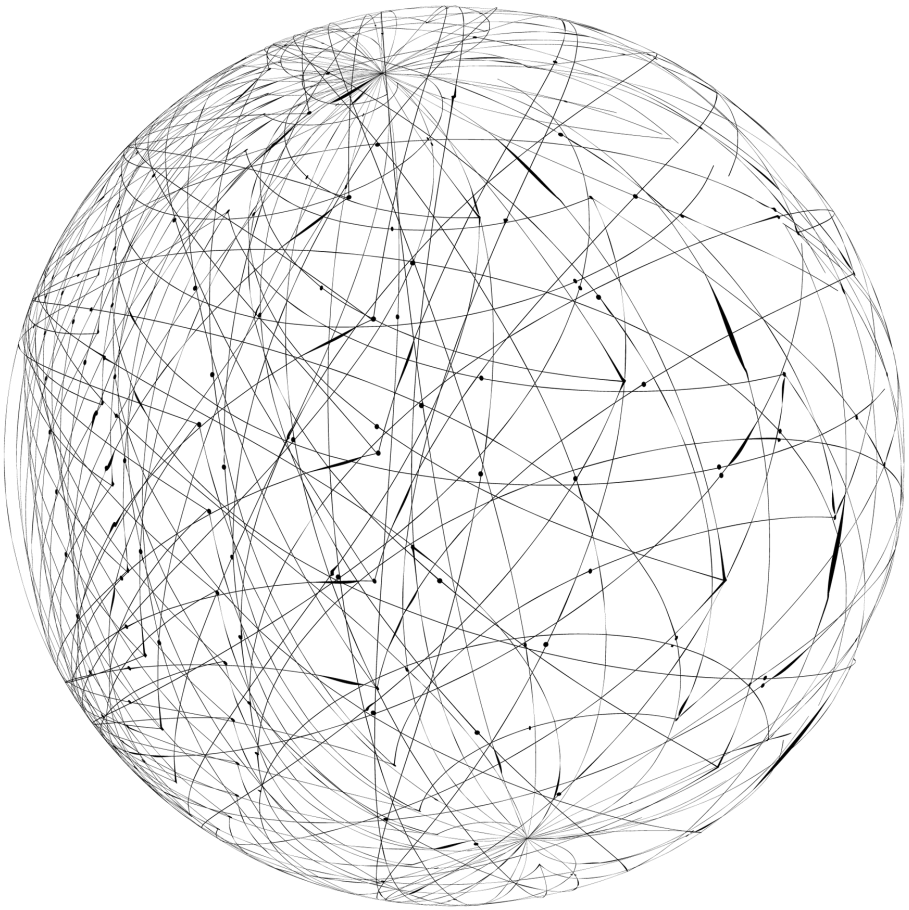
UNIVERSITY OF GOTHENBURG
SCHOOL OF BUSINESS, ECONOMICS AND LAW



Blockchain organizations

Decentralized autonomous organizations and the law

Master's thesis in Law, 30 higher education credits

Amanda Langwagen Elfström
Supervisor: Merima Bruncevic

Department of Law
University of Gothenburg
Gothenburg, Sweden 2018

Master's thesis 2018
30 higher education credits

Blockchain organizations

Decentralized autonomous organizations and the law

Amanda Langwagen Elfström

Supervisor: Merima Bruncevic

UNIVERSITY OF GOTHENBURG
SCHOOL OF BUSINESS, ECONOMICS AND LAW

Department of Law
University of Gothenburg
Gothenburg, Sweden 2018

Blockchain organizations
Decentralized autonomous organizations and the law
Amanda Langwagen Elfström

© AMANDA LANGWAGEN ELFSTRÖM, 2018.

Supervisor: Merima Bruncevic, Department of law

Master's Thesis 2018
Law
University of Gothenburg
SE-405 30 Gothenburg

Cover: Illustration by Giusy Difalco. Licensed under Creative Commons CC0.

Contents

Chapter 1

Background and problem

Where blockchains are known, it is mostly through Bitcoin and other cryptocurrencies, but the underlying technology can be used for various other applications. Ethereum is a blockchain developed with the purpose of being a base for creating new applications and areas of use for the technology.[1] Examples of what Ethereum has been used for so far range from various game applications to starting to put the Swedish land registry on the blockchain.[2]

One of the blockchain applications on Ethereum is called a decentralized autonomous organization (DAO). The first one to take off was the application created around 2016 called The DAO, which has the purpose of acting as a decentralized and democratic organization, where the decisions are made by the members themselves without the involvement of managers.[3] Even though this particular DAO is no longer active, the idea of having an organization that is not governed by a central authority has been used in building new DAOs and may be expected to remain popular.[4]

The DAO as a phenomenon has a few characteristics. As mentioned, it is not governed by a central authority, instead the decisions are made by the members in accordance with some pre-set rules. The rules are embedded in the underlying code of the DAO, so-called smart contracts. Another characteristic is that the DAO only exists in the virtual world of the blockchain. It has no physical office, the members make their actions where they are at the moment, and thus it does not seem to be bound to a specific national jurisdiction. All this gives the impression of the DAO being untouched by conventional regulation, but as Nathaniel Popper points out in an article in The New York Times "You can't code away your responsibilities".[5]

The uncertainty on how to treat DAOs in a national context causes various problems for the members of the DAO. An example of an issue is uncertainty regarding how the members get bound by agreements with external parties through the DAO: are they bound automatically or do they need to enter into agreements personally? Another problem is how liability is distributed among the members of the DAO. Depending on how the liability situation looks, the risks of participating in a DAO could vary greatly and make participation either very desirable or something that should be avoided.

There are several potential approaches to answering the question on how a DAO should be regarded from a legal perspective. On one hand, it claims to be an organization, so it could be viewed

[1] Buterin, Vitalik. A Next Generation Smart Contract & Decentralized Application Platform. 2013. p. 11 ff.

[2] Lantmäteriet. Lantmäteriet har tittat på blockkedjetekniken. 2016. From `https://www.lantmateriet.se/sv/Nyheter-pa-Lantmateriet/lantmateriet-har-tittat-pa-blockkedjetekniken/` (2018-05-13)

[3] Waterss, Richard. Automated company raises equivalent of $120M in digital currency. Financial Times. 2016. From: `https://www.cnbc.com/2016/05/17/automated-company-raises-equivalent-of-120-million-in-digital-currency.html` (2018-03-19)

[4] The website `stateofthedapps.com` currently (2018-03-15) has twelve projects under the DAO tag.

[5] Popper, Nathaniel. A Venture Fund With Plenty of Virtual Capital, but No Capitalist. The New York Times. New York. 2016

through various national laws on associations. This actualizes questions regarding where the DAO is physically situated and if the organization could be a legal person. On the other hand, the DAO could be seen as a set of contracts, thus actualizing contractual principles and highlighting the relationships surrounding the DAO.

A third view is to take a step back and ask if not the blockchain should be seen as something separate from national jurisdictions. This question requires a deeper understanding of what law is, how it is created and by whom. But if the answer is that the blockchain could be seen as a jurisdiction, some uncertainties for the members of a DAO can be removed and participating in one is more desirable.

This thesis will look at blockchains in general and DAOs in particular and try to bring some clarity to the issues laid out above.

Chapter 2

Purpose and method

2.1 Purpose

The purpose of this thesis is to compare the digital phenomenon referred to as decentralized autonomous organizations (DAOs) to national association law, with a starting point in Swedish law, and to make an argument around the de facto regulation of the DAO as an organization. The comparison will use the example case of the organization referred to simply as The DAO, and it will be focused on the consequences for the rights and liabilities of the members of The DAO in relation to third parties, and discuss what different legal perspectives on The DAO could mean for the members.

My research questions for this thesis are:

1. Does The DAO match any legal definitions in association law?
2. Could The DAO be defined in other ways than through association law, e.g. in the "jurisdiction of the blockchain" or as a contract?
3. What do the answers to the above mean for the personal liability of the members of The DAO in relation to third parties?

2.2 Method

In order to see how The DAO corresponds to various legal constructions, one first needs to know how The DAO is constructed. This thesis therefore first has to deal with The DAO itself, and then with the legal issues surrounding it.

2.2.1 Blockchain and The DAO

Chapters 3 and 4 consist of a description of what blockchain technology is and how The DAO is structured. Since both of these are relatively new phenomena, The DAO was created as late as in 2016, there is not much research literature on the topic. I have therefore had to seek information with other sources. In these chapters I have mostly relied on information from the whitepapers of the respective parts. These whitepapers often describe the essential parts of the technology and some background as to why the technology is relevant. To ensure that the information I use in this

thesis have credibility, I have cross-checked the information from the sources with each other, as well as with some other sources which are given credibility by other actors. If the same information appears in several sources, I have deemed it to be credible enough for the purpose of this thesis.

2.2.2 The DAO as an association or a contract

When comparing The DAO to legal constructions such as various associations and contractual structures, I have used a legal dogmatic method. Here, I have relied on legal texts and preparatory works to a large extent, and complemented this with legal doctrine.

In the comparison with associations, I have taken the starting point in the Swedish law on associations, such as the Partnership and Non-registered Partnership Act (1980:1102), the Companies Act (2005:51) and the Co-operative Societies Act (1987:667). I have supported the analysis in this part by using preparatory works and literature, to find the underlying purpose and logic of the law.

I have then used a comparative method for mapping out how The DAO would be treated internationally. Since the common and the civil law system value preparatory works differently I have focused my efforts on finding the relevant laws and then compared these to the Swedish legislation. Some previous comparative research have already been done in the area of European company law and laws on cooperative societies. I have relied on European Comparative Company Law by Andenas et.al.[1] and International Handbook of Cooperative Law by Cracogna et.al[2] for guidance on where to find the rules in these areas.

When analyzing The DAO from the perspective of contracts, I have mainly used the general contractual principle of freedom of contract, which is the same almost everywhere. The analysis should therefore be valid for most jurisdictions across the globe.

2.2.3 Blockchain as a jurisdiction

Chapter 7 analyzes The DAO, and blockchain in general, from more of a philosophy of law perspective. For this I have used the so-called legal constructivist approach. When I talk about legal constructivism I join the understanding of Glavå and Petrusson in Illusionen om rätten! – juristprofessionen och ansvaret för rättskonstruktionerna.[3] Here they propose that the role of lawyers is to deconstruct the law, as well as design it.[4] This means that to see if the blockchain could work as a jurisdiction I have deconstructed what it means to be a jurisdiction and tried to find some crucial components of the concept. I have then applied those components to the blockchain in a process of designing an understanding of the law. I believe that the law is not simply something that can be found but an ongoing process of creation.

The latter perspective is also supported by Jannice Käll in her doctoral thesis - Converging Human and Digital Bodies.[5] I have used this work for analysing where the law can be found in a digital context and how one can distinguish entities on the blockchain from each other when they do not exist in the physical world. I have further used the theories and reasonings of Bruno Latour

[1] Andenas, Mads and Woolridge, Frank European Comparative Company Law. Cambridge University Press. Cambridge. 2009

[2] Cracogna, Dante. Fici, Antonio and Henrÿ, Hagen." International Handbook of Cooperative Law. Springer, Berlin, Heidelberg. 2013

[3] Glavå, Mats and Petrusson, Ulf. Illusionen om rätten! – juristprofessionen och ansvaret för rättskonstruktionerna. Askeland, B & Bernt, J.F. (eds.), Erkjennelse og engasjement : minnesseminar for David Roland Doublet [1954-2000] Fagbokforlaget, Bergen. 2002

[4] ibid. p. 23 ff.

[5] Käll, Jannice. Converging Human and Digital Bodies - Posthumanism, Property, Law. Juridiska institutionens skriftserie, School of Business, Economics and Law. 2017

in Reassembling the Social - An Introduction to Actor Network Theory[6] for discussing digital boundaries or borders, since these are relevant concepts when discussing jurisdictions. Finally, I have used the writings of Lawrence Lessig in Code: Version 2.0[7] for the discussion on how we could see code as a form of law, and how that impacts the blockchain.

[6] Latour, Bruno. Reassembling the Social, An Introduction to Actor-Network-Theory. Oxford University Press. New York. 2005

[7] Lessig, Lawrence. Code: Version 2.0. Basic Books. New York. 2006

2.3 Disposition

Chapter 1 gives a short background to the subject of the thesis and hopefully helps the reader determine if one should continue reading the full text.

Chapter 2 consists of the introduction to this thesis, such as the purpose and method used for the work.

Chapter 3 and 4 explain blockchain technology and The DAO. They are written for the reader without any previous knowledge on the subject. For the reader who is already knowledgable on blockchains and DAOs these chapters can be overlooked.

Chapter 5 analyses The DAO in the light of laws on association. It begins with a comparison between The DAO and Swedish legislation and continues with an international comparison. The latter takes its starting point in the conclusions from the comparison with Swedish law. The chapter also contains a section on partnership agreements in the form of smart contracts. It should be read in relation to section 3.2.1, which discusses smart contracts in a more general sense.

Chapter 6 breaks down The DAO into a set of contracts between the actors of the organization. It looks at the important aspects of these agreements and discusses how one could look at the normative space of smart contracts.

Chapter 7 discusses blockchain as a jurisdiction of its own and the question of whether one can claim that "code is law"? It connects to the discussion of how one should define the law and how and who we should allow to be creator of the law. It then applies the conclusions to the specifics of The DAO.

Chapter 8 summarizes the conclusions of this thesis and gives a few concluding remarks of a more general nature.

2.4 Descriptions of some words and phrases

This thesis has a focus on blockchain technology and introduces several concepts and actors which I expect to be new to the reader. I will therefore list some of these below, for the reader to come back to in case there is some confusion.

Coin - Coins are units on the blockchain that are only used for holding value. Their value is determined by the market, and is often very speculative. The aim with creating coins is that they should be useable for the same purposes as fiat currencies. Examples of coins are bitcoins (BTC) and ether (ETH).

Contractor - A contractor is a person or entity who performs work on behalf of The DAO or offers it investment opportunities of another kind. Anyone who owns at least one DAO token and can create a smart contract to represent the proposal of the work or the investment may be a contractor.

Curator - A curator is a person who verifies that proposals for The DAO are created by identifiable entities and that the description of the project matches the smart contract. They are hired by The DAO and can be fired at any time. The curators may or may not be completely external from The DAO.

DApp - Abbreviation of decentralized application. DApps consist of smart contracts and can take the form of anything from lotteries to organizations.

DAO - Abbreviation of decentralized autonomous organization. A DAO is an example of a DApp and is an organization without middlemen where the owners partake in all decisions regarding the organization.

Hash - A hash is number of a fixed length, generated by running any other number or a string of text through a hash function, i.e. an algorithm.

Miner - Miners are the actors on the blockchain who are responsible for the creation of blocks, in cases where the blockchain uses proof-of-work. The miners create blocks through solving a puzzle that requires them to expend power. Through this, anyone can see which version of the blockchain is the correct one by looking at which version of the blockchain has had the most work done on it.

Node - Nodes are the actors that make up the peer-to-peer network of the blockchain. Anyone can be a node by downloading the history of the blockchain and can then partake in verifying and storing the full history of the blockchain. The nodes represent the decentralized nature of the blockchain.

Protocol - The protocol is the rules by which the blockchain network has to abide. It consists of the source code for the blockchain. When different blockchains are discussed, it is in reality different protocols that are the topic of the debate. Examples of blockchain protocols are Bitcoin and Ethereum.

The DAO - The DAO is an example of a decentralized autonomous organization. It was created for the purpose of investing ether into various projects and gain a return on investment on behalf of its owners. The DAO was created in 2016 and is the example case used for analyzing DAOs in this thesis.

Token - Tokens are units on the blockchain that can represent other things than merely a market value. Examples of things that can be represented by tokens are voting rights in organizations or physical products in a supply chain. The tokens are defined by smart contracts.

Token holder - Token holders are participants in The DAO. They are the owners of The DAO, with the ownership represented by DAO tokens. For the main part of this thesis the token holders

are referred to as members of The DAO.

Chapter 3

Technology

3.1 Blockchain

3.1.1 Introduction

Blockchain started with the issuance of a whitepaper about Bitcoin in 2008, though the idea of decentralized registries or currencies existed before that.[1] The whitepaper is written by the pseudonym Satoshi Nakamoto and describes a "purely peer-to-peer version of electronic cash"[2] that will remove the need for trusted third parties in economic transactions. As the first of its kind, Bitcoin provides a good example of the essentials of blockchain technology. Later on in this chapter I will discuss another blockchain, Ethereum, and some of its related features.

3.1.2 Peer-to-peer network

Two major actors in the blockchain network are the nodes and the miners.[3] The nodes represent the distributed nature of the blockchain. Every node stores the full transaction history of the blockchain and can in a simple way verify specific blocks. Because of this network of nodes there is no central data storage or central authority that controls the information on the blockchain. All information is instead stored all across the network. Anyone can participate in the network as a node, but being a miner requires more, which will be elaborated in the section about proof-of-work.

3.1.3 Removing trust

Bitcoin takes its starting point in the problem of the need for trust in economic transactions. When transacting physical money, authorities have made it difficult to make counterfeits, and the receiver of a $100 bill can be fairly sure that it is valid. In electronic cash, however, the transaction is not made by sending the money, but by copying it to the receiver. Therefore it is relatively easy to create a copy and send it, while keeping the original to oneself.

As the parties involved in a transaction of electronic cash cannot trust each other, they involve mediators, or trusted third parties, often in the form of financial institutions such as banks. These parties keep track of all account balances and ensure that there is no double-spending of money. The

[1] Buterin (2013) p. 1
[2] Nakamoto. Bitcoin: A Peer-to-Peer Electronic Cash System. 2008 p. 1
[3] Nakamoto uses node for both actors, despite their different tasks. ibid. pp. 3 and 5

aim of Bitcoin is to replace these mediators, and their associated costs, with a cryptographically secure way of managing transactions, thus removing the need for trust altogether. Thus, instead of having a bank keep a ledger of all transactions, the blockchain itself is the ledger and everyone can see it. One a side note, I would claim that even though there is no need to trust individuals, there still is a need to trust that the system works as intended, turning the removal of trust into a relocation of it instead.

3.1.4 Public and private keys

One component of this trustless system is the use of asymmetrical cryptography, also called public-key cryptography. Public-key cryptography allows actors to send messages or transactions in a secure way, so that unauthorized actors cannot read the message if they intercept it. It also enables the use of digital signatures, which is what blockchains use it for. The public-key cryptography utilizes mathematical functions to pair cryptographic keys, so that a message encrypted by key A can be decrypted and read by key B.[4]

Every person who wants to send or receive Bitcoin generates a pair of cryptographic keys. One is public, and can be seen by anyone, while the other is private and should be kept secret by its owner. When combining the private key with a message or similar, a digital signature is created, and anyone who uses the corresponding public key can verify that the signature is created by the correct person.[5]

A second outcome of using public and private keys is that the identity of the individual is protected in pseudonymous way. Anyone can see that transactions are being made between different parties but they cannot see who these parties are, as the public key does not contain any information that can be used to identify its owner.[6]

3.1.5 Digital signatures

In Bitcoin every transaction has a digital identity made up by a chain of digital signatures created from previous transactions and private and public keys. When a new transaction is to be made, the sender creates a digital signature by adding the private key of the sender and the public key of the receiver to a so-called hash, made up by previous transactions. A hash, or hash value, is a number of a fixed length, generated from any other number or a string of text that has been run through a hash function. The hashes are unique in such a way that changing only a small character of the input will change the hash completely.[7] The connection between a transaction and the previous ones is shown in figure 3.1.

[4] Hirsch, Frederick J. Introducing SSL and Certificates using SSLeay. World Wide Web Journal - Special issue: Web security: a matter of trust archive Volume 2 Issue 3, Summer 1997 p. 141-173

[5] Nakamoto (2008) p. 2

[6] Nakamoto (2008) p. 6

[7] For more on hashes see Schneier, Bruce. Cryptanalysis of MD5 and SHA: Time for a New Standard. 2014. From: `https://www.schneier.com/essays/archives/2004/08/cryptanalysis_of_md5.html` (2018-05-10)

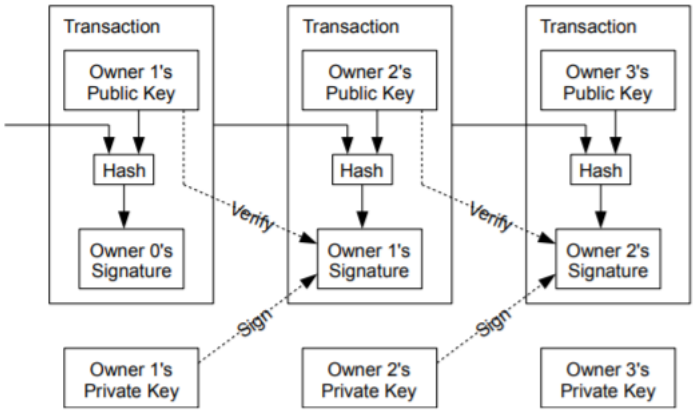


Figure 3.1: A chain of transactions in the Bitcoin blockchain.[8]

The transaction is then bundled together with other transactions in a block, and given a timestamp that proves the existence of the data at that point in time. The block creates a new hash, which is used in the following transactions, see figure 3.2. Since every block builds upon the previous one in a chain-like manner, every new one serves to reinforce previous ones.[9] This is where the name blockchain comes from.

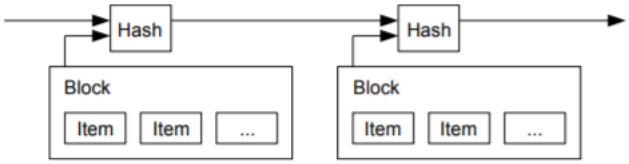


Figure 3.2: The connection between blocks and hashes.[10]

3.1.6 Proof-of-work

The creation of blocks is done through a peer-to-peer model, involving nodes referred to as miners. The miners are given the task of applying random numbers to an algorithm connected to the block and come up with a pre-determined value, usually a number starting with a certain amount of zeroes.[11] These calculations require the miners to expend power and once a block has been created it cannot be changed without redoing all that work. In short, the miners are the actors who drive the creation of new blocks on the blockchain.

Since all blocks are based on previous ones, a person who wants to change one block will have to change all the following ones as well. Further, since the chain works on a "one-CPU-one-vote"[12] model, the chain which has required the most work to be expended will always be considered the correct one. This means that a person who wants to change one block not only has to catch up with all blocks that have been verified after the one that he or she wants to change, the person also needs to surpass the original chain and make the new one longer. Doing so will be very costly,

[8] Image taken from Nakamoto (2008).
[9] Nakamoto (2008) p. 2
[10] Image taken from Nakamoto (2008).
[11] Exactly how this calculation is done is not relevant for this thesis.
[12] Nakamoto (2008) p. 3

and the chance of catching up with the original chain will only become more difficult the longer the chain is.[13]

The described model is called proof-of-work and the difficulty of the algorithm is adapted to the average time it should take to create a block. If for some reason the blocks are created too quickly, the protocol ensures that the difficulty of the algorithm is adjusted, so that the time to create the blocks returns to the desired pace.[14] This means that more work will be required to solve the algorithm and the time to create a block will stay at the desired level. Once a block has been created, it is broadcast to the network and the miners will start working on the next block, using the hash generated by the previous one.

3.1.7 Other proofs

Proof-of-work is not the only method for creating blocks. Another method is proof-of-stake. In short, it works by having validators instead of miners, who stake their existing coins for the right to create blocks.[15] To put it in another way, where the miners get a right to create and add blocks to the blockchain through working on solving an algorithm, the validators get the same right by temporarily freezing some of their existing assets, i.e. staking them.

Proof-of-stake is more energy efficient than proof-of-work, since it does not require expenditure of power for solving an algorithm, but it has other trade-offs. One example is that while proof-of-work allows someone to see which chain is the valid one by comparing how much work has been spent on validating the blocks, there is no mechanism that does the same for proof-of-stake.

3.1.8 Protocols

What has been described so far is how some issues are solved by the Bitcoin protocol.[16] The protocol is a key concept in relation to blockchain, as it is the set of rules by which the nodes act and communicate with each other. Ivan Liljekvist, a blockchain specialist who has among other things been featured in Forbes on the subject,[17] describes protocols as "common rules ... that the network plays by."[18] These rules, as with everything else created on the blockchain, are written in code. This code is, for the public chains, written in an open manner so that everyone can view and read it.[19]

The protocol further defines the coins, i.e. the cryptocurrencies. Examples of coins are bitcoin (BTC), not to be confused the Bitcoin blockchain, and ether (ETH) on the blockchain called Ethereum. A distinction needs to be made between coins and tokens, where the latter are created on the smart contract level of the blockchain. Tokens will be described in section 3.2.1.

[13] ibid.
[14] ibid.
[15] Altmann, Peter. The Manual 2. Unpublished. 2018. p. 31 f.
[16] Other examples of protocols are Litecoin, Ripple and Neo. For more information see Ivan Liljekvist. Difference between COIN, TOKEN and PROTOCOL - Programmer explains. 22 Sept. 2017. From: `https://www.youtube.com/watch?v=pcilyT3fh-0` (2018-04-13)
[17] Guzman, Alexavier. The Ripple Effect of Cryptocurrencies. Forbes. 2018. From: `https://www.forbes.com/sites/forbesproductgroup/2018/01/11/the-ripple-effect-of-cryptocurrencies/#a3527fa60800` (2018-03-29)
[18] Liljekvist, Ivan (22 Sept. 2017) ca 8 minutes in
[19] The source code for the Ethereum blockchain can be found at `https://github.com/ethereum/`.

3.2 Ethereum

Ethereum is a blockchain protocol similar to Bitcoin, but that was created to facilitate applications that the Bitcoin blockchain was too limited to enable.[20] While Bitcoin is mainly a currency blockchain, Ethereum is "the ultimate abstract foundational layer"[21] on top of which anyone can create smart contracts and other applications. The basic rules governing the blockchain are still mostly the same for Ethereum as for Bitcoin.

The applications that are built on Ethereum are referred to as DApps, or decentralized apps. The use cases of these DApps range from fully financial applications to not financial at all.[22] Some examples of current DApps are social networks, lotteries and peer-to-peer music composition networks.[23]

3.2.1 Smart contracts

Smart contracts make up the layer on top of the blockchain protocol. A smart contract is a piece of code that is executed on the blockchain. It has a unique characteristic compared to "regular code", i.e. what you see in software, which is that it can hold money.[24] When put together in an ecosystem, smart contracts can create DApps of which The DAO is an example.[25]

Smart contracts control the issuance of tokens on the blockchain, e.g. the DAO tokens that will be mentioned below. The main difference between a coin and a token is that they have been defined on different levels of the blockchain, i.e. on the protocol or in a smart contract.[26] They also differ in their area of use, where the purpose of the coin is to represent a financial value, whereas the token may represent other rights. Examples of how tokens may be used are to represent physical objects or voting rights.

Computer scientist Nick Szabo talks about smart contracts as "computerized transaction protocols"[27], that may be compared to the functioning of a vending machine as a means of performing a contract. Smart contracts can be used to execute most traditional contractual terms, such as payment, damage and insurance, and are embedded in code.[28] They also have the purpose of minimizing the need for intermediaries, along the lines of the overall ideology of blockchain technology.[29]

Smart contracts were not invented for the blockchain, but have previously been written about under the name of computable contracts. When discussing smart contracts from a legal point of view it is important to understand that they are not written in the same way, or even the same language to some extent, as the contracts lawyers, and people in general, are used to. Professor Harry Surden describes the difference by claiming that smart contracts are "data-oriented".[30] This kind of contracts is mainly meant to be read and processed by computers, in order to automate certain aspects of the agreement. Traditional contracts, in contrast, are written in words that are

[20] Buterin (2013) p. 11 ff.
[21] ibid. p. 13
[22] ibid. p. 19
[23] Most, if not all, DApps can be found on the official DApp website, `https://www.stateofthedapps.com/`.
[24] Liljekvist, Ivan. Difference between DAPPS and Smart Contracts? Programmer explains. Sent live on 9 March 2018. From: `https://www.youtube.com/watch?v=4rczD8xKPJc(2018-04-13)`
[25] ibid. ca 5 minutes in
[26] Liljekvist, Ivan. (22 Sept. 2017)
[27] Szabo, Nick. Smart Contracts. 1994. From: `http://www.fon.hum.uva.nl/rob/Courses/InformationInSpeech/CDROM/Literature/LOTwinterschool2006/szabo.best.vwh.net/smart.contracts.html` (2018-03-29)
[28] Szabo, Nick. The Idea of Smart Contracts. 1997. From: `http://www.fon.hum.uva.nl/rob/Courses/InformationInSpeech/CDROM/Literature/LOTwinterschool2006/szabo.best.vwh.net/smart_contracts_idea.html` (2018-03-29)
[29] Szabo (1994)
[30] Surden. Harry. Computable Contracts. UC Davis Law Review (Vol. 46) p. 639. 2012

meant to be read by humans, so called "natural languages".[31] These contracts, or contractual terms, are often more open-ended and leave room for interpretation, whereas the data-oriented contract does not.

Because of the above, smart contracts will not be suitable for all kinds of agreements, for example those where some space for interpretation is needed or when the contract includes a complex set of conditions. Smart contracts are currently mostly useful in automating various transactions, either for cryptocurrencies or other kinds of tokens. The requirement is that the contract terms can be put as "machine-readable" data instead of natural language sentences.[32]

3.2.2 Decentralized autonomous organizations

The decentralized autonomous organization (DAO) is a version of a DApp based on smart contracts. Before going on to describe the organization called The DAO, I would like to note that a DAO can either be used to automate functions in organizations that are already formed in a national context, or be used by individuals who do not want to form a traditional organization. In the former case, there is no legal problem to be discussed in the context of this thesis, the DAO is merely a tool among others in the corporate setting. In the latter case however, using a DAO will mean navigating a legally unclear area and that is the context in which this thesis is relevant.

In the Ethereum whitepaper DAOs are described as "long-term smart contracts that contain the assets and encode the bylaws of an entire organization"[33]. A DAO makes use of the decentralized network for creating a distributed and democratic[34] governance system for the organization.

The idea is that the decisions of the organization are made through the voting rights of the members or shareholders, where a pre-set percentage of the votes will direct actions.[35] If the use of cryptocurrencies removes the need for trusted intermediaries in finance, a DAO removes the need for organizational intermediaries, such as a various management positions.

[31] ibid. p. 642 f.
[32] ibid. p. 647 f.
[33] Buterin (2013) p. 1
[34] Democratic in this sense means that the members of the organizations may partake directly in the governance of the organization. It should not be confused with the use of the word in the traditional sense as a citizen of a nation. I will return to the idea of democracy and blockchains in chapter 7.
[35] Buterin (2013) p. 23

Chapter 4

The DAO

4.1 Introduction

The most famous example of a DAO up to date is the organization simply called The DAO. It was created in 2016 by Simon and Christoph Jentzsch and raised the equivalent of almost $150 million in just a month's time.[1] After some time it was subject to a hack, where the assailant managed to exploit a weakness in The DAO's code to transfer 3.6 million ether to his or her account. An important aspect of the hack is that the hacker did not actually change any parts of the DAO's code. The hacker merely found a weakness that allowed him or her to withdraw more ether from the common account of The DAO than he or she had originally put in.[2] The difference between an unauthorized change of the code and a, possibly immoral, exploitation of an existing piece of code is crucial in the discussion of whether we could see code as law, which will be returned to in chapter 6.

This hack, often referred to as The DAO Hack, lead to a fork[3] in Ethereum and the termination of The DAO.[4] Still, blockchain experts claim that DAOs will continue to be important in the future and The DAO serves as an example for how a DAO can be built and governed, although one should try to avoid their mistakes.[5] For the sake of clarity, I will use present form when discussing The DAO for the rest of this thesis, even though the organization no longer exists.

4.2 The business

The DAO aims to be an organization without middlemen where "(1) participants maintain direct real-time control of contributed funds and (2) governance rules are formalized, automated and enforced using software"[6]. It was created to be an advanced hybrid between a crowdfunding platform and a venture capital firm, where the minority owners are protected against fraud and

[1] Staff, The Economist. The DAO of accrue. A new, automated investment fund has attracted stacks of digital money. The Economist. 2016. From: `https://www.economist.com/news/finance-and-economics/21699159-new-automated-investment-fund-has-attracted-stacks-digital-money-dao` (2018-03-21)

[2] Siegel, David. Understanding The DAO Hack for Journalists. Medium. 2016. From: `https://medium.com/@pullnews/understanding-the-dao-hack-for-journalists-2312dd43e993` (2018-04-03)

[3] A fork is a split in the blockchain, which creates a parallel chain to the original. Examples of forks on the Bitcoin blockchain are Bitcoin Private and Bitcoin Cash.

[4] Siegel (2016)

[5] Liljekvist, Ivan. ICOs and tokens replacing traditional shares? Sent live 15 Nov 2017. From: `https://www.youtube.com/watch?v=dtuHRP4gbAg` (2018-04-13) ca 9.30 min. in

[6] Jentzsch, Christoph. Decentralized Autonomous Organization to Automate Governance. 2016. p. 1

given the possibility to directly weigh in on the organization's investment decisions.[7] How this works will be explained below.

The DAO makes use of three types of coins and tokens. Since it is built on Ethereum it uses ether for investing in proposals but it also has tokens of its own. The DAO tokens represent voting and ownership rights in the organization.[8] The DAO has a common account where the token holders put funds, and these are later invested in various proposals. When a token holder transfers funds to the account, they get rewards tokens in return. When proposals generate profits, a return on investment goes back to The DAO. The shareholders can then either choose to use the profits for investing in new projects or issue them as rewards to the shareholders, according to the distribution of reward tokens.[9]

4.3 The roles

An individual participating in The DAO can hold one, or several, out of three roles. These are contractors, curators and token holders. They fill different purposes and will be explained below.

The founders of The DAO mainly use "token holders" when talking about the owners or shareholders of The DAO, although "members" or similar sometimes appear. For the rest of this thesis, with the exception of section 4.3.3 below, I will use "members" for the same purpose to make the comparison with existing associations clearer and to make the text easier to follow for readers without prior experience of blockchains and its language.

4.3.1 Contractors

The way in which The DAO mostly resembles a crowdfunding platform is that it only holds funds, in ether, and DAO tokens. It does not produce any physical or digital products, code or hardware. All these, and most other actions that The DAO wishes to take have to go through a contractor.[10]

The contractors will create proposals for projects, which are submitted for consideration by the members of The DAO. The projects can either be for services specifically aimed to The DAO, e.g. to change part of the code in order to add functions to the organization, or they can be completely unrelated to The DAO itself. A project could be that the contractor wishes to create a blockchain application for health care services, and needs funds to get started. The proposal for The DAO would be to invest in this project and get a return on investment later on.

The proposals need to be described in some detail and connected to a smart contract. The latter is where funds will be sent if the proposal is accepted for funding. Anyone who owns at least one DAO token can become a contractor and submit proposals.[11] The requirement to attach a smart contract to the proposal does however mean that in order to become a contractor for The DAO, one needs to have some knowledge on programming, or have the help of someone who knows how to code.

4.3.2 Curators

Since anyone can be contractor, the organization needs a function to protect the members from dishonest proposals or the misuse of power by majority owners, who could potentially submit and

[7] ibid.
[8] ibid. p. 2
[9] ibid. p. 10
[10] ibid. p. 2
[11] ibid.

accept a proposal to send funds to their own accounts. This function is held by the curators.

Curators are chosen after nomination by one of the members. They do not need to be members themselves but their tasks, which are described below, demand that they have knowledge on blockchains and smart contracts and the ability to read and understand the latter. Even though anyone could be a curator, it is recommended that they are individuals who are trusted by the DAO community.[12]

The role of the curators is to control who can receive ether from The DAO through ensuring that the contractor is an identified person or organization and that the proposal matches the smart contract that is supposed to govern it.[13] If these two criteria are fulfilled, the curators approve the proposal by adding it to a so-called whitelist. It is only whitelisted proposals that can receive funds from The DAO. In the words of the founders "This gives the curator of a DAO considerable power"[14] and might compared to the power of the board in a limited liability company. Later in this thesis I will discuss the difference between the role and mandate held by the curators and the role of a board in a company. It should be noted already now that the power of the curators, though significant, is limited to the actions mentioned above. The mandate of the curators only covers the verification of identity and the matching between proposal and the smart contract. They are not authorized to make any judgments or valuations of the proposals and do not make any recommendations on what proposals to invest in.[15]

4.3.3 Token holders

An individual who wishes to participate in The DAO can do so by purchasing DAO tokens. These can either be bought during the creation phase, which is the initial issuance of the tokens, or through buying them from an existing token holder after that, when the DAO tokens can be transferred freely.[16] The DAO tokens exist on the Ethereum blockchain, and therefore they are bought using ether.

The voting rights of the token holders are proportionate to the amount of tokens he or she holds.[17] The rights are exercised in relation to the proposals mentioned in the previous sections. Further, when The DAO has spent ether it generates reward tokens. These get their value from the ether that is sent back to The DAO from the contractor after a successful project. A proposal will be made to decide whether the reward tokens should be used for funding new proposals or rewarding the token holders. [18]

The right to vote on all actions of The DAO seemingly gives the token holders a significant power, but since they can only vote on proposals that have been whitelisted by the curators, this power is in reality somewhat limited.

Finally, The DAO provides the token holders with a form of minority protection through the possibility to create a split of the DAO, either for retrieving their funds when not in agreement with the majority or when not trusting the curator and wanting to vote for a new one.[19] This could be seen as a way of leaving the original DAO and starting a new one, without selling one's tokens.

[12] Tual, Stephan. On DAO Contractors and Curators. 2016. From: `https://blog.slock.it/on-contractors-and-curators-2fb9238b2553` (2018-04-13)
[13] ibid.
[14] Jentzsch (2016) p. 7
[15] Tual (2016)
[16] Jentzsch (2016) p. 2
[17] ibid.
[18] ibid. p. 10
[19] ibid. pp. 2, 6 ff.

Chapter 5

How does The DAO correspond to laws of associations?

5.1 Introduction

The right to form organizations is protected as a fundamental human right.[1] But while The DAO's mere existence is legal, this says nothing about its capacity to act as a legal person or the rights and liabilities of its members.

When assessing the legal status of The DAO I have chosen to look into legislation on associations, or organizations, as the word is part of the name and how they describe themselves. The fact that they put that name on themselves is of course no guarantee that The DAO will be an organization in the meaning of the law, but that issue is what thesis aims to make clearer. There are also possibilities that The DAO could be a contract, which I will look into in chapter 6, a community or some other form of gathering of individuals and values. But the analysis needs to start somewhere, and in this thesis I will begin with the associations.

The following chapter will start with a comparison between Swedish legislation and The DAO, to identify which basic forms of organizations are relevant for consideration. Based on the conclusions of that section, some international comparisons will be made.

The aspects that will be compared in the initial analysis are the creation of the organization, whether or not the organization can act as a legal person, whether or not the organization may partake in economic activities, how the voting and membership rights are governed and how liability is divided within the organization. I will also use section 5.2.5 to consider if a partnership agreement could be written in the form of smart contracts.

[1] Swedish Instrument of Government (1974:152) chapter 2, section 1. European Convention on Human Rights, Article 11. Etc.

5.2 Swedish comparison

5.2.1 The creation of the organization

For "simple" organizations, such as non-profit associations or sole traders, the members only need to start acting with a common interest in order for the organization to be created.[2] This criterion is easily reached by The DAO and I would argue that it may have reached this stage before the code was even deployed, as the decision to form the organization was made at an earlier stage when the Jentzsch brothers started working on it. In either case, The DAO fulfilled this criteria when the code was deployed and people started buying DAO tokens.

For more complex organizations the Swedish legislator has decided to set registration as a requirement for the creation of the organization.[3] This sprung from the need to raise capital in organizations with economic activities and wanting the organization to be able to act as a legal person.[4] The entry into an official register provides investors and other stakeholders with the transparency that is needed for risk-taking and capital investments, and is a widespread and simple measure.[5]

As will be returned to in chapter 7, the ideology of the blockchain puts emphasis on decentralization of power and the avoidance of middle-men.[6] The use of registries for companies managed by a national authority is the opposite of this ideology. The registration authority represents a centralized power with the capacity to determine which companies are given legal capacity and which are not. This strongly indicates that The DAO, or any DAO that is created by blockchain enthusiasts, is not and will not be registered with a national authority.

With the public and transparent nature of the blockchain, one might argue that The DAO's existence on the blockchain should be compared to a registration.[7] However, there are no explicit rules for how the blockchain should serve as a register, where its authority lies or what information it should keep etc. and as long as this is lacking, it does not provide the transparency that is the purpose of a register and the basis for credit for the organization. Another hinder for allowing the existence on the blockchain to serve as a form of registration is that it takes the form of code. The information that would ordinarily serve to give transparency to the organization is thereby written in a way that is not accessible by everyone, but only those who have the capacity to read and understand code. Together, these aspects give that the existence on a blockchain currently cannot serve as a registry for organizations. The registration requirement thus effectively hinders The DAO from consideration for any of general or limited partnership, or limited liability companies.

The co-operative association and the general partnership may be created before registration, through agreements, but they are not legal entities before registration. When unregistered, the rights and liabilities of the members or partners are joint and several. The lack of legal identity is troublesome for The DAO, see below.

Even though the requirement for registration excludes most organizational forms from consideration for The DAO, I will still use them for comparison in the sections on Swedish legislation for pedagogical purposes.

[2] Partnership and Non-registered Partnership Act (1980:1102) chapter 1, section 3

[3] Partnership and Non-registered Partnership Act (1980:1102) chapter 1, sections 1 and 2. Companies Act (2005:551) chapter 2, section 4

[4] Sandström, Torsten. Svensk aktiebolagsrätt 3 uppl. Norstedts juridik. Visby/Vällingby. 2010. p. 45 f.

[5] Sandström (2010) p. 45 ff. Compare with e.g. ULPA (2001) sect. 201 (a)

[6] Jentzsch (2016) p. 1

[7] Partnership and Non-registered Partnership Act (1980:1102) chapter 1, section 1. The Co-operative Societies Act (1987:667) chapter 1, section 2

5.2.2 The organization as a legal person

Registered organizations in Sweden are given identity as legal persons and are thus given the capacity to enter into agreements and gain rights and liabilities on behalf of their members. This is crucial for an organization that strives to be efficient and operate on a larger scale.

When the organization is a legal person, it is enough that a person with the capacity to act on behalf of the organization takes part in agreements. Any agreements are made with the organization as such and there is no need to mention every single member in the agreement. This is further beneficial for large organizations with a membership base that is often changing, which is the case of The DAO, as it would be highly impractical to mention every current member in every agreement.

The opposite situation has the members actively participating in agreements in order to be bound by them, as is the case with sole traders or similar.[8] If the purpose of The DAO had been to invest its members money only in proposals for which the members have voted yes, the idea of only being bound by those agreements would work. However, that is not how The DAO is set up. The members invest money into a pool and then vote on proposals. If a proposal gets the majority of the votes, it is invested in with all required funds independent of whether the member has voted yes or no. That way, even members who do not want to be bound by a particular agreement will be so.

Further, investment proposals are not the only agreements the organization has to enter into. There might be other work that needs to be done for the organization, for example creating a website. The proposal would be voted on, and the majority decision would in reality bind all members by the agreement. It is both unrealistic and impractical to imagine a model where the website is only accessible and useful for the individual members who voted yes and not the others.

The only Swedish organizational form that is given the status of a legal person without a registration is the non-profit organization.[9] Still, as will be elaborated in the next section, this is not a viable option for The DAO. Another way of creating a united front or the right for certain persons to act on behalf of the others is through agreements. This option will be considered in chapter 6.

5.2.3 Economic activity

Most forms of organizations were developed for the purpose of enabling commerce on a larger scale and the legislators have taken this into consideration.[10] Thus, all organizations in the comparison, except non-profit associations, are meant for the purpose of engaging in economic activities.[11]

Non-profit associations are as a starting point not meant for economic activities, as the name suggests. Rather, their purpose should be to promote the social interests, religion or politics of the members, or other similar activities. Some economic activities are allowed, but they are more in line with selling "fika"[12] at a football event or raising money for a new couch in the clubhouse. The non-profit organization should not have activities whose main goal is to enrich the members of the organization.

Since The DAO has an express purpose of investing in proposals with the aim of making a profit for it members, it is not suited for being a non-profit association. Even if they were to call themselves that to turn the organization into a legal person, there is a risk that The DAO would instead be

[8] Partnership and Non-registered Partnership Act (1980:1102) chapter 4, section 5

[9] Proposition 1986/87:7 om ekonomiska föreningar. p. 77

[10] See for example Nial, Håkan and Hemström, Carl. Om handelsbolag och enkla bolag. 4e uppl. Norstedts juridik. 2008. Chapter 1.

[11] See tables 5.1 and 5.2.

[12] The Swedish concept of having a cup of coffee and something sweet, often for the purpose of socializing.

considered an unregistered co-operative association, which would mean a completely different, and unwanted, liability situation for the members.

Co-operative associations may engage in economic activities, but there are certain requirements on the overall goal of the association. In the Co-operative Societies Act (1987:667) the goal of the association should be to "promote the members' financial interests" but it should be done by activities in which the members participate as consumers, suppliers, through labor, by using the services of the association, or in a similar way.[13] Any co-operative association whose purpose is to promote the members financial interests through other activities cannot be a legal person.[14] The members of The DAO do not participate in The DAO in such as way as the act describes, the closest possible thing would be as suppliers of funds, but that is far-fetched. The DAO can therefore not be a co-operative association in Sweden, even though a DAO with another purpose may be.

5.2.4 Voting and membership rights

The aspect of how individuals can acquire membership in The DAO, and what kind of decision or voting rights this entails is one of the more interesting comparisons to make. It shows the internal structure of the organization and could be said to be an indication of what kind of organization The DAO strives to be.

General partnerships and sole traders have a governing principle where every partner has to agree on decisions regarding the governance of the organization, and thus effectively has veto rights in decisions, unless they have agreed otherwise through the partnership agreement.[15] The principle of joint decisions may work well for small organizations with active partners, but it is not suitable for as large organizations as The DAO. It is also not how The DAO is set up. There are for example no veto rights corresponding to the Swedish legislation, as this would make decision-making practically impossible. The DAO is in general more impersonal than a general partnership or a sole trader typically is.

The limited partnership has two categories of partners, the general partners and the limited partners.[16] A parallel might be drawn to the roles of curators and members in The DAO, but this comparison is rough and not really truthful to the actual capacities of the actors. While the limited partners and the members of The DAO both are, or aim to be, limited in their responsibility to the monetary investment they have made, the members of The DAO retain the right to vote on proposals, thus taking part in the governance of The DAO. This does not correspond with the role of a limited partner, and the comparison is faulty. The role of the curators is more similar to a board than a general partner, in that they prepare what proposals the members have to consider, and that they are given mandate by the members, without necessarily being owners. The curators are also limited in their capacity, more so than a board even, since they have a very clearly laid out and limited responsibility. Further, a curator can be fired, which is not the case with a general partner of a limited partnership.

The voting and governance systems of co-operative associations lie closer to the structure of The DAO and even more so those of the limited liability company. The co-operative association is lacking in the comparison of one member - one vote v.s. one token - one vote of The DAO.[17] Since you usually cannot have more than one membership per person, and the number of votes in no way corresponds to how much you have invested in the co-operative association, it is not a good comparison.

The voting and ownership structure of the limited liability company is the most similar to The

[13] The Co-operative Societies Act (1987:667) chapter 1 section 1
[14] ibid. chapter 1, section 2
[15] Partnership and Non-registered Partnership Act (1980:1102) chapter 2, section 1
[16] ibid. chapter 1, section 2
[17] The Co-operative Societies Act (1987:667) chapter 7, section 3

DAO. Here, one share - one vote, combined with the possibility to acquire more than one share is close to how The DAO is structured.[18] As noticed by the Securities and Exchange Commission (SEC), the actual power of the members through this voting system, with such a large amount of members and no close connection between them that would allow them to "exercise meaningful control"[19] lies much closer to the role of shareholders in a limited liability company than a general partnership.

The role of the curators could be compared to the board, see above. The SEC concluded that "These facts [little actual power, much dependency on the curators] diminished the ability of DAO Token holders to exercise meaningful control over the enterprise through the voting process, rendering the voting rights of DAO Token holders akin to those of a corporate shareholder"[20]. There are however some limitations to the role of the curators that sets them apart from a board, and which makes me question the comparison. The power to whitelist proposals is indeed great, for without it there would be no proposals for The DAO to invest in. However, after that the power of the curators disappear. They do not exercise any judgments on proposal or oversee any actual investments, this is all up to the members of The DAO.[21] When the curators have whitelisted the proposals, if the members do not take any decisions on funding any proposals, nothing will happen. This limitation means that the curators do not partake in the "management of the company's affairs"[22], to the extent that the Companies Act lays down.

The DAO has an aspect to it that pushes the limits of how we see companies one step further than the limited liability company does. Where the partnership has partners who are personally involved in the company and the limited liability company has distributed membership and control, The DAO has distributed and pseudonymous control. The public-key cryptography that creates accounts on the Bitcoin blockchain is also used in Ethereum. The public keys are used for buying DAO tokens, i.e. ownership in The DAO, and the identity of the members will not be disclosed unless they choose to do it themselves. This could allow one member to have a large share of the ownership in The DAO under several accounts, and thus be a majority owner in the disguise of several smaller owners. The pseudonymous ownership represents another conflict with the system of transparency that has been a leading factor in the development of organizations for commercial purposes.[23]

5.2.5 Smart contracts as a partnership agreement

Three of the relevant examples above - general and limited partnerships and sole traders, can be changed through a partnership agreement, which could assign other mechanisms for voting rights than those stated in the Partnership and Non-registered Partnership Act. This means that the organization could be designed through the partnership agreement to fit the structure of The DAO, especially if a set of smart contracts could fill the role of a partnership agreement.

As there are no explicit rules regarding the form of the partnership agreement, general contractual principles apply. There have been no indications that a contract taking the form of computable code cannot be a legally valid agreement. On the contrary, there are already agreements in this form in use, e.g. the use of one-click agreements for streaming services such as Spotify.[24] We can also see a use of conduct-based agreements, e.g. when entering a bus or putting money into a vending machine.

[18] Companies Act (2005:551) chapter 4, section 1

[19] Securities and Exchange Commission. Release No. 81207 / July 25, 2017. Report of Investigation Pursuant to Section 21(a) of the Securities Exchange Act of 1934: The DAO. p. 14

[20] ibid. p. 15

[21] Would, Gav. Why I've Resigned as a Curator of the DAO. Medium. 2016. From `https://medium.com/@gavofyork/why-ive-resigned-as-a-curator-of-the-dao-238528fbd447` (2018-05-13)

[22] Companies Act (2005:551) chapter 8, section 4

[23] Sandström (2010) p. 45 ff

[24] An example would be when the customer clicks a "yes" button, and a software defines what features the customer may access.

As mentioned in section 3.2.1 some contractual terms may be difficult to translate into computable code. However, when it comes to the voting rights in The DAO, it is governed through smart contracts. As voting in a DAO is a transaction of some sort, i.e. the members send their votes, it is quite suited for the smart contract format. It may involve certain trade-offs for the members of The DAO, but due to the freedom of contract the members are not legally hindered from making such trade-offs.[25] The exception being when the trade-off is hidden is such a way that the agreement is invalidated due to deceit, using the Contracts Act (1915:218) section 30.

An issue that needs to be addressed here is how to control the legitimacy of the vote, or the identity of the person who sends it. Here again the public and private keys are important. As long as the private key remains secret, the other members can use the public key to verify that the vote is sent from the correct person, i.e. the holder of the private key. They have no way of seeing the actual identity of the holder of the private key however. This issue would be of lesser importance for the internal relationships of The DAO than for the transparency towards external actors, as mentioned above.

This means that even though smart contracts might not be useful for all conditions of a partnership agreement, they could be used for determining voting rights.

5.2.6 Liability of the members

Given the above, The DAO would be considered by Swedish law to be a sole trader. This would mean that the members are only liable for agreements in which they have actively participated, but wherever there is liability it is unlimited.[26] As will be discussed below, there is a possibility to bind all members through internal agreements, but the starting point is the mentioned. This is impractical and uncertain for both the members and the contractual partners of The DAO. The risk for the contractual partners is high when they do not know whether they can make claims towards all members or merely a few. The members will also be faced with high risk and uncertainty, as they might be liable for unexpected and large sums of money. This could effectively stop the interest in investing in The DAO.

5.2.7 Overview of Swedish association law

Tables 5.1 and 5.2 show how the key factors look for the different Swedish laws on forms of associations. The colors indicate how well they correspond to the structure of The DAO. Red means that the legislation does not correspond at all, yellow means that it corresponds to some extent, or has the potential to do so, and green means that it corresponds to the structure of The DAO.

[25] See e.g. Surden (2012) p. 675
[26] Partnership and Non-registered Partnership Act (1980:1102) chapter 4, section 5

Table 5.1: Table of Swedish law on associations and how they correspond to the structure of The DAO

	Partnership	Limited partnership	Sole trader	The DAO
Legislation	Partnership and Non-registered Partnership Act (1980:1102)	Partnership and Non-registered Partnership Act (1980:1102)	Partnership and Non-registered Partnership Act (1980:1102)	
Is created when:	After a mutual agreement has been made to conduct economic activities together in a company, and the company has been registered (1:1)	After a mutual agreement has been made to conduct economic activities together in a company, and the company has been registered (1:2)	After a mutual agreement has been made to conduct business together in a company (1:3)	The underlying smart contracts are created and then deployed. Members buy tokens representing ownership in The DAO.
Economic activity	Yes (1:1)	Yes (1:2)	Yes (1:3)	Invests in proposals, with the intent of eventually creating a return on investment for the members of The DAO.
Registration	Yes (1:1)	Yes (1:2)	No (1:3)	Not registered
Legal entity	Yes (1:4)	Yes (1:4)	No (1:4)	
Liability of owners/partners	Jointly and severally liable (2:20)	Limited partner: limited to the invested sum. General partner: joint and several (3:1, 8, 2:20)	Personal liability for the agreements in which the partner participated (4:5)	
Owner-ship/membership	Requires acceptance by all existing partners (2:2)	Requires acceptance by all existing partners (3:1, 2:2)	Requires acceptance by all existing partners (4:2, 2:2)	Anyone can buy tokens and thus become owners of The DAO.
Requirement to have a board	No	No	No	No board, democratic decision-making on day-to-day business as well through voting on proposals. However, the curators have a major power position, consisting of the control over the proposals. The curators decide what proposals can be voted on and their role is sometimes compared to a managerial position.
Voting/Decision rights	Any partner can act on behalf of the partnership, and has veto rights, unless something else has been decided through an agreement between the partners. (2:3, 17)	General partners have the same rights as partners in a partnership, limited partners have no right to participate in the governance of the partnership. (3:1, 2:3, 17, 3:4)	All partners have to agree on decision regarding the governance and actions of the partnership (4:3)	The right to vote is decided through ownership of tokens. One token, one vote. ”Management”, in the meaning that someone chooses which proposals may be voted upon, is done by the curators, see above.

Table 5.2: Cont. of table 5.1

	Co-operative association	Non-profit association	Limited company	The DAO
Legislation	The Co-operative Societies Act (1987:667)	No legislation	Companies Act (2005:551)	
Is created when:	When at least three members have decided to create the association. (2:1, 3)	When the members decide to create it.	When the founding record is signed by all founders. (2:4)	The underlying smart contracts are created and then deployed. Members buy tokens representing ownership in The DAO.
Economic activity	Yes	No, but with exeptions.	Yes (3:3)	Invests in proposals, with the intent of eventually creating a return on investment for the members of The DAO.
Registration	Yes (1:2)	Voluntary	Yes (2:22)	Not registered
Legal entity	Yes, if registered (1:2)	Yes	Yes, after registration (2:25)	
Liability of owners/partners	Limited to the assets of the association, if registrered. If it is unregistered the liability is joint and several (1:3)	Decided in the statutes. Often limited	Limited to the equity after registration (1:3) but joint and several before registration (2:26)	
Owner-ship/membership	Membership should be open for anyone, unless there are special reasons to deny someone membership (3:1)	Decided in the statutes.	Can be traded freely, unless otherwise agreed upon in the statutes (4:7-8, 18)	Anyone can buy tokens and thus become owners of The DAO.
Requirement to have a board	Yes (2:1, 6:1)	Decided in the statutes.	Yes (8:1)	No board, democratic decision-making on day-to-day business as well through voting on proposals. However, the curators have a major power position, consisting of the control over the proposals. The curators decide what proposals can be voted on and their role is sometimes compared to a managerial position.
Voting/Decision rights	Voting rights, one member, one vote (7:3)	Decided in the statutes.	Owners can vote at the association meetings (7:1). One share, one vote. Day to day business is managed by the board and the CEO (4:1, 8:1, 4, 27, 29)	The right to vote is decided through ownership of tokens. One token, one vote. ”Management”, in the meaning that someone chooses which proposals may be voted upon, is done by the curators, see above.

5.3 International comparison

5.3.1 Introduction

In this section I will look at various laws on associations within the EU and the US. As will be seen, most organizations are defined in similar ways across the globe. Since I have made an in-depth analysis of the relevant criteria in the Swedish comparison, I will limit myself in the following to avoid too much repetition. Thus, I will delimit the international comparison to identifying the forms of association that The DAO would reasonably be categorized as and leave out the ones that are clearly disqualified. Examples of organizations that will not be dealt with in the following are private and public companies of the jurisdictions touched upon below. These companies are all connected to a requirement to be registered with national registration authorities, and are thereby disqualified from consideration in the same way as their Swedish equivalents.[27] Before going into the specific forms of associations, I will engage in a short discussion about the problems of the global nature of The DAO.

5.3.2 The place of residence

An inherent problem with The DAO is that its digital nature makes it instantly global and unbound to a geographical location. Due to this, it is necessary to look at The DAO from an international viewpoint but it is also difficult to determine which nation's law should be applied.

Anna Warberg has discussed the problem of choice of jurisdiction in insolvency situations, and I believe some of her ideas can be translated to fit the purpose of this thesis.[28] One reason why I consider them to be translatable is that insolvency situations deals with demands for liability and refunds from third parties, and this is one of the topics of this thesis. The other reason is that Warberg's discussion highlights the issue of the extension claim, i.e. that a company needs to have some sort of attachment to the jurisdiction where a procedure in court is going to take place. The extension claim is problematic for The DAO, which I will explain in this section.

An example for how the authorized court for conflicts should be determined is The Swedish Code of Judicial Procedure (1942:740) chapter 10, section 1. Here the law says that it is the court of the jurisdiction where the person or company has its residence that is authorized. The use of residence in the law is what actualizes the extension claim. When discussing the extension claim there are two views of where the company should be considered to have its residence. One is that the company has its residence in the nation of its registered office. The other is that the residence should be where the company has its actual office and business.[29] Both of these are problematic for The DAO.

As mentioned in section 5.2.1, The DAO is not, and is not likely to ever be, registered with a national authority. Neither does the existence on a blockchain suffice to replace the role of the authority. This means that The DAO will not have registered office to serve as a ground for residence. The other option, which courts are encouraged to use when determining the place of residence for companies with extensive cross-border business, is to assess where the company has its main interests.[30] It is however difficult to find a jurisdiction in which The DAO would have its main interests. As mentioned in section 4.3.1, The DAO does not offer any products or services and since anyone can participate, it could have both members and contractors in any and all parts

[27] See for example the United Kingdom Companies Act 2006, section 15(4) or the French Commercial Code L123-1.

[28] Warberg, Anna. Gränsöverskridande insolvens - En studie av den internationella domsrätten för insolvensförfaranden inom EU. Juridiska institutionens skriftserie. School of Business, Economics and Law at the University of Gothenburg. 2017

[29] Warberg (2017) p. 112 f.

[30] Warberg (2017) p. 117

of the world at once. This makes it difficult to find a place where The DAO would have its main interests.

Without a registered office or business in the physical world it will not automatically be considered to belong to one specific jurisdiction. Instead it is probable that every jurisdiction in which The DAO has business parties, or other parties who identify themselves as having a conflict with The DAO, will analyze it from its own perspective.

5.3.3 European unregistered associations

Since The DAO in its pure form is an unregistered organization the only forms of associations that will be relevant for comparison are the ones that do not require registration for their existence. This means that the comparison is limited to various forms of sole traderships or partnerships within the member states of the EU. The co-operative association will be briefly touched upon, as it is not relevant for The DAO, but could be for similar organizations. Further, since The DAO has a purpose of giving its members a return on investment, the comparison will only include partnerships or associations that allow commercial activities

Starting with the co-operative association, regulation is scattered. Some member states have explicit laws for this kind of organization, e.g. Germany and Portugal, others have it as part of a more general legislation, e.g. Italy and Belgium, while still others are more vague in their legal definition.[31] The co-operative association is not very easy to compare to The DAO in an international setting, mainly because so much can be said about the co-operative association and because it can vary a lot between nations. As with the Swedish legislation, a lot of weight is put on the purpose of the co-operative association, and it is questionable whether the mutual profit purpose of a co-operative association really matches the business of The DAO.[32]

The limitations regarding the purpose of The DAO versus a co-operative association leads to the conclusion that in the European setting, it is the sole traders and the partnerships that are most relevant for consideration in relation to The DAO. In France for example, where the general partnership needs to be registered, The DAO would probably be considered a de facto partnership. This means that the organization would not be a legal person in France and that the members would have unlimited liability for the obligations of The DAO in which they have participated.[33] This construction is very similar to the Swedish sole trader when it comes to entering into agreements and liability. In other countries, where the general partnership may be unregistered, the de facto situation for the members of The DAO will still be the same.[34]

Overall, the legislations in other member states of the EU are similar to Swedish legislation. For the members of The DAO, this means that they can expect to be faced with unlimited liability for any contractual obligations that they have entered into through The DAO. They also need to regulate internally how representation towards third parties should happen, in order to ensure effective management of agreements, though it could be argued that this is already done through the structure of The DAO.[35]

5.3.4 EU associations

The EU has made an effort to create a few legal associations that can exist across the borders of the members states. As with many other associations, these carry a requirement of registration in

[31] Cracogna et.al. International Handbook of Cooperative Law. Springer, Berlin, Heidelberg. 2013. p. 11
[32] For more on this see Cracogna et.al. (2013) esp. chapter 1.4
[33] French Code Civil, Articles 1871-1873
[34] See for example The United Kingdom Partnership Act 1980 and the German Commercial Code, Article. 105
[35] See section 6.3.3.

order to be legal persons, or to allow limited liability for its members.[36]

The European Cooperative Society (SCE) could have been an option for The DAO, were it not for e.g. the requirement that the shares need to be held by named persons, which is contrary to the ideology if the blockchain.[37] Another problem with the SCE is that it requires the capital to be expressed in a national currency, which will be difficult for The DAO since the capital is expressed in ether, which is not considered a currency.

The other potentially interesting European association is the European Economic Interest Grouping (EEIG). Apart from registration in Article 6, it may only have members who are "natural persons who carry on any industrial, commercial, craft or agricultural activity or who provide professional or other services in the Community"[38]. Together, these are enough to exclude The DAO from being an EEIG.

It may also be worth noting that the use of European associations is not very widespread. In Sweden for example there were a total of three SCEs and five European Companies (SE) in 2017.[39]

5.3.5 Partnerships in the United States

The Revised Uniform Partnership Act (1997), RUPA, defines a partnership as "an association of two or more persons to carry on as co-owners a business for profit"[40]. The definition is independent of the persons' intentions, so that even when they do not have an intention of forming a partnership, this could still be the case if the criteria in section 202 of the Act are fulfilled. The regulation is similar to the laws on for example general partnerships in the UK and sole traders in Sweden. This greatly impacts the members of The DAO, as they have no control of whether they should be considered a partnership under US law or not. As Carla Reyes points out in a blog post for Columbia Law School "many of the participants that did intentionally join the association for business purposes joined in the context of peer production, explicitly choosing (they thought) not to form a partnership".[41]

Since the intentions of the members are irrelevant for the assessment of whether The DAO should be a partnership, the actual circumstances needs to be considered instead. The SEC did this and issued a report[42] which has since been quoted by e.g. Carla Reyes above. Reyes says that "Deep in the ruling, the SEC, in passing, called The DAO "an unincorporated association[sic!]." ... The DAO investors constituted a group of persons carrying on a joint association for the pursuit of profit. The SEC's comment might be read to say The DAO was a partnership."[43] This conclusion is in line with what has been discussed in this chapter.

In the end, the rules in RUPA and similar laws means that the members of The DAO will be caught in an unintended form of association, and an unexpected liability situation. This highlights the discrepancy between national laws and the ideas behind the blockchain technology and peer-to-peer networks.

[36] See for example COUNCIL REGULATION (EC) No 1435/2003 of 22 July 2003 on the Statute for a European Cooperative Society (SCE), Article 11 (1)

[37] COUNCIL REGULATION (EC) No 1435/2003 of 22 July 2003 on the Statute for a European Cooperative Society (SCE), Article 4 (3)

[38] COUNCIL REGULATION (EEC) No 2137/85 of 25 July 1985 on the European Economic Interest Grouping (EEIG), Article 4 (1)(b)

[39] Statistics from `http://www.bolagsverket.se/be/sok/etjanster/statistik/statistik-1.3538` (2018-04-03)

[40] RUPA section 101 (6)

[41] Reyes, Carla L. How Should the Law Classify Decentralized Businesses? The CLS Blue Sky Blog. Columbia Law School. 2018. From: `http://clsbluesky.law.columbia.edu/2018/01/03/what-type-of-legal-entity-are-decentralized-businesses/` (2018-02-26)

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

[43] Reyes (2018)

5.4 Conclusion

Despite the use of tokens as representative measures of the members' ownership and right to vote in The DAO, the organization is most likely to be considered a general partnership or sole trader within the scope of national legislations.

The main discrepancy between The DAO and these organizations is that The DAO is generally an impersonal organization, the members are pseudonymous and distributed across the globe. This is in great contrast to how the partnerships are designed where "the personal element is of considerable importance"[44]. The SEC in the US claims that The DAO actually constitutes "an arrangement that bears little resemblance to that of a genuine general partnership"[45] and that "By contract and in reality, DAO Token holders relied on the significant managerial efforts provided by Slock.it and its co-founders, and The DAO's Curators, as described above. Their efforts, not those of DAO Token holders, were the "undeniably significant" ones, essential to the overall success and profitability of any investment into The DAO."[46] Still, the unregistered and decentralized nature of The DAO, together with its purpose makes it difficult to categorize the organization in any other way than as a partnership.

The consequences for the members of The DAO are unwanted and very risky. For these unincorporated organizations, the liability of the members is unlimited, joint and severable for any agreement they have participated in through The DAO. This means that any and all members of The DAO may suddenly be faced individually with demands based on contractual obligations of the organization. Further, as mentioned previously, the members need to regulate internally how representation should happen, in order to ensure effective business and contract-making.

[44] Andenas et.al. European Comparative Company Law. Cambridge University Press. Cambridge. 2009. p. 130
[45] Securities and Exchange Commission. Release No. 81207 / July 25, 2017. Report of Investigation Pursuant to Section 21(a) of the Securities Exchange Act of 1934: The DAO. p. 14
[46] ibid. p. 15

Chapter 6

The DAO as a contract

6.1 Introduction

General legal principles give that there is a freedom of contract in most jurisdictions around the globe. Leaning on this principle could make the relationship between The DAO and its members more clear and more predictable, both in the national context and the global. The freedom of contract has two aspects that are important for The DAO. First, it means that the members can decide between themselves how decisions are made, who can represent who in contract situations with third parties, how liability shall be divided between the members etc. Second, it means that there is no formal requirement on how these agreements should be made. Thus, the creation and acceptance of smart contracts could be enough for a binding agreement between the members.

The DAO is not made up by one, but rather several smart contracts. In the same way, when analyzing it from a perspective of legal contracts it is not only one, but several contracts. Of these, some may be in the form of smart contracts, but some rather seem to be traditional agreements, that may not be outspoken but can be understood from the actions of the members and creators of The DAO.

6.2 Normative space

A question that needs to be asked when considering smart contracts in the setting of traditional contracts is what the normative space is in computable contracts. Natural language contracts can be more or less decidedly open ended and leave room for interpretation, meaning that the normative space can be quite big. For computable contracts this is less certain.

Code as law is created to enforce regulations ex-ante and through preventing unwanted behaviors.[1] This could open up for an argument where a smart contract needs to prevent all unwanted behaviors, so that if something is possible, it is also allowed. The discussion around the DAO hack illuminates this position, which is held by the supporters of Ethereum classic.[2] On the other hand, the smart contract regulates actions in a very concrete way, so that the opposite argument can be held, if it is not regulated in the smart contract, it is not meant to be in the agreement. Smart contracts are thus either normatively very closed or normatively very open.

[1] DiFilippi, Primavera and Hassan, Samer. Blockchain technology as a regulatory technology: From code is law to law is code. First monday. Vol. 21. Nr. 12. 2016. From: `http://firstmonday.org/ojs/index.php/fm/article/view/7113/5657` (2018-04-14)

[2] See `https://www.reddit.com/r/ethereum/comments/4oiqj7/critical_update_re_dao_vulnerability/` (2018-04-03)

This issue will be touched upon in the section below when discussing the various contracts that make up The DAO.

6.3 The agreements

6.3.1 Introduction

When analyzing The DAO, its creation, governance and relationships, four main contractual relationships appear. The first one is the agreement between the founders to create the organization, and the code on which it runs. The second is the internal agreement between the members of The DAO, how voting and representation works and how profits should be divided etc. The third agreement is the agreement between The DAO, or rather its members, and the curators and the fourth agreement is between The DAO and the contractors. The first two should be seen as two agreements, while the latter two are rather two categories of agreements but that in reality would be separate agreements for each of the individual curators and contractors.

Apart from the above, there are a few minor categories of agreements in relation to The DAO. These are for example the sale of tokens, through an ICO or by a member, and how a split-DAO will create a new agreement. These will only be mentioned here, and left to someone else to elaborate on.

6.3.2 The creation of The DAO

When the founders of The DAO started working on the project, they can be said to have made a, spoken or unspoken, agreement to start working together for the purpose of creating a digital platform for crowdfunding via cryptocurrency. Simon and Christoph Jentzsch were part of that agreement, potentially together with a few other coders etc.[3]

There is not much to be known about that agreement, as it may very well have been a silent one. The contents cannot be explored further than to say that they agreed to work towards creating the platform. There were probably no requirements to actually achieve anything and it could be compared to a Memorandum of Understanding.[4]

The duration of this agreement was from when the parties started working on the project until the code was deployed on Ethereum. The reason why I do not consider the agreement to extend further in time is because it was only for the purpose of creating the platform, the founders have not made any ownership claims on that ground in The DAO.[5]

This agreement was not made in code and thus the normative space is quite big. Further considering that the agreement may not have been defined at all by the parties, it is somewhat likely that it could be considered to be an agreement in line with the basic rules of sole traders or general partnerships.

[3] Jentzsch, Christoph. The History of the DAO and Lessons Learned. 2016. From: `https://blog.slock.it/the-history-of-the-dao-and-lessons-learned-d06740f8cfa5` (2018-04-10)

[4] A Memorandum of Understanding is a written commitment to collaborate or similar, which does not contain any other legally binding clauses. It mainly serves the purpose of stating the parties' will to act towards a common goal.

[5] See for example Jentzsch (2016) The History of the DAO and Lessons Learned where he claims that the founders only aimed to be a service provider among others.

6.3.3 Agreement between the members

The agreement between the members is to a large extent based on the smart contracts governing The DAO. It regulates the internal relationships of The DAO. Everyone who owns at least one DAO token will be subject to this agreement, and new owners will enter into it through purchasing the tokens.

The rights conferred through this agreement are to a large extent related to decision-making and taking part of the profits of The DAO. First, the smart contracts have decided that one DAO token equals one vote. This means that the members have agreed that voting and decision rights shall be proportionate to the ownership shares of The DAO.

Second, they have agreed that profit should be divided according to the distribution of reward tokens. This does not necessarily correspond to the ownership shares, but rather to investments made in proposals. This is especially interesting when comparing to how profits are usually distributed in a general partnership or a sole trader, where it is often ownership that determines what share of the profits each partner will get.

Third, the internal agreement confers a right to opt-out of the organization by creating a split-DAO. This opportunity does not correspond to the rights of any existing organizations and may be a thesis subject on its own.

The fourth right is the right to freely[6] sell DAO tokens, i.e. ownership shares in The DAO. In contrast to partnerships and sole traders, where all partners must accept new owners, the members of The DAO may do as they wish. This right is partly conferred by the smart contracts, which technologically allow the action. Still, the possibility to take an action is not enough to make it contractually acceptable. The members could have decided, through a natural language agreement, to reprimand the member who sells his or her DAO tokens without prior permission. They have not done so, but have rather silently accepted this behavior and I therefore argue that the right to freely sell one's DAO tokens is part of the internal agreement. Here, I have used the normative space of the spoken and unspoken agreement to come to the conclusion.

The members have also agreed to be bound by majority decisions. This is important, for several reasons. First, it removes uncertainty for external actors. The external actor can trust that a proposal accepted by a majority vote will bind all members in the succeeding agreement. The reliability can be expected to increase the possibilities for The DAO to find contractual partners. Second, it removes uncertainty for the members themselves. They will know that they are a party to every agreement The DAO has entered into through a majority vote. Third, it makes it easier for The DAO to enter into agreements in general. When all members agree to be bound by majority decisions, there is no need to investigate which individuals should partake in each agreement. Instead, all members are bound automatically.

Something should also be said about representation when entering into external agreements. The members have agreed to be bound by majority decisions. These decisions are made by voting on proposals, which will either be accepted or rejected. The act of entering into the agreement is made through the smart contracts underlying the proposal and the voting mechanism of The DAO. Which means that it is not a person who enters into agreement on behalf of others, but an automated process based on the outcome of the vote. This process seem to be unique for The DAO, but does not necessarily pose a problem from a legal point of view.

As long as the members hold DAO tokens for the original DAO, they will be parties to this agreement. The right to freely sell DAO tokens is similar to how shares in a limited liability company can be transferred. The similarity could lead one to believe that the rights and liabilities of the owners are transferred in the same way as well. However, in the comparison with national legislations the conclusion was that The DAO will be considered a general partnership or a sole

[6] With "freely" in this context I mean free as in "free speech" and not free as in "free food".

trader, and for these organizations the rights and liabilities are not transferred in this way. Partners usually keep the liability for agreements in which they participated, even after they have left the partnership. The members of The DAO would thus still be liable for any agreements they have participated in during their time as members. Due to the pseudonymous nature of the blockchain, this might be hard to enforce in the case of The DAO as one might not be able to identify previous members. But that is a separate issue.

A research question for the future in relation to the internal relationship of The DAO would be what happens when a member decides to create a split-DAO and stop participating in the original. Would the liabilities for earlier agreements remain? Can they still claim profits from reward tokens? etc. I will not go into this discussion here, as it requires more time and space than this thesis allows for.

The normative space in this agreement differs between the rights. The voting and representation are embedded in code and can not technologically be done in another way, and the normative space for these is small. Regarding the right to sell tokens or for how long a member should be bound by agreements after leaving The DAO, either through selling the DAO tokens or by creating a split DAO, the normative space is much bigger. The agreement does not seem to confer any specifics in these cases and some guidance might be needed from national regulations or case law.

6.3.4 Power of curators

The curators of The DAO get their power from an agreement between the curators and the members. The object of this agreement is to give the curators the mandate to select which proposals to whitelist. The agreement bears some similarity to an agreement of power of attorney.

The two main parts of the agreement are the definition of mandate and the regulation of the possibility end the mandate. Although the curators are given a lot of power, the actual role is well defined. They are to whitelist proposals where the description and the smart contract match each other and that are from contractors who can be identified.[7] The mandate ends when the members of The DAO decide to fire the curator or when he or she resigns the position.

The normative space of this agreement is small. The mandate is defined as a specific set of actions, and in line with rules on power of attorney the mandate should not go above this.[8] The key to this limitation is that the curators do not make any investment decisions or bind the members in agreements with third parties in any way. The whitelisting only decides which proposals may be considered and it is up to the members to accept or reject the proposals. Therefore, it does not seem reasonable to extend any rights or liabilities for the curators beyond the aforementioned.

6.3.5 Proposals

The proposals, or rather the proposals that are accepted, are agreements between the contractor and the members of The DAO. Proposal is a good description of what they initially are, an offer for the members to enter into an agreement with the contractor. After an internal vote, the members will either accept or reject the offer.

The object of these agreements will be different for each proposal, but the common factor will be that the proposal should offer a possibility for the members to invest ether in a project, in return for a service or a return on investment. This means that the contractor will get ether, and the members will be provided a service or a right to a share of the future profit of the project, or something similar.

[7] Tual (2016)
[8] See e.g. The Swedish Contracts Act (1915:218) chapter 2

Not much more can be said in general about the agreements with the contractors, as they will most likely be different for each proposal. As the proposals are to be submitted both via a smart contract and a more detailed description, the normative space of the proposals is more clear than for the other agreements in this chapter. This is due to the added aspect of natural language descriptions, which may convey rights or liabilities on all parties to agreement. To determine the rights, liabilities and normative space for these agreements they will have to be studied individually, which will not be done within the scope of this thesis.

6.3.6 Liability

Something must be said about the liability aspect of the agreements above. There are no clear restrictions on liability in either of these, maybe with the exception of the agreement with the curators. As the mandate of the curators is restricted to verifying a few aspects of the proposals, their liability should only cover those actions.

For the internal agreements, between the founders and between the members of The DAO, the liability aspects are hard to identify. The founders do not seem to have regulated it at all, at least not in a way that can be identified by an external party. The agreement between the members shows some intention of allowing members to withdraw from situations where e.g. the majority tries to take advantage of the minority, through the possibility to create a split DAO. That only regulates internal relationships however. They do not seem to have regulated how liability shall be borne or divided in relation to external actors.

As there does not seem to be an agreement stating otherwise, resort will have to be taken to general contractual principles when there is a conflict with a third party. Taking guidance from the conclusion in chapter 5, it is likely that all founders or members, depending on which agreement the situation touches upon, will be held jointly and severally liable.

6.3.7 Other remarks

The fact that The DAO can be seen as a contract, or a set of contracts, does not remove its status as a sole trader or a general partnership. Being a contract does not make it immune to other legal constructions, but rather serves to use the possibility the regulations give to regulate the internal relationship through partnership agreements or similar. The agreements in this chapter mainly regulate the rights of the participants, i.e. founders, members and curators, and not the liabilities. In lack of contractual regulations, the liability will most likely be decided through national legislations.

Through recent reports indications are made that when events have taken place that could motivate placing The DAO within a national jurisdiction, that jurisdiction will treat it as a party liable under their legislation. The digital and global nature of the blockchain could make this connection difficult, as it would either have to be through the natural persons participating in The DAO, or through the parties with which The DAO interact, thus placing its actions on a geographical market. For more on this discussion see section 5.3.2.

Chapter 7

Where do we find the law?

7.1 Introduction

One issue with blockchain technology is that it is not easily placed within a national legislation. The distributed nature of the blockchain could be said to put it in every geographical location where there is a node. This question poses problems when trying to define The DAO as a legal organization, since the location of the "chief executive office"[1] often decides which jurisdiction should apply to a partnership or organization.

Some argue that the blockchain should not be placed within a jurisdiction at all. Rather, it could be argued that the blockchain should instead be considered a jurisdiction, with laws, of its own. As Käll puts it, maybe we should not "consider law to be vested in textual/nation-stated founded ideas of law, only"[2]. This idea, of law as something other than the official texts of a book stamped with the word "law", is also supported by Lawrence Lessig. When Lessig discusses freedom and regulation in cyberspace, he means that there needs to be a constitution, but that this constitution is "an architecture — not just a legal text"[3] and he further means that this architecture "is a kind of law: It determines what people can and cannot do."[4]. As mentioned in the introductory chapters of this thesis, I will be using the theories of Käll and Lessig, as well as Bruno Latour, in the discussion of the following chapter regarding if we can see code as law and the blockchain as a jurisdiction.

The idea that the blockchain consists of code and other effective laws and that there are certain powers behind them, gives us a new perspective when looking at blockchains. Especially when we enter into the discussion knowing that the forces underlying the blockchain are mainly private ones, either as individual persons or as commercial parties, we can see that we might be dealing with some kind of "privatized law"[5]. The problems of privatized law will be returned to later in this chapter.

If the argument of blockchain jurisdictions turns out to be victorious this would mean that for actions taken strictly on the blockchain, e.g. a transaction of coins for a token, there should be no need for other national laws to apply, but instead the "law" of the blockchain would take precedence. For actions that are crossing the "border" between the blockchain and the physical world legislation on choice of law should apply in the same way as for actions crossing geographical borders in the physical world.

[1] See e.g. RUPA 106 (a)
[2] Käll. (2017) p. 36
[3] Lessig (2006) p. 4
[4] Lessig (2006) p. 77
[5] ibid.

Although the argument that the blockchain should be a jurisdiction of its own is an interesting argument to make, I claim that there are some barriers to making it an effective one, as will be seen at the end of this chapter.

Before entering the discussion some clarifications are needed. Since The DAO is an application on a larger blockchain, this chapter will take a step back and look at blockchains in a broader sense, but with some examples connected to The DAO. Today, there are public and permissioned blockchains, and some hybrids between the two. The permissioned blockchains bear no or very little similarity to a jurisdiction, but are rather a tool for private actors to manage data and communication. Therefore, the permissioned blockchains will not be considered in the following discussion. It is instead the public blockchains that might be relevant. Features such as not being owned by anyone, and being open for anyone to engage on makes them interesting to look at. Public blockchains have the capacity to grow and become large, whereas permissioned blockchains do not have to be larger than the owner company needs them to be. Bitcoin and Ethereum are examples of public blockchains, as well as currently being the two biggest blockchains, and will as such serve as examples for the following discussion.

It is also important to remember that blockchain is not simply a technology, but is built on an ideology.[6] Some technologies have come to a stage where they are separated from the interests that created them, e.g. the technology that makes up a car, and could be called neutral in the sense that they will be filled with the purpose and values of their user independent of the values of the initial creator. These technologies should not be relevant to discuss as jurisdictions. The blockchain however, is essentially an idea of decentralized and distributed power, which becomes embodied when the protocol is applied to it.[7] This is part of why it is interesting to look at from the perspective of a potential jurisdiction. It is not a neutral technology, but it has a more or less clear agenda which is pushed in the design of the blockchain protocol.

7.2 Physical and digital borders

National legislation works so that it comes into force under certain conditions, often when actions are taken within the nation's area of jurisdiction. If an action falls under another nation's jurisdiction, that nation's legislation will be used.[8] The change of jurisdiction often happens when a physical border is crossed, such as the border between Sweden and Norway.

Geographical borders are not relevant when discussing blockchains but, as Latour discusses, groups create their own borders, or boundaries, towards others in order to create and define the own group. Latour means that there are certain steps for the creation of a group, which I argue can all to some extent be applied to the blockchain. The first of these is having spokespeople, whose role is to speak for the group and define it in relation to others.[9] The decentralized nature of the blockchain could make this step difficult, but instead one can see something similar to a movement, where many actors are engaged in the blockchain community and push its agenda in different forums, often on the internet.

The second and third steps of Latour's group creation are more easily applied to the blockchain. The boundaries of the group needs to be traced in relation to others, thus in some way defining the others as well as the own group. Then, the boundaries need to be set.[10] The blockchain traces and sets its boundaries in the protocol and essentially has two boundaries. One is the on-chain or off-chain boundary, meaning that some actions or transactions take place on the blockchain itself, while others are taken in the physical world or in a digital environment that is not the blockchain.

[6] Blockchain has its roots in the cypherpunk movement and libertarianism. An easy summary of the connection can be found in the thesis Bitcoin och Borgenärerna (2018) by Stina Karinsdotter.
[7] Liljekvist, Ivan. (22 Sept. 2017)
[8] In the EU this is regulated in the Rome I and Rome II regulations for the area of international private law.
[9] Latour (2005) p. 33 ff.
[10] ibid.

This boundary is relevant for example when tokens are represented by physical objects. The other boundary is between different protocols, i.e. Bitcoin and Ethereum.

These boundaries, set in the protocols, are all created through code. As such, they can be difficult to visualize but it is not impossible. On the contrary, they can be observed in the various digital interfaces that are created to enable communication and translation between blockchains, or between a blockchain and its surroundings. There are for example services that allows one to exchange coins on one chain for coins on another, e.g. when exchanging BTC for ETH, as well as exchanging coins for fiat currencies such as US dollars.[11]

The fourth step of Latour's groups is to be studied or observed by some sort of social science instrument.[12] This thesis could be one example of this and there are probably more to come.

In this line of thought, no group is independent of its surrounding environment, as without it there would be nothing towards which the boundaries can be defined. Comparing it to Käll's reasoning about human and digital bodies, no body can exist at all without the environment with which it has relations. Käll quotes Claire Colebrook to explain the dependency of the relations with other actors, as well as the need for a factor that sets the body apart from the outside, in order to be able to function properly. What Colebrook means is that "A completely closed body that had no world would be deprived of the means of ongoing life; an absolutely open body without border would not be a body at all, would have no ongoing identity, What is required, then, is a border or membrane that enables communion with an outside, but an outside that is always outside for this bounded body, and that is managed so as to produce only the alteration or perturbation required for ongoing self-maintenance."[13] Again, the protocol can serve the purpose of defining the blockchain as body and allowing it to communicate with its surroundings.

Going back to the blockchain, it could be said that it would not exist as a group or a body, without its relations with others, and would not be as interesting to study if there were no conflicts with the off-chain world. At least the problems of this thesis would no longer be relevant. But now, the blockchain does make claims, and puts up borders to national legislations that could justify its existence. An example is the claim of immutability. The blockchain strongly opposes the interference of intermediaries and governments. A transaction on the blockchain cannot be changed after the event, even though for example fraudulent behavior is behind it. In a national legislation on the other hand, transactions can be undone through authorities and banks.

Thus, the blockchain has borders towards national legislations that could make it a jurisdiction. Further, two blockchain protocols, e.g. Bitcoin and Ethereum, should be considered separate jurisdictions in the question at hand.

7.3 National and effective laws

Critical legal theory challenges the assumption that law can only be found in courts, and that all law is created by governments and parliaments.[14] Instead of of only considering formal law, one also needs to think about the powers and forces which push bodies to act in certain ways, so called effective laws. Further, even when studying formal law, this can not be done without also considering how this is being practiced, thus connecting back to the law as a force.[15]

In the blockchain setting, the main force that pushes bodies is the protocol. As mentioned in the

[11] Rosic, Ameer. Best Cryptocurrency Exchanges: The Ultimate Guide. 2017. From: `https://blockgeeks.com/guides/best-cryptocurrency-exchanges/` (2018-04-27)

[12] Latour (2005) p. 33 ff.

[13] Colebrook, C. Time and Autopoiesis: The Organism has No Future, in eds. Guillaume, L. and Hughes, J. Deluze and the body, p. 12 (Referenced in Käll (2017) p. 107)

[14] Käll (2017) p. 124

[15] ibid. p. 132 f.

technology section, the protocols are the rules by which the network plays. No transactions can be made, no communication can take place and no smart contracts can be created that are in conflict with the protocol. This resembles the way national legislation serves to control the behaviour of actors within their jurisdiction, with the exception that the protocols prevent behaviors through technological measures whereas national legislation exercises control through the threat of sanctions.

To this we can add a posthumanist perspective.[16] Through it we see that national law is always created by conflicting interests and that the forces or powers behind these interests are rarely of the same size or weight.[17] The same conflict is present when we observe the forces that pushes bodies on the blockchain. What is interesting about the blockchain is that the initial code is often created by one or a few people, such as Satoshi Nakamoto with Bitcoin and Vitalik Buterin with Ethereum. Especially with Bitcoin, which is written under a pseudonym, it may be difficult to assess the actual forces behind it but as more and more people decide to join the network, it gains power over time.

There is an interesting conflict in this, where the blockchain idea of distributed power originates from the power of a limited circle of people. Essentially, the democratic debate that should precede legislative measures is lost in this dynamic, despite the fact that democratization, in the sense of power from the people, seems to be a founding principle of blockchain. The development of the effective laws underlying the blockchain are rather created in an oligarchic way, where the rest of the community only has the option to opt-in or opt-out. This differs not only from the way law traditionally is created, it is also different from the dynamic processes that form social norms in that it is an instant opt-in or opt-out rather than something that develops over time.

The logic of opt-in, opt-out is rather the logic of commercial markets. Consider Facebook for example. The creators of Facebook have set some rules that you are bound by if you choose to use their services. If you do not want to abide by those rules, you can choose to use another social networking platform, with another set of rules that suits you better. Lessig refers to these relationships as "merchant-sovereigns", in contrast to "citizen-sovereigns" where the state is party with power.[18] Lessig takes on the discussion from the perspective of cyberspace and the internet and claims that "As a descriptive matter, then, cyberspace is not yet dominated (or even broadly populated) by citizen-sovereignties. The sovereignties we see so far are all merchant-sovereignties. And this is even more clearly true with the Internet. To the extent sites are sovereign, they are merchant-sovereigns. Our relationship to them is the same as our relationship to McDonald's"[19]. I would claim that the same dynamics are true for blockchains and that they should be highlighted in the discussions over "Code is law".

The conflict between law-making by merchant-sovereignties with an opt-in, opt-out logic and law-making by citizen-sovereignties through democratic debate needs to be addressed before we decide whether we want to accept law-making through blockchain protocols in the future.

7.4 Code is law?

The expression "code is law" has been around for some time now and refers to the code as a means for governance and enforcement.[20] One of the prominent voices in the discussion is Lawrence Lessig who began investigating code as a means of regulating cyberspace in the late 1990 with his

[16] When using posthumanist theory in this thesis, I join Käll in her interpretation of what it is. Some important parts for this thesis are the criticism of law as only embodied in certain texts and that there would be an absolute outside of the law, but also the realization that law is constantly created and not something that is to be found. (Käll (2017) e.g. p. 34 f. and 135 ff.)

[17] Käll (2017) p. 144

[18] Lessig (2006) p. 287

[19] ibid.

[20] An example of enforcement through code is Digital Rights Management, which will not be discussed here.

book Code and Other Laws of Cyberspace[21]. His updated version of this work, Code: Version 2.0, from 2006 has already been referenced above and has also been one of the sources for the following sections.

The discussion has also started taking the turn towards "law is code" meaning that legislation should be considered when writing code and its enforcement should be implemented in the code.[22]

When discussing whether or not code can or should be considered law in the blockchain setting, I will make a distinction between code in the form of the protocols and code in the form of smart contracts. The reason for this distinction is that the protocol affects the entire blockchain, while the smart contracts often only affect the application or the transaction they build. This is despite the fact that the code itself technologically works in the same way but is rather based on the hierarchy on the blockchain. A comparison could be to see them as law or contracts, where the law binds everyone while the contract only binds the contracting parties.

As mentioned, the blockchain protocols serve one purpose of defining the borders of the group that is the blockchain and exclude others. The other purpose is that of being the de facto legislation of the blockchain, the embodiment of "code is law". From the perspective of critical legal theory, this is an act of breaking free from a normative theory of law, and instead trying to engage in a discussion of what the law ought to be.[23]

I argue that there are two types of "law" in the protocol. The first type is rules for communication, as mentioned. These rules govern how the nodes must act in order for a transaction to be verified and added to the blockchain. I would compare them to procedural law in national legislation, and as they are embedded in the code of the protocol they could have enough transparency and security as to be able to serve as law.

When it comes to "material law" the blockchain is no longer as comparable to national legislations. The three basic "laws", or rather ideologies, that often surround the blockchain are decentralization and immutability and some mixture of anarchy and direct democracy. I argue that these are all fallible in one way or another.

The decentralization is founded on the idea that anyone can be a node in the network and add to the blockchain.[24] In reality, this is becoming less and less true, as it becomes more expensive to be a node due to the need for more computational power the larger the blockchain becomes. This becomes especially clear in the case of miners.[25] The fact that you can also de facto buy more power by purchasing more computational power to mine does not seem as much as a decentralization of power as an allocation of power to the rich. In the capitalist, market system, this is already the case. But it becomes problematic when the system, the blockchain, is to be used for other things than strict market applications. For example, there is a discussion about using blockchains for creating and storing digital identities[26] and the question needs to be asked if this application is still desirable if it means that we effectively put the control of our identities in the hands of a private entity. An argument against this worry is that we have already put some control of our identities in the hand of private companies. Considering how much of our personal data we have given to companies such as Facebook or Google, one could argue that individuals do not care very much about who controls their personal data.

Close to the decentralization principle lies the idea of direct democracy as a governance structure, in that changes should be done after a discussion in the community where everyone gets a say. This is actualized in voting situations, otherwise the governance is more similar to anarchy. It is not a

[21] Lessig, Lawrence. Code and Other Laws of Cyberspace. Basic Books. New York. 1999

[22] See for example DiFilippi and Hassan (2016)

[23] See Käll (2017) p. 141

[24] Note that being a node in the network is not the same as being able to use the services that are offered on the blockchain. You do not need to be node in order to trade with bitcoin for example.

[25] See: `https://bitcoin.org/en/full-node#minimum-requirements` (2018-04-14)

[26] See e.g. Hackett, Robert. Why Blockchains and Identity Go Together. Fortune. 2018. From `http://fortune.com/2018/01/20/blockchain-identity-civic-silicon-slopes/` (2018-05-10)

democracy of equals however, as more money will give you more votes, through controlling more nodes or tokens. In the example of The DAO, more money can buy more tokens, which equals more voting power in the organization. The pseudonymous nature of the blockchain makes it hard to know how much power lies with one person, and in the end the governance may turn out to be more similar to an oligarchy than a democracy. This idea, or something similar to it, has been expressed by Robert Herian, who claims that "blockchain creates the perfect illusion of decentralization"[27] while in reality it exchanges the power of government for the power of capitalists.

The discussion about how we put power in the hands of a few people resembles the discussion Lessig drives about regulation of cyberspace and the internet. Lessig refers to the holders of power as "sovereigns", both when they act in a national setting and in cyberspace. On the matter of how we essentially give up our democratic power in cyberspace he says "what about democracy? In real space, the rule is that sovereigns are legitimate only if democratic. We barely tolerate (most) nondemocratic regimes. The general norm for real space life is that ultimately, the people rule. But the single most interesting nondevelopment in cyberspace is that ... Democracy has not broken out across cyberspace, or on the Internet. Instead, democracy is a rare exception to a fairly strong rule—that the "owner" of the space is the sovereign"[28]. On the blockchain, the people neither rules the creation of the basic code, nor the addition of blocks to the chain. The former is controlled by programmers and the latter by whoever holds the most nodes. The problem of "law" being created by programmers will be discussed in the next section.

The immutability is closely connected to personal responsibility and risk on the blockchain. When a transaction is made it is final and cannot be undone. Aspects such as duress or typing mistakes are not taken into consideration, which creates moral issues. Should we accept a legal system where one can get away with what is widely considered criminal or immoral behavior? The DAO hack and the Ethereum hard fork is an example of when this conflict was actualized. Due to a fault in the code, a "hacker" was able to place 3.6 million ETH of the investors' money in a separate account.[29] The discussion following this eventually lead to a so-called "hard fork" on Ethereum, which reset the chain from the block previous to the hack and restored the funds.

This decision was not accepted by all, since it broke the principle of immutability, and to some extent decentralization, and part of the Ethereum community stuck to the old chain, where the funds were still in the hands of the hacker, creating the Ethereum Classic chain.[30] This conflict illustrates the conflict between moral considerations and the "law" on the blockchain.

7.5 Problems with "code is law"

Apart from the problems above, where the material rules do not seem to represent the reality of the blockchain and there is conflict between the laws of the blockchain and moral considerations, there are other issues that arise from trying to treat the blockchain as a jurisdiction. These will be touched upon in this section.

The first problem, which will become increasingly obvious the more blockchains are created is just that. More and more blockchains are created, and if the protocol is the layer that turns a blockchain into a jurisdiction we will soon have an ocean of new jurisdictions to navigate. Not all protocols follow the same rules, and the question will arise where we should draw the line between a blockchain that is merely a technological tool and one that is a jurisdiction. One such line could

[27] Herian, Robert. Decentralization and the Distributed Reproduction of Capitalist Power. In Gloerich, Inte; Lovink, Geert and De Vries, Patricia eds. MoneyLab Reader 2: Overcoming the Hype. Institute of Network Cultures. 2018. p. 50

[28] Lessig (2006) p. 285

[29] Siegel, David. Understanding The DAO Hack for Journalists. Medium. 2016. From: `https://medium.com/@pullnews/understanding-the-dao-hack-for-journalists-2312dd43e993` (2018-04-03)

[30] For a sense of the discussion see `https://www.reddit.com/r/ethereum/comments/4oiqj7/critical_update_re_dao_vulnerability/` (2018-04-03)

be between public and permissioned blockchains, but not even this is a clear cut case, as there are also hybrids between the two with varying levels of openness.

Another problem is related to enforcement. The blockchain only practices enforcement ex-ante, meaning that the code prevents people from acting in certain ways, and not ex-post as national legislations do.[31] The blockchain also only regulates actions on-chain, so that a transaction made at gunpoint cannot be touched by the law of the blockchain. Further, with the private and public key cryptography it is difficult to identify the individuals behind the actions for enforcement ex-post. The latter is not limited to cases where the blockchain could be considered a jurisdiction but is a problem for almost all enforcement in blockchain related issues.

Lessig proposes a solution to some of the problems related to enforcement. He suggests that governments will always try to regulate behaviors and that market forces will ensure that companies, in his examples it is companies on the internet, will comply with regulations as it will be bad for business to not do it.[32] In the blockchain setting, this is closely related to the on-chain, off-chain dynamic. Even though governments seem to have a hard time regulating behavior on-chain, they can create laws to govern the off-chain environment. When blockchain companies want to do business with actors on the off-chain market, or use physical products that exist off-chain, they will have to comply with the regulations. If they do not comply, chances are that the company will fail to find partners and customers, making compliance the most profitable option.

This approach is not guaranteed to work in every case. Lessig provides an example of a case when government tried to subsidize one product, which they could regulate, in order to get the consumers to buy that instead of unregulated products. The idea was that the companies offering products would then switch to the regulated one. The problem for the government was that people preferred the unregulated products to the subsidized one and kept buying those even though they were more expensive.[33] For cases like these, and for issues demanding actions ex-post, enforcement will continue to be an issue for quite some time.

Third, we need to consider the consequences of calling the blockchain a jurisdiction in the bigger sense before determining it to be so. In this thesis the focus is the perspective of organizations, but what happens to the cryptocurrencies if the blockchain is a jurisdiction? This should be subject to further consideration and research.

Fourth, when very few programmers control the initial code and its development we may be removing democratic debate from the creation of law. If the majority of the community only have the option to accept or reject proposals, the chance for moderation of regulations is low. There may also be a transparency problem here, as people will be required to understand coding languages to be able to read the "law".

7.6 What this means for The DAO

If the blockchain would be considered a jurisdiction of its own and the protocol law, it is the law of the blockchain that should regulate organizations on the blockchain. However, the protocol is such a basic layer of rules that there is nothing deciding what an organization is or what it can do as long as it complies with the rules of communication.

On one hand this could limit the possibilities for what The DAO could be or do, as it would be surrounded by uncertainties. On the other hand, by looking at the underlying ideology of the blockchain, there is a possibility that The DAO would be able to set its own limits and be whatever its members want it to be. When the aim of the blockchain is to get rid of central authorities who

[31] For more on this see DiFilippi and Hassan (2016).
[32] Lessig (2006) chapter 4, see esp. p. 64
[33] ibid. p.65 f.

decide the limits of what can be done, it is not unreasonable to assume that the "law" of the blockchain would be freedom to act in whatever way one deems to be reasonable.

7.6.1 Defining the organization

How does one decide the boundaries of The DAO, when there is no law to set the definitions? Käll uses the dichotomy of inner and outer determinations for defining bodies in the posthumanist jurisprudence. The inner determination consists of the relation between the own power and the power of the environment, or similar. This defines and individualizes the body. The outer determination is created when the individual body relates to its surroundings. The outer determination is further dependent of the inner, implying that "through being a specific measure of force or intensity, every body will relate in a specific way to other bodies"[34].

When seeing The DAO as a body on the blockchain, in form of an organization, one could try to define it through its relations with other actors on the blockchain or on a market. The inner determination takes the form of power in the form of executed code. When the code is deployed, it is a power that decides e.g. who can be part of The DAO and allows one to relate to The DAO, as one would with a body. Looking back at the Colebrook quote, the code is what closes off The DAO to give it identity, while at the same time being the medium for interactions with the outside.

Compare this with registered organizations in national legislations, where the registration and the statutes of the organization defines the boundaries, so that a third party can clearly see what is inside the organization and what is outside, and interact with the organization accordingly. In The DAO, the code is visible for third parties through its publication of the blockchain, making it accessible in a way comparable to a registration. The rules set in the code define functions of The DAO in a way similar to how the statutes govern a national organization. See however section 5.2.1 on the dissonance between the blockchain and registries in accordance with existing national laws. The difference between that discussion and the case here, is that the former has to comply with existing requirements, while the latter can make up its own rules on what a register needs to be.

7.6.2 The organization as a legal person and liability of its members

As touched upon above, the code of The DAO governs how it interacts with others, and vice versa. In looking how The DAO relates to the rest of the blockchain, one could say that the blockchain treats The DAO as a legal person. This can be seen for example in how all the staked ether of the members go into a common account and it is The DAO that then invests in projects and not the individual members.

The members further vote on how The DAO as an entity should act, and the minority is bound by the decisions made. The DAO can also hire others to do work for the organization, such as creating a website. These agreements should bind all members of The DAO, as it would be highly impractical to have every individual member be part of every agreement in their own capacity. Together, this further strengthens the image of The DAO as something separate from its members and a legal entity of its own.

The liability of the members is a more complicated issue than The DAO's capacity to act as a legal person. By treating the blockchain as a jurisdiction, priority should be given to the "law" of the protocol over the smart contracts running The DAO. The protocol does not have rules specifically governing liability, but some guidance could be taken from the principles of immutability and pseudonymity. These indicate that the only responsibility put on the actors on the blockchain is that the transactions they make shall be valid. It does not extend this to a liability regarding what

[34] Käll. (2017) p. 106

happens with the tokens after the transaction or anything that happens off-chain. We may again use the example of the DAO hack. The protocol itself did not put any liability on the creators of The DAO or the organization itself for having the faulty code that allowed the hacker to withdraw the ether he or she did not have a right to. Another example is so-called ICOs[35] where the investors bear their own risk for investing in an ICO where the founders might take off with all the value without delivering.

Since the protocol does not seem to place any liability on the individual members, the question is whether the smart contracts underlying The DAO do so. There are two indications of a limited liability of the members. First, the majority has the possibility to bind the minority in agreements. In Swedish organizations this right is often connected to a limited liability of the members. When an organization exercises joint and several liability, it is often connected to a veto right or a requirement to have consensus for decisions.[36]

Second, The DAO included a right for the members to withdraw their investment before they made a vote on decisions and place it in a sister DAO. This would then make sure that the money of that member would not be included in the investment made. The right to withdraw one's investment strongly indicates that The DAO had no intentions of binding its members to anything other than the money they decided to invest.

The above seems to give that if the blockchain is treated as a jurisdiction of its own, The DAO should be considered a legal entity with limited liability for its members. This is only true for actions that are made purely on-chain however. When The DAO interacts with an off-chain market, the choice of law might lead to other kinds of liabilities for the members, especially if the national legislation does not accept The DAO as an organization with the capacity to act as a legal person.

7.7 Conclusion

Even though it is interesting at a first glance to discuss the possibility of treating the blockchain as a jurisdiction of its own, separate from geographical and national boundaries, it is not a feasible option.

The first complication is that the rules that can be set in code are not capable of matching the complexity of traditional legislation, not even for regulating the creation or capabilities of organizations to satisfy simple needs for certainty and predictability. If smart contracts are not capable of matching traditional contracts when it comes to allowing for normative space, we should not expect the protocols to be able to match law for the same reasons.

The inclination to treat the blockchain as a jurisdiction also fails to understand that there no such thing as "the blockchain", but rather that there are several blockchains with rules of their own. Each blockchain has its own mechanisms of governance and control, and treating each one as a jurisdiction risks being complicated and risky.

The main reason why we should not treat blockchains as jurisdictions is the fact that the forces that control the blockchain are mainly private interests. If we only accept sovereigns who are democratic in the physical world, why should we accept non-democratic ones in the digital world? I draw the conclusion that we should not accept blockchains as jurisdictions until they can prove that they satisfy claims for democratic debate and power of its "citizens". Thus, in the end the final, and major, drawback of treating the blockchain as a jurisdiction is the loss of democratic debate and the placement of the de facto power in the hands of software developers alone.

[35] Initial Coin Offerings can be compared initial public offerings but for blockchain tokens instead of traditional company shares.
[36] See tables 5.1 and 5.2

Chapter 8

Concluding remarks

In this thesis I have discussed The DAO from the perspectives of national organizations, as a set of contracts and finally in the setting of a potential blockchain jurisdiction. The aim has been to identify what the liability of the members would be in relation to third parties.

When analyzing The DAO in the light of various national laws on associations, I found that the lack of registration of The DAO as a formal organization excludes it from consideration from most forms of companies. Chapter 5 included a discussion on whether the existence on a blockchain could serve as a form of registration, but the conclusion was that the blockchain, e.g. by being written in code, is not transparent enough to serve the intended purposes of a register of companies held by a national authority.

When analyzing The DAO from a contractual perspective, four main relationships were laid out. These are the relationship between the creators, the internal relationship of the members, the relationship between the members and the curators and the relationship between the members and the contractors. To a large extent, these relationships seem to be regulated through more or less unspoken agreements, where the parties have not considered the liability perspective. For issues relating to liability of the members, other rules on liability therefore should take precedence.

Unfortunately for the members of The DAO, independent of perspective, they seem to put themselves in a position of unlimited liability when participating in The DAO, and becoming a member is a high risk investment. There is however a possibility that parties who want to claim their rights in relation to the members of The DAO will face enforcement issues, due to the pseudonymous nature of blockchains, which stems from the public-key cryptography that is used in designing the network.

The above leads me to pose the question if not the development of blockchain organizations should push us to reconsider our current forms of organizations. I think that the discussion on whether or not we should allow parties to use the blockchain as a registry should be developed, and options for ensuring transparency through other means than registration with national authorities should be explored.

A part of the discussion in this thesis has been about the difference between smart contracts and natural language contracts, and how this difference affects the normative space of agreements. This is an interesting topic which I think is relevant for lawyers, and others, to continue discussing in order to grasp how we can use smart contracts for regulating contractual relationships.

With the help of the theories of Latour and Käll, I was able to distinguish some features that set the blockchain apart from its surroundings and to identify the forces who are pushing actions on the blockchain. This enabled the discussion on whether the blockchain could be a jurisdiction separate from national laws. The continuance of that discussion was strengthened by the writings of Lessig

regarding code as a regulatory force. With the help of Lessig's theories I questioned whether the sovereigns of the blockchain should be accepted as creators of law, when these sovereigns are private entities who have not been chosen through a democratic process. I expect this topic to be the subject of continued debate, as it has been for several years already, but my conclusion is that we are not yet ready to accept code as law if we value democracy.

In spite of all that has been concluded here, The DAO has a structure that can make decision-making more effective in large organizations than it currently is, even though it fails to touch upon division of liability. If The DAO was to be used as tool within an existing organization, these problems would most likely disappear and the potential of the technology might be utilized.

Finally, blockchain is still a relatively new area of technology and is in the process of maturing. I look forward to seeing where this will end up and what new topics it will lead us to explore.

Reference List

Swedish law

[1] Code of Judicial Procedure (1942:740).

[2] Companies Act (2005:551).

[3] Contracts Act (1915:218).

[4] The Co-operative Societies Act (1987:667).

[5] Partnership and Non-registered Partnership Act (1980:1102).

[6] Proposition 1986/87:7 om ekonomiska föreningar.

International law

[1] COUNCIL REGULATION (EC) No 1435/2003 of 22 July 2003 on the Statute for a European Cooperative Society.

[2] COUNCIL REGULATION (EEC) No 2137/85 of 25 July 1985 on the European Economic Interest Grouping.

[3] French Code Civil.

[4] French Commercial Code.

[5] German Commercial Code.

[6] Revised Uniform Partnership Act (1997).

[7] United Kingdom Companies Act 2006.

[8] The United Kingdom Partnership Act 1980.

Literature

[1] Peter Altmann. *The manual 2*. Unpublished, 2018.

[2] Mads Andenas and Frank Woolridge. *European Comparative Company Law*. Cambridge University Press. Cambridge, 2009.

[3] Vitalik Buterin. *A Next Generation Smart Contract & Decentralized Application Platform*. Ethereum White Paper, 2013.

[4] Claire Colebrook. *Time and Autopoiesis: The Organism has No Future*. in eds. Guillaume, L., Hughes, J. Deluze, and the body, p. 12 (Referenced in Käll (2017) p. 107,

[5] Antonio Cracogna Dante. Fici and Hagen. Henrÿ. *International Handbook of Cooperative Law*. Springer, Berlin, Heidelberg, 2013.

[6] Primavera DiFilippi and Samer Hassan. *Blockchain technology as a regulatory technology: From code is law to law is code*. First monday. Vol. 21. Nr. 12, 2016. URL: http://firstmonday.org/ojs/index.php/fm/article/view/7113/5657. Fetched 2018-04-14.

[7] Mats Glavå and Ulf Petrusson. *Illusionen om rätten! – juristprofessionen och ansvaret för rättskonstruktionerna*. Askeland, B & Bernt, J.F. (eds.), Erkjennelse og engasjement : minnesseminar for David Roland Doublet [1954-2000] Fagbokforlaget, Bergen, 2002.

[8] Alexavier Guzman. *The Ripple Effect of Cryptocurrencies*. Forbes, 2018. URL: https://www.forbes.com/sites/forbesproductgroup/2018/01/11/the-ripple-effect-of-cryptocurrencies/%5C#a3527fa60800. Fetched 2018-03-29.

[9] Robert Hackett. *Why Blockchains and Identity Go Together*. Fortune, 2018. URL: http://fortune.com/2018/01/20/blockchain-identity-civic-silicon-slopes/. Fetched 2018-05-10.

[10] Robert Herian. *Decentralization and the Distributed Reproduction of Capitalist Power*. In Gloerich, Inte; Lovink, Geert and De Vries, Patricia eds. MoneyLab Reader 2: Overcoming the Hype. Institute of Network Cultures, p. 50, 2018.

[11] Frederick J. Hirsch. *Introducing SSL and Certificates using SSLeay*. World Wide Web Journal - Special issue: Web security: a matter of trust archive Volume 2 Issue 3, Summer 1997 p. 141-173, 1997.

[12] Christoph Jentzsch. *Decentralized Autonomous Organization to Automate Governance*. The DAO White Paper, 2016.

[13] Christoph Jentzsch. *The History of the DAO and Lessons Learned*. Slockit, 2016. URL: https://blog.slock.it/the-history-of-the-dao-and-lessons-learned-d06740f8cfa5. Fetched 2018-04-10.

[14] Jannice Käll. *Converging Human and Digital Bodies - Posthumanism, Property, Law*. Juridiska institutionens skriftserie, School of Business, Economics and Law. University of Gothenburg, 2017.

[15] Stina Karinsdotter. *Bitcoin och borgenärerna - En kryptovaluta i konflikt med konkursinstitutet?* School of Business, Economics and Law. University of Gothenburg., 2018.

[16] Bruno Latour. *Reassembling the Social, An Introduction to Actor-Network-Theory*. Oxford University Press. New York, 2005.

[17] Lawrence Lessig. *Code: Version 2.0*. Basic Books, New York, 2006.

[18] Satoshi Nakamoto. *Bitcoin: A Peer-to-Peer Electronic Cash System*. Bitcoin White Paper, 2008.

[19] Carl Nial Håkan och Hemström. *Om handelsbolag och enkla bolag. 4th edt.* Norstedts Juridik, 2008.

[20] Nathaniel Popper. *A Venture Fund With Plenty of Virtual Capital, but No Capitalist*. The New York Times. New York, 2016.

[21] Carla L. Reyes. *How Should the Law Classify Decentralized Businesses?* The CLS Blue Sky Blog. Columbia Law School, 2018. URL: http://clsbluesky.law.columbia.edu/2018/01/03/what-type-of-legal-entity-are-decentralized-businesses/. Fetched 2018-02-26.

[22] Ameer Rosic. *Best Cryptocurrency Exchanges: The Ultimate Guide*. 2017. URL: https://blockgeeks.com/guides/best-cryptocurrency-exchanges/. Fetched 2018-04-27.

[23] Torsten Sandström. *Svensk aktiebolagsrätt 3 uppl.* Norstedts juridik. Visby/Vällingby, 2010.

[24] Bruce Schneier. *Cryptanalysis of MD5 and SHA: Time for a New Standard*. 2014. URL: https://www.schneier.com/essays/archives/2004/08/cryptanalysis_of_md5.html. Fetched 2018-04-10.

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

[26] David Siegel. *Understanding The DAO Hack for Journalists*. Medium, 2016. URL: https://medium.com/@pullnews/understanding-the-dao-hack-for-journalists-2312dd43e993. Fetched 2018-04-03.

[27] The Economist Staff. *The DAO of accrue. A new, automated investment fund has attracted stacks of digital money*. The Economist, 2016. URL: https://www.economist.com/news/finance-and-economics/21699159-new-automated-investment-fund-has-attracted-stacks-digital-money-dao. Fetched 2018-03-21.

[28] Harry Surden. *Computable Contracts*. UC Davis Law Review (Vol. 46), 2012.

[29] Nick Szabo. *Smart Contracts*. 1994. URL: http://www.fon.hum.uva.nl/rob/Courses/InformationInSpeech/CDROM/Literature/LOTwinterschool2006/szabo.best.vwh.net/smart.contracts.html. Fetched 2018-03-29.

[30] Nick Szabo. *The Idea of Smart Contracts*. 1997. URL: http://www.fon.hum.uva.nl/rob/Courses/InformationInSpeech/CDROM/Literature/LOTwinterschool2006/szabo.best.vwh.net/smart_contracts_idea.html. Fetched 2018-03-29.

[31] Stephen Tual. *On DAO Contractors and Curators*. Slockit, 2016. URL: https://blog.slock.it/on-contractors-and-curators-2fb9238b2553. Fetched 2018-04-13.

[32] Anna Warberg. *Gränsöverskridande insolvens - En studie av den internationella domsrätten för insolvensförfaranden inom EU*. Juridiska institutionens skriftserie, School of Business, Economics and Law. University of Gothenburg., 2017.

[33] Richard Waterss. *Automated company raises equivalent of $120M in digital currency*. Financial Times, 2016. URL: https://www.cnbc.com/2016/05/17/automated-company-raises-equivalent-of-120-million-in-digital-currency.html. Fetched 2018-03-19.

[34] Gav Would. *Why I've Resigned as a Curator of the DAO*. Medium, 2016. URL: https://medium.com/@gavofyork/why-ive-resigned-as-a-curator-of-the-dao-238528fbd447. Fetched 2018-05-13.

Internet sources

[1] Bolagsverket. *Bolagsverket statistics*. Bolagsverket. URL: http://www.bolagsverket.se/be/sok/etjanster/statistik/statistik-1.3538. Fetched 2018-04-03.

[2] Bitcoin Core. *Public-Key Cryptography*. From Bitcoin Core. URL: https://bitcoin.org/en/full-node#minimum-requirements. Fetched 2018-04-14.

[3] *Critical update RE: DAO Vulnerability*. From Reddit. URL: https://www.reddit.com/r/ethereum/comments/4oiqj7/critical_update_re_dao_vulnerability/. Fetched 2018-04-03.

[4] Lantmäteriet. *Lantmäteriet har tittat påblockkedjetekniken*. Lantmäteriet, 2016. URL: https://www.lantmateriet.se/sv/Nyheter-pa-Lantmateriet/lantmateriet-har-tittat-pa-blockkedjetekniken/. Fetched 2018-05-13.

[5] Ivan Liljekvist. *Difference between COIN, TOKEN and PROTOCOL - Programmer explains*. From Youtube, 22 Sept. 2017. URL: https://www.youtube.com/watch?v=pcilyT3fh-0. Fetched 2018-04-13.

[6] Ivan Liljekvist. *Difference between DAPPS and Smart Contracts? Programmer explains*. From Youtube, Sent live on 9 March 2018. URL: https://www.youtube.com/watch?v=4rczD8xKPJc. Fetched 2018-04-13.

[7] Ivan Liljekvist. *ICOs and tokens replacing traditional shares? Ivan on tech live.* From Youtube, Sent live on 15 Nov 2017. URL: `https://www.youtube.com/watch?v=dtuHRP4gbAg`. Fetched 2018-04-13.

Jag, Amanda Langwagen Elfström, registrerades på kursen första gången vårterminen 2018. Jag har inte deltagit i något tidigare examinationstillfälle.