arises. Therefore, for a smart contract to achieve this level of functionality the contract or smart contract will need more than a mere statement that the UKJT Rules will apply. Even if such functionality were achieved, the assets controlled by the smart contract may not be sufficient to satisfy what is being claimed in the dispute. The UKJT Rules cover this situation as the tribunal is also given the power to direct any interested party.¹³⁹⁶ If the interested party does not comply with the direction, presumably the matter would require court enforcement.

¹³⁹¹ The UKJT Rules can be incorporated by including the text: 'Any dispute shall be resolved in accordance with UKJT Digital Dispute Resolution Rules', UK Jurisdiction Taskforce (n 88) 5.

¹³⁹² UK Jurisdiction Taskforce (n 88) 5.

¹³⁹³ *Ibid* 7.

¹³⁹⁴ Juris (n 1232) 16. If the smart contract concludes without a dispute, or the time for a challenge expires, the attached JRS tokens are returned to the parties.

¹³⁹⁵ *Ibid*.

¹³⁹⁶ 'Interested party' is defined as 'a party to a contract into which these rules are incorporated including, in relation to a digital asset, a person who has digitally signed that asset or who claims to own or control it through possession or knowledge of a digital key', UK Jurisdiction Taskforce (n 88) 5.

The third and most interesting type of dispute resolution under the UKJT Rules, for the purposes of this thesis, is that the Rules expressly allow for an ‘automatic dispute resolution process’, which includes ‘peer-to-peer or other voting by a community’.¹³⁹⁷ Thus DDRs are permitted to be used in the UKJT Rules as an alternative to arbitration or expert determination. Indeed, Frederico Ast, the creator and CEO of Kleros, is quoted in the UKJT Rules as being supportive of them.¹³⁹⁸

The UKJT Rules state that ‘[t]he outcome of any automatic dispute resolution process shall be legally binding on interested parties’,¹³⁹⁹ but the UKJT Rules are not binding on the courts. It could be argued, however, that the UKJT Rules give the parties the choice of arbitration, expert determination or an automatic dispute resolution process, which includes a DDRS. If the parties wanted the ultimate benefit of appealing to a court (in exceptional circumstances) they should choose the arbitration track.

5.6 Conclusion

This chapter’s first aim was to critically examine the existing dispute resolution institutions and assess whether they are suitable for resolving disputes concerning DAOs. The chapter found that the existing dispute resolution institutions are not suitable for resolving most disputes concerning DAOs for the following reasons. The courts would be limited to hearing only some of the high-value disputes relating to DAOs because of the cost and time it takes to resolve disputes. In addition, some disputes involving DAOs will be between parties, the identities of which are not known. Even if the parties’ identities are known, they may be in different jurisdictions, making hearing the case and enforcement difficult, if not impossible. The courts therefore are likely to play only a small role in the resolution of disputes concerning DAOs. As an example, at the time of writing Aragon was involved in a dispute of more than USD800,000, which will be heard by the courts rather than Aragon Court. Tribunals — designed to be more informal, cheaper and faster than the courts — do not fill the remaining gap

¹³⁹⁷ Ibid 12.

¹³⁹⁸ ‘As CEO of a company in the blockchain and dispute resolution industry, I’m very impressed with the Rules. I believe they strike a good balance between industry needs, technological realities and consumer protection imperatives. It is my hope that this project will result in forward looking legislation contributing to the UK leadership in the new global and decentralized economy.’ UK Jurisdiction Taskforce (n 88) 12.

¹³⁹⁹ Ibid 6.

because even if the parties' identities are known, they will not always be located in the same jurisdiction. DAOs are unlikely to be members of industry-funded dispute resolution schemes. The UKJT Rules with their arbitration or expert determination, however, do offer a new alternative dispute resolution mechanism. Mediation and arbitration are too expensive for low-value disputes.

The second aim of the chapter was to understand how DDRSs resolve disputes concerning DAOs and evaluate their effectiveness. As the chapter explained, there is significant variation between DDRSs, and many are using novel mechanisms. It is more likely that DAOs will use a third-party DDRS for disputes rather than create their own DDRS for two reasons: first, the complexity of designing a DDRS and the need to maintain that DDRS; and second, a DAO that creates an internal dispute resolution mechanism would be seen as raising conflicts of interest for disputes against the DAO itself.

While some DDRSs, such as Aragon Court and Kleros, use the same process regardless of the value of the dispute, Jur uses a different process depending on the value of the dispute. For Juris, disputes can rise through the levels with more experienced adjudicators at the highest level. Thus, the costs for Jur and Juris can be more proportional to the value of the dispute. However, for the parties to a dispute, cost remains an issue for some DDRSs. DDRSs' use of people as adjudicators means that the cost of using some DDRSs can be reasonably high. On the other hand, Jur is attempting to reduce the cost to the parties in its Open Layer by requiring the party lodging the dispute to pay 1 percent of the dispute value, and by using game theory and allowing adjudicators to bet on the outcome of the dispute.

The ability to insert arbitration clauses into smart contracts, which grant a DDRS control of the smart contract in the event of a dispute, is a significant advantage of those types of DDRS. They allow a degree of enforcement and it does not matter that the parties did not know the other party or parties' identities when entering the smart contract. However, not all disputes concerning DAOs will necessarily involve smart contracts with considerable funds attached to them.

DDRSs use a mix of inexperienced and experienced adjudicators and they are cognisant of errors in the decision-making process by allowing most internal appeals.

The final aim of the chapter was to investigate the extent to which the state can intervene in disputes decided by DDRSs. Are the DDRSs' rulings final, or could an aggrieved party attempt to appeal a decision to a court? Some dispute resolution services, such as industry dispute resolution schemes, exclude the courts' operation; however, the validity of those clauses has not been tested in the courts. On the other hand, appeals from arbitral awards are permitted in narrow circumstances. Permitting appeals against arbitral awards can be justified as the arbitration sums in question are often high. While the backstop of court intervention for an egregious error from a DDRSs is attractive, the trade-off jeopardises the speed and finality of decisions, especially for those involving large numbers of low-value claims. In addition, DDRSs, such as Aragon Court and Kleros, acknowledge the risk of errors in decision-making and allow for internal appeals.

The next chapter explores how DAOs are currently regulated as an organisational form, why that current treatment is not optimal and how DAOs should be regulated as an organisational form.

Chapter Six: Legal Structures for DAOs

*There is no such thing as survival of the fittest, only survival of the fit. This means that there is no one answer that is right, but many answers that might work.*¹⁴⁰⁰

6.1 Introduction

This chapter explores the legal treatment of DAOs as an organisational form. IC includes in its wide ambit the evolution of existing organisational forms and the emergence of new ones.¹⁴⁰¹ Thus the use of blockchain (ledgers) to enable the creation of new organisations, DAOs, would predict that existing legal organisation forms are not sufficient to accommodate DAOs. As a result, to accommodate DAOs existing organisational legal forms would require modification or new legal organisational forms created.

Just as there is no one governance model for DAOs,¹⁴⁰² there is no single legal structure for DAOs. DAOs, if they adopt legal structures, use diverse legal structures.¹⁴⁰³ However, while a DAO needs a governance structure to operate, a DAO can operate without formalising its legal structure, because most DAOs conduct their transactions online and do not interact with the legal system or regulated entities.¹⁴⁰⁴ For example, DAOs do not require a bank account because they can use cryptocurrencies to transact.¹⁴⁰⁵ Indeed, some DAO founders have created DAOs without even turning their mind to the legal structure of their DAO or considering whether they need to create a legal structure.¹⁴⁰⁶

Notwithstanding that most DAOs have not formalised their legal structure, the law is likely to impose a legal structure upon DAOs, just as it does for any organisation of people. For example, for-

¹⁴⁰⁰ Margaret J Wheatley and Myron Kellner-Rogers, *A Simpler Way* (Berrett-Koehler Publishers, 1996) 16.

¹⁴⁰¹ See Claude Ménard, 'A New Institutional Approach to Organization' in Claude Ménard and Mary M Shirley (eds), *Handbook of New Institutional Economics* (Springer, 2008) 281, 311 – NIE is the main building block of IC.

¹⁴⁰² See Chapter Four.

¹⁴⁰³ Kaal (n 47) 30, explaining that legal designs for 'DAOs are still largely relegated to experimentation'. While Kaal uses the term 'legal design', this chapter uses the term 'legal structure'.

¹⁴⁰⁴ Coala (n 41).

¹⁴⁰⁵ Interviewee 5 (consultant).

¹⁴⁰⁶ Interviewee 1 (DAO founder).

profit DAOs are likely to be found to be partnerships.¹⁴⁰⁷ The limitations of the partnership structure for DAOs is that the DAO would not be a legal entity: it is unable to enter into contracts, own property, sue and be sued, and otherwise interact with the legal system.¹⁴⁰⁸ If a third party or a DAO member wished to sue a DAO, it would need to attempt to enforce its rights against the people associated with the DAO,¹⁴⁰⁹ such as the other DAO token holders who held tokens at a specific time.¹⁴¹⁰ People and organisations could also unwittingly become DAO token holders by receiving DAO tokens through airdrops. The potential liability of token holders creates uncertainty. People and organisations may be less willing to be token holders because of their potential liability and third parties' uncertainty over their ability to enforce transactions. Therefore, for DAOs to realise their full potential, a legal framework other than a partnership should be considered.¹⁴¹¹

Potential legal liability of token holders is a concern for some involved with DAOs. One interviewee, in response to the question of whether they considered the lack of clarity about DAOs' legal status a problem, stated:¹⁴¹²

It is clearly a problem for some people. The challenge in that is most times the DAOs are online communities and, as discussed earlier, sometimes it is more permissionless and sometimes less. You don't always have full awareness of the legal status of different participants. Whether they have legal obligations to the jurisdiction that they are from or whatever. DAOs are typically not KYC compliant or AML compliant, there isn't this framework and from that perspective the lack

¹⁴⁰⁷ Zetzsche, Buckley and Arner (n 39) 1400; and De Filippi and Wright (n 10) 141–142. See also Metjahic (n 10) who argues that DAOs should be recognised as partnerships to clarify how the law treats DAOs and their members.

¹⁴⁰⁸ Coala (n 41).

¹⁴⁰⁹ Ibid.

¹⁴¹⁰ The general rule in partnerships is that partners are not liable for the actions and debts of a DAO that took place or were incurred prior to that person becoming a partner, nor are they liable for events that occurred after they ceased to be a member of the partnership. However, there are exceptions. For example, a partner may be liable if a third party did not know the person they were dealing with had ceased to be a partner.

¹⁴¹¹ Coala (n 41).

¹⁴¹² Interviewee 6 (consultant). The interviewee also relayed a story of a person who had submitted a successful proposal to a DAO for funding for work. While they performed the work that person did not accept any of the DAO tokens for payment because they were scared about the rulings of the US Securities and Exchange Commission (SEC) in relation to money transmitter laws. The person was so scared that their health was affected, and they needed to take time off work due to stress.

of clarity in that sense definitely presents a hard time for some people. I wish it would just be completely unnecessary to think about that, but I can see how it becomes very necessary.

A DAO's legal structure and its governance are inextricably intertwined: different legal structures allow for different levels of decentralisation. DAOs can evolve their legal structures as they become more mature, for example, moving from legal structures that are centralised to less centralised. One interviewee, at the beginning of creating what was to become a DAO, but had first been structured as a corporation in its bootstrapping phase, observed that they were:

looking to decentralise the governance of that protocol over time. So, moving from a centralised limited liability company to a DAO model with some steps likely in between. I'm looking to potentially use a trust or foundation model in the middle that still has centralised control, and then decentralising the governance of that.¹⁴¹³

Thus for the interviewee it was a process of evolving their legal structure from the corporation as a centralised entity, and thus unsuitable for a DAO's legal structure, through to less centralised entities and then to a DAO.¹⁴¹⁴ The interviewee identified that the legal structures between a corporation and a DAO were likely to be either a trust or a foundation because the required levels of centralisation were not as high as that needed for a corporation.¹⁴¹⁵

This chapter has three aims. The first is to analyse whether partnership and unincorporated societies and associations (excluding unincorporated non-profit associations in the United States), are suitable legal structures for DAOs. The second is to analyse the different legal wrappers used for DAOs and their effectiveness. The third is to evaluate legislatures' attempts to recognise DAOs through amendments to existing legislation or through the creation of new legal frameworks.

¹⁴¹³ Interviewee 3 (DAO founder, not yet in operation).

¹⁴¹⁴ Ibid.

¹⁴¹⁵ Ibid.

Law varies between jurisdictions. A range of different jurisdictions are referred to in this chapter, however, the main jurisdiction used is New Zealand. The reasons for this choice are threefold. First, it would not be possible to canvas the law in each jurisdiction. Second, New Zealand is the jurisdiction in which the author is based and has the most experience and knowledge. Third, New Zealand's law is similar to that of other jurisdictions, in particular, Australia and the United Kingdom, thus it is not an outlier.

Terminology for legal structures can vary between jurisdictions. A society in New Zealand can be called an association or a non-profit or a not-for-profit in other jurisdictions. If a society is incorporated in Australia or the United Kingdom, it is called a company limited by guarantee.¹⁴¹⁶ The treatment of unincorporated not-for-profits varies between jurisdictions.¹⁴¹⁷ For example, in Australia, New Zealand and the United Kingdom, an unincorporated not-for-profit is not a separate legal entity separate from its members, and is thus unable to own property, enter contracts, or sue or be sued.¹⁴¹⁸ Instead specific members of the unincorporated not-for-profit can be sued.¹⁴¹⁹ Yet, an unincorporated not-for-profit in Wyoming, United States, for example, can do such things.¹⁴²⁰ Unincorporated not-for-profits are relevant to DAOs as they provide a legal wrapper that may be suitable for some DAOs.

The meaning of a term, such as 'limited liability company', is not consistent across jurisdictions. The limited liability company, the main form of company in New Zealand, Australia and the United Kingdom,¹⁴²¹ is the equivalent of the US corporation.¹⁴²² Hence this thesis' use of the term

¹⁴¹⁶ It used to be possible to register companies limited by guarantee in New Zealand, but this was abolished by the Companies Act 1993 (NZ) because companies could limit distributions to shareholders in their constitutions, New Zealand Law Commission, *Company Law Reform and Restatement* (June 1989) [2.8].

¹⁴¹⁷ Even what is treated as 'not-for-profit' varies between jurisdictions. Some US states treat for-profit trusts as unincorporated associations, Carla L Reyes, 'If Rockefeller Were a Coder' (2019) 87 *George Washington Law Review* 373, 408.

¹⁴¹⁸ Matthew Turnour, 'Should Australians Have a Revised Uniform Unincorporated Nonprofit Associations Act?' (2020) 37(4) *Company and Securities Law Journal* 279.

¹⁴¹⁹ K L Fletcher, 'Unincorporated Associations and Contract: The Development of Committee Liability and the Unresolved Issues' (1979–1980) 11(1) *University of Queensland Law Journal* 53.

¹⁴²⁰ Wyoming 17-22-104(a) and 17-22-106(a).

¹⁴²¹ For example, New Zealand also recognises co-operative companies, Co-operative Companies Act 1996 (NZ).

¹⁴²² The United States has three types of corporation. C corporations (C-corps) are essentially the same as a limited liability company in New Zealand, Australia and the United Kingdom. C-corps can have unlimited shareholders and pay taxes on their income. Shareholders and employees pay tax on the income they derive from the corporation. S corporations (S-corps) have a limited number of shareholders and do not pay corporate tax. Their shareholders report the income they receive from the S-corp and report it in their personal tax returns. B corporations (benefit corporations; B-corps) are recognised in state law in most US states and are

‘corporation’ to refer to limited liability companies in New Zealand, Australia and the United Kingdom. The corporation is a separate legal entity: the shareholders are not liable for its debts or obligations.¹⁴²³ In contrast, in the United States, a limited liability company (LLC) is not an incorporated entity. The LLC grew out of partnership law¹⁴²⁴ and is a hybrid of a partnership and a corporation.¹⁴²⁵ The LLC allows for taxation at a partnership rate, limited liability of shareholders, default rules¹⁴²⁶ more suited to small businesses¹⁴²⁷ and the ability to craft contractual arrangements within the LLC.¹⁴²⁸ Thus a limited liability company in New Zealand, Australia and the United Kingdom is fundamentally different to an LLC in the United States. LLCs are of relevance to DAOs as many DAOs have been registered as LLCs in US states.

The regulation of DAOs is problematic because DAOs are underpinned by emerging technologies, specifically blockchain. DAOs are not yet mainstream, some have failed, and others are in proof-of-concept stages. Therefore, regulators need to evaluate the extent of regulation required to protect consumers and investors. The legal design and therefore the legal regulation of DAOs is an example of the regulators’ dilemma.¹⁴²⁹ Regulate too early and the benefits of new technology may be lost as innovation is stifled.¹⁴³⁰ However, if regulators wait too long it may be too late to regulate as

sometimes called public-benefit corporations. They are social enterprises that look at the triple bottom line and are designed to benefit society. There are also certified B-corps. Certification is done by B Lab and must meet relatively high standards, Suntae Kim et al, ‘Why Companies Are Becoming B Corporations’, *Harvard Business Review* (17 June 2016) <<https://hbr.org/2016/06/why-companies-are-becoming-b-corporations>>.

¹⁴²³ See generally, Paddy Ireland, ‘Limited Liability, Shareholder Rights and the Problem of Corporate Irresponsibility’ (2010) 34(5) *Cambridge Journal of Economics* 837.

¹⁴²⁴ Ribstein (n 103) 3.

¹⁴²⁵ Howard M Friedman, ‘The Silent LLC Revolution: The Social Cost of Academic Neglect’ (2004) 38(1) *Creighton Law Review* 35, 42.

¹⁴²⁶ Default rules are rules that the law imposes unless the parties agree to change them. While some rules are default and can be changed, others are mandatory and cannot be changed. For example, if a clause in a contract purports to alter a rule that cannot be altered, a court would not uphold that clause. For a discussion of default and mandatory rules see Brett H McDonnell, ‘Sticky Defaults and Altering Rules in Corporate Law’ (2007) *SMU Law Review* 383.

¹⁴²⁷ Friedman (n 1425) 42. There are also Series LLCs, see below 6.3.5.

¹⁴²⁸ Douglas K Moll, ‘Minority Oppression & (and) the Limited Liability Company: Learning (or Not) from Close Corporation History’ (2005) 40 *Wake Forest Law Review* 883, 885.

¹⁴²⁹ Collingridge (n 104) and Anna Butenko and Pierre Larouche, ‘Regulation for Innovativeness or Regulation of Innovation’ (2015) 7(1) *Law, Innovation and Technology* 52.

¹⁴³⁰ Chartered Accountants Australia and New Zealand, *The Regulator of 2030: Regulating our Digital Future* (2017) <<https://charteredaccountantsworldwide.com/regulator-2030-regulating-digital-future/>> 7.

technological ‘lock-in’ or ‘path dependence’ can occur and vested interests become too powerful.¹⁴³¹ Yet, as this chapter shows, it need not be the case of top-down imposition of regulation, a form of central planning.¹⁴³² Instead, DAOs may be able to craft their own legal structure or structures, which the courts and even Parliament may accept. History is rich with lawyers and businesses using a bottom-up process of experimenting with legal structures that courts have subsequently recognised. For example, the modern corporation is the product of changing business practices, to which legislatures were forced to respond.¹⁴³³ More recently, Australian lawyers created trading trusts, which the courts in Australia and New Zealand have accepted as legitimate legal structures.¹⁴³⁴

Regulatory competition can also occur. A jurisdiction can compete for business by recognising legal structures that are attractive to organisations, hoping they will register in that jurisdiction.¹⁴³⁵ The recognition of the modern corporation in the United Kingdom with its separate legal entity and limited liability of shareholders, was in response to France and the United States recognising such entities.¹⁴³⁶ The LLC was first recognised in Vermont, United States in the 1970s¹⁴³⁷ and there is now LLC legislation in almost every US state.¹⁴³⁸ Indeed, the LLC is now a popular commercial legal structure in the United States.¹⁴³⁹ Regulatory competition, however, raises the risk of regulatory arbitrage.¹⁴⁴⁰ Regulatory arbitrage in this context means two things: first, where an organisation registers or operates (or both) in a jurisdiction because its regulations are more favourable to it.¹⁴⁴¹

¹⁴³¹ Collingridge (n 104) cited by Sarewitz (n 104) and Ribstein (n 103) 15.

¹⁴³² Ribstein (n 103) 3–4.

¹⁴³³ Ron Harris, ‘Political Economy, Interest Groups, Legal Institutions, and the Repeal of the Bubble Act in 1825’ (1997) 50 *Economic History Review* 675 and Harris, ‘The Private Origins of the Private Company’ (n 99).

¹⁴³⁴ Paul Heath, ‘Bringing Trading Trusts into the Company Line’ (2010) 16(9) *Trusts & Trustees* 690.

¹⁴³⁵ The LLC in the United States was created first in Wyoming, specifically for an oil company, Mary Szto, ‘Limited Liability Company Morality: Fiduciary Duties in Historical Context’ (2004) 23(1) *Quarterly Law Review* 61, 64.

¹⁴³⁶ Colin Mackie, ‘From Privilege to Right: Themes in the Emergence of Limited Liability’ (2011) 4 *Juridical Review* 293, 309, citing HC Deb 29 June 1855, vol 139, col 323 (Mr Bouverie, quoting Mr Baker, a London solicitor).

¹⁴³⁷ Wyoming Limited Liability Company Act, ch 158, 1977 Wyo Sess Laws 577 and see Hamill (n 102).

¹⁴³⁸ Hamill (n 102) 295.

¹⁴³⁹ Mohsen Manesh, ‘Creatures of Contract: A Half-Truth About LLCs’ (2018) 42(2) *Delaware Journal of Corporate Law* 391, 393.

¹⁴⁴⁰ Joel F Houston, Chen Lin and Yue Ma, ‘Regulatory Arbitrage and International Bank Flows’ (2012) 67(5) *Journal of Finance* 1845, 1846.

¹⁴⁴¹ Heikki Marjosola, ‘The Problem of Regulatory Arbitrage: A Transaction Cost Economics Perspective’ (2019) 15 *Regulation and Governance* 388.

and second, that jurisdictions are engaged in a race to the bottom: they compete between themselves to offer the most friendly environments for DAOs to operate in, which includes relaxation of otherwise strict rules.¹⁴⁴² Indeed, as one interviewee, who used the term ‘regulatory arbitrage’, observed:¹⁴⁴³

we should not be pressured into a regulatory race to the bottom. You can't have industry coming to us saying, oh well fine, we'll just take our business to this other friendly jurisdiction and risk market integrity and our reputation for having really strong financial markets for that cause when we don't even really have a lot of evidence to say that is the opportunity cost that we face.

As this chapter shows, regulatory arbitrage is occurring. As one interviewee said:¹⁴⁴⁴

I personally enjoy the sort of regulatory arbitrage that DAOs are creating at the moment. I think it's because I think it's a good chance to explore new organisational methods without regulations, so we can see what the upsides and downsides are. And so I'd like to see a more hands-off approach [although] not permanently, but for some time, so that we can more readily experience those benefits ... So something like the sandbox approach that's been trialled in certain places like Taiwan, I think is sensible because I don't know what the laws should be, but I'm very interested in seeing how well they can operate with less regulation.

Chapter Six is structured as follows. Part 2 considers how DAOs fit within partnership law and the law for unincorporated societies and associations, and examines the limitations of those legal structures for DAOs. Part 3 analyses DAOs’ use ‘legal wrappers’ to avoid the finding that a DAO is a partnership or an unincorporated society or association.¹⁴⁴⁵ Part 4 evaluates legislatures’ attempts to accommodate DAOs as legal entities within existing legislative environments, such as Vermont’s

¹⁴⁴² See generally Houston, Lin and Ma (n 1440) 1846.

¹⁴⁴³ Interviewee 9 (regulator).

¹⁴⁴⁴ Interviewee 3 (DAO founder, not yet in operation).

¹⁴⁴⁵ ‘The Legal Wrapper for the DAO’, *Live The Life* (Web Page, 26 May 2020) <<https://livethelife.tv/legal/>>.

Blockchain Based Limited Liability Companies (BBLLC)¹⁴⁴⁶ and Wyoming's DAO Supplement.¹⁴⁴⁷ Part VI explores Malta's attempt to create a new legal framework inter alia for DAOs.

6.2 Treatment of DAOs as Partnerships and Unincorporated Societies

This section analyses the potential treatment of DAOs as partnerships or unincorporated societies or associations, the limitations of such treatment for DAOs and their members, and how the law has adapted in the past to recognise new legal structures in response to changing business practices.

At the time of writing, the question of whether a for-profit DAO that has not used another legal structure is a partnership has not been before the courts. Nor has the issue of whether a not-for-profit DAO is an unincorporated society.

6.2.1 DAOs as Partnerships

The literature is clear: a for-profit DAO would be considered a partnership because two or more people have combined to operate a business with a view to making a profit.¹⁴⁴⁸ The law does not recognise a partnership as an entity separate from its members.¹⁴⁴⁹ Each member of a for-profit DAO would therefore be a partner in the DAO. DAOs that are not-for-profit, including charities, cannot be partnerships due to the lack of a profit motive. Not-for-profit DAOs are explored in 6.2.2 below.

The law regulating partnerships applies when people create for-profit entities and they do not formalise an alternative legal structure,¹⁴⁵⁰ for example, people in a partnership can incorporate and create a corporation. When people engage in activities with others with the intent to create a profit and do not formalise their legal structure, many people may not realise that they have formed a

¹⁴⁴⁶ See below 6.4.2.

¹⁴⁴⁷ See below 6.4.3.

¹⁴⁴⁸ See, eg, Zetzsche, Buckley and Arner (n 39) 1400; De Filippi and Wright (n 10) 141–142; and Metjahic (n 10). Technically partners form a firm; the partnership is the relationship between the partners, Partnership Law Act 2019 (NZ) s 10.

¹⁴⁴⁹ For example, New Zealand's Partnership Law Act 2019 (NZ) provides that 'partnership is the relation that exists between persons carrying on a business in common with a view to profit', s 8. The entity the partners create is not called a partnership, it is called a firm, s 10 '(a) persons who have entered into partnership with one another are collectively called a firm; and (b) the name under which their business is carried on is the firm name'.

¹⁴⁵⁰ Palley, 'How to Sue a Decentralized Autonomous Organization' (n 165).

partnership. For example, two people merely agreeing to purchase goods to on-sell are in a partnership. Thus laws will apply to and be imposed on the members of DAOs, regardless of whether they agree to such imposition. The enforcement of law against DAO members is made more difficult due to the pseudonymity of some, if not many, of the DAO members.¹⁴⁵¹ Thus in practice, DAO members who are identifiable face considerable risks as they could potentially be sued for the DAO's debts,¹⁴⁵² or be targets of regulatory enforcement.¹⁴⁵³

Some DAOs that purport to be not-for-profit may be found to be for-profit and thus partnerships.¹⁴⁵⁴ As one interviewee observed, if the DAO has tokens that can be transferred and people or entities are willing to pay for those tokens, that DAO may be viewed as a for-profit DAO, rather than a not-for-profit DAO.¹⁴⁵⁵ This is because not-for-profit organisations cannot issue shares and most DAO tokens will be similar to a share in a corporation if they represent a share in the DAO's equity.¹⁴⁵⁶ It may be possible to construct a DAO that is not-for-profit; for example, Moloch DAO, a DAO set up to donate funding to Ethereum projects, has non-transferable tokens.¹⁴⁵⁷ Moloch DAO, however, is selective as to whom it admits as a member: a member needs to champion the application of a prospective new member.¹⁴⁵⁸ In addition, care must be taken in what is termed a profit. If a member of the Moloch DAO exits the DAO they receive their share of the Moloch DAO's resources,¹⁴⁵⁹ and their share may have increased in value during the time they were a member, thus it might appear as though they have obtained a profit through their membership. However, the profit would have been generated through the rise in value of the ether they deposited; had they simply held that ether it would have increased in value.

¹⁴⁵¹ Samman and Freuden (n 663) 8.

¹⁴⁵² Rodrigues, 'Law and the Blockchain' (n 403) 689 and Kaal (n 47) 25.

¹⁴⁵³ Kaal (n 47) 25.

¹⁴⁵⁴ Ibid.

¹⁴⁵⁵ Interviewee 10 (regulator).

¹⁴⁵⁶ Arnold (n 299) 235.

¹⁴⁵⁷ Richard Red, 'Moloch DAO' (n 603).

¹⁴⁵⁸ Soleimani et al (n 14).

¹⁴⁵⁹ This is called 'ragequit' in Moloch, see Soleimani et al (n 14).

The following analyses why it is not appropriate for DAOs to be regulated under partnership law.¹⁴⁶⁰ First, if there is a partnership, the law imposes a number of default rules. For example, unanimous consent is required from all partners to add a new partner to the partnership.¹⁴⁶¹ Most DAOs will not require the consent of existing members for new members to join; indeed, many members of DAOs will not realise that new members have joined, especially if the DAO's tokens are sold on exchanges. Even if the consent of members is required, it is rare to require all members to agree to the admission of a new member. However, the partners can agree to change the default partnership rules,¹⁴⁶² and a DAO is likely to change many of the default rules through its smart contracts or other documentation.

Not all default rules of partnerships, however, can be changed. For example, the members of a for-profit DAO may agree that they will not be individually liable for the DAO's debts, and the DAO's liability is limited to its assets. Such an agreement will not be binding on a third party unless that third party agreed to it; therefore, the DAO members will remain liable for the DAO's debts regardless of any agreement between the members.

Second, when a partner enters or leaves a partnership the partnership ends automatically and a new one is formed.¹⁴⁶³ This rule cannot be overridden by agreement.¹⁴⁶⁴ Therefore, each time a person who did not already have DAO tokens acquires DAO tokens or an existing DAO token holder divests themselves of their DAO tokens, the partnership ends and a new one forms between the remaining token holders. Depending on the DAO, a DAO's tokens may be traded multiple times a day. If partnership law applied to such entities, partnerships would dissolve continually, and new partnerships would form.

¹⁴⁶⁰ As one commentator noted, '[d]epending on the number of investors [in a DAO], the bounds of a general partnership may become stretched', Marc Jones, 'Decentralised Autonomous Organisations and the Impact They May Have on the Legal Profession' in Tech London Advocates and The Law Society, 'Blockchain: Legal & Regulatory Guidance (September 2020) 39, 41 <<https://www.cak.cz/assets/pro-advokaty/mezinarodni-vztahy/blockchain-legal-and-regulatory-guidance-report-sep-2020.pdf>>.

¹⁴⁶¹ Partnership Law Act 2019 (NZ), s 50.

¹⁴⁶² See Robert W Hillman, 'Private Ordering within Partnerships' (1987) 41 *University of Miami Law Review* 425, 448. See also Partnership Law Act 2019 (NZ) s 44(2).

¹⁴⁶³ *Hadlee v Commissioner of Inland Revenue* (n 163) 455.

¹⁴⁶⁴ *Ibid.*

Third, partnerships are generally between people who know and trust each other.¹⁴⁶⁵ That is why, for example, partnership law recognises the nature of the relationship between partners by providing, for example, the default rule that 'no partner may be introduced as a partner without the consent of all existing partners'.¹⁴⁶⁶ In contrast, DAOs are often designed for people who do not know each other and therefore may not trust one another, they often allow anyone to acquire the DAO's tokens, and the identity of the DAO member may be unknown. People's ability to be in the same organisation as those they either do not know or trust is possible through the use of smart contracts, which allows a shift from trust in people to trust in the code.¹⁴⁶⁷ However, there are exceptions. For example, in Moloch, an existing member must champion a person's application to become a member of Moloch and the existing members are required to vote in each new member.¹⁴⁶⁸ If there are hundreds or even thousands of DAO token holders, and therefore members, it stretches the concept of a partnership,¹⁴⁶⁹ as the members will not know and trust all the other members.

Another factor demonstrating the close ties between partners is the imposition of fiduciary duties, which are strict and onerous, on the partners,¹⁴⁷⁰ including members of the DAO.¹⁴⁷¹ Fiduciary duties are not as relevant for DAOs as they are for traditional organisations, because there is no management in a DAO that makes the decisions and conducts the work on behalf of owners.¹⁴⁷² Indeed, some US states have seen fit to allow LLCs, which are a form of partnership,¹⁴⁷³ to contract out of fiduciary duties,¹⁴⁷⁴ because the parties within the LLC may prefer to allocate risks themselves,

¹⁴⁶⁵ Palley, 'How to Sue a Decentralized Autonomous Organization' (n 165).

¹⁴⁶⁶ Partnership Law Act 2019 (NZ) s 50.

¹⁴⁶⁷ Morrison, Mazey and Wingreen (n 9) 3.

¹⁴⁶⁸ Soleimani et al (n 14).

¹⁴⁶⁹ See above n 1460.

¹⁴⁷⁰ Robert Flannigan, 'The Strict Character of Fiduciary Liability' [2006] *New Zealand Law Review* 209, 210.

¹⁴⁷¹ Metjahic (n 10) 1548.

¹⁴⁷² Kaal (n 47) 26.

¹⁴⁷³ See 6.3.5 below.

¹⁴⁷⁴ H Justin Pace, 'Contracting Out of Fiduciary Duties in LLCs: Delaware Will Lead, but Will Anyone Follow?' (2016) 16(3) *Nevada Law Journal* 1085.

rather than run the risk of judicial error.¹⁴⁷⁵ As will be seen below, some DAOs are structured as LLCs and have contracted out of fiduciary duties.¹⁴⁷⁶

Fourth, because of the close nature of the relationship between partners, partners are considered agents of each other and the partnership.¹⁴⁷⁷ Partners as agents can bind their fellow partners and the partnership,¹⁴⁷⁸ although the partnership and the other partners are not automatically bound by all of an errant partner's acts — only those for which the partner had authority.¹⁴⁷⁹ But authority is a wide concept. A partner may have no actual authority and they may have been told expressly that they have no authority to act, yet they are deemed by the law to have authority if the third party did not know they lacked authority and it was reasonable in the circumstances to assume the partner had authority.¹⁴⁸⁰

Agency law does not map well to DAOs. Agency rules are designed to protect third parties who do not and usually cannot know the nature of the agent's authority.¹⁴⁸¹ Transparency is a feature of DAOs:¹⁴⁸² a third party can verify what actions the DAO can undertake by looking at its smart contracts. Practically, also, a DAO can act only according to its rules (its smart contracts). Suppose a DAO member did something that would bind an ordinary partnership, for example, a DAO token holder agreeing to pay a supplier for services. In that case, the DAO could not pay for those services without a proposal to that effect which is accepted by the DAO's membership through voting.

¹⁴⁷⁵ Ibid.

¹⁴⁷⁶ See also Carla L Reyes, '(Un)Corporate Crypto-Governance' (2020) 88 *Fordham Law Review* 1875 who argues that fiduciary duties should not be imposed on blockchain protocols, which would include DAOs.

¹⁴⁷⁷ Partnership Law Act 2019 (NZ) s 17.

¹⁴⁷⁸ Ibid s 18.

¹⁴⁷⁹ Ibid s 18(2).

¹⁴⁸⁰ For example, a partner is authorised to make purchases of up to USD10,000 if the partner had previously purchased laptops from X (a third party) and the invoices were always paid. If that partner purports to purchase four new laptops at USD3,000 each from X, and if X was unaware of the limit, it would be reasonable for them to assume the partner had the authority to purchase the laptops. The partnership and the partners would be bound by that contract.

¹⁴⁸¹ Michael Conant, 'Objective Theory of Agency: Apparent Authority and the Estoppel of Apparent Ownership' (1968) 47 *Nebraska Law Review* 678, 682.

¹⁴⁸² 'Decentralised Autonomous Organization (DAO) Framework' (n 399).

Fifth, because partnerships are not separate legal entities, there is no legal entity to sue and jurisdictional issues can arise.¹⁴⁸³ A person wishing to sue a DAO would have to sue the DAO's members and it may be difficult to ascertain their identity.¹⁴⁸⁴ A public key may be the only information known about a DAO token holder.¹⁴⁸⁵

Because a traditional partnership is not a legal entity, it cannot own its assets and partnership assets must be held by one or more of the partners on trust for the partnership.¹⁴⁸⁶ To be sure, people (trustees) holding a partnership's assets are required by law to act in the best interests of the partnership and its partners, but laws are not always followed.¹⁴⁸⁷ Indeed, there is no practical need for a DAO to use others to hold property such as tokens because a DAO can control assets held on a blockchain.¹⁴⁸⁸ DAOs, therefore, can avoid the danger of partnership property being misused by the people holding it on trust for the partnership.

The ability of a DAO to hold and control assets on a blockchain does not extend to other forms of property that do not reside on a blockchain currently, such as land and intellectual property rights. Such assets would require a trustee to hold those assets on behalf of the DAO. It is likely, however, that blockchain-based registries will be used for traditional assets, including land.¹⁴⁸⁹ Some of those blockchain-based asset registries, particularly with land, are likely to be controlled by the state,¹⁴⁹⁰ and are unlikely to accept registrations by an entity that did not have legal personality.

¹⁴⁸³ Stephen D Palley, 'Determining Jurisdiction When a DAO is Sued', *Bay Pay Forum* (22 May 2016) <<https://www.baypayforum.com/blockchain-coins/determining-jurisdiction-when-a-dao-is-sued>>.

¹⁴⁸⁴ Palley, 'How to Sue a Decentralized Autonomous Organization' (n 165) and Andrew Hinkes, 'The Law of The DAO', *CoinDesk* (21 May 2016) <<https://www.coindesk.com/the-law-of-the-dao>>.

¹⁴⁸⁵ Greenfield (n 1) 176. Public keys, however, may not necessarily be anonymous, Geoff Goodell and Tomaso Aste, 'Can Cryptocurrencies Preserve Privacy and Comply with Regulations?' (2019) 2 *Frontiers in Blockchain* <<https://doi.org/10.3389/fbloc.2019.00004>> 4.

¹⁴⁸⁶ *Commissioner of State Revenue v Rojoda Pty Ltd* [2020] HCA 7 [3].

¹⁴⁸⁷ New Zealand Law Commission, *A New Act for Incorporated Societies* (June 2013) [1.6]–[1.7].

¹⁴⁸⁸ Coala (n 41).

¹⁴⁸⁹ J Michael Graglia and Christopher Mellon, 'Blockchain and Property in 2018: At the End of the Beginning' (2018) 12 *Innovations* 90. Trials for the use of land titles being put on a blockchain are being conducted in a number of jurisdictions, see Desiree Daniel and Chinwe Ifejika Speranza, 'The Role of Blockchain in Documenting Land Users' Rights: The Canonical Case of Farmers in the Vernacular Land Market' (2020) 3 *Frontiers in Blockchain* <<https://doi.org/10.3389/fbloc.2020.00019>> 2.

¹⁴⁹⁰ Graglia and Mellon (n 1489).

Partnerships face an additional problem through the lack of a legal identity as they cannot enter into contracts because they lack legal personality.¹⁴⁹¹ Legally the DAO would need one of its members to enter into contracts on its behalf.¹⁴⁹² Yet, as with the position of a DAO being able to hold and control assets (in practice, not in law), a DAO could enter into a smart contract. The question is whether in law a DAO could enter into a contract itself and not be reliant on another person or entity to enter into the contract on its behalf. While not all smart contracts attempt to create legal contracts,¹⁴⁹³ some smart contracts will attempt to create legal contracts, for example, agreeing to pay for work to be done for the DAO.¹⁴⁹⁴ The question of whether an agreement entered into by the DAO would be regarded as a contract has not yet been tested in the courts, but the literature is clear that a DAO could not enter into the contract itself as it lacks legal capacity.¹⁴⁹⁵ Even if a DAO member is prepared to enter into a contract on behalf of the DAO there is the issue of whether organisations would be willing to enter into the contract. Government departments, for example, are reluctant to enter into contracts with unincorporated entities because of their lack of legal capacity to contract.¹⁴⁹⁶

Sixth, the personal liability of token holders for the debts, liabilities and wrongs committed by the DAO may limit the number of people prepared to become DAO token holders and thus potentially stifle their development.¹⁴⁹⁷ The shareholders in a corporation enjoy limited liability.¹⁴⁹⁸ In contrast, partners are jointly liable for the debts of the partnership as well as jointly liable and severally liable for the wrongs of their fellow partners and for those things for which the partnership is liable, which

¹⁴⁹¹ Coala (n 41).

¹⁴⁹² Aleksei Gudkov, 'Legal Aspects and Distributed Character of the Decentralised Network Organization' (15 August 2017) <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2911498> 8.

¹⁴⁹³ Grimmelmann (n 55) 2.

¹⁴⁹⁴ The Defiant (n 1064).

¹⁴⁹⁵ Coala (n 41).

¹⁴⁹⁶ Treasury, 'Guidelines for Contracting with Non-Government Organisations for Services Sought by the Crown', *New Zealand Treasury* (Web Page, April 2009) <<https://www.treasury.govt.nz/sites/default/files/2007-11/tsyngoguide09.pdf>> 29, cited by Cordery, Fowler and Morgan (n 41) 285.

¹⁴⁹⁷ Metjahic (n 10) 1548 and Coala (n 41), 'people transacting with DAOs often do so without appreciating the legal risks and potential liability attached to those transactions.'

¹⁴⁹⁸ Companies Act 1993 (NZ) s 97. Note: it is possible in some jurisdictions to have an unlimited company, in which case the shareholders' liability is not limited, Sarah P Bradley, 'Unlimited Liability in the Modern Context: An Examination of Shareholder Liability in Nova Scotia Unlimited Liability Companies' (2015) 38(1) *Dalhousie Law Journal* 69. In Australia unlimited liability companies (no liability companies) are limited to those whose sole object is mining purposes, s 112(2) Corporations Act 2001 (Cth).

were incurred at the time they were a member.¹⁴⁹⁹ Also the lack of separate legal status may result in the creators or members that contribute code, rather than the DAO, being personally liable for bugs in the DAO's code that cause loss or harm.¹⁵⁰⁰

One argument in favour of treating DAOs as partnerships is that their members should be liable for the debts and wrongs of the DAO. Indeed a similar argument was made in the mid-19th century debates over whether shareholders in companies should enjoy limited liability.¹⁵⁰¹ The Joint Stock Companies Registration and Regulation Act 1844 (UK) had enabled the registration of companies as legal entities, but their shareholders remained personally liable for their debts and wrongs.¹⁵⁰² There was considerable debate about whether shareholders should be protected by granting them limited liability.¹⁵⁰³ Earl Grey, in the House of Lords debate in 1855, argued that providing shareholders with limited liability 'would depart from the old-established maxim that all the partners are individually liable for the whole of the debts of the concern'.¹⁵⁰⁴ Grey, however, lost his argument with the passing of the Limited Liability Act 1855 (UK), which granted limited liability to a corporation's shareholders. Thus, it would not be exceptional if DAO members were not personally liable for the DAO's debts and wrongs.

6.2.2 DAOs as Unincorporated Societies

The law of unincorporated societies (or their equivalent, depending on the jurisdiction, for example, the term 'unincorporated associations' is used in Australia¹⁵⁰⁵) apply when people do not formalise an alternative legal structure.¹⁵⁰⁶ For example, a group of residents and landowners who combine to

¹⁴⁹⁹ Partnership Law Act 2019 (NZ) ss 22 and 25.

¹⁵⁰⁰ Coala (n 41).

¹⁵⁰¹ For a discussion of the development of the partnership to the modern company, see Sims, 'Blockchain and Decentralised Autonomous Organisations (DAOs)' (n 244) 432–435.

¹⁵⁰² Mackie (n 1436) 305.

¹⁵⁰³ Philip Lipton, 'The Introduction of Limited Liability into the English and Australian Colonial Companies Act: Inevitable Progression or Chaotic History?' (2018) 41 *Melbourne University Law Review* 1278, 1289–1297.

¹⁵⁰⁴ HL Deb 7 August 1855, vol 139, col 1904 (Earl Grey).

¹⁵⁰⁵ In Australia unincorporated societies are called 'unincorporated associations', Standing Committee on Economics, 'Disclosure Regimes for Charities and Not-For-Profit Organisations', *Australian Senate* (December 2008) 61.

¹⁵⁰⁶ Palley, 'How to Sue a Decentralized Autonomous Organization' (n 165). And see below nn 1533–1535.

protest an environmental issue are an unincorporated society.¹⁵⁰⁷ It is common for traditional unincorporated organisations not to take the steps of incorporation.¹⁵⁰⁸ It is likely that not-for-profit DAOs would be treated as unincorporated societies. The following analyses why it is not appropriate for not-for-profit DAOs to be treated as unincorporated societies.¹⁵⁰⁹

In contrast to partnerships, which are governed by legislation,¹⁵¹⁰ unincorporated societies are regulated by the common law.¹⁵¹¹ The difficulties posed by unincorporated societies and associations have long been recognised,¹⁵¹² leading to reform in the United States and to the adoption in the United States of a Uniform Unincorporated Nonprofit Association Act and a more recent Revised Uniform Unincorporated Nonprofit Association Act.¹⁵¹³ However, the analysis in this section applies to unincorporated societies governed by the common law, with unincorporated non-profit associations in the United States addressed in a later section.¹⁵¹⁴

¹⁵⁰⁷ *Friends of Pakiri Beach v McCallum Bros Ltd* [2008] 2 NZLR 87; [2008] NZCA 87.

¹⁵⁰⁸ Standing Committee on Economics (n 1505) 62, explaining that unincorporated associations are the most common legal structure used by Australian not-for-profit organisations.

¹⁵⁰⁹ For more conventional unincorporated organisations, their treatment as, for example, an unincorporated association is not ideal. Unincorporated associations have been described as ‘very dangerous creature[s]’, Standing Committee on Economics (n 1505) 62.

¹⁵¹⁰ For example, Partnership Law Act 2019 (NZ).

¹⁵¹¹ Standing Committee on Economics (n 1505) 61 and see generally, von Dadelszen (n 384); Alexandra Sims, ‘Unincorporated Societies’ in Susan Watson (ed), *The Law of Business Organisations* (Palatine Press, 5th ed, 2009) 754; Alexandra Sims, ‘Incorporated Societies’ in Susan Watson (ed), *The Law of Business Organisations* (Palatine Press, 5th ed, 2009) 770; and Fletcher, *The Law Relating to Non-Profit Associations in Australia and New Zealand* (n 98). Prior to the first partnership legislation, partnership law was contained in case law, *Hosking v Marathon Asset Management LLP* [2016] EWHC 2418 (Ch) [21].

¹⁵¹² ‘Unincorporated associations have long been a problem for the law’, *Cox v The Evergreen Church* (1992) SW 2d, 167, 169, quoted by Elizabeth S Miller, ‘Doctoring the Law of Nonprofit Associations with a Band-Aid or a Body Cast: A Look at the 1996 and 2008 Uniform Unincorporated Nonprofit Association Acts’ (2012) 38(2) *William Mitchell Law Review* 852, 853. See also, Standing Committee on Economics (n 1505) 62 where unincorporated associations were described as ‘very dangerous creature[s]’.

¹⁵¹³ See generally Turnour (n 1418) who argues that Australian states should reverse the common law position that unincorporated associations are not legal entities.

¹⁵¹⁴ See 6.3.6 below.

Unincorporated societies in Australia, New Zealand and the United Kingdom are not separate legal entities,¹⁵¹⁵ and are therefore similar to partnerships in that respect.¹⁵¹⁶ The lack of a legal identity and thus legal status causes problems, as it does with partnerships.¹⁵¹⁷ Because of their unincorporated nature there is no legal entity to sue and jurisdictional issues can arise.¹⁵¹⁸ In addition, unincorporated societies cannot enter into contracts because they lack legal personality.¹⁵¹⁹ The lack of legal status also means that other people and entities may not be willing or may even be barred from dealing with them.¹⁵²⁰ Nor can unincorporated societies hold property.¹⁵²¹ Indeed, one reason why societies were ultimately allowed to incorporate, if the members so wished and gain a separate legal status in New Zealand, was due to trustees, which held societies' assets, not following the law, and doing what they liked with the society's assets.¹⁵²² However, as with partnerships,¹⁵²³ with a DAO there is no practical need to use others to hold property such as tokens because of the DAO's ability to control assets held on a blockchain.¹⁵²⁴ However, again as with partnerships, there may be property, such as land, that can be held by legal entities only.¹⁵²⁵ A not-for-profit DAO, therefore, cannot avoid all the danger of the DAO's assets being misused by the people who are meant to hold it on trust for the DAO.

¹⁵¹⁵ *Te Ara Rangatu O Te Iwi O Ngāti Te Ata Waiohū Inc v Attorney-General* [2019] NZAR 12 [25], '[t]he only recognised exception to the general rule that an unincorporated body, association or group has no legal personality, is where statute has expressly or by necessary implication treated an unincorporated body as being a legal entity distinct from its members either generally or for specific purposes.' There can be exceptions, however, for narrow purposes. For example, in Australia unincorporated associations are considered to be entities for income tax purposes, Standing Committee on Economics, 'Disclosure Regimes for Charities and Not-for-Profit Organisations', *Australian Senate* (December 2008) 62.

¹⁵¹⁶ See above n 1483.

¹⁵¹⁷ See above nn 1483–1495.

¹⁵¹⁸ Palley (n 1483).

¹⁵¹⁹ Cordery, Fowler and Morgan (n 41) 284–285.

¹⁵²⁰ In New Zealand some government agencies are barred from funding unincorporated societies, Ministerial Direction, 'Direction to Callaghan Innovation—Criteria for Assessing Proposals for Funding Project and Student Grant Funding' (3 October 2018) <<https://gazette.govt.nz/notice/id/2018-go4864>> 2, yet Callaghan Innovation, a Crown entity, can provide funding to an LP registered under the Limited Partnerships Act 2008 (NZ).

¹⁵²¹ Cordery, Fowler and Morgan (n 41) 284–285.

¹⁵²² New Zealand Law Commission, *A New Act for Incorporated Societies* (June 2013) [1.6]–[1.7].

¹⁵²³ See above n 1488 and accompanying text.

¹⁵²⁴ Coala (n 41).

¹⁵²⁵ See above n 1490.

Another limitation of unincorporated societies law for DAOs is that members of an unincorporated society can be liable for the debts of the society in certain situations. First, if the society's rules state that they are liable, for example, if they agree to personally indemnify the committee or the trustees for actions taken when transacting business on behalf of the society,¹⁵²⁶ and second, members can be liable if they voted in favour of expenditure of the action which incurred liability.¹⁵²⁷ Indeed, it has been observed that the use of unincorporated not-for-profit organisations 'usually results from sheer ignorance of the possible degree of personal liability of its members'.¹⁵²⁸ According to this reasoning, DAO members in a not-for-profit DAO that took part in voting may be responsible for the outcome of each decision in which they participated. Thus DAO members who are identifiable face considerable risks as they could potentially be sued for the DAO's debts,¹⁵²⁹ or be targets of regulatory enforcement.¹⁵³⁰ Members who realised the nature of their potential liability may be reluctant to vote and the DAO's governance mechanisms may stall. In addition, for DAOs that use a council or similar body that makes decisions, that body may be treated as the society's committee and people on those bodies may be liable.¹⁵³¹ In addition, was with partnerships, the lack of separate legal status may result in the creators or members that contribute code, rather than the DAO, being personally liable for bugs in the DAO's code that cause loss or harm.¹⁵³²

A not-for-profit in Australia, New Zealand and the United Kingdom can avoid the effects of being found to be an unincorporated society by incorporating. The type of incorporation depends on the jurisdiction. In the United Kingdom, it would be done by forming a company limited by

¹⁵²⁶ Sims, 'Unincorporated Societies' (n 1511) 764.

¹⁵²⁷ Ibid.

¹⁵²⁸ Howard L Oleck, 'Nonprofit Unincorporated Associations' (1972) 21 *Cleveland State Law Review* 44, 47 who notes that the use of unincorporated not-for-profit organisations 'usually results from sheer ignorance of the possible degree of personal liability of its members'.

¹⁵²⁹ The liability of members of unincorporated societies, see eg, Victor Lirette, 'Unincorporated Non-profit Associations in Contract: A Need for Reform' (1983) 21(3) *Alberta Law Review* 518.

¹⁵³⁰ Kaal (n 47) 25.

¹⁵³¹ Sims, 'Unincorporated Societies' (n 1511) 765. If the DAO had funds and the committee members acted within the DAO's rules, the committee members would have a right of indemnity against those funds, Fletcher, *The Law Relating to Non-Profit Associations in Australia and New Zealand* (n 98) 124–132.

¹⁵³² Coala (n 41).

guarantee¹⁵³³ or in Australia by either incorporating as an incorporated association in a state,¹⁵³⁴ or as a company limited by guarantee. In New Zealand, incorporation is achieved by creating an incorporated society.¹⁵³⁵ The problem with using such incorporated structures for not-for-profit DAOs is that they require governing bodies such as a board of directors or a committee.¹⁵³⁶ While as Chapter Four identified, some DAOs do use councils, the members of which may be regarded as playing the role of directors and committee members, not all DAOs use such centralised decision-making bodies. Requiring all not-for-profits DAOs to use a centralised decision-making entity is likely to constrain the development of such DAOs' decentralised decision-making.

The next section analyses the use of 'legal wrappers' and whether they could be used to achieve a type of basic legal structure that would avoid the constraints of the law of partnership and unincorporated not-for-profits.

6.3 DAOs' Use of Legal Wrappers

In relation to DAOs, a legal wrapper has been defined as 'not necessarily an entity, it could be any kind of legal ordering, it could be a charter or constitution among members of an unincorporated association'.¹⁵³⁷ Legal wrappers are an attempt to slot DAOs within existing legal frameworks and enable the DAO to enter into contracts, sue and be sued, hold property, and limit the liability of the DAO members.

This section evaluates the use of legal wrappers that have been or could be used for DAOs. It begins by evaluating the main types of entity that have and are being used for DAOs, their benefits as

¹⁵³³ Companies Act 2006 (UK).

¹⁵³⁴ See, eg, Associations Incorporation Act 2009 (NSW); Associations Incorporation Act 1981 (QLD); Associations Incorporation Reform Act 2012 (Vic); and Corporations Act 2001 (Cth).

¹⁵³⁵ New Zealand (Incorporated Societies Act 1908 (NZ)).

¹⁵³⁶ See generally Companies House, 'Model Articles for Private Companies Limited by Guarantee' (Webpage, 18 September 2018) <<https://www.gov.uk/government/publications/model-articles-for-private-companies-limited-by-guarantee/model-articles-for-private-companies-limited-by-guarantee#committees>>.

¹⁵³⁷ Adam J Kerpleman, 'Legal Wrappers for DAOs and the LexDAO Constitution', *Medium* (19 August 2020) <<https://medium.com/lexdaoism/legal-wrappers-and-the-lexdao-constitution-ba89e46a644c>> and 'The Legal Wrapper for the DAO' (n 1445).

well as their limitations.¹⁵³⁸ The legal wrappers analysed are limited partnerships and limited liability partnerships; foundations; Swiss Associations, which include the decentralised autonomous association structure; business trusts, LLCs; unincorporated non-profit associations; and a combination of structures.

6.3.1 Limited Partnerships and Limited Liability Partnerships

Limited partnerships (LPs) and limited liability partnerships (LLPs) are recognised in many jurisdictions.¹⁵³⁹ LPs and LLPs may be suitable for for-profit DAOs because they are designed to remedy the drawbacks of general partnerships, which include the lack of a legal entity¹⁵⁴⁰ and the lack of limited liability for partners.¹⁵⁴¹

LPs have two types of partner, limited and general. Limited partners have limited liability, general partners do not.¹⁵⁴² In return for limited partners' limited liability, the limited partners cannot take part in management.¹⁵⁴³ A management decision would include taking part in a decision to approve or veto investments made by the LP if the value of the investment is less than half the limited partnership's assets prior to the investment.¹⁵⁴⁴ LPs, however, have limited application for DAOs and are not an appropriate legal structure for most DAOs. First, they are not suitable for not-for-profit DAOs, although it is unlikely that one legal structure will suffice for all DAOs. Second, because the limited partners cannot take part in the management of the DAO, a DAO's governance framework

¹⁵³⁸ It does not, for example, look at creating a DAO as a limited cooperative association in Colorado, see OpenLaw, 'The Era of Legally Compliant DAOs', *Medium* (27 June 2019) <<https://medium.com/@OpenLawOfficial/the-era-of-legally-compliant-daos-491edf88fed0>> and see Kaal (n 47) 41–42.

¹⁵³⁹ For example, New Zealand (Limited Partnerships Act 2008 (NZ)). Each state in Australia has its own legislation, see eg, Partnership Act 1891 (Qld) Chapter Four – Incorporated Limited Partnerships; United Kingdom (Limited Partnerships Act 1907 (UK) and Limited Liability Partnerships Act 2000 (UK)); Singapore Limited Liability Partnerships Act 2005 (Sing); India, Limited Liability Partnership Act 2008 (Ind); and most US states have specific LLP legislation.

¹⁵⁴⁰ In some jurisdictions an LLP is a separate legal entity, Mohammad Rizal Salim, 'Limited Liability Partnership in Malaysia: A Corporate Governance Perspective' (2013) 24(12) *ICCLR* 421, 424.

¹⁵⁴¹ Coala (n 41).

¹⁵⁴² For example, Limited Partnerships Act 2008 (NZ) ss 25, 27 and 31.

¹⁵⁴³ For example, Limited Partnerships Act 2008 (NZ) s 20(1). Schedule 1 of the Act sets out activities that do not constitute taking part in the management of a limited partnership.

¹⁵⁴⁴ Limited Partnerships Act 2008 (NZ) sch 1 cl b(i). One exception to the investment rule is if the partner is a member of an advisory committee of the limited partnership, cl b(ii).

would not work effectively as the limited partners would be unable to vote on many of the DAO's actions. Third, the names and other personal information of limited and general partners must be provided to the relevant registrar, which means that the ability to enter and exit the DAO would be cumbersome.

LLPs are similar to LPs, but they typically have only one type of partner and all the partners can take part in management if they so agree.¹⁵⁴⁵ The ability of all LLP partners, and therefore DAO members, to take part in management would appear to make the LLP structure more attractive for for-profit DAOs than LPs. A co-founder of a proposed DAO, SocialKapital, believed that LLPs were the preferred legal structure for DAOs¹⁵⁴⁶ because DAOs had the hallmarks of a partnership. However, DAO members would be required to register as members of the LLP and this registration requirement for DAO members may reduce the attractiveness of an LLP as a legal structure for DAOs. Indeed, at the time of writing, no DAOs appear to have registered as LLPs.

6.3.2 Foundations

Foundations are not-for-profit organisations and their regulation varies between jurisdictions, particularly within US states,¹⁵⁴⁷ where they are a common legal structure.¹⁵⁴⁸ Foundations have proved more popular for DAOs than LPs or LLPs. MakerDAO uses a foundation based in Denmark,¹⁵⁴⁹ and Synthetix used one in Australia.¹⁵⁵⁰ While Ethereum is a proto DAO, rather than a DAO,¹⁵⁵¹ it was

¹⁵⁴⁵ Salim (n 1540) 424.

¹⁵⁴⁶ Sirus Knight, 'How to Structure a DAO', *Medium* (26 May 2016) <https://medium.com/@social_kapital/how-to-structure-a-dao-5b5b208b6ce7>.

¹⁵⁴⁷ David C Hammack and Steven Rathgeb Smith, 'Foundations in the United States: Dimensions for International Comparison' (2018) 62(12) *American Behavioral Scientist* 1603, 1603.

¹⁵⁴⁸ Ibid. The Bitcoin Foundation, registered as a 501(c)(6) not-for-profit organisation, was created in 2012 to 'accelerate the global growth of bitcoin through standardization, protection, and promotion of the open source protocol', Jon Matonis, 'Bitcoin Foundation Launches to Drive Bitcoin's Advancement', *Forbes* (27 September 2012) <<https://www.forbes.com/sites/jonmatonis/2012/09/27/bitcoin-foundation-launches-to-drive-bitcoins-advancement/?sh=1375ecc5d868>>.

¹⁵⁴⁹ MakerDAO, 'Putting The Maker Foundation in Context', MakerDAO <<https://community-development.makerdao.com/en/learn/MakerDAO/maker-foundation/>>. MakerDAO also has the Dai Foundation based in Denmark, which owns the Maker community's intellectual property, including its trademarks and copyrights.

¹⁵⁵⁰ Kain Warwick, 'Transition to Decentralised Governance', *Synthetix Blog* (Blog Post, 17 December 2019) <<https://blog.synthetix.io/transition-to-decentralised-governance/>>.

¹⁵⁵¹ See above 3.3.3.

the first blockchain entity to use a not-for-profit Swiss foundation for its ICO.¹⁵⁵² It has been argued that the use of not-for-profit Swiss foundations for ICOs was to circumvent US securities law and the laws of other jurisdictions.¹⁵⁵³

One reason for the use of foundations is because robust DAO legal structures did not exist at the time those DAOs were formed and it was a way of providing confidence in the project that was to become the DAO.¹⁵⁵⁴ That is, there were safeguards about how the DAO's assets were to be used,¹⁵⁵⁵ thus moving from a centralised project to a more decentralised one over time.¹⁵⁵⁶ Synthetix saw the creation of a foundation as a temporary measure to start and guide the DAO in its early stages before winding up the foundation and distributing its assets and governance to a DAO,¹⁵⁵⁷ or in the case of Synthetix three DAOs.¹⁵⁵⁸ Synthetix's legal structure at the time of writing has therefore understandably been described as 'occupy[ing] decidedly grey legal territory'.¹⁵⁵⁹ One interviewee similarly identified a foundation as using elements of centralised control.¹⁵⁶⁰

¹⁵⁵² Dmitri Boreiko, Guido Ferrarini and Paolo Giudici, 'Blockchain Startups and Prospectus Regulation' (2019) 20 *European Business Organization Law Review* 665, 669.

¹⁵⁵³ By structuring DAOs and other organisations as foundations they were arguably not subject to securities laws that would have otherwise prevented their ability to, for example, sell tokens to non-accredited investors, see Usha R Rodrigues, 'Embrace the SEC' (2020) 61 *Washington University Journal of Law & Policy* 133, 144 citing Ralph Atkins, 'Switzerland Embraces Cryptocurrency Culture', *Financial Times* (25 January 2018) <<https://www.ft.com/content/c2098ef6-ff84-11e7-9650-9c0ad2d7c5b5>>.

¹⁵⁵⁴ Warwick, 'Transition to Decentralised Governance' (n 1550).

¹⁵⁵⁵ Ibid.

¹⁵⁵⁶ Interviewees 2 (DAO founder), 3 (DAO founder, not yet in operation), 5 (consultant), 6 (consultant) and 7 (consultant). See also Thurman (n 19).

¹⁵⁵⁷ Cooper Turley, 'Synthetix Dissolves Foundation in Favor of Community DAOs', *DeFi Rate* (29 July 2020) <<https://defirate.com/synthetix-foundation-dao/>> and Brady Dale, 'MakerDAO Foundation Plots its Own Demise', *CoinDesk* (4 April 2020) <<https://www.coindesk.com/makerdao-foundation-plots-its-own-demise>>.

¹⁵⁵⁸ Kain Warwick, 'Synthetix Foundation Decommissioned', *Synthetix Blog* (Blog Post, 28 July 2020) <<https://blog.synthetix.io/synthetix-foundation-decommissioned/>>.

¹⁵⁵⁹ Interviewees 2 (DAO founder), 3 (DAO founder, not yet in operation), 5 (consultant), 6 (consultant) and 7 (consultant). See also Thurman (n 19), where Aave and Synthetix, both DAOs, are described as 'a pair of sprawling, high-stakes experiments being undertaken in real time'.

¹⁵⁶⁰ Interviewee 3 (DAO founder, not yet in operation).

6.3.3 Swiss Associations and Decentralised Autonomous Association Structure

Switzerland, in addition to recognising foundations, also has Swiss Associations, which are an alternative to foundations.¹⁵⁶¹ A Swiss law firm has created a framework for decentralised autonomous associations (DAAs) to better align the Swiss Association to DAOs by removing centralisation points.¹⁵⁶² Instead of the Association's board of directors, with its rights to manage the Association's affairs, every member of the DAA member community has the right to propose new projects and to vote on whether those projects are to be funded.¹⁵⁶³ The voting is done on-chain and thus cannot be reversed.¹⁵⁶⁴ With on-chain voting, if a proposal succeeds, the outcome of the vote is executed automatically without the need for human involvement.¹⁵⁶⁵

While the ability of members to make proposals and vote upon them and use on-chain voting would appear to suit most DAOs and would be an attractive legal structure for DAOs, DAAs have significant limitations for DAOs. The main limitations are the association is limited to one member—one vote,¹⁵⁶⁶ and membership is not easy to acquire.¹⁵⁶⁷ One member—one vote would remove the ability to use sophisticated voting schemes and thus complex governance mechanisms.¹⁵⁶⁸ Another limitation is that DAO tokens would not be freely transferrable. For a person to become a member of a DAA, they must have Swiss residency or prove they have travelled to Switzerland within the previous three months.¹⁵⁶⁹ In addition, the DAA requires one DAA delegate, a natural person, to perform tasks required under Swiss law, for example, representing the DAA to the outside world and keeping the

¹⁵⁶¹ Philippe Pulfer and Laura Luongo, 'An Overview of the Swiss Philanthropic Sector', *WhosLegal.com* (Web Page, 30 November 2017) <<https://whoswholegal.com/features/an-overview-of-the-swiss-philanthropic-sector>>.

¹⁵⁶² MME, 'Model Articles of Association of a Decentralised Autonomous Association: An Experiment on Ethereum' (May 2020) <<https://info.mme.ch/magazinbeitrag-daa-lp?hsCtaTracking=922c7b95-2116-47ba-8157-d4c53fd9f780%7C1ac787f8-52ec-43fd-b9ec-9b338094e1ad>>; Luka Müller at al, 'Decentralized Autonomous Association (DAA)', *MME* (Web Page, May 2020) <https://www.mme.ch/en/magazine/magazine-detail/url_magazine/decentralized_autonomous_association_daa>; and Validity Labs, 'Daa', *GitHub* (2020) <<https://github.com/validitylabs/daa/tree/web>>.

¹⁵⁶³ *Ibid* 5.

¹⁵⁶⁴ *Ibid*.

¹⁵⁶⁵ Buterin, 'Notes on Blockchain Governance' (n 724).

¹⁵⁶⁶ Kaal (n 47) 45.

¹⁵⁶⁷ *Ibid* 47.

¹⁵⁶⁸ *Ibid* 45.

¹⁵⁶⁹ MME, 'Model Articles of Association of a Decentralised Autonomous Association' (n 1562) 5. The DAA uses Whitelisters to ensure that the applicants meet the residency and travel requirements.

member registry.¹⁵⁷⁰ Notwithstanding the limitations of the DAA structure, it may be suitable for a few DAOs. At the time of writing, HOPR, which is creating a privacy-preserving messaging protocol, was using a DAA.¹⁵⁷¹

More malleable legal structures than the Swiss Association and DAAs are LLCs and series LLCs (SLLCs). However, before analysing LLCs and SLLCs, the next section looks at business trusts because one scholar, Carla L Reyes, who has written extensively on blockchain and DAOs,¹⁵⁷² argues that business trusts are more appropriate for DAOs than LLCs or SLLCs.¹⁵⁷³

6.3.4 Business Trusts

In the United States, the jurisdiction in which Reyes writes, some states regard business trusts as separate legal entities, and therefore allow them to sue and be sued.¹⁵⁷⁴ In contrast, in New Zealand, as in other jurisdictions, business trusts, called trading trusts, cannot be registered and are not legal entities.¹⁵⁷⁵ The disadvantage of business trusts or trading trusts is that the people or the entities holding trustee tokens are a centralising element as they:¹⁵⁷⁶

allow the trustees to direct the activity of the business trust: to select which products and services to bring to market, to contract with service providers and vendors, and to distribute profits back to the

¹⁵⁷⁰ Ibid 3.

¹⁵⁷¹ MME, 'Beyond DAOs and Foundations: The Decentralised Autonomous Association (DAA)', MME (Web Page) <https://www.mme.ch/fileadmin/files/documents/MME_Compact/2020/200528_Presentation_Webinar_DAA_DAO.pdf>; Kaal (n 47) 46-47; and Sebastian Bürgel, 'Bootstrapping Decentralized Governance: The HOPR Genesis DAO', *Medium* (10 February 2021) <<https://medium.com/hoprnet/bootstrapping-decentralized-governance-the-hopr-genesis-dao-fd4e6a2eb41b>>.

¹⁵⁷² See, eg, Carla L Reyes, 'Conceptualizing CryptoLaw' (2017) 96 *Nebraska Law Review* 384; Carla L Reyes, 'Moving Beyond Bitcoin to an Endogenous Theory of Decentralized Ledger Technology Regulation: An Initial Proposal' (2016) 61(1) *Villanova Law Review* 191; Reyes, '(Un)Corporate Crypto-governance' (n 1399); Reyes, 'If Rockefeller Were a Coder' (n 1417); and Reyes, 'Autonomous Business Reality' (n 16).

¹⁵⁷³ Reyes, 'If Rockefeller Were a Coder' (n 1417) 400 citing Shawn Bayern, 'Of Bitcoins, Independently Wealthy Software, and the Zero-Member LLC' (2014) 108 *Northwestern University Law Review* 1485.

¹⁵⁷⁴ Reyes, 'If Rockefeller Were a Coder' (n 1417) 400.

¹⁵⁷⁵ If a trading trust is used in New Zealand it is common for the trustee to be a trustee company. However, that trustee company merely holds the assets for the beneficiaries and normally has no assets of its own.

¹⁵⁷⁶ Reyes, 'If Rockefeller Were a Coder' (n 1417) 415, Reyes, however, sees the ability of the trustees to direct the DAO's activity as a positive feature, not a limitation.

certificate tokenholders. Only a trustee token, and not a certificate token, would be endowed with the right to transfer or otherwise dispose of the DAO's property.

The trustees would be elected by the DAO's token holders,¹⁵⁷⁷ and thus the latter (who are beneficiaries of the business trust) would presumably be able to remove the trustees who were not acting in a way approved by the token holders.

The limitation of a business trust is that those with trustee tokens have the ability to transfer the DAO's property, which on face value would defeat the purpose of a DAO because no single person should have the ability to transfer or otherwise dispose of the DAO's property. However, there would be numerous trustee tokens,¹⁵⁷⁸ thus there would be multiple trustees and not a singular or even a few trustees. Yet, the token holders remain vulnerable to the trustee's actions. If a DAO did use such a structure, it would also be engaging in delegative democracy¹⁵⁷⁹ as the token holders would be delegating their decision-making to the trustees. This may suit some DAOs, but not all DAOs. In addition, the holders of trustee tokens risk potential personal liability and while they may have a right of indemnity against the DAO's assets, the DAO's assets may be insufficient.

Alternatively, Reyes has a more ambitious argument: that the DAO's smart contracts themselves could serve as the trustees.¹⁵⁸⁰ For example, this would prevent people as trustees unlawfully transferring the DAO's assets to themselves or a third party because the assets could only be transferred according to the DAO's smart contracts. However, if the DAO's token holders wish to amend the smart contract, this would presumably require the token holders (the beneficiaries) to make the amendments. For beneficiaries to have that level of control over the trustee and thus the trust would be highly unusual, and it is difficult to see a court accepting such an argument. Thus, an attempt to use the DAO's smart contract as the trustee is not likely to work unless the DAO is one in which no changes to its smart contracts are made once it is released. While such a DAO can be

¹⁵⁷⁷ Ibid.

¹⁵⁷⁸ Ibid.

¹⁵⁷⁹ See generally Ford (n 938).

¹⁵⁸⁰ Reyes, 'If Rockefeller Were a Coder' (n 1417) 418.

created, the chances of it remaining operational for a sustained length of time is remote as its smart contracts may contain errors, as occurred with The DAO, or it is realised that other changes are required.

Notwithstanding the limitations of trusts as a legal structure for DAOs, it may be possible to creatively engineer a trust so that the trustee's power is limited¹⁵⁸¹ and a trust is just one structure used by a DAO. The use of a trust in a wider structure is looked at below in 6.3.7.

LLCs and SLLCs are looked at next as, to date, they have been the most popular form of legal structure used by DAOs.

6.3.5 LLCs

This section deals with LLCs, which are not to be confused with limited liability companies in New Zealand, Australia, the United Kingdom and other jurisdictions or a corporation in the United States. A corporation can be registered in the bootstrapping phase of a DAO's creation; thus the corporation turns the DAO over to the network.¹⁵⁸² A corporation is therefore not an appropriate legal structure for a DAO given its centralised structure.

This section focuses on LLCs in the United States because some DAOs have been registered as LLCs in that jurisdiction. LLC legislation varies between US states because LLCs are regulated at the state level, rather than the federal level.¹⁵⁸³ Thus there is no uniform treatment of LLCs in the United States. Notwithstanding most jurisdictions do not offer LLCs as a legal structure within their jurisdictions, those jurisdictions do recognise LLCs as valid legal structures and allow LLCs to sue and be sued in their jurisdiction.¹⁵⁸⁴

¹⁵⁸¹ Interviewee 3 (DAO founder, not yet in operation) identified a trust as having some form of centralised control but not as much as a company.

¹⁵⁸² Interviewee 3 was using a company registered in New Zealand in the creation phase of the DAO before its governance was decentralised and its legal structure changed.

¹⁵⁸³ Daniel M Hausermann, 'For a Few Dollars Less: Explaining State to State Variation in Limited Liability Company Popularity' (2011) 20(1) *University of Miami Business Law Review* 1, 22–33.

¹⁵⁸⁴ In *Moda Systems America LLC v Guardian Bandsaws Ltd* [2020] NZHC 1476, an LLC registered in Colorado, United States, was able to apply for and receive an interim injunction against a New Zealand company in a New Zealand court.

LLCs are a combination of a partnership and a corporation which grew from partnership law¹⁵⁸⁵ and are a common legal structure in the United States.¹⁵⁸⁶ While LLCs are not incorporated entities,¹⁵⁸⁷ they are registered entities that provide limited liability to their members. They are not taxed separately and each DAO's rules can be crafted, much like a partnership agreement.¹⁵⁸⁸ Thus if members of an LLC wish to expel a member, they will be unable to expel that member unless the relevant LLC Act or the LLC's operating agreement provides for such a power.¹⁵⁸⁹

SLLCs are a variation of LLCs and allow for people to partition risk and set up a number of LLCs.¹⁵⁹⁰ SLLCs are a relatively new invention; not all US states have SLLC legislation.¹⁵⁹¹ Using a traditional example, a real estate developer with a number of properties could form a SLLC and place each property in its own series.¹⁵⁹² Each series, and thus each property, would be separate; thus if one had large liabilities the others would not be liable for its losses.¹⁵⁹³ Instead of using multiple LLCs, SLLCs are designed to allow for a more cost-effective and simple structure because one operating agreement is used for all of the series.¹⁵⁹⁴ The SLLC structure allows people to create a number of related DAOs. The failure of one or more DAOs would not affect the viability of any of the successful DAOs as the liability of each DAO is separate.

Early in the development of DAOs, one commentator argued that DAOs should be structured as LLCs and even more so as SLLCs, rather than as corporations.¹⁵⁹⁵ DAOs have been registered as LLCs

¹⁵⁸⁵ Ribstein (n 103) 3.

¹⁵⁸⁶ See Manesh (n 1439) 393, who notes that at the end of 2016 in Delaware, 827,611 LLCs were registered, compared with 298,025 corporations and 90,626 limited partnerships.

¹⁵⁸⁷ Cf Evan Hathaway, 'What is the Kansas Series LLC and Why Should You Care?' (2020) 59 *Washburn Law Journal* 519, 522 and Nadelle Grossman, 'Casual Convergence in Unincorporated Entity Law' in Robert W Hillman and Mark J Loewenstein (eds), *Research Handbook on Partnerships, LLCs and Alternative Forms of Business Organisations* (Edward Elgar, 2015) 319.

¹⁵⁸⁸ Friedman (n 1425) 42. SLLCs are also looked at below in 6.3.5.

¹⁵⁸⁹ New York: *Chiu v Chiu*, 896 NYSDd 131, 132 (Sup Ct App Div 2 2010) and see Thomas E Rutledge, 'It's Not Me, It's You: Planning for Expulsion of Members from LLCs' (2016) 19(4) *Journal of Passthrough Entities* 43.

¹⁵⁹⁰ Hathaway (n 1587) 522.

¹⁵⁹¹ For example, Kansas has relatively recently recognised SLLCs, Kan Stat Ann §17-76, 143 (2012) and see generally, Hathaway (n 1487).

¹⁵⁹² Hathaway (n 1587) 544.

¹⁵⁹³ *Ibid* 545.

¹⁵⁹⁴ *Ibid*.

¹⁵⁹⁵ Houman B Shadab, 'Empowering Distributed Autonomous Companies', *Lawbitrage Blog* (Blog Post, 21 February 2015) <<https://lawbitrage.typepad.com/blog/2015/02/empowering-distributed-autonomous-companies.html>>. Shadab uses the term DAC (decentralised autonomous company) rather than DAO; however,

in multiple US states. OpenEsq LLC, established in New York, was the first DAO registered as an LLC.¹⁵⁹⁶ MetaCartel Ventures DAO LLC (MCV)¹⁵⁹⁷ was also registered in New York. MCV has the most complete LLC operating agreement:¹⁵⁹⁸ its MCV's Grimoire¹⁵⁹⁹ is tied to the MCV's smart contract (its code).

OpenLaw offers a 'limited liability wrapper' as a free service that DAOs can use to create an LLC, or in OpenLaw's terminology an LLC-DAO,¹⁶⁰⁰ thus an LLC-as-a-service.¹⁶⁰¹ Other entities also offer similar services; for example, OtoCo allows people to create a SLLC in Delaware quickly through Ethereum with no paperwork required.¹⁶⁰² The SLLCs OtoCo are facilitating are designed to be created quickly and allow the creators to be shielded from legal risks as they develop the DAO.¹⁶⁰³ The benefits of an entity providing an LLC-as-a-service or a SLLC-as-a-service can be significant because it can be expensive to create an LLC operating agreement as the DAOs will normally want to change the default rules under the state LLC legislation in which they are registering.¹⁶⁰⁴ The default rules that are likely to be changed are limiting or removing partners owing fiduciary obligations to one another, removing the requirement for a manager or owner of the LLC, and modifying the books and records requirement to enable them to be managed by blockchains and blockchain-based software.¹⁶⁰⁵

DAC was the terminology used in early 2015 and now the term DAO is used, see above nn 388–391 and accompanying text. Shadab was writing in 2015, which was well before the creation and fall of The DAO, which did not choose a legal structure.

¹⁵⁹⁶ Open, Esq LLC DOS ID: 5529356, registered on 8 April 2019 and see Kaal (n 47) 40.

¹⁵⁹⁷ MetaCartel Ventures DAO LLC is registered in Delaware 7849030.

¹⁵⁹⁸ MetaCartel Ventures DAO (n 257).

¹⁵⁹⁹ A grimoire is a book of spells. The magic theme is continued with members referred to as either goblins or mages depending on their status in the LLC, MetaCartel Ventures DAO (n 257) [4.2.(d)].

¹⁶⁰⁰ OpenLaw, 'The Era of Legally Compliant DAOs' (n 1538).

¹⁶⁰¹ OpenLaw, 'Limited Liability Company Operating Agreement – Open, ESQ LLC' <<https://lib.openlaw.io/web/default/template/LLC-DAO%20Operating%20Agreement>>.

¹⁶⁰² Otonomos, 'How to Run a Company (Almost) Entirely on Ethereum' 6 February 2020 <<https://otonomos.com/2020/02/how-to-run-a-company-almost-entirely-on-ethereum/>>. Paperwork is required if the SLLC intends to have a bank account.

¹⁶⁰³ Ibid.

¹⁶⁰⁴ Aaron Wright and Christopher Allen, 'DAOs and LAOs' (PowerPoint Slides, 27 July 2020) slide 13.

¹⁶⁰⁵ Ibid.

OpenLaw has also created 'The LAO', a for-profit, limited liability autonomous organisation,¹⁶⁰⁶ which uses an LLC wrapper.¹⁶⁰⁷ The LAO was created to eliminate the limitations in the way The DAO had been structured.¹⁶⁰⁸ The first limitation was The DAO's lack of an express legal structure;¹⁶⁰⁹ however, it was likely to have been a partnership.¹⁶¹⁰ There was also confusion about the hacker's liability and the DAO members' liability to one another, including the liability for the loss of the funds.¹⁶¹¹ To mitigate The DAO's shortcomings, OpenLaw states that the LAO:¹⁶¹²

will be set up as a limited liability entity, organized in Delaware, using curated smart contracts to handle mechanics related to voting, funding, and allocation of collected funds. This entity will presumably limit the liability of LAO members and help clarify their relationship to avoid knotty questions related as to whether partnership law applies. This structure will also provide members of the LAO with tax flow — through treatment by the Internal Revenue Service, such that tax is not paid by both the entity and a person holding a beneficial interest in the LAO.

The LAO, by using an LLC, is therefore an attempt to limit the liability of its token holders and set out the relationship between the members as well as provide for more efficient tax treatment.

Second, the US Securities and Exchange Commission (SEC) found that The DAO's tokens were securities and federal securities law applied.¹⁶¹³ To mitigate against a finding that The LAO's tokens are securities, membership of the LAO was limited to accredited investors.¹⁶¹⁴ The MCV too is limited to

¹⁶⁰⁶ The LAO, 'The LAO: A For-Profit, Limited Liability Autonomous Organization', 4 September 2019, Medium <<https://medium.com/openlawofficial/the-lao-a-for-profit-limited-liability-autonomous-organization-9eae89c9669c>>.

¹⁶⁰⁷ William Foxley, 'OpenLaw Launches First 'Legal DAO' for Distributed VC Investments', *CoinDesk* (29 April 2020) <<https://www.coindesk.com/openlaw-launches-first-legal-dao-for-distributed-vc-investments>>.

¹⁶⁰⁸ The LAO, 'The LAO' (n 1606).

¹⁶⁰⁹ See Jentzsch (n 25), where no legal structure was mentioned.

¹⁶¹⁰ Zetzsche, Buckley and Arner (n 39) 1399.

¹⁶¹¹ The LAO, 'The LAO' (n 1606).

¹⁶¹² *Ibid.*

¹⁶¹³ *Ibid.*, and see Securities and Exchange Commission, *Report of Investigation Pursuant to Section 21(a) of the Securities Exchange Act of 1934: The DAO* (25 July 2017 <<https://www.sec.gov/litigation/investreport/34-81207.pdf>>.

¹⁶¹⁴ The LAO, 'The LAO' (n 1606).

accredited investors only.¹⁶¹⁵ To be an accredited investor a person must have a relatively high net worth, income or have sufficient professional knowledge.¹⁶¹⁶ While it is not clear whether LAO and MCV tokens are securities,¹⁶¹⁷ and the issue of whether DAO tokens are securities is beyond the scope of this chapter and thesis, they may well be as both the LAO and MVC are akin to VC investment funds.¹⁶¹⁸ Notwithstanding that the rules over who is eligible as an accredited investor in the United States were widened in 2020 to take knowledge and not simply assets into account,¹⁶¹⁹ the accredited investor rules still exclude most people.¹⁶²⁰ Therefore, the majority of people will not be eligible to become members of such DAOs. Therefore, the requirement that LAO and MCV members must be accredited investors would limit the utility of the LAO and MCV to be used as model LLC structures.

The LLC is not a perfect vehicle for DAOs due to its limitations. First, while a DAO's members would not be personally liable for the LLC's debts, those members may still be liable for their own torts, for example, if a member coded a smart contract negligently.¹⁶²¹ Second, even if a shareholders' agreement allows a board of directors to be dispensed with, there must be at least one shareholder who is a natural person.¹⁶²² Third, registering a DAO as an LLC is not definitive as that registration may

¹⁶¹⁵ Ibid.

¹⁶¹⁶ 17 CFR 230.501. To be an accredited investor a person must satisfy one of the following conditions: an annual income of at least USD200,000 (or USD300,000 if combined with a spouse's income); be worth more than USD1 million, excluding the value of their primary residence; or is a 'knowledgeable employee' of certain investment funds or holds a certain licence, see E Napoletano and John Schmidt, 'What is an Accredited Investor?', *Forbes* (24 September 2020) <<https://www.forbes.com/advisor/investing/what-is-accredited-investor/>>.

¹⁶¹⁷ The LAO, 'The LAO' (n 1606).

¹⁶¹⁸ Whether a DAO's tokens are a security depends upon the jurisdiction and a number of factors, see generally, Securities and Exchange Commission, 'Report of Investigation Pursuant to Section 21(a) of the Securities Exchange Act of 1934' (n 1613); Philipp Hacker and Chris Thomale, 'The Crypto-security: Initial Coin Offerings and EU Securities Regulation in Fiduciaries' in Philipp Hacker et al (eds), *Public Blockchains, in Regulating Blockchain: Techno-social and Legal Challenges* (Oxford University Press, 2019) 229; and Emily Fry, 'Blockchain Innovation and Securities Regulation: An Analysis of Initial Coin Offerings under the Financial Markets Conduct Act 2013' (LLB Honours Dissertation, University of Otago, October 2017) <<https://www.otago.ac.nz/law/research/otago698328.pdf>>.

¹⁶¹⁹ Taylor Tepper, 'SEC Rule Change Gives More People Access to Riskier Investments', *Forbes* (27 August 2020) <<https://www.forbes.com/sites/advisor/2020/08/27/sec-definition-change-accredited-investor/?sh=654ca7b31543>>.

¹⁶²⁰ Prior to the expansion of accredited investors to include those with sufficient knowledge, the SEC estimated that only 13 percent of US households would meet the accredited investor test, Jess Thomas, 'Redefining Accredited Investor: That's One Small Step for the SEC, One Giant Leap for Our Economy' (2020) 9(2) *Michigan Business & Entrepreneurial Law Review* 175, 178.

¹⁶²¹ Reyes, 'If Rockefeller Were a Coder' (n 1417) 400 citing Bayern (n 1573) 1499.

¹⁶²² Reyes, 'If Rockefeller Were a Coder' (n 1417) 401.

be revoked. For example, in Delaware, the Attorney General can initiate proceedings in a court to cancel an LLC's certificate for 'abuse or misuse of its limited liability company powers, privileges or existence'.¹⁶²³ Fourth, unless the creators of a DAO are using the services of an entity which offers LLC-as-a-service, the cost of creating an LLC operating agreement can be high because DAOs would be required to formulate their own LLC operating agreement. Finally, while the LLC may work for some for-profit DAOs they may not work as well as for non-profit DAOs.¹⁶²⁴ Indeed, as we have seen, other DAOs have used different structures, such as foundations.

Despite their limitations, of all the legal structures analysed so far, LLCs offer the most suitable legal structure for for-profit DAOs. Indeed, as will be seen below, Wyoming has created a sui generis structure for DAOs using its framework.¹⁶²⁵

6.3.6 Unincorporated Non-profit Associations (United States)

An unincorporated non-profit association in many US states is able to hold property, enter into contracts and sue and be sued, if that state has adopted the Uniform Unincorporated Nonprofit Association Act¹⁶²⁶ or the Revised Uniform Unincorporated Nonprofit Association Act.¹⁶²⁷ Also, in effect, its members have limited liability.¹⁶²⁸ For states that have adopted the Uniform Unincorporated Nonprofit Association Act, the unincorporated non-profit is treated as a legal entity for some purposes, although not for all.¹⁶²⁹ Under the Revised Uniform Unincorporated Nonprofit Association Act, which has been adopted by some states, an unincorporated non-profit is a separate legal

¹⁶²³ For, example, Delaware Limited Liability Company Act § 18-112.

¹⁶²⁴ Some US states allow not-for-profits to register as LLCs, Miller, 'Doctoring the Law of Nonprofit Associations with a Band-Aid or a Body Cast' (n 1512) 853.

¹⁶²⁵ See 6.4.3 below.

¹⁶²⁶ See generally Wyoming 17-22-104(a) and 17-22-106(a).

¹⁶²⁷ The Revised Uniform Unincorporated Nonprofit Association Act has not yet been widely adopted by US states, see Alexis Logsdon, 'Legal Guidelines for Starting and Running Your Nonprofit Organization' *Mission Box* (31 January 2020) <<https://www.missionbox.com/article/112/legal-guidelines-for-starting-and-running-your-nonprofit-organization>>.

¹⁶²⁸ Miller, 'Doctoring the Law of Nonprofit Associations with a Band-Aid or a Body Cast' (n 1512) 871.

¹⁶²⁹ Ibid 859.

entity.¹⁶³⁰ The ability to register unincorporated non-profit associations in US states avoids the problems associated with unincorporated societies in Australia, New Zealand and the UK, namely the inability to hold property, enter into contracts and sue and be sued, and the potential liability of members for the debts and wrongs of the society or association.

A not-for-profit DAO could register as an unincorporated non-profit association in a US state. LexDAO,¹⁶³¹ an association for legal engineering professionals, has organised itself as an unincorporated non-profit association in Wyoming.¹⁶³² LexDAO's constitution sets out its rules.¹⁶³³ A person must apply for membership, but unlike Moloch, there is no vote of the members, and applications can be admitted or denied for any reason.¹⁶³⁴ LexDAO's constitution provides that it is governed through its smart contracts.¹⁶³⁵

In addition to using single legal structures, a combination of structures can be used to operate a DAO as the Dash DAO shows next.

6.3.7 Combination of Structures

As the preceding sections have demonstrated, there are a variety of legal structures that DAOs could use, or as with the DAA, variations on existing legal structures could be devised. Alternatively, instead of a DAO adopting one legal structure, it could use a combination of structures, which may not be registered or formed in the same jurisdiction. The Dash DAO, for example, uses four entities in its operations, as Figure 6.1 shows.

¹⁶³⁰ Ibid 871.

¹⁶³¹ <<https://www.lexdao.coop/>>.

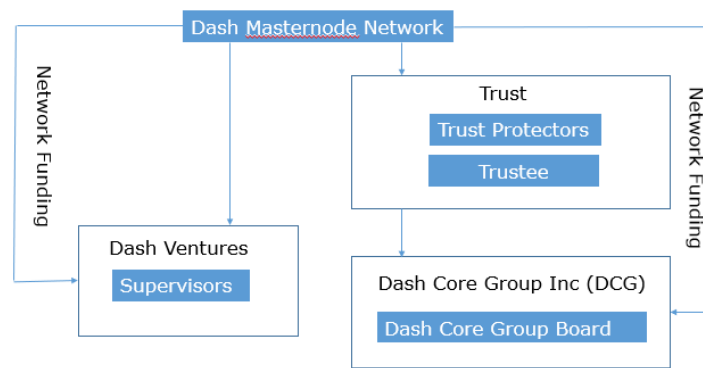
¹⁶³² Kerpleman (n 1537). See also MetaMedia, 'Legal Wrappers for DAOs with Adam & Ross of LexDAO' (YouTube, 6 August 2020) <https://www.youtube.com/watch?v=pCBL0X4ideA&feature=emb_err_woyt>.

¹⁶³³ LexDAO, 'LexDAO Constitution Information', *GitHub* <<https://github.com/lexDAO/LexDAO-Constitution>>.

¹⁶³⁴ Ibid cl 2.2.

¹⁶³⁵ Ibid cl 2.3.

Figure 6.1: The Dash DAO's Combined Legal Structures¹⁶³⁶



The first entity comprises the Dash DAO's masternode network, which is in effect an unincorporated society.¹⁶³⁷ Thus not all of the Dash DAO's token holders are members of that society. However, any person or entity can become a masternode if they stake 1,000 Dash tokens and operate the necessary specialised computer equipment or contract with a third party to provide those services.¹⁶³⁸ The identities of some, but not all, masternodes are known.¹⁶³⁹

The second is Dash Core Group (DCG), a C-corp established in Delaware.¹⁶⁴⁰ The DCG's internal operations are organised like a traditional hierarchical organisation.¹⁶⁴¹ Originally the DCG was structured as an Arizona non-profit organisation (a trade association); however, the trade association's legal structure was found to be unsuitable because if the DCG received donations over a certain threshold it needed to identify the donors in filings.¹⁶⁴² The trade association was also limited as it was unable to lobby government agencies and politicians.¹⁶⁴³ DCG carries out most of the Dash DAO's

¹⁶³⁶ Figure 6.1 has been adapted from Taylor, 'Dash Core Group Legal Structure Details' (n 46).

¹⁶³⁷ Taylor, 'Dash Core Group Legal Structure Details' (n 46).

¹⁶³⁸ Szilard (n 1014).

¹⁶³⁹ Cali Haan, 'Maintainer of Dash Cryptocurrency "Masternode" Allegedly Disappeared with Funds', *Crowdfund Insider* (3 December 2019) <<https://www.crowdfundinsider.com/2019/12/154778-maintainer-of-dash-cryptocurrency-masternode-allegedly-disappeared-with-funds/>>.

¹⁶⁴⁰ Taylor, 'Dash Core Group Legal Structure Details' (n 46).

¹⁶⁴¹ Rachel McIntosh, 'Dash Core CEO Ryan Taylor on Decentralization & the Future of Crypto Usage', *Finance Magnates* (6 September 2020) <<https://www.financemagnates.com/cryptocurrency/news/dash-core-ceo-ryan-taylor-on-decentralization-the-future-of-crypto-usage/>>.

¹⁶⁴² Taylor, 'Dash Core Group Legal Structure Details' (n 46).

¹⁶⁴³ Ibid.

development work,¹⁶⁴⁴ thus if the work performed by DCG was faulty and caused loss, DCG would be the entity liable and not the masternodes as an unincorporated entity.

Third is a trust, the Dash DAO Irrevocable Trust, established in New Zealand. The masternodes are the trust's beneficiaries.¹⁶⁴⁵ The trust owns all DCG's shares and as such controls DCG's board of directors.¹⁶⁴⁶ Unlike in Reye's conception of a business trust,¹⁶⁴⁷ the trustee in the Dash trust has no ability to direct the decisions made by the Dash DAO. Thus while the DCG is structured like a traditional hierarchical organisation, its shares are owned by the Dash trust rather than DCG's shareholders.¹⁶⁴⁸ The Dash DAO has limited the centralising effects of a trust because the trustee, who administers the trust, acts on the legal instructions of the trust protectors.¹⁶⁴⁹ Therefore, those trust protectors dictate what the trustee can and cannot do and can replace the trustee.¹⁶⁵⁰ The trust protectors, in turn, are elected annually by the masternodes.¹⁶⁵¹

At first, the use of a trust would appear to be a weakness in the Dash DAO's structure. The trustee holds the legal title and thus owns the trust property. They could potentially sell or transfer the trust's assets to a third party and that third party is able to retain those assets if it paid the market price and did not realise or had no reason to know the assets were transferred in breach of trust.¹⁶⁵² However, in practice, the DCG owns few assets, the masternode network votes on what work is to be done for the Dash DAO, and DCG is the main group that carries out such work. The masternodes also

¹⁶⁴⁴ The proposals for funding for the Dash DAO are listed on DashNexus <<https://app.dashnexus.org/proposals/leaderboard>>. Of the proposals listed as passing on 4 March 2021, DCG was to receive well over half of the requested Dash, 2,929 of 4,572. Of the remaining Dash, most was going to other entities for marketing and outreach activities.

¹⁶⁴⁵ McIntosh (n 1641). If the masternodes cease to exist because the Dash blockchain is no longer in operation, the International Red Cross is the secondary beneficiary, Taylor, 'Dash Core Group Legal Structure Details' (n 46).

¹⁶⁴⁶ Taylor, 'Dash Core Group Legal Structure Details' (n 46).

¹⁶⁴⁷ See Reyes, 'If Rockefeller Were a Coder' (n 1417) and above 6.3.4.

¹⁶⁴⁸ McIntosh (n 1641).

¹⁶⁴⁹ Ryan Taylor, 'Dash Network Elected Trust Protectors: Closing the Governance Loop', *Medium* (1 January 2019) <<https://blog.dash.org/dash-network-elected-trust-protectors-closing-the-governance-loop-4f07b46da03e>>.

¹⁶⁵⁰ Taylor, 'Dash Core Group Legal Structure Details' (n 46).

¹⁶⁵¹ Ibid. For the results of the 2020 trust protector election, Fernando Gutierrez, 'Results of The Dash DAO Irrevocable Trust Elections', *Dash Blog* (Blog Post, 5 May 2020) <<https://blog.dash.org/results-of-the-dash-dao-irrevocable-trust-elections-67109ae5e622>>.

¹⁶⁵² That is, the purchaser was a bona fide purchaser for value without notice, *Akers v Samba Financial Group* [2017] UKSC6 [83].

approve proposals for changes to the Dash DAO's smart contracts. The funding for the payments to DCG and others that put forward successful proposals for funding is created by the Dash blockchain each voting period and paid out to successful proposals. If surplus Dash tokens remain after the payments to successful proposals, that Dash is destroyed.¹⁶⁵³ Thus there is not a large treasury to exploit.

The Dash Investment Foundation (Dash Ventures), the fourth entity, is incorporated as a Cayman Islands foundation company limited by guarantee.¹⁶⁵⁴ The foundation allows for Dash to invest in profit-driven enterprises and to partner with others. The Dash masternodes elect six supervisors to oversee the foundation.¹⁶⁵⁵ While the supervisors make the key organisational and operational decisions, the foundation's directors must approve them.¹⁶⁵⁶ The directors and investment managers are responsible for the day-to-day operations.¹⁶⁵⁷

The use of the Dash trust is innovative and serves as an example of what can be achieved through combining a mix of different legal structures. There remain numerous points of centralisation in the Dash DAO's structure with the use of its trustee, trust protectors, supervisors, directors and investment managers; however, these arguably lie at the periphery of the Dash DAO and enable its token holders, including its masternodes, to maintain and operate the Dash blockchain. The DCG too is problematic. The Dash DAO could be considered as not conforming to the ideal of a DAO because one entity, the DCG, performs the majority of the work for the Dash DAO. In an ideal DAO, no single entity or person performs the majority of the work for the DAO. Yet, other people and entities are able to win work for the Dash DAO by making proposals and developing a reputation for the quality of their work. Also, by the trust owning the DCG's shares, any profits from the performance of the work can be returned to the DAO.

¹⁶⁵³ The technical term is 'burnt', see Red, 'Observations of the Dash Treasury DAO' (n 775).

¹⁶⁵⁴ Ryan Taylor, 'Introducing the Dash Investment Foundation', *Dash* (Blog Post, 10 May 2019) <<https://blog.dash.org/introducing-the-dash-investment-foundation-370cafcc48ee>>.

¹⁶⁵⁵ Ibid.

¹⁶⁵⁶ Ibid.

¹⁶⁵⁷ Ibid.

6.4 Legislatures Expressly Accommodating DAOs within Existing Legislation

This section looks at legislatures' attempts to modify their LLC legislation to make registering a DAO in their jurisdiction as an LLC more attractive. US states have been amongst the most active jurisdictions to accommodate DAOs, which carries on a tradition of courageous states 'try[ing] novel social and economic experiments without risk to the rest of the country'.¹⁶⁵⁸ Indeed, Wyoming was the first state to recognise LLCs¹⁶⁵⁹ and is one of the first to expressly permit DAOs to register as LLCs in its jurisdiction.¹⁶⁶⁰

This section begins by analysing the attempts of three US states — Delaware, Vermont and Wyoming — to accommodate DAOs within their LLC legislation. Those states have been analysed as they have chosen the LLC as the most appropriate legal structure for DAOs and they have used a broad range of methods to bring DAOs within their LLC legislation.¹⁶⁶¹

6.4.1 Delaware

Delaware has historically had attractive LLC laws, which enable a great deal of flexibility for LLC members.¹⁶⁶² Delaware amended its corporation statute in 2017 to enable any records administered to be stored on one or more distributed electronic networks or databases.¹⁶⁶³ Thus, Delaware, unlike Vermont and Wyoming, has not expressly recognised the registration of DAOs. Max Ganado et al argue that notwithstanding Delaware's modest step, registration in that state is likely to appeal to those who seek strong corporate protection and Delaware will learn from other states' experiences

¹⁶⁵⁸ *New State Ice Co v Liebmann* 285 US 262 (1932) [50], quoted by Max Ganado et al, 'Mapping the Future of Legal Personality', MIT Computational Law Report (20 November 2020) <<https://law.mit.edu/pub/mappingthefutureoflegalpersonality/release/1>>.

¹⁶⁵⁹ Wyoming Limited Liability Company Act, ch 158, 1977 Wyo. Sess. Laws 577 and see Hamill (n 94) 295.

¹⁶⁶⁰ See 6.4.3 below.

¹⁶⁶¹ Montana has been excluded from the analysis, despite an argument that Montana has attempted to accommodate DAOs by exempting utility tokens from securities law (Mont Code Ann. § 30-10-105), see Max Ganado et al, 'Mapping the Future of Legal Personality' (n 1658). Montana's move, however, is unlikely to be of assistance to DAOs as DAO tokens that carry voting rights will be considered governance tokens and not utility tokens.

¹⁶⁶² Nielsen (n 777) 1116.

¹⁶⁶³ 8 DE Code § 224 (2017), provided that the records could be converted into clearly legible paper form within a reasonable time.

and build upon its initial action.¹⁶⁶⁴ The cautious approach has already succeeded in part as The LAO has registered in Delaware.¹⁶⁶⁵

6.4.2 Vermont

Vermont has amended its LLC chapter¹⁶⁶⁶ to expressly include blockchain-based limited liability companies (BLLC).¹⁶⁶⁷ The text is short and reads:

Notwithstanding any provision of this chapter to the contrary:

- (1) A BLLC may provide for its governance, in whole or in part, through blockchain technology.
- (2) The operating agreement for a BLLC shall:
 - (A) provide a summary description of the mission or purpose of the BLLC;
 - (B) specify whether the decentralized consensus ledger or database utilized or enabled by the BLLC will be fully decentralized or partially decentralized and whether such ledger or database will be fully or partially public or private, including the extent of participants' access to information and read and write permissions with respect to protocols;
 - (C) adopt voting procedures, which may include smart contracts carried out on the blockchain technology, to address:
 - (i) proposals from managers, members, or other groups of participants in the BLLC for upgrades or modifications to software systems or protocols, or both;
 - (ii) other proposed changes to the BLLC operating agreement; or
 - (iii) any other matter of governance or activities within the purpose of the BLLC;

¹⁶⁶⁴ Max Ganado et al, 'Mapping the Future of Legal Personality' (n 1658).

¹⁶⁶⁵ Ibid.

¹⁶⁶⁶ 11 V.S.A. § 4173 (Subchapter 012: Blockchain-Based Limited Liability Companies, which is part of Chapter 025: Limited Liability Companies, which is part of Title 11: Corporations, Partnerships and Associations).

¹⁶⁶⁷ 11 VSA § 4173 and Higgins (n 113).

(D) adopt protocols to respond to system security breaches or other unauthorized actions that affect the integrity of the blockchain technology utilized by the BBLLC;

(E) provide how a person becomes a member of the BBLLC with an interest, which may be denominated in the form of units, shares of capital stock, or other forms of ownership or profit interests; and

(F) specify the rights and obligations of each group of participants within the BBLLC, including which participants shall be entitled to the rights and obligations of members and managers.

The BBLLC Act therefore amends Vermont's LLC legislation by expressly enabling an organisation to use its smart contracts for voting and thus governance. The BBLLC Act, however, is limited because it still envisages the use of managers. Notwithstanding the BBLLC Act's limitations, as at 21 March 2021, 19 domestic BBLLCs were registered.¹⁶⁶⁸ An advantage of Vermont's BBLLC is that foreign BBLLCs can be registered; therefore, it is not restricted to members residing in that state.

6.4.3 Wyoming

Wyoming recently passed the 'Wyoming Decentralised Autonomous Organizations Supplement' ('DAO Supplement') under Wyoming's Title 17 — Corporations, Partnerships and Associations.¹⁶⁶⁹ The DAO Supplement comes into effect on 1 July 2021 and recognises DAOs as a new type of LLC.¹⁶⁷⁰ The DAO Supplement is an 'AN ACT relating to corporations; providing for the formation and management of decentralized autonomous organizations; providing definitions; and providing for an effective date'. The DAO Supplement is more detailed than Vermont's BBLLC legislation.

¹⁶⁶⁸ 20 domestic BBLLCs had been registered, however, one has since been dissolved <<https://bizfilings.vermont.gov/online/BusinessInquire/>>.

¹⁶⁶⁹ WS 17-31-101–17-31-115.

¹⁶⁷⁰ Decentralized Autonomous Organizations, SF0038 (Wyoming, 2021) <<https://www.wyoleg.gov/Legislation/2021/SF0038>>.

The registered name for a DAO in Wyoming would require the use of one of the following terms — DAO, LAO or DAO LLC — to denote its status.¹⁶⁷¹ The requirement of an express term in the DAO's name is not a requirement in Vermont.¹⁶⁷² Requiring that a DAO expressly indicates that it is a DAO in its name is prudent as it would alert potential members and third parties of its status as a DAO without the need to perform a search of Vermont's business entities.¹⁶⁷³

Wyoming's DAO Supplement defines a 'decentralised autonomous organisation' as a 'limited liability company organized under this chapter'.¹⁶⁷⁴ Therefore, the DAO Supplement is not a sui generis statute: the Wyoming Limited Liability Company Act¹⁶⁷⁵ applies to DAOs to the extent that the Act is not inconsistent with the DAO Supplement.¹⁶⁷⁶ Two types of DAO are recognised: member operated and algorithmically managed.¹⁶⁷⁷ This thesis regards algorithmically managed DAOs as AI (artificial intelligence) DAOs.¹⁶⁷⁸ The DAO Supplement acknowledges that DAOs will be presumed to be member managed, unless the DAO's articles of organisation provide that it is algorithmically managed.¹⁶⁷⁹

The DAO Supplement requires that a DAO's articles of organisation and smart contracts,¹⁶⁸⁰ except as otherwise provided by the DAO Supplement, govern a broad range of things. They include: the relations between members and between members and the DAO;¹⁶⁸¹ the rights and duties of

¹⁶⁷¹ 17-31-104(d). The DAO Supplement defines a LAO (limited liability autonomous organisation) as a DAO, 17-31-102(a)(iv).

¹⁶⁷² Only three of the DAOs registered in Vermont as BBLLCs on 31 March 2021 included the term DAO in their names.

¹⁶⁷³ Vermont Secretary of State, Corporations Division <<https://bizfilings.vermont.gov/online/BusinessInquire>>.

¹⁶⁷⁴ 17-31-102(a)(ii).

¹⁶⁷⁵ 17-29-101-1105.

¹⁶⁷⁶ 17-31-103(a).

¹⁶⁷⁷ 17-31-104(e).

¹⁶⁷⁸ See above n 395 and accompanying text.

¹⁶⁷⁹ 17-31-104(e).

¹⁶⁸⁰ 17-31-102(a)(ix) defines a smart contract as an 'automated transaction, as defined in W.S. 40-21-102(a)(ii) ["a transaction conducted or performed, in whole or in part, by electronic means or electronic records, in which the acts or records of one (1) or both parties are not reviewed by an individual in the ordinary course in forming a contract, performing under an existing contract or fulfilling an obligation required by the transaction"], or any substantially similar analogue, which is comprised of code, script or programming language that executes the terms of an agreement and which may include taking custody of and transferring an asset, administering membership interest votes with respect to a decentralized autonomous organization or issuing executable instructions for these actions, based on the occurrence or nonoccurrence of specified conditions'.

¹⁶⁸¹ 17-31-106(c)(i).

members;¹⁶⁸² the DAO's activities and the conduct of those activities;¹⁶⁸³ the means and conditions for amending the DAO's operating agreement;¹⁶⁸⁴ the procedure for amending the DAO's articles of organisation;¹⁶⁸⁵ how membership interests are transferred and how members withdraw from the DAO;¹⁶⁸⁶ the procedures for amending, updating, editing or changing the DAO's smart contracts;¹⁶⁸⁷ and all other aspects of the DAO.¹⁶⁸⁸ The DAO's use of blockchain is therefore an essential part of the DAO Supplement. For example, members have no right to inspect or copy records if that information is available on a public blockchain.¹⁶⁸⁹

DAOs are permitted to have an operating agreement to supplement their articles of association and smart contracts.¹⁶⁹⁰ Thus the DAO Supplement recognises three things: the DAO's articles of organisation, and its smart contract and operating agreement. As with other entities registered in Wyoming, DAOs require a registered agent.¹⁶⁹¹ That agent need not be a natural person and could be a commercial registered agent.¹⁶⁹² The ability to use a commercial registered agent means a member would not need to be the DAO's registered agent, nor form the DAO.

The DAO Supplement would allow DAOs to be formed and operated in Wyoming for any lawful purpose and need not be for profit.¹⁶⁹³ However, in the United States the practical ability to have a not-for-profit LLC is reduced because all of its members must be not-for-profit entities, thus

¹⁶⁸² 17-31-106(c)(ii).

¹⁶⁸³ 17-31-106(c)(iii).

¹⁶⁸⁴ 17-31-106(c)(iv).

¹⁶⁸⁵ 17-31-106(c)(ix).

¹⁶⁸⁶ 17-31-106(c)(vi) and (vii).

¹⁶⁸⁷ 17-31-106(c)(x).

¹⁶⁸⁸ 17-31-106(c)(xi).

¹⁶⁸⁹ 17-31-112. The DAO Supplement uses the term 'open blockchain', which is defined in 17-31-102(a)(vii) as 'a blockchain as defined in W.S. 34-29-106(g)(i) that is publicly accessible and its ledger of transactions is transparent'.

¹⁶⁹⁰ 17-31-108.

¹⁶⁹¹ 17-31-105(b).

¹⁶⁹² 17-28-101(a)(D)(ii)(II), commercial registered agents provide services to at least 10 entities and have written agreements for the entities they represent.

¹⁶⁹³ 17-31-105(c).

natural people could not combine to create a not-for-profit LLC.¹⁶⁹⁴ That limitation stems from the US Inland Revenue Service's tax treatment for not-for-profit-organisations, and could be changed.¹⁶⁹⁵

The DAO Supplement appears to allow sophisticated voting schemes because the articles of organisation, the DAO's smart contract or operating agreement can provide for voting rights.¹⁶⁹⁶ If the DAO's smart contract or operating agreement do not provide for voting rights three default rules apply.¹⁶⁹⁷ First, membership assets and thus voting rights are calculated by dividing a member's contribution of digital assets to the DAO, divided by the total amount of digital assets contributed to the DAO at the time of a vote.¹⁶⁹⁸ Thus unless this rule is changed, only contributions in the form of digital assets are recognised, not other contributions to the DAO, such as performing work for a DAO.¹⁶⁹⁹ Digital assets are defined broadly as a representation of economic, proprietary or access rights that is stored in a computer-readable format.¹⁷⁰⁰ Second, if a member did not contribute digital assets to become a member, that member would possess one membership interest and be entitled to only one vote.¹⁷⁰¹ The ability to change these default rule is important as it would enable more sophisticated voting schemes. Third, a quorum would require at least a minimum of membership interests entitled to vote.¹⁷⁰² The ability to change this default rule is important because of the difficulty of ensuring that at least 50 percent of eligible votes are cast for any vote.¹⁷⁰³

In summary, LPs, LLPs, foundations and associations all have their limitations. A combination of structures may be possible as the Dash DAO shows; however, people are in designated roles, thus creating points of centralisation. LLCs are more promising for for-profit-DAOs as they, for example,

¹⁶⁹⁴ David S Walker, 'A Consideration of an LLC for a 501(c) (3) Nonprofit Organization' (2012) 38(2) *William Mitchell Law Review* 640, 640–641.

¹⁶⁹⁵ See generally, *ibid.*

¹⁶⁹⁶ 17-31-111(a)(i)–(iii).

¹⁶⁹⁷ *Ibid.*

¹⁶⁹⁸ 17-31-111(a)(i).

¹⁶⁹⁹ For the ill fit of this rule with some DAOs see generally Stratis, 'Different Ways to Distribute Reputation in a New DAO', *DAO Talk.org* (1 May 2019) <<https://daotalk.org/t/different-ways-to-distribute-reputation-in-a-new-dao/583>>.

¹⁷⁰⁰ Wyoming 34-29-101.

¹⁷⁰¹ 17-31-111(a)(ii).

¹⁷⁰² *Ibid.*

¹⁷⁰³ See above n 695 and accompanying text.

achieve limited liability for DAO members and allow DAOs to craft the DAO's operations. Of all the legal structures examined in this section, the most appropriate for DAOs are Wyoming's DAO Supplement (for-profit-DAOs) and registering an unincorporated non-profit association in some US states (for not-for-profit DAOs).

6.5 Malta's Sui Generis Framework

The legal wrappers used by DAOs are attempts to adapt the legal structures that have been designed for traditional hierarchical organisations. It is not simply a change from a 'paper-centred paradigm' to a 'digital centered paradigm';¹⁷⁰⁴ rather DAOs are utilising technology that allows their smart contracts to, for example, hold their property and not allow their members to act contrary to their rules.

It may be possible to create new legal structures or regulatory frameworks or both. In 2018 Malta created a new framework with its Innovative Technology Arrangements and Services Act 2018.¹⁷⁰⁵ The Act regulates innovative technology arrangements (ITAs), which include DAOs.¹⁷⁰⁶ In contrast to allowing people to register entities with minimal checking and oversight, the Maltese approach requires significant oversight and Malta has created a stand-alone regulator for ITAs.¹⁷⁰⁷ Applicants are required to apply to the Malta Digital Innovation Agency (MDIA) for certification of an ITA.¹⁷⁰⁸ For the MDIA to grant certification a registered systems auditor is required to perform an audit and review of the code¹⁷⁰⁹ and the DAO must have a registered technical administrator.¹⁷¹⁰ The latter

¹⁷⁰⁴ Ganado et al, 'Mapping the Future of Legal Personality' (n 1658) 23.

¹⁷⁰⁵ Innovative Technology Arrangements and Services Act 2018 (Malta) sch 1. See also Steve Tendon and Max Ganado, 'Legal Personality for Blockchains, DAOs and Smart Contracts' (2018) *Corporate Finance and Capital Markets Law Review* 1.

¹⁷⁰⁶ Innovative Technology Arrangements and Services Act 2018 (Malta) sch 1 cl 3 and see Malta Digital Innovation Agency, 'Innovative Technology Arrangements Guidelines', *Malta Digital Innovation Agency* (Web Page, 30 October 2018) <https://mdia.gov.mt/wp-content/uploads/2018/10/Innovative-Technology-Arrangements-Guidelines-30Oct2018_Final.pdf>. See also Ganado (n 1605).

¹⁷⁰⁷ Ellul et al (n 111) 217.

¹⁷⁰⁸ Innovative Technology Arrangements and Services Act 2018 (Malta) s 5.

¹⁷⁰⁹ *Ibid* s 8.

¹⁷¹⁰ *Ibid* s 8(c).

must have the ability to intervene to prevent a material loss to any user or material breach of the law.¹⁷¹¹

Malta's solution, however, is designed primarily for AI DAOs,¹⁷¹² and is not suitable for DAOs governed by people.¹⁷¹³ It does not appear as though any DAOs have been certified as ITAs. The primary limitation of Malta's solution for DAOs governed by people is that one person, the registered technical administrator, would have the unilateral ability to make changes to the DAO's code, which is something that DAOs' governance mechanisms are designed not to do. That is, no single person or entity is meant to control a DAO. Another limitation is that while changes to the code can be made,¹⁷¹⁴ those changes require the systems auditor to carry out the review and the technical administrator to review the changes and confirm they meet the required standard.¹⁷¹⁵ Thus, the DAO's governance structure may not work because proposed changes to the DAO's code that its token holders had agreed upon could be unilaterally rejected by the systems auditor or technical administrator.

6.6 Conclusion

This chapter has addressed three aims. The first aim was to analyse whether the application of partnership law and the law of unincorporated societies and associations (excluding unincorporated non-profit associations in the United States) to DAOs is suitable. The chapter found that such laws are a poor fit. The limitations include that the DAO would not be recognised as a legal entity and would be unable to enter into contracts by itself,¹⁷¹⁶ yet a member of the DAO as an agent of the partnership¹⁷¹⁷ could legally bind the DAO to contracts without the DAO's agreement, which would defeat much of

¹⁷¹¹ Ibid s 8(d)(iii).

¹⁷¹² Marlene Ronstedt and Andre Eggert, 'Among Blockchain-Friendly Jurisdictions, Malta Stands Out', *CoinDesk* (4 July 2018) <<https://www.coindesk.com/among-blockchain-friendly-jurisdictions-malta-stands-out>> 'the decisions are made and executed by artificial intelligence and smart contracts'.

¹⁷¹³ See generally Idlar Shakirov, 'Research on Decentralized Autonomous Organizations' (DAO)', *Medium* (30 September 2020) <<https://medium.com/gromorg/dao-research-42709eda6675>> who notes that the Maltese approach has been criticised by people in the DAO industry.

¹⁷¹⁴ Innovative Technology Arrangements and Services Act 2018 (Malta) s 12.

¹⁷¹⁵ Ibid s 12(2).

¹⁷¹⁶ If the intention of the DAO members is to create a profit, Partnership Law Act 2019 (NZ) s 8.

¹⁷¹⁷ Ibid s 17.

the purpose of the DAO. The treatment of DAOs as partnerships can have severe consequences for DAO members as they would be jointly liable for the DAO's debts.¹⁷¹⁸ For those DAOs treated as unincorporated societies, the DAO would also not be able to enter into contracts¹⁷¹⁹ and its members may be liable for the DAO's debts.¹⁷²⁰

The second aim was to analyse the experimentation and effectiveness in the legal structures of DAOs through the use of legal wrappers for DAOs. Of the legal structures used by DAOs the most successful appear to be LLCs and registration as unincorporated non-profit associations in the United States. A combination of legal structures, such as that created for the Dash DAO, is also possible, yet in adopting them the Dash DAO may have too many centralisation points.

The third aim of the chapter was to evaluate the deliberate invention by the Delaware, Vermont and Wyoming legislatures to accommodate DAOs within their LLC legislation. The legislative action clarifies that DAOs can be registered as DAOs in those jurisdictions. Of the three, Wyoming's legislation is the most wide-ranging. Malta's more transformational and progressive stance of creating an entirely new legal framework for ITAs, including DAOs, while ambitious, is designed for AI DAOs and not DAOs governed by people. In particular, the Maltese legislation requires that a technical administrator has the power to intervene and make changes in the DAO's operations. Thus, the Maltese framework is not suitable for DAOs governed by people.

¹⁷¹⁸ Ibid s 22.

¹⁷¹⁹ Cordery, Fowler and Morgan (n 41) 285.

¹⁷²⁰ Sims, 'Unincorporated Societies' (n 1511) 764.

Chapter Seven: Summary and Conclusion

*Regulation needs to catch up with innovation.*¹⁷²¹

7.1 Introduction

The DAO is an organisational form that uses blockchain technology.¹⁷²² The use of blockchain technology to impose *ex-ante* limitations, rather than *ex-post* monitoring and enforcement, enabled the creation of a new form of organisation that was not possible before the advent of blockchain. The first DAO appeared in 2014, and since then DAOs have seen sustained growth and different approaches towards governance, dispute resolution and their legal structures. Our understanding of organisational forms that use technology, such as DAOs, and the implications for governance, dispute resolution and legal structures is scant. Therefore, this thesis evaluates and provides recommendations on how DAOs should be governed, how to effectively resolve disputes and what legal structures are appropriate.

This thesis critically evaluates three interlinked themes through the lens of institutional cryptoeconomics (IC): DAO governance models, dispute resolution and legal structures for DAOs. The aim of the thesis is to:

1. analyse the effectiveness of DAOs' governance frameworks;
2. examine the emerging dispute resolution mechanisms and their methods for resolving disputes between members and third parties of a DAO, including the effectiveness of those dispute resolution mechanisms;
3. evaluate the extent to which DAOs could be accommodated within existing legal structures.

¹⁷²¹ James Quinn, 'Paulson to Tighten US Mortgage Regulation as Crisis Deepens', *The Telegraph* (13 March 2008) <<https://www.telegraph.co.uk/finance/newsbysector/banksandfinance/2785996/Paulson-to-tighten-US-mortgage-regulation-as-crisis-deepens.html>>.

¹⁷²² While DAOs currently use blockchain technology, or more accurately distributed ledger technology (DLT), another technology yet to be invented may also be used, see above n 379 and accompanying text.

7.2 Contribution

The contribution of this thesis, which uses IC as its methodological framework, is the examination of the interrelationships between three themes central to DAOs: governance, dispute resolution and legal structures. IC — the study of how blockchains interact with existing and future social institutions, including the shape of the firm — would appear to explain how blockchain can be used to shape the form of the firm and thereby create DAOs from a purely technological viewpoint. However, the thesis finds that because of human behaviour, the use of technology alone is not sufficient to transform the firm and create sustainable organisations. In other words, technology by itself is not a ‘silver bullet’ for solving governance issues. Instead, blockchain is used in combination with innovative governance designs to create ‘governance mechanisms’ designed to harness the benefits of decentralised human decision-making, whilst limiting its potentially destructive effects. IC, therefore, is not limited to pure technology and must take human psychology into account. The thesis’ findings have generated recommendations for policymakers and future research as well as the creators and participants of DAOs.

7.2.1 Governance

The first theme is governance. The thesis finds that there are a variety of approaches to DAO governance. DAOs exist along a continuum, from fully decentralised to partially centralised. Thus, blockchain’s interactions with social institutions and organisations and its ability to shape the firm have not resulted in the creation of a single, rigid, organisational shape. Because of the problems associated with full decentralisation, DAOs use a variety of governance mechanisms, which are a mix of new and old mechanisms, and governance in DAOs includes what traditionally would be thought of as operational decisions.

The finding that DAOs exist along a continuum contrasts with much of the literature and even the term ‘decentralised’. That literature depicts DAOs as fully decentralised organisations with no gatekeepers. According to this view, any person can acquire a DAO’s tokens. In turn, any token holder can propose a rule change or request funding (proposal), and token holders vote on each proposal

using a one token—one vote voting scheme.¹⁷²³ No managers or centralised bodies are required to propose and make decisions as the token holders are the sole decision-makers. Nor are managers required to oversee the implementation of the decisions as they are executed automatically via the DAO's smart contracts, which may or may not include an amendment to the DAO's smart contracts.

In practice, the promise of fully decentralised governance structures for DAOs is elusive and full decentralisation creates significant difficulties. Those difficulties include: the submission of too many proposals; no strategic oversight of proposals and no vetting of proposals, which can result in poor quality, malicious or accidentally harmful proposals. There is also the limitation of token holders' lack of time and skills when assessing the quality of proposals prior to voting. Thus, the pure application of blockchain does not solve governance issues, and IC must consider human behaviour.

DAOs use a variety of governance mechanisms: there is no one model governance framework for DAOs. The governance mechanisms are a mix of the old and the new: some have been gleaned and repurposed from traditional hierarchical organisations and institutions, with some reviving mechanisms stretching back to Ancient Greece. Innovative new mechanisms, made possible by technology, have also been created. Blockchain enables the implementation of governance mechanisms that were not possible before, or if they were possible, they were too expensive and difficult to implement widely. The mechanisms range along each stage of the proposal, voting and implementation processes.

The thesis finds that the governance mechanisms used by DAOs depend on many factors, again showing that blockchain's interactions with institutions and the ability to shape firms is not dictated solely by the technology. Those factors include: the time at which the DAO was created — while DAOs can evolve their governance mechanisms, older DAOs typically have less sophisticated governance mechanisms and more recent DAOs are likely to use centralised bodies such as councils; whether the DAO controls significant resources; the number of token holders; whether membership is

¹⁷²³ While it may be possible to use a one member—one vote voting scheme, so that each member has one vote, it is relatively easy for a person or entity to create multiple accounts. For a DAO to enable one member, one vote it will need to perform some type of KYC and, for example, imposing limitations on who can become a member of the DAO, which would mean it was no longer fully decentralised.

by application only; whether the founding team retains a significant element of control, for example, by owning a large percentage of the DAO's tokens; and whether on-chain governance is used.

Drawing on IC with its ledger-centred view and ability to shape firms, blockchain enables the transformation of governance. DAO governance is more expansive than governance in traditional hierarchical organisations where many decisions are operational and decided upon by managers. The evidence from the literature is that within DAOs there is no separation between traditional governance and operational decisions: both come under the umbrella of governance in DAOs.

Part of the governance role within traditional hierarchical organisations is the resolution of disputes. While the use of smart contracts is likely to reduce disputes, it will not remove them entirely. Unlike traditional hierarchical organisations, DAOs do not normally have a small group or groups within them to resolve disputes or have disputes resolved under their auspices. Thus, this thesis addresses dispute resolution for DAOs.

7.2.3. Dispute Resolution

The second theme is dispute resolution. The thesis finds that notwithstanding the use of smart contracts, disputes will still arise and while IC predicts that blockchain can change the ways in which disputes are resolved, technology itself is not the complete answer. The internal resolution of disputes within DAOs by selling tokens, making proposals or forking the DAO are blunt tools and unlikely to be sufficient to solve all disputes. Instead of DAOs creating their own decentralised internal dispute resolution mechanisms, independent external (DDRSs) are being created. Those DDSRs can be used to, amongst other things, resolve disputes concerning DAOs and also are using a wide range of dispute solution mechanisms. The effectiveness of the DDSRs will depend on whether national courts can hear appeals from their rulings.

The phrase '*code is law*', in relation to DAOs, means whatever is coded on a smart contract is correct, and as such, no disputes can arise. However, '*code as law*' cannot be taken literally. Disputes may arise for different reasons, including errors in code. An example of the limitations and ultimate rejection of '*code is law*' in certain circumstances was seen early in the development of DAOs when a

hacker exploited an error in The DAO's smart contracts, which, if permitted to stand, would have resulted in the hacker absconding with tokens worth millions of dollars.

IC would posit that the use of blockchain and its ability to shape the firm would also change how disputes are resolved, which has been borne out partially in the thesis. The literature identified three ways to resolve disputes: token holders can exit the DAO by selling their tokens;¹⁷²⁴ token holders can put forward proposals to resolve the dispute; or dissatisfied token holders can fork the DAO and create a new DAO. However, just as technology (blockchain) by itself does not explain fully how DAOs will be shaped because it fails to consider human psychology, the ongoing viability and substantiality of DAOs through the exclusive use of these three ways is unlikely to be sufficient. The forking option is a blunt tool and may splinter the community surrounding the DAO. Following the fork, one or even both DAOs may not have sufficient people engaged to continue successfully.

Nor will the three ways of resolving disputes cover all disputes relating to DAOs. As DAOs mature, they will likely provide goods and services to third parties and operate platforms for third parties to provide goods and services to others. Disputes may arise that are not covered by smart contracts, for example, a disagreement about the quality of work provided to a DAO by a third party. Thus, the need for dispute resolution is not confined to internal DAO disputes.

The requirement for dispute resolution is not unique to DAOs. Various institutions, including national courts, offer dispute resolution, however, those institutions, particularly the courts, have well-recognised limitations, including time, cost and, in relation to smart contracts, difficulty in identifying parties. Indeed, the release of the UK Jurisdiction Taskforce's Digital Dispute Resolution Rules (the UKJT Rules), which come under the auspices of the Law Society for England and Wales and are endorsed by the President of the Court of Appeals for England and Wales, for the resolution of disputes arising in the context of digital assets, smart contracts, blockchain and other new technologies is an acknowledgement that the existing institutions are not fit for purpose.

¹⁷²⁴ For Moloch DAOs, the DAO member would ragequit and leave the DAO by burning their shares and would receive their share of the funds held by the Moloch DAO, Soleimani et al (n 14).

The prediction that IC can be used to predict that blockchain will shape the way disputes are resolved was borne out as the thesis found that blockchain could be used to create DDRSs, a new form of dispute resolution. The DDRSs can be used to resolve disputes within DAOs, disputes between third parties and DAOs, and other blockchain and non-blockchain related disputes. The UKJT Rules recognise the value of DDRSs for resolving smart contract disputes.

Just as DAOs are using a broad range of governance mechanisms, DDRSs, which use humans as adjudicators, also employ a broad range of mechanisms to resolve disputes. Despite some DDRSs adopting the same terminology as traditional dispute resolution institutions, such as 'courts', the processes of such DDRSs are distinctly different to those of traditional courts.

The literature does not address the crucial question of whether national courts will abide by a DDRSs' ruling if one party attempts to appeal it. The thesis finds that courts should be excluded from hearing appeals from DDRSs because of the need for certainty for DAO token holders and others dealing with DAOs, that disputes will be resolved efficiently, and finality will be achieved quickly. On the other hand, if all the parties to a dispute wish to use a national court, they should be entitled to do so.

7.2.4 Legal Structures for DAOs

The third theme is legal structures for DAOs. While DDRSs are likely to be used for the majority of disputes concerning DAOs, if a DAO has not adopted a legal structure, not only may the DAO not be able to sue in its own right, individual token holders may be personally liable for simply participating in the DAO, for example, by voting or even simply owning the DAO's tokens. In addition, the level of a DAO's decentralisation and, therefore, its governance, can dictate the choice of legal structure, thus legal structures and governance are also interlinked. The thesis finds that while there is little thought in some DAOs to potential legal structures, the continued development of DAOs is reliant on DAOs adopting legal structures. Indeed, DAO creators have an increased focus on the adoption of legal structures. Moreover, jurisdictions are increasingly aware of the potential benefits of expressly

enabling the registration of DAOs in their jurisdictions and are amending legislation or even creating entirely new regulatory frameworks.

IC would predict that the ability of blockchain to enable changes to the shape of firms by changing governance mechanisms, including the way in which disputes are resolved, would require changes to legal structures to accommodate DAOs and their decentralised governance. That prediction has been borne out as the thesis finds that current legal structures are a poor fit for DAOs. A for-profit DAO that does not adopt a legal structure (use a legal wrapper) is likely to be treated as a partnership, which creates many problems. The DAO cannot enter contracts, own property, sue or be sued, not to mention the personal liability of their token holders. While for-profit DAOs can avoid some of the practical limitations of traditional partnerships, because they can hold property through their smart contracts, if DAOs wish to engage fully with the outside world they require independent legal recognition.

Not all creators and token holders, however, are concerned about creating legal structures. They see their DAOs as purely experimental vehicles with minimal resources they are prepared to lose. On the other hand, creators of DAOs who have recognised the problems of not expressly adopting a legal structure have used legal wrappers to acquire legal recognition and protection for their token holders. Those legal wrappers, which provide the DAO with a legal structure, include foundations, Swiss Associations, unincorporated non-profit associations,¹⁷²⁵ LLCs, and a combination of legal structures and other mechanisms.

The types of legal wrapper and thus legal structure depend on many factors, including the type of DAO, when the DAO's legal structure was formed, the desired decentralisation level of a DAO's governance, and the value of the DAO assets the DAO controls. A DAO's legal structure need not remain fixed: it can change as its governance changes; thus governance and legal structures are intertwined.

¹⁷²⁵ US states permit the registration of unincorporated non-profit associations; thus they are different from unincorporated societies and associations in jurisdictions such as New Zealand, Australia and the United Kingdom.

Some lawyers are creatively attempting to adapt existing legal structures, such as LLCs in the United States, and Associations in Switzerland, to accommodate DAOs; thus blockchain is influencing the shape of organisations. Indeed, some US states are amending their LLC legislation to recognise DAOs expressly, thus attempting to lure the registration of DAOs in their jurisdictions. An alternative strategy is to create from scratch a new legal structure for DAOs. Malta has implemented a bold legal framework for DAOs and other ITAs. Malta's legal framework, however, has been designed for AI DAOs (DAOs operated by algorithms) and is not suitable for DAOs as it requires that two people have considerable control over the actions of the DAO.

Because of the wide range of DAOs, using one legal structure for all DAOs even within a single jurisdiction is unworkable. The thesis finds that using different legal structures and modifying existing ones is the most prudent course given the developing nature of DAOs. Of the current legal structures, the most appropriate for for-profit DAOs is the Wyoming LLC and for not-for-profits it is registration as unincorporated non-profit associations in the United States. More ambitiously, a DAO could instead use a business trust where the smart contract is regarded as the trustee. However, such a move is fraught with risk: it is uncertain whether a court would uphold such a structure.¹⁷²⁶

Not all jurisdictions will need to modify their laws or create new legal frameworks because, as with other legal entities, a DAO can register in one jurisdiction, and other jurisdictions will recognise it.

7.3 Practical Implications and Policy Recommendations

DAOs are a fast-growing organisational form, with some controlling many millions of dollars' worth of assets.¹⁷²⁷ Thus, DAOs require and deserve serious attention. In addition, their governance mechanisms need not be restricted to use within DAOs and can be used within traditional hierarchical organisations, even if it is just to lower transaction costs within those organisations.

¹⁷²⁶ The preceding section on dispute resolution relates to disputes voluntarily entered into with the DAO. Tortious claims, for example, would only be heard by a DDRS if the plaintiff agreed for a dispute to be heard by a DDRS.

¹⁷²⁷ On 30 March 2021 DeepDAO, a DAO tracker, which tracks the top performing DAOs, estimated that the combined assets under management of the 108 DAOs it tracks was USD879 million <<http://deepdao.world/#/deepdao/dashboard>>.

This thesis' critique of the different governance mechanisms used and proposed for DAOs will be of use for those creating DAOs, token holders and potential token holders, third parties dealing with DAOs and policymakers who will need to understand this new organisational form. As one interviewee observed, 'if we tried to explain to a regulator what a DAO is it would go so far above their head'.¹⁷²⁸

For DDRSs to resolve disputes effectively it will be necessary to exclude courts from hearing appeals from DDRSs unless all the parties to the dispute agree to such an appeal. The first step in the exclusion of the courts is for people and organisations entering into smart contracts that involve DAOs to clearly state in the smart contract and in the wet contract if there is one, that all disputes arising from it are to be decided by a specific DDRS and its ruling is final. Depending on the DDRS, it is possible to include code in the smart contract to halt it and assign the dispute to the DDRS for resolution. There should also be a statement that an alternative DDRS can be used if all the parties agree. In addition, the parties can agree to have a national court hear the dispute if required, for example: if the specified DDRS is no longer operational; if, due to the quantum involved, all the parties agree that the courts are the most appropriate forum; or if all the parties to the dispute wish to appeal the DDRS' ruling.

However, the first step will not necessarily prevent a court from hearing an appeal from a DDRS' ruling as the courts can ignore the initial parties' agreement. The second step is to amend each court's rules to limit the court's jurisdiction and exclude it from hearing appeals from DDRSs. In practice, this is cumbersome, and few jurisdictions are likely to agree to carry out such amendments. The following could be inserted in the relevant court rules:

If parties to a smart contract agree that any disputes arising out of it will be decided exclusively by a specified decentralised dispute resolution service, the court shall have no jurisdiction to hear the dispute or any appeals from the dispute resolution service's ruling. If the agreement is in a smart contract, the parties' use of that smart contract is deemed to be an agreement for

¹⁷²⁸ Interviewee 7 (consultant).

the specified dispute resolution service's exclusive jurisdiction over the dispute.

Notwithstanding an agreement that a dispute resolution service has exclusive jurisdiction for disputes arising out of the smart contract, the parties can agree that the court can hear the appeal.

Such wording would not be limited to DAOs; it could be used for any smart contract, the usage of which is expected to rise.¹⁷²⁹

The analysis of legal structures demonstrates that DAO token holders can face considerable liability if the DAO has not adopted a legal structure. Creators have a choice of legal structures, which will often require registration in a foreign jurisdiction. This thesis recommends registering for-profit DAOs as LLCs in the United States and not-for-profit DAOs as non-profit associations in the United States.

Policymakers should keep abreast of the developments in DAOs and legal structures for DAOs and start to amend or develop their own jurisdiction's legal structures to attract DAOs to register in their jurisdictions. Malta's law regulating ITAs, which includes DAOs, should not be adopted by other jurisdictions because it is designed for AI DAOs.

So that third parties realise they are dealing with a DAO, if the DAO is registered as a legal structure, the entity's name should include the term 'DAO'.

7.4 Limitations of the Research and Recommendations for Future Research

The thesis is confined to DAOs governed by people and does not cover AI DAOs. There are currently many DAOs governed by people and few, if any, AI DAOs. Other limitations are that the thesis focuses on New Zealand and countries with similar laws and institutions. The data were heavily reliant on the literature, with limited use of data, and there were a limited number of interviews. The disputes of

¹⁷²⁹ For example, the UK's Law Commission published a call for evidence on smart contracts in December 2020: 'To ensure that the jurisdiction of England and Wales remains a competitive choice for business, there is a compelling case for reviewing the current legal framework in England and Wales to ensure that it facilitates the use of smart contracts.'

only one DDRS, Kleros, were analysed, because at the time of analysis it was the only DDRS with sufficient disputes to analyse.

The thesis does not explore the creation of an international framework for DAOs that is jurisdiction independent, despite one interviewee raising this as a suggestion when they were asked whether changes in law were required to accommodate DAOs.¹⁷³⁰ The exploration of the creation of an international framework is excluded from the ambit of the thesis because it is not realistically feasible in the medium term that jurisdictions would agree to cede sovereignty in such a way.¹⁷³¹

There are many avenues for future research on the three themes of this thesis — DAO governance, dispute resolution and legal structures. In addition, and although it was outside the scope of this thesis, it is recommended that future work is conducted on the evolving nature and practice of AI DAOs as they will increase in number and importance.

Ongoing research is needed to evaluate whether fully decentralised governance mechanisms can be designed or whether DAOs will need to persist with their use of centralised bodies. If centralised bodies continue to be used, research is required to determine whether DAOs over time replicate delegative democracy with candidates running election campaigns and forming groups, akin to political parties. As DAOs increase in number and mature, there will be an abundance of data to use for this evaluation and analysis.

For dispute resolution, as more disputes are decided, there will be more data to analyse the effectiveness of the DDRSs, thus allowing for evaluation of the differences between different dispute resolution mechanisms. For example, are crowdsourced decisions from anonymous adjudicators a satisfactory method of resolving disputes, or does the use of vetted adjudicators result in better decision-making? Does the use of incentives and disincentives (the loss of tokens) influence

¹⁷³⁰ Interviewee 6 (consultant) who noted that a legal framework that is ‘jurisdiction independent [is required] because any other option makes it just way too complicated. You can’t expect every person that opens a DAO, which is equivalent to a Facebook group, to start considering jurisdiction implications in Kenya or wherever, or Europe, if they are from somewhere else. It is completely impracticable. So it has to be something that is digitally native and global’.

¹⁷³¹ Indeed, interviewee 10 (regulator), in relation to what changes in law and practice are required to accommodate DAOs, noted that even within one jurisdiction the seemingly simple issue of e-signing had still not been resolved in that interviewee’s jurisdiction. ‘Hand based signatures’ (also called ‘wet signatures’) were required for some legal processes, whereas others allowed for e-signing.

adjudicators' decision-making positively or is it affected negatively? Future research should also investigate the experiences of DDRSs' adjudicators and parties to disputes that have used DDRSs' services.

As DAOs increase in number and increasingly use legal wrappers, more research is required on the types of legal wrapper chosen and whether they influence the evolution of DAO governance. Research on jurisdictions' amendments to their laws and the creation of entirely new legal structures to accommodate DAOs will be an ongoing line of research.

Appendix A – Ethics Approval Letter

Macquarie Business School Subcommittee
Macquarie University, North Ryde
NSW 2109, Australia



17/06/2019

Dear Dr Selby,

Reference No: 5201950429217

Project ID: 5042

Title: Regulating DAOs (decentralised autonomous organisations) and DACs (decentralised autonomous corporations) that use DLT (distributed ledger technology) in New Zealand and Australia

Thank you for submitting the above application for ethical review. The Macquarie Business School Subcommittee has considered your application.

I am pleased to advise that ethical approval has been granted for this project to be conducted by Dr John Selby, and other personnel: Associate Professor Alexandra Sims, Dr Kay Chan.

This research meets the requirements set out in the National Statement on Ethical Conduct in Human Research 2007 (updated July 2018).

Standard Conditions of Approval:

1. Continuing compliance with the requirements of the National Statement, available from the following website:
<https://nhmrc.gov.au/about-us/publications/national-statement-ethical-conduct-human-research-2007-updated-2018>.
2. This approval is valid for five (5) years, subject to the submission of annual reports. Please submit your reports on the anniversary of the approval for this protocol. You will be sent an automatic reminder email one week from the due date to remind you of your reporting responsibilities.
3. All adverse events, including unforeseen events, which might affect the continued ethical acceptability of the project, must be reported to the subcommittee within 72 hours.
4. All proposed changes to the project and associated documents must be submitted to the subcommittee for review and approval before implementation. Changes can be made via the [Human Research Ethics Management System](#).

The HREC Terms of Reference and Standard Operating Procedures are available from the Research Services website:
<https://www.mq.edu.au/research/ethics-integrity-and-policies/ethics/human-ethics>.

It is the responsibility of the Chief Investigator to retain a copy of all documentation related to this project and to forward a copy of this approval letter to all personnel listed on the project.

Should you have any queries regarding your project, please contact the [Faculty Ethics Officer](#).

The Macquarie Business School Subcommittee wishes you every success in your research.

Yours sincerely,



Associate Professor Jana Bowden

Chair, Macquarie Business School Subcommittee

The Faculty Ethics Committees at Macquarie University operate in accordance with the National Statement on Ethical Conduct in Human Research 2007, (updated July 2018), [Section 5.2.22].

Appendix B – List of Interviewees

Thirteen semi-structured interviews were conducted with a range of DAO stakeholders from July to September 2019. Three interviews were excluded from the analysis because despite claims made online that the project the interviewee was involved in was a DAO or would be a DAO once launched, no DAO would be operating. Those projects were either pseudo DAOs¹⁷³² explanation of pseudo DAOs) or an entity that did not use blockchain and was controlled by a single person.

Interviewee No	Position/Role	Type of DAO	Operational (at time of interview)
1	Founder	Operating a blockchain	Yes
2	Founder	Running organisation on top of third party blockchain	Yes
3	Founder	Running organisation on top of third party blockchain	No
4	Working for a DAO ¹	Operating a blockchain	Yes
5	Consultant	Various	Yes and No ²
6	Consultant	Various	Yes and No ²
7	Consultant	Various	Yes and No ²
8	Consultant	Various	Yes and No ²
9	Regulator	N/A	N/A
10	Regulator	N/A	N/A

Table B.1 – Table of Interviewees

Notes:

¹ The interviewee was not a traditional employee, rather they were providing work to a DAO and being paid for that work

² A range of DAOs were being advised upon

¹⁷³² See above 3.3.2 for an explanation of pseudo DAOs.

Appendix C – Semi-Structured Interview Questions

Three slightly different sets of interview questions were used as the questions depended upon the role of the interviewee. The three different sets were for founders and “employees”, consultants who advised a number of DAOs and regulators. The follow up questions were used only if those questions had not been addressed in the primary question.

Founders/employees

1. What is your background in relation to decentralised autonomous organisations (DAOs)?

Follow up: what is your technical ability (if any) in coding?

2. What are your thoughts on distributed ledger technology (DLT) in general and what does decentralisation mean to you?

3. What has been your experience of laws and industry practices in the creation of your DAO?

Follow up: what laws/industry practices have been the greatest help and why?

Follow up: what laws/industry practices have been the biggest obstacles and why?

Follow up: if changes in law and practice are required to accommodate DAOs what would those changes be?

4. Why do you consider your project to be a DAO?

5. What is your business model?

Follow up: if your DAO uses a token, why is a token used?

Follow up: If your DAO does not use a token, why is a token not used?

Follow up: how will you judge whether the DAO has been a success?

6. Will the participants in the DAO be required to use a single identity and will that identity be required to match their real-world identity?

7. How has your DAO been funded or will be funded?

Follow up: if you had an initial coin offering (ICO) (or will be having an ICO) what factors drove (or will drive) where it took/takes place?

Follow up: were there limitations on who was or will be allowed to participate in your ICO, and if they were, what were the reasons for excluding people from participating in the ICO?

Follow up: if attempts were made to limit the number of tokens one person/entity could purchase in the DAO, ie through private sales, pre-sales, ICO etc, what mechanism was used to ensure a wide distribution?

Follow up: Have you used, or do you plan to use an airdrop and if so, how will it work?

8. Did you fork an existing DLT, base your code on an existing DLT or create a new DLT and what were your reasons for doing what you did?

Follow up: If your source code is not open source, why did you decide not to make it open source?

Follow up: is work being done by employees/contractors chosen by management, or do token holders vote in people/teams to do the work?

9. If you have partnered with another organisation to help create the DAO why did you chose to work with that organisation rather than going it alone?
10. Are token holders and/or miners making all the decisions on the operation of the DAO? If not what needs to occur for you to become a fully functioning DAO?
11. Only if tokens have been created - have you set aside tokens to distribute as incentives for people to use and contribute to the DAO and, if yes, how will those incentives work?
12. Does the structure (or proposed structure) of your DAO allow you to do things that would not be possible through using traditional structures, eg company with shareholders and management running the company reporting to a board?

Follow up: what can or are you able to do that could not be done using a traditional structure?

13. Do you think governance is important for DAOs and why do you think that way?
14. Has a governance system been created for your DAO (or is in the process of being created) and how will it work?
15. How do you intend to resolve disputes about how the DAO is governed/changes made to code?
16. How do you intend to resolve disputes between users of the DAO, eg if people selling goods/services to each other and there is a dispute such as the goods weren't as advertised?
17. Do you intend to use AI in your DAO in relation to decision making and if so, how will AI be used?
18. If you could make changes in the governance system of your DAO what would those changes be?
19. What are the benefits/disadvantages of a DAO running a regulator node?
20. What do you see as the future of DAOs?

Follow up: what does your ideal future of DAOs look like and how can it be achieved.

Follow up: what would be your nightmare future in relation to DAOs and what steps do you think need to be taken to attempt to prevent that future playing out?

21. Where do you get your information on DLT from and what are the most important and least important sources of information for you and why?

Follow up: how useful/influential have academics writing/speaking in the area of DAOs/DLT been for you and what type(s) of media that they have used have been the most useful?

22. Any other comments on DAOs

Consultants

1. What is your background in relation to decentralised autonomous organisations (DAOs)?

Follow up: what is your technical ability (if any) in coding?

2. What are your thoughts on distributed ledger technology DLT in general and what does decentralisation mean to you?

3. What has been your experience of laws and industry practices in creating DAOs?
 - Follow up: what laws/industry practices have been the greatest help and why?
 - Follow up: what laws/industry practices have been the biggest obstacles and why?
 - Follow up: if changes in law and practice are required to accommodate DAOs what would those changes be?
4. Do you consider any of the projects you have consulted on to be DAOs?
5. What were the business models of those DAOs?
 - Follow up: if the DAOs use a token, why is a token used?
 - Follow up: If the DAOs do not use a token, why is a token not used?
 - Follow up: how will you judge whether the DAOs have been a success?
6. Will the participants in the DAO you have consulted on be required to use a single identity and will that identity be required to match their real-world identity?
7. How have the DAOs been funded or will be funded?
 - Follow up: if the DAOs had an initial coin offering (“ICO”) (or will be having an ICO) what factors drove (or will drive) where it took/takes place?
 - Follow up: were there limitations on who was or will be allowed to participate in your ICO, and if they were, what were the reasons for excluding people from participating in the ICO?
 - Follow up: if attempts were made to limit the number of tokens one person/entity could purchase in the DAO, ie through private sales, pre-sales, ICO etc, what mechanisms were used to ensure a wide distribution?
 - Follow up: Have you used, or do you plan to use an airdrop and if so, how will it work?
8. Where existing DLTs forked, had their code based on an existing DLT or was a new DLT created and what were the reasons for the choice?
 - Follow up: If the source code is not open source, why was that choice made?
 - Follow up: is coding being done by employees/contractors chosen by management, or do token holders vote in people/teams to do the work?
9. If your clients have partnered with another organisation to help create their DAOs why was that decision made?
10. Are token holders and/or miners making all the decisions on the operation of the DAOs, if not what needs to occur for them to become fully functioning DAOs?
11. Only if tokens have been created – have tokens been set aside to distribute as incentives for people to use and contribute to the DAOs and, if yes, how will those incentives work?
12. Does the structure (or proposed structure) of DAOs allow things to be done that would not be possible through using traditional structures, eg company with shareholders and management running the company reporting to a board?
 - Follow up: what can be done that could not be done using a traditional structure?

13. Do you think that governance is important for DAOs and what why do you think that way?
14. Have governance systems been created for the DAOs you have consulted on (or are in the process of being created) and how will they work?
15. How do the DAOs intend to resolve disputes about how the DAO is governed/changes made to code?
16. How do the DAOs intend to resolve disputes between users of the DAO, eg if people selling goods/services to each other and there is a dispute such as the goods weren't as advertised?
17. Is it intended that AI will be used in DAOs in relation to decision making and if so, how will AI be used?
18. If you could make changes in the governance system of the DAOs you have advised on what would those changes be?
19. What are the benefits/disadvantages of a DAO running a regulator node?
20. What do you see as the future of DAOs?
 Follow up: what does your ideal future of DAOs look like and how can it be achieved.
 Follow up: what would be your nightmare future in relation to DAOs and what steps do you think need to be taken to attempt to prevent that future playing out?
21. Where do you get your information on DLT from and what are the most important and least important sources of information for you and why?
22. Any other comments on DAOs?

Regulators

1. What is your background in relation to decentralised autonomous organisations (DAOs)?
 Follow up: what is your technical ability (if any) in coding?
2. What are your thoughts on distributed ledger technology (DLT) in general and what does decentralisation mean to you?
3. What do you think are the features of a DAO?
4. What has been your experience of DAOs as a regulator?
5. What concerns, if any, does your government agency have that people from your country are deciding to do initial coin offerings ("ICOs") in another jurisdiction?
 Follow up: what steps, if any, are being taken to encourage ICOs to occur in your jurisdiction
 Follow up: (for those DAOs that are not using an ICO), what attempts, if any, are being taken to encourage DAOs to be set up in your jurisdiction?
6. What concerns, if any, does your government agency have that people based outside your country are allowing the citizens of your country to participate their ICOs?
7. What has been your experience of laws and industry practices in the creation of DAOs in your country?

Follow up: what laws/industry practices have been the greatest help in assisting the creation of DAOs and why?

Follow up: what laws/industry practices have been the biggest obstacles for the creation of DAOs and why?

Follow up: if changes in law and practice are required to accommodate DAOs what would those changes be?

8. Why do you think that people are setting up (or attempting to set up) DAOs rather than using conventional structures, such as companies?

9. Do you think that DAOs should be operated under conventional structures, such as companies, or do you think an argument can be made that either conventional structures need to be modified or a new legal structure created?

Follow up: if yes to modifications, what modifications are needed and why?

Follow up: if yes to new legal structure, what would it look like?

10. Explain why you think (or don't think) governance systems are important for DAOs?

11. What are the features of governance structures of DAOs that you think have a good chance of being successful and why?

12. What are the features of governance structures of DAOs that you think have been poorly thought out and why?

13. Why would it (or would it not be) desirable/important that parties retain the ability to go to national courts if there are disputes between participants in the DAO, both at a governance level and at a consumer level?

14. When should peoples' identities (single identity that matches their real-world identity) be known when participating in a DAO?

Follow up: what are the occasions, if any, where people should be allowed to be anonymous or pseudonymous when participating in a DAO?

15. How would you judge whether a DAO has been a success? ie can have a very high token price but no workable platform, or can have a low or even very low price with a lot of people using the platform.

16. There are various options for DLT, what are your thoughts on open source, permissioned blockchains and patents in DLT.

17. What are the benefits/disadvantages, if any, of a DAO running a regulator node?

18. What do you see as the future of DAOs?

Follow up: what does your ideal future of DAOs look like and how can it be achieved.

Follow up: what would be your nightmare future in relation to DAOs and what steps do you think need to be taken to attempt to prevent that future playing out?

19. Where do you get your information on DLT from and what are the most important and least important sources of information for you and why?

Follow up: how useful/influential have academics writing/speaking in the area of DAOs/DLT been for you and what type(s) of media that they have used have been the most useful?

20. Any other comments on DAOs.

Appendix D – Analysis of 30 Kleros Disputes

In August 2020 a random selection of 30 decided cases in Kleros was analysed. The website <random.org> was used to generate the case numbers (Kleros uses case numbers instead of case names) on 15 August 2020. The cases were (from oldest to more recent) 6, 27, 29, 37, 48, 57, 70, 76, 88, 100, 112, 114, 122, 128, 154, 161, 174, 180, 211, 212, 217, 233, 244, 255, 257, 260, 293, 301, 316 and 322. Cases that were still in progress were excluded from analysis. All the information that jurors see, including the evidence provided by parties, is accessible online, as are the voting results and any justifications provided.¹⁷³³

Because none of the cases analysed concerned disputes concerning DAOs, the analysis is not included in the body of the thesis. The information, however, is useful for general disputes and has therefore been included in this appendix.

The most common type of case was adding a token to Kleros' token curated list at 14 (46.6 percent). Cryptocurrency exchanges spend considerable amounts of time on due diligence of tokens to ensure that they are correct and not scams. If a person wants to add a token and someone else believes the token should not be added, the token can be challenged using the Kleros Court.¹⁷³⁴ The next most common case type was adding a story to Kleros Storytelling or DeversiFi Storytelling at 8 (26.6 percent).¹⁷³⁵ Kleros Storytelling or DeversiFi Storytelling were competitions which encouraged people to produce social media content and if their submissions met the requirements they shared a prize pool. If people did not think the standard was met, they could challenge the submission through the Kleros Court. There were two (6.6 percent) to determine whether a posting on social media was fake news. There was also one each (3.3 percent) for: removing a token from a token-curated list; whether a piece of art was a contemporary artwork; whether a Gitcoin grant was valid; whether a

¹⁷³³ However, one detail that was not always provided was the court that heard the dispute. Of the 30 cases analysed, the court details were not provided for eight cases; of those provided, two were in the General Court with the remainder in the TCR Court.

¹⁷³⁴ Frederico Ast, 'Tokens on Trial: Early Learnings About Decentralized Justice', *Kleros Blog* (Blog Post, 17 April 2019) <<https://blog.kleros.io/tokens-on-trial-some-early-learnings-about-decentralized-justice-this-is-what-were-learning-from-the-first-ever-community-driven-court/>>.

¹⁷³⁵ Ben Wilson, 'Create Content, tell a Story and Earn \$5000 in NEC Rewards!', *DeversiFi* (2020) <<https://blog.deversifi.com/story-telling-bounty/>>.

website was infringing copyright; and whether one particular news outlet was a reliable news media. Therefore, none of the analysed cases involved disputes between two parties and were rather challenging the actions of someone posting or attempting to post content online including the accuracy of such content.

Because all of the earliest 10 cases analysed related to adding a token to Kleros' token-curated list, it is possible that later cases are more likely to deal with disputes. There are, however, two reasons against this argument. First, as Table B.1 shows, of the more recent cases analysed, adding a story was the most common case, and the two most recent were for adding a token. Second, the 10 most recent cases, including cases that had not yet closed at the time of the analysis, were also looked at, and of those, four were for adding tokens¹⁷³⁶ and five related to storytelling.¹⁷³⁷ The remaining case did relate to a dispute, which was a dispute against Kleros for the payment of rewards.¹⁷³⁸ Thus the disputes analysed were relatively trivial, and there were no high-value disputes amongst those analysed.

Jurors are not required to provide justifications for their decisions in Kleros, but they can do so if they wish. Justifications are useful for parties to the dispute to see why a decision was made and for later jurors to see what the jurors' rationale was in arriving at their decision.¹⁷³⁹ Thus, the justifications are a type of precedent. Yet only in eight (26.6 percent) of the cases were justifications given.¹⁷⁴⁰ One improvement in Kleros' system could be to require each juror to provide a justification for their decision.

¹⁷³⁶ Cases 330, 335, 336 and 337.

¹⁷³⁷ Cases 329, 331, 332, 333 and 334. The 10th case did relate to a dispute, but it was a dispute against Kleros for the payment of rewards.

¹⁷³⁸ Case 328.

¹⁷³⁹ Vitello and Malbašić (n 1206).

¹⁷⁴⁰ For the early cases the justifications were not captured, Vitello and Malbašić (n 1206). The lack of capture did not, however, affect the percentage of justifications given. Excluding the earlier cases where the justifications were not captured resulted in the same percentage of just over a quarter of cases containing justifications (seven out of 21).

Case No.	Add token	Fake News	Remove token	Was artwork contemporary	Bitcoin grant valid?	Add story	Copyright infringement	Reliable news source	Round 2	Round 3	More than 3 jurors in first round	Unanimous in Round 1	Juror not voting	Justifications given	Applicant won/lost
6	x											x			Lost
27	x											x			Lost
29	x											x			Lost
37	x														Won
48	x														Won
57	x								x			x			Lost
70	x											x			Won
76	x												x		Lost
88	x												x		Lost
100	x											x		x	TCR
112		x										x		x	News False
114	x													x	Refused to arbitrate
122	x									x				x	Win
128			x										x		Win
154	x														Lost
161		x									x				News False
174				x							x				
180					x						x		x		
211						x							x		TCR
212							x						x		
217						x									
233						x						x			TCR
244						x						x			TCR
255						x						x			TCR
257						x						x			
260						x						x			
293						x				x		x		x	
301								x			x		x		General
316	x												x	x	TCR
322	x											x		x	TCR

Table D.1: Analysis of 30 Kleros Disputes

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