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Challenges and Limitations of Granting Legal Personality to Distributed/Decentralized Autonomous Organizations

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A thesis submitted for the degree of Doctor of Philosophy

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Abstract

Apart from the legal questions, related topics from other fields are also included to help put the legal matters into a broader context. Thus, before selected legal topics are analysed, attention is paid to the broader background of what the law is supposed to regulate: social relations and how the DAOs fit into them. Selected philosophical, social and economic points are presented in which decentralized autonomous organizations are shown to differ from traditional subjects of law (people and human-managed legal entities). Consideration is also given to what practical impact those differences are likely to have once they are treated as (legal) persons. This aims to build one of the stepping stones of the following corporate-law-based analysis and is meant to help understand the deep roots of the legal principles which may become particularly troublesome once decentralized autonomous organizations start to be considered as subjects of law.

I also examine whether it is likely that granting DAOs legal personality will bring substantial benefits for states as well as for the individual users and whether such benefits are likely to outweigh the burdens of adjusting the existing legal system to accommodate a new type of legal entity. I also briefly discuss whether the aspects of legal personality of DAOs (and liability for unlawful losses that have occurred during their operation) might, and should, be regulated at EU level or even international level, taking into consideration the decentralized and borderless nature of DAOs.

The research results so far show that the vast majority (if not all) of the thorny points of granting today’s DAOs separate legal personality can be overcome by adopting specific technological and organizational solutions and by maintaining an appropriate level of human involvement. On the other hand, it also appears that this will result in a certain kind of compromise solution, which will require DAOs to give up part of their original nature, and competent authorities to make additional, significant efforts to secure that non-compliant DAOs aren’t left to enjoy the benefits of legal personality unregulated. Further, it appears difficult to design relevant laws in a way that would provide a safe legal framework for advanced types of DAOs which are likely to exist in the future.
Lay Summary

Decentralized or distributed autonomous organizations, in short: DAOs. Those terms may feel a bit empty, but if ‘Bitcoin’ is said, everyone knows, at least in outline. However, at the same time, few people are likely to realize that if they think about Bitcoin as a payment system, they actually think about a distributed autonomous organization. But even understanding DAOs as a synonym for alternative payment systems would be unduly simplistic. In general, it can be said that a DAO is a business project translated into a computer code and left run upon a distributed database infrastructure. The economic potential of this kind of profit-making arrangements reaches far beyond the field of cryptocurrencies, which gives rise to the idea of making them official sociolegal and socioeconomic subjects, i.e., legal persons. This, on the other hand, comes at a time when the law in most countries only recognises businesses being run by sole practitioners or traditional, centralized and material, business entities. However, DAOs show numerous features that make their fitting into the established legal frameworks rather difficult. While first attempts to address the need for a more tailor-made regulation have been made, there seems to be a continuing need for a more holistic approach. This thesis was written to respond to this need and offers an analysis of selected elementary points in which DAOs may become a disruptive point in terms of the existing law of persons I also offer suggestions as to how to address those issues, if a decision to provide DAOs with separate legal personality is made.
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Part 1: Initial Remarks

1.1 Introduction

Fifteen\textsuperscript{1} years after Bitcoin, the first cryptocurrency system and probably the first real distributed autonomous organization was set into operation, the potential of profit-making arrangements based on blockchain is becoming more and more apparent, giving rise to many innovative business ideas going far beyond the field of cryptocurrencies. Side by side with those opportunities, first problems are emerging as well. Apart from rather notorious cases of alternative payment systems serving as a facilitation tool for crime and/or terrorism financing, several cases of serious failures in blockchain-based investment-management project have aroused public awareness in more recent years. The failure of an arrangement called ‘The DAO,’ might have been one of the first ones, but was later followed by others, such as the Mango Markets exploit in 2022. Another case concerning blockchain-based-arrangements, Tulip Trading Limited (A Seychelles Company) v Bitcoin Association For BSV & Ors being tried by the UK courts since early 2022 and still without a final outcome at the time of completion of this thesis opens further questions, such as who should have jurisdiction over the underlying blockchain-based arrangements and whether those in control over the underlying blockchain infrastructure owe fiduciary duties. Finally, one of the most recent cases, the collapse of the FTX cryptocurrency exchange in late 2022, connected with solvency concerns over one of its affiliated trading companies, highlights, among others, the risks stemming from the volatility of alternative payment means.

Those, and many other cases, all have brought legally difficult questions and may illustrate that (semi-) autonomous blockchain-based business arrangements (such as distributed/decentralized autonomous organizations, usually abbreviated as ‘DAOs’) have created, in the short time of their existence, a host of (apparently) new legal issues, which may not fit easily into existing legal frameworks. Many of those questions turn on the same pivotal point: how the law should treat DAOs? This is a difficult question. Due to their technological nature, DAOs are immaterial electronic systems roughly comparable to bots,

\textsuperscript{1} As of the year of completion of this thesis.
but their practical use would suggest seeing them as a certain kind of socioeconomic entities such as businesses. It does not seem easy to even establish which of those points of view prevails, never mind asking if DAOs are mere tools in the hands of those who set them into operation, or if they deserve separate legal personality similar to that traditional business entities have.

Thus, there seems to be a need for a tailor-made discussion on those issues, taking into account that questions typical for DAOs, namely that of artificial intelligence of different levels being present and the question of decentralization or even distributed nature can now emerge in a single system and may result in a synergy (rather than a bare sum) of further questions, with possible anonymity of the stakeholders adding up to this even further. Who should be accountable and liable for the operations of a system in which a particular owner or operator may not be easily identifiable? Some voices say that it might, under certain circumstances, be the system itself, while others warn that such a model may easily serve as a liability shield for those who use electronic systems for illicit purposes as well as for those who trade in too risky a way.

So far, the idea of separate legal personality for DAOs has led to a sometimes-heated academic debate, with opinions about the benefits and risks, or the ethical, legal and economic implications all contested. Eventually, the current happenings and discussions have not been left without response even at the regulatory level. First pieces of relevant law have already appeared in several jurisdictions and others may see the work being in progress. Thus, for example, the UK Law Commission for England and Wales launched an ambitious project of law reform exploring whether or not DAOs should get legal personality in 2022. In a handful of other jurisdictions, the enactment of new laws on DAOs or a more

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2 Existing laws may suggest following the *res nullius* (unowned property) principle. This, however, does not appear to be a significant help. Apart from that, there is a doubt as to whether a DAO, although not actively operated by its founders or members, can be understood as without owners as there are persons benefiting from it, or factually possessing a portion of it through the membership tokens.


generalist regulation concerning profit-making technological arrangements and virtual assets has already happened. However, the work does not seem completed and a need for further development thereof can be reasonably expected.

This thesis aims to contribute to this discussion and development, especially by highlighting some of the intrinsic difficulties that such a project would face at the level of practical inclusion of DAOs into the traditional legal frameworks and by making some recommendations about particular points to address and how those could be approached.

As a novelty element and contrary to most of the existing works, this thesis does not limit itself to a single question or a single national legal environment. Instead, it is drafted in a jurisdiction-neutral manner and follows a paradigm that a rather holistic and generalist point of view on the discussion on whether or not DAOs should be recognised by the law as independent legal persons, and if so, if one of the existing forms should be used or if an entirely new regime is to be created for them, is needed at this stage. Thus, a number of works on the general matter of artificial legal personality and particularized publications narrowly focusing on a very specific sub-question of the matter of legal personality for DAOs, or other autonomous electronic systems were critically analysed with the aim of synthesising existing knowledge into a single piece of work which would take into account the specific features of DAOs and how they appear in relation to conventional thinking on legal personality for human-made profitable organisations.

As a result, a set of selected core questions regarding both the general notion of artificial legal personality and particular elements of legal existence of an economic entity as a legal person is presented. This is meant to form the elementary sociolegal context of legal personality of DAOs. Those questions are critically addressed in an as “jurisdiction-neutral” way as possible, to allow application throughout various jurisdictions. The aim is to provide a blueprint for assessment of whether granting such systems legal personality could (i) bring a satisfactory solution for the known liability problems in them and (ii) allow for more legal certainty or for identification of the central problems which granting legal personality to DAOs would bring.
The presented questions often do not seem to find a unanimous answer and the practice is likely to see many details would needing to be considered with regard to the particularities of any given jurisdiction. However, this is not seen as diminishing the importance of raising those questions and trying to search at least for sample answers or certain patterns to be followed. For a clearer illustration of what problems can be expected, or what a good practice in approaching them could be, I will provide examples of legal provisions, chosen from several national jurisdictions, which, as well as illustrating remarkable discrepancies between the concepts of the traditional law of persons and the nature of DAOs, will show that a significant amount of work has already been done in this area.

The topic is approached from several points of view, not all of them purely legal. Rather, important broader socioeconomic connotations are taken into consideration as well. This should help overcome the paradigm that, asking narrowly whether granting DAOs legal personality is possible, we can reach a very straightforward answer: yes, it is (and some jurisdictions have even already done so). Instead, my research starts by asking a different question, “Is it plausible?”; and if so, under which conditions? Looked at this way, the answer does not seem so straightforward, but needs to be sought even more urgently.

This is because granting DAOs legal personality means that they are sanctified by a state as subjects of the law and subjects of social relations. This gives the general public a reassurance that they are plausible, required to comply with the law and reasonably safe, pulling them out of the cypherpunk communities and attracting more people to both establish them and become their business partners or customers. This is, however, a double-edged sword. Doing so, it can be equally argued that even though we admit that DAOs bear certain risks, granting them legal personality actually means that the legislator is aware of those risks and tries to tame them. But even such an approach brings us to the same concluding point: a public trust that there is a legislator who took care to make sure that DAOs do not constitute an unreasonable and uncontrollable risk. Such trust might be present, but the consequences will depend on whether it is well-grounded.

Further, DAOs are specific, and still rather new, arrangements and there are indications that many of those people recently attracted to engage with them are unlikely to have a realistic
idea about what they are actually playing with.\(^5\) Thus, meticulous care needs to be taken by legislators to make sure that one of the most promoted results of granting legal personality to the DAOs, an increased legal certainty in relation to them, does not, in the end, turn into an increased level of mess instead.

At the same time, the novelty of DAOs appears to be giving rise to the need for a specific approach on its own. This thesis argues that this need should not be mistaken for a need to throw the existing knowledge away and start all over. While the existing discussion is often framed through the lens of a new technology needing new answers, this thesis identifies some of the underlying issues behind this question which are, in general, far from novel. Just a short glimpse into the history of enterprise and corporate law will show that they have, even though in a somewhat modified form, occurred long before anybody has even thought about DAOs as such. Some kinds of autonomous electronic agents being used in entrepreneurial activities have, indeed, been known for some time. There is also the question of the extent to which their operation can be understood as legally valid acting. And even the mere idea of an artificial legal person still entails an open discussion of certain questions.

In this point of view, DAOs appear to be more of an evolutionary step than a real revolution. Even if, at first sight, they may seem to be a certain kind of ‘new breed emerging’ a better perspective may be to see them as the next link in an existing chain. In this thesis, DAOs are approached from a point of view that does not disregard old questions. Rather, the selected topics are understood as the latest round of an old debate, where many of the old questions

\(^5\) Studies were performed which show significant discrepancies in understanding the core notions of decentralized ledger technologies and related arrangements between expert public from various fields, cf for example Kelvin F K Low and Eliza Mik, ‘Pause the Blockchain Legal Revolution’ (2020) 69(1) International & Comparative Law Quarterly 135 <https://www.cambridge.org/core/journals/international-and-comparative-law-quarterly/article/pause-the-blockchain-legal-revolution/38547480F362E4FF564895D5A81EDA1> or Marten Risius and Kai Spohrer, ‘A Blockchain Research Framework’ (2017) 59(6) Bus Inf Syst Eng 385. The relevant blogs and fora of the communities may also show signs of significant amount of misunderstanding of the core notions among broad public. In the meantime, the practice brings examples of difficulties caused by DAOs being launched without reasonable backup plans being in place, cf Abram Brown, ‘Crypto Investors Wanted To Buy The Constitution. Instead, They Birthed Another Hyped-Up Meme Coin’ Forbes (12 January 2021) <https://www.forbes.com/sites/abrambrown/2021/12/01/crypto-tokens-people-constitution-dao-ether-redeem-refund/> accessed 24 February 2024.
should be exactly the ones to be asked again. This thesis analyses how the answers differ from what we know from the field of traditional business establishments and legal entities. Troublesome points are identified in which a step towards an immaterial autonomous decentralized electronic system as a valid form of business operation may bring undesired and intractable consequences.

Particular space is given to reflection on the existing discussion on the nature and plausibility of DAOs, which has been giving initial indications of what may be needed to make them valid participants in socioeconomic relations, while highlighting early indicators of the risks of the wider spread of potentially uncontrollable autonomous electronic systems. Indeed, in parallel with that, DAOs on various levels of decentralization and autonomy have been appearing, leading to a significant number of them being already present at the time of drafting this thesis. Subsequently, the first attempts to provide DAOs and similar technological arrangements with a specific legal status have appeared in some states, making the whole question even more alarming. A closer analysis will show that most of them are far from perfect, leading to a further question as to whether we should embrace those pieces of legislation, if only as baby steps towards consolidation of the law accommodating another step in technological progress, an inevitable result of human curiosity and inventiveness, or should we scream from the top of our lungs: “Stop! Stop it before it is too late!”? And upon answering this initial question, what should our further

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7 See for example Lynn LoPucki, ‘Algorismic Entities’ (2018) 95(4) Washington University Law Review 887, especially 889-903. It must be further noted that the danger of autonomous electronic systems getting out of control has been, at least in some form, perceived long before anybody has even thought about decentralized autonomous organizations as described in this thesis. Notably, such warnings can be found even in the out-of-academia works. To name just one classical example, Karel Čapek, *R.U.R.: Rossum’s Universal Robots* (Wildside Press 2010), should be remembered and revisited at this point. Taking into consideration current development in autonomous electronic systems, both of tangible and intangible nature, this work, going back little more than a century, becomes more and more appealing in its core message: innovation, even though meant to be useful for people, should be, now maybe even more than ever before, approached thoughtfully and in a precautionary manner in order to reduce the risk that it actually becomes threat to mankind. Cf also ‘Robot Wars: 100 Years on, It’s Time to Reboot Karel Čapek’s RUR’ *The Guardian* (1 July 2021)
steps be? Existing sources do not seem to provide a unanimous and reasonably holistic response to this question. This thesis was drafted in the hope that it may push mankind closer to such an answer, bringing various disparate elements together and integrating them in a broader setting which sees the current debate as but a continuous tradition of balancing the interests of economic actors in complex capitalist economies, and embedding a broader vision of the well-governed society that also incorporates ethical and societal concerns.

Here my thoughts partially follow up, most contemporaneously, on Lynn LoPucki (2018), who argues that the survival of mankind in the time of algorithmic entities may depend on recognizing that the law determines the very nature of the corporate personality and on the ability to act accordingly. This may sound rather portentous and even a bit odd in the context of this thesis, as Lynn LoPucki (2018) actually does not speak explicitly about decentralized or distributed algorithmic entities. However, the warnings to approach algorithmic business arrangements thoughtfully and cautiously can be easily stretched onto DAOs without any sense of oddness.

Contrary to most of the technological inventions so far, DAOs have the potential to present a substantial step towards people giving up control over their invention and responsibility for it, allowing a product of their activity literally to live its own life and interact with existing relations among the members of society. Again, this idea is not brand new and it seems worth reminding at this point that there is no unanimous agreement even yet on the nature of a traditional legal entity, leaving us with basically two points of view: a legal entity being either mere property of its owners or a separate social unit independent of the particular people who are its members at a given moment. If the latter appears to fit better, is there a danger that it may make some of the stakeholders complacent? We have an established point of view which fits the new arrangement, thus, what is the problem? An answer to this question is spread at the heart of this thesis.

8 LoPucki (n 7)
9 This is determined by the technological nature of decentralized autonomous organizations and will be explained in the initial chapters of this thesis.
10 Susan Watson, The Making of the Modern Company (Contemporary Studies in Corporate Law, Hart Publishing 2022) 4-7
This thesis sees the potential issues that DAOs can cause as self-contained members of legal and socioeconomic life as stemming basically from three roots. All of them are, to some extent, discussed in the relevant stages of this thesis. The first root is represented by the most basic features of the technological nature of DAOs, such as running on a public blockchain infrastructure, being resistant to subsequent changes and enabling anonymous participation. The second root is the autonomous, or algorithmic nature of their decision-making, which, compared to traditional business arrangements, significantly changes the way human discretion happens and takes effect within the arrangement. The third root is a rather theoretical one at the time of drafting this thesis, but may become more significant in the future. That is the possibility to power the DAOs with advanced, non-deterministic artificial intelligence, which would determine the DAO's decision-making in real-time in a way that may become nearly impossible to predict or understand for the human participants of the socioeconomic relations in question. Although this does not, and will not, apply to all DAOs – in reality, most of them are likely to only follow rather simple algorithms roughly comparable to the functioning of a vending machine – this matter still appears to be worth discussing as the potential impact of such DAOs may be serious.

The above-mentioned roots often require a broader introduction to be successfully set in the overall context of the DAOs as a potentially disruptive element of regulated socioeconomic relations. For example, the reality of entrepreneurs being pushed into creativity by technological innovation and trying to accommodate a new way of running a business into a legal system which is not particularly suitable therefor is far from a new phenomenon. This may be demonstrated by the example of John D. Rockefeller’s project of a business trust (also called Massachusetts trust), a solution invented to overcome the limitations of the corporate forms of that time and to provide a suitable vehicle for Rockefeller’s business plans. This, by coincidence, has a surprising amount in common with the idea of DAOs\(^\text{11}\) and therefore is helpful in terms of setting certain notions important for the discussion of legal personality of DAOs within the broader context of socioeconomic activities.

\(^{11}\) See Reyes (n 6)
As the genesis and principles of this type of trust are sufficiently described by the existing literature we can make a long story short and conclude that Rockefeller was successful in his time. However, before we take an example from him of how to approach DAOs nowadays, we must keep two things on our minds, which will help us understand some of the problems that must be expected to emerge around DAOs.

Firstly, even the success of his project was not absolutely straightforward. Rather, his innovative solution of the existing legal framework being ill-fitting to his business project was subject to further examination and challenged from the point of view of the antitrust law at the time. This, in the end, led to a compromise solution thanks to which the modern corporate form of business trust developed.\(^\text{12}\) It can be reasonably assumed that any attempts to give the DAOs a form of legally acknowledged businesses will follow a similar pattern; i.e. long-term research and staggered legal and socioeconomic development is to be expected before DAOs reach a stable form as businesses, if this is reachable at all. The result will constitute a trade-off solution in which there will be a compromise involving some features of traditional legal frameworks and some of typical DAOs.

Secondly, Rockefeller was operating strictly in the physical (rather than virtual) world where everything could have been moved, destroyed or seized if necessary. This is probably one of the most significant differences between Rockefeller as a promoter of the business trust and today’s promoters of DAOs, and a point to which particular attention must be paid. The technological progress that has given rise to cyberspace has also opened both unprecedented ways of development and success as well as unprecedented trouble, allowing for immaterial and intangible arrangements to exist and to occasionally take effect in the physical world as well. Thus, one of the things that need to be thought about is the possible consequences, and we need to think about them ahead of time to avoid unintended and possibly irreparable damage.

\(^\text{12}\) Even this may be an example how an innovative way of enterprising led to unwanted results which required new legal regulation. For a more elaborate explication see for example Wayne D Collins, ‘Trusts and the Origins of Antitrust Legislation’ (2013) 81(5) Fordham Law Review 2279
Governments may, indeed, decide to support DAOs as an innovative way of running a business and a promise of further economic growth. A handful of them have already done so, mostly in rather simple ways. Some others are exploring the need for a specific legal approach to them at the moment.\(^{13}\) However, it would be incorrect to think that all that can be done has been done once a simple act acknowledging a DAO as a new type of legal entity was passed in one country, although it could be tempting for the other jurisdictions to follow their example and do the same. On the contrary, there is, apart from other issues, a rather complex phenomenon of ill-fitting of DAOs into the existing legal frameworks, which has many layers and requires a holistic and elaborate approach. This is likely to entail adjustments both at the side of regulation and at the side of DAOs themselves. Creating a new type of legal entity or exempting DAOs from the laws they should regularly comply with as socioeconomic units but are unable to do so for obvious technical reasons appears as a straightforward solution to the problem, but any such step should be preceded by a thorough analysis of the possible broader consequences. This is because the law does not stand on its own. Its purpose is to provide norms of conduct to the (both individual and collective) members of the society. Therefore, any legal regulation is only meaningful as long as there are social relations which can benefit therefrom. Therefore, it must be asked what changes are for the better if the law starts dealing with DAOs specifically.

Currently, most jurisdictions would see DAOs as things (objects) rather than as persons (subjects and members of social relationships). A detailed look shows that this approach may not be sufficient as the decentralized autonomous organization DAO-constituting programs do not work the same as MS Word or Sage X3. They can be set to run without being actively and continuously operated by people and they can (but do not necessarily have to) be equipped with, or in a certain way facilitated by advanced artificial intelligence, making their future behaviour possibly unpredictable for people. Most importantly, they run on a distributed ledger infrastructure, which means that they cannot be easily switched off or rebooted if something goes wrong or if they are not needed anymore.

\(^{13}\) Cf UK Law Commission (n 4)
On top of all, their technological nature allows for their originators and users to remain anonymous. A combination of those factors is likely to lead to specific issues and gives rise to the question of who can be held liable if any damage occurs. Those aspects are dealt with in detail in the dedicated passages of this thesis. Here, as a brief introduction to the research question, it can be said that one of the possible responses to the challenges stemming from those specific features of DAOs is to recognize DAOs as separate legal persons, i.e. make them legally capable of having rights and duties on their own. While this idea has been discussed for some time and has even already been brought into life in a small number of jurisdictions, its practical performance in any particular jurisdiction should be inspected from various points of view and carefully thought through. Thus, it should be assessed whether, or to what extent and under which conditions, DAOs can comply with the norms of the existing legal framework and whether, or to what extent and under which conditions it appears reasonable to adjust the norms of the existing legal framework if DAOs cannot comply with them.

It can be shown that the ability of DAOs to comply with the traditional law is not self-evident. On the contrary, we will probably be able to find at least some points in which DAOs cannot easily comply with existing laws (at least not without partially denying their very nature), or in which enforcement of existing laws against DAOs is likely to be nearly impossible. Those points should be identified and addressed before proceeding to grant DAOs legal personality, because it makes no sense to deliberately create a legal personality

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14 This can be shown in the example of Bitcoin, a cryptocurrency system that is deemed to be the first real DAO in the world. Although its founder is named as Satoshi Nakamoto, this is a pseudonym and the real identity of Bitcoin’s originator(s) and its current operator(s) has never been revealed. Notably, it would be extremely difficult and costly to do so if they make a serious effort to remain anonymous, which is why nobody attempts to do so as long as there are no genuinely compelling reasons present. However, as Bitcoin does not have a separate legal personality, should there be need to hold somebody responsible for any issues related to the Bitcoin payment system, finding the people behind would probably be only possible for state authorities, and, on the top of all, only with exertion of extreme investigatory powers and effort. An individual intending to bring a civil lawsuit would not be able to determine whom they should sue at all. However, this does not occur automatically. Examples of DAOs whose originators or operators are known to the public will be presented in this thesis as well, but just the presence of the option of a fully anonymous decentralized autonomous organization gives rise to concerns that should be dealt with if legal personality for them is being considered.
for something that is not reasonably capable of complying with the law or against which the law cannot be reasonably enforced.

Of course, some of the issues may be easily resolved by the abolition of the laws that constitute an obstacle to a DAO operating lawfully, or by providing for an exception that would exempt DAOs from the relevant obligations. Such a step may be defended as removing obstacles to innovation and making a necessary adjustment of the law to reality. On the other hand, other aspects of the legal principles in which DAOs may fall short must be carefully examined and assessed. Many thorny legal principles have very deep and well-grounded roots, providing a stable and well-functioning framework for other social relations. Giving them up just to open up the way for DAOs may quickly turn into throwing the baby out with the bathwater, leaving significant loopholes in the traditional and legal and socioeconomic structures which are still very much in use.

Aiming to contribute to the existing knowledge in the field, this thesis offers a holistic point of view on the problem by covering a set of selected elementary problems about the possible legal personality for DAOs in five parts. After some initial remarks covering the introduction, methodology and literature review, a brief outline of the background of DAOs and existing discussions about the problems around autonomous electronic systems being involved in legal and socioeconomic relations is provided. This is included because, while this thesis is meant for the legal audience with an interest in technology, rather than for technology experts, it is understood that a solid insight into the nature of DAOs by the technology-lay public is an extremely crucial, although not specifically legal, point. On the other hand, this thesis is not meant to be a dictionary of blockchain-related terms or any kind of ‘blockchain for dummies’ textbook. Thus, a rather high level of preliminary knowledge as well as an active ability to refer to the sources on which this thesis builds upon is still presumed.

The initial chapters present and build up on selected existing definitions, occasionally providing a very brief explanation of selected notions of the technological background, as well as a brief outline of the core questions of legal personality for autonomous electronic systems, as well as considering their possible consequences for the discussion about legal
personality for DAOs, including setting up the theoretical and philosophical stepping stones for the future discussion about the law-related aspects of DAOs as potential legal persons. This happens especially if there does not seem to be at least a relatively unanimous definition of a certain notion available, or if the existing definitions do not seem to provide sufficient clarity about the notion for its use in this thesis, but also if certain particularly crucial ideas need to be highlighted and pinpointed in front of the reader’s eyes for further analysis or in order to achieve a higher level of accessibility and comprehension. Particular attention is paid to a manner in which DAOs differ crucially from any kind of traditional legal person: they can be designed in a way that allows them to run permanently on a distributed infrastructure, independently on any people being (or not being) present inside. Key consequences of this combination of features are explained to provide a stepping stone for further explication of points in which certain legal constructions are difficult to apply on DAOs.

It is taken into consideration that there is no single and universal type of DAO. While this thesis normally works with a rather hypothetical archetype of a DAO as an arrangement gifted with the maximum possible level of decentralization and autonomy, the practical exemplars may differ in those features, which is also reflected once the background of DAOs is discussed. The defunct project of The DAO is used as an example of an arrangement which may still define as a DAO although its autonomy is limited and the people in control thereof are known. Another defunct project, this time from the physical world, the Tin Council, is used as a basis for an experimental translation of the traditional entrepreneurial structures into the terms of archetypal DAOs, on which some perilous points of DAOs are demonstrated. This is followed up on by several further examples throughout the thesis; however, it should be noted that those were chosen by the author based on their potential to illustrate the practical dimensions of the discussed problem rather than by their economic or legal importance.

The other party, i.e. the blockchain communities, is being heard as well as a part of establishing the grounds and key writings stating the principles of the blockchain community, cryptocurrencies and similar relevant arrangements are considered in order to
make a reasonable prediction about the extent to which legal personality for DAOs is likely to be a welcome step for their originators and operators. However, a straightforward answer should not be expected. Even from a brief overview, it appears that granting DAOs separate legal personality, if found plausible, is likely to result in a certain kind of compromise solution, assuring that this innovative way of enterprising is not subject to unreasonable legal obstacles on the one hand, but equally it cannot benefit from being unduly freed from well-grounded duties which traditional legal entities must obey. Further, a comparable level of enforceability of law against the DAOs should be achieved as that which is currently present in relation to the traditional entities. Such goals are not easy to achieve and undoubtedly require not only the state laws being amended to be able to accommodate DAOs, but also DAOs themselves to give up part of their original nature and comply with legal principles that used to be designed for the physical world, as long as technically possible. This may not always be good news for their originators and other stakeholders.

A further part of the thesis deals with selected conceptual aspects of artificial legal persons in general and tries to set those in the context of an autonomous electronic system running on a distributed infrastructure, which may be particularly relevant for making a decision about whether DAOs should be acknowledged as entities capable of acting as valid and plausible parties to legal and socioeconomic relations in general. Again, the list of such aspects provided in this thesis is not exhaustive. Rather, only the most elementary ones were selected, taking into consideration the overall scope and aim of this thesis.

This is followed by a discussion of more particular and practical questions of how DAOs could cope in the traditional frameworks of legal and business entities. Building upon some of the key works on the legal personality of DAOs existing so far, I first try to discuss the options of fitting DAOs into the framework of the most common existing types of legal entities. In the course of doing so, I try to consider the default possibilities which might be available in some jurisdictions and to address the thorniest points of ill-fit. This shall serve as stepping stones for further discussion on which type of legal person a DAO should be, if any. This both starts and ends with discussing a legal personas as construction created by people and for people, and therefore needing a rather significant level of insider involvement of people in its day-
to-day operations. Depending on jurisdiction, this need may be expressed in legal provisions directly regulating the existence and activities of legal entities, but is not limited to their own framework. Rather, it usually bleeds into more general layers of law, making interactions between legal entities and individuals capable of legal regulation. This can be most instructively demonstrated by an example of the concept of good faith and fair dealing, notions of private law which are indivisibly connected with the human mind but may apply in the world of legal entities as well – through the individual people involved in running the legal entity in question!

Further aspects that are covered within part four are more of a particular and practical nature. An example of such aspects is the role of legal capital in entities that are likely to hold a significant portion of their assets in cryptocurrencies rather than in a fiat currency or physical items, as well as selected examples of formal duties to which a legal entity may be subject, depending on its jurisdiction (such as registration with a competent authority or compliance with various anti-money-laundering measures).

The final part of this thesis contains the conclusions. Some of the core questions of granting legal personality to DAOs are: Why do we want to do so? Is it worth it? What steps will need to be taken? Are the results we are likely to achieve reasonably satisfactory for all stakeholders? What are the broader consequences of the necessary adjustments likely to be? Are they going to be excusable? Those get reiterated once more at the end, but this thesis does not aim to give a universal and unanimous answer. This would not even be possible as many particularities differ from jurisdiction to jurisdiction and sometimes from one particular model of DAO to another. Thus related subquestions need to be answered on an individual basis. This thesis rather provides a primer on the core subquestions to ask and suggests patterns of how to approach them, with an overall framework of the possible answers being outlined.
1.2 Methodology

This thesis engages in desk-based research relying on a wide range of documentary sources stemming both from the academic research and non-academic environments: scholarly publications, sources of law and case law, but also various articles and websites (not limited to the scholarly ones), which may serve as examples illustrating the current development or audible discussions in the field of DAOs. Those sources are analysed and critically assessed with the aim of setting up a holistic and methodological framework for discussion about the possibility and plausibility of granting DAOs legal personality in almost any jurisdiction.

The purpose of this thesis is twofold. Firstly, it aims to collect, bring together and put into context the rather disparate elements of the analysis of plausibility of legal personality for DAOs which has taken place thus far, as well as seeking to form a certain kind of elementary guide which aims to methodically cover the primers of an answer to the question of whether granting legal personality to DAOs is plausible in a holistic and concise manner. Secondly, it seeks to integrate the existing knowledge into a broader vision of a well-governed society, and thus to offer a deeper thought about the possible risky aspects of an innovative solution (namely: DAOs) being brought into the socioeconomic and legal life.

To achieve this goal, three pillars will be used to support the overall argument developed in this work. Firstly, the pre-blockchain discussion on autonomous electronic agents and their position within the traditional legal frameworks will be build upon. Secondly, existing discussions on the possibility and plausibility of legal personality for electronic systems equipped with advanced artificial intelligence will be reflected on. The possibility of DAOs being equipped with advanced artificial intelligence and any legal problems emerging therefrom will be considered. Thirdly, the existing discussion on the legal status of distributed autonomous business arrangements, as well as the first exemplars of their actual legal recognition, will be confronted in conjunction with the previous two elements, so as to form a more holistic approach to the core of sociolegal questions regarding DAOs.

Apparently, not all questions this thesis deals with are purely legal. Rather, related topics from other fields are also included to help put legal matters into the broader context of
social and socioeconomic relations which the law normally aims to regulate. Although some preliminary understanding of blockchain technology and general questions of electronic agents is presumed, the initial chapters provide a very brief explanation of selected aspects of both the technological base and the broader socioeconomic context of DAOs.

This is meant not only to make this thesis more comprehensible to readers without deep technological expertise but, even more importantly, to provide a practical terminological background for the purposes of this thesis by presenting the most prominent examples of definitions of the core notions that have formed the author’s own understanding, so that the comprehensibility of the text is not compromised by one of the biggest problems of this emerging field: lack of unanimously accepted definitions. As part of this process, various sources stemming from the blockchain-using communities are analysed and their main thoughts are put in the context of the idea of making decentralized autonomous organizations legal entities. This serves to allow an assessment whether such a step is likely to be wanted by the founders of decentralized autonomous organizations.

Before selected legal topics are analysed, some attention is also paid to the broader background of what the law is supposed to regulate in general: social relations, and how the DAOs fit into them. Thus, certain broader, philosophical, social and economic points are presented in which DAOs differ from traditional subjects of law (people and human-managed legal entities) and I ask what practical impact those differences are likely to have should existing law apply.

There is, however, no intention to only raise questions that are necessarily new. On the contrary, most of those questions have been discussed before in times when current-traditional legal entities were emerging. Now, I try to analyse those questions in the context of DAOs. This, again, develops the subsequent legal analysis and is meant to help understand the deep roots of the legal principles which may become particularly troublesome once DAOs start to be considered as subjects of law.

Particular legal questions crystalize out of the general matters discussed at the beginning of the thesis. Those should be understood broadly as this thesis is primarily meant to raise or re-iterate important questions about granting legal personality to DAOs on a general level,
i.e. without relation to a particular jurisdiction or particular design of a DAO. Therefore, questions which may generally arise due to the technological nature of the DAOs and which are common to a higher number of jurisdictions have been chosen to be discussed. Thus, the discussion follows yet the paradigm that “[t]he basic law of corporate governance—indeed, most of the corporate law—has achieved a high degree of uniformity across developed market jurisdictions, and continuing convergence toward a single, standard model is likely”\(^{16}\) and mostly picks up general topics which a majority of developed market jurisdictions are likely to need to address. However, if this appears to be helpful for a more in-depth explication of the problem, examples are taken from selected national jurisdictions as well as from EU law, in which it shall be shown how much, and in which aspects, DAOs differ from legal entities previously presumed by the selected legal orders. Consideration is given to the extent to which the DAOs can be imagined as existing legal entities under the current law (even subject to only slight modifications or subject to meeting some realistic conditions) or whether they cannot be easily included in the existing legal frameworks, so that a completely new type of legal personality is required for them. Particular attention is paid to cases where an outstanding example of practical dealing with DAOs is already present in a national law. Especially respective laws of the countries that have already adopted blockchain-relevant regulation are used as reference materials for comparison.

Further, the broader context of the respective law or legal principle is taken into consideration in the assessment of whether creating such a new legal personality category is desirable. In all cases, the (sometimes obvious) risks of acknowledging DAOs as legal entities are balanced against the liability benefits. Consideration is given to whether it appears likely that granting DAOs legal personality will bring substantial benefits for states, as well as for the individual users; also whether such benefits are likely to outweigh the burdens of adjusting the existing legal system in order to accommodate a new and rather unprecedented type of legal entity. A question of whether the aspects of legal personality of DAOs and liability for the unlawful losses that occurred in the course of their operation

might and should be regulated at EU level or even international level, taking into consideration the decentralized nature of DAOs, is also briefly touched upon.

1.3 Literature Review

While a substantial amount of work has been done with regard to the question of whether DAOs should be recognized as a legitimate way of running a business, as well as whether they should be granted their own legal personality, the existing sources appear to be rather fragmentary or narrow, often presenting a certain point of view without a broader context, or sufficient analysis of the complex consequences, or only focusing on a single, very particular, aspect of the question.

A large number of various resources had been used when composing this thesis, from scholarly books and articles, through reports issued by numerous stakeholding organizations, to websites of all kinds and even works of fiction. It was identified that those sources illuminate selected aspects of the studied issue, but no work would try to bring at least the most elementary strands of the inquiry together. Thus, the existing literature will be approached with the aim of providing a more comprehensive and holistic point of view on the topic and composing a certain kind of framework or primer on the idea of the legal personality of DAOs.

Works of the classics of blockchain research such as Primavera de Filippi and Greg McMullen (June 2018), Primavera de Filippi and Aaron Wright (2018), Laila Metjahic (2017) or Nick Szabo (6 July 2004) as well as selected existing laws throughout jurisdictions serve to set the basic terminology used throughout the thesis, occasionally accompanied by parallels from the classical fictional works such as Milan Kundera (1992) or Karel Čapek (first published 1920, 2010) for a more comprehensible picture of the functional issues of autonomous electronic systems.

A surprisingly large amount of older literature, some of it having emerged as long as about two to three decades ago, finds its use in the process of explication of why the idea of the legal personality for DAOs deserves a dedicated discussion. For example, works such as Emily
M Weitzenboeck (2004), Steffen Wettig and Eberhard Zehender (2004), Curtis E Karnow (1996) or Tom Allen and Robin Widdison (1996), which have outlined some of the important questions of the legal aspects of computer-facilitated business activity many years ago, are relevant for the research question of this thesis. However, it should be noted that those works predate blockchain technology and have merely centralized autonomous electronic systems as their focal point. Therefore, they should be read minding the fact that they only provide an outline of certain deeper and rather itemized roots of the problem, which must be later correctly set into the relevant context. Following the same idea, it is remarkable that recent writings on the legal aspects of both material and immaterial electronic systems, such as Joanna J Bryson, Mihailis E Diamantis and Thomas D Grant (2017), Sheikh M Solaiman (2017) or Gabrielle Patrick and Anurag Bana November (2017) still build on those rather vintage sources, showing that no revolution has happened on one hand, while, on the other hand, pointing out how the recent technological progress makes the old topics revive and adds up new dimensions to the original questions. Comparing the older and the newer literature, it can be shown that the prevailing opinion on one of the core questions has not changed substantially: electronic systems are mainly (although not exclusively) seen as tools for whose use and actions the humans who are in control of them should be held responsible.

Apart from that, works presenting the relevant issues from the point of view of a DAO and its originators. Classics of the mere blockchain community such as Eric Hughes (1993) and Satoshi Nakamoto (2008), as well as follow-up works of Joe Liebkind (10 August 2018) or Eugenia Politou and others (2021) present the basic facts and serve as priceless stepping stones in trying to estimate whether legal personality of DAOs could be a welcome step for those who set them into operation and those who participate in them. However, analysis of those sources does not provide a unanimous answer to the questions the discrepancies in understanding the elementary ideas give rise to.

There is a widespread awareness that the question of responsibility/liability and accountability is a complex one for many reasons, not only for DAOs but for any kind of electronic agents. Moreover, the available literature shows another interesting aspect of
using autonomous electronic systems in business activities (and perhaps elsewhere) throughout time: on the one hand, they achieve computationally correct results with incomparably higher accuracy than humans; on the other hand, the results of the computing processes may not be suitable for being assessed by the measures of norms of conduct which have been set with human thinking and behaviour at the centre. This should bring us to another thread of the research question: DAOs can be in certain way equipped with, or facilitated by, artificial intelligence, which may vary in complexity and bring specific issues.

If we dig deeper into the element of artificial intelligence possibly being a feature of a DAO, we can largely rely on existing literature on artificial intelligence in centralized autonomous electronic systems to examine certain points that will be relevant in the context of DAOs as well. Thus, Philip N Johnson-Laird (1993) and Spyros G Tzafestas (2016) help to capture the basic idea of approximation of computational processes to human thinking, which makes a valuable stepping stone for more particularized works such as Herbert L Roitblat (2020) and Tie-Jun Huang (2017), focusing on the possibility of achieving general artificial intelligence, followed up by Rene V Mayorga and Leonid I Perlovsky (2008) on artificial sapience, Erik Cambria and others (2009) on common sense computing, William S Bainbridge (2014) on personality capture and emulation and Arlindo Oliveira (2017) on redefining humanity in the context of technological progress. Those provide new points of view on the issues we face as we attempt to accommodate the functionality of automated electronic systems into the law and its of abstract notions such as a reasonably prudent person, person of sound mind, acting in good faith or due care etc.

Particular examples such as AlphaGo in David Silver and others (2016) and Attila Egri-Nagy and Antti Törmänen (2020) or Google AI in Cade Metz (14 March 2016) have also been considered to explain that computational processes differ from the human mind and behaviour, even if they are designed to mimic it. Notably, the same can be found in the above-mentioned Herbert L Roitblat (2020) who presents a similar example using the game of chess as an illustration. In general, those sources agree that although enormous progress has been made in the field and further research is running, computational processes cannot be reasonably set on par with human thinking and behaviour. As this thesis follows the view
of Jurica Dujmovic (9 January 2022) that complex DAOs with embedded (even advanced) artificial intelligence will be possible one day, those resources need to be read while keeping in mind the overall context of blockchain-based nature of DAOs and the fact that artificial intelligence will work slightly differently in DAOs than in centralized electronic systems. However, it must be equally noted that ideas such as those of Jurica Dujmovic (9 January 2022) are still rather abstract and that a limited number of sources working on the concept of on-chain artificial intelligence is available. However, works such as Sushil K Singh, Shailendra Rathore and Jong H Park (2020), Adedoyin A Hussain and Fadi Al-Turjman (2021), Saurabh Singh and others (2020) or Tiago M. Fernández-Caramés and Paula Fraga-Lamas (2022) provide primers on the topic.

Moving back to the basic question of whether DAOs could be integrated into the existing framework of legal persons, it can be concluded that it has been dealt with by a rather smaller number of sources, most of them seeming to be fragmentary. There is also no unanimous answer to the question and most of the authors pick only selected aspects of the matter in order to support their main argument, while many other subtopics are left aside. A theoretical discussion on whether decentralized autonomous organizations fit the most general idea of legal personality can be easily supported by works such as Jeanne Gaakeer (2016), Visa A J Kurki (2019), Susanna K Ripken (2019), Luciano Floridi and Mariarosaria Taddeo (2018), Max Ganado (6 June 2018) or Jiahong Chen and Paul Burgess (2019).

The most prominent pieces of work dealing with DAOs in a more specific context of particular legal entity types, which actually gave rise to this thesis are Shawn Bayern (2015) and Shawn Bayern and others (2017), later followed by Shawn Bayern (2021). Arguing that legal personality for DAOs is a necessary step to promote their broader deployment, those works seek jurisdictions and types of legal entities that could, even unintentionally, open the door for DAOs being incorporated. Those give rise to many provocative ideas; however, put into a context of both older and newer sources on corporate law and, in more general terms, the theory of a firm, as well as selected examples of national laws, they appear to be pieces of academic debate rather than working patterns usable in everyday practice. Those are followed later by Carla L Reyes (2019), offering a more sophisticated yet rather specific
construction that could accommodate certain types, although presumably not a majority, of DAOs.

These works deserve a more in-depth analysis and discussion, as well as attention paid to some possibly risky approaches such as trying to exploit loopholes in existing laws to the extent which could be considered being *praeter legem*, or in being only able to accommodate a very specific type of arrangements in question. However, they serve as valuable stepping stones for the discussion and a certain kind of devil’s advocate of this thesis, opening up space for a broader discussion on the points in which DAOs substantially differ from existing forms of legal entities and why those differences should not be ignored. Thus, comprehensive sources of corporate law and theory knowledge, such as Michael C Jensen and William H Meckling (1976), Nicola de Luca (2017), Susanna K Ripken (2019) or Laura Macgregor (2020) are referred to, accompanied by smaller works and relevant examples of case law from various jurisdictions. We can even reach back to Adam Smith (first published 1776, 2000) and show that this classical work is, despite its age, still very much valid when analysing why the concept of DAOs not only fails to fully remove the disadvantages of traditional companies but also brings new issues or allows old issues to become even more dangerous. More modern works in the same field, such as Nicholas Grier (2020) and Philip J Stern (2017), accompanied by those which try to set the issues of corporate structures into the context of blockchain arrangements, such as Timothy Nielsen (2020) or Lynn LoPucki (2018), overall only confirm the concerns and give rise to a question as to what extent granting legal personality to the DAOs is to the benefit of society at all.

Even one of the newest sources at the time of drafting this thesis, Thibault Schrepel (2021), using the paradigm outlined by Ronald H Coase (1937) and the theory of a firm to explain on the socioeconomic level that DAOs are somewhat different from than what the law so far acknowledges as legal entities and therefore that precaution is needed if they are recognized as another type of entity. Further, it also points out the disputability of to which extent DAOs reduce transaction costs with regard to the difficult and lengthy changes-making process.

So far, separate legal personality in DAOs has been discussed primarily from the point of view of allowing for limited liability of their founders or members, or opening a way for
those arrangements being open to being sued on their own, even if the founders or members are impossible to find. This can be seen for example in Dirk A Zetzsche, Ross P Buckley and Douglas W Arner (2018) or, once again, in Carla L Reyes (2019). A more complex question of to which extent the law of legal persons would be practically enforceable against them has, however, been given significantly less attention. Digging more into the practicalities of how a DAO might cope as a legal person, the general literature on the respective questions in traditional legal entities, accompanied with examples from selected national laws as well as EU Law, presents a valid and valuable source. Thus, Nicola de Luca (2017), and most of the sources referred to therein, build a solid foundation to show that, at least in the European legal environment, legal entities are traditionally designed to fulfil their obligations via the natural persons who participate in their functioning. Focusing on selected particular aspects of DAOs which may impact their ability to comply with broader legal frameworks requires referring back to works dealing with the original issue in the context of traditional legal entities, although first pieces of research specific to DAOs appear in some of the sub-fields. Thus, the question of membership, memberless organizations and the need for members in corporate bodies has been described on a general level in various commentaries to national laws. In addition, particularities of replacing human agents with electronic ones have already been examined in a rather elaborate manner. As well as sources which relate to general questions of human decision-making and acting being emulated by an electronic system, various national laws and case-laws, as well as grey literature produced by the stakeholding organizations, are available throughout jurisdictions.

A substantially smaller portion of relevant academic sources is available, which focus on the procedural aspects of incorporation. In general, one must rely on national laws on the incorporation of existing entities, and relevant commentaries, and setting the actual reality of DAOs in their context, as well as on a small number of national laws already allowing for the incorporation of DAOs. While a trend towards simplification and digitalisation of the incorporation procedure is visible even in traditional entities, cf for example José C Llapis Benllolch (2018) or Michele Nastri (2021), sources which would deal specifically with incorporation of a memberless entity are scarcely available. However, an interesting alternative to them may be seen in a set of Maltese laws regulating innovative technological
solutions, which is applicable to DAOs. Although those laws do not allow for the incorporation of a DAO as a legal person, the principles they set out may serve as a valuable source of inspiration as to what needs to be given attention if DAOs are to be provided with any kind of official recognition.

On the contrary, the question of capital and capitalization in DAOs finds numerous valid sources in which to seek answers, although without a very persuasive result. A comprehensive general analysis of various aspects of legal capital is presented in Marcus Lutter (2006). Putting this in the context of DAOs and one of their most typical features – holding their assets in cryptocurrencies – may suggest that legal capital is likely to become one of the thorniest points of DAOs as potential legal entities. However, such a point of view may be easily relativized by the existing legal sources on both the EU and national level as well as by academic sources such as John Armour (2006) or Wilhelm Niemeier (2012). While the existing literature does not seem to offer a unanimous answer to the question of whether legal capital (or its substantial part) in a cryptocurrency does constitute an issue, more persuasive results can be found in the sub-field of capitalization, i.e. raising capital for a legal entity. In all cases, the nature of cryptocurrencies as a type of asset has been discussed for some time, for example by Akshaya Kamalnath (2020), Renato Mangano (2019) or Lauren Holtmeier (15 June 2021) and national laws, as well as case law, dealing specifically with them (and similar instruments) occur. A separate subchapter relates to raising capital for DAOs and similar arrangements. This has been dealt with rather elaborately at the level of academic literature, such as Philipp Hacker and Chris Thomale (2018) and legal practice, from which the publication of Clifford Chance (February 2020) is particularly remarkable. There is also case law, mainly from the U.S., showing that existing laws regulating the emission of securities can largely be applied to initial coin offerings. A particularly interesting point can be seen in the call for international harmonization in this subfield, which can be seen in Philipp Maume and Mathias Fromberger (2019) or Rhys Bollen (2010).
Part 2: Background

2.1 Decentralized/Distributed Autonomous Organizations (DAOs): Nature, Basic Features and Legal Status

Should DAOs be provided with legal personality? And if they were, what consequences would it entail? What benefits would it bring? What sacrifices would it take? Those are questions which only can be reasonably answered once the highly specific notion of a DAO is duly understood. In order to provide the essential theoretical and technical background for this topic, the following pages will be devoted to selected problems associated with the core terminology and overall understanding of DAOs, briefly explicating notions such as blockchain, distributed ledger technology and a decentralized/distributed autonomous organization itself.17

From the terminological point of view, this thesis builds mainly (but not exclusively) on the Glossary provided by the UK Law Commission18 as an accessible basis of core terminology used in the context of DAOs. However, it should be noted that the definitions provided by the UK Law Commission are far from the only existing ones and do not even necessarily have to be seen as the prevailing ones in the field. As such, they should be understood in terms of this limitation even in the context of this thesis. This chapter also tries to pinpoint some of the core notions and occasionally offers additional points of view on selected more complex notions, which may, among others, be required to be taken into consideration when trying...

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17 It must be further noted that the definitions provided in this thesis represent examples selected by the author as particularly worthy of pinpointing and further discussion, rather than an exhaustive or binding list thereof. There may be numerous further definitions available in time, based on development of thinking in the field both at legal and academic level. For an example of a rather comprehensive illustration of how the notions relevant for decentralized/distributed autonomous organizations may be understood by a governmental body see UK Law Commission (n 4) vi-xiv, 9. Neither does this chapter constitute a comprehensive explication of the technological background and concept of DAOs as such as providing one is not a purpose of this thesis. In this point, Sven Riva, ‘Decentralized Autonomous Organizations (DAOs) in the Swiss Legal Order’ [2021] Volume XXI Yearbook of Private International Law Vol XXI - 2019/2020 601 <https://www.degruyter.com/document/doi/10.9785/9783504386962-028/html> can be referred to as an accessible and comprehensible resource.

18 UK Law Commission (n 4) vi-xiv
to answer the question of whether DAOs should be granted legal personality and what would such a step take in the context of any particular jurisdiction.

First, a broader point of view on the concept of DAOs as innovative socioeconomic arrangements, as well as on the role of blockchain and smart contracts in their functioning, will be provided. This will help create a basis for discussion on what DAOs are, how they differ from robots (or other centralized electronic systems equipped with a certain level of autonomy and/or artificial intelligence, in which legal personality has been discussed) and whether their nature points towards providing DAOs with legal personality. Then we will focus on selected principles of algorithmic decision-making, explain some of the important questions thereof and put them in the context of smart contracts and DAOs, to suggest the impact they might have on traditional principles of business. This, combined with the basic definitions provided by the UK Law Commission, should provide a theoretical framework for further discussion about the possibility of DAOs being legal persons. Thereafter, selected questions stemming from recent development in the field will be outlined. It will be explained why this topic is of importance and needs to be discussed, as well as in which direction the discussion should be led. Finally, the other side will be heard to provide a brief insight into whether the key ideas of the blockchain-based environments may be compatible with the traditional frameworks of the law.

2.1.1 Technological Background in a Nutshell: Distributed Ledger Technologies, Blockchain and Smart Contracts

The essential technological base for DAOs is currently blockchain. This is a distributed database and also a complex technological solution combining business principles, economics, game theory, cryptography, and computer science engineering\(^\text{19}\) into a peer-to-peer system of value exchange and record-keeping. It works automatically (i.e. without being actively and constantly operated by people) and allows for the creation of systems

equipped with various levels of autonomy by running further computer programs upon itself. Further, it does not require any trusted third parties (such as banks or brokers) to be involved, as those are replaced by cryptographic proof. Blockchain is probably the most significant example of distributed ledger technologies nowadays. Due to this, the term ‘blockchain’ will be used throughout this thesis as a shorthand for distributed ledger technologies. However, most of the ideas are meant to be applicable to any other exemplars of distributed ledger technologies which might come into use.

From a technical point of view, blockchain is a distributed ledger, i.e. a database, an entire copy of which is saved on every node connected in the blockchain network, while each node is connected to every other one. Any new transaction is represented online as a block referencing the previous one and broadcasted to each of the nodes to be verified via a consensus mechanism. If the verification is successful, the block is connected (chained) to the previous blocks. After the new chain of the blocks gets broadcasted to all nodes, the transaction is completed and the record about it is saved in each node. This makes the transactions so executed irreversible and the records immutable, at least under regular circumstances (i.e. unless it is successfully hacked).

For an example of a legal definition, we may reach to the Maltese law, defining distributed ledger technology as “a database system in which information is recorded, consensually shared, and synchronised across a network of multiple nodes as further described in the First Schedule of the Innovative Technology Arrangements and Services Act, whether the same is certified under that Act or otherwise” or in the law of the U.S. state of Arizona, defining blockchain technology as “distributed ledger technology that uses a distributed, decentralized, shared and replicated ledger, which may be public or private, permissioned or 

\footnotesize
\begin{itemize}
    \item [20] ibid 4
    \item [21] For a further comprehensive explication of blockchains/distributes ledger technology, see for example Vedat Akgiray, ‘The Potential for BlockchainTechnology in Corporate Governance’ (2019). OECD Corporate Governance Working Papers 21Primavera de Filippi and Greg McMullen, ‘Governance of Blockchain Systems: Governance of and by Distributed Infrastructure’ (June 2018) or Singhal, Dhameja and Panda (n 19)
    \item [23] Act XXX of 2018. as amended by Legal Notice 106 of 2021 and Act XLVI of 2021, Virtual Financial Assets Act (hereinafter also referred to as “VFAA”) S 2 al 12
\end{itemize}
permissionless, or driven by tokenized crypto economics or tokenless. The data on the ledger is protected with cryptography, is immutable and auditable and provides an uncensored truth.”

Apart from individual transactions directed by human users, blockchain can also provide a technological base for so-called ‘smart contracts’. Those represent a specific type of computer program. A set of smart contracts running upon a blockchain infrastructure is then, in brief, the principle of functioning of a DAO, which, in some cases, may proceed autonomously, i.e. once the code is written and set into operation, little to no further human involvement is needed.

Smart contracts are usually defined as “sets of promises, specified in digital form, including protocols within which the parties perform the promises,” or as “self-executing contracts with the terms of the agreement between the parties being directly written into lines of code”, which usually run across a blockchain network or another distributed ledger technology. Again, for an example of a legal definition, we may reach to the Maltese law, defining smart contracts as “a form of technology arrangement consisting of (a) a computer protocol; or (b) an agreement concluded wholly or partly in an electronic form, which is automatable and enforceable by computer code, although some parts may require human input and control and which may be also enforceable by ordinary legal methods or by a mixture of both”, or to the law of the U.S. state Arizona, defining smart contracts as “an event-driven program, with state, that runs on a distributed, decentralized, shared and

28 VFAA S 2 al 44
replicated ledger and that can take custody over and instruct transfer of assets on that ledger.\textsuperscript{29}

It must, however, be noted that the wording ‘smart contract’ is merely a technical term for a certain type of computer program. In spite of their name, smart contracts do not automatically need to be contracts in the legal sense of this term; neither does the word ‘smart’ necessarily indicate that they include the element of highly advanced artificial intelligence. To qualify as contracts in the legal sense, they still must embody agreements which are meant to have legal effects and also meet any criteria for a valid contract as provided for by the applicable law.\textsuperscript{30} Apart from that, smart contracts can vary in their complexity from cases as simple as the functioning of a vending machine to complex transactions.

Eventually, they can even be so complex and sophisticated that they (more precisely: a set of them) may, technically (but not necessarily legally, as will be described in further chapters of this thesis) replace the traditional establishment and operations of an enterprise, ranging from its set-up through predictable day-to-day operations and even to sophisticated decision-making based on artificial intelligence. For the purposes of this thesis, the term ‘smart contracts’ will be used in its broadest sense, i.e. describing all computer programs meeting the technical definition stated above, regardless of the level of their complexity and regardless of whether they meet the legal requirements to form a valid contract. However, readers should keep in their mind the broad range of options this term may cover.

\textsuperscript{29} AZ Rev Stat § 44-7061 (2017) E(2)

\textsuperscript{30} An interesting example of how the legal value of a contract can be dealt with in smart contracts can be found in the Monegasque blockchain law-making process, where a proposed legal definition of smart contracts read as follows (translated from French by the author): \textit{“Smart contracts are autonomous, self-executing algorithms which serve to transfer value or information via blockchain. They constitute legal actions and have legal effect. Therefore, the aspects of their validity and legal effects are governed by the general contractual law.”} Cf Projet de loi No. 237 de M. Thierry Poyet relative à la blockchain (Monegasque Proposal for Blockchain Law No. 237 from 4.12.2017, submitted by Mr Thierry Poyet), Art 2. Consolidated version as of 26.5.2021 cited. This closely appears to follow Article 12 of the United Nations Convention on the Use of Electronic Communications in International Contracts, according to which \textit{“[a] contract formed by the interaction of an automated message system and a natural person, or by the interaction of automated message systems, shall not be denied validity or enforceability on the sole ground that no natural person reviewed or intervened in each of the individual actions carried out by the automated message systems or the resulting contract.”} While the definition of a smart contract did not appear in the final version of the law, its proposed version still may serve as a source of inspiration for how to interpret the notion of a smart contract in the terms of the existing contract law.
2.1.2 Roots of the Concept of DAOs

It will be shown later in this thesis that automated electronic agents are nothing new. For example, the idea of recordkeeping of transactions and titles in a replicated database was presented by Szabo as early as in 1998, although it took about ten further years to set the first system of value exchange based on decentralized ledger technology into operation. This, however, does not mean that all the essential questions regarding them have found their answers since then. Moreover, the development of decentralized computing technology has opened up new possibilities for establishing electronic agents based on decentralized ledgers (blockchain), which has contributed also to the development of new legal issues and questions over time.

The general understanding of the idea of decentralized/distributed autonomous organizations as dealt with in this thesis reaches back to 2008, when ‘Satoshi Nakamoto’ introduced Bitcoin, the first elaborate establishment based on blockchain. This gained public awareness and broad use as the first known DAO. It was soon followed by further electronic payment systems based on similar technological principles. With regard to DAOs, the most interesting of these is possibly Ethereum, which allows additional software to be run thereon and thereby opens space for the operation of smart-contract-based systems of various levels of complexity and autonomy, such as The DAO, DigixDAO or Steemit. Those serve as good examples of where the development of blockchain-based establishments is going and show that decentralized profit-making establishments, with more or less autonomy, are perfectly possible under the current state of the art.

2.1.3 What is a DAO?

“Agnes thought to herself: the Creator loaded a detailed program into the computer and went away. That God created the world and left it to a forsaken humanity trying to address him in an echoless void – this idea isn’t new.”³⁴ A quote from a novel titled ‘Immortality’ by Milan Kundera, first published in 1990, unintentionally provides a surprisingly sophisticated lay explanation of the basic mechanism of an archetypal DAO, save that, contrary to the world, the DAO has a humble human being for the Creator. And, as everything created by humans and for humans, even DAOs are likely to be subject to considerations about the need for them to be subordinate to human-imposed rules; in other words, for their legal recognition and regulation. This gives rise to a substantial question: how do we define a DAO for the purposes of the law?

There is no single and unanimously accepted definition of a DAO so far.³⁵ However, it seems useful to introduce some examples thereof for a more holistic idea of what this notion can comprise. Luis Cuende, co-founder of the Aragon DAO platform, defines a DAO as an “internet-native entity with no central management which is regulated by a set of automatically enforceable rules on a public blockchain, and whose goal is to take a life of its own and incentives people to achieve a shared common mission.”³⁶ In other words, DAOs can be described as economic establishments expressed in code and running on blockchain, without having any administrative and personnel structure and sometimes even any tangible property³⁷ or as an “organization of immutable community governance rules formed around a common goal.”³⁸

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³⁴Milan Kundera, Immortality (Faber and Faber Limited 1992) 12
³⁷Cf. Various descriptions of distributed autonomous organizations, such as presented by Hsieh and others (n 33) or by Metjahic (n 37)
³⁸Daniel Kraus, Thierry Obrist and Olivier Hari (eds), Blockchains, Smart Contracts, Decentralised Autonomous Organisations and the Law (Edward Elgar Publishing 2019)
Probably the best-known example of a DAO is the Bitcoin Network.\(^{39}\) As suggested above, from the technical point of view, any DAO is a smart contract or a set of smart contracts, or, understood on an even higher level of abstraction, a computer program.\(^{40}\) But what can it be in addition to that? Based on their functionality, DAOs may resemble certain kinds of services, provided by their creators and operators to the users. Also analogies with entities or partnerships are rather common,\(^{41}\) although it can be shown that they bring certain issues, at least under the current state of the art. But before reconsidering the possibilities of acknowledging DAOs as entities from a legal point of view, it appears useful to briefly discuss their nature as smart contracts.

As suggested above, DAOs are computer programs.\(^{42}\) However, they are computer programs of rather a specific nature. A set of smart contracts which builds a DAO represents encoded, immutable and self-enforced business logic, which should bring lower transaction costs thanks to automation, i.e. replacing human agency with an algorithmic one. Technically, the code inside could even substitute the by-laws or articles of incorporation or part of them\(^{43}\) in the concept of a DAO as an entity, while artificial intelligence, if included and sufficiently complex, could replace the board of directors or other persons involved in decision-making. However, while resembling enterprises, DAOs work somewhat differently from traditional businesses. Those differences may lead to issues, some of which will be discussed later in this thesis.

Especially, it must be stressed once again that once the set of smart contracts of which a DAO consists of is coded and run, making any post-coding changes follows a specific procedure which is different from how decisions within traditional legal entities are adopted.

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\(^{39}\) At this point, Bitcoin as a platform is meant rather than the individual bitcoins as pieces of a cryptocurrency. Cf. Hsieh and others (n 33)


\(^{42}\) Cf. Metjahic (n 37)

\(^{43}\) Cf Wyoming Decentralized Autonomous Organization Supplement S 17-31-106 or Act №205, An act relating to blockchain business development (State of Vermont Blockchain Act) § 4173.
and effectuated and which may not be speedy and effective enough to allow for an adequate response to the changes in the outer environment. Due to the nature of the public blockchain, it is almost impossible to change any records which have already been made. This is a separate issue, but even modifications of the code itself, which are meant to have an effect in the future, are not free of problems. It had been mentioned before that DAOs can run without being actively and continuously operated by people.

This, however, does not mean that they operate in a vacuum which might exclude any human interaction at all. While DAOs do not have members and managers in the sense in which those are understood in traditional legal and economic entities (companies, businesses, partnerships), they still have various stakeholders who may either participate in the maintenance and development of such a DAO or be its simple users.44 Those stakeholders are not primarily bound by a legal contract but are driven by a common goal.45 Thus, there would typically be a type of token connected with voting rights (usually called ‘membership tokens), whose holders would be able to vote on various proposals regarding the deployment of funds or commencing a certain project, or changing the code.46

On the other hand, the change-making process may be very time-consuming as it requires the consensus of a potentially high number of token-holders who possibly do not know each other and do not actively cooperate. This turns out to be particularly perilous in terms of changing code of a DAO, potentially opening the door to malicious actions such as bugs (if present) being exploited, or even just the simple lack of protection of minority members being exploited by malicious actors for a rather long time until a consensus is reached and the problem fixed.47

45 El Faqir, Arroyo and Hassan (n 35) 2
All this gives rise to a number of issues not only in the fields of law and policy but also in philosophy, economics, psychology and ethics. As will be described below, current legal systems are mostly not sufficiently prepared for such innovation. The following chapters will assess selected questions that occur if DAOs are provided with legal personality, discuss the potential limits of such a solution and suggest what advantages and disadvantages such solutions may bring, as well as reflecting on the first steps already made in this field.

2.1.4 The DAO vs. Any Other DAO: DAOs Can Take Many Forms

It has been stated that there is no unanimous definition of a DAO. An alert reader might have noted that, unless the abbreviation ‘DAO’ is used, two similar terms are used throughout this thesis: ‘decentralized autonomous organizations’ and ‘distributed autonomous organizations’. A brief explication thereof, accompanied by an example illustrating some of the practical demonstrations that there is nothing like a single type of a DAO, may become useful at this point, creating a stepping stone for the future argument that certain questions require a granulated and balance-seeking approach, rather than it being possible to find a single and unanimous answer.

There is a technological difference between ‘decentralized’ and ‘distributed’, which, however, will be considered negligible for the purposes of this thesis. The idea of an archetypal DAO should be a distributed autonomous organization, i.e. an algorithmic entity running on the infrastructure of a distributed (rather than merely decentralized) database. In particular this feature is known to be a source of certain questions, some of which are discussed later in this thesis. However, the practical reality may be more complex and it cannot be excluded that some algorithmic business arrangements which could otherwise show a substantial number of features qualifying them as a DAO (and therefore at least some ideas expressed in this thesis being relevant for them) can, in fact, run on a database infrastructure which is merely decentralized. Trying to provide a most general and timeless

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48 For an accessible overview see for example Blockchain Engineer, ‘Centralized vs Decentralized vs Distributed’ <https://blockchainengineer.com/centralized-vs-decentralized-vs-distributed-network/> accessed 15 June 2023
framework of the core issues around DAOs, this thesis uses the terms ‘decentralized autonomous organizations’ and ‘distributed autonomous organizations’ interchangeably.

What may be even more surprising is, however, the mere fact that there is no unified idea of the form of a DAO, overall. On the contrary, DAOs can take numerous forms, varying not only in the level of decentralization, but also in the number of participants, and level of autonomy. This is likely to make any thoughts of legal personality for DAOs more difficult as finding a one-fits-all framework is improbable.

To state one of the first examples of how, with various blockchain-based establishments being present in the world for some time, first cases of problems have already appeared, some of which illustrate the variety of DAOs possible, there is the (in)famous case of the failure of a blockchain-based establishment named The DAO (Decentralized Autonomous Organization).

The DAO, with capital ‘T,’ made the ‘DAO’ abbreviation or the collocation of ‘decentralized autonomous organization’ known far beyond the expert audience, sometimes without a proper idea of what they meant being shared at the same time. This may be a cause of terminological discrepancies, undue simplifications and misunderstandings regarding the notion of decentralized/distributed autonomous organizations. These should be clarified in order to support a correct understanding of the scope and subject matter of this thesis.

Therefore, it appears useful to briefly outline the difference between The DAO as a particular establishment and the notion of distributed or decentralized autonomous organizations in general. This will also create one of the stepping stones for future ascertainment that only certain types of DAOs may prove to be capable of being plausibly granted legal personality.

The arrangement named ‘The DAO’ was a venture capital firm established on 30 July 2015 for crowdfunding purposes, which was run on the Ethereum blockchain and followed the same principles as Bitcoin. For some time, the establishment appeared to be successful, as it led to about 10,000 people from all over the world investing over 168 million dollars
therein. However, an attack, making use of a bug in the program, resulted in more than 3,600,000 dollars being stolen from The DAO, which caused a breakdown of the project. The case became common knowledge and due to the name of the establishment in question, it may have led to a perception that ‘The DAO equals a DAO’. However understandable, this is a misconception which may lead to an impression that all DAOs are of the same structure as The DAO, which, despite its name, was allowed a relatively low level of autonomy, although it was decentralized and probably even distributed. The contrary is true, in reality so far there are numerous arrangements based on blockchain, varying in the level of their complexity and autonomy, and many other alternatives are imaginable.

This, on the other hand, does not exclude The DAO from the scope of the analysis made in this thesis. In fact, it can be doubted if a fully autonomous DAO is something more than a hypothetical concept that helps the academic discussion highlight the problems which may occur in connection with decentralized and distributed algorithmic business arrangements. This thesis, although using this concept as well, has been drafted with the full awareness that existing, and possibly upcoming, blockchain-based establishments may feature various levels of both decentralization and autonomy, as well as of the activity of the membership-token-holders. The abbreviation ‘DAO’ will basically be used to describe any possible

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51 The nature of The DAO, including the explanation as to why it was decentralized but not truly autonomous, as well as what this means in the context of the general definitions of a DAO, can be set out in an elaborate way. However, it is not necessary for the purpose of this chapter and it is available in existing literature, see for example Metjahic (n 37) 1541 – 1546 and Filippi and Wright (n 25) 101 f. and 131 f. At this point, it should be, most importantly, understood that there are numerous establishments based on blockchain or other types of decentralized or distributed databases, varying in the level of their complexity, decentralization and autonomy already in existence. The DAO was decentralized in the sense that, unlike a standard corporation, it had neither a true managing body, nor did it rely on any other means of traditional corporate governance. Instead, its decision-making was based on group consensus of its human members. This was the way in which The DAO differed from a true distributed autonomous organization, which is directed solely by a previously made code and once set into operation, can function without any further human interaction (i.e. autonomously). In other words, in spite of having the word “autonomous” in its business name, The DAO was not really autonomous by its nature.
52 Notably, the awareness of the number of DAOs being non-negligible and of the need to develop an institutionalized and unified approach towards them starts to get through to the lawmaking stakeholders even in the countries which haven’t introduced specific DAO-related legislation, cf. UK Law Commission (n 4).
arrangement which meets, to a substantial extent, the overall idea of a decentralized or distributed autonomous organization.

For the purpose of the general or theoretical discussion of the relevant issues within this thesis, primarily archetypal distributed autonomous organizations will be considered, as described by Metjahic (2017), i.e. those including the aspect of high autonomy as well as the aspect of the distributed nature. This follows the idea expressed above and is meant to start with a certain kind of worst-scenario example, or, to reverse the idea, to help identify what a DAO must not lack if it is to be capable of a plausible legal personality. At the same time, however, existing examples of blockchain-based establishments may be taken into consideration as well when the practical and contemporary issues are in question, regardless of their actual level of decentralization and autonomy and regardless of whether they meet Metjahic (2017)’s definition of a DAO in its entirety.

2.1.5 Archetypal DAOs as Real Businesses: Examples Based on the Existing Discussion

The general idea of DAOs has been explained above. It will be explained later in detail that granting DAOs legal personality is inevitably connected with certain unclarities, practical difficulties and questions which still need to be addressed. Apart from that, it will be shown that even the mere question of whether legal personality for DAOs is likely to be welcomed by their originators does not find a unanimous answer. However, the attempts which have been made so far show that at least some of the DAOs’ originators have an interest in giving their arrangements a practical legal form.

So far, such cases seem to have always been related to DAOs with limited autonomy, i.e. those in which a significant portion of human involvement of particular and identifiable individuals in their management is present. However, fast-paced technological development may bring DAOs with a very high level of both decentralization and autonomy, and possibly even with the involvement of advanced artificial intelligence on an on-chain basis, sooner or

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53 Metjahic (n 37) 1541 – 1546
54 For example American Cryptofed DAO LLC, Altcoin DAO LLC, Binaryx Protocol DAO LLC etc.
Therefore, it appears worth trying to think about, even just as a hypothetical example at the moment, the idea of a highly autonomous DAO (possibly also with members in the form of membership-token holders) running on a public (permissionless) distributed ledger as an archetype of the notion of DAO, and try to discuss how this could be approximated to the known business structures which provide the basis for what is currently regulated by the traditional corporate law. This could serve as an illustrative example which helps to identify certain thorny points of DAOs as business arrangements and which provides a stepping stone for future discussion about the extent to which the thoughts about legal personality for highly autonomous DAOs should be seen as meaningful and plausible for the future as well as what challenges may need to be tackled to make the idea of legal personality for highly autonomous DAOs work for most of the stakeholders.

Let us assume that there might be a (nearly) fully autonomous DAO performing a business activity, which is entirely managed by a set of algorithms and only interacts with humans at the endpoints of its activity. For the purpose of our example, let us also assume that a separate legal entity of a DAO should offer limited liability to its beneficiaries (regardless of whether we call them founders, operators, members or participants). To make an overview of the extent to which this appears to be legitimate and plausible, let us further outline the structure of such an entity in terms of how a DAO – entity would mirror the structures of traditional entities the law already normally sanctifies and regulates.

As there is no unanimous answer on which particular type of entity is the most suitable one for being approximated by a DAO, the outline will be done in a very general manner. Basically, we can assume that a legal entity is likely to have several bodies, each of them having a different function. There will be always a certain kind of a supreme body, typically built up from the totality of shareholders or other types of owners, and a managing body,

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56 This appears to be one of the key question especially in the context of warnings outlined by LoPucki (n 7). As correctly pointed out, algorithms do not have conscience or other kind of ethical thinking, which raises an urgent need to regulate them strictly via both legal and technical mechanisms to keep their operation in a plausible framework.
typically built up from a certain number of managing directors. Depending on the jurisdiction and type of entity, there might be also a separate supervisory body. The law typically provides for that such bodies must consist of persons and how the bodies which consist of more than one person adopt and enact their decisions. This may happen for example by voting (most typically in the supreme body), unanimously, or by each member deciding and acting independently. Can a DAO be structured and function in an (at least roughly) comparable way?

Starting with the entity’s supreme body, we can reasonably assume that a DAO will always have a group of persons which could be approximated to members of an entity, holding a share of interest therein and taking profit therefrom. The aggregate of all such persons (membership-token holders) then could be understood on par with the aggregate of shareholders in a traditional entity and their decision-making could be approximated to per rollam voting in a general meeting. A certain kind of problem may be seen in a situation in which the DAO does not issue any membership tokens at all. In that case, we could theoretically rather easily turn back to Bayern (2015)’s idea of a memberless entity as introduced more in detail later on, but the practical reality seems to offer further ways of approach.

For example, we can follow the actual flow of the DAO’s profits and use the notion of the beneficial owner, also mentioned above, to form a construction under which the persons taking profits from a DAO could be understood as its members. In such cases, a smaller number of people, who are even likely to meet in person in a similar way as a standard general meeting of, let us say, an LLC member base, would do, may be expected to be involved. Thus, with a bit of effort, we can at least theoretically find that a DAO has a certain kind of members, as well as who should be understood as being a DAO member.

However, thinking about the managing bodies may give rise to a much more complex set of questions. First of all, it must be discussed whether the developers who drafted the DAO’s code, i.e. practically shaped the initial nature of the DAO and who may even influence the
shape and functioning of the DAO in the future,\textsuperscript{57} can be in all cases understood as DAO’s managers. At the same time, it may be difficult to divide the member’s role from the managing one due to the members being the ones who adopt decisions on any subsequential changes of the code. Further, the DAO’s code is basically all-in-one equivalent to what we could call a body corporate of the DAO. It is the DAO’s mere substance (or at least a prevailing part of it) as well as an alternative to both the managing and supervisory body.

Therefore, it is also difficult to legally classify the actual authors of the code in terms of the traditional corporate law and corporate governance and this also complicates the legal position of the members who propose and vote on subsequent changes of the code. Are those people closer to the founding members, who have invested their time and skills in actually creating the DAO in a way which could be approximated to developing a unique business model for a traditional entity, or to the lawyers who drafted the memorandum of association? Can they be considered managers because they created and set into operation the technical means which secure the practical management of the DAO? A straightforward answer is not going to be given here as all the alternatives seem, at least theoretically, possible.

Then a more complex problem will be encountered once we strengthen our attempts to identify the mirror-reflection of a traditional entity’s managing body in a DAO. A short but little-saying answer would read as that the decision-making body is replaced by the mere code of the DAO, more precisely said, by those its parts which relate to its operations and interactions with the outer world. Hence, any existing discussions about accountability shielding via automated electronic systems may find their application. For example, starting from the intentions of the programmer at the time of programming, we can theoretically understand the programmer as a manager, but for a practical application of this idea, we must inevitably ask, who is the programmer and the factual possibility of applying liability for the system’s behaviour to such a person will depend on whether we find an answer. Some

\textsuperscript{57} This can be illustrated by the example of The DAO and the subsequent Ethereum fork.
options on how to approach this question will be discussed more in detail later on in this thesis.

In all cases, the idea of liability shielding being discussed does not automatically mean that the decisions made by an algorithm are bound to enjoy freedom from scrutiny and accountability within the entity’s structure, even if the author of the DAO is no longer to be found. Similarly, as the supreme body of a traditional legal entity votes on the appointment and removal of a managing body, the aggregate of membership-token holders of a DAO may vote on changes being made to the algorithm which makes and governs the DAO. Leaving the possible model of a DAO as a business trust with designated – trustee-like – sort of token-holders aside for now and focusing on the most general idea of a completely flat-structured DAO, attention must be drawn to the fact that, on one hand, membership token holders are typically entitled to raise proposals and to vote, while, on the other hand, there is no guarantee that any of them will exert a sufficient amount of care and understanding for the relevant matters.

Together with the difficulty in reaching a consensus among the token-holders, this may lead to severe delays or blocks in decision-making and prevent speedy action from being taken if needed. At this point, it might be even worth highlighting the double-edged nature of limited liability – a feature which tends to be seen as crucial by their supporters for the broad deployment of DAOs\(^\text{58}\) – once again. It may be easily assumed that with the only risk being the loss of money already invested in a DAO, a significant portion of the membership-token holders may be even less motivated to take care of the ongoing condition of the entity in which they are holding a share and to promote changes to be made, if this appears to be needed.

Having mentioned that traditional legal entities may, depending on the circumstances, also have supervisory bodies, it should be noted that it appears difficult to imagine that a similar arrangement could be meaningfully done in DAOs. This does not seem to be a problem from a legal point of view as not every type of legal entity must have a supervisory body and thus,

\(^{58}\text{Reyes (n 6) 390}\)
creating a DAO-suitable entity type without one is unlikely to be disruptive at the level of elementary principles of existing corporate laws. On the other hand, the absence of an at least relatively independent supervisory body increases the risk of negligence, and reliance on collective responsibility, with no-one to step in if there is a problem, especially in DAOs with a particularly high number of membership-token holders. Those aspects appear likely to make the prevention, or early rectification, of any misconduct of a DAO-governing algorithm significantly more difficult than a comparable action would be in traditional entities.

However, and rather surprisingly, most of the issues discussed in this subchapter and this thesis as a whole are much less induced-by-the-DAOs-as-such than they might seem at first sight. This may be demonstrated with the help of the examples presented by Joanna J Bryson, Mihailis E Diamantis and Thomas D Grant (2017) who bring an interesting analysis of the possible questions around accountability and liability shielding in the context of the discussion about the possibility and plausibility of legal personality for material robots, using several examples of innovative arrangements from the physical world to explain the possible accountability and liability issues, one of them being the collapse of the International Tin Council. In particular, those thoughts may help to precise the point of view from which DAOs should be seen as potential candidates for legal personality and how the question of legal personality in them should be approached.

Bryson primarily discusses the question of the possibility and plausibility of legal personality for sophisticated robots. Seeing a DAO as an immaterial robot, which is a completely sound point of view on its own, could tempt us to translate the presented thoughts on robots one-to-one to DAOs, but the reality is a bit more complex. In particular, it seems that material robots and DAOs do not share the same criteria of deserving a separate legal personality. While the discussion about the possibility and plausibility of legal personality for material robots usually turns around a high level of autonomy and advanced artificial intelligence (sometimes even mimicking sentience) being involved in the system, in DAOs, the prevailing criterion seems to be their purpose as socioeconomic arrangements. This can be explained more in detail with the help of the example of the collapse of the International Tin Council.
In terms of autonomy, organization and purpose, DAOs actually resemble the Tin Council arrangement slightly more than robots as discussed by Joanna J Bryson, Mihailis E Diamantis and Thomas D Grant (2017), having, in reality, subjects of law pursuing economic interests behind themselves who have certain means to influence their conduct and to whom one can, at least theoretically, be referred if the decision to look behind the legal person of the DAO itself is made.

The collapse of the International Tin Council further shows an example of how there was an arrangement in the physical world which suffered similar problems as DAOs are likely to suffer from, illustrating that before another arrangement in which such problems can be expected (although modified by the technical nature of the arrangement), those should be addressed and solutions should be made available.

Starting from a purely practical point of view, the financial aspects of the International Tin Council’s arrangement are worth a brief mention at first, as they, connected with the troublesome possibility of reaching the subjects of law behind the organization, also constitute a source of predictable issues. The International Tin Council being undercapitalized and consisting of subjects enjoying sovereign immunity become an ‘empty shell’ – an arrangement being formally accountable on its own but without a practical way to make it face its liabilities, rendering its creditors practically unable to collect their payables. A similar situation can occur in a DAO, which can, in reality, have no assets on its own and even the subjects behind it may be protected by a powerful tool, which is, in this case, not the sovereign immunity, but the anonymity achieved through the blockchain structure.

However, even if those responsible persons can be effectively reached in an individual case, there are still questions of how, indeed if at all, their liability can be established by standard means. Looking at the example of the Tin Council again, Romana Sadurska and C. M Chinkin (1990) point out that "[l]iability must be channelled through legal constructs stemming from...

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the right of direction and control.” Thus, the respective relations between the activity of the DAO in question and the persons behind it must be examined.

It has been explained above that a DAO is basically directed by a pre-defined algorithm. The Tin Council had the role of a buffer manager, which was performed by a natural person on one hand, but, on the other hand, “could be considered merely an instrumentality through which the Council functioned. His express authority to buy and sell tin was sufficiently broad to make his actions intra vires [and t]he member States could have acted to terminate his authority.”60 Thus, with a little bit of imagination, we can find an analogy between the regular working manner of the International Tin Council buffer manager and the operation of a DAO’s algorithm.

The role of the members in such an atypical arrangement gives rise to other questions. To follow our example further, let us consider that “[t]he members of the Council are not professional directors acting as agents of the company, with fiduciary duties specified by law. Instead, they serve as representatives of individual member States.”61 Again, a distinctive parallel with the arrangement of a typical DAO can be seen. Neither the membership-token holders in a DAO are directors in the typical sense of this word and it can be disputed whether, and if so to what extent, they can be understood as being obliged to prioritize the interests of the DAO as a whole over their own.

At the same time, they are the only persons able to change the existing algorithm of the DAO and thereby direct the conduct of the organization in real time, regardless of whether they can be considered directors or not. Here, we can also observe a risk of the practical will to direct the organization being limited, or even absent. A scenario was described 62 in the Tin Council case, showing that “when the ITC was threatened with collapse the political will to keep it going had ebbed away. The failure of will was compounded by the byzantine internal workings of the Council. Decisions were taken by consensus; votes were rare. The temptation to fudge decisions and avoid confronting issues was strong.” This can easily occur

60 Sadurska and Chinkin (n 61) 865
61 ibid
in any DAO. The requirement for a consensus of 51% of all membership token holders for any decision being adopted, connected with anonymity of members and possibly low motivation to actively engage with the functioning of the DAO are likely to lead to deadlocks or delays, especially if a high number of members is absent from the decision-making process.

It has been reported that the International Tin Council, as well as several other physical-world arrangements, have brought problems concerning accountability and liability in their time. Very similar problems can be identified in the concept of DAOs. Some of them were briefly outlined above and will, together with further ones, be discussed more in detail in the following chapters of this thesis.

2.2 Autonomous Artificial Systems and Legal Personality Discussions: What Does It Mean for DAOs?

There are various theories on the notion of legal personality, from the ancient concept of *persona*, understood as a role, through Kant’s and Hegel’s approach based on moral philosophy or the Historical School founded by Hugo Grotius, towards a recent bundle theory presented by Visa A J Kurki (2019), to name at least the most significant examples. Regardless of whether ancient or modern, none of them appears to offer a ready-made approach to the issues which the development of the notion of legal personality incurs as a consequence of the unprecedented advance in electronic technologies: the question of legal personality in the digital environment still needs complex discussion. However, the purpose of this chapter is not to give an unambiguous answer either, nor will it serve to discuss the notion of legal personality from a doctrinal point of view.

Rather, this chapter aims to put the notion of legal personality in the context of decentralized autonomous systems, given that they might be provided with various levels of autonomy and artificial intelligence. The terminology and definition of legal personality, as

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set in this chapter, will be used in the further text of this thesis as a stepping stone for the
discussion of the advantages and risks of granting legal personality to DAOs and to provide
reasoning for the choice of the particular mode of legal personality to be taken into
consideration.

For the purposes of this thesis, legal personality will, in its broadest sense, be understood as
the ability to have rights and obligations (also called passive legal capacity)\(^\text{64}\) and will be
distinguished from (active) legal capacity, which will be understood as the ability to perform
legal acts on one’s own.\(^\text{65}\) As a consequence, legal personality will be seen as a prerequisite
to legal capacity. Taking this into consideration, it will be discussed which kind of legal
personality (if any), DAOs should be granted.

In this context, it must be noted that any answer to this question is unlikely to be
unanimously accepted, universally valid and timeless. In this context, let us remember that
the entire idea of whom and what the notion of legal personality should cover differs in time
and place. Further, there have always been various types of legal personality whose
properties were based on the purpose which the law aims to achieve by granting legal
personality to a particular group of recipients.\(^\text{66}\) Thus, it is essential to identify the idea
behind DAOs to discover the possible purposes and factual possibilities of their legal
personality.

The deeper roots of the discussions about possible legal personality of electronic agents
focus on centralized systems and tend to devolve from their autonomy and ability to mimic
sentience, bearing a more or less distinguishable undertone of legal personality for

\(^{64}\) Cf. Bryant Smith, ‘Legal Personality’ (1928) 37 (3) The Yale Law Journal 283-299, 283

\(^{65}\) Graham Gooch and Michael Williams, A dictionary of Law Enforcement (Second edition, Oxford University
Press 2015)

\(^{66}\) A limited or no legal personality of slaves in ancient societies is notorious in this context. What may be more
remarkable is that history has seen a certain level of legal personality being granted to animals for the purposes
of making them subject to criminal proceedings, cf Edward P Evans, Criminal Prosecution and Capital
Punishment of Animals (E.P. Dutton and Company 1906), or a specific legal-personality regime of ships, cf
Bryant Smith, ‘Legal Personality’ (1928) 37(3) The Yale Law Journal 283
<http://www.jstor.org.ezproxy.is.ed.ac.uk/stable/789740>. Similarly, a still disputable question of whether
(and if, to which extent) individuals have legal personality for the purposes of international (public) law, can
illustrate this idea, cf Conrado M. Assenza, ‘Individual as Subject of International Law in the International Court
electronic agents to be thought about as an equivalent of the legal personality of a natural person. However, those thoughts have been proven at least controversial on their own for many reasons. While a separate examination of this question would be beyond the scope of this thesis, it will be shown further that they do not appear to fit the practical needs of the discussion about legal personality for DAOs. To develop this thought, I become inspired by Bryson’s idea of law as a system of norms created by humans and for humans, as well as by some of Solaiman’s thoughts on legal personality for non-human entities, and follow the basic premise that legal personality granted to anything different from a human should be supported by an interest of a distinguishable group of people and serve those interests, as well as arguing that any non-human legal person should feature a sufficient connection to the natural persons whose interests it serves.

As a prominent example, Sheikh M Solaiman (2017) discusses the possibility of granting legal personality to sophisticated centralized robots, as possessors of advanced artificial intelligence and systems provided with a significant level of autonomy, making comparison with the concepts of legal personality of corporations, idols, natural artefacts and even building up on thoughts expressed earlier in discussions on whether legal personality should be granted to chimpanzees. This can serve as a good stepping stone in the discussion about the possible basis for legal personality for DAOs.

First of all, it should be explained that the criteria of autonomy and sentience do not seem suitable for the assessment of whether DAOs should be granted a separate legal personality. This has been briefly suggested above when the case of the International Tin Council collapse was introduced and can be developed further. Unlike human beings, whose legal

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68 Bryson, Diamantis and Grant (n 59) 276
70 Those were elaborately analysed for example by Joshua C Gellers, Rights for Robots: Artificial Intelligence, Animal, and Environmental Law/ Josh C. Gellers (1st, Routledge 2020) XX and Solaiman (n 69) significantly builds up on this idea. It is not a purpose of this thesis to provide a detailed explication thereof; rather, the overarching idea is to be noted that some authors compare advanced artificial intelligence with animals which show a high level of sentience and reasoning.
personality is, at least within the frameworks of national laws, usually based on the current understanding of human rights and human dignity, and therefore has, apart from the purely formal or utilitarian, also non-negotiable ethical and philosophical aspects, non-human systems always gain their legal personality for predominantly utilitarian reasons.

Further, we should be wary of alleged similarities between robots (which can be related to all artificial autonomous systems in this context) and chimpanzees (or any other kinds of animals capable of a higher level of sentience and reasoning). Such similarities, although tempting to be used as an argument to support the relevance of the discussion about legal personality for robots, are only superficial. If we think in-depth, we will note that the autonomy and intelligence of each of them stem from completely different roots and cannot be compared one to another due to their natures.

Firstly, animals have specific moral value as living and sentient beings, which has been acknowledged by legislators in various jurisdictions. Thus, it would seem more logical to derive the idea of them deserving a certain scope of rights from their ability to suffer, a feature which artificial systems do not show, rather than from their autonomy or intelligence. Secondly, the behaviour of animals is fully driven by their instincts and the laws of nature, basically independent from human activity (although those may be used by humans as a basis for training animals kept in captivity). Unlike animals, the behaviour of autonomous artificial systems is, at least in its roots, determined by the principles put in by their human creators. In this regard, any artificial autonomous system seems in its nature closer to a legal entity (company or foundation) than to an animal: by way of, and reason for, its emergence, as well as the way that the key features of legal personality, such as self-awareness, will, decision-making and determination of its own conduct are vested therein.

Following the approach of Sheikh M Solaiman (2017), we can offer a comparison with other non-human objects having legal personality. For example, if idols and natural artefacts are provided with legal personality in some jurisdictions, it is a kind of legal personality which is, in its roots, actually similar to the concept of a foundation (although not necessarily exactly

\[71\text{ Cf for example zákon č. 89/2012 Sb., občanský zákoník (Czech Civil Code) S 494}\]
the same), as its purpose is primarily to protect and support interests of certain groups of people in the object (worshippers of a particular religion, for whom an idol is of crucial importance for their religious practice, or stakeholders in environment protection, who aim to preserve certain natural artefacts as valuable pieces of natural heritage etc.).

Those thoughts represent examples of what should be reflected in the criteria for legal personality being granted to a certain system. Taking them into consideration, we can basically agree with Sheikh M Solaiman (2017) in the conclusion supporting the notion of robots as mere products and tools. This, however, does not do the job when DAOs are to be discussed.

Overall, it seems that a lot of inspiration can be taken from Luciano Floridi (2009)’s approach with regard to DAOs. Indeed, any kind of artificial autonomous system created by humans is created primarily to help people pursue certain goals and the people who created such a system did so actively and with certain intentions. In this regard, centralized robots indeed do not differ from hammers. A similar pattern can be applied to DAOs, but certain modifications are needed.

Especially, while the presence of robots is limited to a particular and clearly identifiable place and their functionality is normally (at least at the time when this thesis was drafted) narrowed down to a limited scope of specific, predefined tasks, DAOs do not necessarily have to share those features. Firstly, DAOs are computer programs running on distributed database systems. This means, firstly, that they are (unlike physical robots) immaterial and decentralized, which makes it almost impossible to localize them, take them under external control or physically destroy them once they have been set into operation. Further, maintaining them and exercising control over them in a regular manner usually requires the participation of a number of persons, who are required to reach a consensus.

Secondly, DAOs can be programmed to perform sets of tasks which in their entirety constitute a holistic and persistent gainful activity. In fact, DAOs can be designed to feature

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very complex functionality, including a broad range of tasks, which are normally performed by the employees or members of a managing body of a company. This means that they can become *de facto* business entities, although they (at least under the current state of the art) cannot meet the legal requirements to be entities *de iure* in most jurisdictions.

As it will be explained in more detail later, DAOs to a certain extent resemble the existing legal entities, such as partnerships, corporations and foundations, which can be seen as tools or vehicles for certain socioeconomic activities. Therefore, it seems reasonable to think about granting them legal personality in the form of a derivative of the legal personality of people, as in the case of existing legal entities. However, this does not automatically imply that the same legal personality which traditional entities have should be granted to DAOs or that all existing entity forms should be open to DAOs. Instead, further analysis of certain questions needs to be performed and the relevant issues need to be addressed first.

The simpler scenario regards an actively managed DAO, i.e. a DAO whose everyday operations run autonomously but which is, at the same time, under the close supervision of its membership token holders who actively engage in running of the DAO, raising proposals for changes if this seems needed and voting on them. This model would resemble a partnership and may serve as a plain example to show that Luciano Floridi (2009)’s approach needs to be modified to fit DAOs. Indeed, the control of the founders and operators over a DAO is different from the control of a craftsperson over a tool such as a hammer and even from that of an operator over a centralized physical robot. Rather, it resembles the control of an owner or director over a business, at least to some extent.

However, things may get more complicated if the founders or current members of the DAO in question decide to be nothing more than passive recipients of the profits. This is surely technically possible – a DAO can be programmed to run without further human intervention and can be even powered by sophisticated artificial intelligence which would also allow for more complex business decisions to be made autonomously. Moreover, the idea of implementing a DAO in a corporate structure so that a company becomes operated in a fully automated way, even under the current state of legislation, has already been presented in
academic discussion. This, however, gives rise to complex issues relating to liability and it is also exactly where this question should be asked: “under which conditions it is plausible to assert liability to an artificial system at all”? Some of the crucial points thereof will be addressed further in this thesis.

Thinking about a DAO running fully autonomously, it must be still remembered that DAOs, or, in more general terms, any artificial autonomous systems, are the results of human intellectual activity (work of the inventors, engineers and programmers), which means that their actual form and mode of functioning is determined by the people in control of them – even if ‘in control’ actually means a decision to leave the system unattended. Keeping this in mind, we can briefly outline why detaching the operation of a DAO from the will and decision-making of those who hold an interest in it does not seem desirable.

At this point, we can, for example, dispute the extent to which essential mental aspects of corporate governance, such as will, decision making and acting with due care, normally performed by the human members of the entity’s governing bodies (or by human representatives of those members which are entities themselves), can be replaced by an algorithm. Although some sources suggest a positive answer, caution is more than necessary on this point.

Systems like DAOs may be equipped or powered with artificial intelligence of various complexity, which may, unless there is active human involvement present, be the immediate agent establishing the arrangement’s will. At the same time, we will face difficulties trying to see this as a genuine and original will. However, we surely can speak about its artificial counterpart, as long as we understand artificial intelligence as an artificial counterpart of genuine natural intelligence. However, it must be remembered that any kind of artificial decision-making mechanism is a computer program and, as such, it is a derivative product of human will and intelligence, reflecting the intentions and capabilities of its author. Thus,

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thinking about DAOs, the crucial elements of legal personality, i.e. the ability to enjoy rights and discharge duties, should, at base, be seen as factually dependent on the work of the human being(s) behind it; the programmer who wrote the source code of the DAO at the beginning, or the members entitled to propose and vote on changes of the code of a DAO, even if (some of) those persons decide not to take any action. As a consequence, thoughts about the way how something which could be called the ‘free will’ of a DAO must also be fed into this framework as well. Overall, this would reflect the free will of those who determine the source code of the DAO, just as the free will of a corporation is understood as reflecting the free will of its governing persons.

Yet for these reasons, it appears more appropriate not to detach electronic agents from those by whose interests their operation is driven, but rather to think about legal personality for an electronic agent (if at all) in similar terms to the legal personality of companies, established and operated by people. This would even correspond with the ultimate liability of the creators or operators of such electronic agents, as suggested by Curtis E Karnow (1996) or Tom Allen and Robin Widdison (1996). A more elaborate discussion of selected points of those questions will be provided in further parts of this thesis.

2.3 Why Is This All Worth Questioning?

To help answer this question, this chapter tries to look at the problem from a broader perspective, taking into account both long-term and current development in the field of autonomous electronic systems and distributed ledger arrangements. This includes, apart from the mainstream perspective of the topic, also a brief insight into what the originators of DAOs are likely to think about the idea of legal personality for DAOs, based on the broadly available sources documenting the philosophy of the blockchain-based communities.

Thinking about autonomous electronic agents, or distributed ledger technologies, in the broadest context, we can see that, as such, they are not such new concepts, as their roots reach back to the 1990s. However, technological progress enabled rather sophisticated combinations and use cases thereof to occur and it is to be assumed that the future is likely
to bring even more development in this field. It has been suggested above that it is not the level of autonomy or complexity of artificial intelligence used in them which should be the criterion to decide whether DAOs should be granted legal personality, but their nature as vehicles for a group of persons pursuing a socioeconomic goal. However, their nature as decentralized/distributed autonomous electronic agents remains present at the same time and plays a certain role in identifying the thorny points of legal personality for DAOs, as well as opening up certain questions which should be satisfactorily answered before legal personality for DAOs is seriously considered. To contribute to this discussion, and to help build stepping stones for future analysis of more detailed subquestions of legal personality for DAOs, this subchapter reiterates and examines some of the core questions of the constantly developing concept of autonomous electronic agents and puts them into the context of DAOs as possible legal persons.

2.3.1 Decentralized Electronic Agents: Old Wine in New Bottles?

The concept of DAOs appears to be a product of technological evolution rather than an absolute novelty. It builds upon ideas that have been there since the 1990s, such as electronic agents, smart contracts or cryptographic building of blocks. However, the technological achievements of the modern era allow rather unique combinations of those ideas to be brought into operation. This also brings new questions that are worth asking before DAOs find a broad and legally recognized application, as well as identifying the need for some of the old questions to be revisited. Some of these are going to be addressed in the following subchapters.

2.3.1.1 Electronic Agents, Autonomous Systems and Artificial Intelligence as Not So Much New Concepts Bringing New Issues Due to Distribution

Although the idea of computer-based systems effectively making contracts in an autonomous way and the substantial legal issues arising therefrom was at its core described
by Weitzenboeck\textsuperscript{75} as early as in 2001, most of the questions have been repeatedly discussed since then. Remarkably, some of them have not found a unanimous answer thus far.

To start with, the discussion was mostly limited to centralized electronic agents, i.e. those which were set into operation by a single, identified or identifiable person and were capable of being managed and maintained by such a person.\textsuperscript{76} A typical example of those could be chatbots and automated ordering/payment reception systems. Nowadays, the situation appears to be more complicated as automated agents may run on a distributed ledger (blockchain), which gives many of the questions a new dimension. But let us start from the beginning.

The mere question of the existence of a valid contract becomes complicated once most of the contracting process is left to computers. The traditional concept of contracting and/or transacting presumes the presence of aspects such as will, intention, agreement or consent, which are inherent to human beings and can hardly be divided from the human mind. However, this concept has been partially disrupted by technological development in the 21\textsuperscript{st} century. To keep things clear, various laws had been adopted in the 1990s throughout individual jurisdictions as well as on the international or supranational level. The E-Commerce Directive,\textsuperscript{77} which supports the idea of contracting via electronic means, may be the most well-known step promoting the use of electronic agents in the EU, but it is not the oldest one in the world. In fact, legislators’ initiatives dealing with the increasing automatization in contracting had appeared even earlier overseas or on the UN level. The UNCITRAL Model Law on Electronic Commerce dates back to 1996, while the model laws of the Uniform Computer Information Transactions and Uniform Electronic Transactions Acts in the U.S. and the Uniform Electronic Commerce Act in Canada were all introduced in the late 1990s. However, these laws see electronic agents as things (mere means of transacting)

\textsuperscript{75} Emily M Weitzenboeck, ‘Electronic Agents and the Formation of Contracts’ (2001) 9(3) International Journal of Law and Information Technology 204

\textsuperscript{76} Such as chatbots or simple automated order systems.

rather than persons, regardless of their level of autonomy and the factual level of control which is exercised over them by identifiable persons. This might even bring terminological unclarities, especially when the term ‘electronic agent’ is being used.

Reflecting on the physical (rather than legal) reality, it sometimes appears to be difficult to recognize whether it is still people entering into contracts with the help of technological means, or whether the technological means themselves can participate in contracts, while also acting on behalf of people who set them into operation. Various authors compare autonomous electronic contracting to an agency, using terms such as ‘electronic agent’. A similar term, an ‘autonomous agent,’ is known in the field of computer science. It might be worth reiterating the core thoughts behind those notions, even in the context of centralized systems, as they may later serve as a basis for the discussion of some of the aspects of the possible legal personality of DAOs.

Under the prevailing state of the art, it is to be noted that the word ‘agent’ should here be understood in its general sense than in the legal terms of an agency (or representational) contract. Otherwise, the word agent itself could suggest that it must be a person, being, at least in the legal literature, rather automatically connected with an agency contract and notions such as a commercial agent. However, exactly this conception is slightly misleading if autonomous electronic agents are discussed, because electronic systems are, in general, not persons.

In fact, it needs to be kept in mind that the traditional law of agency usually does not suit the reality of arrangements called ‘electronic agents’ and therefore it would be inaccurate to think about electronic agents in terms of the usual idea of the agency contract. On the other hand, this should not be understood as a reason to exclude the word ‘agent’ from the

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80 Bayern, Autonomous organizations (n 6) 35-45
discussion, even as shorthand. Instead, while speaking about electronic agents, the original meaning of the word ‘agent’ is to be kept on mind to avoid confusion. This stems from the Latin verb *agere*, which, in its most general sense, means ‘to do’ or ‘to move’. Also the English word ‘agent’ finds use in many fields, including grammar or chemistry and may be, in general terms, understood basically as an actual doer or initiator apart from its legal definition. In this thesis, the term ‘electronic agent’ will be used to describe any electronic system which is programmed to take actions without being immediately controlled by a human operator, regardless of whether such an electronic agent meets the definition of an agent under the existing law of agency of any jurisdiction.

As suggested above, so-called electronic agents are not generally persons in the legal sense and therefore they cannot act legally on their own, which leaves all the results of such electronic contracting attributable solely to the natural or legal person that set the respective electronic agent into operation. However, the development and increasing complexity of artificial intelligence opens space for discussions about whether such an approach is the only correct one. The first thoughts of providing autonomous electronic agents with legal personality are of practically the same vintage as artificial intelligence itself. However, voices arguing against granting legal personality to centralized autonomous electronic systems, such as certain kinds of robots, have been audible for some time. In pointing out, for example, serious doubts on whether electronic systems can be exposed to adequate sanctions for breach of their legal duties\(^81\) or the risk of an electronic system’s legal personality being used as a liability shield for its actual operator or another person profiting from its operations,\(^82\) these voices sound perfectly reasonable so far.

Such thoughts as those suggested above have, hitherto, mostly touched on sophisticated robots or centralized electronic contracting systems,\(^83\) although works have already appeared regarding the possibilities of legal personality for decentralized electronic systems, even without regard to the complexity of artificial intelligence they are equipped with.\(^84\) This

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\(^81\)Cf for ex. Solaiman (n 69), 158-161
\(^82\)Cf for ex. Bryson, Diamantis and Grant (n 59), 284
\(^83\)Cf for ex. Weitzenboeck (n 75)
\(^84\)Cf Bayern and others (n 73)
has been briefly touched on in the previous subchapter and selected points of this idea will be discussed further in this thesis.

2.3.1.2 Autonomous Electronic Systems Thinking and Acting: But What Can People Expect?

As suggested above, the expression ‘smart contract’ is to be understood as a technical term rather than as a sign of smartness in the sense in which most people would understand the word.

In this context, it must be noted that various levels of artificial intelligence come into question in DAOs and not all of them are supposed to bring a significant level of issues. Actually, most of the so-called smart contracts can be expected to follow the rather simple computer logic allowing them to do only what they were programmed to and letting them freeze (or at best, report an error) if anything goes wrong. This may be called ‘good old fashioned artificial intelligence’ and is expected to be one of the uncomplicated cases in terms of the DAO functioning. Remarkably, the UK Law Commission (2022) limits itself to this kind of systems.

However, following the overall progress in the field of information technology and artificial intelligence, involvement of even very advanced types of artificial intelligence in DAOs through oracles has already emerged and some argue that it appears imaginable that such an advanced form of artificial intelligence may even become embedded into the smart contracts forming a DAO. This is likely to bring specific issues.

We need to take into consideration the nature of DAOs and especially their potential for development into a new type of highly or fully autonomous automated alternative to traditional enterprises, at least in certain fields. It appears to be useful to briefly explain the nature and potential of complex electronic agents, in the context of artificial intelligence which emulates human thinking and acting in the course of running business, and also what

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85 Cf Erik Cambria and others, ‘Common Sense Computing: From the Society of Mind to Digital Intuition and beyond’ (Berlin, Heidelberg, 2009) 253
86 Dujmovic (n 55)
the issues may be of them figuring as socioeconomic subjects. Especially, it should be noted that running a business by a living businessperson is a complex set of mental processes which is driven by a multitude of factors, which, apart from the economic and computable ones, include those stemming from purely personal features of the business owner or manager, e.g. personality, personal beliefs, conscience, need for appreciation or ethical thinking. Those factors have a significant impact on their decision-making and subsequently on the functioning of the enterprise in broader context of the socioeconomic relationships.

Thus, human businesspeople can base their decisions at least partially on non-computable factors, as well as aiming to reach more subtle goals than simple maximization of profit, turnover or revenue on share, goals such as community interest, corporate social responsibility, positive business-to-business and business-to-customer relationships, simply the feeling of being useful and respected. By doing so, they use both measurable data such as prices, costs or due dates as well as subtle, sometimes even not objectively expressible, concepts such as intuition, emotion, or common sense. Following this idea, the broader context of a business entity as a subject of socioeconomic relationship must be taken into consideration, noting especially the fact that there are particular, living people at the end of any economic transaction, who pursue goals set by a human mind. Keeping this in mind, we need to ask whether and if so, to which extent, those mental processes can be emulated by artificial intelligence and what the benefits and risks of such emulation would be.

Actually, this idea is far from new, and having a brief look at its roots in the deeper past might help us to find out what may be needed at most to make intuitive artificial intelligence believed in by people: common sense, the ability to think critically, and especially coping with inaccurate input data. The then-modern trends towards the idea of so-called “common sense computing,” were elaborately described in 2009, paying their attention also to the past projects attempting to embed common sense into computer programs. Although still strictly deterministic, those might be seen as some of the first steps towards digital intuition and artificial intelligence mimicking human thinking, whose emergence we are witnessing.

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87 Cf Hansmann and Kraakman (n 16) 441
88 Cambria and others (n 85) 256
nowadays. Indeed, intuition has been spoken about as a “process of making analogies between the current problem and the ones solved in the past to find a suitable solution”, to suggest that this might be a way for artificial intelligence to be able to cope even with situations which it has not encountered before.\textsuperscript{89} However, there are also opinions warning that there are significant queries where artificial intelligence is compared to human intelligence and that artificial intelligence may not be able to deal with unknown problems.\textsuperscript{90}

Such ideas were not purely theoretical, even when written, but they seem to be of even greater importance nowadays. So-called counterintuitive results, i.e. results of decision-making which has been made in perfect compliance with the predefined rules on one hand, but has produced an outcome which, for some reason, is not expected,\textsuperscript{91} have been known even in the legal field for some time, but not necessarily only there.

The difficulties of approaching counterintuitive results in immaterial dimensions can be illustrated using a commonly known example of a counterintuitive result in the physical world, which is the discovery of Earth being rotating around the Sun, rather than vice versa. While human intuition and common sense would, based on a person’s own perceptions, tend to assume the Sun is rotating around the Earth, an objective approach and careful examination based on the impersonal laws of physics rather than on personal perceptions shows that the opposite is true. However, it must be noted that this notorious example is natural-science based and strictly relates to the material world, a world which is primarily governed by the laws of physics which cannot be overridden by any human-induced norms. In such settings, even a counter-intuitive reality must be fully accepted as there are no human powers to take influence over it (you cannot make the Sun rotate around the Earth, even though this would better fit your perception of the Universe). A different approach may be needed where a purely human creation or activity (such as a computer program or enterprise) is subject to a purely human-created set of rules (such as a state law or computer code written by humans and enabling automated execution of certain tasks). As it may be

\textsuperscript{89} ibid 256
\textsuperscript{90} Cf for example Herbert L Roitblat, *Algorithms Are Not Enough: Creating General Artificial Intelligence* (The MIT Press 2020)
\textsuperscript{91} See also Gabrielle Patrick and Anurag Bana, ‘Rule of Law Versus Rule of Code: A Blockchain-Driven Legal World’ (IBA Legal Policy & Research Unit Legal Paper, November 2017) 25-27.
reasonably expected that human creations governed by human-created rules are meant primarily to facilitate certain goals set by humans, the performance of any such apparatus being set in operation should be subject to human supervision and assessment of how it serves its purpose, rather than mere acceptance of any impact of its operation.

Thinking back to the example of the Earth rotating around the Sun, it seems clear that any counter-intuitive findings based on natural laws inevitably need to be accepted as correct (as long as there is no incorrect input data or computational mistake). It will be argued, on the contrary, that counterintuitive conclusions based on human-induced rules usually deserve to be revisited. This does not automatically mean that they are supposed to be inappropriate. Indeed, computationally correct results which are surprising and hard to understand for the human mind at the time of release may, and are even likely to, work out well in the end. On the other hand, some level of human oversight over the use of such results appears to be desirable, especially with regard to the possibility of broader negative consequences of such results being used in socioeconomic relationships.

In the context of autonomous electronic systems (not necessarily reduced to DAOs), this means that there may not be anything like a fully autonomous electronic system, as long as we are not prepared to embrace the ‘rule of code’ with all its consequences. This may be shown, again, in the example of the failure of The DAO. The human intervention of The DAO’s blockchain developers reverting the hackers’ attack was undoubtedly interfering with the “code is law” principle, notably to the disagreement of some of the members. On the other hand, it was performed in order to make up for a flaw in the code which enabled the attack and by the principles which the traditional law would have protected and have been supported by another (and not small) group of the members.

However, some counterintuitive situations still may result from laws not being able to take regard of all real-life circumstances which might occur in individual cases.92 Those should normally be mitigated by various legal constructions such as discretion, defences or correctives, which are meant to apply in exceptional cases and serve as circuit-breakers if

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the mechanical application of substantial law would lead to results which contradict the general values of the society. It is a difficult job of judges, especially in the higher courts, to deal with such situations and to search for solutions and actually one of the reasons why replacing judicial work with artificial intelligence is such a complex problem. However, human thinking usually finds its way around this. Jurisdictions usually rely on the experience and overall human and moral qualities of judges, incorporating brief instruction into the written law,\textsuperscript{93} while scientists invite sophisticated, algorithmized methodologies as to how to find the true cause of counterintuitive results in particular cases and how to resolve them.\textsuperscript{94}

As an lay-accessible example, AlphaGo, a Google’s program mimicking playing the game of Go, which uses advanced artificial intelligence combining deep neural networks and tree searches and is capable of machine learning,\textsuperscript{95} can be used to illustrate how artificial intelligence reaches results which are computationally correct on one hand but fail to meet the basic expectations of the human mind and therefore non-functional in the broader context of interaction with humans on the other hand. This program has developed the ability to regularly defeat even the most top-class Go players within units of draws, but, what is more interesting is that some of its draws, even though correct, seemed profoundly illogical to the human experts until the victory was reached.\textsuperscript{96} Comments such as "That’s a very strange move,"\textsuperscript{97} or "I thought it was a mistake,"\textsuperscript{98} made by extremely skilled human players, provide illustrative examples of how difficult it may be for humans to understand

\textsuperscript{93} Cf for example for example Czech Civil Code S 2 (3), which reads as follows (thesis author’s own translation): “Interpretation and application of a provision of law must not be contrary to the good morals or result in cruelty which would outrage common human feelings.”

\textsuperscript{94} Cf Fungwacharakorn, Tsushima and Satoh (n 92)

\textsuperscript{95} For an elaborate description of the AlphaGo’s logic see David Silver and others, ‘Mastering the Game of Go with Deep Neural Networks and Tree Search’ (2016) 529(7587) Nature 484 <https://go-gale.com.ezproxy.is.ed.ac.uk/ps/retrieve.do?tabID=T002&resultListType=RESULT_LIST&searchResultsType=SingleTab&hitCount=221&searchType=BasicSearchForm&titlePosition=9&docId=GALE%7CA441882814&docType=Report&sort=Relevance&contentSegment=ZONE-MOD1&prodId=AONE&pageNum=1&contentSet=GALE%7CA441882814&searchId=R2&userGroupName=ed_it&w&lnPS=true>, another example may be represented by Libratus, a computer programme mimicking playing Poker, which defeated several excellent human players, leaving them with the impression that the steps made by it were wrong or at least weird, see Woodrow Barfield and Ugo Pagallo (eds), Research Handbook on the Law of Artificial Intelligence (Edward Elgar Publishing 2018) 642


\textsuperscript{97} ibid

\textsuperscript{98} ibid
the thinking of artificial intelligence and that discrepancies and misunderstandings between
human and artificial thinking can be expected to have practical impact if such sophisticated
artificial intelligence becomes broadly deployed in various fields of originally human activity.

Staying in the field of Go for a little longer, the challenges in playing it in the post-AlphaGo
era as described by Attila Egri-Nagy and Antti Törmänne (2020) may serve as a more
elaborate example of such important differences between artificial intelligence and human
intelligence and their practical impact.

First, let us ask why people play Go at all.99 There are many reasons, apart from the simple
winning, we can spot more subtle ones, such as having fun, learning new skills, or exploring
the game itself.100 Playing against another human player also means a certain kind of social
event. However, if we ask what the aim of AlphaGo is, we surely reach the answer that there
is only one: to win, maybe as quickly as possible. Also, the way the computer algorithm
approaches the game and sets the playing strategy differs from the way humans do so.101
This undoubtedly brings some changes in the mindset of the human players, who are likely
to think differently about playing against a computer than about playing against another
human player.

This example may illustrate that even advanced artificial intelligence thinks differently from
natural human intelligence and the former is unlikely to fully replace the latter. Artificial
intelligence generally excels in retrieving and processing hard data, which, subject to the
correctness of such input data, or ability to cope with inaccuracies therein, enables it to
reach a computationally correct result in up to no time, natural human intelligence is much

99 Looking deeper in the past, we can find similar example related to playing chess, cf for example Roitblat (n 90).
“Chess was thought to be indicative of using strategy, reading the motivations of other people, and
engaging in deep analysis of the situation,” see Roitblat (n 90) 13, but this description only fits for how playing
chess is being perceived by human beings. However, computer programs are capable of reducing the
enjoyment and excitement of exerting and constantly improving those abilities to a rather simple algorithm
organising the permitted chess movement into a structure of a branching tree, in which the movement which is
at likeliest to lead to the victory is being searched by purely mathematical means, see Roitblat (n 90) 13-14. It is
far from uninteresting that the very fundamental principle of the already described AlphaGo is practically the
same, while advanced heuristic was added, to help reduce to a manageable the number of branches which need
to be searched through to find the right movement, see Roitblat (n 90) 14.

Philosophies 37 37, 43

101 ibid 43
less efficient in this and must rely on additional sources of input, such as their own personality, personal experience, emotions, beliefs, intuition, personal preferences, and common sense. However, with norms and patterns of social and socioeconomic interaction developed with the knowledge of those imperfections, and the ‘soft’ factors, being present. Therefore, we should not stop our thoughts at the discussion about playing Go against a well-working computer algorithm. Instead, we should think about similar issues which are likely to be raised by DAOs, especially what DAOs powered with advanced artificial intelligence might cause in the context of business activities and how human businesspeople will be affected by them.

The use of hard-to-verbalize and hard-to-compute sources of input in most aspects of decision-making and reflecting hard-to-compute goals while running a business is, in general, common to all human beings. Thus, any businessperson can reasonably expect their human business partners doing the same and use their social intelligence and business experience to predict their partner’s next steps. On the contrary, similarly, as a human player got confused by the decisions made by AlphaGo, it can be expected that businesspeople may experience difficulties in understanding artificial intelligence deployed in business sufficiently to be able to predict the next step of an artificially intelligent electronic agent or to have a justified trust in the correctness of its outputs, especially if advanced, non-deterministic artificial intelligence comes into question.

On the other hand, it is not without interest that some of the problems regarding soft aspects of thinking and decision-making, such as personality, intuition, or common sense, are not new and have already been tackled. Then, setting them into the context of DAOs may open interesting perspectives on the extent to which the whole concept of a DAO fits not only into the existing legal framework (which will be discussed later in this thesis as well) but also into the general framework of socioeconomic relationships.

For example, William Bainbridge (2014) represents a work on capturing and emulating human personality through an electronic system. While it studies this topic much more in the context of the idea of making people immortal by capturing an individual’s personality by electronic means, the results are still very much relevant in the context of this thesis.
simply by suggesting clearly enough that although significant progress has been made on this point, spotting, capturing and emulating all relevant personality traits may not be as easy as we might wish it to be. Moreover, the ideas presented therein can be used to show that there will be difficulties in creating an artificially intelligent agent which would mimic the personality of a good entrepreneur. Especially, we must note that although current technological development allows for capturing substantial portions of an individual’s personality via electronic tracking of the person’s behaviour, defining an ideal entrepreneur’s personality and expressing it in programming language constitutes a different level of this art, which hasn’t necessarily been mastered yet.102

There has also been research regarding moving from artificial intelligence towards something which their authors call artificial sapience.103 This might seem like an important step for autonomous electronic systems to approach the way people think and act. However, the related discussions suggest that replacing the human mind in its entirety with artificial intelligence so that it can emulate the decision-making of human managers or shareholders so as to create a corporate will or intention may not yet be possible. Rather, an average DAO algorithm may resemble much more the thinking of a primitive animal,104 with the difference that it will be able to process an enormous amount of data within its pre-defined set of concept objects. This, however, may not suffice if DAOs should gain broader deployments which might require more complex decision-making and more human-friendly behaviour. But, in any event, those fields are not left without interest. Deployment of a fuzzy-neuro approach may offer an answer to the question of how to emulate the non-conscious parts of human thinking by an electronic system, which may help reflect the need

102 Regarding the study and description of human personality, cf for example Updesh Kumar (ed), The Wiley Handbook of Personality Assessment (John Wiley & Sons 2016). It must be particularly noted that even personality psychology only describes and studies selected aspects of human personality, usually those which are of particular importance for a selected field of human life or activity. This, however, does not mean that those aspects of human personality which might be left out of scope of psychological study are unimportant in the sense that they would be without impact on behaviour of the individual to whom they relate. On the other hand, such unrevealed and undiscovered aspect cannot be reasonably assumed to be programmable in their entirety and may cause unintended differences between the behaviour of autonomous artificial intelligence and behaviour of human beings.

103 Cf Rene V Mayorga and Leonid I Perlovsky, Toward Artificial Sapience (Springer London 2008)

for a DAO to be a functioning participant of socioeconomic relationships in which people are involved. Apart from that, methods aiming for control architectures for sapient robots which have an embedded emotion model being designed have been also proposed.\(^\text{105}\)

This continues to be particularly interesting nowadays, taking into consideration the progress in artificial intelligence analysing human emotions, as electronic systems emulating emotions may be the next step in creating human-responsive artificial intelligence. It has been acknowledged that “emotions play an important role in reasoning; they are related to basic mechanisms such as memory and remembering. Emotions have been considered necessary to acquire knowledge,”\(^\text{106}\) which follows the argument that “[t]he question is not whether intelligent machines can have any emotions, but whether machines can be intelligent without any emotions.”\(^\text{107}\) Existing sources show that, depending on what we understand about the notion of intelligence, the answer might be “yes” in some cases;\(^\text{108}\) on the other hand, it must be noted that not every such “intelligence” will deserve to be set (even just approximately) on a par with natural human intelligence. Indeed, it seems that reflecting emotions in advanced autonomous electronic agents may be a key to approximating the way artificial intelligence adopts decisions to the way that humans do, resulting in automated decision-making being more understandable for humans and bringing results which would be more acceptable for human members in socioeconomic relations.

\(^\text{105}\) Angélica V. García-Vega and Carlos Rubén de la Mora-Basáñez, ‘Emotions and Sapient Robots’, Toward Artificial Sapience (Springer, London 2008) 213. With regard to the EU legal environment, it must be noted that it can be reasonably expected that new limits will be set to the systems recognizing and processing emotions of their human counterparts (users, stakeholder) in the course of EU law’s development, cf European Commission, ‘Proposal for a Regulation of the European Parliament and of the Council Laying Down Harmonised Rules on Artificial Intelligence (Artificial Intelligence Act) and Amending Certain Union Legislative Acts’ (COM/2021/206 final, Brussels 21 April 2021) COM(2021) 206 final - 2021/0106(COD) <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021PC0206> accessed 14 December 2021. This is likely to impose additional burdens on those who set an “emotionally intelligent” electronic system in operation.


The remaining question, however, is whether we are capable of doing so and if yes, whether we can do so safely.109

On the other hand, ideas on going further with the non-conscious parts of thinking, resulting in the emergence of something which might be called digital intuition, have already appeared in the meantime. Reaching to the example of AlphaGo once again, it can be shown that current deep neural network systems may reach computationally correct results in a way which cannot be explained to humans and whose correctness cannot be verified by humans before their consequences are allowed to happen. This might reshape the relationship of people to the electronic agents, making the algorithm a certain kind of oracle whose pronouncements need to be believed at the level of faith rather than at the level of trust.111

It is rather obvious that many of the key aspects of decentralized autonomous organizations have complex philosophical and psychological backgrounds. Therefore, they need to be examined also from the philosophical (rather than purely from the mathematical) point of view. Robosophistry asks how complex behaviours can be controlled by artificial intelligence and examines the possibilities and limits of the intelligence, cognition, consciousness and similar (normally understood as biological or natural) aspects in electronic systems. This may open a way to a more comprehensive answer to one of the most important questions: how to program the mental processes of a successful businessperson into an electronic system. At the same time, current robosophistry also brings several important warnings. Spyros G Tzafestas (2016) contests the very notion of artificial intelligence, warning that there is no computer which would have passed the famous Turing test in its full form and drawing attention to the opinions claiming that even future...

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109 Cf García-Vega and de la Mora-Basáñez (n 105), 214-215, stressing that there is no unanimous answer even to the question what emotions are.


development may not bring any change to this. The reasons appear to be rather simple. Pointing out the prevailing opinion that “complex behaviours are controlled (at least in the larger part) by inner representational states that carry contents, and driven by processes such that the system can make plans and solve problems,” we can conclude that there might be such aspects of behaviours and decision-making of which we are still unaware, or which we cannot describe in a way which would allow their modelling and programming.

Moreover, clear evidence that we still don’t know everything that we need to create artificial intelligence which would be a passable alternative to the human one may be seen simply in the fact that even human intelligence is still a matter for debate, leaving many crucial questions without unanimous answer. And it may easily be exactly those subtle aspects which would distinguish a living businessperson or an organized group of businesspeople (corporation) from a DAO, in both positive and negative aspects.

This brings us back to the mental processes which businesspeople perform while running their businesses and raises important questions, such as if there are no unanimous definitions and understanding of some of the crucial notions, how then do we want to program them? Are we sure that we can capture all processes which are essential to determine a good company director’s behaviour? Can we ensure that individual modules of the complex process will cooperate and conflicting interests be balanced in a socially desirable way? And how far do we manage to deal with the unique ideas and experience which the programmers (sometimes even unknowingly) embed into the code? And is humanity prepared for all this?

This thesis is not providing answers to all those questions. Rather, it aims to raise awareness of the potentially hidden challenges and re-iterate some of the old questions in the context of the current technological development, to remind us that while computers will always do only what they were programmed to, a careful approach is desirable in order to avoid

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112 Spyros G Tzafestas, An Introduction to Robophilosophy (River Publishers Series in Automation, Control and Robotics, River Publishers 2016) 100
113 ibid 77
opening ways to undesirable results by underestimating the complexity of today’s computational technology and artificial intelligence.

2.3.2 Issues in Examples and Emerging Questions

In spite of the failure of The DAO, decentralized/distributed autonomous organizations continue to exist and although so far they seem to be rather simple and mostly only focused on managing funds, their potential to spread beyond the field of alternative payment systems has been noticed some time ago. This can be documented by examples such as Maker DAO, The LAO or GnosisDAO, as well as various opinions which are audible from both academia and practice. On the other hand, there needs to be discussion as to what the actual potential of DAOs appears is, i.e. which subject-matters of business are suitable to be run in the form of a DAO. Obviously, as long as we consider fully autonomous DAOs, i.e. those which operate without human intervention except for the very input (customer’s orders, supplies from suppliers) and output (delivery of products to the customers), the subject matter of DAOs business is necessarily limited to products and services which either are immaterial or capable of being fully automated.

On this point, Soichiro Takagi (2017) presents quantitative research which identifies activities which appear to be suitable to be performed by a DAO, based on skills and abilities needed for respective human occupations. It seems unsurprising that occupations such as Gaming Supervisors, Customs Brokers, Police, Fire, and Ambulance Dispatchers or

115 Some of the interesting examples mention a peer-to-peer electricity exchange or a potential of smart contracts and digital currency to enable an Internet of Things in which devices could buy and sell data with micro-payments, cf. Soichiro Takagi, ‘Organizational Impact of Blockchain through Decentralized Autonomous Organizations’ (2017) 12(1) International Journal of Economic Policy Studies 22 <https://ideas.repec.org/a/spr/ijoeps/v12y2017i1d10.1007_bf03405767.html> 26. Although this thesis focuses on DAOs which are established with the aim of performing a gainful activity (and therefore resembling a traditional business arrangements), it must be, noted that not all DAOs are created for profit-making purposes. In fact, there appears to be a high proportion of DAOs which are run for charitable purposes or knowledge-sharing, or for the purpose of a person’s own property management. Such arrangement would face a slightly different set of challenges and require a slightly different approach as well. This, however, slightly exceeds the intended scope of this thesis.
Indeed, running suitable business ideas as DAOs or using DAOs as a form of running charitable (non-profit) organizations may be seen as a way to remove certain disadvantages of human-managed legal entities.

Looking back on the first known DAO, Bitcoin, we can easily establish that its functioning mechanism is deterministic and technologically rather simple. In DAOs of this type, the issues to be expected stem mainly from the lack of flexibility in dealing with unpredicted situations and from the possible difficulty of identifying the responsible people behind the organization. A more difficult situation arises if advanced (non-deterministic) artificial intelligence becomes involved.

While, at this point, I primarily have on my mind the idea of complex DAOs as presented by Jurica Dujmovic (9 January 2022), it should be noted that decentralized electronic agents equipped with an embedded artificial intelligence as a part of their mere code, and being able to perform complex tasks on their own and their practical deployment in running business, are more or less a matter of future, if practically possible at all. However, a certain level of interconnection between artificial intelligence and blockchain-based arrangements is already visible and discussed. Focusing closely on what is available in fully functioning form at the moment, or reasonably foreseeable to emerge, we can identify one of the most recent examples of such a troublesome arrangement in MangoDAO, which has experienced an exploit through an oracle manipulation.117

For illustrative purposes, it might be useful to introduce the arrangement and the case in more detail.118 Mango Markets is a decentralized finance trading platform running on the Solana blockchain, whose governance is performed via a distributed autonomous organization called MangoDAO and whose future development is taken care of by an entity called Mango Labs, LLC.

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116 Cf ibid 34, to the same matter see also UK Law Commission (n 4) 20-21.
117 Max Koopsen, ‘Mango Labs Sues Avraham Eisenberg Over Mango Markets Exploit’ Decrypt (26 January 2023) accessed 8 May 2023
118 For the details of the case see Mango Labs, LLC v. Eisenberg, 1:23-cv-00665, (S.D.N.Y.)
MangoDAO issues governance tokens (MNGOs) connected with voting power and enabling the holder to participate in the decision-making on changes of the DAO’s protocol. It has a highly decentralized, flat structure with no ‘superusers’ having privileged access being present. As such, its governance relies on proposals being raised and voted on by the governance token holders. MangoDAO also uses artificial intelligence in the form of an oracle\textsuperscript{119} which monitors selected different exchange markets. Based on the development of those markets, it makes decisions on how to evaluate the Mango and subsequently to make decisions about buying and selling.

In late 2022, a person named as Avraham Eisenberg discovered a weakness of the smart contract forming the DAO and found a way to use one of the derivatives traded on Mango Markets to manipulate the value of MNGOs, so that the AI automatically changed their value. Doing so, they gained both money and governance tokens, which enabled them to exercise more influence over the MangoDAO, this all without even unlawfully interfering with the smart contract as such.

This is what happened, but thinking about the nature of the MangoDAO in a bit more depth, other undesirable scenarios can be imagined. Such a system opens a way to certain perils which shall be discussed in other parts of this thesis. For example, the high level of decentralization opens a way for the DAO to run away if the DAO community stops effectively functioning, i.e. if there are not enough participants who would exercise their voting rights at a certain moment. In such a case, the DAO would be out of control, with

\textsuperscript{119} Deployment of an oracle is a currently used way of connecting blockchain arrangements to the off-chain world and also of converging artificial intelligence and blockchain-based arrangements. In such a case, there is a smart contract, which may be rather simple, running on a blockchain infrastructure, connected to a centralized system which supplies it with the data relevant for its running. This smart contract may be, again, a simple one, but also one equipped with advanced artificial intelligence, processing certain sorts of data and supplying the outcome to the blockchain arrangement. The biggest peril of such system resides in its susceptibility of the oracle to a hack or malfunction. This is known as the blockchain oracle problem. See Richard, Mahenda M Surya and Avenia C Wibowo, ‘Converging Artificial Intelligence and Blockchain Technology Using Oracle Contract in Ethereum Blockchain Platform’ (2020 Fifth International Conference on Informatics and Computing (ICIC), Gorontalo, Indonesia, 11/3/2020 - 11/4/2020) and Giulio Caldarelli and Joshua Ellul, ‘The Blockchain Oracle Problem in Decentralized Finance—A Multivocal Approach’ (2021) 11(16) Applied Sciences 7572 <https://www.mdpi.com/2076-3417/11/16/7572> for an elaborate explication.
those who would be prepared to do so not being able to interfere, if only to stop it, due to not having enough governance tokens to achieve the consensus.

Further, there is a possibility of another, rather unexpected involvement of artificial intelligence, which is a node being operated by a (centralized) automated system equipped with advanced artificial intelligence, instead of a human owner of the governance token. This would result in such a node voting on the proposals based on automated decision-making instead of human judgment, which could bring unpredictable and potentially undesired outcomes, some of them undoubtedly having legal consequences.

Thus, even without considering what we might call a most-complex-case scenario, represented by a DAO running on a permissionless blockchain, allowed a very high level of autonomy and artificial intelligence, based on a non-deterministic algorithm being involved in some way, it can be understood that the effectively existing, regardless of whether more or less successful, attempts to create working DAOs raise (apart from other) legal questions. Some of them are far from new, although they show some new aspects which should be considered, as well as what has been (sometimes even unsuccessfully) discussed before. While some authors stress the advantages of smart contracting and blockchain governance, others warn about serious, yet unresolved questions which may severely impact the practical usability of blockchain-based systems.

Starting with the alpha and omega of all blockchain-based systems, which is the mere sustenance and maintenance of the underlying blockchain, we can see that one of the key problems remains unresolved, giving rise to the question of how long all this may function and what happens if there is nobody left to take care. Indeed, some of the advantages of public blockchains (and sometimes even the advantages of using blockchain technology in particular as a decentralization tool) have been discussed for some time, especially in connection with the idea of Web 3.\footnote{Cf for example Thibault Meunier, ‘Web3 — A Vision for a Decentralized Web’ The Cloudflare Blog (10 January 2021) <https://blog.cloudflare.com/what-is-web3/> accessed 30 January 2022}
However, a closer look may show that we are trying to arm ourselves with a double-edged sword. “No permission is needed from a central authority to post anything on the web, there is no central controlling node, and so no single point of failure ... and no “kill switch”! This also implies freedom from indiscriminate censorship and surveillance.” This is how the idea of decentralization was understood by the early web community and the same principles basically apply to DAOs, becoming, surprisingly, a source of problems rather than their solution. Indeed, the distributed nature of the underlying technology offers a high level of protection against both random technical failures and deliberate actions of individuals, which can be seen as an advantage. On the other hand, its permissionlessness and openness may promote a risk of lack of maintenance, lack of individual accountability and slow decision-making processes, leaving issues without response for prolonged time periods.

Some jurisdictions, however, could, in theory, provide a certain kind of legal answers to the problem of no one being responsible for maintaining a public blockchain as a technological infrastructure, maybe even an existing DAO, or at least are close to being able to provide such answers. Civil law systems know a principle stating that ownership constitutes, apart from the rights, also a commitment of the owner, who is obliged to use its ownership to serve the common good or at least so that it does not cause harm to others.  

This could mean that those who set up a blockchain network with the intention of letting others use it should be obliged to take care of it. On the other hand, the practical aspect thereof appears to be more than troublesome. As blockchain is decentralized and at the same time enables anonymity, it may be practically impossible to identify and find its originator and/or current contributors. Nor may it be possible to force them to maintain a blockchain in a certain (desirable) way, as there is in general little relevant legislation to support such steps. Walch suggests that blockchain developers should be treated as

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122 Cf for example Grundgesetz für die Bundesrepublik Deutschland (German Constitution), Art 14 (2) or Usnesení č. 2/1993 Sb., Usnesení předsednictva České národní rady o vyhlášení listiny základních práv a svobod jako součástí ústavního pořádku České republiky (Czech Charter of Fundamental Rights and Freedoms), Art 11 (3)  
This would fit the “ownership as commitment” principle, but still would not remove the issue of finding and identifying them, nor does it prevent them from disclaiming their liability. This, as Angela Walch herself acknowledges, puts the use of public blockchain into *caveat emptor* territory, which makes the mere creation and operation of DAOs on a public blockchain an extremely risky enterprise. However, this appears to be little help in everyday practice either. Obviously, the situation is much simpler if we consider private blockchains.

However, they also make much less sense themselves, as they lose a substantial part of one of their core features – decentralization. This, on one hand, removes some of the difficulties stemming from the inability to identify the operators and users of such arrangement, the impossibility of deactivating the arrangement, or the practical immutability of the past records. On the other hand, it brings such arrangements closer to the nature of simple tools in the hands of their operators, making them less interesting for academic discussion. Therefore, only DAOs based on a public blockchain are considered for the purposes of this thesis.

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125 ibid 69

126 Although it is not an aim of this thesis to describe in detail the technical elements of blockchain technology, smart contracts and DAOs, it still appears to be useful to briefly explain the difference between public and private blockchain to provide a more approachable insight into why private blockchains bring less issues when it comes to running DAOs on them. A public blockchain consist of nodes connected into a decentralized distributed network, which means that no single subject (or limited group of subjects) has control over the network/sum of all nodes. On the contrary, private blockchain is still distributed in the sense that all the nodes are connected with each other but shows certain level of centralization as the network (sum of all nodes) is being controlled by a single subject or by a limited number of identified subject. For a more elaborate explanation of the differences between public and private blockchain see for example Toshendra K Sharma, ‘Public Vs. Private Blockchain : A Comprehensive Comparison’ *Blockchain Council* (7 August 2019) <https://www.blockchain-council.org/blockchain/public-vs-private-blockchain-a-comprehensive-comparison/> accessed 8 May 2021. Apart from that, hybrid solutions appear, combining the features of public and private blockchain, for example by running the application on a private blockchain while saving a hash of a predefined number of last block in a public blockchain as means of control and security check, cf for example ‘PC Quest: What is Blockchain? The Difference Between Public and Private Blockchain’ 0971216X (31 August 2018) <https://link.gale.com/apps/doc/A552424311/ITOF?u=ed_itw&sid=ITOF&xid=b9c4f467> accessed 7 May 2021.
Current developments anyway show that there are persons and entities which are prepared to undergo the risks, as various blockchain-based organizations (of various levels of autonomy) have occurred. And they also show certain problems emerging.

Apart from the above-mentioned failure of The DAO, a more recent example of such a risky arrangement may be Binance, a group of firms running a cryptocurrency exchange and also providing a cryptocurrency called Binance Coin. Binance has recently faced serious issues resulting in its disconnection from the acknowledged payment systems, some national authorities coming out against it or its operations being banned in some countries. One of the most recent cases at the time of drafting this thesis is a hack involving unauthorized transactions worth hundreds of millions of USD, followed by a collapse of the FTX cryptocurrency exchange, which resulted in the FTX founder convicted for several financial crimes in late 2023.

But FTX was an officially approved cryptocurrency exchange, backed by an (although admittedly very complex) structure of existing business arrangements, with the identities of the key people behind them being intentionally made known. Based on available online sources, also at least some of the firms behind the Binance system are incorporated.

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Similarly, The DAO, while not incorporated itself, was run by an existing legal entity. This means that there has been a good likelihood of the responsible persons being reached and required to act if there is a problem. Around, most notoriously, Bitcoin, the situation seems a bit more complicated with Satoshi Nakamoto never having been identified and only some of the persons in control over the basic structures being known.\textsuperscript{130} Moreover, there may be other DAOs, existing or emerging in the foreseeable future, which not only may be unincorporated but there may also be up to no reasonable link to their originators or those who are in control over them available.

Indeed, some thoughts in this thesis are probably rather academic at the time the thesis itself has been drafted. However, they seem worth mentioning and taking into consideration anyway, as the fast paced and difficult-to-predict directions of technological development require being open-minded even to ideas which may seem like science fiction today.

There are already first attempts to give blockchain-based establishments specific legal recognition, either through incorporation as legal (business) entities or by other means. One example illustrating that this is not free of additional issues is the Maltese blockchain law adopted in 2019, which has already aroused the attention of the IMF, being suspected of opening doors to circumvention of current anti-money-laundering (AML) laws.\textsuperscript{131} Laws allowing DAOs to be incorporated as a new type of limited liability company have been emerging in some of the U.S. states since 2021.

It will be shown later in this thesis that in spite of the effort of the legislators and continuous development, those laws still are not free of flaws and loopholes either. Both may lead to serious issues once such entities starting operating in a way which has an impact outside the country of their jurisdiction. The principle of mutual recognition of legal persons may in such cases lead to the result that such establishments will inevitably find involuntary legal recognition, even in jurisdictions which may not at all be prepared to deal with them,

\textsuperscript{130} Such as the Bitcoin Association (https://bitcoinassociation.net/), a Swiss non-profit association identifying itself as supporting and maintaining the original Bitcoin protocol.

becoming a disruptive element resulting in possible issues in various legal fields. Therefore, an effort for international consensus on the core questions of the DAOs, and a search for an approach to the DAOs which might (at least in its principle) be usable for most (if not all) jurisdictions, is desirable before the mere principle of mutual recognition of legal entities finds itself at stake.

However, the question of what such legal personality should look like in particular is difficult to answer and there is no way of granting legal personality to DAOs on which the experts would generally agree. Even before the first LLC-based corporate forms for DAOs started appearing, voices claiming that DAOs can, at least in some jurisdictions, be subject to existing corporate law, had become audible. While Shawn Bayern and others (2017) give examples of jurisdictions in which a DAO could, at least for some time and under some circumstances, operate in the framework of existing corporate law, this may appear to be more like searching for loopholes in existing laws than a serious attempt to find a secure legal position for DAOs. Although smart contracts may in general be valid as contracts in a legal sense, establishing and running a company normally requires certain criteria to be met and certain duties to be fulfilled, which usually cannot be achieved if all the functioning of the arrangement takes place exclusively in cyberspace.

First attempts to create a DAO-adapted form of an LLC as a separate type of legal person have, in the meantime, become visible in several U.S. states. Some of them will be analysed in later chapters of this thesis and it will be shown that they bring some interesting ideas, but also have serious weaknesses in other ways. Further, voices criticising the entire idea of immaterial autonomous electronic systems being granted legal personality for various reasons have been audible as well.132 Some of their arguments focus on artificial intelligence becoming a threat to mankind if given too much space in socioeconomic life and seem to aim much more into the future rather than being an emergent issue at the time of their presentation. However, they should be heeded in present time as well as it must be

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132 See for example LoPucki (n 7) or Bryson, Diamantis and Grant (n 59)
remembered that granting legal personality to such a type of establishments is a step which, once made, will, in all probability, not be reversible once such entities find a broader use.

This would also speak in favour of the continued discussion, timely regulation and precautions being taken in order to secure that DAOs cannot lawfully operate without being under a reasonable level of enforceable regulation, human oversight and control. The upcoming chapters are meant to analyse certain practical points in which the idea of legal personality for DAOs might become troublesome, especially in terms of human control (not) being present over them, or general legal norms not being easy to enforce against them. They will also suggest possible solutions to such trouble, as well as examining whether there are any points in which no plausible approach appears to be known at present.

2.3.3 Audiatur et Altera Pars: What DAOs’ Stakeholders Might Say About Giving DAOs Legal Personality or Another Type of Recognition

2.3.3.1 Who, What and Why Should Be Heard
So far, we have discussed the general legal, economic and social questions around the possibility and plausibility of granting legal personality to the DAOs, primarily from the mainstream point of view. But what is such a step likely to bring to the originators, beneficiaries and other stakeholders of the DAOs themselves? And do they actually want this at all? This subchapter discusses some of the key questions about the impact on DAOs themselves, of granting legal personality to DAOs, i.e. its impact on the DAOs’ originators and other stakeholders. I also seek to rectify some myths around that.

The current attempts to provide DAOs with a more suitable legal status than of computer programs show that newly created legal frameworks for the DAOs are likely to attract at least some users. Numerous blockchain-based LLCs already exist in the U.S. states which enable and regulate them and the Maltese system of registration of innovative technological solutions, which covers DAOs, has also been working for some time. On the other hand, it
must be noted that those, as well as any possibly upcoming, legal frameworks are unlikely to cover all DAOs which may factually exist.\textsuperscript{133}

A certain level of understanding of the typical mentality of founders of DAOs, as well as of their participants or users is needed to understand why this is the case, as well as to estimate what the answers to the questions raised at the beginning of this chapter could be. Therefore, certain particularly important texts originating from the cypherpunk and cryptocurrency communities, as well as other relevant sources, will be examined and the core ideas will be put in the context of the principles of the law of traditional business operation and legal entities.

For the purposes of this chapter, particular attention will be paid to two features which seem to be promoted remarkably strongly in the cypherpunk and cryptocurrency communities and which appear to be worth discussion before we start thinking about a framework for the legal personality for DAOs: the anonymity of the participants and immutability of blockchain records.\textsuperscript{134} While available sources show that both of them may be interpreted in a rather flexible way, further discussions on their content and the extent of their relativity appear to be needed. In particular, certain issues still need to be addressed and finding a consensus on the notions of anonymity/privacy and immutability of blockchain records is likely to be one of the first important steps on the way to including a higher number of DAOs into a legal framework.

\textsuperscript{133} An example of this can be, once again, the idea of accommodating DAOs into the concept of business trust. While the idea of different classes of token-holders with different rights and responsibilities may be working in some cases, it appears unlikely that it will be useful or attractive for everyone who intends to set up a DAO.

\textsuperscript{134} The deepest core of the cypherpunk/cryptoanarchy mentality, namely the independence of national states and jurisdictions, will not be discussed in detail at this point. This, however, does not mean that it is considered of lesser importance. Rather it does not appear worth more in-depth analysis in the scope of this thesis as there is little unclear in it. It appears clear that at least some portion of existing DAOs will continue to exist out of the system even if legal personality or other options of legal recognition for them were introduced, merely because their stakeholders would have an interest in this being the case. On the other hand, this should not be understood as an impediment to introducing the idea of legal personality for DAOs in general. Rather, a plausible solution should be sought to enable as many DAOs as possible to function within the standard legal framework, while the others should be approached in another suitable way. Selected aspects of this will be briefly addressed in the later text.
2.3.3.2 Transparency in Content, Anonymity in Actors: Advantage or a Problem?
Starting with the former, it has been explained above that a legal personality for DAOs is impractical without the responsible people behind it being identifiable. This may shed a confusing light on the matter if we take into consideration the eye-striking superficial anonymity of the blockchain users. However, a closer examination may show that things are far from that straightforward.

Using Bitcoin as an example of a DAO, we can conclude that it was designed with the aim of keeping transactions transparent, in the sense of making their content publicly available, but also anonymous in the sense that, by adopting specific measures, the content of the transaction is not linked to an identifiable person. Indeed, Bitcoin is notorious for its founder(s) and operator(s) not being known beyond the pseudonym of Satoshi Nakamoto and also enables an extremely high level of anonymity to be achieved by common token holders – if they wish so.

However, a minority of Bitcoin users seem to genuinely take measures to keep their transactions anonymous in everyday traffic. With most Bitcoin being traded on centralized exchanges requiring identification, the owners of particular bitcoins or parties to Bitcoin transactions became systemized in a way which makes them easy to track in most cases – without the people behind seeming to protest.

Having a look even more deeply into the roots, namely into the Cypherpunk Manifesto, which contained one of the early calls for privacy in the electronic age, we see clearly that it contains a call for anonymous transaction systems, such as the DAOs may be. However, even in terms of this vintage source, it appears disputable if anonymity really needs to be absolute and unpierceable in such cases. As the document itself points out, the difference between privacy and secrecy (interestingly pleading for privacy rather than secrecy) and operates with the idea of an anonymous system allowing individuals to reveal their identity when

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135 See Nakamoto (n 32) 6
desired. It may be concluded that there is an open door not only for the anonymity of participants being less than absolute but even for establishing a widely acknowledged standard about when revealing the identity of the participants is desirable.

In the more recent past, The DAO, already mentioned in the early chapters of this thesis, even intentionally made its founders known from the beginning. Nowadays, there are already numerous examples of DAOs incorporated in the U.S., which stand on par with traditional LLCs, with their members being registered with the competent company registrars and complying with all applicable regulations.¹³⁸

Two things may be concluded from the sources available so far. Firstly, anonymity in blockchain-based arrangements was probably never realistically meant to be absolute. Secondly, there is no consensus on what anonymity means. Thus, it appears likely that a decent number of those considering setting up a DAO may do so even within a framework requiring disclosure of their identity. However, further research and further discussion seem desirable, in order to achieve a common and nearly universally acceptable level of balance between the need for privacy, by which the mere emergence of the DAOs was co-driven, and the need for information about responsible people being available to the state authorities to make legal recognition of the DAOs meaningful.

2.3.3.3 Semel in Blockchain, Semper in Blockchain, Broken in Blockchain and How to Fix It
Interestingly the immutability doctrine may be found to face very similar problems as those which arise around anonymity. Broadly understood, the immutability of blockchain records means that once a record is made, it cannot be subsequently altered or deleted.¹³⁹ It must be noted that this is a generalizing and simplifying definition. In reality, changes to the

blockchain records are technically possible under specific circumstances and cases of them actually having been done are already known. Remembering the infamous case of The DAO once again, we can present a very particular example thereof and, at the same time, point out that there seems to be no agreement on how orthodox we should be in our interpretation of the notion of immutability.

Again, the case of The DAO having failed, after a bug in the source code was exploited and ether worth approximately $3,600,000 was stolen from the DAO by an unknown hacker can serve as an example. Taking into consideration the immutable nature of the blockchain records, we could have reasonably expected that there would not have been anything which could be done about it and the participants would have had to put up with a great loss. However, The DAO participants who lost their investment were not the only ones affected. With The DAO containing about 15% of all Ether, the attack compromised the whole Ethereum network, including several further projects in which The DAO’s participants were also involved, as well as the Ethereum cryptocurrency system.\textsuperscript{140} Taking into consideration the possible broader circumstances, The DAO’s originators started to explore even rather non-standard options regarding how to deal with the regrettable situation. There had been various proposals on how to deal with the consequences of the attack considered, from which a hard fork was chosen to the end, i.e. the attacker-made transactions were reverted and the ether taken from The DAO was returned to a refund smart contract. Subsequently, The DAO was terminated. However, it must be noted that the hard fork solution, although approved by an overwhelming majority of the token holders to the end, turned out to be highly disputable among the members of the Ethereum community.

The orthodox supporters of immutability in blockchain warned against the slippery slope of making exceptions from the ‘code is law’ principle, suggesting that such interference was unlikely to remain a one-off, and that the trust in the authenticity of blockchain records would be undermined by opening this option. However, voices suggesting that the ‘code of law’ principle should not be applied in a draconian way, and that it was humans to have the

\textsuperscript{140} David Siegel, ‘Understanding The DAO Attack’ \textit{CoinDesk} (25 June 2016) \url{https://www.coindesk.com/learn/2016/06/25/understanding-the-dao-attack/} accessed 2 April 2022

Hard fork solution having won may speak against blockchain records being called immutable, but, on the other hand, it also opens a significant space for interpretation of the notion of immutability and discussion on the possible exception(s) therefrom. In all cases, it has been proven that the immutability of blockchain records should not be understood as absolute. However, it must be noted that the hard fork solution in The DAO was only possible thanks to the limited autonomy of The DAO and the cooperation of The DAO’s originators and Ethereum developers. This is not something that occurs automatically. Therefore, a precautionary approach should be taken to the question, especially, if DAOs are not gifted with such care and control from their originators who can be expected to act lawfully, operate within a standard legal framework and be able to fix unexpected problems.

It has been said that the failure of The DAO was caused by an unknown attacker having made use of a bug in the source code of the organization itself. Little can be done in such cases unless there is a sufficient level of human control over the DAO in question. And even then, the whole question of whether blockchain records should be mutable, even though only under exceptional circumstances, remains highly disputable. In addition, other technical solutions to deal with non-standard situations can be implemented. Embedding an automatic recovery/refund procedure in cases where a transaction is performed by mistake or in a faulty way, as well as a procedure allowing the DAO to respond to court orders and other decisions of competent authorities which regard it, into each DAO, is, theoretically, rather easy to imagine. To make sure that the original transaction is not easily accessible while not relevant, a concept of ‘blockchain pruning’\footnote{Steven Norton, ‘Downfall of DAO Digital Currency Fund Shows Blockchain Reputational Risk’ \textit{The Wall Street Journal} (20 June 2016) <https://www.wsj.com/articles/BL-CIOB-9991> accessed 30 May 2022 7-8} may be adjusted in a way that the procedure will, for those purposes, be triggered by specified circumstances rather than by the lapse of time.
We can discuss whether this, in principle, mirrors the legal remedies in the physical world, such as declaring a faulty legal act null and void, *restitutio in integrum* or payment of damages. Indeed, if there is a faulty legal act, it will not disappear upon being declared null and void and sometimes not all of its factual effects can be fully undone. On the contrary, they can be merely remedied (rather than undone) in many cases. And even if you are supposed to be reimbursed for the money you have paid, you are unlikely to get back exactly the same coins and banknotes you have given out. Following those principles, the described ideas do not even seem to contradict the principle of immutability of blockchain.

A question remains how to deal with situations which are not fully in the control of the DAO, i.e., if the DAO in question cannot run a standard remedy procedure because the means in question got completely out of its control. This can be demonstrated again by the example of The DAO, in which the malicious action was perpetrated by one of its users. It is not difficult to imagine that things could be significantly different when it comes to attacks from outside. However, even those risks should be addressed in a reasonable manner, similarly to businesses in the physical world who habitually insure their property against fire or theft. This would be the case not only for the sake of the DAO’s founders, but also in order to improve the general trustworthiness of blockchain-based business arrangements.\(^\text{143}\)

In all cases, the topic of possible remedial actions in blockchain seems to need further research and further discussion, with the aim of finding a consensus throughout the blockchain-users community.

2.3.3.4 Catch Me if You Can…But What if You Cannot?

It has been briefly suggested above that one of the aims of blockchain-based arrangements is to remove dependence on the state, centralized intermediaries and fiat currency. Thus, the basic idea of legal personality for DAOs may speak against the original nature thereof and actually against the foreseeable mentality of their originators and participants. This is, to a great extent, true. Self-evidently, a DAO existing in the framework of legal persons equals a

\(^{143}\text{ Cf Eugenia Politou and others, ‘Blockchain Mutability: Challenges and Proposed Solutions’ (2021) 9(4) IEEE Transactions on Emerging Topics in Computing 1972}\)
DAO which cannot strive for an independence from a national state. Neither does it seem plausible that it could maintain full anonymity of its stakeholders or cut itself completely off from the fiat currency. Thus, it can be reasonably expected that even if legal personality for DAOs is available, a certain number of DAOs’ originators will not make use of it in the interest of remaining independent from the state and that therefore a certain number of DAOs will voluntarily remain out of the system.

It has been explained above that this does not automatically mean that such arrangements remain unregulated. On the contrary, certain provisions of the general law may still apply and there is, at least theoretically, likely to be a way to assess such activities, both at the civil and criminal law level, as described above. On the other hand, investigations leading to revelation and prosecution of the particular individuals behind such DAOs, or imposing civil liability on them, may be, depending on the measures those individuals take to secure their anonymity, extremely demanding and their actual costs may be disproportionate to the potential benefits of having formal justice done. Thus, it appears advisable to address DAOs existing outside of the traditional legal framework and their stakeholders in another way than repression.

This requires a carefully balanced approach. Somewhere at the beginning, real money was invested in exchange for the tokens and it can be reasonably assumed that at least a significant number of the participants would be willing to have real laws apply to reach a remedy if something goes wrong, perhaps some of them not necessarily understanding that there may be cases in which this would be rather impractical. An adequate response to this challenge may be found in the field of combatting drug crimes: harm reduction instead of prosecution, i.e. only to apply the investigatory and punitive powers in the most serious cases. Of course, the principle needs to be slightly adjusted for the purposes of DAOs. In practice, this could mean refraining from prosecuting not only participants in unregistered DAOs but also their founders, unless the DAO exercises a clearly criminal and sufficiently

144 Siegel (n 140)
serious activity. Harm reduction can then occur through raising awareness among the general public about the risks of investing real money in DAOs.

2.4 Concluding remarks on Part 2

This part was to establish the grounds for discussion about the main challenges and limitations that the idea of legal personality for DAOs would face. For this purpose, basic terminology was reiterated, showing, among other, that many of the core notions in the field find no unanimous definition. While remarkable examples of existing definitions were presented in the text, it needs to be kept on mind that there is no exhaustive and universally accepted dictionary of the terms in the field and this part of the thesis had no ambition to be one. On the contrary, the lack of unified and universally accepted definitions of the core notions constitutes one of the big challenges to DAOs being subject to a tailor-made legal approach in general, not only in terms of discussion about the possibility of granting legal personality to them. This is taken into account throughout this part, as well as throughout this thesis as a whole, as a source of both ambiguity and flexibility. It is assumed that any legally acknowledged definitions to be adopted in an individual jurisdiction would need to be preceded by a multilateral discussion involving the main stakeholding groups and follow the practical reality of both blockchain-based arrangements and the underlying foundational laws they rely upon.

Further, this part sets the concept of DAOs in the context of the existing debate about artificial legal persons at the most general level, as well as seeking to reprise the debate on the legal nature of autonomous electronic agents and explain the main reasons why this is a live topic for DAOs. This entailed reiterating some existing notions and questions as well as providing some examples of thought-provoking events in the recent or current development around DAOs, both in terms of the troublesome cases which needed to be approached by state authorities and in terms of new laws relevant for the emergence of blockchain-based

\footnote{I.e., unless the purpose of the DAO is criminal itself, as prosecution solely for unauthorized business and/or tax evasion etc. would not be meaningful.}
arrangements. This part of the research shown that while DAOs seem to fit into the broader family of electronic agents, the distributed nature of the system(s) and the effective possibility for human actors to remain anonymous, constitute important additional features by which DAOs differ from centralized autonomous electronic agents and which need to be given specific attention when legal status of DAOs is discussed and especially when discussing the idea of providing them legal independence in the form of legal personality. And, rather counterintuitively, this does not automatically equal that separate legal personality for DAOs is justified by the convenience of shifting liabilities from possibly unreachable human actors to the system itself.

Finally, a very brief insight into the fundamental materials relevant for blockchain-based socioeconomic arrangement was made in a bid to make an estimation of what the originators of DAOs would themselves say to the idea of DAOs being officially recognized as legal persons. However, a unanimous and persuasive conclusion could not be made in this point. Instead, it turned out that most of the materials which were examined were drafted in a way that allows for a twofold interpretation and while they could be reasonably expected to plead for detachment of the underlying communities from the officially recognized structures and regulation, their actual wording leaves room for accommodating most of the legal requirements which a traditional legal entity needs to meet. This may be eventually underpinned by the recent practice of some US states, which see high numbers of DAOs incorporated in a rather short time since the possibility of doing so was established.

Eventually, in spite of not exactly contributing to certainty, the lack of unanimously accepted definitions and standpoints may turn out to represent a partially positive element here, allowing for certain flexibility necessary for creating legal definitions which will reasonably suit both the existing and still-needed structures of the traditional law regulating legal entities and a substantial number of DAO founders.

This all should serve as an initial stepping stone for the following parts of this thesis which are focused on more exact questions of what legal personality for DAOs is likely to bring.
Part 3: General Questions Emerging in the Context of DAOs Being Granted Legal Personality and Possible Answers to Them

3.1 DAO as a Potential Artificial Legal Person: Core Questions of Legal Entities Being Re-Iterated

The previous text outlined briefly that legal personality for DAOs is a complex concept, requiring an in-depth discussion, and introduced the basic notions needed for such discussion being able to happen. Further, it was suggested that if legal personality for DAOs is considered, such legal personality should follow the pattern of a vehicle to pursue socioeconomic goals, and therefore be based on the interests of identifiable, or at least definable natural persons. This part shall put those ideas and notions in the conceptual context of legal entities, pointing out some core, but particularly difficult, questions which the concept of artificial legal person traditionally brings. It will also take a closer look into how the existing challenges change if a centralized human-managed business arrangement is replaced by a distributed and automated one. This part presents general and sometimes metaphysical questions regarding the granting of separate legal personality to a socioeconomic arrangement, which need to find a persuasive answer before discussion of more particular and practical questions takes place.

It is not surprising that assigning rights to an artificial subject will give rise to numerous questions. While the sense and purpose of doing so is obvious when it comes to closely-knit collectivities/groups – legal personality serves here as a certain kind of ‘visibility cloak’ which helps other parties track obligations and entitlements of such an establishment146 - there are always other aspects which must be taken into consideration and carefully balanced against the benefits of such a visibility cloak. When discussing the possibility and plausibility of granting artificial legal personality to DAOs, it may be noticed that, among many others, similar questions as those which used to emerge at the advent of traditional legal entities

146 Kurki (n 63) 167
may emerge once again. This, however, does not mean that the answers will automatically be the same.

Apparently, some kind of a visibility cloak for DAOs, as collectivities could become useful in certain aspects. To illustrate this idea, it might be helpful to look once again at the case of the MangoDAO exploit. There was a civil lawsuit finally brought by Mango Labs, LLC, the entity in charge of further development of Mango Markets, to which the governance token holders turned, and also a criminal one, which gave rise to an important question: What is the status of the DAO community as a victim? Whom should the relevant authorities address regarding the exploitation? Without the DAO as such having a legal personality, and with it not being easy to reach the individual governance token holders, there was only one option left: to use the DAO’s discussion forum to submit legally relevant documentation. It is understandable to common sense that this is not an ideal solution and a DAO being a single entity might seem capable of resolving the underlying problem. However, it could have equally given rise to other problems at the same time.

Following the paradigm that blockchain arrangements (including DAOs) are not automatically the same as traditional legal entities (firms), although similarities are present, it can be concluded that the relevant questions should be asked again and answers to them should be sought with regard to the technological and socioeconomic nature of DAOs. The answers should help us to assess thoroughly whether granting DAOs legal personality makes sense at all, and what challenges society and economic relations are likely to face if this happens. Therefore, in this chapter the selected core topics of corporate personality, stemming especially from the limited liability of the participants, collective responsibility and the plausibility of a collectivity being granted rights, will be briefly

147 Thibault Schrepel, Blockchain + Antitrust: The Decentralization Formula (Edward Elgar Publishing 2021) 95-98

148 If applicable; it must be noted that some jurisdictions also recognize partnerships with unlimited liability of all or some of the participants as corporations (usually called ‘personal corporations’ to be distinguished from corporations with limited liability, which are usually called ‘capital corporations’), cf zákon č. 90/2012 Sb., Zákon o obchodních společnostech a družstvech (Czech Corporations and Cooperatives Act), Ss 95-131. However, this chapter is meant to cover the most remarkable issues of artificial legal persons in general rather than analyse each type of legal entity that normally occurs in the European legal environment. Thus, corporations with limited liability will be in the primary focal point for the purposes of this chapter.
reconsidered and put in the context of DAOs. An artificial person theory as described by Susanna Ripken (2019) will thereby serve as a basis for understanding the core features of legal personality of entities, although other approaches may be reflected if appropriate.

3.1.1 Entity Shielding and Limited Liability

Once upon a time, limited liability corporation was called “the greatest single discovery of modern times,” enabling business owners to run their businesses while being able to decide voluntarily and deliberately how much they will risk while doing so, rather than putting all their property at risk automatically.149 While this undoubtedly enabled enterprises to grow to the extent to which we know them nowadays, it also opened doors to taking on inappropriate risks and deliberately avoiding responsibility for failures. Sometimes, the entity shield can be even used for illicit purposes or circumvention of the law, an example of which may be so-called empty-shell companies.150 And even if this is not the case, a certain portion of losses and damages is unjustly transferred onto third parties every time a limited liability entity goes bankrupt.151

151 For a more elaborate analysis of risks and losses being spread among third parties by limited liability entities, see for example Stephen M Bainbridge and Matthew T Henderson, Limited Liability: A Legal and Economic Analysis (Edward Elgar Publishing 2016) 47 – 52. It should be noted that the issue of distributing losses among third parties applies to any kind of limited liability organizations (i.e. not exclusively to the private enterprises, but also touching international organizations), which can be demonstrated by the example of the International Tin Council, cf for example Sadurska and Chinkin (n 59)
The law has basically two instruments to deal with this problem. One of them is the unlimited liability of managing directors for breach of duties\textsuperscript{152} or (depending on the jurisdiction) the possibility of piercing the corporate veil (mainly in common-law jurisdictions). The other one is a prescribed amount of legal capital in connection with the liability of shareholders for obligations of the entity before the legal capital is paid up (in civil law jurisdiction).\textsuperscript{153} Eventually, in the case of public limited companies (PLCs), the law may prescribe a higher minimum amount of initial capital, as well as the portion thereof which must be paid up before the company can be incorporated and registered.\textsuperscript{154} However, those only help to a limited extent as they usually only apply under specific circumstances,\textsuperscript{155} and sometimes it seems that states may tend to prioritize making the overall legal environment favourable to entrepreneurial activities by keeping measures reducing the limited liability risks to a minimum.

This may be illustrated by the still-rather-recent changes such as the abolition of legal capital requirements, or the introduction of single-member limited liability companies. The latter one may be particularly remarkable, as the European legal environment shows a trend towards removing both lower and upper limits on the number of shareholders in

\textsuperscript{152} CF for example Simon Mortimore QC, \textit{Company Directors : Duties, Liabilities, and Remedies} (Oxford University Press, Incorporated 2017) 461-656

\textsuperscript{153} Cf zákon č. 513/1991 Sb., obchodní zákoník (Czech Commercial Code valid until 31.12.2013), S 108 (1), which prescribed a minimum initial capital of CZK 200 000 (approx. GBP 6667) in connection with S 109 (1) thereof, which prescribed a minimum capital contribution of CZK 20 000 (approx. GBP 667) per shareholder, which could lead to the total minimum initial capital under S 108 (1) having to be exceeded in an individual case. S 106 (2) then provided for each shareholder’s liability in the total amount of the non-paid-up initial capital. However, this changed as the Czech Commercial Code was repealed during the reform of the Czech Private Law in 2014.

\textsuperscript{154} Cf Czech Corporations and Cooperatives Act, S 253

\textsuperscript{155} Thus, the conditions under which the corporate veil can be pierced, vary from jurisdiction to jurisdiction and may only cover a clearly fraudulent or otherwise wrongful conduct which occurred under the full control of the owners, while mere undercapitalization of an entity or any other cases when an entity lacks sources to fulfil its obligation are not covered, cf \textit{Morris v. Dept. of Taxation} (1993) 82 N.Y.2d 135 (1993) (Court of Appeal of the State of New York) para 141 and \textit{Walkovszky v. Carlton} (1966) 223 N.E.2d 6 (1966) (Court of Appeals of the State of New York) para 8-9 respectively. Similarly, the liability of the LLC’s shareholders may be limited to the unpaid amount of the initial capital or to other amount as prescribed by the applicable law, cf Czech Corporations and Cooperatives Act, S 132 (1), for more elaborate analysis of the shareholders’ liability in the Czech law cf for example Radek Sendera, ‘K (Ne)omezenému Ručení Společníků s.r.o.’ (2020) <https://www.epravo.cz/top/clanky/k-neomezenemu-ruceni-spolecniku-sro-111322.html> accessed 30.03:2021
companies. While the attempts to harmonize laws around single-member private limited liability companies in the EU remained unsuccessful, as the SUP Directive Proposal was eventually withdrawn, the existing EU law does not provide for any limitations on the number of shareholders (except for strict limitations on when a company may acquire its own shares, resulting in memberless companies not being viable in the long-run). The decision on whether to allow single-member companies is thereby left entirely to the member states, some of which actually do so at the time of writing this thesis.

This development signifies a diversion from the *tres faciunt collegium* principle, in which the above-mentioned visibility cloak principle used to be easy to see, towards prioritising support to small and mid-sized enterprises in a less risky form than the activity of a sole trader. This may argue in favour of allowing DAOs to incorporate in the form of a limited liability entity, and maybe even permitting a legal form of a memberless company. This idea will be discussed in detail in chapter 4 of this thesis and it will be shown that it gives rise to serious questions. At this point, it should be pointed out that while the *tres faciunt collegium* principle has felt slightly out-of-date for some time, we must still weigh carefully how far we are willing to go to promote new forms of enterprise.

In this context, it has been already demonstrated that a single-member company may serve as a dummy for a sole trader and help to avoid liability even in an undue manner. It appears equally imaginable that a possibly memberless entity encapsulating a DAO could

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156 Andrea Vicari, ‘European Company Law’, *European Company Law* (De Gruyter 2021) 42
158 Belgium, Czech Republic, Finland, France or Germany can be named as examples of countries which allow for single-member companies with limited liability. For a brief overview see Thomas Ohr, ‘Compact Overview of the Most Common Legal Entities for Companies in all EU Member States’ *EU-Startups* (30 December 2022) <https://www.eu-startups.com/2022/12/compact-overview-of-the-most-common-legal-entities-for-companies-in-all-eu-member-states/> accessed 15 May 2023
159 Digest of Justinian 50.16.85
160 At this point, it should be remembered that the ancient principle was given a significant portion of flexibility in the modern era, when some jurisdictions reduced the compulsory minimum number of corporation’s members to only two; this happening before single-member companies started to be promoted. However, the ‘visibility cloak’ function appeared to still be present in corporate status until single-member companies were introduced.
161 See above.
perform even worse at this point, having no members who could be affected by piercing the corporate veil.

Similar conclusions may be drawn regarding lowering the minimum amount of initial capital of limited liability companies to a symbolic value (or its complete abandonment), which can be found in many countries both in and outside of Europe. While the supportive effect with regard to small and mid-sized businesses is indisputable,\footnote{Olivier Sciales, ‘Luxembourg’s One-Euro Company Provides Major Incentive for Entrepreneurs’ Chevalier & Sciales (17 February 2017) <https://www.cs-avocats.lu/corporate/luxembourgs-oneeuro-company-major-incentive-entrepreneurs/> accessed 31 March 2021} some experts warn that this is to the detriment of creditor protection.\footnote{Dominika I Wągrodzka, ‘LLC Without Initial Capital?’ (2014) <https://www.bnt.eu/en/news/legal-news/1782-limited-liability-company-without-initial-capital-2> accessed 31 March 2021} On the other hand, there still are stricter rules on the minimum amount of initial/legal capital of public limited companies. Especially, a specified portion of thereof portion must be paid up before the company can be incorporated and registered and its subsequent changes are subject to regulation as well.\footnote{At the EU level, cf Directive (EU) 2017/1132 of the European Parliament and of the Council of 14 June 2017 Relating to Certain Aspects of Company Law (Text with EEA relevance) [2017] OJ L 169/46, especially Art 45 ff.} Those duties are burdensome and it might appear difficult to think that they should apply to DAOs. On the other hand, they also appear more helpful when it comes to protection of creditors and other third parties. This will be further discussed in a subchapter devoted to the capitalization of DAOs.

It will be shown later in this thesis that finding a current type of legal entity to fit DAOs is a difficult task on its own. The perspective of limited liability and entity shielding, however, opens some additional questions which need to be considered when searching for a model which DAOs should follow. Most importantly, it must be noted that limited liability on its own is likely to be of limited advantage for founders or beneficiaries of DAOs, due to their very nature. Running on blockchain, which enables anonymity, DAOs make it possible for their founders, or current members, to remain unidentified by users, as well as by the authorities, if they actively aim to do so. Just as we do not know who Satoshi Nakamoto is, we may find ourselves unable to identify founders of other DAOs, unless they willingly expose themselves or make a significant mistake in maintaining their anonymity, or if an
extreme amount of investigatory power is exerted to break through the measures that secure their anonymity. Incorporating a DAO would mean actively giving up this anonymity by registering some persons as members and representatives (directors) thereof. In this context, limiting liability in DAOs feels like nothing more than a fair balance to giving up anonymity and does not seem to bring much additional advantage to the founders or members themselves. Moreover, it does not bring a significant advantage for investors, creditors and common users, as there might not be sufficient funds in a DAO to cover its liabilities, with the possibilities of holding to account those who caused such conditions being very limited, at least in some jurisdictions. Some of the most significant particularities of entity shielding will be discussed separately in further subchapters, but in general, it can be concluded that, compared to leaving DAOs without a specific regulation, actively introducing an entity shield, and/or limited liability, as such is unlikely to constitute a significant change to the level of protection for those involved in operations of a DAO.

3.1.2 Doing Good, Doing Wrong and Being (Held) Responsible

Collectivities such as traditional legal entities, but also families, municipalities, nations or churches, have been understood as having some kind of corporate personality and being able of corporate responsibility and liability for a longer time. However, a collectivity does not inevitably need to have a legal personality to allow for thoughts about their corporate personality and responsibility, which can be shown in the example of families and/or clans.\textsuperscript{165} This, on the other hand, should not lead to the conclusion that there is no connection between collective responsibility and legal personality. Leaving aside examples reaching back to the Old Testament and shifting our attention to modern legal entities, we can see several issues regarding collective responsibility which have been discussed and which appear to deserve to be re-iterated when thinking about granting legal personality to DAOs.

\textsuperscript{165} Cf for example Jurrien Mol, \textit{Collective and Individual Responsibility : A Description of Corporate Personality in Ezekiel 18 And 20} (BRILL 2009), especially chapter 3
It can be assumed that a number of people are involved in developing a DAO and setting it into operation. It appears almost inevitable that there will be numerous token-holders involved in subsequent decision-making and promotion of changes within a running DAO. This means that questions of collective and shared responsibility are relevant. Apart from the entity shielding, which has been discussed in a separate subchapter above, sharing of responsibility among multiple people involved, including its consequences for the conduct of the collectivity as a whole, is clearly one of the questions we should discuss before deciding to facilitate the existence and operation of DAOs by granting them legal personality.

Cooperation and collective decision-making may benefit from synergy effects and help reach more accurate decisions, as well as opening doors for new ideas to be identified and pronounced. However, it has its dark side as well. Sharing responsibility with others may help individuals to relieve negative feelings about potentially undesirable outcomes of their decisions, making them prone to decide in a more ruthless way than they would on their own. This has a serious impact on the quality of decisions adopted within legal entities and things seem to get even more complicated when we think that, contrary to a traditional legal entity having a rather limited number of members of the managing body, a DAO may have myriads of token-holders entitled and expected (but not necessarily forced) to participate in the decision-making and that a consensus among those token-holders must be reached for each decision which has not been initially incorporated into the DAO’s code.

Apart from that, it must be noted that cooperation and a synergy effect may easily disappear at the level of the token-holders. The token-holders’ decision-making in this point generally resembles a per rollam voting in a general assembly of a big traditional PLC, where each participant (shareholder) makes decision on their own, based on the information they have at their sole disposal, possibly without there being the possibility of any discussion prior to the voting. A consensus of 51% of all tokens must be achieved to adopt a decision.

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167 This is, however, a resolvable problem and there are already examples of DAOs whose founders took care of the maintenance of the stakeholders community and ran a discussion forum on which the proposals having been raised can be further discussed, cf, for example, the Gnosis DAO (see https://forum.gnosis.io/) or
The consensus mechanism helps, on one hand, to reduce the risk of malevolent action by an individual, but on the other hand, it makes decision-making ineffective where a large number of token-holders are expected to vote and reach a consensus. The risks of mismanagement and inefficiency of the decision-making process have been touched on above and selected aspects thereof will be discussed in more detail in the following subchapter. However, there is exactly this additional layer of the problem which should not be disregarded either. It is already known that individuals tend to assume less responsibility, and to be less prone to take action, in collective settings compared to when on their own. In the context of DAOs’ decision-making, this may result in various sorts of unwanted results. For example, where the number of token-holders is high and the level of understanding of the question on which the voting takes place differs among the individual token-holders, the cooperation or synergy effect is likely to be replaced by some token-holders perhaps not voting, or voting randomly because they don’t believe their vote will make a difference in the context of so many others, or by stronger tendencies towards herding behaviour by less-informed token-holders. Also, contrary to the traditional PLCs, no mechanism is in place for protecting minority shareholders, or holders of a dissenting opinion.

MangoDAO (see https://dao.mango.markets/dao/MNGO). On the other hand, success of such discussions is largely dependent on the activity of the participants.


169 At this point, it must be stressed that to reduce the risk of malevolent action of an individual does not equal excluding it completely. A majority of 51% of all votes being gathered by one person (or a small handful of cooperating persons) and being used in a way which harms the minority has been described for example by Christoph Jentzsch, ‘Decentralized Autonomous Organization to Automate Governance Final Draft - Under Review’ (23 March 2016) <https://perma.cc/338L-74Sj> accessed 4 December 2021 2. It must be noted that while the law usually provides for protection of minority shareholders in traditional entities in comparable cases, there is no such default statutory protection in DAOs. Thus, while protection of the minority token-holders in DAOs is technically possible, cf Jentzsch (n 169) 2-3, its implementation is not compulsory and fully depends on the decision of the DAO’s originators.
Apart from general questions of collective responsibility and collective liability, which would apply to traditional legal entities as well (although now they are often modified or aggravated by the technological nature of DAOs), there are further questions which emerge on top of them which should be discussed taking into consideration the nature of DAOs as autonomous electronic systems. Those generally relate to the ethics of algorithmic agents and would apply to DAOs with a high level of autonomy, i.e. those which are managed solely or highly prevalingly by algorithms, rather than by the decision-making of the membership token (sometimes also ‘governance token’) holders based on continuous oversight and active participation.

This is likely to be a matter of the future rather than a contemporary at the time of drafting this thesis, but it is still worth considering. As DAOs can be equipped with artificial intelligence and programmed to operate autonomously, i.e., without needing to be actively operated by their founders or token-holders, it should be asked whether, or to which extent, the complex legal rules and ethical standards acknowledged by humans can be translated into code and adhered to by an artificially intelligent electronic system. Those questions have already been discussed in connection with tangible autonomous electronics systems, such as robots or autonomous weapons, and any conclusions reached there basically apply to DAOs analogically – with one difference: a DAO cannot be localised and easily physically restrained or destroyed if it gets out of control.

To provide just a very brief idea about how artificial intelligence may fall short in compliance with human-set rules of conduct, let us have a look at the example of the Titanic maritime disaster as presented by Meredith Broussard (2018). Starting with the known properties of survivors and victims, we can, processing the data with a mathematical model, conclude that wealthy people have better chances of surviving similar accidents and therefore could be for example charged lower premiums on life insurance. This makes sense computationally and logically, indeed, wealthy people usually have better means to secure their sustenance and protection in general, not only in the case of a shipwreck, but the broader social impact of such a conclusion does not appear to be desirable. The benefit of insurance lies in an even
distribution of risk across a large pool of people,\textsuperscript{170} which allows the insurers to earn reasonable profit while each of the insured ones can afford to stay protected. Therefore, charging the wealthy ones less based on them having (mathematically) a better chance to live long, including a better chance for rescue if hit by an unfortunate event, practically limits the poorer ones in access to protection via insurance. This, obviously, is not an approach which could be called ethical or socially responsible and is likely to be even unlawful based on the applicable laws, for example in the field of consumer protection or protection against unlawful discrimination. We can surely imagine a fully autonomous, artificially intelligent DAO acting like this. The question is if we can imagine a fully autonomous, artificially intelligent DAO programmed in a way which secures that it will not do so.

A simple understanding of the problem might lead one to answer ‘yes’, imagining a certain kind of if/then-commands-based code, which, once launched, automatically submits an application for registration to the competent authority, pays any applicable fees, drives the entity so that it behaves lawfully while performing its business activity, allows for response to decisions of courts and other competent authorities and even executes an automatic wind-up of the entity, if required by the law or by an official decision. A more advanced arrangement may even automatically consult official sources of law in predefined time intervals (if available online or otherwise supplied to the system) and modify its behaviour within the time so that any changes in the law are reflected and adequately responded to.

As well as noting the burden on business registration authorities, which would have to check the code of each such entity-to-be for the ability to comply with the law for a later discussion, we can dispute whether writing a code allowing for such conduct is reasonably practicable.

To start a detailed search for the answer to our core question, we must first ask what is actually right and what is wrong in an artificially intelligent DAO. This is a hard-to-answer question. The notion of right and wrong is established by people and their content largely depends on people’s understanding of numerous, very often abstract notions and

\textsuperscript{170} Meredith Broussard, Artificial Unintelligence : How Computers Misunderstand the World (MIT Press 2018)
perceptions of various circumstances. Thus, while we can reasonably assume that programming a DAO in a way that makes it check the official sources of law regularly and directs its actions in order to secure compliance with the applicable law is theoretically possible, securing that such directions are made in a way which leads to the conduct mandated by the legislator is another story. Indeed, “[l]aw and society are set up to accommodate all of the things that humans think matter. Data-driven decisions rarely fit with these complex sets of rules. The same unreasonable effectiveness of data appears in translation, voice-controlled smart home gadgets, and handwriting recognition. Words and word combinations are not understood by machines the way that humans understand them.”

Thus, the answer does not seem to sound like a persuasive ‘yes’, at least not at the current state of the art.

To continue, the written law sometimes relies on unwritten norms of conduct and vague notions. Moreover, both legal and ethical norms of conduct regularly change over time and are sometimes understood differently from person to person. Thus, even finding a computationally-functional way how to incorporate lawful and ethical conduct into a DAO’s code does not necessarily have to bring the desired results, as it would first have had to be unanimously understood and agreed what lawful and ethical conduct actually is for all situations which the DAO in question can get involved in, and such a DAO would have needed to be supplied with this information. This may, indeed, become another stumbling block as the laws, as well as an overall idea of what is ethical and correct, change over time and there are often several various interpretations of the same norm, leading to different results.

Additional issues stemming from this may be expected especially in common law systems, but also in other jurisdictions in which case law plays an important role. To ensure that the

171 ibid 119; for an illustrative example of such discrepancy see also Broussard (n 170) 166.
172 At this point, it should be pointed out that the ignorantia iuris non excusat principle may fall short in fully autonomous DAOs, even if they are equipped with advanced artificial intelligence and can harvest information from the Internet. The reason was described above: it is the difficulty of recognizing relevant pieces of information from less relevant or even misleading ones, which may lead to the impossibility of ensuring that the DAO will autonomously and reliably pick up up-to-date legal texts and writings of renowned experts in the field as a basis for its future conduct.
173 Cf Jentzsch (n 169) 1, pointing out that “people do not always agree what the rules actually require.”
right decisions are being made, the artificial intelligence of a DAO would, for example, need to be able to deal with old case law being overridden, diversions from the usual case law based on very specific (and possibly not programmable) circumstances of a particular case, or discrepancies in the case law in similar cases, caused by the courts not being able to find unanimous interpretation of a general legal norm. Similarly, it might need to be able to deal with highly non-standard situations in which compliance with the formal law may not be desirable for a particular reason and predict if any defence can be successfully claimed in such cases. Those issues are sometimes not easy to resolve even for human reasoning, never mind a computer program. While there are experiments with legal artificial intelligence already in existence, a fully autonomous artificially intelligent DAO would need to be equipped with a very advanced and well-working legal artificial intelligence to secure its plausible functioning as a party to legal and socioeconomic relationships. This does not seem feasible under the current state of the art.

Of course, breaches of the law cannot be avoided completely, regardless of whether we think about a future fully autonomous and artificially intelligent DAO, or about the DAOs of today, which are still rather simple-coded and at least partially controlled by their creators or members. Therefore, it should be also discussed whether remedies can be reached if a breach occurs. Traditionally, civil and criminal liability, as well as administrative sanctions, may be imposed on those who breach the law, but it must be asked how DAOs fit into this concept.

In general, remedies for breaches of law committed by a DAO under human control may work well even without the DAO having a separate legal personality, as long as the people behind such a DAO can be identified and found. As explained in earlier stages of this thesis, a DAO may be understood as a certain kind of tool in the hands of its originators, actual operators or members, who are responsible for its operation. Thus, standard liability rules can usually apply in such cases. An example of this may be, again, The DAO, which was created and operated by an existing German corporation. This corporation called Slock.it UG

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174 Cf for example Peter Wahlgren, *Artificial Intelligence and Law* (Kluwer Law and Taxation; 1992) or Michael Legg and Felicity Bell, *Artificial Intelligence and the Legal Profession* (First edition, Hart Publishing; Bloomsbury Publishing 2020)
was investigated by the U.S. Securities and Exchange Commission (SEC) with regard to the activities of The DAO relevant to the U.S. markets, and although no enforcement action was taken in the end, it was found that there might have been a breach of the U.S. securities laws on the part of both the corporation and its co-founders, as well as some of the stakeholding intermediaries. The absence of incorporation and formal legal personality of The DAO itself had no substantial impact on this finding. Comparably, currently, existing arrangements such as GnosisDAO or MangoDAO are not separate corporations. For example, GnosisDAO is, in the words of its founders, “a collective that uses Gnosis products to transparently guide decisions on development, support, and governance of its token ecosystem.” In comparable cases, it is mainly the DAO’s originators and operators who could benefit from a DAO’s separate legal personality as this could help limit their own liability.

A different situation may occur if we have a fully autonomous DAO running on a public blockchain. Being left alone by its originators after being launched, with the membership token holders, or other benefactors, possibly being anonymous and therefore extremely hard to find, as it could easily become the case, as for example in MangoDAO, a DAO having legal personality appears to be a promising way to have someone to be held liable for any damages and breaches of law which may occur in the course of its operation. In such cases, the legal personality of such a DAO itself should theoretically provide more protection to the common users and other stakeholders. However, the practical aspects thereof may be much more complex than expected. Further chapters of this thesis will provide examples of common legal principles which are closely connected to the concept of human-managed entities and thus require specific attention if DAOs are to get separate legal personality and retain, at least basically, their nature at the same time. In addition, some points regarding the practical enforcement of liability may become difficult. Those aspects are not the same, but many of them are strongly interconnected.

175 See https://gnosis.io/gnosisdao/. Gnosis DAO was launched by Gnosis Limited a company incorporated in Gibraltar.
Right at the beginning, for example, it may remain unclear who is responsible for maintaining the public blockchain upon which a DAO runs, or the extent of liability for any flaws in the DAO’s code. The possible fiduciary duties of the blockchain developers and the questions around liability for the decision to run an entity on a public blockchain are going to be touched on later in this thesis. Flaws in a DAO’s code constitute a separate subtopic of this question and will be also touched on later, especially in connection with the notion of acting on behalf of a legal entity, but it will be shown that a unanimous and persuasive answer is difficult to reach. While we could treat any misbehaviours of the DAO in the same way as defects of any other product (computer program)\footnote{Indeed, undesirable behaviour of the algorithm sometimes cannot be reasonably foreseen even if the highest standard of care is applied. This has been described yet by Curtis E Karnow, ‘Liability for Distributed Artificial Intelligences’ (1996) 11(1) Berkeley Technology Law Journal 147 <https://www.jstor.org/stable/24115584> accessed 15 February 2020 161, who calls such incidents “pathological decisions” and warns that they are more of an indivisible part of artificially intelligent programs than of flaws in the true sense. In other words, once artificial intelligence is deployed, pathological decisions will occur. There is no way to prevent, or even effectively foresee, them. This is, however, not to argue that exclusively human-based decision making is free of pathological decisions. Rather, it should be understood as stressing the point that predicting, preventing and even identifying andremedying pathological decisions made by an algorithm follows different principles from dealing with those made by humans, and may be beyond the capabilities of the human mind.} and therefore apply the general norms regulating product liability, the practical impact does not necessarily be the desired one. With DAOs likely to be open-source, community-based projects in which numerous people are involved without any formal structure, at least some of them possibly remaining anonymous, it may be nearly impossible to determine who has written the flaw-containing part of the code, or to reach such a person once the problem becomes visible. Another aspect which must be taken into consideration is the defence of the state of the art, which helps the person who brought the flaw into the code free themselves from liability (even if identified) if they proceeded following the available knowledge in the art and could not reasonably foresee that what they program is actually a flaw.\footnote{cf Jentzsch (n 169); Beck (n 3) 474}

Further, if a flaw is brought into the code by its subsequent changes, it could be asked if only the author of the proposal for the flaw-containing change should be held liable, or if such liability should attach to all token-holders who voted in favour of the change. While this could be handled by applying the rules about the members and/or managers of a traditional
entity having to use sound business judgment and act in the justifiable interest of the entity, there may be, again, doubts about the extent to which any token-holder who is entitled to raise proposals and/or vote on them can be practically expected to have sufficient expert knowledge to make a well-grounded decision in such matters. This all closes the vicious circle of the failure of an accountability principle in DAOs, leaving the liability for the damages caused by flaws in the code being imposed on the DAO as such being perhaps the most practicable solution.\textsuperscript{179}

Further, it should be noted that the technological nature of DAOs gives rise to difficulties in the application of fault as the primary legal basis for liability. With most (if not all) of the day-to-day decisions being made algorithmically, it may be too difficult to determine the basic elements of fault, such as intention or knowledge, at least in some cases. Even the originator of the algorithm may sometimes be actually unable to reasonably predict its future behaviour, which may exclude holding them liable based on fault, even by negligence. This phenomenon is called the ‘accountability gap’ and serves as one of the arguments supporting separate legal personality for autonomous electronic agents, leading to the idea that if no person behind an artificial electronic system can reasonably assume responsibility for the system’s behaviour, the responsible entity should be the system itself.\textsuperscript{180}

Looking into the two basic liability concepts, namely criminal and civil liability, it can be concluded that legal personality for DAOs may be a helpful tool in promoting legal certainty and the factual possibility of claiming and recovering damages by those whose rights may be breached in the course of the DAO’s operation. However, with fault being difficult to establish, it appears that the principle of accountability (in criminal cases) or strict liability (in civil cases) would need to apply instead, which means that a DAO will be liable for any

\textsuperscript{179} Theoretically, a responsible person could be determined on the legal-fiction basis, i.e. purely formally, for example precisely for the purposes of incorporation of a DAO and its interaction with the physical world, or might emerge automatically from an adoption of an existing legal construction which appears suitable to accommodate a DAO, cf Bayern, \textit{Autonomous Organizations} (n 6), especially Chapter 4. However, the extent to which such a solution would be equitable from this person’s own perspective is disputable, as they would be responsible for something which they had little to no factual possibility of influencing.

breaches of law occurring in the course of its operation, regardless of their particular cause, even in cases in which fault would apply in sole practitioners or traditional entities. This means additional burdens for a DAO or its creators and members (if a similar liability as in the piercing-of-corporate-veil cases is imposed).

Therefore, it must be expected that dissenting voices will be audible. On the other hand, such an approach can become particularly helpful in matters of criminal liability of DAOs. Contrary to civil liability, which depending on jurisdiction,\(^ {181}\) may reasonably allow for the accountability/strict liability (rather than fault) principle to apply to natural persons (originators or members of a DAO, as long as they can be identified and reached), criminal liability for actions committed by a DAO cannot be reasonably based on an accountability principle where natural persons are to be charged and therefore absolutely requires a DAO to have a separate legal personality, unless its originator or operator can be identified and, cumulatively, fault (intention or negligence, as applicable) can be proven.\(^ {182}\)

Finally, it has been mentioned above that the DAOs should be able to respond to the decisions of the state authorities (such as courts, administrative bodies or arbitrators) adequately and bear liability imposed on them as a consequence of breaches of law committed by them. This is not necessarily limited to paying fines, complying with a ban to obtain subventions and enter into procurement contracts or, even facing forced dissolution order by a court (which constitutes a particularly thorny point and will be discussed more in detail later), to name just a few examples of punishments which may be imposed on a legal entity. It should be equally able to pay civil-law damages or to refrain from certain activities, if ordered to do so. Moreover, a DAO should be able to do further things to be a valid participant in social and legal relationships; for example, to modify its behaviour in response

\(^{181}\) An interesting example can be found in the Czech Civil Code, S 2925 (1). This provision stipulates strict liability of anyone who operates any establishment which is of significant risk. It is not determinative whether such person has/needs specific legal permission to do so, neither is the nature of the establishment specified. Any establishments, and continuous operations, in which occurrence of serious harm cannot be reasonably excluded, even if high level of due care and proceeding in accordance with the state of art is exerted may be considered as establishments of significant risk. Therefore, highly autonomous and artificially intelligent DAOs as described by Karnow (n 178) can be included under this provision. On the other hand, it must be noted that such an approach does not necessarily need to fit all jurisdictions and may be even too disruptive in legal systems which are not open to the concept of strict liability, cf Karnow (n 178) 193.

\(^{182}\) Cf LoPucki (n 7) 901
to reputational risks and well-reasoned social pressures, respond to formal requests to rectify a faulty status, if relevant, or learn from punishment and refrain from faulty behaviour in the future.\textsuperscript{183} Again, unless the autonomy of a DAO is limited and substantial changes can be made by the individuals behind it, this needs to be secured by embedding the respective mechanisms in the DAO’s code.

It must in all cases be noted that the DAOs and similar electronic arrangements can, on the factual level, exist and do both good and bad things, and be almost impossible to hold to account, regardless of whether they have legal personality or not. Therefore, granting DAOs legal personality is, in general, not a universal way of achieving better control over their conduct. Further, granting them legal personality means an even stronger commitment to police them and secure that, at least those which officially exist as legal persons, comply with the law and that breaches are punished by the jurisdiction which does so. Otherwise, the whole concept of legal personality for DAOs would basically stop making sense and, more seriously, could undermine the principle of legal certainty and the general trust in the state and law even in other fields.

Finally, it may even open the door to DAOs not only accumulating wealth but also leveraging it in capital markets and maybe even taking part in the political process; this all without having to bear most of the burdens which humans and traditional, human-operated entities must bear when doing so.\textsuperscript{184} Therefore, some of the proposed simple legal personality models, such as an automatic legal personality for DAOs (similar to the concept of automatically emerging partnerships in some jurisdictions) are hard to imagine as working solutions. Instead, we must ask which criteria a DAO should meet to be eligible for the status of a valid participant in social and legal relationships and only think about granting legal personality to such DAOs, which really meet those criteria. Some of the related questions will be raised further in this thesis.

Of course, not all actually existing DAOs will be covered by such an approach and most of those which follow illegitimate goals are likely to make part of the other group. Therefore, it

\begin{itemize}
  \item \textsuperscript{183} Cf ibid 904
  \item \textsuperscript{184} ibid 902
\end{itemize}
appears reasonable to aim for separate legal personality for DAOs, as it may be helpful to increase the overall credibility and reputation of those who intend to operate a DAO in an open and honest manner, without illicit goals and without the intention to stay anonymous. On the other hand, it must be noted that it is likely to be of limited help in eliminating the illicit activities of some DAOs.  

3.1.3 Mismanagement and Inefficiency Reduced by a Code or Translated into the Code?

Limited liability and division of the control over the corporate assets and liabilities between the owners and the managers bring, apart from benefits, also risks. It was Adam Smith (first published 1776, 2010) who warned about corporations being mismanaged and ineffective due to the owners not having sufficient information and control over the corporation and managers being prone to prioritize their own interests over the interests of the corporation and its owners. The modern era does not seem to show much change, which can be documented by examples of the failures of Enron, Worldcom and Parmalat. Moreover, even if working properly, the separation-of-control-and-ownership model entails significant agency costs, which might make certain transactions non-profitable.

The promoters of DAOs often argue that the mere construction of DAOs will help resolve those problems, based on the nature and features of the underlying technology. In particular, storing the information in a distributed database, with all changes based on consensus protocol requiring the votes of holders of 51% of the membership tokens to any decision being made, should prevent a single party from taking control of the organization and making and enforcing selfish decisions. Autonomous, algorithm-based, governance

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185 As an obiter dictum, the opposite side of the problem could be mentioned as well. Bayern, Autonomous organizations (n 6) 76-116 presents several constructions which may allow for a purely pro forma compliance of autonomous organizations where there is a legal requirement that a legal entity has members. This may, however, bring an unexpected problem in those ‘pro forma members’ being held responsible for conduct of a DAO, over which they could not have real control in certain situations.

186 Cf Adam Smith, Wealth of Nations (Electric Book Company 2000) 990

promises to remove the principal-agent problem.\textsuperscript{188} Automated contracting is expected to minimize the transaction costs to a level that allows transactions to happen which would be too small and too costly to negotiate in a traditional business environment.\textsuperscript{189}

However, it would be short-sighted to see those features as pure advantages. Instead, possible downsides must be considered and examined. In particular, it should not be expected that replacing human decision-making with an algorithm will remove the problem of mismanagement. Further, it should be questioned whether such a solution is likely to at least significantly reduce it, or whether mismanagement will merely change its form once human managers are replaced by an algorithm.

From one point of view of the problem, blockchain-based arrangements are often described as trustless in the sense that the participants need neither to trust each other, nor to appoint a trusted intermediary to facilitate the transaction(s), because the trust is replaced by a corruption-resistant technology. This, however, should not be understood to mean that no trust at all is needed. On the contrary, trust in a human manager or group of managers and the employees appointed by them is here actually replaced by trust in the technological solution operating at the level of management.\textsuperscript{190} But does this particularity change something in everyday practice? Probably just a little. At this point, it must be once again remembered that all computers, including both their hardware and software features, are nothing more than products of human work.\textsuperscript{191} As a result, the management of a simple DAO\textsuperscript{192} is, at least in its roots, actually performed by human programmers, even though it is later immediately executed by a computer algorithm without further human input.

\textsuperscript{189} Takagi (n 115) 26
\textsuperscript{190} Cf Walch, ‘In Code(rs) We Trust: Software Developers as Fiduciaries in Public Blockchains’ (n 124)
\textsuperscript{191} Broussard (n 170) 18
\textsuperscript{192} Such as Bitcoin, cf Academy (n 188). In this context, it must be noted that maintaining a payment system (cryptocurrency) is a rather simple set of tasks compared to other fields of business in which DAOs are expected to find deployment. Once a more complex activity involving more of human factor, is in question, advanced artificial intelligence and machine-learning based systems may become involved and things are likely to become much more complicated, even at the level of algorithmic decision-making.
Thus, one way of running a DAO entails that the main part of managerial decision-making being made in the coding phase, which means that the programmers must firstly be able to formulate the business model adequately, and secondly be skilled enough to translate it into code. Any mistakes made in this phase may constitute a serious problem. This can be, once again, illustrated in the example of the MangoDAO exploitation, in which the exploiter did not even need to tamper with the code – it was enough for them to find a weakness of the code, left there unintentionally by the programmers, and make it work to their own advantage.

This, however, is not the only way DAOs can run. As mentioned above, the concept of DAO presumes the participation of certain persons in the form of membership tokens, electronic keys which are connected with a certain bundle of entitlements: typically the right to receive a portion of the DAO’s profit and a right to vote on proposals for changes to be made to the current functioning of the DAO. It is up to their holders how they use them, thus, another scenario is perfectly imaginable: that a DAO will be, actually, actively managed by the membership-token holders through proposals being raised and voted on. Compared to a DAO with passive members, this model brings different sorts of issues and also gives rise to different considerations with regard to liability issues. Some of them will be addressed later in this thesis.

Further, as noted above, blockchain-based transactions are automated and formalistic and blockchain records are basically immutable. This results in specific consequences, such as that any transactions made based on a code containing mistakes will persist even after the code is changed.\footnote{This, however, is not an exception-free rule and its practical implementation depends partially on the level of autonomy with which a DAO is provided. In the case of the above-mentioned The DAO, the blockchain developers retained enough control above the database to be able to reverse the fraudulent transactions which had been made by a hacker (see above for a brief description of The DAO, explaining also that it was not fully autonomous). On the other hand, this was not accepted by all the users. As a consequence, the immutability promoters decided to leave the fraudulent transactions in place and create a new branch of the chain.} Rather demanding actions will be needed to mitigate the consequences, even in situations where informal ways of correction could reasonably be applied if a traditional contract was in question. On top of this, changing a DAO’s code, even just to fix a
bug, still requires a consensus vote and therefore may be a lengthy procedure. This may appear to be a critical weakness if a serious bug is revealed and quick action needs to be taken to fix it. If the consensus is not reached quickly enough in such cases, a bug is likely to be found and used by a malicious third party.¹⁹⁴

Taking this into consideration, it may be concluded that successful management of a DAO equals, to a great extent, writing good-quality code, reflecting the goals of the DAO and defining the ways to achieve them, while concurrently foreseeing any possible unintended use cases and being able to prevent them. Exactly this, however, constitutes a stumbling block to creating a well-working DAO, especially if it seeks to implement a more complex business idea. The reasons are many. As already mentioned briefly above, defining a successful and well-working business arrangement is far from easy as too many rather vague, and sometimes competing, factors step in. While the most typical economic goals of a business, i.e. maximizing profit or maximizing turnover, may be easily expressed in a source code, the ways to reach them appear to be much more difficult to define, requiring numerous variables to be considered and weighed. Thus, the coders must assess the business opportunity correctly and code a long-term, viable business strategy which should be as resistant to changes in the outside environment as possible, so that any subsequent changes in the code (which would be subject to the consensus of the token-holders later) are not needed at a short notice.

This requires them to be able to estimate the development of the respective market(s) and the behaviour of other possible players while in the phase of coding, as well as seeking to consider the broader social context of the activity, such as the legal framework or general

¹⁹⁴ Reaching back to traditional legal concepts, a parallel with an ancient Roman concept of dictatorship can be followed to explain that clear, rapid and resolute decision-making is crucial in emergencies and sometimes appears to be useful to adopt even at the cost of temporary deferral of the principles which are valued at normal times, cf William E Dunstan, Ancient Rome (Rowman & Littlefield Publishers 2002) 77. The problem does not appear to be purely theoretical. An infamous case of The DAO, mentioned above briefly and solely for the purpose of terminological clarification, can now serve as an example of how slow, consensus based, decision-making can open the door to a DAO being hacked, based on design vulnerabilities which do not get fixed quickly enough, cf Cryptopedia Staff (n 47). To fix the problem, the core Ethereum developers had to be gathered to intervene to the end, cf Quinn DuPont, ‘Experiments in Algorithmic Governance: A History and Ethnography of ‘The DAO,’ a Failed Decentralized Autonomous Organization’ in Malcolm Campbell-Verduyn (ed), Bitcoin and Beyond: Cryptocurrencies, Blockchains and Global Governance/ edited by Malcolm Campbell-Verduyn (RIPE Series in Global Political Economy, 1st. Routledge 2017) 164
understanding of business ethics and social responsibility. Further, there is also a need to foresee possible malicious activities from outside and adopt functioning measures to protect the DAO. This all basically needs to be completed during the coding phase and how the new DAO will cope with those challenges largely depends on the abilities of its creators.

It has been mentioned that continuous, active engagement of the participants in DAOs is possible, in spite of DAOs being called ‘autonomous’. This opens a way for rectification of any possible errors made in the coding phase, but equally sets a high demand on those who are entitled to make proposals for changes and vote on them. Such active participation would, on one hand, reduce the reliance on the quality of the work of the initial developers, but, on the other hand, increase the risk of additional errors being induced by insufficiently knowledgeable participants.

The question of efficiency does not find an unanimously positive answer either. While it is true that transparent, algorithm-based governance significantly limits malicious insiders in promoting their own interests at the cost of the organization, there might be signs of inefficiency in dealing with third parties. In particular, it must be noted that a simple DAO based on a set of deterministic algorithms works in a manner similar to a vending machine, i.e. follows a highly standardized procedure and anything which does not fit the procedure will not work. This makes the “customer is king” principle obsolete. Now, it is not the trader who should do their best to meet the customer’s demands, it is vice versa. This may discourage, or even exclude, some people from becoming customers of a DAO and finally lead to a loss of opportunities which a traditional business would be able to take advantage of by using an individualized, customer-focused approach. Thus, a DAO-based business model is likely to only be efficient in those business activities in which the individualized approach and trader-to-customer interactions are not required.

Therefore, it can be concluded that, in general, only careful optimism is advisable regarding the question of whether the concept of a DAO can resolve the issues of companies being mismanaged or ineffective. While some of the problems (such as the malevolent action of

195 Cf Szabo, Smart Contracts: Building Blocks for Digital Markets (n 195)
human managers, who may take advantage of the informational asymmetry and pursue their own goals at the cost of the owners) can be successfully resolved, others remain in place, being slightly reshaped (e.g. limited ability to estimate the development of the market or to respond timely to the changes of the outer environment). "Can you build a set of responses that work in any situation? No way. You can think of responses that would suit most situations, but not all. There will always be limitations to what a computer can say in response to a human because there will always be limits to the imagination of the human computer programmer." Taken out of its original context, this quote perfectly summarizes the main weakness of a simple DAO and provides a concise answer to the question of why mismanagement cannot be eliminated through business activity being managed by an algorithm rather than by human beings, indeed it does not seem that it could be even significantly reduced. Thus, considering simple DAOs, at least some aspects of mismanagement appear to be translated into the code (while such translation obviously brings slightly different issues from the “original,” i.e. cases of mismanagement which habitually occur when the managing tasks are performed by humans) rather than removed.

Further, the situation turns out to be even more complex if we think about advanced artificial intelligence, based on algorithms, allowing for machine learning getting involved in running a DAO. As already briefly described above, such technology enables the algorithm to work on a non-deterministic basis and learn from the data which is made available thereto. Some of the aspects of advanced artificial intelligence managing a business, operating in socioeconomic relations and acting vis-a-vis human counterparts are going to be discussed in detail below.

The basic principle remains the same regardless of the complexity of the artificial intelligence used. It must be stressed again that even such kinds of artificial intelligence are nothing other than human works – albeit very complex works trying to mimic the functioning of a human brain. And while the common understanding may be that those types of artificial intelligence

\[\text{196 Cf Academy (n 188)}\]
\[\text{197 Cf Cryptopedia Staff (n 47)}\]
\[\text{198 Cf Broussard (n 170) 27}\]
intelligence are some kind of “ghost in a machine”\textsuperscript{199} or “simulated person”\textsuperscript{200}, the reality cannot be much further from this perception. As already suggested above, they cannot emulate the functioning of the human brain in its entirety.

This may lead to results different to those which human management activities would have produced, because managing a business arrangement, when being done immediately by human(s) in its entirety, requires a certain level of general intelligence\textsuperscript{201} and managerial abilities, which are not limited to work with computable variables. While the core principles can be identified, generalized and even turned into a comprehensive scientific theory, many particularities remain uncaught or require an individualized approach. General human intelligence in business management can be further enhanced by appointing collective managerial bodies, consisting of a relatively small number of people. This allows for a synergy effect, opening space for each of the members to present their unique point of view when a potential outcome is being discussed. It also works as a certain kind of checks-and-balances mechanism, helping to detect the possible mistakes or malicious actions of an individual. This general intelligence is something which still cannot be emulated by electronic agents.\textsuperscript{202} While there are new and promising experiments with creating sophisticated computers, which imitate the neural system of a brain and how a real brain processes information (so-called “neuromorphic computers”),\textsuperscript{203} at this time it appears that developing a general artificial intelligence which can deal with complex functions (such as one which could imitate, in their entirety, the mental processes of a good manager) still remains a challenge unlikely to be surmounted in a foreseeable future.\textsuperscript{204}

\textsuperscript{199} ibid 32
\textsuperscript{200} ibid 32
\textsuperscript{201} For the purposes of this thesis, (natural) general intelligence can be defined as “the ability to deploy the same core suite of cognitive resources on a wide range of different tasks,” see Henry Shevlin and others, ‘The Limits of Machine Intelligence: Despite Progress in Machine Intelligence, Artificial General Intelligence is Still a Major Challenge’ (2019) 20(10) EMBO reports e49177, 2 and general artificial intelligence as “[t]he machine intelligence that could successfully perform any intellectual task that a human being can, be adaptive to the external environment, and even forms its own selfawareness,” see Huang (n 114)
\textsuperscript{202} See subchapter 2.3.1.2 for selected general issues of attempts to emulate human thinking. At this point, some aspects that are particularly important for the question of mismanagement and inefficiency in DAOs will be dealt with.
\textsuperscript{203} Huang (n 114) 522
\textsuperscript{204} Shevlin and others (n 201), 4
What we are left with at the moment is therefore so-called “narrow artificial intelligence.” This is artificial intelligence designed to perform a rather narrowly defined task and includes existing arrangements based on neural networks, such as the above-mentioned AlphaGo. While such systems undoubtedly can excel in the specific task for which they were programmed, and therefore can be helpful in simple DAOs, their utility becomes much more disputable if we consider their deployment as a base for a DAO performing a complex entrepreneurial project. In reality, such a project would take an artificially intelligent system consisting of many modules, each of them specialized in one particular task, which would have to be interconnected and able to interoperate so that a solution covering the project in its complexity is reached at the end. This might appear to be manageable in the near future but, as the next step, let us have a look into the functioning of the individual modules.

Writing an algorithm which manages to both perform its own individual task, and interoperate with other algorithms within the same system, requires the individual elements of its functioning (such as goals, means to reach them, rules of conduct, and criteria for decision-making) to be defined precisely enough to be capable of being expressed in a programming language. This, however, must be done by people and such a process may fail because of the discrepancies between imprecise everyday human language and exact mathematical language. Further types of bugs and problems may occur as well, many of them introduced unconsciously as a result of the programmer’s own imperfect point of view.

Further, as narrow artificial intelligence is based on statistics being performed on outrageous volumes of data, any such algorithm must be supplied with a sufficient quantity of relevant data to train itself, and further with relevant, real-time data to adopt its decision while in

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205 For example to play a desk dame.
206 A comparison with driving a car can be offered. “[D]riving is not one job. Driving is many jobs simultaneously. The machine-learning approach is great for routine tasks inside a fixed universe of symbols. It’s not great for operating a two-ton killing machine on streets that are teeming with gloriously unpredictable masses of people.” See Broussard (n 170) 133. Running a business may be seen as a similar case, save for the risks to life and health.
207 Cf ibid 88
208 Cf ibid 150 and the topic of algorithmic bias.
This is bound to result in two types of problems. Firstly, while many people tend to see data as a certain kind of objective truth, this concept is not really true as the vast majority of (if not all) data is, at least at root, socially generated, i.e. produced by people.\textsuperscript{209} This means that they bear an element of subjectivity, meaning that decision-making which relies on an algorithm processing large volumes of data is unlikely to remove all human imperfections from decision-making. Secondly, processing data by computers still has rather significant limits. While it appears self-evident that the algorithm must be supplied with relevant and sufficiently representative data to reach sound decisions, another important feature of such data may be easily forgotten: the data must be computable. \textit{Unless a factor is loaded into the model and represented in a manner a computer can calculate, it won’t count. Not everything that counts is counted. The computer can’t reach out and find out the extra information that might matter. A human can.}\textsuperscript{210} Those wise words can be further explained by going back to the example of artificial intelligence playing desk or card games.

First, it must be noted that most of those games have to the end deterministic rules throughout, in the sense that their rules allow for a limited (although sometimes very high) number of situations (draw, card combination, positions of stones etc.) to occur at a given moment. This is something that very seldom occurs in real life. Real life keeps bringing sudden, unpredictable situations and what happens next very often depends on subtle nuances of people’s behaviour, which cannot be counted or expressed in a deterministic way. As a result, some of the important decision-making factors which a human mind would have spotted and considered will inevitably be omitted by an artificial intelligence making decisions about the same thing - due to the fact that they are not computable.

Broussard explains the way tree-search-based algorithms fail if applied to social decisions using a rather simple model which is meant to calculate the statistical chance that a particular passenger involved in the Titanic maritime disaster would have survived. This chance is calculated based on computable properties of each passenger, such as gender, age, fare class, cabin number etc. However, it is well-known that more subtle, human-based,
factors such as the way the officer who was in charge of boarding the passengers into the lifeboats interpreted the “women and children first” command, as well as individual decisions about the self-rescue strategy of those who were not admitted to the lifeboats, in reality had huge impact on each individual’s chances to survive the disaster as well. However, the statistical model did not reflect them at all, as they are not computable.\footnote{ibid 95 - 119} For similar reasons, self-driving cars fail to operate properly on crowded streets, poor-quality roads or under limited visibility – there is too little relevant data to allow for a sound data-based decision or too many non-computable variables having a real impact on driving safety, which are omitted by the algorithm which determines the car’s movement.\footnote{ibid 139} It can be reasonably assumed that an algorithm which is designed to run a complex business will experience similar difficulties in dealing with non-standard or difficult-to-predict situations.

Apart from that, we can expect that there will be further challenges in the field of preventing mismanagement and increasing efficiency in business arrangements managed by algorithms. One of them is the rigidity of algorithmic decision-making. As already mentioned, advanced artificial intelligence is based on statistics and rapid-tree search. This technology, however, does not allow for approaching a problem from various perspectives, seeking new paradigms and inventing new solutions.\footnote{Roitblat (n 90) 16} It relies solely on processing huge amounts of data to estimate what is going to happen next and adjust its response in a way which brings the result defined as optimal by the programmer. In this context, it must be noted that all those decisions are based on already-existing (therefore past) data. Moreover, if a decision made this way fails due to particular settings of non-computable factors, the algorithm will not consider the same type of progression ever again, even if the non-computable factors change in the future.

This necessarily brings risks related to the data quality, completeness and relevance, especially if the algorithm mines the data autonomously from the Internet rather than being actively supplied therewith by a human operator or a human-controlled oracle. In particular, an algorithm may be unable to judge which data is still to be considered up to date with
regard to a given situation, or may filter inaccurate data, as well as necessarily omitting non-computable data. It may also be unable to deal with situations where a certain kind of data is unavailable or is only available in a volume which is not sufficient to allow a plausible generalisation. A wise human manager would probably seek consultation with, or advice from, a more experienced human in such cases, hoping to be given new perspectives on a problem they cannot resolve on their own. An algorithm will continue searching for more and more computable data and process those data the same way as usual, reaching an outcome which will surely be computationally correct in the context of the algorithm used for the computation but may be unlikely to meet the desired ends.\(^{214}\)

Further, there might be problems with revealing bugs and learning from mistakes. Human managers can provide elaborate and comprehensible reasoning for their decisions, including both computable (what data they used, how much weight each category of data was attributed, what the volume of the data was) and non-computable (which goals were competing, which of them was given priority and why, which experts were consulted, whether personal sympathy played role, whether interpersonal and intercultural context was taken into consideration and in which way etc.) and they are usually able to explain, step-by-step, the way they reached the decision (except of the cases when they simply followed their gut instinct). This allows for the decision-making process to be checked step-by-step methodically if there is a problem, or even in the course of preventive control (for example by a corporation’s supervisory body). Potential mistakes can be revealed, hopefully even before their consequences occur and their cause can be investigated so that the mistake is corrected on time (if possible) and avoided in the future. Advanced artificial intelligence cannot do the same.

As briefly suggested above, the decision-making process of a deep neural system cannot be reverse engineered, in the sense that people will be able to get an explanation of the way a particular decision was reached. This means that such a decision will not be capable of being

\(^{214}\) "The definition of insanity is doing the same thing over and over again and expecting a different result." Those famous words are usually credited to Albert Einstein, who undoubtedly would have had people on his mind as the agents of such conduct. Interestingly, a closer look may suggest that electronic agents can turn this principle upside down. By omitting non-computable factors, they may end up doing different things and expecting the same results unduly and reaching unsound outcomes to the end as well.
double-checked and any possible problems will only become apparent as late as at the
moment the consequences occur. This may seem marginal at first sight, as long as there is
no real-time human interference planned for DAOs anyway. But still, a second thought
should be given to this aspect. It has been suggested already that this will result in people
needing to believe in algorithmically-made decisions, but this does not mean that the
problem is purely psychological or philosophical. On the contrary, there will be practical
issues as well. In particular, this approach will limit the ability of the developers to reveal and
fix bugs in the existing code, as well as to learn from mistakes made in the past and avoid
them in the future.

Thus, while decentralized autonomous organizations represent an innovative concept of
business-running, their benefits from the point of view of reducing mismanagement and
inefficiency still appear to be subject to many limitations under the current state of the art.
In particular, only some of the factors which traditionally lead to mismanagement and
inefficiency in business corporations are capable of being removed by leaving the managerial
decision-making to an algorithm, rather than to people. Moreover, some such factors may
remain, although modified, or be even elevated to a new level, bringing new and possibly
unexpected challenges, or even completely new kinds of issues not previously known in the
world of human decision-making.

3.1.4 Dissolution Impossible: Old Wine Matured to Unexpected Dimensions

It has been seen that traditional legal entities (especially corporations) are, or should be, of
perpetual existence. This concept deserves further discussion when it comes to its
application on DAOs. Notably, the wording of ‘perpetual existence’, especially if combined
with the technological nature of DAOs, begs an rather automatic understanding that a
particular legal entity is expected to last forever. However, a closer examination will show
that the notion of perpetuity is to be understood as being only relative, meaning basically
nothing more than that when membership of existing members stops it does not

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automatically mean the entity ceases to exist as well. This can be concluded just from the fact that national jurisdictions usually provide both for procedures regarding voluntary or forced dissolution and winding-up of an entity and for procedures preventing an entity from being dissolved in situations when the general conditions for doing so are met but salvaging the entity and securing its recovery and continuation appears to be more desirable.

Indeed, the perpetual existence of an entity should be understood practically as a synonym for its separate legal personality and transferability of shares, meaning that an entity’s existence is not dependent on the existence and participation of any of its current members. In other words, an entity as a legal person will persist unchanged even if its members change over time. 216 This also appears to be the reason why some jurisdictions deal rather comprehensively with cases in which an entity loses some or even all its members unexpectedly. This will be dealt with later in a subchapter devoted to the notion of an entity’s membership and how it matches DAO membership. At this point, it needs to be pointed out that the laws regulating legal entities normally predict some cases, in which an entity ceases to exist. This may happen for various reasons, such as by virtue of law, upon a decision of a court or by a decision of the members. 217 While the particularities may differ from jurisdiction to jurisdiction, it can be concluded that the law may allow the members to wind up the entity if they agree that they do not want to continue its activity, as well as an entity being wound up involuntarily either because of a reason prescribed by the law 218 or upon a decision of the court. 219

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216 However, this rule is not free of exceptions. Depending on the jurisdiction, unlimited partnerships may occur with a legal personality whose existence is basically bound to the participation of the founders, cf, for example, Czech Corporations and Cooperatives Act, Ss 95-117. Those provisions relate to the concept of unlimited partnerships with legal personality in the Czech law. See especially S 113, which specifies the reasons for such partnerships being wound up or the articles of association being redrafted, including the death of a member.

217 For comprehensive material regarding dissolution and winding-up of an entity in the UK law see for example Nicholas Grier, Company Law (5th edition, Thomson Reuters 2020) Chapter 17.

218 Taking an example from the Czech law, a legal entity is dissolved when the time for which the entity was established has lapsed or if the entity has reached its goal, cf for example Czech Civil Code, S 168.

219 There may be various reasons for such decision being issued. Apart from the criminal-law sanctions, the law may further provide for subjects entitled to apply for an entity to be wound-up in civil proceedings, or for situations when the court must wind-up an entity even ex officio, cf for example Czech Civil Code, S 172 and Czech Corporations and Cooperatives Act, S 93.
Therefore, it should be understood as normal that a legal entity is bound to cease to exist at a certain time point and every entity which is incorporated should be prepared for this eventuality happening one day. The concept of traditional legal entities has developed well-working mechanisms regarding how to dissolve and wind up an entity over time, both on a voluntary and forced basis. DAOs may make some of the old and long-resolved problems of a corporation needing to be dissolved revive, especially if this should happen without the founder’s consent and before it has reached its goal. But even in such cases, deep roots of the problem may be identified, which may suggest how to approach it. In particular, even at the very beginning of so-far existing corporate law, situations used to occur when a corporation had to be dissolved without the founder’s consent and before it reached its goal. Using English law as an example, it might be interesting to mention a procedure reaching back to the times when corporations used to be founded by a royal charter and called *quo warranto*, which, as described by Phillip Stern (2017), is “*attacking the validity of corporations by accusing their governors of failing to live up to the terms of their charters or questioning the very validity or origin of the charter itself.*”\(^{220}\) This hasn’t always worked smoothly even in those long-ago times; again, Phillip Stern (2017) describes a case when “[f]amously, the Crown tried as early as the 1630s to recall the Massachusetts corporate charter via quo warranto, but was unable successfully to examine the charter, not least because the company, many of its leaders, and even the document itself had been transported across the Atlantic.”\(^{221}\)

The whole story might have appeared to be nothing but a piece of history for a long time. However, it still bears an important message which appears to be reviving and is notably relevant for any jurisdiction when we discuss DAOs as possible legal persons. While today’s companies usually get incorporated upon meeting the general conditions prescribed by the applicable law and filing the required documents with the competent authority, rather than on the basis of a sovereign’s charter, forced dissolution still remains an option in certain cases. This often happens as a result of corporate criminal liability or if the corporation stops


\(^{221}\) ibid
meeting legal requirements. And, although the option of deliberately moving the seat of a corporation to a jurisdiction which offers more lenient requirements how a business is run remains live, physical removal of corporate documents, assets and personnel from the reach of the national authority seeking dissolution of such corporation could hardly be sufficient to reach the goal described above. This is because today’s jurisdictions require copies of all substantial corporate documents to be kept by a registrar authority and can use instruments such as extradition and letters rogatory if the case requires an outreach to another country’s territory.

DAOs, on the other hand, appear to be generally rather safe from the risk of forced dissolution and therefore from termination of their legal personality simply due to their nature. Operating upon a distributed ledger infrastructure makes them intangible, practically unstoppable and impossible to localize, which may quickly return state authorities to the times of *quo warranto*. Of course, DAOs could be officially declared dissolved, which would make them cease to exist as subjects of law, but, at the same time, they could comfortably continue their factual activity as there might not be any other practical possibility to achieve dissolution in fact, such as removing the smart contract forming the DAO from the underlying database or otherwise physically forcing a DAO to stop operating. On top of that, there is a risk of DAOs equipped with advanced artificial intelligence emerging in the rather near future, and these may even autonomously replicate if they find themselves at risk of destruction.222 This would open doors to further issues on top of the difficulties of stopping/dissolving the original organization.

For the same technical reasons, DAOs running on a public blockchain may reach a stage in which they cannot be dissolved, even voluntarily. For example, if a sufficient number of the token holders are inactive, this may result in a situation in which the other members, if they decide not to continue with their activity, only have the option of abandoning the DAO and leaving it to run alone. This is not an ideal case, taking into consideration that common users

222 Cf LoPucki (n 7) 904-905.
may remain unaware of this fact and incur damage if they attempt to interact with such an abandoned DAO.\textsuperscript{223}

Therefore, but not only for those reasons, it appears highly advisable to search for suitable approaches to both voluntary and forced dissolution of DAOs, which are likely to be different from those which jurisdictions apply to traditional entities.\textsuperscript{224}

3.1.5 Finding a DAO’s Applicable Law and Jurisdiction: Mission Impossible?

Thinking about setting DAOs into the existing legal frameworks, the question of applicable law and jurisdiction cannot be avoided. While it is obvious that a DAO cannot sue or be sued unless it has legal personality,\textsuperscript{225} granting it legal personality would mean that DAOs could both sue and be sued. This raises the question of where emergent disputes should be heard. Contrary to traditional forms of business, which have been established for a long time, as well as having established procedural rules for determining applicable law and jurisdiction for disputes we must carefully consider whether we can find or establish usable rules for determining applicable law and jurisdiction regarding DAOs.

\textsuperscript{223} This could be compared with a situation when a traditional entity is in the process of winding up. In such cases, the law may, depending on jurisdiction, provide for a duty to inform the stakeholders, and even the public about the entity terminating its activity. This usually applies in cases when the entity ceases to exist without a legal successor and a liquidation (settlement of the entity’s property) is being performed, cf for example Czech Civil Code S 187-209; words “in liquidation” must be appended to the name of the legal entity under S 187 (2) in such cases.

\textsuperscript{224} One option may be, for example, the state making a bid to purchase the tokens from the users if the conditions for a mandatory dissolution of a DAO are met or a court decision on dissolution is reached. This way, the state could summon sufficient control over such a DAO to promote steps towards its wind-up. On the other hand, this would mean additional costs for the state with limited expectation of success – as the token holders may be anonymous, it might not be possible to take any steps with regard to those who are inactive or refuse to sell their tokens (such as expropriation). Additionally, an option to impose sanctions under criminal law on those who abandon a DAO may be considered, following the pattern of the existing criminal offence of “misuse of property” as known for example in the Czech law, cf zákon č. 40/2009 Sb., trestní zákoník (Czech Criminal Code) S 229. However, it must be noted that such an approach would be only of limited help as there is, again, a need to identify and reach the persons who were in factual control of the DAO at last.

\textsuperscript{225} This, however, does not mean that no legal personality for DAOs equals no jurisdiction around DAOs. It must be remembered that if the persons in control of a DAO (or similar arrangement) can be identified and served with the respective paperwork, a claim can be raised directly against those persons and jurisdiction shall be determined, if appropriate, with respect to such persons, as it was for example in Tulip Trading Limited (A Seychelles Company) v Bitcoin Association For BSV & Ors [2023] EWCA Civ 83, [2023] WLR(D) 62
International private law traditionally applies the notion of closest connection when determining applicable law and jurisdiction for a legal event. This has a strong geographic background, which complicates the whole question when DAOs are considered. The distributed nature of DAOs’ underlying technology means that any DAO cannot be localized unless this is possible based on individual circumstances. Similarly, it cannot be easily geographically determined where a smart contract was entered into, as well as where a malicious action occurred, which led to damage to a DAO’s user. This, however, does not automatically mean that its applicable law and jurisdiction cannot be determined. On the other hand, the only usable determinant is likely to be the location of the actual parties to the legal event, which unfortunately does not necessarily appear very helpful.\footnote{See Florence Guillaume, ‘Aspects of Private International Law Related to Blockchain Transactions’ in Daniel Kraus, Thierry Obrist and Olivier Hari (eds), \textit{Blockchains, Smart Contracts, Decentralised Autonomous Organisations and the Law} (Edward Elgar Publishing 2019) for elaborate example of the problems which may occur once we try to apply the traditional conflict-of-laws norms to blockchain-based arrangements and transactions. In particular, the authors explain why the closest connection principle does not seem to be very suitable for blockchain arrangements. However, those conclusions do not constitute an exceptionless rule and jurisdiction of a set of given court over a given case must be assessed case by case. Thus, if overall allowed by a given national conflict-of-laws rules, the possibility of proceedings being served out of the jurisdiction can be considered, as can be also illustrated by Tulip Trading case (n 221).}

The determination of applicable law and jurisdiction may differ from jurisdiction to jurisdiction based on the international private law norms applicable. It also depends on the particularities of the case. However, in general, it appears that finding the applicable law and jurisdiction for legal disputes regarding a particular DAO and its activities seems to be possible \textit{per se}. Reaching a fair judgment and being actually able to enforce it is, on the other hand, a different story, in which various factors are expected to play a role. Some of them will be discussed in later chapters of this thesis.

In general, it may be concluded that the overall state of the art with generally respected conflict-of-laws principles may not offer a suitable solution for determining the applicable law and jurisdiction for unregistered blockchain-based arrangements and it appears highly advisable for national jurisdictions to revisit their conflict-of-laws norms and to reassess whether they can be reasonably applied on blockchain-based arrangements, as well as to adopt any adjustments which might be needed.
From this point of view, it indeed appears useful to enable some kind of registration of DAOs so that the state of registration could be used to determine the jurisdiction for a DAO. This idea is not new and is not even dependent upon legal personality. Jurisdictions allowing for some kind of registration of blockchain-based establishments already exist, although not all of them have connected the registration of a DAO with granting them legal personality.\footnote{For example, Maltese law provides for a rather detailed system of registration of innovative technological arrangements, comfortably covering DAOs, but without granting separate legal personality to those arrangements. On the contrary, some of the U.S. states amended their corporate laws in order to accommodate DAOs as a variety of LLC.}

On the other hand, it should be noted that in order to make any kind of registration of DAOs a working instrument in the determination of jurisdiction and/or applicable law and subsequent enforcement of legal obligations against them beyond state borders, there must be at least a basic agreement on legal personality, or another kind of registration thereof being plausible. Otherwise, another problem may arise. While the principle of mutual recognition of companies, or other bodies corporate, is rather broadly spread when traditional legal entities are in question, it may be quickly undermined if there is a need to recognize decentralized or distributed autonomous organizations, due to their controversial nature. The key is a device called ‘\textit{ordre public}’ or, in English, ‘public policy reasons’. This principle of international private law is only meant to be used exceptionally. It allows a jurisdiction to avoid application of a norm of foreign law, which would otherwise be applicable under the conflict-of-laws norms or recognition of foreign decision, in cases in which such application or recognition would lead to consequences which are unacceptable with regard to basic principles of the law and social values of the jurisdiction in question.

It will be explained later that DAOs normally have a number of highly specific features which significantly interfere with some of the long-established principles of corporate law or with certain public-law regulations by which traditional legal entities must abide. It appears likely that a compromise solution, suppressing the full application of some of those principles, or providing a modified way of their interpretation, may be necessary to allow for DAOs to be accommodated in most legal systems. This does not necessarily have to be to the taste of all jurisdictions. Rather, some of them may insist on the strict observance of the principles in
question not being derogated from under any circumstances. This may mean more than the obvious; that such jurisdictions will be unwilling to introduce a DAO-suitable type of legal person in their own laws. A less apparent, yet not less important, level of the problem is that such jurisdictions may, for public policy reasons, refuse to recognize foreign blockchain-based entities which might be factually operating on their territory, or whose activities have effects occurring on their territory (such as harm incurred by a customer).

Thus, even though conflict-of-law norms would require the application of laws under which a DAO would legally exist and be capable of rights, obligations and legal actions, a particular jurisdiction may refuse to apply such law and treat the DAO in question as a non-person (for example as a thing). This is not a desirable outcome. On the contrary, international discussion and cooperation in handling blockchain-based profit-making arrangements seems needed, as DAOs normally operate in borderless cyberspace. The effects of their activities may occur in any jurisdiction, independent of the jurisdiction in which the DAO in question was established. The opposite, i.e. discrepancies resulting from some jurisdictions allowing DAOs to exist as legal persons, while others stubbornly refuse them, are likely to complicate the legal position of those who are meant to be protected by the institution of legal personality for DAOs: common users and originators or operators of DAOs.

3.2 DAOs without Legal Framework: Unauthorized Businesses?

The vast majority of jurisdictions leave DAOs without specific regulation, which might give the impression that DAOs are hanging in a legal vacuum. This is, however, far from true. In reality, a lack of such a specific regulation does not automatically equal a lack of law being present, and a detailed analysis will show that a number of existing laws are capable of covering DAOs, although this may not be always apparent at first sight and even though practical enforcement of such laws against DAOs and their originators and beneficial owners, could be difficult.

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228 At the time of drafting this thesis.
Thus, how should DAOs be approached by existing legal frameworks? One of the first ideas in such cases may be to apply the *praeter legem* principle and consider running DAOs as allowed, based on them not being expressly prohibited. A more thorough examination may, however, show that things are not necessarily so straightforward.

Firstly, it must be noted that the *praeter legem* principle is not unlimited. While it is, in a simplified way, explained as that what is not prohibited is allowed, it has a further layer in which some of the “allowed” activities are restricted. This means that they may only be performed within a certain legal framework. A typical example of such activity is entrepreneurship.

This is likely to be equally relevant for DAOs. While DAOs can be seen as a certain kind of gainful activity, i.e. they could be approximated to running a private business, it must be noted that many jurisdictions make running private businesses subject to an elaborate legal framework, including public law regulation and supervision by state authorities.\(^{229}\)

In general, anyone running a private business is likely to be obliged to comply with a set of public law norms regarding this activity. Typically, the law may provide for an exhaustive list of approved business forms, making illegal any other ways of running a business than those, which are expressly regulated.\(^{230}\) There might be also administrative duties such as holding a license for certain specifically regulated activities,\(^ {231}\) registration with the competent

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\(^{229}\) Returning to the example of the Binance group, it can be pointed out that one of the most serious problems realised by the FCA and therefore reasons for prohibiting Binance from performing regulated activities in the UK, is that crypto exchange cannot be effectively supervised, cf Jamie Crawley, ‘FCA Said Binance Had Complied With Its Requirements, But Was ‘Not Capable’ of Being Supervised’ *CoinDesk* (25 August 2021) <https://www.coindesk.com/markets/2021/08/25/fca-said-binance-had-complied-with-its-requirements-but-was-not-capable-of-being-supervised/> accessed 15 December 2021

\(^{230}\) Cf for example zákon č. 455/1991 Sb., o živnostenském podnikání (živnostenský zákon) (Czech Act on Conducting Business) or Czech Corporations and Cooperatives Act, which provide mandatory rules on running businesses by businesspeople and corporations, including an exhaustive list of the forms of private businesses.

\(^{231}\) This typically regards insurers, brokers, or traders with regulated goods, picking up from the activities which are likely to be performed via a DAO. Cf the notion of unauthorized company defined with regard to the insurance industry in Internal Revenue Service, ‘Internal Revenue Manual 4.42.6 Glossary’ (29 May 2002) <http://www.irs.gov/-irm/-part4/-irm_04-042-006.html> accessed 10 August 2020 as “[a] company not licensed to do business in a State.”
authority (business registrar, chamber of commerce etc.) or disclosure of annual accounts or annual reports in a prescribed form.\textsuperscript{232} Business-specific taxes may be imposed as well.\textsuperscript{233}

With DAOs not being broadly recognized as business corporations, there still might be (depending on the jurisdiction) an option of running a DAO as a tool which facilitates the business activity of a sole practitioner, unincorporated association or partnership. This, however, does not appear to be likely to be preferred by businesspeople, due to unlimited liability being too large a burden to be borne. Also, some of the legal duties relating to running a business under the existing law may be difficult to fulfil, or enforce, due to the specific nature of DAOs. Some of those questions will be discussed more in-depth later in this thesis.

For the purposes of this chapter, it should be noted that DAOs being left without tailored regulation may equal profit-making DAOs being made illegal, at least in jurisdictions which adopt elaborate regulation of operation of business. This is not a hypothetical issue. Indeed, there are jurisdictions in which running a business without registering with the competent authority is an offence, either under administrative law or even under criminal law.\textsuperscript{234} This should not impinge upon civil-law claims of those who may suffer damage in relation to a DAO’s activity,\textsuperscript{235} but it still may have interesting consequences when DAOs are in question.

On this point, one must be agree with Shawn Bayern (2015) that such a state of art constitutes a substantial limitation to the overall social potential of DAOs.\textsuperscript{236} Making certain activity illegal or, at best, leaving it in the grey zone, will undoubtedly discourage a high portion of people from initiating it, as well as others from engaging with such arrangements. In the case of DAOs it means that an innovative solution is being sidelined and has therefore

\begin{itemize}
\item \textsuperscript{232} Cf for example zákon č. 563/1991 Sb., o účetnictví (Czech Accounting Act), S 21a in connection with zákon č. 304/2013 Sb., o veřejných rejstřících právnických a fyzických osob (Czech Act on Public Registers of Persons and Legal Entities), S 66 (c)
\item \textsuperscript{233} Cf for example zákon č. 586/1992 Sb., o daních z příjmů (Czech Act on Income Tax), especially Ss 7 – 7b and Ss 17 – 21a
\item \textsuperscript{234} Cf for example Czech Act on Conducting Business, S 62 (1) (j) and Czech Criminal Code S 251
\item \textsuperscript{235} Cf for example Czech Civil Code, S 420 (note that the provision remains silent on the need for any permission or licence, meaning that what matters is the actual activity rather than a formal entitlement to perform it)
\end{itemize}
limited opportunities to prove its usefulness. On the other hand, there are practical issues both with providing DAOs with a tailored legal framework and with not doing so: adopting one or another option is likely to always be a compromise solution, leaving some questions unresolved.

Now, let us assume that a DAO without a legal framework constitutes running an unauthorized business in a given jurisdiction and briefly discuss what this would be likely to mean in everyday reality. The first and possibly most obvious idea is that anyone who is caught running a DAO can be punished. But while the existence of a DAO is likely to become apparent to the competent authorities at a certain time point, revealing and prosecuting the individuals who benefit therefrom may require enormous investigatory effort due to the anonymous nature of such an arrangement, with no guarantee that all perpetrators would be caught and/or that a reasonable portion of the illicit profit would be seized. A further logical consequence, which would be a court ban on continuation of the activity or a forced dissolution of such DAO, is then practically impossible to occur due to the distributed nature thereof. This is far from desirable, but would recognizing DAOs as legal entities truly provide a solution to this problem?

To find the answer, it is necessary to ask what the policy reason is behind laws regulating operation of business. In general, the main goals pursued by such regulation are, firstly, securing that businesses are run by people who are qualified to perform the subject matter of the business activity and, secondly, keeping a record of the existing businesses for inspection and tax purposes. Taking into consideration the nature of DAOs, it must be asked how such regulation could be enforced in everyday practice. For example, the question of qualification needs to be approached in a very different way as the activity in question is immediately performed by an algorithm rather than by a person. At first sight, it appears that the qualification of the programmers who wrote the algorithm should be assessed in order to secure that such activity will be performed to an acceptable professional standard. This is, however, unlikely to bring satisfactory results. In fact, it appears much more useful to audit the source code of DAO itself, which would, itself, bring

\(\text{Cf for example explanatory note to the Czech Act on Conducting Business.}\)
new challenges to the competent authorities. Similarly, any subsequent inspections would need to be targeted primarily on the functioning of the algorithm, while correction of any issues which might have been found by such an inspection would still be subject to the consensus of the participants, possibly without being capable of being effectively enforced by the authorities. Tax issues are far from uncomplicated either.

Further, it also must be considered that any sanctions (or even threat of sanctions) under public law should be in the *ultima ratio*, which means that they should only apply if there are no less intrusive means available to reach the same goal. In our case, it means that we should ask whether it is worthwhile, and in the best interests of society, to attempt to prosecute (or otherwise punish) all the founders and/or participants of any DAO even if such a DAO simply runs in a grey zone, without further serious breaches of the applicable law being committed, or whether other efforts should be made to protect members of the society from any harm which an interaction with a possibly dubious DAO may cause.

Further, the laws regulating business-running normally stem from centuries-old principles and most of them were drafted in times when either DAOs did not exist, or at least their social potential has not yet been so broadly discussed. At the current state of the art, it may be asked to which extent it is reasonable to maintain regulation, which is prohibitively difficult and expensive to enforce against DAOs. However, this question does not have to find a straightforward answer. Therefore, it seems to be reasonable to revisit the current framework of legal entities and try to identify the most crucial points in which DAOs may experience difficulties when trying to fit therein. On the assumption that there will be such points, a question emerges whether the law should adjust to the current development in society and whether recognizing DAOs as a new kind of legitimate business should find broader consideration by legislators in individual states or by the regulatory bodies at international level.
3.3 Concluding Remarks on Part 3

Artificial legal persons have always raised questions and issues even at the most general and conceptual levels of abstraction. Over time, existing law has developed relatively stable entity forms as well as mechanism(s) to deal with most of those issues to an extent which offers an acceptable level of balance between the benefits and risks. However, thinking about DAOs as about possible bearers of legal personality seems to require those questions being reiterated and answers to them being reassessed. This part looked at some of the general questions of collective socioeconomic units and legal persons and tried to set them in the context of the technological reality of blockchain-based arrangements. Special attention was paid to the idea that DAOs as a form of business arrangement have a potential to remove or significantly reduce the inefficiencies typical for human-managed entities. However, it has been shown that decentralization, and replacement of day-to-day human decision-making by a predefined algorithm, do not necessarily lead to the notorious imperfections of human-managed legal entities being removed. Rather, many of them are more likely to re-occur in a transformed and more intractable forms. Similarly, it can be concluded that the technological nature of DAOs is likely to aggravate traditional problems stemming from limited liability and collective responsibility. Further, it reintroduces a need to search for a working mechanism to protect of the minority participants and holders of dissenting opinion. Apart from that, certain difficult points of achieving justice and enforcing the law against legal entities on a general level have been reiterated to show that a new approach may be required in terms of certain legal mechanisms may be required to ensure that legal procedures which would work easily in traditional entities do not become redundant in DAOs. A specific problem was identified regarding the impossibility of localizing a DAO and to taking it under external control, which may impede the enforcement of the law against it, even if the law itself is settled.

Having considered those rather conceptual questions, it may have been enough to say that there are too many questions unanswered to think about a plausible legal personality for DAOs at the moment. However, a more particularized discussion about the key elements of corporate compliance and how DAOs fit into this framework, will still be offered in the next
part, to demonstrate that issues are likely to occur, not only at a conceptual level, where they may not be obvious, but also in the course of everyday practical functioning of DAOs as subjects of the law.

Part 4: DAOs as Legal Entities: What about Compliance?

4.1 Algorithmic Entities: How Might Existing Legal Entity Forms Fit DAOs?

This part aims to examine selected particularities of what challenges should be addressed if DAOs, as autonomous artificial systems, are to be recognized as legal persons, being seen as being on a par with traditional legal entities, such as corporations or foundations. The points selected for discussion include practical questions related to the aspects of such arrangements which relate to a status of a legal entity. Those start with what type of a legal entity (if any of the known ones do so) fits the concept of DAO. Also, going from notions such as corporate membership or corporate governance in the context of DAOs, to specialist elements of corporate compliance, such as legal capital requirements, identifiability of stakeholders and even the mere procedure of incorporation, which seem to be likely to bring unexpected and sometimes difficult issues, if underlying laws are applied to DAOs. The final chapter of this part then discusses the notion of meaningful human control over an electronic agent and its possible use as a basis for setting up a standard for token-holder engagement in DAOs. This will all help us to discover certain hidden aspects of the functioning of DAOs and put them in the light of the existing general regulation applicable to legal entities. I will also seek an answer to one of the crucial questions around granting DAOs legal personality: can we reasonably cope with the practical demands, risks and costs of DAOs being artificial legal persons?

A certain amount of specialist work has been already done especially in the area of searching for a suitable entity form for DAOs, in which the works of Shawn Bayern appear to represent particularly outstanding examples. Some of Bayern’s ideas will be used here as stepping
stones for discussion about the extent to which the existing legal entity forms are suitable to accommodate DAOs.

Bayern basically follows the definition of legal personality as the capability of having a certain set of rights and duties and argues that certain types of existing legal entities may serve as legal containers for autonomous systems designated for the pursuit of profit-making purposes. This means that they might accommodate (among others) DAOs. However, my research suggests that Bayern’s construction of autonomous systems inhabiting any existing type of legal entity either makes use of loopholes in existing law, or leaves the autonomous system as a mere tool in the hands of shareholders or managers.

Various questions emerge in this context, not all of them finding satisfactory answers. I offer a brief critical discussion of some of Bayern’s ideas, which appear to be particularly important in the context of discussing whether DAOs can be encapsulated in some of the current legal entity frameworks. Following up on this, I will try to explore if a self-contained and systemically plausible construction of legal personality for DAOs can be considered.

Further, we must keep in mind that Bayern’s ideas primarily follow the U.S.-American point of view, which is, in many aspects, different from what we can find in European jurisprudence. This leads to certain difficulties in understanding the core ideas. However, it should not automatically be seen as being to the detriment of the usability of Bayern’s work for Europe-based lawyers and stakeholders as it, on the other hand, exposes some particularly thorny points which may be relevant for the discussion on mutual recognition of legal entities in the international space, as well as on many further questions regarding enterprising in the international framework. All that needs to be done at this point is to keep


239 At this point, it must be clarified that Bayern understands the notion of an autonomous system broadly and his interpretation does not distinguish much between centralized and decentralized autonomous systems. In fact, such distinction is of low importance for Bayern’s own work. However, in the context of this thesis, we must keep in mind that while most of the arguments which are valid in terms of discussion about legal personality for centralized autonomous systems apply to decentralized autonomous systems as well, although decentralized autonomous systems entail additional issues which require further in-depth discussion. For another detailed discussion of the idea of the currently legal entities serving as legal containers for autonomous systems see also LoPucki (n 7) who, again initially without distinguishing between centralized and decentralized algorithmic entities, follows up on Bayern’s work and points out certain risks of legal personality of autonomous artificial systems.
in mind the differences between the U.S.-American and European principles of organizational law.

In the European legal environment, three important aspects must be taken into consideration when taking inspiration from Bayern and discussing to which extent the current legal frameworks can accommodate DAOs as legal persons.

Firstly, there might be objections to Bayern’s statement that a business corporation “can act legally without ongoing intervention by individual people.”\(^{240}\) This is not a universal truth, as can be shown by examples from some jurisdictions which consider legal entities as legal persons with no or limited active legal capacity. In such cases, the legal entities need to be represented by natural persons having full legal capacity.\(^{241}\)

Secondly, Bayern operates with the idea of a ‘memberless entity’. While it is true that certain jurisdictions leave room for memberless entities, as described by Bayern, this occurs for specific reasons which need to be taken into account and the sense and purpose of respective legal provisions must be examined and discussed before a conclusion is made that certain jurisdiction allows for memberless entities. This will be discussed later in a more detailed way to show that this legal instrument appears to be more of an emergency solution, which protects an entity from automatic dissolution in case of unpredictable loss of all members, rather than something a legislator intended to allow to exist permanently.

Thirdly, legal entities are traditionally established by people and in order to support people in achieving certain goals. Therefore, we might think it is generally a good idea to keep them under human control. A legal entity consisting purely of an autonomous electronic system might, apart from other issues, cause serious concern in its contact with individuals and human-managed entities (as suggested above by the example of AlphaGo).

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\(^{240}\) Bayern (n 225) 96

\(^{241}\) This can be concluded from the respective provisions of national laws which regulate the legal status of persons, while wordings such as ‘act on behalf of an entity,’ ‘represent an entity,’ or ‘substitute the will of the entity,’ suggest that an entity is meant to be a person without its own active legal capacity, cf. Czech Civil Code, S 151, for outside-of-Europe for example see Ley General de Sociedades Mercantiles (Mexican General Law of Corporations), Art 10.
In all cases, further discussion on the topic appears to be necessary. While Bayern’s remark that granting legal personality strictly by the force of law seems to be rather slow when it comes to autonomous artificial systems\(^\text{242}\) appears to be true, this should not be automatically considered harmful in this case. As DAOs, once set in operation, are practically unstoppable, the ‘marry in haste, repent at leisure’ principle applies here with the highest level of urgency, as well as and a slower and more thoughtful approach, enabling legislators to weigh thoroughly the advantages and disadvantages of granting autonomous systems legal personality, may even pay out in the end.

Yet Bayern himself admits that most traditional legal entities would face serious problems in attempting to accommodate an autonomous artificial system as a legal person.\(^\text{243}\) Some of them are of a more general nature and do not need to be necessarily bound to one specific jurisdiction.

For example, there are usually some statutory requirements for the establishment and functioning of legal entities. The details thereof vary from jurisdiction to jurisdiction but in general, we can say that many jurisdictions provide for a rather rigorous set of rules about how, and by whom, an entity may be established and what it must do in the course of its existence. As will be shown by examples presented below, it appears doubtful whether those requirements can generally be reasonably met, or enforced, if the entity in question consists of an autonomous system only. This means that many jurisdictions may need either to give up or significantly modify the interpretation of some of the very basics of their statutory regulation of legal entities, or set up a robust framework of requirements of minimum human involvement in autonomous-system-based entities in order to be able to accommodate DAOs.

In this point, common law systems may take advantage of their greater flexibility compared to civil law systems. However, even if we find organizational laws do not prohibit an entity from being operated in such a way, we still must ask whether such operation complies with

\(^{242}\) Bayern, ‘The Implications of Modern Business–Entity Law for the Regulation of Autonomous Systems’ (n 236) 110

\(^{243}\) ibid 96-97
the sense and purpose of the laws (rather than just with their mere wording) and how it fits into the general legal framework.

Bayern himself appears to be avoiding the question of advantages and risks of autonomous systems as legal persons, focusing fully on trying to open doors to allow them to be legal persons in the existent frameworks. I will add this point of view, reflecting as well some of the thoughts of Lynn LoPucki (2018) and addressing this topic with equal emphasis, finally reaching back to one of the key quotes of Bayern’s work: “A regime that refuses to recognize autonomous systems at all may, similarly, limit the social potential of such systems.”

Following this, I try to emphasise the need to discuss what kind of social potential (good or bad) will prevail in the operation and regulation of DAOs. Indeed, DAOs are a certain kind of innovative way of entrepreneurship, which can bring some progress to the overall economy, maybe even comparable to how Rockefeller’s business trust did some years ago. Thus, while a strict refusal of DAOs may build hurdles to innovation and progress and sound overall rather obscurant, embracing them should be a well-thought-through step either.

This topic has at least three main dimensions. Firstly, we should ask whether admission of DAOs as legal persons is possible, plausible, and desirable within a particular jurisdiction. In this regard, we can assume that, due to their nature, DAOs cannot fully comply with the existing law applicable to the legal entities in many jurisdictions without compromising on at least some of their own underlying ideas, and are also more difficult to police, at least in some aspects. This means that if we think about granting DAOs legal personality and allowing them to exist and operate as legal entities, we must also think about rather complex adjustments to be made to existing law so that compliance is technically possible for DAOs, as well as effectively enforceable against them. However, one must carefully weigh whether such adjustments are reasonable in the broader context of a well-governed society and what their risks are with regard to other generally respected principles and interests.

244 ibid 96
Secondly, we cannot automatically suppose that if some jurisdictions adopt such changes and allow DAOs to become legal entities, other jurisdictions will share their approach, which may raise questions regarding the principle of mutual recognition of legal entities among independent jurisdictions. This has been mentioned before but remains an important point which deserves to be kept in mind.

The third aspect looks more at the social and policy sphere than into the mere letter of the law. We must ask why individual states would (or would not) like to promote DAOs by granting them separate legal personality. One of the best audible arguments supporting separate legal personality for DAOs may be attracting investments and innovators by providing a safe legal environment for new entrepreneurial arrangements. However, this may be a double-edged sword due to the nature of DAOs, especially the more complex ones, and the possible broader socioeconomic impact of their deployment.

4.2 DAOs in Europe and Beyond: EU Corporate Law as a Possible Stepping Stone for the Upcoming Discussion in Europe and what Other Jurisdictions Have to Add-On

Over time, first experiments with legal personality of DAOs and similar blockchain-based arrangements have been brought in practice in the U.S. Indeed, the modern U.S. law of legal entities shows a high level of flexibility, which seems likely to allow for accommodation of new ways of entrepreneurship, with fewer changes to existing law being necessary, although some of the suggested, and even practically implemented, solutions may appear disputable.245 The situation appears to be more complex in Europe, but still, a certain amount of effort at legal recognition of DAOs is also visible in the European legal environment. This will be reflected in the further text, using, among others, some of Bayern’s ideas summarized above and it will be discussed about the extent to which existing legal entity forms are suitable to accommodate DAOs.

Malta, Estonia, and Lichtenstein, to mention the most significant examples, are known for having approached blockchain-based models of entrepreneurship more concretely and have

245 Bayern, *Autonomous organizations* (n 6), especially Chapter 4
promulgated laws which aim to provide a certain level of specialist regulation in this field. Most of those laws, however, appear to be rather itemized pieces of legislation which do not cover DAOs in their entirety. On the other hand, the impact of those laws cannot be limited to the territory of the respective states, mainly due to the country-independent nature of DAOs. Therefore, a more comprehensive discussion at the EU level (rather than at the level of individual Member States) may appear advisable, so that the legal approach to DAOs gets unified. Further, because DAOs appear to be some kind of business arrangements, it appears to be useful, in order to establish their possible legal position in the European legal environment, to think about DAOs in the context of the EU Company Law, as well as in the context of the Company Law of selected European jurisdictions or even other jurisdictions in which the Company Law stems from European roots.246

In general, EU Company Law is meant to serve principally the purpose of enhancing and facilitating the practical functioning of the unified common market, by providing a harmonized legal framework for setting up and running companies in and beyond the Member States, so that services, innovation and creativity can move freely.247 However, for the purposes of this thesis, it will serve mainly as a source of inspiration and a helpful tool to explain certain thorny points of legal personality for DAOs from the point of view of the sense and purpose of the existing legislation in Europe.

EU law, as well as laws of individual jurisdictions whose roots reach back to Europe, offers a broad range of both existing and draft legislation regarding traditional legal entities. This may serve as a valuable source of inspiration, in terms of what the intentions of the EU  

246 The specific situation of the UK at the time of drafting this thesis must be noted at this point. With Brexit having taken place in 2020, the UK ceased to be an EU member state. However, this does not automatically mean that all EU-based norms stopped applying as of the date of the end of the transition period. While directly applicable EU regulations clearly do not apply after 31 December 2020 (unless specifically retained), it must be noted that there remains a significant amount of EU-derived legislation (such as national laws implementing EU directives), including in the field of Corporate Law, which will remain applicable until revisited by the UK legislator. Apart from that, it must be noted that many pieces of EU directly applicable legislation (not necessarily limited to corporate law) affecting legal entities may continue to apply even to entities settled outside the EU’s territory as long as operations performed within the EU territory are concerned or as long as EU citizens are affected.

legislator or in terms of the common point of view in Europe regarding legal entities were and are. It may possibly even provide an implicit answer to the question of whether individual states should (rather than technically could) allow accommodation of DAOs into the existing frameworks of legal entities (as suggested by Bayern). Taking this into consideration, it must be, on the other hand, noted that while the general background tends to be comparable among the discussed countries, there are many particularities which differ from country to country and relevant questions should be judged from the perspective of both EU and respective national jurisdictions, as appropriate in an individual case, to reach a plausible answer when examining whether in a given jurisdiction DAOs could and should be seen as a type of legal entities.

To start with the mere definition of a legal entity, it must be noted that even this may differ among jurisdictions. There may also be different opinions about this in the field of jurisprudence. An interesting example, originating from Malta, is represented by Ganado, who states that “every known legal entity is an artificial artifact that is defined by the assets over which it can unilaterally and autonomously exercise command and power.”\textsuperscript{248} Such a definition could easily cover DAOs. On the other hand, it might not fit in many civil-law jurisdictions, as those may adopt a more diffuse model, dividing legal entities into corporations (defined by persons they consist of) and foundations (defined by their assets),\textsuperscript{249} distinguishing various types thereof in each of those two big branches. In the civil law model, Ganado’s definition would only cover foundations in the broadest sense, while corporations would basically be left out. While there is no unanimous opinion on how the current definition of legal entity might cover DAOs, many pieces of legal regulation can provide examples worth further consideration in a search for one.

In the context of EU Company Law, some of the types of entities (particularly the “European” ones) are hard to imagine as legal capsules for DAOs. On the other hand, their regulation (even in draft or even proposed but eventually not adopted) provides a number of examples

\begin{footnotesize}
\begin{enumerate}
\item Cf Czech Civil Code, S 201 and S 303
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of unified and comprehensive pieces of EU company law or samples of EU thinking about company law which give a rather holistic picture of what the EU legislator understands as the most important elements of the notion of an entity. For instance, the withdrawn SPE Regulation Proposal\(^2\), as well as the withdrawn SUP Directive Proposal,\(^3\) may serve as an inspiring source of European-wide understanding of the basic features of private limited liability companies, while the SE Regulation\(^4\) can serve the same purpose with regard to public limited companies. Analogically, the withdrawn FE Regulation Proposal\(^5\) can be used as a source of Europe-wide understanding of the core notions of the concept of a foundation.

4.2.1 Members and Shareholders as Owners of any Business

Members and shareholders are one of the crucial features of traditional corporations. Those notions describe subjects (either natural persons or legal entities) which own a portion of a corporation. Under normal circumstances, all companies have members, while members of companies which issue shares are called shareholders.\(^6\) Although the requirements on who may be a member or a shareholder of a corporation may differ among jurisdictions and some jurisdictions may apply stricter regulation on members than on shareholders, those notions will not be strictly distinguished from each other for the purpose of this thesis, as the important question lies elsewhere: how the traditional notion of a member or shareholder (in more general terms: company owner) fits those who launch or benefit from the operation of a DAO.


\(^6\) See Grier (n 217) 3
Among other matters, the SPE Regulation Proposal defines who may be a company’s member or shareholder, taking into account natural persons, companies or firms under Article 48 of the EC Treaty. A European Company, a European Co-operative Society, a European Economic Interest Grouping or another European Private Company as possible founders (and subsequently members) of a European Private Company. A founding member, as well as any other person whose name is entered in the list of shareholders which the company is obliged to keep, are understood as members of a European Private Company. It also suggests that any such company should have at least one member, as the proposed Article 23 (2) provides (among others) that a European Private Company must have at least one issued share at any time. Similarly, the wording of Article 3 (2) of the SE Regulation suggests that an SE, and presumably also public limited companies, should always have at least one shareholder.

Some national jurisdictions take into consideration that there may be situations in which a company loses all members and that an automatic cessation to exist may not always be the best solution. However, this is not an exceptionless rule and also should not be automatically considered as an authorization for a memberless entity to be left in operation. Examples of such situations will be discussed further in this chapter. In general, it may be concluded that allowing an archetypal DAO to be a corporation, judged by existing measures may lead to difficulties regarding meeting the requirements on the member structure, at least from the European point of view.

4.2.2 Memberless Companies as Potential Legal Containers for DAOs: Good Idea with Troublesome Results

Getting back to basics, it should be noted that the idea of a memberless company is hard to justify in itself, given the meaning of the word ‘company’. Originating in Latin, the word comprises of the prefix *cum-* (Latin for ‘with’ or ‘together’) and the noun *panis* (Latin for

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255 Treaty Establishing the European Community (Nice consolidated version) [2002] OJ C 325/1
256 See Commission of the European Communities (n 250), Chapter 2 of the Explanatory Memorandum
257 See ibid, Art 2(1)
‘bread’). Thus, companions, or members of a company, were originally understood as people who share bread with each other. This corresponds with the idea of company members being obliged to make their decisions for the good of the company and perhaps gives a feeling of oddity to the relatively construction of a single-member company at the same time. On the other hand, single-member companies are still not difficult to imagine, similar to imagining a selfish person not sharing their bread with anyone and keeping, storing and consuming it all on their own. Common sense and feeling can, however, suggest that such behaviour is far from optimal, which might have been, although subliminally, a reason why companies traditionally had to have more than one member.

Nevertheless, single-member companies have become allowed in many jurisdictions in order to accommodate the reality of socioeconomic development, which is explained in another place in this thesis. Thus, the idea of doing the same with memberless companies in order to help DAOs and similar technology-based economic units to thrive may seem rather logical. But, on a second thought, we can conclude that, compared to single-member ones, zero-member companies seem to be a different kind of story. To go back to the bread metaphor, if there is a loaf of bread but nobody to interact with it, how would it make sense to still think about a company? Similarly, it seems difficult to understand memberless companies as the next step in the same evolutionary pathway as what gave rise to single-member companies. Rather, a different approach seems to be needed.

Indeed, the idea of a memberless company seems somewhat odd for rather deeper reasons, not all of them being easily palatable from the perspective of supporting innovative ways of running a profitable activity. In terms of modern company law, it may be noted that while some jurisdictions expressly prohibit memberless companies, usually by prohibiting an entity from acquiring all its own shares, others may, expressly or implicitly, allow companies to be memberless, at least for a certain period of time. A remarkable example may be found in German corporate law, more particularly in the German Limited Liability Companies Act, which appears not to prohibit memberless companies. Indeed, while strict conditions under

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258 Cf Gesetz vom 6. März 1906, über Gesellschaften mit beschränkter Haftung (Austrian Act on Limited Liability Companies), S 81
which a limited liability company may acquire its own shares are provided for by German law, no provision which expressly prohibits a limited liability company from acquiring all its shares (of course, in the way provided for by the law) is present. On the other hand, no clear answer is available to the question of what should happen with such a company if the condition persists for a prolonged time period. Shawn Bayern and others (2016), when discussing memberless companies as possible legal shells for DAOs, offers, among other, complex academic discussions on this topic, which draws the conclusion that this might be a way in which German corporate law could finally accommodate DAOs. I would not fully agree with this.

For example, while acknowledging that establishing a zero-member LLC is not allowed by German law, Shawn Bayern and others (2016) argues that this “does not prevent an existing single-member limited liability company to “lose” its only member, for example by an acquisition of its own shares, by testamentary succession, or by a forfeiture or redemption of its shares. As a consequence, the existing GmbH would potentially transform into a memberless company — that is, a company without any natural persons as members, but which could well serve as a shell for an autonomous system.” While seeing some problems in the actual absence of a functioning decision-making body in a memberless entity directed by an autonomous electronic system, Bayern finally concludes that the German law “presents the possibility of an autonomous system exercising some or all the elements of legal personhood through the vehicle of a memberless limited liability company.”

This opinion does not appear to be astray. Ganado, following his own definition of a legal entity, asks: “If assets that are controlled and organized in arbitrarily complex ways by an artificial legal entity, which was created for the benefit and for the convenience of society to deal with it, what prevents recognizing that the controlling entity can actually be a software artifact that acts autonomously with self-sufficiency, and exercises unilateral power over those assets, keeping in view the purposes and the standards expected for governance and

259 See Gesetz betreffend die Gesellschaften mit beschränkter Haftung (German Limited Liability Companies Act), S 33
260 See Bayern and others (n 73) 142
261 ibid 140-141
262 ibid 143
compliance? Trying to answer this question as it is, we could easily reach the answer, ‘nothing’. However, analysing the question itself shows another question to ask: Is a legal entity always created for the benefit and convenience of society? Or is it rather created for the benefit and convenience of a closed group of persons? While it appears that the notion of legal entities was invented to facilitate business-running and other activities which ultimately serve the benefit and convenience of society as a whole, a particular entity is normally established for the benefit and convenience of those whose activities it should facilitate.

Focusing back on the example of memberless entities in Germany, if the respective regulation is understood in the overall context of German corporate law, as well as in the context of the concept of private companies in the EU legislation and the corporate law of some other EU Member States, the non-prohibition of acquisition by a limited liability company of all its own shares should not automatically be deemed to equal permission to create a perpetually memberless company, which is suitable to accommodate autonomous electronic systems as limited liability companies. While there appears to be no unified opinion on whether memberless companies should be allowed to persist for prolonged time periods, a closer examination below will show that their existence seems much more like an exception for emergency cases. A small amount of flexibility is thereby left to judges by the legislator, so that limited liability companies losing all their members may be judged case-by-case so that they do not have to be automatically dissolved when a more suitable solution might be available. However, they are not an empty legal container to be filled with newly invented constructions in the future.

In support of what is stated above, an example can be found in Czech law of a more elaborate approach to the same issue. In general, Czech law only allows corporations to acquire their own shares if expressly allowed by the Czech Corporations and Cooperatives Act. Section 149 thereof provides for particular conditions under which a share of its own

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263 Ganado (n 248)
264 Cf Solaiman (n 69) 164
265 Bayern and others (n 73) 141-142
266 See Czech Corporations and Cooperatives Act, especially S 33
may be acquired by a limited liability company (excluding acquisition by an agreement on share transfer!) and also specifies detailed conditions about the further treatment of such shares. Interestingly, Czech law even foresees the possibility of the acquisition of all its shares by a limited liability company. In such cases, however, the managing director must take care to transfer at least one of the shares to a third party within three months of the acquisition of the last share. If this does not happen, the competent court shall dissolve the company even ex officio.

Public limited companies, also called stock corporations, seem to follow similar patterns, with the main difference being that their shares may be publicly offered and traded. Also this corporate form can be meaningfully discussed as a possible legal container for DAOs, especially with regard to the fact that tokens offered in Initial Coin Offerings of DAOs may be recognized as securities in some jurisdictions and therefore can be seen as a cyber-alternative to traditional stock/shares, if they share the key features with them.

Seeking inspiration in existing EU legislation, it appears that the idea of a shareholderless public limited company does not appear very plausible in the European legal environment either. This can be demonstrated by Article 60 of the Directive (EU) 2017/1132, which allows Member States to “permit a company to acquire its own shares, either itself or through a person acting in his or her own name but on the company's behalf.” Notably, the wording of the provision suggests that the decision on whether to allow for the acquisition of even a portion of a public company’s own shares is left on each Member State and therefore it cannot be expected that such a permission is a Europe-wide standard.

Moreover, while many jurisdictions make use of this permission, there are specific rules which must be followed by such acquisition. Also, while the Directive contains no prohibition

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267 On the other hand, it should be noted that this is not necessarily a one-to-one analogy, cf Benjamin Sherry, ‘What Is an ICO?’ Investopedia (16 January 2018) <https://www.investopedia.com/news/what-ico/> accessed 22 July 2021, which warns that “unlike an initial public offering (IPO), investing in an ICO won’t result in you having an ownership stake of the company you’re giving money to. You’re gambling that the currently worthless currency you pay for now will increase in worth later and make you money.”

268 Cf for example Timothy Nielsen, ‘Cryptocorporations: A Proposal for Legitimizing Decentralized Autonomous Organizations’ (2020) 2019(5) Utah Law Review 1105 accessed 5 February 2021 1112, this topic will be given specific attention in the subchapter devoted to capitalisation of DAOs.
of all own shares being acquired, some of the requirements appear unlikely to be met when all own shares are acquired. Apart from that, there are some jurisdictions in Europe (not exclusively in the EU) which have decided to expressly prohibit public limited companies from acquiring all their shares.269

4.2.3 DAO Membership as a Specific Notion Bringing Specific Problems

As it may be disputable how the notion of membership as understood by traditional corporate law, i.e. a share of the company’s ownership, could apply to DAOs, it also appears interesting to ask who could or might be considered as a member of a DAO or what the notion of DAO membership means at all. The following ideas aim to find parallels between members of a traditional corporation and those who operate a DAO, or benefit from its operation in some way. Grey literature regarding some existing DAOs shows that the notion of membership is known in the field of blockchain-based establishments and finds meaningful usage.270

In this context, it must be noted that every DAO has been created and set in operation by somebody and that usually, there are people profiting from its operation most of the time, although those people may not be reasonably identifiable in certain circumstances. On the other hand, as there is no broadly acknowledged legal definition of a member available for DAOs, the definition will largely depend on the creators of a DAO. Therefore, it is useful to examine how the blockchain community understands membership of a DAO.

The Blockchain Council271 describes the principle of DAO membership as ownership of one or more tokens, which are, on a factual level, shares in a DAO. In terms of a DAO, each member

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269 Cf Bundesgesetz betreffend die Ergänzung des Schweizerischen Zivilgesetzbuches (Fünfter Teil: Obligationenrecht) (Swiss Act on Amendment of the Swiss Civil Code (Part Five: Law of Obligations), S 659 or Companies Act 2006 (UK), S 690
270 Cf. For example, websites of some existing DAOs, such as Espeo Blockchain, see https://espeoblockchain.com/blog/decentralized-organization or Moloch DAO, see https://www.molochdao.com/, which operate with the notions ‘member’ and ‘membership’.
is represented by an address and there is no limitation on who or what may own or control the address. This means that not only persons but also automated systems, such as bots or other DAOs, may hide behind such an address. This, of course, constitutes an issue if we think about ownership of such an address in legal terms, as some of the “address owners” can, in reality, be items without their own legal personality. The people, or entities, which set them in operation, and are responsible for them, may not always be easy to identify.

Moreover, there is usually a small group of persons who have a more significant influence on the actual running of a DAO, such as the blockchain developers maintaining the underlying infrastructure, programmers developing and maintaining the actual code of the respective DAO (if relevant), or even owners of the core computing capacities. While those persons do not necessarily have to cooperate in real time, or even know each other (especially not beyond their own group), their factual impact on establishing, maintaining and running a DAO is so significant, that they practically create a group of supermembers (to be distinguished from the ordinary members, i.e. the token holders) and might be even roughly compared to the founders of a PLC, even if no articles of association are present which such persons would sign. Thus, those supermembers can remain anonymous, making their chances of escaping liability much higher than those of the founders of a traditional company would have.

It may be further disputed whether and if, then to what extent, token holders can provide decisional input to a DAO, which may be seen as one of the core features of a member. This depends on the features of the token they hold. Timothy Nielsen (2020) describes a division of tokens into native tokens, issued on the relevant blockchain layer and preserving the underlying incentive system, and tokens issued on a sidechain, i.e. on the application layer overlaying the native blockchain layer, not necessarily being connected to that incentive system, rather representing entitlements such as voting rights, ownership rights or claims to real assets.

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273 Nielsen (n 268), 1109
This might provoke an idea of owners of the native tokens only being understood principally as members, while the owners of the tokens issued on a sidechain could be seen as the common users. On the other hand, Nielsen himself prefers, for the purposes of his work, to use the term “token” for the tokens issued on a sidechain, rather than for the native tokens, which might suggest that the owners of tokens issued on a sidechain should be understood as the current members, while owners of native tokens represent either the founders, or mere providers of infrastructure. In all cases, there is no clear answer to the question of whether all token owners, or only selected groups of them, should be understood as members of the respective DAO.

Notably, existing law has been dealing with this question at various levels. Authorities in various countries who are competent to exercise oversight over securities markets have issued case law and guidance on blockchain tokens being treated as securities, from which one may infer the circumstances in which they can be considered an equivalent to company shares. The first laws providing for blockchain-based LLC forms presume those entities have members and offer legal definitions of membership of a DAO, while there are at least outlines of the notion of DAO membership being taken into consideration in states which have already decided to treat DAOs as companies.

Thus, examining the Wyoming Decentralized Autonomous Organization Supplement, a specific law enabling incorporation of DAOs in the U.S. state of Wyoming (see also below), we can derive the definition of a DAO’s member from the legal definition of membership interest, which is “a member's ownership right in a decentralized autonomous organization, which may be determined by the organization's articles of organization or operating agreement or ascertainable from a blockchain on which the organization relies to determine a member's ownership right. A membership interest may also be characterized as either a digital security or a digital consumer asset as defined in W.S. 34-29-101, if designated as such in the organization’s articles of organization or operating agreement”. Therefrom we may

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274 ibid
275 Some details thereof are discussed below in the subchapter 3.2.5.
276 W.S. 17-31-101 through 17-31-116
277 W. S. 17-31-102 (a)(6)
conclude that a member is a holder of a certain type of blockchain token related to the DAO in question, unless the articles of organization or operating agreement provide for another definition thereof.

Comparably, the Blockchain Act adopted in the U.S. state of Vermont uses the term “participant”, which is defined as “(A) each person that has a partial or complete copy of the decentralized consensus ledger or database utilized by the blockchain technology, or otherwise participates in the validation processes of such ledger or database; (B) each person in control of any digital asset native to the blockchain technology; and (C) each person that makes a material contribution to the protocols.” This describes well the core groups of people involved in running a DAO. On the other hand, it substantially exceeds the traditional notion of a member or shareholder of a company. Further work with the notion needs to be carried out.

4.2.4 Foundations as Most Suitable Legal Shells for DAOs?

Foundations, as understood by the civil law systems, follow a different pattern from corporations, having their core in assets rather than in persons. This makes the idea of a DAO being a foundation easier to imagine, as there are usually no obstacles to a computer program being the core (or even only) asset of a foundation. While such an idea seems basically imaginable, a cautious approach is advisable for several reasons.

For example, the traditional notion of a foundation still relies on the involvement of people, even though this takes place on the level of governance, rather than on the level of substance. This would mean that the form of a foundation would only be suitable for DAOs with a high level of active participation of the membership-token holders.

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278 State of Vermont Blockchain Act S 4172 (2)
279 Cf Czech Civil Code, S 303, outside of Europe also for example Indonesian Foundation Law No. 16/2001 dated August 6, 2001, Art 1(1) or Taiwanese Foundation Act, Art 2 (1). For more comprehensive discussion of the legal status of foundations in European legal environment see for example Chiara Prele (ed), Developments in Foundation Law in Europe (39, Springer Netherlands 2014) It should be noted that wordings such as “is established with property” or “consists of property” appear regularly among jurisdictions.
Plus, as foundations have no members in the sense of owners of a share in the entity, they logically cannot serve a common goal pursued by the members, as corporations do. Rather, they normally serve purposes which result in some kind of social benefit. Nevertheless, foundations can usually conduct business under conditions provided for by the applicable law. On the other hand, as they are meant to serve main purposes other than profit-making, some jurisdictions restrict the way foundations use their profit, or prohibit them from having profit-making as their only objective.\footnote{280} This may constitute severe additional limitations concerning which types of DAOs could be encapsulated into the legal form of a foundation.

The common law alternative of foundations, called trusts, may seem to offer a suitable legal shell for DAOs, reaching back to Rockefeller’s concept of a business trust.\footnote{281} However, even this is not free of issues. Taking into consideration just that Rockefeller’s concept of a business trust was meant to consist of business companies, it would be necessary to consider each membership-interest-token holder as a businessperson, because the beneficiary of a business trust must be somebody performing business activity and having legal personality.\footnote{282} Further, it may turn out unsuitable for jurisdictions which do not know the concept of business trust in general.

### 4.2.5 Corporate Bodies

The traditional law of legal entities normally assumes that both corporations and foundations must have a managing body, i.e. a board of directors, one or more managing directors and/or a board of trustees. Some of the entities must or may, on the top of the managing body, have a supervisory body as well. While individual jurisdictions may differ in the requirements regarding the constitution and members of such corporate bodies, existing and draft EU legislation regarding legal entities may be used as a valuable source of

\footnote{280} Cf for example Privatstiftunggesetz (Austrian Act on Private Foundations), S 1 (2) or Czech Civil Code, S 306 (2)
\footnote{281} Reyes (n 6) 411-418
\footnote{282} Cf ibid 406-407
inspiration about the point of what a Europe-wide understanding of the proper composition of corporate bodies should look like.

The SPE Regulation Proposal represents a remarkable example of EU-wide understanding of a person being fit, proper and qualified to serve as a director in a limited liability company. Firstly, under Article 30 of the SPE Regulation Proposal, only a natural person may serve as a managing director of a European Private Company. Although such a requirement does not apply in all EU-Member-State jurisdictions and all entities, leaving Member States free to allow for legal entities to be managing directors, or members, of managing bodies of business corporations (or certain types thereof) established under the respective national law under certain circumstances, this could be seen as a testimony to the importance of the involvement of real people (natural persons) in the day-to-day management of the business corporations.

Examples of this idea working in practice can be found in some national jurisdictions. The German Limited Liability Companies Act, at Section 6 (2) expressly provides that only natural persons may serve as directors in limited liability companies. Czech law, on the contrary, allows for legal entities to be members of corporate bodies. However, while acting as members of such bodies, they must be represented by a natural person who meets all requirements for being a member of a corporate body themself (especially is in a full legal capacity).\textsuperscript{283} Staying in Europe but leaving the EU, we can use Switzerland as an example of a country where all members of corporate bodies must be natural persons.\textsuperscript{284}

Public limited companies follow a similar pattern, although there are some differences. Article 47 SE Regulation expressly allows legal entities to be members of SE bodies, as long as this is provided for by the SE’s statutes and generally allowed by the national law of the Member State in which the SE has its seat. In such cases, a respective legal entity must be represented by a natural person, under conditions provided for by the respective national

\textsuperscript{283} See Czech Civil Code, S 152 (2). It must be noted that this applies basically to all types of legal entities. The only exception from the requirement of full legal capacity applies to members of bodies of entities acting with regard to the interests of minors or people with diminished active legal capacity, where involvement of people with a limited legal capacity in the entity’s bodies is permitted.

\textsuperscript{284} See Swiss Act on Amendment of the Swiss Civil Code (Part Five: Law of Obligations), S 707 (3) and S 809 (2)
law. Given that there are discrepancies among the Member States in this, the EU legislator seems to be leaving this matter to the national legislatures without providing any guidance as to which approach is preferred.

Overall, it can be in all cases understood that corporate laws in Europe hold the engagement of natural persons in the decision-making bodies of corporations to be an important requirement on the functioning of the corporations. Thus, creating a corporate type which replaces the decision-making bodies with an algorithm would constitute a disruptive element in the existing concept of corporate law.

4.2.6 Foundations in Need of Bodies as Well

Foundations, having their identity in assets rather than in persons, follow different constitutional and governance patterns than corporations. What remains the same, nevertheless, is the fact that they cannot operate without the involvement of humans. In this aspect, it seems rather difficult to become inspired by the thoughts of the EU legislator, as the most relevant source at the moment, the withdrawn FE Regulation Proposal, remains silent on whether the members of a managing body of an FE can be solely natural or also legal persons. The requirement is that members of the FE’s bodies must have a full legal capacity and must not be deemed or declared incapable of serving as members of the foundation’s bodies under the law of a Member State. Again, applicable national laws differ in this matter, but it can be assumed that at least some jurisdictions would only be able to accommodate DAOs as foundations as long as the membership-token holders can reasonably be seen as being on par with trustees in a traditional foundation.

As with many others, the idea of accommodating DAOs into the concept of business trust mentioned at the beginning of this thesis, can also be discussed from this point of view. This would, however, presume creating two sorts of token holders, one type acting as trustees

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286 Cf ibid, Art 28
while the other would be beneficiaries and an equivalent to member company shareholders in a traditional business trust. Such a solution seems possible, although it would, to some extent, undermine the flat structure of DAOs as well as their autonomy. Therefore, it is likely to suit only a particular type of DAO instead of being a relatively universal solution.

4.3 Corporate Governance

Discussing questions around the possibility of the DAOs being accommodated by some of generally acknowledged corporate forms, it appears useful to also mention the notion of corporate governance, which, in the most general sense, can be defined as “the system by which companies are directed and controlled,” or as a set of “relationships between a company’s management, its board, its shareholders and its other stakeholders.” We could argue about what the goals of successful corporate governance. Some argue the goal is maximising the shareholder value in the long term, while others might take into consideration the interests of many other stakeholder groups. At the same time, we can agree as to the most important actual actors entrusted with corporate governance in a traditional entity: the bodies of the entity, especially the managing body. DAOs replace the activity and decisions of the corporate bodies with a predefined code, which is left to run on a blockchain.

287 Reyes (n 6) 415
289 OECD, OECD Principles of Corporate Governance (OECD PUBLICATIONS 2004) 11, cf also European Commission, ‘Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Action Plan: European Company Law and Corporate Governance - A Modern Legal Framework for More Engaged Shareholders and Sustainable Companies’ (COM(2012) 740 final, Strasbourg 2012) <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52012DC0740&from=EN>. It should be noted that for the purposes of this thesis, the term ‘other stakeholders’ covers any subjects that engage with the entity and do not fall into the scope of the named categories, including outsiders such as the entity’s customers, suppliers or business partners. Thus, the notion of corporate governance is meant to cover both the internal mechanisms of the entity and the determination of its behaviour towards the outer world.
This opens space for a rather extensive discussion about how to approach the traditional notions and concepts of corporate governance in the context of DAOs. At this point, it must be remembered once again that any DAO, is in the first instance, a computer program, i.e. a written piece of work which, regardless of whether this was intended or not, reflects the author’s state of mind both at the level of knowledge and, to some extent, at the level of beliefs or opinions.

This, in fact, means that the actual human originator of each automated decision/transaction performed by a DAO is the author of the code, possibly together with those who allow the code to be run by maintaining the underlying blockchain structure. Such arrangements bring their own particular issues, and one must question whether they can reasonably be set on a par with corporate governance, as understood by traditional corporate law. If so, we need to ask further how the differences from traditional legal entities will impact the way DAOs need to be approached as an entity type.

In the European legal environment, corporate governance is subject to rather comprehensive regulation at both national and EU level, with the common understanding of its core element having been developing for a long time. While there is little technical problem with allowing the activity of the entity’s governing bodies to be replaced by the operation of an electronic tool (in a similar way to a handwritten signature being replaced by a stamp or by an electronic signature), it appears useful to consider the extent to which the crucial points of conduct required by the existing regulation, normally being performed by the entity’s governing and bodies, can be achieved by an autonomous electronic system.

4.3.1 Selected Principles of Corporate Governance

In everyday practice, corporate governance consists in great part of the conclusion and performance of various contractual relationships. The latter definition of corporate governance quoted above expressly takes into consideration relationships between various types of persons involved. While this appears to be of little difficulty in the case of simple, itemized and standardized transactions, consideration of a complex activity of
entrepreneurship provokes thoughts as to the extent to which the essential elements of such relationships, such as acting in good faith, acting with due care and following good commercial practice, as well as the core notions of day-to-day business operation, such as negotiation, contracting, will, intention or consent would fit in the world of autonomous electronic systems.

An interesting example, illustrating how some of those notions are understood in the context of blockchain-based entrepreneurship, can be found outside of Europe. A judgment of the Court of Appeal of the Republic of Singapore in the case Quoine Pte Ltd v B2C2 Ltd [2020] SGCA (I) 02\textsuperscript{291} gives an elaborate point of view on certain topics and serves to illustrate that although algorithmic trading may happen without direct human involvement, its broader context still covers non-algorithmic stakeholders, including people. The subject matter of the case was breach of contract and breach of trust in algorithmic cryptocurrency trading. The judgment contains an elaborate analysis of some of the crucial elements of contracting, such as intention or mistake, which might become troublesome if contracting is left entirely to an algorithm. Some of these elements will be picked up below for further analysis in the context of autonomous electronic systems.

\textit{4.3.1.1 Acting in Good Faith and Fair Dealing}

Starting with good faith, it can be argued that this notion, reaching back to ancient Roman Civil Law, appears to run contrary to automated algorithmic decision-making, although this may not be apparent at first sight. The above-mentioned Adam Smith (first published 1776, 2010) was well aware that there are no guarantees that people managing companies will abide by good faith.\textsuperscript{292} At first sight, replacing human decision-making with an algorithm, often assumed to be capable of more objective decision-making, might look like an effective solution. In reality, things may not be so straightforward. To understand the real situation, we must first understand the origin, sense and purpose of the notion of good faith.

\textsuperscript{291} Quoine Pte Ltd v B2C2 Ltd (2020) Quoine Pte Ltd v B2C2 Ltd [2020] SGCA(I) 02 (Court of Appeal of the Republic of Singapore)
\textsuperscript{292} Smith (n 186) 990
Originally, it was invented to give judges some flexibility in applying positive law, so that certain particular circumstances of individual cases, which could not be reasonably anticipated by or codified into the legal provisions, be taken into consideration. Obviously, things have moved on since then, but the core principle remains. This can be illustrated for example by Emily M Weitzenboeck (2004), which presents a concise overview of the modern understanding of good faith and fair dealing in selected countries. A common feature can be isolated from this: when speaking about good faith, the individual circumstances of a case in question must be taken into consideration.

There seem to be limits regarding the extent to which such a construction can be turned into code. While simple and deterministic transactions, which can rely on exact and rigid rules, seem relatively safe at this point, the more complex the activity in question becomes, the higher the risk of unexpected issues emerging. It must be particularly noted that running a business requires decisions to be made in real time and with regard to the actual circumstances, not all of which can be reasonably predicted at the time of writing the code. An example can be taken from the world of centralized electronic agents, in particular from the Amazon ordering tools. A remarkable case occurred in Germany. This regarded so-called Dash Buttons, small devices provided by Amazon which enabled quick and simple ordering of a particular, pre-set product. Should the pre-set product be unavailable at the time of the order, the seller was allowed to replace it with a similar product of the same brand, without any notice to the customer. Also any subsequent changes in the price of the pre-set product could be applied without the customer being informed about them. This resulted in a lawsuit filed by a consumer protection body and eventually the provision was found to be in breach of German consumer protection law. Finally, Amazon was ordered to amend its terms and conditions with regard to ordering via Dash Buttons, so that the customers were made aware that changes in the product, or final price, might happen without specific notice.

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294 See BGH vom 13.10.2020 (VIII ZR 161/19) OLG München vom 10.01.2019 (29 U 1091/18) LG München I vom 01.03.2018 (12 O 730/17)
This case also caught the attention of the Austrian Retail Association, where ordering through Alexa, another electronic agent of Amazon, was under scrutiny. It was found that customers in Austria ordering goods through Alexa were shown prices incorporating German VAT, while the price including Austrian VAT was only displayed to the customer after the order was confirmed. This was in breach of Austrian consumer protection law.\textsuperscript{295}

Issues like this may cause practical problems in DAOs, especially if there is a lack of active engagement of the membership-token holders. They may be partially resolved by a more diligent approach to the algorithm design, but even this is not a panacea. Apart from generating profit in a lawful way, corporate governance seeks many further goals which must be driven by good faith, such as corporate social responsibility, maintaining a good reputation or satisfactory relationships within the supply chain. Those goals must be prioritized correctly in real time, based on a particular situation. Ethical considerations must also be made from time to time and there may be situations when a tiny difference in the circumstances of a case makes a substantial difference to the goal sought by the decision-making process in question. Similarly, the behaviour of human stakeholders is influenced by many factors, some of which can hardly be processed by an algorithm. While such factors could be taken into consideration and adapted to appropriately by a socially skilled human counterpart in the course of the contracting process, it is difficult to imagine that most of them would be successfully dealt with by a machine.

Moreover, the principle of good faith and fair dealing is not limited to the most crucial decisions of the entity’s management. It applies even to contracting made in the course of the day-to-day operations of an entity; an activity which seems to have a better perspective of being successfully operated by an algorithm. For example, EU law imposes the duty to act in good faith on professionals contracting with consumers\textsuperscript{296} and applies good commercial

\textsuperscript{295} Handelsverband, ‘Amazon Alexa Widerspricht Österreichischem Konsumentenschutzrecht’ <https://www.handelsverband.at/presse/presseaussendungen/amazon-alexa-widerspricht-oesterreichischem-konsumentenschutzrecht/>

practice as a standard of acting in good faith and fair dealing in contractual relationships between businesspeople.

As well as the rigid rules of the positive law, these principles are also formed by case law and soft law. Some of the particular features may differ in individual fields of trade and sometimes even in different geographical locations. At first sight, it may appear that if the algorithm is supplied with relevant data regarding the content of good faith or good commercial practice, compliance must be easy to achieve. However, both good faith and good commercial practice regularly entail acting in accordance with certain notions whose implementation in code may be more difficult. This can be shown in the above-mentioned example of ordering goods through Amazon Alexa, where no bad faith seems to be present but still the arrangement falls short of the standards of good faith in contracting between professionals and consumers, due to the system not being able to reflect that there are different VAT rates in different countries and that this has to be reflected in the final price displayed to the customer.

The case described above appears to be a rather simple one, where the standards of acting in good faith are provided in basically programable terms, thus an amendment of the electronic agent’s code should be a sufficient means of achieving a lawful state. In more complex, or less deterministic, cases more subtle notions such as ‘intention,’ ‘knowledge,’ ‘awareness,’ or ‘mistake,’ may need to be taken into account and more difficult questions may arise, especially once insider or business-to-business relations are discussed. Again, the judgment in the case Quoine Pte Ltd v B2C2 Ltd [2020] SGCA (I) 02 may be helpful, as it contains an elaborate analysis of the notions of intention and mistake in contracting, paying particular attention to the conditions under which a contract can be voided due to a mistake on the part of one or both parties. In this point, it must be stressed that notions such as ‘knowledge’ or ‘awareness’ have strong psychological connotations and, on the most general

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level, one must judge carefully the extent to which (if at all) they can be encoded into an algorithm. And even here, there are problems.

While in individual jurisdictions courts of law have developed tested methods for how to assess whether a person was, could, or should have been aware of a certain fact, sometimes it is necessary to take into consideration variables such as education, cognitive ability, life experience or social background of the person in question. Judging matters of knowledge and awareness in algorithms must naturally follow different patterns. Instead of assessing the factors which have an impact the on knowledge of people as individuals in real time, one would need to ask firstly, whether a relevant piece of data was supplied to the algorithm, secondly whether the algorithm was programmed to process this piece of data in the course of calculating the output and thirdly, whether the calculation process was capable of reaching an appropriate result. This, however, appears to be primarily a matter of computer science. However, it appears that the only people who could reasonably be held liable for any trouble are those who decided that the algorithm would be set into operation in its existing form and way of functioning - the authors of the code and the authors of the pieces of data supplied to the algorithm.

Again, this conclusion can be compared with the judgment of the Court of Appeal in the case Quoine Pte Ltd v B2C2 Ltd [2020] SGCA (I) 02, where the court itself agreed that in the case of ‘deterministic’ algorithms, any analysis concerning either knowledge of a mistake, or unconscionably taking advantage of someone, must be done by reference to the state of mind of the programmers of the algorithms at the time of the programming.”

The Court of Appeal further concluded that “there may be situations where a programmer or the person running the algorithm who did not contemplate the relevant mistake at the point of programming came to learn of it subsequently before the contract had been formed, and yet allowed the algorithm to continue running, intending thereby to take advantage of the

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298 See Quoine Pte Ltd v B2C2 Ltd (n 291), para 97. Note that adopting this paradigm for DAOs would basically mean setting the authors of the code on par with management of a traditional company and would result in additional rules applying to them, including, for example, disqualification of unreliable persons from management (cf Marcus Lutter, ‘Legal Capital of Public Companies in Europe – Executive Summary of Considerations by the Expert Group on “Legal Capital in Europe”’ in Marcus Lutter (ed), Legal Capital in Europe (De Gruyter 2006) 12) where relevant.
mistake. In such a case, it would be wrong to ignore the subsequent acquisition of knowledge.”\textsuperscript{299}

While those conclusions appear to be perfectly sound even from the point of view of European legal thinking, it must be noted that, regardless of jurisdiction, in the case of non-deterministic algorithms such a strategy may lead to inequitable results, as not all outputs may be reasonably predicted by the programmer or by the person operating the algorithm, and no clear answer may be available to the core questions. An older piece of U.S. case law in this field, also perfectly plausible in the context of European legal thinking, teaches us that “[a] computer operates only in accordance with the information and directions supplied by its human programmers. If the computer does not think like a man, it is man’s fault.”\textsuperscript{300}

While this remains perfectly true and applicable today in the case of deterministic algorithms, more complex DAOs equipped with advanced artificial intelligence and based on non-deterministic algorithms might require this principle to be revised with regard to some practical issues of the non-deterministic algorithms. While it would definitely be possible to determine whether a relevant piece of data was supplied to an algorithm or not, and this could even be influenced directly by those interfering with the algorithm, predicting in which way such piece of data will be processed by a non-deterministic algorithm is a much more difficult task, which may well turn out to be impossible. This might require a search for a more balanced approach to judging what the authors of such non-deterministic algorithms as well as those who decided to operate them could have expected to be achieved by the algorithm, based on the data supplied. A principle of due care and of following the acknowledged professional standards might be one of the possibly plausible solutions in such cases.

4.3.1.2 Day-to-Day Business Operations and Acting on Behalf of an Entity

Legal acts performed by a legal entity or on behalf of a legal entity are normally subject to legal regulation. While the particularities vary from jurisdiction to jurisdiction, overall, the

\textsuperscript{299} Quoine Pte Ltd v B2C2 Ltd (n 291), para 99
\textsuperscript{300} State Farm Mutual Auto Ins. v. Bockhorst, 453 F 2d 533, 537 (10th Cir. 1972), para 537
law usually provides for a set of requirements regarding certain qualities of such legal acts. Various issues must be taken into consideration in this context. As suggested above, the notion of electronic agents as tools used in the course of running businesses, usually to perform routine day-to-day tasks, has been known and accepted for some time. Until DAOs started emerging, such tools used to be normally concentrated in the hands of individuals or centrally managed groups of individuals (such as traditional legal entities), which allowed most of the related legal issues to be resolved within the framework of existing law without substantial difficulties. However, the emergence of DAOs seems to be giving a need for further discussion on such topics. Some of them will be addressed below.

Not being under the centralized and direct control of easily identifiable natural persons, the acts performed by DAOs give rise to additional challenges on both theoretical and practical level. It must especially be discussed whether the factual acts of algorithms of DAOs can be considered legal acts at all and, if so, by whom, or on whose behalf, such acts are being performed. Further, a discussion on mandatory qualities of such legal acts, such as being performed in good faith, applying principles of fair dealing (good commercial practice) or sticking to a prescribed form (written, in the form of a notarial deed etc.) needs to follow, taking into consideration the actual nature of the act.

As suggested above, the business activities of DAOs are based on so-called ‘smart contracts’, which is a specific type of computer program, usually meant to replace traditional terms, conditions and agreements. This, however, does not automatically mean that every smart contract automatically qualifies as a contract in the legal sense. To do so, smart contracts must embody agreements which are meant to have legal effect and also meet any criteria for a valid contract as provided for by the applicable law. The practical aspects of doing so definitely deserve further discussion.

First of all, again, valid legal acts can only be performed by those who have sufficient legal capacity to do so and who are legally entitled to do so in a particular situation. This issue has been broadly discussed in the context of centralized electronic agents, as suggested above,

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mostly concluding that an electronic agent is a certain kind of tool in the hands of those who set it into operation and therefore the acts effectuated by an electronic agent are actually acts of such a person.\(^{302}\) However, things are a bit more complicated if we think about DAOs, especially if we think about them as about separate legal persons. The very concept of ‘electronic agent,’ as usually understood in the sources cited above, falls short in such cases as those as an operating DAO, which, if understood as an entity, is, in fact (not legally), both a principal and its own electronic agent all in one. This brings substantial difficulties in understanding some of the crucial elements of both the principal-agent relationship (although only perceived on the factual level) and the legal issues of using an electronic agent as a tool.

Yet one of the crucial elements of contracting, called *consensus in idem* or meeting of minds,\(^{303}\) can serve as an example of a notion that needs further analysis in this context as its one-to-one translation into an electronic environment may bring unexpected problems. In general, this notion assumes that there is an offer made by one person to another person and an acceptance made by the person to whom the offer was made. Those persons are the future contracting parties. This does not necessarily need to be done by the contracting parties personally. Representation by other persons, or the use of technical means, is usually allowed, but it must be remembered that any rights and obligations arising from a contract are to be attributed to the contracting parties.\(^{304}\) This is strongly connected with another crucial element of contracting, which is the legal capacity of the contracting parties. Not having legal personality (save legal capacity), DAOs represent a problem in the field of contracting, being unintentionally a tool of those who set them into operation, while, at the same time, those people may not be actually identified as parties of the (smart) contract at. Granting DAOs legal personality might resolve this problem. However, other issues would need to be addressed in such cases.

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\(^{302}\) Cf for example Weitzenboeck (n 75)


\(^{304}\) Cf Wettig and Zehender (n 301)
As discussed above, the potential legal capacity of DAOs should be discussed in the context of the legal personality of legal entities (artificial legal persons). Depending on jurisdiction, this may be a source of new problems regarding the legal capacity of such subjects. National jurisdictions vary in the rules regarding legal capacity of legal entities, which means we can find regulations allowing legal entities to be subjects without their own legal capacity and therefore in need of being represented by a natural person, as well as regulations which grant them a legal capacity limited to the scope of its activities as agreed in the articles of incorporation. Some may even grant legal entities full legal capacity.

Thus, granting DAOs legal personality could resolve those problems in the jurisdictions which acknowledge legal entities as subjects of separate legal capacity, as it would enable them to act legally on their own, provided that legal acts performed via algorithm will be recognized. However, jurisdictions which adopt the approach of a legal entity as subject with limited legal capacity cannot adopt such a solution easily anyway and would still have to address the need for human involvement: possibly by imposing a requirement of algorithmic contracting being traceable back to a responsible natural person who was competent to make it. Again, this is not an easy task in the case of DAOs.

Further, any legal act must meet certain formal requirements as provided for by the applicable law. While those requirements vary depending on the jurisdiction and the type of legal act, it can be generally understood that some legal acts must be executed in writing or even in the form of a notarial deed. Those requirements constituting a practical problem in the usual course of operation of DAOs may seem very rare, on the other hand, they still

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307 However, it must be noted that this makes only a systemic or conceptual difference – in the practical reality, the act would still need to be effectuated by an authorized natural person, acting as a tool (‘prolonged arm’) of the entity rather than as a self-contained representative.
should still be discussed and addressed, as necessary for the sake of legal certainty and to avoid creating loopholes in the law.

Commencing with the written form, it seems necessary to determine whether smart contracts performed by a DAO can count as contracts which are executed in writing. To reach a conclusion, the notion of ‘in writing’ must be defined first. EU Law offers such a definition, providing that "‘written’ or ‘in writing’ means any expression consisting of words or figures which can be read, reproduced and subsequently communicated, including information transmitted and stored by electronic means." 308 Based on this definition, smart contracts can be considered as being executed in writing. If this is the case, it must be further considered whether identification of the token holder in the blockchain network may count as a certain kind of signature. The primary source of law regarding this matter in the EU is the eIDAS Regulation, 309 which provides for conditions under which a handwritten signature may be replaced by electronic means, i.e. especially mandatory features which an electronic means of signing must have to legally qualify as an alternative to a handwritten signature.

It must be especially noted that while any kind of electronic signature should be accepted as a piece of evidence in official proceedings, 310 only a qualified electronic signature, i.e. "an advanced electronic signature that is created by a qualified electronic signature creation device, and which is based on a qualified certificate for electronic signatures" 311 is a legal alternative to a handwritten signature. 312 This may cause difficulties in those jurisdictions which adopt (at least in some cases) a strict approach, requiring that a legal act executed in writing contains a handwritten signature of the person(s) acting. Hence, it may be shown

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309 Regulation (EU) No 910/2014 of the European Parliament and of the Council of 23 July 2014 on Electronic Identification and Trust Services for Electronic Transactions in the Internal Market and Repealing Directive 1999/93/EC, [2014] OJ L 257/73; again, this should be understood merely as an example how the matter can be dealt with, as the definition of ‘in writing’ as well as of any relating notions must always be sought in the context of the law which is applicable in the particular case.

310 See eIDAS Regulation, Art 25 (1)

311 See eIDAS Regulation, Art 3 (12)

312 See eIDAS Regulation, Art 25 (2)
that smart contracts performed in the course of operations of DAOs may fall short in an important requirement – the need to enable an officially recognized identification of the signatory.\textsuperscript{313}

A more troublesome issue may be seen in those acts which must be executed in the form of a notarial deed, a typical example of which may be acts relating to the incorporation and registration of an entity.\textsuperscript{314} It is obvious that a code of a computer program does not equal a notarial deed, regardless of jurisdiction. However, it might be useful to discuss whether there might be some room for flexibility on this, i.e., whether it might be reasonable to allow the source code of the smart contract, running on blockchain, to be seen as an equivalent to a notarial deed. To answer this question, the sense and purpose of some legal acts which have to be executed in the form of a notarial deed must be taken into consideration.

Basically, the role of the notary in drafting legal documents consists of securing three elements of a legal act: authenticity, integrity and conformity with the applicable law. At least some of those functions can be replaced by electronic arrangements. The authenticity and integrity may be, under specific circumstances, reasonably secured by electronic means, such as advanced electronic signatures and digital seals instead of being guaranteed by the authority of a notary in person.\textsuperscript{315} Conformity with the applicable law, however, appears to be a more complicated issue, as guaranteeing that this is the case often requires a high level of expert knowledge.\textsuperscript{316}

\textit{4.3.1.3 Fiduciary Duties: Acting with Due Care and in the Best Interest of the Entity}

Apart from acting in good faith, which applies mainly (although not exclusively) in relation to other parties, another core principle needs to be followed in the course of corporate

\textsuperscript{313} See eIDAS Regulation, Art 26 (b)
\textsuperscript{314} But also any subsequent changes thereof, conveyance of immovable property, in some jurisdictions even mortgages.
\textsuperscript{315} A practical example can be seen in the Acronis Cyber Notary Cloud, see https://www.thobson.com/acronis-cyber-notary-cloud
\textsuperscript{316} For more elaborate discussion on the possibility to replace the notarial agenda by electronic arrangements cf for example José C Llopis Benlloch, ‘Notaries and digitalisation of company law’ (2018) 19(1) ERA Forum 49 or Michele Nastri, ‘Blockchain, Smart Contracts and New Certainties: What Future for Notaries?’ in Benedetta Cappiello and Gherardo Carullo (eds), \textit{Blockchain, Law and Governance} (Springer International Publishing 2021)
governance: acting with due care and in the best interest of the governed entity. Similarly to acting in good faith, mentioned above, acting with due care is also an ancient principle of Civil Law which has been widely recognized among jurisdictions for centuries. Within traditional entities, it particularly obliges the managers (in general, the members of the entity’s bodies), but is to some extent relevant even to the members.

It must be noted that the duty to act with due care and in the best interest of the entity is a fiduciary duty. This means, simply said, that those duties are derived from the trust that the principal vests in the agent and are often undergirded by information asymmetry.\textsuperscript{317} To put it in the language of traditional legal entities, the individual members, as well as the entity as a collectivity, will appoint managers and other members of the entity’s bodies, whom they consider skilled and reliable, to exercise the office and trust that they will do what they are expected to, sometimes without having a detailed understanding of their particular jobs.

This may lead to problems once an algorithm replaces real people.\textsuperscript{318} This can be, again, explained by an example from fiction. “As the little girl Agnes used to go for walks with her father and once she asked him whether he believed in God. Father answered: I believe in the Creator’s computer. The answer was so peculiar that the child remembered it. The word computer was peculiar and so was the word Creator, for Father would never say God but always Creator as if he wanted to limit God’s significance to his engineering activity. The

\textsuperscript{317} Again, this is a very simplified summary. For an elaborate explanation, see for example Andrew Stafford and Stuart Ritchie, \textit{Fiduciary Duties: Directors and Employees}/ Andrew Stafford, Stuart Ritchie (2nd ed. Jordan Publishing 2015) or The Law Society of Upper Canada Legal Education Committee (ed), \textit{Fiduciary Duties} (Special lectures of the Law Society of Upper Canada 1990, De Boo 1991) or Dennis J Block, Nancy E Barton and Stephen A Radin, \textit{The Business Judgement Rule: Fiduciary Duties of Corporate Directors}/ Dennis J. Block, Nancy E. Barton, Stephen A. Radin (5th ed. Aspen Law & Business 1998). It is not the purpose of this thesis to provide an in-depth analysis of the notion and extent of fiduciary duties. However, two points should be remarked at this point. Firstly, acting with due care and in the best interest of the entity are not the only fiduciary duties which may exist within the concept of corporate governance. They merely serve as a certain kind of umbrella notions to show a troublesome point of an algorithmic entity. Secondly, the understanding of the content of fiduciary duties of members of a legal entity’s bodies varies in its particularities from jurisdiction to jurisdiction, sometimes even from one legal expert to another, and changes in time. The presented text generalises the topic in order to avoid those small differences which are not important for demonstration of the problems stemming from human fiduciaries being replaced by an algorithm.

\textsuperscript{318} This is a generalized statement. Technically, the legislator may provide for a disapplication or different application of the norms regulating the exercise of fiduciary duties in DAOs, cf W. S. 17-31-104 (c) and W. S. 17-31-110. However, the purpose of this subchapter is to discuss the matter of fiduciary duties in DAOs on a general level and raise some related in-depth question, so as to provide a primer for a possible future conceptual discussion about the notion of fiduciary duties in DAOs.
Creators computer: but how could a person communicate with the computer? So she asked her father whether he ever prayed. He said: That would be like praying to Edison when a lightbulb burns out.” 319

This may be understood as a poetic illustration of the notion of a trustless trust, which does simply means that we replace trust in the people who would be personally performing the activity in a traditional entity with trust in the algorithm, or, digging even deeper, in the programmers who created the algorithm. There is informational asymmetry even there. A minority of people who would seriously consider acquiring membership tokens in a DAO can be expected to have sufficient knowledge to understand how advanced algorithms or underlying blockchain structures work. But, as long as they decide to get involved in a business in the form of a DAO, we must ask: what do they actually trust? Do they trust in the programmer having written the algorithm well? Do they trust in the algorithm doing what they expect it to do?

Thinking this way may give rise to a temptation to shift the duty of care to the programmers. This could, in theory, be possible, considering those who commission the DAO as customers of those who actually write the code. However, the practical reality of the emergence of DAOs may see the initial works being performed in very informal settings, without written contracts or set responsibilities, with no systematic documentation being in place, and with people joining and leaving the project. In addition, the originators actually being the first holders of membership-tokens, which would be later sold to third parties. Under such circumstances, the traditional model of liability in producer-customer relationship may be difficult to meaningfully apply. 320 However, this constitutes an issue which would need to be addressed.

Further, two basic types of scenarios are imaginable, depending on the actual functioning model of the DAO in question.

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319 Kundera (n 34) 12
320 However, the first laws providing for the blockchain-based LLC forms try to deal with this issue, cf State of Vermont Blockchain Act S 4174 (a).
The first of them is an archetypal DAO, which has been programmed, launched and then left to run with minimal, or no, human interference. In such a case, the algorithm itself could be seen as a certain kind of replacement for the managing body. However, if we try to apply the notion of due care in this context, it can be explained that allowing for such a solution would not fit a legal framework operating with it.

To develop this idea and examine whether an algorithm can be expected to be able to act with due care on its own, similar to a human manager, at least a very general overview of the mere notion of due care must first be provided. Following the ancient Roman explanation of this notion, it can be understood that acting with due care means acting as a good father would act in relation to his family and belongings. This obviously needs further interpretation so that it can be put in the context of modern entrepreneurship. This is very often a matter of case law, although some jurisdictions benefit from having the notion codified in written law.

For instance, Czech law offers a detailed example of how acting with due care can be understood in corporate governance. Section 51 (1) of the Czech Corporations and Cooperatives Act provides for the basic features of a member of a corporate body acting with due care, which are carefulness, relevant knowledge, business judgment, a reasonable assumption, good faith, informed acting, acting in the justifiable interest of the corporation and loyalty. Again, those are notions with strong psychological, social and even emotional backgrounds, which can hardly be translated into a code. It can be concluded that what was said above regarding good faith can apply mutatis mutandis to due care. Therefore, an algorithm itself cannot act with due care in the sense that this notion is understood in traditional corporate governance. Several details deserve further discussion in this context.

Notably, the notion of acting in the justifiable/best interest\textsuperscript{321} of an entity appears to need a different approach to that in traditional entities. At first sight, it appears plausible that an algorithm can act in the interest of an entity, as long as it is programmed in a way which

\textsuperscript{321} More often called ‘justifiable interest of the entity’, for the purposes of this thesis, the best interest of the entity is meant to be the interest which a good manager would understand as the best to be pursued by an entity in a given moment.
determines such acting and is supplied with relevant data. However, the notion as such has further layers which should be taken into account. While often described as a principle of ‘loyalty’ or ‘no self-interest’ in traditional entities, it is normally understood as a duty of the member of the entity’s body to always prioritize the entity’s interests over their own.\textsuperscript{322} This interpretation cannot work in algorithmic entities for obvious reasons. The set of the decision-making algorithms being the same as the entity itself excludes conflict of interests, i.e., the algorithm acting in the best interest of itself automatically acts as best for the entity.

In general, members of the entity’s governing body are expected to assume calculated risk and make use of business opportunities and gaps in the market.\textsuperscript{323} This does not appear to be a big problem. It can be assumed that an electronic system, equipped with advanced artificial intelligence programmed in a relevant way and supplied with a sufficient amount of input information, will reach better results than a human or a small group of humans when, based on the available data, it comes to the identification of the most effective ways to reach profit, as well as in mitigating the risks.\textsuperscript{324} On the other hand, there are certain limitations which must be taken into account.

Firstly, it must be always kept in mind that an electronic system is not a synthetic clone of a human mind and it may omit, or misinterpret, some other aspects of entrepreneurship, especially those with deep social or psychological backgrounds. Similarly, it may take into account details which a human mind would omit in certain cases, occasionally reaching results which may be computationally correct but not plausible where humans are concerned. This raises a need to open the pre-question of this discussion: What is the justifiable interest of an entity? A general answer to this question can hardly be given. Rather, it must be sought in a particular situation, weighing various, often contradictory,


\textsuperscript{323} Cf Florian Möslein, ‘Robots in the Boardroom: Artificial Intelligence and Corporate Law’ in Woodrow Barfield and Ugo Pagallo (eds), Research Handbook on the Law of Artificial Intelligence (Edward Elgar Publishing 2018) 17

socioeconomic interests, as well as the internal settings of the entity in question, in a way which would lead to an overall sustainable decision. This does not necessarily have to be the one bringing the highest monetary profit.

Secondly, it must be kept in mind that any algorithm only processes the data supplied to it, usually without being able to check its adequacy. The quality of the outputs then relies on the quality of the input data. This appears to be a problem if the algorithm operates fully autonomously, relying on data which are partially generated by the system itself, partially supplied by human stakeholders (founders, customers, business partners and their representatives) or a centrally controlled oracle, or even partially retrieved from the Internet by the algorithm itself, without people using sound mind and common sense to check the quality of such data. Errors and non-standard outputs are practically inevitable in such cases.

This may happen both accidentally and intentionally, and if also there is nobody to check the quality of the outputs, errors may be left unobserved and uncorrected for prolonged periods of time, which may lead to disastrous results once the erroneous outputs touch the real world. First ideas are already available as to how to approach this problem and possibly find a way towards an artificial intelligence which can mimic human critical thinking and dealing with inaccurate input information. However, until a reliable and universally

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326 See Hui Chen and others, “The Application Research of AlphaGo Double Decision System in Network Bad Information Recognition” in De-Shuang Huang and others (eds), Intelligent Computing Methodologies (2018) 284. On the other hand, it would be inaccurate to deem that such an issue is new and relates solely to the deployment of autonomous electronic systems. A remarkable example of a failure to deal with inaccurate input information, which was eventually committed by people, and which resulted in a legal dispute, can be seen in the case of MT Højgaard A/S (Respondent) v E.ON Climate & Renewables UK Robin Rigg East Limited and another (Appellants), [2017] WLR(D) 562, [2017] UKSC 59, [2017] Bus LR 1610. The dispute arose from a contract to build an offshore wind farm, in which some of the properties of the wind farm were determined by a reference to an international standard for the design of wind turbines. Unfortunately, both parties overlooked that there was a typo in the standard – one of the formulas in the standard contained a constant with a misplaced decimal point. Following the mistaken formula caused a defect which was only revealed much later. This led to a dispute, in which the wind farm’s builder was held liable for breach of warranties (notably, although they strictly followed the wording of the contract and the standard). This example illustrates that human parties to a contract are not supposed to implement the wording of a contract blindly. Rather, they are
deployable mechanism of accuracy control for input information exists, it should not be assumed that algorithmic arrangements are capable of sound judgment.

Summarizing the above, it can be concluded that algorithms have some potential to act in the best interest of an entity, if programmed in a relevant way and supplied with sufficient and relevant data. As the core of an algorithmic entity, it even benefits from the absence of conflict of interest. This, however, does not mean that they mimic acting with due care as human members of managing bodies would do, as the background of its actions is different. Contrary to humans, an algorithm does not do so based on knowledge, judgment and free will, but on mathematical and statistical processing of computable data, which may not be enough to substitute for a notion so strongly connected to the human mind.

However, the negative answer to the question of whether an algorithm can act on its own with due care does not need to mean the end of the discussion. Taking into account a different model of DAO governance, namely a DAO where its membership-token holders actively and continuously engage, a shift in approach may follow and slightly different questions can be asked, focusing more on the due care being exercised by the membership-token holders themselves.

For example, we can discuss whether operating an enterprise with the use of algorithmic governance is itself in accordance with the due care principle. Unfortunately, a holistic and unanimous answer cannot be given. Instead, certain crucial points must be discussed to identify the factors which may be important in individual cases in seeking an answer to this question.

Another example of such a question may be that of how much oversight over the overall condition of the algorithm; another would be how much expert knowledge should be required from anyone who makes, or can make, changes to the algorithm. This follows the required to apply due care, common sense and relevant expert knowledge while performing a contract and legal consequences occur if they fail to do so. A question arises as to the extent to which algorithms are capable of doing the same at a level comparable with humans. Therefore, there is a risk that significantly more similar disputes may arise if fully autonomous electronic systems are broadly deployed in entrepreneurial activities, basically due to the possible general inability of electronic systems to detect inaccurate input information and to deal with it adequately.
premise that every electronic system can only do what it was programmed to. Thus, analogically as suggested above when discussing the question of good faith, even here, we need to examine the system’s ability and preparedness to act in the justifiable interest of the entity, which must be judged at the level of the code and be traced back to those who have control over the code. This may cause at least two sorts of problems.

Firstly, regardless of the nature of the algorithm, its operation may eventually result in the membership-token holders, who can raise proposals on changes and vote on them, being seen as a certain kind of managing directors of the DAO in question. Secondly, it may lead to possibly inequitable burdens being placed on those subjects in the case of non-deterministic algorithms and systems based on machine learning, where the operational processes as well as the results of the everyday operation of the algorithm cannot be foreseen with a reasonable level of certainty in the time of programming.

Further, perhaps a less visible layer of the application of the concepts of due care and acting in the best interest of an entity to blockchain-based establishments relates to the blockchain structure on which a DAO runs. A public blockchain is, by its nature, a decentralized and distributed technology, individual parts of which may be located in different geographical locations, owned by different subjects and physically handled by different persons. Therefore, we must ask under which conditions they are operated and whether they represent a suitable background structure for running a business; in other words, whether running a business relying on public blockchain as its underlying infrastructure is in accordance with the principle of due care. Walch argues that at least some public blockchain developers act de facto as fiduciaries, while and thus they are saved from the corresponding accountability and liability.327 I will follow this idea to explain why the decision of the

327 See Walch, ‘In Code(rs) We Trust: Software Developers as Fiduciaries in Public Blockchains’ (n 124) 59. Remarkably, the author points out the idea that “the core developers and significant miners of public blockchains function as fiduciaries of those who rely on these systems and should, therefore, be accountable as such;” cf also Angela Walch, ‘Call Blockchain Developers What They Are: Fiduciaries’ American Banker (8 September 2016) <https://www.americanbanker.com/opinion/call-blockchain-developers-what-they-are-fiduciaries> accessed 23 December 2021. This idea is provocative just from the point of view that such core developers and significant miners that those people became de facto fiduciaries let us say blindly: they very often did not actively assume any function connected with fiduciary duties, they merely created something and let others use the product. This aspect is analysed by Walch herself. On the other hand, there is a deep
founders to run an entire business on public blockchain may itself become disputable in the context of the duty of the managers to act with due care and in the best interest of the entity, as well as the duty of each member not to act to the detriment of the entity or other members.

Walch herself elaborately describes the shift of the necessary trust in other people while doing business with the known usual business partners – members, managers and employees of businesses, to the unknown individuals involved in the development and maintenance of public blockchain structures, describing some of the core practical consequences. I would like to add a slightly different point of view to this and discuss the same issue from the perspective of the *culpa in eligendo et inspiciendo* principle, one of the notions which stem from ancient Roman law and survive until today in many civil law jurisdictions. In short, *culpa in eligendo et inspiciendo* means a breach of duty to choose and supervise the co-operators and business partners who should be used in the course of the performance of a contract with due care.\(^2^{28}\) Obviously, the practical possibilities of choice and supervision are extremely limited when a DAO is being run on a public blockchain, as the people and structures behind the infrastructure are usually unknown to those who start and run a DAO upon it. However, the principle as such still applies, as the people behind the blockchain infrastructure are in the position of the suppliers of the DAO in question. And there are real risks in using a public blockchain, stemming for example from insufficient coding, key person risk or negligent performance,\(^2^{29}\) while remedies are difficult to claim if the person to be held liable cannot be reasonably found.

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philosophical and ethical background to the whole idea, which can be, in laypeople’s language, approximated to the story presented in Stephen Spielberg, *A.I. Artificial Intelligence* (Warner Bros. Pictures 2001). There is an advanced technological product whose creators and those who significantly contributed to its operation are (at least morally) responsible for it and should not be allowed to abandon it without cause and without taking reasonable precautions so that the risk of harm to the others is minimized. Obviously, the legal part is a different and much more complex story. Again, the “misuse-of-property” pattern may become useful in such cases.


\(^{29}\) As described by Zetzsche, Buckley and Arner (n 272)
Another interesting question may emerge, going back to the previously mentioned idea of Walch: that blockchain developers should be understood as de-facto fiduciaries. In particular, it might be interesting to ask what would happen if a currently working and maintained blockchain structure was abandoned by its developers and left without anybody taking care of it. While the individual nodes appear to be likely to keep their legal status as pieces of their owners’ property, the blockchain structure (database) as a whole might be seen as abandoned property, which would result in rather specific legal consequences. Leaving aside the intellectual-property-related aspects of the database and seeing a particular instance of a blockchain structure simply as an item, we could easily consider such a conclusion plausible.

This, however, appears to be too little help on its own. The concept of abandoned property (res derelicta), reaching back to ancient Rome, would rather bring various challenges if applied to a blockchain structure which is no longer maintained. Theoretically, an abandoned blockchain structure could be appropriated by somebody else under the conditions provided for by the applicable law, which might mean that the users who have an interest in doing so might be allowed to appropriate the abandoned blockchain structure and start treating it as their own property. The practice is, however, much more complicated. The question of whether an abandoned blockchain structure qualifies for the legal status of abandoned property is difficult to answer. Firstly, the question of applicable law emerges once again, leaving us without a straightforward answer, as a public blockchain structure cannot usually be unanimously localized and subordinated to a single jurisdiction (unless all nodes are located in one state). Moreover, even if the question of applicable law finds its solution, it must be noted that the conditions prescribed by the national law in question may be difficult or even impossible to meet or appropriation may be excluded by the law itself.

330 Walch, ‘In Code(rs) We Trust: Software Developers as Fiduciaries in Public Blockchains’ (n 124) 68
331 I.e., considering the very copy of the database as an individual item through which the database is expressed and upon which a particular DAO runs rather than the database in general as its authors’ work.
332 The particularities will differ from jurisdiction to jurisdiction. However, civil law jurisdictions find the common roots of their understanding of res derelicta in Digest of Justinian Lib. XLI Tit. VII
So, for example, the French Civil Law does not allow for the appropriation of an abandoned property by a third party at all, providing instead that any things without an owner become property of the municipality on whose territory they find themselves.\footnote{See Code Civil (French Civil Code) S 711 and 713} Other jurisdictions may require the appropriator to know for sure, or at least be in good faith about the fact that the appropriated thing is abandoned (rather than lost or just temporarily laid off).\footnote{Cf for example Austrian Civil Code, S 386 or Czech Civil Code, S 1051} This will, again, bring difficulties, taking into consideration the limited possibilities to observe the behaviour of the developers, sufficient to establish that they had a genuine intention to abandon the blockchain structure.

As a result, anyone wanting to appropriate a blockchain structure would be left to examine whether the founders still take care of the blockchain or not based solely on limited signs, such as long-term lack of maintenance and/or further development, which do not have to be reasonably reliable. As a result, the appropriation may be legally invalid, opening the door for the original establishers and developers to resume interaction with the blockchain structure, possibly even causing damage or loss to an appropriator who, in the meantime, has treated the blockchain structure as their own, without such appropriator being able to obtain compensation.\footnote{However, it should be noted that this is a general pattern and that practice may bring different cases based on individual circumstances. Currently, a case of Tulip Trading case (n 214) shows that the claimants basically adopt Walch’s approach to fiduciary duties. No unanimous conclusion has been made as to whether the fiduciary duties of persons owning or maintaining the public blockchain structures should be legally acknowledged (cf [2023] EWCA Civ 83, [2023] WLR(D) 62, which is the most recent decision issued in the case as of the time of this thesis being drafted, and in which the court concludes that “[t]he time to decide on the [fiduciary] duty in this case is once the facts are established.”). However, a suggestion that Walch’s concept could be right is also included in the court’s conclusion.}

Those issues make using public blockchain particularly perilous from the point of view of the standard of acting with due care being hard to achieve. This makes public-blockchain-based arrangements a risky business. Also the decision to run a business as a DAO on a public blockchain being left to the managers, who are normally obliged to act with due care, which entails verification of business partners and a reasonable level of supervision over their
performance, would bring substantial difficulties.\textsuperscript{336} An example would be a claim raised by the dissenting members against the others, based on the choice of the particular public blockchain being to the detriment of the business, due to the impossibility of checking whether the people behind the blockchain infrastructure are suitable partners for the business.\textsuperscript{337}

4.4 Capital(isation), Protection of Creditors, AML and Beyond

As legal entities are normally meant to facilitate the participation of certain people in socioeconomic life, their monetary aspects must be considered as well. This subchapter is meant to point out some particularly thorny points of setting DAOs in the context of how the issues of capitalisation and maintenance of capital are understood in traditional legal entities. This, apart from the general questions of the importance of legal capital, basically includes two more specific topics. The first one is how a DAO raises capital at its very beginning. Such an activity is likely to resemble a subscription of shares or other securities under some circumstances, giving rise to the question of whether it should be subject to the same, or similar, regulation. The second one is the (technical) possibility of a DAO having all, or at least a substantial portion, of its capital in cryptocurrencies and the legal issues which might arise from such a situation.

4.4.1 The Function of Legal Capital Revisited

Before we start discussing some of the DAO-specific aspects of legal capital, it appears useful to briefly revisit the main functions, thus to provide context for some of the thorny points which regulation of DAOs may see in the field of capitalisation and capital maintenance, and to explain why capitalisation matters for DAOs. In general, securing the solvency of an entity

\textsuperscript{336} This only applies to DAOs with limited autonomy, in which a significant involvement of humans in their running is presumed. In fully autonomous DAOs, the last people having control over the DAO are assumed to be its originators, but even then, it is highly desirable that the decision to run the DAO on a public blockchain is unanimous.

\textsuperscript{337} Cf for example Czech Corporations and Cooperatives Act, S 108
and protecting creditors’ interests can be traditionally understood as the main functions of legal capital. 338

Apart from that, a set level of legal capital, and a duty to maintain it throughout the existence of the entity, may serve as a tool preventing companies from being set up without an elaborate business plan and therefore without a reasonable chance to succeed. 339 This makes abuse of small company arrangements more difficult, 340 as well as forming an obstacle to dangerous manipulations of capital markets. 341 However, a set minimum amount of legal capital is not a necessary condition for an entity’s existence, not even in limited companies. This might be illustrated by some jurisdictions traditionally not providing for the requirement of a certain level of legal capital at all, usually replacing this with the possibility of piercing the corporate veil, and holding shareholders responsible, if undue harm is caused to the entity’s creditors. 342

The concept of legal capital has been subject to discussion for some time 343 and while a trend towards easing requirements is noticeable even in countries where legal capital is traditionally part of corporate law, 344 it appears that a set level of legal capital is still relevant at least in a significant number of cases. At this point, private and public companies must be discussed separately, as the level of importance of legal capital in each of the company types

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338 For a general overview of the topic of legal capital in Europe (but not strictly limited thereto as there are contributions devoted to the situation in the US as well) see Marcus Lutter (ed), Legal Capital in Europe (De Gruyter 2006)
340 ibid 30
341 Lutter, ‘Legal capital of public companies in Europe – Executive summary of considerations by the expert group on “Legal Capital in Europe”’ (n 298) 9, see footnote 18 for an example
342 Note that the notion of legal capital is not necessarily present in all national jurisdictions. Rather, it is mainly typical for those of German and Romanic roots, cf ibid 3. On the other hand, there is no minimum share capital for private limited companies in the UK and the minimum legal capital requirement for PLCs was only introduced due to the implementation of the EU legislation. Similarly, legal capital requirements are mostly absent in many of the US states. For a more detailed comparison between the European and US approach to legal capital see Andreas Engert, ‘Life Without Legal Capital: Lessons from American Law’ in Marcus Lutter (ed), Legal Capital in Europe (De Gruyter 2006)
344 Cf Wilhelm Niemeier, ‘What Kinds of Companies Will a “One-Euro-EPC” Generate?’ in Heribert Hirte and Christoph Teichmann (eds), The European Private Company - Societas Privata Europaea (SPE) (De Gruyter 2012) 296, 297
appears to differ significantly. It may be shown that legal capital requirements in private companies appear to feel slightly obsolete to some national legislators.

The SPE Regulation Proposal, and discussions around it, may serve here as valuable reference material which will help to clarify the sense and purpose of legal capital in private companies in the contemporary legal thinking in the European legal environment. In particular, it must be noted that one of the core features of the proposed European Private Company, was the minimum amount of legal capital being set at €1, has not been accepted unanimously either. Thus, warnings were audible against the use of so-called ‘one-euro companies’ to limit the liability of businesspeople, who would otherwise need to operate as sole practitioners, which would result in transferring the risks to their business partners. The low rate of long-term viability of such companies was also noted.  

While the SPE Regulation Proposal had been withdrawn by the time of writing of this thesis, national jurisdictions requiring companies to have a certain minimum level of legal capital have adopted various approaches to legal capital within their own regulation of private companies. As already briefly mentioned, the requirements of legal capital in private companies differ greatly even just in the European legal environment, with some jurisdictions keeping the stakes rather high while others significantly lower the required amount of legal capital (specifically for private companies), sometimes even to a symbolic value, usually to one unit of the country’s legal tender.

Together with the above-mentioned emergence of single-member companies in some jurisdictions, the trend to reduce the amount of legal capital for private limited companies is

345 Cf ibid 338
346 For example Denmark, Germany (for LLCs), Norway
347 This is commonly known under the name “One-euro companies”, and may occur as a separate corporate form different from a LLC as for example in Germany (called “Unternehmengesellschaft,”), or by lowering the minimum level of legal capital for a LLC to a symbolic level as for example in the Czech Republic, where the minimum legal capital for LLCs is CZK 1, Portugal, where the minimum share capital is €1 per share, or in the Netherlands where there is no minimum capital requirement at all for LLCs. However, it must be noted that both approaches have advantages and disadvantages. While minimum capital and legal capital may be seen as "primitive regulatory technology [...] likely to generate more costs than benefits" by some authors, cf for example John Armour, ‘Legal Capital: An Outdated Concept?’ (2006) 7(1) Eur Bus Org Law Rev 5 27, it still must be noted that compulsory minimum capital undoubtedly plays some (even though maybe limited) role in creditor protection and giving it up where it has been traditionally present creates a hole therein and indeed may lead to undesired results, cf Niemeier (n 344)
may suggest that efforts to simplify the legal conditions for smaller businesses, and to open the way to non-traditional solutions, may be prevailing over the traditional concept of legal capital as a means of protection of creditors and as a price to be paid for limited liability.\textsuperscript{348} This may imply that there should be, at least from the point of view of legislative technique, little issue in allowing DAOs being established without a compulsory minimum level of legal capital, as an equivalent of traditional private companies, regardless of whether they would fit into the framework of traditional capital requirements.

On the other hand, the possibility of DAOs offering tokens to the broad public makes at least some of them more like public, as opposed to private, companies, giving rise to the question of whether they should be subject to the same regulation, both at the level of capitalization and at the level of securities offerings. This appears to be worth discussion as it seems that the traditionally rather high amount of legal capital in public companies finds justification in the need to protect investors and creditors of such companies, as well as supporting overall economic life.\textsuperscript{349} A much older example from Germany illustrates that abandoning no-legal-capital PLCs in 1923\textsuperscript{350} was a good step forward, showing that “[a]s the fraudulent establishment of stock corporations has played virtually no role since the introduction of minimum capital and the preventive control of the raising of capital, there is no apparent need to modify the obviously well-functioning system and to replace it with a system with which there have already been bad experiences in Germany.”\textsuperscript{351}

\textsuperscript{348} For the notion of legal capital as price for limited liability see Eidenmüller, Grunewald and Noack (n 339)
\textsuperscript{349} See relevant provisions of the Directive (EU) 2017/1132 of the European Parliament and of the Council of 14 June 2017 relating to certain aspects of company law (2017) OJ L169/46. It should be noted that this law finds its roots deep in the Second Council Directive 77/91/EEC of 13 December 1976 on coordination of safeguards which, for the protection of the interests of members and others, are required by Member States of companies within the meaning of the second paragraph of Article 58 of the Treaty, in respect of the formation of public limited liability companies and the maintenance and alteration of their capital, with a view to making such safeguards equivalent [1977] OJ L 26. Cf again ibid 9, seeing fixed capital as both a reasonable rule of corporate finance and as a means of prevention of dangerous manipulations of capital markets. This might illustrate that the notion of legal capital has proven relevant at least to some extent throughout time.
\textsuperscript{350} As suggested by Andreas Pentz, Hans-Joachim Priester and André Schwanna, ‘Raising Cash and Contributions in Kind when Forming a Company and for Capital Increases’ in Marcus Lutter (ed), \textit{Legal Capital in Europe} (De Gruyter 2006) 55-56
\textsuperscript{351} See ibid 59
This can be analogically understood, so that if DAOs offering tokens to the broad public are seen as equivalents of public limited companies, they should be required to meet the same legal capital requirements as traditional public limited companies. Also the remarks regarding the inefficiency of control after the fact\(^{352}\) are plausible in the context of DAOs and should be actually taken even more seriously keeping in mind the nature of DAOs. It cannot remain without interest that the same source which offers this idea also warns against certain disadvantages which occurred in the historical development of private limited liability companies, which are subject to more lenient regulation, eventually concluding that bringing substantially more freedom for shareholders leads to trouble, as the personal connection and self-control mechanisms tend to fail even within a small number of shareholders.\(^{353}\)

Bearing in mind that DAOs do not differ largely from traditional companies in the sense that they need financial means to operate, and that there will always be a certain group of stakeholders investing real sources (money, products, services) in them, it appears that the questions of capital and capitalisation are as relevant for DAOs as for traditional companies, regardless of whether we see them as equivalent more to private or public companies. First attempts to give DAOs the general form of LLCs are already visible, leaving the questions of capital and capitalisation to general laws regulating LLCs in their jurisdictions. This may set certain limits on the types of DAOs which may be incorporated in those jurisdictions and it may still seem useful to promote in-depth and more general research about which type of company, if any, DAOs should represent, before the particularities of capital and capitalization thereof will be discussed. However, this general question, which, moreover, needs to be approached from the point of view of respective jurisdictions, goes well beyond the scope of this thesis. Rather, some more particular and more focused, capital-related questions will be discussed, to point out specific problems for the protection of creditors and investors in DAOs. For this purpose, it will be assumed that it would be desirable that DAOs have, and maintain, a certain level of legal capital.

\(^{352}\) ibid 58
\(^{353}\) ibid 62
4.4.2 Raising Capital for a DAO: Initial Coin Offerings

As with most economic projects, potential DAOs are in need of initial capital, which can be translated into a need for investors. While significant amounts of capital are not compulsory for LLCs (and comparable companies) in many jurisdictions anymore, the factual need for financial means is no less urgent anyway. While small projects are likely to rely on funds brought by their founders (similarly to traditional LLCs), larger ones may choose to raise funds from the public via so-called ‘initial coin offering’ (abbreviated as ‘ICO’), a fundraising mechanism offering investors a tokens in a DAO in exchange for their investment, which is typically made in cryptocurrencies.\(^{354}\) This, on a closer look, perilously resembles (although not necessarily being exactly the same, as suggested above) the initial public offering; in other words, the subscription of shares to the public, performed by public limited companies.\(^{355}\) It may also resemble a process of issue of other securities, which is traditionally subject to rather strict regulation. Therefore, it may be asked whether such regulation should apply analogically to ICOs as well and if so, to what extent.\(^{356}\)

An outstanding example may be taken from the U.S.\(^{357}\) The token offering of The DAO, already mentioned in early sections of this thesis, was investigated by the United States


\(^{355}\) This understanding could be also supported by ‘Initial coin offering’ in Cambridge Free English Dictionary (2023) <https://dictionary.cambridge.org/dictionary/english/initial-coin-offering>, which says: “An initial coin offering (ICO) is the cryptocurrency space’s rough equivalent to an IPO in the mainstream investment world."

\(^{356}\) Time-proven examples from the U.S. show that although there was no specific law relating to the initial coin offerings present at the time, application of traditional securities laws should not be ruled out simply because of the relative novelty and rather specific nature of the tokens and initial coin offerings, see for example SEC v. C.M. Joiner Leasing Corp., 320 U.S. 344, 351 (1943), ruling that “[t]he reach of the [Securities] Act does not stop with the obvious and commonplace. Novel, uncommon, or irregular devices, whatever they appear to be, are also reached if it is proved as a matter of fact that they were widely offered or dealt in under terms or courses of dealing which established their character in commerce as ‘investment contracts,’ or as ‘any interest or instrument commonly known as a ‘security’.” A similar conclusion may be found also in Reves v. Ernst & Young, 494 U.S. 56, 61 (1990), ruling that “Congress’ purpose in enacting the securities laws was to regulate investments, in whatever form they are made and by whatever name they are called.”

Securities and Exchange Commission (SEC). Three conclusions may be made from its investigative report. Firstly, the report constitutes a piece of case law establishing that ICOs may be inspected by an authority which is competent to inspect offerings of securities. Secondly, it makes sense to ask whether the tokens are securities in the sense of national securities law and relevant case law. Thirdly, tokens of The DAO were recognized as securities in the sense of the applicable law by the SEC. A more recent example of the securities-law treatment of membership tokens in DAOs is likely to follow, stemming from the public-law aspects of the MangoDAO exploit. In this case, not only the SEC but also the Commodity Futures Trading Commission and Department of Justice brought charges for fraud and market manipulation against Avraham Eisenberg based on his exploitation of the MangoDAO’s smart contract.

However, the SEC’s conclusions on the case of The DAO, or any other case, should not be understood as an unequivocal answer to the question. As suggested above, the functional principles of DAOs allow for the creation of various types of tokens; not all blockchain tokens can be seen as an equivalent of securities, and still less can they be considered an equivalent of shares. On the contrary, whether blockchain tokens are securities, or not, needs to be assessed case by case, based on their actual properties, applying criteria from the local law to determine whether a certain instrument is a security.

In the U.S., such criteria are most noticeably defined by the so-called Howey test. To qualify as a security under the Howey test, an instrument must meet a definition of an investment contract, i.e., to be “a contract or scheme for the ‘placing of capital or laying out of money in a way intended to secure income or profit from its employment,'” or, more elaborately, “a contract, transaction or scheme whereby a person invests his money in a common enterprise

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358 In this case, the Securities Act of 1933 and the Securities Exchange Act of 1934
359 BakerHostetler, ‘DOJ, CFTC and SEC Bring Separate Actions for the Same Conduct: Alleged Digital Asset Manipulation and Fraud Scheme on Mango Markets Platform’ (27 February 2023)
360 Hacker and Thomale (n 354) 669-687
and is led to expect profits solely from the efforts of the promoter or a third party, it being
immaterial whether the shares in the enterprise are evidenced by formal certificates or by
nominal interests in the physical assets employed in the enterprise."³⁶²

Regarding the case of The DAO, it should be particularly noted that the tokens were sold to
the public for the Ethereum cryptocurrency, they were proportional to the amount of
Ethereum paid by a buyer, ownership and voting rights were granted to the holders of DAO’s
tokens and the token owners could expect a return on investment based on the information
provided to them in promotional materials.³⁶³ Those aspects, however, must be assessed on
a case-by-case basis for each DAO and each type of token in question. Existing research
suggests that a viable methodology to do this is available.³⁶⁴

On the other hand, blockchain tokens having the legal status of securities entails numerous
duties for their issuer. This can be rather burdensome, especially if we consider that this
means to require the issuer of the tokens to be able to assess whether the tokens it issues
meet the definition of securities under the general law and to be able to see which law they
are required to comply with. As a result, calls can be heard for more specific regulation, and
possibly also for exceptions, where reasonable.³⁶⁵ An example of such regulation, providing

³⁶² ibid

³⁶³ U.S. Securities and Exchange Commission, ‘Report of Investigation Pursuant to Section 21(a) of the Securities
b5r7byAhWFoFwKHakqDxQFnoECAMQAQ&url=https%3A%2F%2Fwww.sec.gov%2Flitigation%2Finvestreport%2F34-81207.pdf&usg=AOvVaw0PEtv82OrFTrNgmtN8psI> accessed 16 August 2021 5-6. Cf also newer case
Balestra v. Atbcoin LLC, 380 F. Supp. 3d 340 (S.D.N.Y. 2019) where the court ruled that the tokens offered by
the defendant in an ICO were securities, based on “the presence of an investment in a common venture
premised on a reasonable expectation of profits to be derived from the entrepreneurial or managerial efforts of


³⁶⁵ Nielsen (n 268) 1114 provides a brief overview thereof, pointing out especially that “[s]ome scholars propose
exemptions to securities regulations for DAOs, claiming that ‘[c]ompliance with the burdensome requirements
of registration ...would destroy this new technology and method of conducting business.’ Concluding that the
best way to prevent this would be for ‘Congress [to] amend the registration requirements to provide an
exemption for DAOs.’ This proposal may enable a DAO to operate more freely but does little to protect initial
and secondary market investors because it simply exempts DAOs from registration and does not impose any
alternative form of mandated disclosure or regulation. In addition, SEC exemption does not resolve the issues
arising from a DAO lacking any sort of formal legal organization or classification which is recognized in the
for conditions under which a developer or seller of a public blockchain token does not qualify as the issuer of a security and therefore does not have to comply with the applicable securities law, was adopted in Wyoming in late 2018. While this appears to constitute a reasonable step towards clarification and predictability in the approach to whether blockchain tokens are securities, or not. Any more extensive exceptions would require a precautionary approach, because any lowering the regulatory standards for token offerings and sales is, in general, likely to lead to undesirable consequences.

Due to the borderless nature of internet-based arrangements (and therefore also of DAOs), the U.S. case law stated above may constitute a certain kind of guideline and source of inspiration for competent authorities and law-making bodies in other states, including those

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366 W.S. 34-29-106 Wyoming Utility Token Act, particularly providing for that "b) An open blockchain token with the following characteristics constitutes intangible personal property: (i) The predominant purpose of the token is consumptive, as defined in paragraph (g)(ii) of this section; (ii) The developer or seller did not market the token to the initial buyer as a financial investment, as defined in paragraph (g)(v) of this section; and (iii) At least one (1) of the following subparagraphs is satisfied: (A) The developer or seller reasonably believed that it sold the token to the initial buyer for a consumptive purpose; (B) The token has a consumptive purpose that is available at or near the time of sale and can be used at or near the time of sale for a consumptive purpose; (C) The initial buyer of the token is prohibited by the developer or seller of the token from reselling the token until the token is available to be used for a consumptive purpose; (D) The developer or seller takes other reasonable precautions to prevent an initial buyer from purchasing the token as a financial investment."

in the European legal environment. This is even starting to be visible at the level of individual European states, as well as at the level of the EU as a whole.

A comprehensive law regulating blockchain arrangements and also covering ICOs has been adopted in Malta. The Maltese VFAA defines notions such as ‘distributed ledger technology asset’, ‘initial virtual financial asset offering’, ‘virtual financial asset’ or ‘virtual token’ and provides for a comprehensive set of conditions which must be met by the issuer, the issuer’s duties and liabilities, as well as additional, ICO-specific, powers of the competent authority. A closer look at the definitions (quoted in footnotes for convenience) shows that this law covers all blockchain tokens, regardless of whether they meet the general definition of securities, or other financial instruments, or not. Apart from that, issuers of tokens which are financial instruments must also comply with the general regulation of financial instruments trading. Further, Malta Financial Services Authority made available a Financial Instrument test tool which can be used to determine the type of token, and which regulation it is subject to, based on providing certain information known to the issuer into a spreadsheet form.

While Maltese blockchain law is an outstanding example of elaborate regulation of the use of distributed ledger technology as a base for economic activities, ICOs being only one exemplar of them, some other countries, when approaching ICOs, tend to rely solely on

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368 Although the inspiration must be considered rather loose there due to the differences in the written law. It cannot be expected that the competent authorities in the EU will simply adopt the Howey test, cf. Maume and Fromberger (n 356) 572

369 VFAA S 2 al 13, “‘DLT asset’ means - (a) a virtual token; (b) a virtual financial asset; (c) electronic money; or (d) a financial instrument, that is intrinsically dependent on, or utilises, Distributed Ledger Technology”

370 VFAA S 2 al 27 “‘initial virtual financial asset offering’ or ‘initial VFA offering’ means a method of raising funds whereby an issuer is issuing virtual financial assets and is offering them in exchange for funds”

371 VFAA S 2 al 54 “‘virtual financial asset’ or ‘VFA’ means any form of digital medium recordation that is used as a digital medium of exchange, a unit of account, or store of value and that is not -(a) electronic money; (b) a financial instrument; or (c) a virtual token”

372 Ibid “virtual token” means a form of digital medium recordation whose utility, value or application is restricted solely to the acquisition of goods or services, either solely within the DLT platform on or in relation to which it was issued or within a limited network of DLT platforms”

373 VFAA part 2


standpoints or regulations issued directly by the authorities competent to supervise financial markets.

Such an example from Germany\textsuperscript{376} shows that the principle of assessing the potential status of blockchain tokens as securities on a case-by-case basis (as suggested by the SEC) may be universal. Moreover, guidance issued by the German Financial Services Authority (BaFin) provides for basic criteria for assessing whether blockchain tokens have the status of securities, or other instruments which are subject to existing financial markets regulation. For example, it specifies that tokens granting their owner rights comparable to those of traditional shareholders qualify as securities.\textsuperscript{377} It is further considered that the value of blockchain tokens may constitute a base for derivatives. Such derivatives should qualify as financial instruments and be subject to the regulation as per existing financial markets.\textsuperscript{378}

Similarly, the UK’s Financial Conduct Authority (FCA) issued a policy statement based on consultation with stakeholders, providing guidance on cryptoassets.\textsuperscript{379} It distinguishes between exchange, utility and security tokens, pointing out that the last category should include only tokens which meet the definitions provided for by applicable general regulation.\textsuperscript{380} However, the guidance as a whole is still rather general and may leave stakeholders in need of additional advice.\textsuperscript{381}

\begin{footnotesize}
\begin{enumerate}
\item ibid 4
\item The Financial Services and Markets Act 2000 (Regulated Activities) Order 2001, see ibid 16
\item ibid 16
\end{enumerate}
\end{footnotesize}
A more elaborate approach can be found in France. The French Financial Markets Authority (AMF) issued a general regulation which includes specific sections devoted to ICOs. Those are meant to apply to token issuers who perform initial coin offerings, as long as those meet the definition of issuing securities and the issuer applies for approval with the AMF. It further sets out a rather comprehensive set of ICO-specific requirements regarding, especially, the prospectus, the duty to nominate a responsible representative and communications by the issuer. The French regulation, however, does not reach a level of complexity comparable to the Maltese one. Similarly, a still rather recent piece of law focused specifically on blockchain-related tokens can be found in Monaco. This covers both private and public offerings of tokens and provides that only a legal entity registered in Monaco may offer tokens in its territory.

So far, it can be concluded that roughly similar principles to the U.S. can be found applied in Europe as well. On the other hand, there would be little surprise in seeing attempts to find an independent way to accommodate blockchain tokens into the legal framework of securities also in the EU. However, a comprehensive regulation does not exist so far. The European Securities and Markets Authority (ESMA) published very brief and very general information in November 2017, urging token issuers to double-check if their ICOs might fall into the scope of the general regulation of financial instruments, and to ensure

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382 See Code Monétaire et Financier (French Monetary and Financial Code) S 552.3
384 Loi n° 1.491 du 23 juin 2020 relative aux offres de jetons (Monegasque Law on Offerings of Crypto-Tokens), Art 1
385 Ibid Art 3
compliance if needed, without providing guidance as to which types of tokens are likely to qualify as financial instruments. Looking for an answer to such a question, MiFiD II must be referred to first. This directive contains basic definitions such as ‘transferable securities’ or ‘financial instrument’ and outlines basic rules of trading on the EU capital market.

Thus, ‘transferable securities’ are defined as “those classes of securities which are negotiable on the capital market, with the exception of instruments of payment, such as: (a) shares in companies and other securities equivalent to shares in companies, partnerships or other entities, and depositary receipts in respect of shares; (b) bonds or other forms of securitised debt, including depositary receipts in respect of such securities; (c) any other securities giving the right to acquire or sell any such transferable securities or giving rise to a cash settlement determined by reference to transferable securities, currencies, interest rates or yields, commodities or other indices or measures,” while ‘financial instruments’ is a more general notion covering transferable securities, money-market instruments, units in collective investment undertakings and specified types of derivative contracts.

It may appear difficult to transfer those general definitions into the everyday practice of blockchain tokens. However, it is likely to be still possible if basic aspects of securities, and


388 Directive 2014/65/EU (n 376)
389 MiFiD II Art 4 (1) (44)
390 MiFiD II Annex I Section C
391 This, however, does not appear to be on its way to change, at least based on the current development in the EU legislation. For example, the proposal for a regulation on crowdfunding service providers presented by the European Commission, see European Commission, ‘Proposal for a Regulation of the European Parliament and of the Council on European Crowdfunding Service Providers (ECSP) for Business’ (Brussels 8 March 2018) COM/2018/0113 final - 2018/048 (COD) <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52018PC0113> accessed 19 August 2021, was criticised for not being clear enough in the point of whether it applies to the ICOs, cf Valeria Ferrari, ‘The Regulation of Crypto-Assets in the EU – Investment and Payment Tokens under the Radar’ (2020) 27(3) Maastricht Journal of European and Comparative Law 325 338, the final text of the regulation reduces the attempts to clarify this to one sentence,
other financial instruments, are kept in mind. Most importantly, no registered document or certificate is needed to create a security. It is sufficient that the instrument in question is transferable,\textsuperscript{392} standardized and negotiable on capital market, and that it can be compared to an item from a list of examples provided for by the respective EU law.\textsuperscript{393}

Although the 2018 Fintech Action Plan brought various initiatives, there is no specialist regulation on the blockchain security tokens at the EU level in force at the moment. However, one important point can be identified. Regardless of the national law or legal system, it is remarkable that the definition of a security or financial instrument should be taken as the starting point to achieve a more general approach to the problem.

While existing regulation may not be completely sufficient, or clear enough, in most countries, it may be still concluded that ICOs do not constitute a major problem from the point of view of legal regulation of DAOs, as legal solutions appear to be possible to find. So far, it appears that competent authorities have managed to find satisfactory definitions of the most crucial notion of securities, as well as to assess whether a particular token represents an example of a security or not.\textsuperscript{394} On the other hand, further development in this field is desirable, both in the sense of adapting the existing laws and their interpretation by the competent authorities so that they meet the reality of DAOs, as well as in the sense of educating potential investors, as well as founders of DAOs, about the specific aspects in which the initial coin offerings differ from traditional offering of securities.\textsuperscript{395}

which reads as follows: “Whilst initial coin offerings have the potential to fund SMEs, innovative start-ups and scale-ups, and can accelerate technology transfer, their characteristics differ considerably from crowdfunding services regulated under this Regulation.” See Regulation (EU) 2020/1503 of the European Parliament and of the Council of 7 October 2020 on European Crowdfunding Service Providers for Business, and Amending Regulation (EU) 2017/1129 and Directive (EU) 2019/1937, OJ L 347, 20.10.2020, recital 15. This can imply that regulation should not apply to ICOs; however, a clearer wording would be more advisable.

\textsuperscript{392} On this point, the fact that transfer of a token is technically possible appears to be sufficient for the token to be seen as transferable, regardless of any contractual restrictions of transferability which may apply, cf Hacker and Thomale (n 354) 664

\textsuperscript{393} ibid 662, note that the decisive criterion is the functional comparability, not the designation of the token.

\textsuperscript{394} Maume and Fromberger (n 367) 563 -572

\textsuperscript{395} Some attempts are already visible on this point, see for example The Dutch Authority for the Financial Markets (AFM), 'Initial Coin Offerings (ICO’s): serious risks' (20 August 2021) <https://www.afm.nl/en/professionals/onderwerpen/ico> or Malta Financial Services Authority, ‘Warning to the public regarding unlicensed VFA companies’ (23 April 2010) <https://www.mfsa.mt/news-item/warning-to-
It must be specially pointed out that there is limited guidance on how the general law of securities should be interpreted in the case of ICOs, even less about it being binding for the competent authorities in most countries. Moreover, the need for a more coherent approach to ICOs is apparent, based either on an international agreement on the matter of DAOs and ICOs, or the so-called ‘race for hegemony.’

On the other hand, it should be noted that granting DAOs separate legal personality is of marginal importance from the point of view of the applicability of securities regulations on ICOs. Existing law suggests that as long as general securities regulations apply, some form of registration of the token issuers is already required. This means that some of the founders, or maintainers, of a DAO must identify themselves to the competent authorities as token issuers. Another option is a DAO being run as a certain kind of tool, or project, without its own legal personality, by an existing company as The DAO was. The hypothetical case is that they might form a new type of legal entity, existing without human involvement, which appears rather troublesome for many reasons, as described in earlier parts of this thesis. However, as long as some human involvement remains compulsory for DAOs, granting DAOs separate legal personality is unlikely to bring substantial change in how they can, and should, comply with securities regulations.

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396 Hacker and Thomale (n 354) 687, cf also Financial Conduct Authority (n 379) 15-16 where need for international harmonization is being discussed.

397 Hacker and Thomale (n 354) 694-696

398 Maume and Fromberger (n 367) 572, on the notion of “race for hegemon” see for example David Lazer, ‘Regulatory interdependence and international governance’ (2001) 8(3) Journal of European Public Policy 474
4.4.3 Assets That Are a Bit Different

As suggested above, the structural and systemic obstacles to allowing DAOs to be private companies even without a set compulsory amount of legal capital seem to be surmountable, although it might be disputable whether doing so would bring any benefits. However, the idea of DAOs being an equivalent of public (rather than private) companies, which would entail them being obliged to maintain a certain level of legal capital, cannot be reasonably excluded. Further, given that the arguments of defenders of maintaining legal capital in private companies appear to be plausible as well, it seems useful to have a closer look at what we can expect to be assets or capital of a DAO. In particular, this subchapter will deal with the question of what happens if a substantial portion (or even all) of the assets of a DAO is represented by units of a cryptocurrency. This is easy to imagine if we think about DAOs which might, for example, sell digital products and only receive payments in cryptocurrencies.

In order to provide a theoretical basis for discussing such a question, it might be useful to remind ourselves what is normally understood as the capital of a legal entity. It can be defined as “[a] fund representing the contributions given to the company by shareholders in return for their shares,” while “[t]hese assets are intended to protect the interests of any creditors in the event of a limited company encountering financial difficulties, and there are rules under the Companies Act 2006 to ensure that this fund is not reduced unless it is absolutely necessary.” This definition, however, may cause difficulties if we attempt to translate it into the practical world of DAOs and cryptocurrencies. Starting with the very notion of assets, it is necessary to examine whether cryptocurrencies qualify as a certain kind of assets, i.e., as a piece of “[p]hysical property and/or rights that have a monetary value and are capable of being those of a juristic person or a natural person.”

Shortly put, to form an entity’s assets, cryptocurrencies therefore must be legally capable of being owned either as pieces of property or as rights. This topic opens questions which do

400 ‘Assets’ in ibid
not permit straightforward answers. It must be particularly noted that the legal status of cryptocurrencies varies from jurisdiction to jurisdiction, depending on whether (and if, so how) they can be covered by the relevant legal definitions within respective national law. This means that they are only assets under the law of a chosen country if they meet its legal definition of assets.

Further, it must be noted that there is, in general, a two-fold answer to this question. While a blockchain token (including a unit of a cryptocurrency) is technically a computer program, and therefore subject to broadly recognized intellectual property rights, it doesn’t seem reasonable to base its status as an asset on this, as its economic value overwhelmingly resides in other factors than in the intellectual input of the programmer who wrote the respective set of rules forming the technological basis of the token. Rather, we should focus on assessing whether they should be given the legal status of assets based on the role they play in the economic activities of their issuers and users. This is something which differs from jurisdiction to jurisdiction. 401

In some countries, it is not clear whether blockchain tokens count as property at all. Warnings about such unclarities have been raised for example in Russia, where many substantial provisions of law relating to things and property appear to be impossible to apply to cryptoassets, as the latter does not fit into the former. 402 Further, concluding that cryptoassets are not assets, in the sense that they could be subject to ownership, already brings issues, even in the world of traditional entities. 403 Then more such an approach seems untenable if including DAOs in the legal framework of legal entities should be considered.

401 Cf for example Jean Bacon and others, ‘Blockchain Demystified: A Technical and Legal Introduction to Distributed and Centralised Ledgers’ (September 2017), especially subchapter 6.4. While it can be reasonably assumed that the development will aim towards acknowledging cryptocurrencies in a clearer manner as assets globally, precaution is still advisable if cryptocurrencies are discussed as assets. On the other hand, it should be noted that no specific law of crypto-assets is necessary to give cryptocurrencies the legal status of assets. To do so, being able to subsume them under the legal definition of a general asset (e.g. thing, right etc.) is sufficient.


403 Lauren Holtmeier, ‘Cryptocurrency Can No Longer Be Ignored as an Asset Class’ ArabianBusinesscom (15 June 2021) accessed 26 August 2021
Some countries are more successful in dealing with this than others. We can see examples of first laws relating to cryptoassets in Lichtenstein, or the above-mentioned U.S. state of Wyoming. Both those states provide rather elaborate rules on including cryptoassets within the general framework of assets and property law. An extreme example is Salvador which has declared Bitcoin its legal tender (alongside with U.S. Dollar). Apart from that, there are countries with existing property laws which are already general enough to be able to effortlessly accommodate cryptocurrencies (and other blockchain tokens) without expressly mentioning them. An example of such a country would be the Czech Republic.

In other countries, things are not that straightforward, but the first pieces of case law on this topic have appeared. Remarkably for the civil-law jurisdictions, especially for the legal environment of the EU, a judgment of the District Court of Florence in Italy in the case of BitGrail was rendered based on the assumption that units of “cryptocurrency are the objects of property.” Interestingly, this was supported by a concept of virtual money, as introduced by local anti-money-laundering law which has its roots in the Directive (EU)

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404 Token und VT-Dienstleister Gesetz (Lichtenstein’s Act on Providers of Token and Technology of Virtual Trust Services), see especially § 2(1)(c) which provides for a legal definition of a token and full chapter II which regulates the position of tokens within the framework of the Lichtenstein’s civil law.

405 W.S. 34-29-101 through 34-29-105 and 34.1-1-210. An act relating to property; classifying digital assets within existing laws; specifying that digital assets are property within the Uniform Commercial Code; authorizing security interests in digital assets; establishing an opt-in framework for banks to provide custodial services for digital asset property as custodians; specifying standards and procedures for custodial services under this act; clarifying the jurisdiction of Wyoming courts relating to digital assets; authorizing a supervision fee; making an appropriation; authorizing positions; specifying applicability; authorizing the promulgation of rules.

406 Decreto No. 57 – Ley Bitcoin (Salvador Bitcoin Law)

407 See Czech Civil Code § 489, which defines a thing (in the sense of law) as “everything which is not a person and serves the needs of people.” It appears obvious that such a broad definition is perfectly capable of covering cryptoassets.

408 Tribunale di Firenze, Sent. N. 18/2019 pubbl. 21/1/2019 (judgment in a case that regards insolvency of a cryptocurrency exchange; for an English translation of the judgment see https://medium.com/@bitgrailvictims/court-decision-by-the-court-in-florence-jan-21-20-c6d0c3e4247c)


and according to which "virtual money means an electronically stored, transferred and exchanged representation of a value, not necessarily backed by a legal tender, which is issued by neither a central bank nor a public body as a means of exchange for buying goods or services". The court concluded that introducing the concept of virtual money into Italian law itself permits the respective provision of the Italian Civil Code to be interpreted in a way which allows subsumption of cryptocurrency tokens under the definition of goods (subjects of ownership) thereunder. More clarity is expected to be brought in the matter by the recently adopted EU Markets in Cryptoassets (MiCA) Regulation, which contains, among others, an elaborate set of definitions regarding cryptoassets and which shall come into force on 30 December 2024.

In the common-law area, courts in New Zealand had to rule in 2020 on whether cryptocurrencies traded on the exchange had the legal status of property. This resulted in another groundbreaking piece of case law, not only for New Zealand, where a clear determination of whether cryptocurrency qualifies for a property status was lacking before, but because of its elaborate reasoning also for any stakeholders searching for inspiration on how to approach the legal status of cryptocurrencies in a more systemic way. While the answer to the core question was affirmative to the end, there were several noteworthy lessons to be learned from the case.

Remarkably, the need for a case-by-case approach, as described above, recurs here once again. In particular, the court acknowledged that there was not and even could not be any uniform definition of this term and that in order to determine their legal status courts should

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412 Decreto Legislativo 25 maggio 2017, n. 90 S 1 (2) (qq)
413 Codoce Civile (Italia Civil Code), S 810
414 Tribunale di Firenze, Sent. N. 18/2019 pubbl. 21/1/2019, para 2, as cited in Mangano (n 409) 200
416 Ruscoe v Cryptopia Limited (in liquidation) [2020] NZHC 728 (8 April 2020)
examine individually features of cryptoassets in question.\textsuperscript{418} The court further conducted comprehensive research consisting of 1) a comparative study among selected common-law jurisdictions, which revealed that there is little clarity on the term overall. Cryptoassets being acknowledged as property is usually supported by the broadness of the definition of the latter or merely by the lack of express obstacles to doing so;\textsuperscript{419} 2) analysis of the core features of various assets which were already undoubtedly recognized as pieces of property. Finally, it managed to identify core features which a piece of cryptoassets should have to be able to be subject to ownership. Those are definability, identifiability by third parties, being in their nature capable of assumption by third parties and a certain degree of permanence and stability\textsuperscript{420}.

The cited cases do not address DAOs as such,\textsuperscript{421} but deal with the insolvency of traditional entities which operate a cryptocurrency exchange. However, they are noteworthy in the context of DAOs, especially in showing that, even with some additional effort in terms of interpretation of existing laws, there can be a way to protect creditors if an entity goes into liquidation even in cases where a significant portion of the entity’s assets is currently in cryptocurrencies.

Those examples illustrate that it is usually possible to deal with legal questions about blockchain tokens acting de facto as an entity’s assets, although comprehensive work, including extensive interpretation of existing laws or creation of new ones, is often needed to achieve desirable results. But even if cryptocurrencies and other blockchain tokens are understood as assets, they still need to be priced to be able to act meaningfully as an entity’s assets, in the economic sense, and to form part of its capital. This may, however, constitute

\textsuperscript{418} Ruscoe v Cryptopia Limited (n 405) para 21
\textsuperscript{420} Cf also Kamalnath (n 417) 139-142
\textsuperscript{421} At this point, it must be stressed that the problem of blockchain tokens as assets and objects of ownership is not specific to DAOs but relates to any kind of person. However, as the blockchain environment is more than supportive of arrangements that use cryptocurrencies in the way in which legal tender would traditionally be used, the emerging questions need to be re-iterated and given attention.
another problem which stems from their volatility.422 With cryptocurrencies being a main asset of an entity, creditors may well face an unreasonable level of unpredictability as to the actual value of their collectibles in a situation where an entity becomes bankrupt. This represents a risk not only for the creditors but sometimes also for the entity itself. The volatility of cryptocurrencies means that their value expressed in legal tender or official currency is subject to frequent and dramatic changes, making calculating the actual capital of an entity owning cryptocurrencies practically impossible in the long run. This represents a serious risk to the entities in forms which are obliged to maintain a certain level of legal capital during their existence. In this context, the ‘recapitalise or liquidate’ rule must be reiterated to see if it can still be applied reasonably to an entity which is supposed to hold a significant portion of its assets in cryptocurrencies.

The ‘recapitalise or liquidate’ rule, sometimes also known as the ‘capital adequacy’ requirement, applies in some jurisdictions only and means that an entity is obliged to maintain a prescribed level of legal capital during its entire existence. Should the entity’s actual capital sink below the prescribed level, the entity must recapitalize, i.e., raise new resources, or reorganize into another legal form of entity which is not burdened with such a high requirement on legal capital within a set period of time. Should the entity fail to do so, consequences such as forced wind-up or personal liability of the directors may follow.423 Obviously, the application of such rules to entities which are likely to hold substantial amount of their assets in cryptocurrencies is more than troublesome. Let us imagine a situation where a short-term, but significant, divergence in a cryptocurrency’s value would make the value of the entity’s assets plummet without any money being actually spent by the entity. In such a case, an entity would be forced to raise additional funds, or face reorganization, or even wind-up, unless the value of the cryptocurrencies held by the entity re-

422 Of course, this will not be the problem of Bitcoin in Salvador; however, other issues may emerge from acknowledging a cryptocurrency as a legal tender. For example, there might be issues when trading with foreign partners as volatility will occur in relation to their home currency.

raised to make the capital meet the legal requirements again, within the grace period the law allows for recapitalization or reorganization. This would be, however, highly impractical for the entities in question and put their long-term stability at substantial risk.

While the ‘recapitalise or liquidate’ rule has sometimes been criticised in the general context of the limited function of legal capital in creditors protection (see above) and faces further challenges at the time of drafting this thesis,\textsuperscript{424} as long as it exists, it must be taken into consideration when deciding on the particular features a DAO-entity should have and the regulation that should apply thereto.

4.5 DAOs in the Light of Beneficial Owners’ Registries and Anti-Money Laundering Laws

A further money-related question arises from the anonymous nature of blockchain structures and is closely related to the notion of a beneficial owner, as known from the law of traditional entities. In particular, it should be asked how DAOs, if granted the status of legal entities, will fit into the contemporary framework of anti-money-laundering law with which traditional entities must comply. This is a difficult question as blockchain structures allow for full anonymity of their users if appropriate steps are taken to ensure this.

Thus, theoretically, there could be a DAO where its founders, token-holders or other users and stakeholders cannot be identified, just as nobody knows for sure who Satoshi Nakamoto is, and those paying with bitcoins may remain anonymous in relation to their transactions if they wish so and if the type of transaction allows for that. An outrageous amount of investigatory power would have to be deployed to break through such an ‘anonymity veil’ which is not worth doing in the vast majority of cases. This opens the door for DAOs being a way to effectively run a business without having to comply with statutory requirements on disclosure.

This may be an issue of limited importance as long as DAOs remain in the grey zone, so that only the most serious crimes committed or facilitated via blockchain structures are worth the investigatory powers to be exerted in order to reveal the people behind them. However, once DAOs are recognized by the law as persons, securing their compliance with applicable laws will be crucial especially from the point of view of legal certainty, fair competition and overall sustainability of law. This subchapter deals with selected aspects of how DAOs could fit into the existing frameworks for the registration of beneficial owners and the know-your-customer\textsuperscript{425} rule.

4.5.1 Beneficial Ownership and Anonymity of Participants

Beneficial ownership and identification of members, in general, represent a particularly thorny point of DAOs for various reasons. Before we examine at least some of them, we need first to discuss who should be deemed to be a beneficial owner of a DAO. In order to do so, it appears useful to briefly recall a general definition thereof. A beneficial owner is traditionally and generally defined with regard to land as “\textit{[a]n owner who is entitled to the possession and use of land or its income for his own benefit.}”\textsuperscript{426} A more entity-specific definition used in the European legal environment can be found for example in the 4\textsuperscript{th} AML Directive.\textsuperscript{427} This understands a natural person controlling an entity, or having a certain activity conducted on their behalf, as a beneficial owner of such entity or activity and will be used for the purpose of this thesis, at least where the European legal environment is being

\textsuperscript{425} N.B. In this context, the term ‘customer’ describes natural and legal persons which are customers of the entities listed in Article 2 Directive (EU) 2015/849 as subject to obligations thereunder. For the purpose of this thesis, the term ‘customer’ as used in the Directive (EU) 2015/849 should be understood, depending on the current context, either as the DAO in question itself, as long as it finds itself in the position of a customer of an entity obliged by the EU AML Directives, or as a customer of a DAO if such a DAO itself is obliged by the EU AML Directives.

\textsuperscript{426} ‘Beneficial owner’ in Law (ed) (n 399)

discussed. However, it must be noted that this was meant for traditional entities and a question must be asked as to how to apply it in the highly specific environment of DAOs.

To assess to whom the definition should apply, the general features of a beneficial owner must be pointed out. In general, it can be stated that a beneficial owner is a natural person who is ultimately in control of a legal entity, or someone who takes or is able to take a set, usually substantial, amount of profit from a legal entity. Assuming that DAOs could be recognized as legal entities, a beneficial owner of a DAO could be a natural person holding a certain amount of participation tokens or, in the case of DAOs which are not fully autonomous, a developer exerting control over the source code of DAO. It might therefore appear reasonable to make such stakeholders subject to a duty to be registered in the register of beneficial owners the same as beneficial owners of traditional entities.

However, the practical aspects of the identification and registration of such individuals appear to be rather complex. Even though the law may impose a formal duty to register beneficial owners, as well as other members and a legal representative of a blockchain-based entity (such as an agent or managing director), it may be very difficult, firstly, to verify which tokens belong to whom and secondly that all existing members are actually registered. An elaborate approach is also required to make sure that the legal representative is not a straw person and the situation becomes even more complex when members, i.e., holders of tokens, are in question.

This, again, is not a completely new problem. The concept of straw men (straw persons) in business has been known for some time as a persistent problem, at least in some jurisdictions. However, with anonymous structures not allowing for a straightforward

428 Cf the requirements on a designated person in Malta, although blockchain-based arrangements do not have separate legal personality there.

429 In the context of commercial law, a straw man (or a straw person) is defined as “[a]n individual who acts as a front for others who actually incur the expense and obtain the profit of a transaction,” see ‘Straw Man’ in Donna Batten (ed), *Gale Encyclopedia of American Law* (3rd ed. Gale 2010). Deployment of straw men in corporations often serves to conceal illicit steps of real managers, or those who benefit from an entity, for example in order to avoid both civil and criminal liability if such entity is about to go bankrupt or serving as a vehicle for illegal activities. Cf for example Vladimír Janošek, ‘Co Vás Čeká a (a možná) i Nemine v Případě Převodu Firmy na tzv. Bílého Boně’ [2019] epravocz <https://www.epravo.cz/top/clanky/co-vas-cek-a-a-mozna-i-nemine-v-pripade-prevodu-firmy-na-tzv-bileho-kone-109653.html> accessed 11 October 2021 or Libor
detection, especially of members of a DAO members, this may appear to be even more
difficult to deal with than in the case of traditional entities, if not practically impossible.
Thus, even if members of a DAO (or at least certain categories of them) were obliged to
register, it might turn out impracticable to verify even that the persons registered are the
actual token holders.

At this point, it may be appropriate to ask whether it is useful to insist on the registration of
members, managers and beneficial owners of blockchain-based entities at all, or whether
anonymous membership therein, which could be eventually compared to (mostly not
anymore existing) bearer (anonymous) shares in traditional stock companies, should be
allowed. This problem has two levels: the practical one and the legal-systemic one. The
practical level is accessible to common sense. No, it is not. To answer the legal-systemic part
of the question, we must look at recent developments around bearer shares, particularly the
fact that bearer shares have been abolished in many jurisdictions, and why this has occurred,
as well as we need to ask for the sense and purpose of the notion of beneficial ownership
and beneficial owners registration in the context of legal entities and how it clashes with the
concept of anonymous bearer shares.

Before doing so, it may be useful to briefly recall what bearer shares are. A bearer share is
defined as “[a] company share owned by the person holding it at a particular time.”430 There
is no name stated on the share, no endorsement is needed to transfer such a share and
there is no central register of owners of any particular issue of bearer shares.431 By their
nature, blockchain tokens resemble bearer shares in the respect that any rights vested in
them can be exercised by the person actually having control over the medium in which the
token is saved and knowing the respective private key, regardless of the identity of such a

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of Terrorism & Proliferation,’ The FATF Recommendations’ (Paris 2012-2023) <www.fatf-gafi.org/recommendations.html> accessed 9 October 2021, according to which “[b]earer shares refers to
negotiable instruments that accord ownership in a legal person to the person who possesses the bearer share
certificate.”
431 Cf also ‘Bearer Bond’ in Rutherford (n 430). The principle applies analogically to bearer shares.

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person and sometimes even regardless of whether they acquired them lawfully or not. This would argue in favour of considering those blockchain tokens which constitute membership in a DAO to be a crypto-equivalent of bearer shares. However, the question of whether such a solution is plausible should be considered individually in each jurisdiction, with regard to the respective jurisdiction’s point of view on bearer shares in traditional companies, so that non-systemic steps are avoided. Several matters need then to be taken into account.

The advantages and risks of bearer shares in traditional companies have been discussed for some time, with rather distinctive outcomes. The main advantage of bearer shares is that of protection of confidentiality of the identity of their holders. On the other hand, they may as easily be used as a tool which facilitates a range of financial crimes.\footnote{For a comprehensive explanation of the nature and typical properties of bearer shares see for example Financial Action Task Force (FATF) (n 430)} Bearer shares have been subject to restrictions in many jurisdictions over still rather recent years, resulting in them being either prohibited or at least burdened with additional conditions and duties resulting in their actual owner being capable of identification. To form a grounded opinion on whether considering legal recognition of anonymous memberships in DAOs is plausible, it appears useful to examine why anonymous bearer shares in traditional companies became subject to abolition or significant restrictions.

First of all, it must be noted that while anonymous bearer shares may be seen as something typical for offshore environments and so-called tax paradises at the time of drafting this thesis, such a point of view is overly simplistic. Taking a little bit of a broader perspective, we can see that anonymous bearer shares used to be rather common even in European countries, even recently. For example, they were only abolished in 2015 in the UK\footnote{This was made via the Small Business, Enterprise and Employment Act 2015 (SBBE), although it must be noted that they were made subject to some restrictions even earlier.} and as late as in 2019 in Switzerland.\footnote{Bundesgesetz zur Umsetzung von Empfehlungen des Globalen Forums über Transparenz und Informationsaustausch für Steuerzwecke, BBl 2019 4489, again, it must be noted that they were made subject to some restrictions even earlier.} Peer reviews performed in the framework of the Global Forum on Transparency and Exchange of Information for Tax Purposes and the Revised Financial Task Force Recommendations\footnote{Financial Action Task Force (FATF) (n 430)} represent valuable reference materials which may
help to shed more light on this development. Picking up some examples of such peer reviews, and subsequent recommendations, which resulted in abolition, or restriction, of bearer shares in selected jurisdictions in recent years may then help reveal the reasons which can be set in the context of DAOs. Thus, we can reach a conclusion as to whether anonymous membership of DAOs deserves to be considered as plausible. Particularly the peer review for Switzerland from 2016, together with the Revised Financial Task Force Recommendations, will serve as an illustration of the reasons for which bearer shares became subject to tight restrictions or even abolition.

The revised task force recommendation addresses bearer shares (or, more generally, bearer negotiable instruments) from several points of view, which all aim to support transparency of bearer negotiable instruments, as well as prevention of their misuse for money laundering and terrorism financing. Thus, for example, it is recommended to consider that companies having nominee shareholders, or issuing shares in bearer form, are at higher risk of money laundering and terrorist financing. Therefore, countries are advised to take all measures to prevent bearer shares from being misused for such purposes, including steps such as a ban on, or immobilisation of, the bearer shares, their conversion into registered shares, or placing a requirement on companies to record the identity of the holders of bearer shares with a controlling interest.

In 2015 Switzerland adopted certain detailed measures in accordance with those recommendations. However, the most recent peer review from 2016 recommended that information on the identity of bearer shares holders should be available in all (i.e. not only selected, especially important) cases, which resulted in further amendments to the law. Finally, a new Swiss Federal Act implementing the recommendations of the Global Forum on

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436 ibid 68
437 ibid 94
438 Bundesgesetz zur Umsetzung der 2012 revidierten Empfehlungen der Groupe d' action financière BBl 2014 9689 and BBl 2014 9689
Transparency and Exchange of Information for Tax Purposes was adopted, entering into force on November 1, 2019. This meant a practical ban on bearer shares in Switzerland.

Apart from what is illustrated by the examples stated above, it must be noted that a regulation restricting anonymous bearer shares which is available nowadays did not come out of the blue, in a sudden reaction of the jurisdictions to the recommendations of the Global Forum on Transparency and Exchange of Information for Tax Purposes by which it was preceded. On the contrary, the process of making bearer shares subject to at least some control tends to be of a longer-lasting character. Independently of the Global Forum on Transparency and Exchange of Information for Tax Purposes issuing recommendations serving as a reference source and inspiration for national law-making in financial and tax-related fields, some jurisdictions had started to apply specific national rules about bearer shares years before the peer reviews and recommendations cited in this thesis were issued. Some of the measures were introduced in a gradual manner.

For example, certain limitations on the issuance of anonymous bearer shares used to apply in the Czech Republic even before the latest peer review took place and recommendations were issued which resulted in the adoption of the Czech Transparency in Public Limited

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439 Bundesgesetz zur Umsetzung von Empfehlungen des Globalen Forums über Transparenz und Informationsaustausch für Steuerzwecke, BBl 2019 4489
<https://www.alexandria.unisg.ch/259027/1/jibfl%20de%20facto%20abolition%20of%20bearer%20shares.pdf>
Companies Act. However, the new, and even stricter regulation resulted in not being able to be protected anymore the identity of a holder of bearer shares. Those examples are far from stray and most of the OECD member states follow the recommendations and this shows that the overall trend is for all members of companies to be identifiable. Although the above-cited documents mostly relate to PLCs, their principles may easily be set in the context of DAOs for the reasons explained above. Therefore, it must be noted that where requirements on the identification of people behind traditional companies already apply, any future requirement on the identification of people behind a DAO would only be a logical continuation of the already existing trend.

The traditional purposes of registration of beneficial owners (and in some cases also other shareholders and stakeholders), such as prevention of tax evasion, money-laundering or terrorism-financing, or the effective possibility to piercing the corporate veil even in cases of entity chaining, are as relevant in DAOs as in the traditional entities. This may even become doubly important if decentralized and potentially anonymous structures (such as public blockchains) or alternative means of payment or unusual objects of economic value (such as various types of blockchain tokens) are involved, because the same structures as those used for running DAOs are notorious for being used for illicit activities by certain subjects, with vast amounts of investigatory powers required to break through them.

441 Zákon č. 134/2013 Sb, o některých opatřeních ke zvýšení transparentnosti akciových společností a o změně dalších zákonů (Czech Transparency in PLCs Act). It must be noted that certain, even though much more lenient, restrictions on bearer shares used to apply, even before this law was adopted. For example, certain types of companies were not allowed to issue bearer shares at all or were only allowed to issue bearer shares if they were immobilized. Also, the general requirement to identify shareholders holding shares which exceeded prescribed amount of voting rights applied to bearer shares as well and the holders of bearer shares in paper form were required to disclose their identity in order to be allowed to participate on the annual shareholders meeting. However, this was deemed insufficient by peer review and adoption of significantly tighter restrictions was recommended, see OECD, ‘Global Forum on Transparency and Exchange of Information for Tax Purposes Peer Reviews: Czech Republic 2012: Phase 1: Legal and Regulatory Framework’ (Paris 2012). Global Forum on Transparency and Exchange of Information for Tax Purposes Peer Reviews <https://read.oecd-ilibrary.org/taxation/global-forum-on-transparency-and-exchange-of-information-for-tax-purposes-peer-reviews-czech-republic-2012_9789264168800-en#page4> accessed 8 October 2021 31-32 and 75-77

442 At the moment, bearer shares are allowed in the Czech Republic unless expressly banned in specific cases, but they must be immobilized, see Czech Corporations and Cooperatives Act S 274 (2). The Czech Transparency in PLCs Act provides for conversion of bearer shares which have not been immobilized in the prescribed time period into registered shares.
Under such circumstances, allowing for anonymous DAO memberships to be legally recognized while membership in traditional companies is subject to regulation aiming at members being identifiable under most, or even all, circumstances seems likely to lead to undesirable results from the point of view of legal certainty, fair competition and overall sustainability of law.

The EU member states must, on top of this, take into account that anonymous memberships in DAOs also appear to be contrary to the overall intentions of the EU legislator, particularly if we take into consideration the above-mentioned concept of beneficial ownership information, as introduced in the 4th AML Directive. The Directive’s scope of application relates to financial and corporate transactions in which financial institutions, legal professionals, tax advisors or estate and letting agents are involved, and therefore it will presumably apply only to a minority of DAOs which use cryptocurrencies as their only means of payment. However, it still may serve as a source of inspiration and of the broader context of the EU legislator’s intentions regarding the identification of persons exercising actual control over legal entities.

Overall, the analysis of existing resources suggests that only those jurisdictions which allow for anonymous bearer shares in traditional companies seem to still have a plausible and systemic option of putting DAOs on a par with such companies and allowing anonymous membership in them, although even those should be aware of the risks connected therewith. On the other hand, those which apply measures to make members of traditional companies identifiable should rather aim to apply the same standards to DAOs. A different approach would result in a non-systemic exception, which might be to the detriment of equal treatment of subjects of law and also open space for registered DAOs being used for illicit activities, which would, eventually, contradict the overall aim of providing registered DAOs with a legal status which would help them maintain a certain level of reputation and credibility comparable with other registered entities, in which there is access to information about owners/shareholders or other stakeholders. Therefore, an exception allowing

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443 4th AML Directive, recitals (especially recitals 7, 8 and 9)
anonymous membership in DAOs does not seem plausible in jurisdictions which don’t allow for anonymous bearer shares in traditional companies.

Being able to assume that most national states would need to maintain transparency in ownership structures of DAOs, as well as identifiability of their owners, as a part of a plausible legal status of DAOs, a further question to be asked is how those states should enact and enforce the requirement that members of a DAO are identifiable. Several aspects need to be taken into consideration in this context.

The question of who should be understood as a member of a DAO has been discussed above. But even if we adopted the broadest available solution, i.e. understanding every token owner as a member of a DAO (maybe except for utility tokens) and if the notion of entity membership was modified to include the DAO model, it still needs to be asked how the duty to register should be enforced and which safeguards should be adopted to prevent the occurrence of straw-persons and undisclosed holders of security tokens attaining membership.

Firstly, providing for a corporate form which enables DAOs does not mean that all DAOs will incorporate. On the contrary, any formal duty to register is likely to be extremely difficult and costly to enforce, using repressive measures, for the reasons described above. Therefore, it may appear more practical to reach out via positive motivation and emphasise that registration will provide DAOs with incentives stemming from legal personality. Apart from the obvious, such as credibility and improved reputation as a legally existing business partner, this may for example give the opportunity to take part in tenders, or obtain subventions, under conditions comparable with those applicable to traditional entities.

Having persuaded at least some DAOs to register, it must be further noted that the authorities who maintain a register of DAOs should be reasonably able to perform preventive control, among other, in relation to the aspect of the persons behind the DAO in question, i.e., to verify that the persons to be registered as members of a DAO are legally capable thereof and that all required documentation submitted by them is correct. Further, as blockchain tokens are usually transferable, as with shares in traditional companies, there
is a need to ensure that any subsequent changes in the ownership structure of any DAO will be registered as well.

First examples of how to address those challenging tasks are already available. Although not exactly providing DAOs with separate legal personality, Maltese law may serve as a valuable source of inspiration on how to approach registration of blockchain-based arrangements and the key people behind them, so that registration serves its purpose rather than being purely formal, bureaucratic act. Indeed, Malta seems to be perhaps the first jurisdiction to present some kind of a holistic legal framework for blockchain-based economic arrangements, having implemented comprehensive legal regulation regarding innovative digital solutions in 2017. This includes a detailed method of legal recognition of blockchain-based establishments. A trinity of laws, namely the Virtual Financial Assets Act (VFAA, already mentioned above), the Malta Digital Innovation Authority Act (MDIAA) and the Innovative Technology Arrangements and Services Act (ITASA) set up a legal framework which is meant to be able to cover blockchain-based establishments (including DAOs) with rules which provide a certain level of legal certainty to most stakeholders.

While the Maltese model leaves arrangements such as DAOs without their own legal personality, it still contains inspiring points, for example in an elaborate preventative control procedure which is performed by a specialist body and precedes registration of any innovative technological solution. There are also more particular measures, such as introducing the role of a registered technical administrator, who must be a natural person meeting specific conditions provided for by the ITASA and fulfilling the duties imposed on them thereby and who is liable for compliance with all of the regulations. Further, there is a duty to notify MDIA if there is a transfer of ownership of at least a 25% share in a legal entity which is an innovative technology services provider.

Should DAOs become separate legal entities, building upon those principles and adopting a similar approach should be considered in relevant jurisdictions. Among others, it might seem desirable to impose a requirement to have technological measures in place to prevent

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444 ITASA S 8(4)(c)
uncontrollable transfers of membership tokens on all potential DAOs. Likewise, all transfers of ownership in membership tokens of DAOs should be recorded on a compulsory basis, in a similar way as in the case of shares in public limited companies. Where technically possible, subsequent audits should also become a standard, to verify that the number of existing membership tokens is the same as the one entered into the register and that all current owners of membership tokens are registered.

4.5.2 Know Your Customer: Anti-Money-Laundering and Countering-the-Financing-of-Terrorism Measures in DAOs World

The legal issues around anonymity in a blockchain environment are not limited to those who immediately benefit from running a DAO. Rather, they may impinge upon a much broader range of stakeholders. The know-your-customer (KYC) principle is another of the key building stones in promoting compliance with transparency requirements, prevention of fraud in electronic commerce as well as in the anti-money-laundering and anti-terrorism-financing efforts. While it normally results in imposing comprehensive duties only on subjects performing particularly specified business activities (e.g., providing financial services), it appears to be as important as the identification of entity holders and beneficial owners and must be examined from two points of view in the context of DAOs.

Firstly, it is not impossible that a DAO may itself run a business or perform any other activity to which the anti-money-laundering laws apply. Should this be done in a regular legal framework by a DAO which is a person in the sense of law, it is essential that such a DAO complies with those laws in the same way traditional entities running comparable business would do. For example, existing cryptocurrency exchanges and providers of virtual currency

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wallet services usually have some obligations in the field of AML, and such businesses being run on a DAO basis should be obliged to do the same. The 5th AML Directive\textsuperscript{448} outlines the scope of such requirements in the EU.

A remarkable example of an implementation of the 5th AML Directive on blockchain-based activities can be found in Estonia. Estonian law acknowledges the operation of cryptocurrency networks as a financial service. Providers of virtual currency wallet services and/or services of exchanging a virtual currency against a fiat currency must register with the competent authorities, apply for a licence and comply with the applicable law, including any anti-money-laundering regulation.\textsuperscript{449} The regulation applies to existing persons and entities and there is no reason why DAOs performing such activities should be exempted if they reach the status of a legal person. However, even this is not a panacea for related problems. Most importantly, the regulation is limited to a specified range of services, so that DAOs created for other purposes would be left out. Further, enforcement of the basic element of the regulation, i.e., prosecution of those who perform regulated activities without a licence, would require an extreme amount of investigatory powers to be exerted if DAOs come into question, while the results may not necessarily meet the expectations.

Further, the KYC principle may yet find its application in the earliest stages of the existence of a DAO, particularly in the stage of the ICO.\textsuperscript{450} As discussed above, an ICO may be understood as an equivalent of an initial public offering, and therefore be subject to the same regulation as the subscription of shares in traditional PLCs. This includes the duty to comply with all AML requirements applicable in the given jurisdiction. It must be noted that those normally go beyond the basic identification of the buyer, which may be relevant for registration of the shareholders of the company/DAO, and includes data related both to the person and financial means in question.

\textsuperscript{449} Cf Rahapesu ja terrorismi rahastamise tõkestamise seadus (Estonian Money Laundering and Terrorist Financing Prevention Act)
\textsuperscript{450} Cf for example Nadine K Ostern and Johannes Riedel, ‘Know-Your-Customer (KYC) Requirements for Initial Coin Offerings’ [2020] Bus Inf Syst Eng 1 <https://link-springer-com.ezproxy.is.ed.ac.uk/article/10.1007/s12599-020-00677-6>
Secondly, it must be noted that ICOs, or those providing specific types of services, are not the only reason why DAOs may be required to follow the know-your-customer principle. A DAO being a legal person, and therefore independent user of the services which may be subject to regulation relating to the know-your-customer principle, must also be capable of disclosing the required information about itself, if applicable. This relates closely to the capability to identify the owners and managers as described above.

Indeed, it must be stressed again that once DAOs reach legal recognition as separate legal entities, the same criteria and duties in the field of anti-money laundering and countering financing of terrorism will apply to them as they apply to natural persons and traditional legal entities performing comparable activities. Therefore, they will need to be able to comply with the applicable requirements even in this field. This means for example that they will need to be able to prove who are their legal and beneficial owners and managers (see above) or where their assets come from.

This, however, entails keeping records about such persons and adopting procedures to ensure that any subsequent transfers of membership-constituting tokens are documented. Also that new owners of such tokens are identified and registered, which may turn out to be prohibitively difficult in the blockchain environment. They may also need to record and maintain a high amount of personal data about their own customers, which means having to find a working way of credibly identifying each customer and of securing compliance with applicable data protection laws\(^\text{451}\) on the other hand. It must be asked if this is possible (or

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\(^{451}\) The possible conflict between the nature of blockchain arrangements and the requirements of data protection law constitutes a separate and rather complex problem, which has not been included in the scope of this thesis. However, it must still be noted that once granted legal personality, DAOs will be obliged to comply with the applicable laws even in this field, which may give rise to additional challenges. In brief, reaching out to EU law only, it may be pointed out, for example, that the immutable nature of the blockchain constitutes an issue in the context of the right to erasure, where fully autonomous DAOs could be challenged due to a person’s right not to be subject to automated decision-making. For detailed examination of the topic, see for example Seval Capraz and Adnan Ozsoy, ‘Personal Data Protection in Blockchain with Zero-Knowledge Proof’, *Blockchain Technology and Innovations in Business Processes* (Springer, Singapore 2021) or Briseida S Jiménez-Gómez, ‘Risks of Blockchain for Data Protection: A European Approach’ (2020) 36(3) Santa Clara High Technology Law Journal 281 <https://www.proquest.com/scholarly-journals/risks-blockchain-data-protection-european/docview/2404652578/se-2?accountid=10673>. Again, specific technological solutions may need to be adopted to ensure compliance with the Data Protection Law.
will be possible in the foreseeable future) and how such compliance could be reached. Options for a blockchain-based solution have been already examined.\textsuperscript{452}

However, it must be noted that the procedure must be managed in its complexity, and in the context of each relevant jurisdiction, in order to justify DAOs obtaining the legal status of entities capable of compliance with existing regulation. Additional issues may arise once fully autonomous DAOs equipped with advanced artificial intelligence arrive. For example, it must be asked who should be responsible for the correct performance of a KYC procedure running solely on an algorithmic basis. Again, such questions should be answered before DAOs are given the status of legal persons.

4.6 Incorporation, Registration and Beyond

Having discussed what a legal entity actually consists of, at both static and dynamic level, some more formal aspects of legal entities must be paid attention to as well. There are opinions claiming that in the case of companies, form is more important than substance,\textsuperscript{453} and while they might sound very conservative, the bureaucratic process of incorporation and registration may be a crucial part of an entity’s life anyway, as many jurisdictions place specific demands on underlying legal acts, acknowledging the moment of registration as the moment when a legal entity commences to exist.\textsuperscript{454}

The process traditionally entails submitting the required documentation to a competent authority and payment of a fee.\textsuperscript{455} Subsequently, the company will be entered into a public register. While the details vary from jurisdiction to jurisdiction, remaining in the European legal environment, the elementary framework is harmonized by the EU law\textsuperscript{456} and therefore there are certain elements of the procedure for incorporation and registration which are common throughout the EU. These are (i) drafting of the articles of incorporation and

\textsuperscript{452} Ostern and Riedel (n 450)
\textsuperscript{453} Grier (n 217) 1
\textsuperscript{454} Cf for example Czech Civil Code, S 126 (1), German Limited Liability Companies Act, S 11 (1)
\textsuperscript{455} For a comprehensive example of the incorporation procedure and related matters (UK jurisdiction) see Grier (n 217) 39-82
\textsuperscript{456} Luca (n 290) 121 -139
statutes; (ii) preventive control; and (iii) entry into the public register.\textsuperscript{457} National jurisdictions provide for certain requirements on the persons who are setting up a new entity, as well as for mandatory formalities for the articles of incorporation and statutes. Those documents must, depending on the jurisdiction, be either checked for completeness and correctness by the administrative or judicial authority which is responsible for the registration, or executed in the form of a notarial deed.\textsuperscript{458} The EU law also provides for a minimum amount of information that the entry should contain, so that sufficient information about each entity is available, through the register, to third parties.\textsuperscript{459}

Establishing a DAO effectively means drafting articles of incorporation and statutes (or at least part of them) in the form of a computer program, which may make preventive control significantly more difficult for the relevant authorities. It also makes the idea of drafting all the documents by a notary too complicated to be practically imaginable. This, however, is not caused by all the incorporation and registration paperwork necessarily needing to be done in paper. On the contrary, using electronic tools to manage the life cycle of traditional entities is a well-known initiative in the EU, reaching back to the Digital Agenda for Europe,\textsuperscript{460} and is currently understood as plausible in general.

While digitalisation has its limitations, it still finds significant use even in the notarial agenda, which is also relevant for the field of incorporation and registration of entities. José C Llopis Benlloch (2018) presents an example of how the notarial agenda in Spain benefits from digitalisation.\textsuperscript{461} This includes fully digitalised online incorporation of companies, which involves the use of standardized articles of association.\textsuperscript{462} Outside Europe, the Indonesian concept of Cyber-Notary may be mentioned as a significant example of digitalization in

\begin{footnotes}
\footnote[457]{ibid 123}
\footnote[458]{ibid 125}
\footnote[459]{ibid}
\footnote[461]{Llopis Benlloch (n 316) 57}
\footnote[462]{ibid 59}
\end{footnotes}
notarial work. The main problem of meaningful incorporation and registration of DAOs lies elsewhere. It must be noted that such examples as those mentioned above already have their own limitations. Those regard even traditional entities and indicate that checking and guaranteeing the correctness and adherence to the law of an instrument of incorporation which is written, even partially, in a form of a computer programme, still requires additional knowledge and skills, which notaries or other authorities responsible of the incorporation-and-registration-of-entities agenda cannot be expected to have.

On the other hand, it is already known that complete abandonment of notarial control where traditionally required, which might be the first idea coming to mind when thinking about this problem, brings serious issues and should not be accepted without thinking twice. Rather, an adjustment in the process of registration of a DAO may be required, going far beyond the existing idea of digitalization of corporate law and notarial matters and resulting in registering a DAO in a more or less different way from a traditional entity. Some jurisdictions already try to address this problem, and examples of solutions can be found. However, none of them represents a holistic and universally adoptable pattern for the purpose of this thesis.

In particular, we can either see blockchain-based establishments being registered without their own legal personality, or perhaps simply partial regulation, which provides DAOs with legal personality but does not provide a comprehensive and tailor-made regulation as to matters of incorporation and registration, basically following the pattern of incorporation and registration applicable to an equivalent traditional entity. Still, those examples may establish a stepping stone for the approach to preventive control in smart contracts for the future.

Maltese law give a prominent example, where the mere concept of the regulation makes it obvious that a blockchain establishment is understood as something other than a traditional entity. The recognition under ITASA is issued to a designated person (usually the applicant)

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463See for example Dina Chamidah and others, ‘Regular Issue: Authority and Power of the Law Relating to Cyber Deed Notary in Indonesia Era Industrial Revolution 4.0’ (2019) 9(1) UEAT 947
464 Llopis Benlloch (n 316) 50
rather than to the technological arrangement alone. The MDIAA establishes a specialized authority designated to perform the certification, registration and supervision of innovative technology arrangements and innovative technology service providers and to maintain a register of such arrangements and providers, which is separate from the register of traditional companies.\textsuperscript{465} This authority executes preventive control of whether the standards of legality, integrity, transparency, compliance and accountability stemming from the applicable law are met and awards certification or other recognition to the arrangements and providers.\textsuperscript{466}

ITASA provides a number of material requirements which arrangement must meet to obtain recognition, including the need to be able to secure compliance with the applicable law, to meet legal obligations or to allow for an intervention of an administrator if a loss to a user or a breach of law occurs\textsuperscript{467} as well as to being able to respond to reasonably predictable changes of law.\textsuperscript{468} There is also a duty to have a representative regularly resident in Malta\textsuperscript{469} and a duty to provide the authority with specific information in specified cases.\textsuperscript{470} Obviously, compliance with all those requirements needs to be enforced.

Thus, MDIA is equipped with a wide range of powers relating to registration and authorisation\textsuperscript{471} or certification\textsuperscript{472} of innovative technology solutions such as DAOs. Granting authorization of an innovative technology solution entails an elaborate procedure in which various factors are considered by the authority, such as whether the applicant (the innovative technology service provider, its technical administrator or any other person involved in the innovative technology arrangement) is a fit and proper person with regard to the arrangement in question,\textsuperscript{473} or whether the arrangement itself meets legal and other requirements, especially with regard to Malta’s overall reputation and international

\textsuperscript{465} See ITASA S 6
\textsuperscript{466} See ibid S 8 (3)
\textsuperscript{467} See ibid S 8 (4) (d)
\textsuperscript{468} See ibid S 8 (4) (c) (iii)
\textsuperscript{469} See ibid S 15
\textsuperscript{470} See ibid S 12
\textsuperscript{471} ibid Part III
\textsuperscript{472} MDIAA Part 6
\textsuperscript{473} Ibid, S 27 (1)(a)
commitments, protection of the public and legal entities or reputation and overall fitness of the applicant and further stakeholders.\textsuperscript{474} Thereby, the type and amount of information, and documentation to be provided to the authority, is not limited. The authority may require any documentation and information it deems necessary to determine whether the innovative technology solution in question is capable of being registered and authorized in terms of the existing legislation.\textsuperscript{475} Certification requires a technological audit of the solution proposal being performed as well.

While the Maltese lawmaker was well aware that blockchain-based establishments may be unable to meet some of the regular requirements for technical reasons, there are a number of exceptions for distributed ledger technology arrangements provided for by S 8(5) of the ITAS. It should be noted that such exceptions are meant as temporary and any recognition made while they apply is conditional to addressing the issues which prevent compliance so that compliance is eventually reached. This is checked by the authority as well.

Lichtenstein adopts a slightly similar approach, but it limits registration to providers of certain services, which serve to secure the integrity of tokens, the connection of tokens to technology-of-trust identifiers and trading with tokens.\textsuperscript{476} Again, the law provides for a set of specific requirements which the person applying for the registration must meet. On the other hand, the cited law is not aimed specifically at DAOs, although it may cover them (rather, it covers all kinds of businesses performing the specified activities). The respective register is kept by the Lichtenstein Financial Market Authority, giving the impression that its purpose relates rather to supervision over the provision of cryptocurrency services, than to providing blockchain-based entities with a specific type of recognition. Registration does not entail granting legal personality to the technological solution used in providing such services.\textsuperscript{477}

\textsuperscript{474} Ibid, S 27 (3)
\textsuperscript{475} Ibid, S 26(1)
\textsuperscript{476} Cf Lichtenstein’s Act on Providers of Token and Technology of Virtual Trust Services, S 12 in connection with S (1) (a)
\textsuperscript{477} Cf Lichtenstein’s Act on Providers of Token and Technology of Virtual Trust Service, Part B
While the first signs of laws providing for a separate legal entity form for DAOs are present in some U.S. states, the preventive control presumed by them does not generally reach the level of elaborateness of the Maltese law. Thus, the Wyoming Decentralized Autonomous Organization Supplement enables DAOs to be established and incorporated as a specific form of LLC, while the Wyoming Limited Liability Company Act still applies with specific modifications to them in such a case.\textsuperscript{478} The law includes a reasonably comprehensive list of requirements on what the articles of organization and operational agreement should cover, but the documents are submitted to the secretary of the state for filing and there does not seem to be any specialist preliminary check of the content of them.\textsuperscript{479}

Also, while each DAO must have a registered agent as provided for by the relevant provisions of the general corporate law,\textsuperscript{480} there is no alignment of the role to the nature of DAOs, nor any specific requirements regarding qualification of such a registered agent in relation to the nature of the DAO and, in addition a registered agent may be not only a natural person but also a legal entity\textsuperscript{481} i.e. even another DAO.

A practically analogical approach can be found in the U.S. state of Vermont, which also adopted a set of laws relevant to blockchain. This provides a comprehensive legal framework for using blockchain technology in business, including regulation of establishing blockchain-based LLCs as a specific type of entity.\textsuperscript{482} Also blockchain-based LLCs under the law of the state of Vermont must provide for selected specific matters, such as degree of centralization, governance matters, the establishment of membership, and rights and obligations of individual groups of participants\textsuperscript{483} in their operating agreements. Similarly to the previous case, the Vermont Limited Liability Company Act applies to the rest of the legal matters relevant for a DAO as a subtype of a LLC. Thus, it also remains unclear how preventive control is made at the level of a DAO’s source code, as well as at the level of qualification of the responsible people. There is also not enough clarity about to what extent

\begin{itemize}
\item \textsuperscript{478} W.S. 17-31-103 a)
\item \textsuperscript{479} W.S. 17-31-106 and W.S. 17-31-107
\item \textsuperscript{480} W. S. 17-31-105 b) in connection with W.S. 17-28-101 through 17-28-111
\item \textsuperscript{481} Cf W. S. 17-28-101 a) ii)
\item \textsuperscript{482} State of Vermont Blockchain Act S 4171–4176
\item \textsuperscript{483} Ibid S 4173-4175
\end{itemize}

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any steps which were not anticipated by the DAO’s algorithm can be enforced. In spite of any possible imperfections of the law, the first blockchain-based LLC thereunder has already been registered.\textsuperscript{484}

Those first exemplars of full legal personality for DAOs represent the first holistic attempts to make DAOs independent participants in legal and economic life, but also appear to be compromise solutions, which should be understood as needing further discussion and development. In particular, it appears advisable to address exactly the practicalities of preventive control. So far, the authorities competent for registering DAOs as corporations are the same as those competent for registering traditional companies. However, perhaps a demand for expert knowledge reaching far beyond what is necessary for traditional corporate law has not been taken into consideration.

Further, it must be noted that even in countries that haven’t addressed the possibilities for incorporation and registration of DAOs yet, there may be options and ideas which are worth discussing. While real incorporation of DAOs as such currently does not take place in the European legal environment, the solutions and initiatives described above show that there are possibilities to address some of the problems which come with incorporation and registration of DAOs. However, this would entail significant effort on the part of competent authorities, as well as acceptance of compromise solutions by the creators of DAOs. The details of this are also discussed in this thesis.

Apart from that, some jurisdictions may leave open doors to partnership-based forms of DAOs’ operation, which require neither incorporation nor registration. Those are usually certain types of partnerships which, however, seem rather controversial due to the unlimited liability of the partners, which would apply to all token holders but which seems to be reasonable and justifiable only in respect of the originators of a DAO and other people who are closely involved in its running and development.\textsuperscript{485} This, however, does not limit

\textsuperscript{484} See Openlaw, ‘Operating Agreement of dOrg, LLC’ <https://lib.openlaw.io/web/default/template/bllc-dao%20-%20vermont>

\textsuperscript{485} Cf Reyes (n 6) 394
their relevance in terms of the discussions about liability in blockchain-based business arrangements and sometimes even about their legal personality.

In some jurisdictions, such forms may even emerge automatically, in the worst case without the partners really wanting it to happen. Explained in laypeople’s language, “if you decide to go into business with another person without filing any state paperwork, you’re automatically in a partnership.”486 This explanation originates from the U.S. and is not an automatic, worldwide and exception-free rule. Some other jurisdictions may require partnerships to register and submit certain paperwork in order to exist legally. On the other hand, we can find examples of automatically emerging structures resembling partnerships even in some European countries.

An example of such arrangements may be the civil law partnership as known from German or Austrian law. A civil law partnership (in German ‘Gesellschaft des bürgerlichen Rechts’) is a non-commercial form of partnership with minimum, to no, formal requirements for set up, serving to organize legal relationship in cases when at least two persons cooperate to reach a common goal without having to form a legal entity. Neither in German nor in Austrian law, do civil law partnership have a legal personality. Therefore, this form is not relevant for the discussion about legal personality for DAOs stricto sensu.

On the other hand, it remains relevant for discussion about human involvement in DAOs and about the liability of the originators of a DAO, and/or its operators, as they emerge automatically upon the factual activity of the persons taking part in the project in question. The civil law partnership is not meant to run a business. It is only allowed to perform gainful activity of a small extent, for which its members must register with the competent authority. However, even such registration does not constitute a legal personality of the partnership. While it appears likely that the activity of the founders/developers of a DAO could, in many cases, have all the necessary formal features to be a civil law partnership, the practical aspects may be a bit more complicated. Especially, it must be noted that if a civil law partnership performing a gainful activity exceeds the prescribed level of turnover it will have

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to transform\textsuperscript{487} or even automatically transform\textsuperscript{488} into a general partnership or other type of business entity as the applicable law prescribes.

Both those aspects would bring problems in everyday practice as, while the civil law partnership stands up from an informal agreement of the partners rather than from any formal legal act,\textsuperscript{489} the registration duty is likely to be difficult to enforce as long as DAOs can operate anonymously, resulting in an effective inability to identify the liable persons if things go wrong. This means that the main benefit of such a legal arrangement is likely to get lost, leaving it a practically empty shell. On the other hand, should the human initiators/beneficiaries of such a DAO be found, the regulation of partnerships would be likely to apply, as long as German law applies to the case as a whole.

Similarly, the law of England and Wales knows the notion of ‘unincorporated association,’ which is an arrangement in which “two or more persons bound together for one or more common purposes, not being business purposes, by mutual undertakings each having mutual duties and obligations, in an organisation which has rules which identify in whom control of it and its funds rests and on what terms and which can be joined or left at will.”\textsuperscript{490} This may differ in small details from the German or Austrian civil law partnership, but the basic problems of them attempting to accommodate DAOs seem to be the same.

A rather different example, but still worth mentioning, can be seen in a Scottish general or limited partnership,\textsuperscript{491} which is an arrangement requiring registration, having a separate legal personality and underlying a rather simple regime in the terms of corporate law. This

\textsuperscript{487} Cf Unternehmensgesetzbuch (Austrian Commercial Code), S 8 (3)
\textsuperscript{488} Cf Handelsgesetzbuch (German Commercial Code), S 105 (2)
\textsuperscript{489} Cf German Commercial Code, S 705 or Allgemeines Bürgerlichen Gesetzbuch (Austrian Civil Code), S 1178
\textsuperscript{490} Conservative and Unionist Central Office v Burrell [1982] 1 WLR 522, 525 by Lawton LJ
\textsuperscript{491} UK limited partnerships, which are in the main focal point of this passage, can be seen as a UK variety of the partnership \textit{en commandite} as known in the continental Europe, cf Frederick Pollock, \textit{Essays in Jurisprudence and Ethics} (F.B. Rothman 1985, 1882) xi. Indeed, legal entities following the same principle may be found in many jurisdictions in Europe and even beyond. Although they require registration, it still appears useful to mention them together with partnerships which may exist without registration, as their core nature follows the basic principles of partnership. Scottish limited partnerships are established in the framework of the UK Limited Partnerships Act 1907, but contrary to the limited partnerships known in other parts in the UK, they have separate legal personality independent from their founders due to the S 4 (2) UK Partnership Act 1890. For the sake of completeness, it should be said that a general (unlimited) Scottish partnership would work similarly in terms of legal personality but would be particularly risky for the participants due to the unlimited liability of all partners.
construction appears more helpful in the context of legal personality for DAOs, being able to include the token-holders as members in a more reasonable manner. However, certain aspects require to be minded, which may become questionable if a DAO is fitted in this type of corporate vehicle. Firstly, it is, once again, difficult to imagine a partnership without members. Thus, there would, again, be a need to establish which kinds of participants qualify as partners.

Further, the concept of limited partnership presupposes two types of members, namely general partners, who manage the entity and whose liability is unlimited, and limited partners, who benefit from limited liability but are excluded from management of the entity. This means that we need to ask which of a DAO’s stakeholders should belong to which of those categories. This could be based for example on the existence of voting rights, so that the holders of tokens connected with voting rights could represent the general partners, while holders of the tokens to which no voting rights are attached could be limited partners. This could fit well with the concept of a capital contribution made by the limited partners, the equivalent of which can be seen in the non-voting membership-token holders purchasing their tokens. On the other hand, there are some further requirements and conditions, whose fulfilment does not appear to be so straightforward.

For example, a Scottish limited partnership is expected to have its principal place of business in Scotland.\(^\text{492}\) This is easily said but much harder to determine and secure for DAOs. It must be once again recalled that a DAO is nothing other a computer program running on a distributed database infrastructure. Therefore, it cannot be localized by traditional means, such as the place where a substantial portion of its activities take place. Instead, ancillary criteria such as the domicile of the general partners, or the market on which the DAO’s products are primarily meant to be offered, might be considered, which may seem less

\(^{492}\) This is not expressly stated by the laws, but can be concluded for example from S 8(A) (1) (d) UK Legislative Reform (Limited Partnerships) Order 2009, which requires an application for registration to “be made to the registrar for the part of the United Kingdom in which the principal place of business of the limited partnership is to be situated.” Cf similarly Shepherd and Wedderburn LLP, ‘Scottish Limited Partnerships (Scottish LPs): Particular considerations where a Scottish LP features as part of a fraudulent scheme’ (2015) <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwiuruKn2qKD1AhXznFwK HUMSC3cQFnoECCAAQ&url=https%3A%2F%2Fshepwedd.com%2Fsites%2Fdefault%2Ffiles%2FScottish%2520 Limited%2520Partnerships.pdf&usg=AOvVaw0We_mbiexHIWDoVvquoMg> accessed 7 January 2022 1
persuasive. Secondly, such a partnership must be registered with the competent authority and underlies some reporting duties (although rather simple). This entails disclosure of details such as names of members and the amount of their capital contribution (where relevant) which may, again, be problematic with regard to the general aim for anonymity in a blockchain environment.

It must be further noted that the administrative requirements may go well beyond the entity’s incorporation and registration. Jurisdictions may require the entity to submit further documents, either on an ad-hoc basis (such as notifications of changes in the by-laws or the ownership structure) or regularly (such as annual statements or financial reports). In traditional legal entities, these have a long-established form by way of human-drafted documents. However, this is unlikely to be the case in archetypal DAOs. While each DAO, by its very nature, generates the same data which is normally included in documents submitted to the registrars by traditional entities, they are unlikely to follow the required format. It should be weighed whether a requirement should be imposed for such data to be re-drafted by a human representative of a DAO into the traditional format, or whether the respective regulation should be amended and a technological solution adopted to enable them to be submitted in a DAO-generated format.

All the examples cited above show that the idea of incorporation and registration of DAOs is basically possible, but not free of practical difficulties which need to be addressed before any such idea is brought to life. Especially, incorporation or registration of DAOs is unlikely to be able to proceed without human involvement on DAO’s part. Also, the nature of DAOs makes the incorporation or registration process more demanding for the registering authorities. However, most of those issues are likely to be able to be effectively dealt with. On the other hand, the anonymous and perpetual nature of DAOs, as well as the nature of the communities of blockchain users (see below), raise the question of the extent to which DAOs can be forced to register and comply with the applicable regulation.
4.6.1 Re-Thinking the Balances: Need for Adaptation of the Incorporation and Registration Procedures to the Reality of DAOs

DAOs differ significantly from traditional legal entities in the way their functioning is secured technically, and therefore also in the way in which it can be influenced from outside. Various points at which DAOs may fall short in complying with existing corporate law and other applicable regulation have been outlined, in a general way, throughout the previous subchapters of this chapter. Overall, those thorny points seem to be capable of being tackled and do not necessarily have to constitute absolute obstacles for DAOs to be considered valid and plausible subjects of law. But still, a precautionary approach is advisable for several reasons.

For example, a DAO as a business model may not be suitable for certain types of business activities which are subject to a high level of regulation, or have highly specialized regulatory requirements, the meeting of which by DAOs may be impractical, or impossible to effectively police and enforce by the authorities. At the same time, it may be worth considering whether some field-specific laws might require to be amended in individual jurisdictions, to stipulate that certain business activities may not be performed by a DAO, if this is relevant with respect to the nature of the activity in question.493

And even if this is not the case, specific technological solutions may require to be implemented in order to tackle the known issues and to make sure that a DAO will be technically capable of complying with the laws, as well as seeking to secure that its general nature and technological features will not be used as a vehicle for illicit activities. These solutions, some of which are briefly outlined in this thesis as well, should be embedded in the source code of the DAO before its launch, to avoid, as far as possible, the complexities of any subsequent changes being made to a DAO. Of course, a DAOs’ creators would be

493 Taking into consideration existing DAO-related laws in the U.S., which practically acknowledge DAOs as a sub-type of LLCs, we can imagine a very practical example. As described above, bigger DAOs benefiting from ICOs could (analogically to the U.S. DAOs as LLCs) be seen as a sub-type of PLCs. Now, let us imagine that such a blockchain-based PLC could operate as a bank in a jurisdiction in which a bank must be a PLC (cf for example zákon č. 21/1991 Sb., o bankách (Czech Banking Act) § 1 (1)). Theoretically, it could be possible. But whether it would be plausible as well is obviously a different question that would need to be answered separately.
responsible for doing so, but the role of the registering authorities in securing that things are
done properly is not negligible either. This, however, may require a non-negligible change of
paradigm with respect to the particular powers and activities which registering authorities
exercise in the course of the registration procedure.

Firstly, it must be noted that the constitutive requirements on traditional legal entities are
usually rather easily met. While details differ from jurisdiction to jurisdiction, in general, they
tend to focus on verification of the basic conditions being met for an entity to be validly
established and allowed to perform the activity it is established to perform. Thus, the
registrars are likely to check the basics, such as whether the articles of association were
drafted in the form which the law requires for them, whether the members of the entity’s
bodies meet the general legal requirements on executive managers, whether the initial
capital was paid up in the required form, or whether any license required for the entity’s
activity (if applicable) is present and valid.

This is normally demonstrated by documentary evidence in paper, or electronic form, such
as certificates, transcripts or deeds, which are written in a natural language and the
registrar’s employees are trained to read and assess them. And while any entity is likely to
be subject to numerous pieces of regulation throughout its existence, its future compliance
with such pieces of regulation is not assessed at the point of the entity’s incorporation and
registration. Rather, any such regulation has a punitive character, which means that it is
presumed that an entity will comply with it through the decisions of its human members,
managers and other representatives and action is taken only by the authorities if a breach is
already demonstrated.

With DAOs consisting in a source code written in a programming language and effectively
replacing both the articles of association and the everyday decision-making of the entity’s
bodies and agents, including their members, employees and other responsible co-workers,
the situation will change substantially. The core steps necessary to ensure that any
registered DAO is at least in principle able and prepared to comply with the applicable law,
will need to be made before the DAO is registered as an entity. In practice, this means that
the registrar would need to verify that a DAO is equipped with technical features which
allow it to perform the subject matter of its business lawfully (including compliance with any regulatory requirements) and respond to the relevant changes in the outer environment, such as being sentenced by a court or being subject to a law which changes during the existence of the entity. This, however, requires a very different scope of expertise than that required for registration of traditional entities which has to be added on top of legal expertise, although the latter does not cease to be needed.

The example of Malta shows that a separate specialist authority might be a solution for the difficulties which the specific nature of DAOs brings to preventive control, while the elevated requirements on the responsible person (compared to those for traditional companies) may help reduce the risk of straw-persons. On the other hand, it must be taken into account that establishing such an authority will involve substantial costs for the state, especially as highly qualified experts need to be employed to check the source codes and related documentation of DAO proposed for registration.

Those costs can be partially relieved by the deployment of automated solutions. An interesting initiative, which may help to facilitate preventive control in smart contracts, can be found in France.494 A team of experts from Université Grenoble Alpes launched a platform which is meant to serve as a dictionary of commonly used standard contractual clauses, translated into smart-contract code (using Solidity language), aiming to help the creators of a smart contract make sure that they use smart contract clauses which are correct from the legal point of view. Although this is still in the stage of an academic project, rather than being an officially approved template comparable for example with the above-mentioned standardized articles of association used in Spain, there appears to be a potential to develop into one in the future. Similar initiatives can be seen in the commercial area throughout Europe, although without an applicable practical result so far.

On the other hand, it should be noted that any such solution cannot fully replace human control and human decision-making, yet there are a variety of particular solutions which can

494 See Université Grenoble Alpes, ‘Smart Contracts: Les Contrats Autoexécutants sur la Blockchain Suivez-Nous’ (Présentation du Projet) <https://smart-contracts.univ-grenoble-alpes.fr/presentation-projet>. However, it must be noted that this is not yet officially recognized and the existing law regarding blockchain technology is limited to the regulation of digital assets.
be embedded into DAOs and programming languages which can be used in their creation. On the contrary, reducing the scope of permissible DAO-constituting clauses to what can be reasonably checked with automated means may even have an opposite effect than what was intended: it may prevent creative technological solutions and discourage DAO-founders from registering their arrangements.

4.7 Meaningful Human Control over an Automated Electronic Agent as a Possible Way of Approach to the Corporate Governance of DAOs

It has been explained that the concept of DAOs as algorithmic, memberless organizations appears to be troublesome with regard to traditional, human-focused, frameworks of compliance, liability and accountability. This could, and even should, constitute an impediment to them being granted a separate legal personality. However, the research done also shows that there may be a solution to most (if not all) of those issues, in finding a way to retain the connection between the algorithmic arrangement and its human stakeholders, similar to what can be found in traditional legal entities. In terms of a DAO as an algorithmically governed arrangement, this can be linked to the notion of meaningful human control, a concept which is already broadly known from the discussion about the legal aspects of autonomous weapons systems495 but which could be transferred to the field of socioeconomic arrangements and provide a certain kind of base for the discussion about how to secure human accountability in DAOs.

However, the highly decentralized, or even distributed, nature of the DAOs excludes a one-to-one transposition of this principle. Rather, it gives rise to the need to redesisse it and develop a tailor-made concept of who should exercise meaningful human control over a DAO, and what such meaningful human control should include in the context of DAOs. Here the answer is likely to be more complex than in the centralized autonomous systems, such as autonomous vehicles or military robots, and there is no unified and unanimous pattern available at the moment. However, a starting point is still available in the legal concept of

495 See for example Filippo Santoni de Sio and Jeroen van den Hoven, ‘Meaningful Human Control over Autonomous Systems: A Philosophical Account’ (2018) 5 Frontiers in robotics and AI 15
who controls a business. Thus, we can leverage the concept of control from corporate
governance and use it as a certain kind of blueprint of what meaningful human control
should mean in DAOs.

It has been explained that accepting artificial autonomous systems as self-containing and
self-responsible decision-makers does not seem desirable and that, therefore, fully
autonomous DAOs do not seem to have the potential to be plausible subjects of sociolegal
relationships on their own. As a consequence, active human engagement in their functioning
needs to become a requirement, as long as DAOs should be a non-negligible part of a well-
governed society as subjects of the law. In the next step, the question arises of whose
engagement should be considered relevant. Turning back to who has control over a
traditional entity, it can be seen that a member of a corporate body, or a body of a
foundation, must be a kind of person in the legal sense, i.e., must have a legal personality.
On top of that, some jurisdictions require such persons to be natural persons, or, if they are
legal entities, to appoint a representative who is a natural person for this role, at least in
some entity types.

Considering the concept of meaningful human control being a promising approach towards
securing the plausibility of DAOs as subjects of law, it appears advisable to apply such a
requirement to DAOs. This could prevent both human stakeholders from escaping liability,
for example through the chaining of companies in them, and the robot-in-boardroom effect
from occurring. In terms of DAOs, two groups of persons should be focused on, as those who
are actually responsible for the condition of the DAO-governing algorithm and therefore as
possible human controllers of a DAO; namely the authors of the original code of a DAO and
the token holders with voting rights. General laws can be applied to many of the related
situations and the first pieces of regulation dealing specifically with this point are already
available.

Thus, the liabilities of non-participating authors of the code can, theoretically, follow
traditional norms regulating contractual or product liability on the part of developers and
the liability for choice of a contracting party on the part of founding members of the DAO,
although the practical application thereof may become difficult, due to the typical nature of
the DAO projects. Further, especially in smaller DAOs, it must be taken into account that a single stakeholder falling into both those groups is likely to be very common. Here, the State of Vermont Blockchain Act provides a source of inspiration and possibly a valuable first step towards a model effectively dealing with the responsibility of members for the condition of the DAO’s source code, foreseeing such situations and providing that such a person has to comply with any applicable fiduciary duties.\textsuperscript{496}

The fact that the importance of immediate human involvement has been realized even by legislators can be further illustrated by the example of the Wyoming Decentralized Autonomous Organization Supplement, which has undergone fast-paced development in its still rather short existence. The law has always foreseen human actors being involved, but, interestingly, the first version thereof differentiated DAOs based on the level of human engagement with their day-to-day management, allowing for the establishing of two types of DAOs; namely a member-managed DAO and an algorithmically managed DAO.\textsuperscript{497} Overall, each DAO established under the Wyoming Decentralized Autonomous Organization Supplement was required to have one or more members,\textsuperscript{498} which means that memberless DAOs have never been permitted and certain involvement of persons was presumed, even in the case of algorithm-managed DAOs. Moreover, each DAO must have a registered agent as provided for by relevant provisions of the general corporate law.\textsuperscript{499}

However, it was foreseen that the management of the algorithmically-managed sub-type of DAOs would be vested in a smart contract and therefore seemed to presume a very low level of engagement of human members in the functioning of the DAO-governing algorithm. At the same time, the first version of the Wyoming Decentralized Autonomous Organization Supplement paid surprisingly little attention to the legal details of such an arrangement, providing solely that algorithmic-managed DAOs were only permitted if smart contracts, in

\textsuperscript{496} State of Vermont Blockchain Act, S 4174 (a)
\textsuperscript{497} W. S. 17-31-104 e) (as applicable until 31\textsuperscript{st} June 2022)
\textsuperscript{498} W. S. 17-31-105 a) (as applicable until 31\textsuperscript{st} June 2022). This requirement has persisted even after the law was amended.
\textsuperscript{499} W. S. 17-31-105 b) (as applicable until 31\textsuperscript{st} June 2022) in connection with W.S. 17-28-101 through 17-28-111. This requirement has persisted even after the law was amended.
which the management of such an entity was embedded, could be updated.\textsuperscript{500} It did not provide for any specific criteria which such a smart contract should have met, nor did it provide for any specific mechanisms of preventive control (especially at the level of the DAO’s source code) or enforcement, beyond that provided by general corporate law.

Eventually, the law was amended in 2022, which resulted in algorithm-managed DAOs being abolished as a separate sub-type of a DAO, with management options being changed, so that a DAO can be managed either by the members, or by the members and a smart contract. More precise requirements were also introduced on what the articles of association must provide for. This argues in favour of a rather higher level of human control in DAOs being seen as the plausible option. However, there seems to be significant room for development in the field of the overall understanding of what should be understood as meaningful human control in an algorithmic business arrangement.

Nowadays, all existing attempts to provide DAOs with separate legal personality and specific corporate form are based on the legal form of an LLC, which is to some extent adapted to the technological nature of DAOs. Those adaptations, however, sometimes come at the cost of a rather significant diversion from the regular structures of traditional LLCs. Although enhanced information duties may be in place,\textsuperscript{501} this may interfere with how the notion of an LLC is generally understood by legal practitioners and businesspeople and become a cause of confusion as to how human control is exercised over such an arrangement.

Using the Wyoming Decentralized Autonomous Organization Supplement as an example once again, it can be pointed out that management of a DAO incorporated under this law can be vested in its members, or its members plus a smart contract,\textsuperscript{502} which, on one hand, corresponds with the actual nature of DAOs, on the other hand, does not fit the traditional idea of an LLC which has a human-based managerial body separate from its members.

More alarmingly, the members of a DAO incorporated under the Wyoming Decentralized Autonomous Organization Supplement are free to agree to reduce or exclude the fiduciary

\textsuperscript{500} W. S. 17-31-105 c) (as applicable until 31\textsuperscript{st} June 2022)
\textsuperscript{501} Cf W. S. 17-31-104 c)
\textsuperscript{502} W. S. 17-31_109
duties which would normally apply under the general LLC laws. This may be seen as a substantial weakness of the regulation, in terms of making meaningful human control over DAOs effectively meaningful, especially because the ability to reduce or exclude fiduciary duties may compromise the standard of care which human controllers should maintain.

Overall, it appears that existing regulation leaves significant space for further development and additional options for legal entity forms should be considered. However, it seems crucial that such development follows the idea of a DAO as an arrangement serving the interest of a certain group of people, and therefore requiring to be under the control, supervision and maintenance of those people. Some of the entity forms to be considered may be partnerships and equivalent entities in the civil-law jurisdictions.

While they come with significant disadvantages, such as the liability burdens on the members and the fact that they can be only considered in such jurisdictions as provide DAOs and similar arrangements with a separate legal personality, their main principle appears to be particularly inspiring with regard to a practical possibility of insisting on the exercise of effective and meaningful human control over a DAO. As has been explained above, the roles of a supreme and a managerial body overlap in DAOs, as in partnerships, and human actions leading to a certain behaviour of a DAO’s governing algorithm are performed by people who could be considered members of both, in terms of the traditional corporate structures.

This, indeed, supports the idea that all of the holders of membership tokens connected with voting rights (i.e. those who can influence the condition of the DAO’s governing algorithm) should be subject to the same responsibilities and fiduciary duties as managers in traditional entities – again, as in a typical partnership. This would serve as a safeguard so that those members will exercise control over the DAO with the exercise of sufficient care and expertise.

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503 W. S. 17-31-110
4.8 Concluding Remarks on Part 4

Apart from conceptual questions of artificial legal personality, thoughts about DAOs as separate legal entities should entail a significant amount of consideration being given to very particular fields of regulation, which traditionally cover legal entities, as well as about how compliance can be secured in everyday practice. This part had a more particular look at certain practical challenges which would require to be addressed regarding this point before DAOs could and should be recognized as legal persons, so as to be seen on a par with traditional legal entities, such as corporations or foundations.

Yet the mere form in which DAOs should be incorporated appears to be a source of dispute. It has been discussed that creating a memberless instance of any of the existing legal forms does not seem viable in the long term. Some jurisdictions may eventually include DAOs in their existing frameworks for legal entities, using some traditional partnership-like forms, considering the membership-token holders to be partners in such an entity. This, however, is not a universally applicable solution. The partnership form, as such, is likely to suit only smaller DAOs. Apart from that, some jurisdictions do not acknowledge partnerships as separate legal persons. Others may prefer to provide DAOs with the possibility of incorporating in a limited-liability-entity form. The latter, however, brings out the problem that the ongoing conduct of DAOs is, to a great extent, detached from the conduct of stakeholding natural persons, both at the temporal and at the spatial level. As a consequence, creating a viable concept of legal personality for DAOs may require a new interpretation of notions such as corporate membership, or corporate governance, when it comes to the practical reality of DAOs.

Further, selected practicalities such as legal capital requirements, identifiability of stakeholders and even the mere procedure of incorporation, were examined in the context of DAOs. In particular, the possibility of a DAO holding a large portion of its assets (if not all of them) in cryptocurrencies was raised as an issue worth specific attention. While it was acknowledged that the volatility of cryptocurrencies values, implying a risk of impossibility of
accurate and stable valuation of assets of a DAO, are unlikely to be an obstacle to legal personality for DAOs fitting into the general legal frameworks.

However, it needs to be kept on mind that inability to value the assets of a DAO may constitute an impediment to DAOs taking certain corporate forms or performing certain activities in individual national jurisdictions. Thus, specific attention to this aspect of DAOs is advisable at the level of national jurisdiction. A thornier point can, however, be seen in particular in subfields such as transparency or incorporation. In particular, the requirement of identifiability of the participants in DAOs appears to be of high importance in all jurisdictions which disallow for traditional bearer negotiable instruments. This, however, imposes elevated demands for control and is likely to require specific technological measures on the part of DAOs.

Similarly, incorporation is likely to rise specific demands, such as the need to change the approach to preventative control, to make it much timelier and much more comprehensive, so that a certain level of guarantee will exist that DAOs are only incorporated if they are technically capable and set to comply with the applicable law.

The final chapter of this part then discussed the notion of meaningful human control over an electronic agent and its possible use as a basis for setting up a standard for engagement of token holders in DAOs. This helped us to discover certain hidden aspects of the functioning of DAOs, allowing them to be seen in the light of existing general regulation of legal entities, and to seek an answer to one of the crucial questions around granting DAOs legal personality: can we reasonably cope with the practical demands, risks and costs of DAOs being artificial legal persons?
Part 5: Conclusions

Academic law-making is dead. This has been known from the times of Kantorowitch.\textsuperscript{504} However, I dare to insist that at least a little bit of it remains necessary, especially in complex fields requiring a high level of expertise across various disciplines.

Regulation of decentralized/distributed autonomous organizations (DAOs) is one of such fields. This thesis was written to discuss a set of the core and elementary aspects of whether decentralized/distributed autonomous organizations, and should, be granted separate legal personality. Also to examine what the main challenges, limitations and risks of granting them legal personality may be, while setting those aspects in mutual context and coherence, as well as in the wider context and coherence of a broader concept of the law as a system of binding and enforceable norms. It is hoped that it contributes to at least a little bit of a resurrection of the cooperation between academia and legislature, by providing a relatively holistic and methodologically solid point of view on this complex and challenging matter, as well as pointing to what legislators and other law-making stakeholders should consider while attempting to find a plausible approach to the issues raised.

The topic of this thesis was chosen because, whether we want it or not, DAOs and other blockchain-based arrangements are present in reality, and, even though this may not be straightforward, they are not exempted from general regulation applicable to the nature or scope of their activity. Without a holistic approach and thorough examination, this may become a source of chaos and legal uncertainty, through difficulties in application of disparate and generalist norms to a specific and still rather novel arrangement. In this regard, the idea of granting DAOs separate legal personality seems logical to arise as a possible solution, leading to a consolidation of their legal status and greater legal certainty around them.

This may be right theoretically, but the practical aspects of the matter are far from simple. Indeed, there are suggestions (at least in some jurisdictions) as to how existing concepts of

\textsuperscript{504} Nils Jansen, ‘Hermann Kantorowicz’ Concept of Legal Science And the Social Role of Legal Scholarship, Today’ (The W.A. Wilson Memorial Lecture, The Edinburgh Centre for Private Law, Edinburgh, 30 March 2022)
legal entities could be used as legal containers to accommodate DAOs, and a small number of jurisdictions already provide for specific blockchain-based LLC forms. On the other hand, it can be concluded that trying to squeeze DAOs into existing legal concepts, or to adapt the existing law of legal entities, which are based on the assumption that such entities are driven by human interests and purposes and governed by principles invented by human thinking, faces difficult challenges as it tries to deal with a technical arrangement which is meant to operate without everyday involvement of humans.

There are still questions to ask. Are the gains capable of outweighing the costs? Won’t it undermine the mere fundamentals of the law of persons as such? And, in the end, will it not create an unacceptable disadvantage for those running their gainful activities in the old-fashioned way? Those are questions which must be answered by each legislator individually before creating a legal personality for DAOs at a national level, but they are also worth being discussed from the perspective of various international bodies. This thesis outlines some of the core criteria which should be taken into consideration when doing so. The presented list is not exhaustive. Only those which appear to be the most fundamental ones at this stage of research were selected for examination, in order to begin building up a comprehensive, holistic and systemic approach to the limitations and challenges the legal personality of the DAOs. However, there are many further issues already known, such as Data Protection, Taxation or environmental impact of the DAOs, which would comfortably fill several additional PhD theses, or even books.

The initial part of the thesis was devoted to outlining the research question and establishing the terminology which would be used, as well as to pinpointing certain difficult aspects thereof, especially with regard to the fact that there is no unanimous definition of a DAO, as well as many related conundrums. Following this paradigm, all the topics were further worked out as broadly as possible, so as to remain open to various options for organizing a DAO.

As one of the first things to do in terms of the research question, I tried to set DAOs into the already established context of electronic/automated agents. This helped to explain one part of the problem of non-human systems being involved in performing legal acts, as well as to
outline certain additional questions which arise if an activity of legal importance is
performed with the help of a decentralized autonomous electronic system, rather than of a
centralized and consistently human-controlled one. The possibility (but not a necessity) of a
DAO being equipped with advanced (non-deterministic) artificial intelligence was reflected
upon as well and it has been explained how DAOs differ from other autonomous artificial
systems in respect of which the possibility of separate legal personality tends to be
discussed. A paradigm seeing the law as a system of norms set by people and for people,
ultimately regulating human behaviour, has been used in order to explain that possible legal
personality of DAOs should not be based on their autonomy, or level of artificial intelligence,
but, similarly to companies, on their ability to be used by people as vehicles to pursue their
goals.

Further, the idea of using existing concepts of legal entities as legal shells for DAOs was
explored. The context for DAOs of certain notorious issues of traditional legal entities was
outlined, to show that DAOs can add to the existing problems which often require a
compromise approach, even in traditional legal entities. While the whole thesis primarily
adopts the point of view of the European legal environment, it is basically intended to be
jurisdiction-neutral. I have outlined elementary issues which can reasonably be expected to
occur in a high number of jurisdictions, occasionally taking examples from selected national
jurisdictions, which have already managed to tackle certain problems, or which present a
particularly inspiring approach to the questions discussed, or whose laws can serve to
demonstrate certain problems or questions in more particular traits.

To help explain the potential problems, EU Corporate Law and corporate laws of selected
national jurisdictions were used to provide examples of the typical practical difficulties of
fitting DAOs into the framework of the existing legal entities. At the same time, jurisdictions
which have already created a specific legal vehicle for the DAOs were revisited and reflected
upon, to discuss the extent to which their effort appears to fulfil the goal which is used as
the main paradigm of this thesis: reducing the legal uncertainty around the DAOs. An
experimental break-down of the idea of a DAO was made, with the aim of comparing it to
traditional corporate structures. This helped to show that traditional corporate structures would face certain difficulties in accommodating the concept of DAOs.

However, certain models of DAOs still can be fitted reasonably into traditional legal frameworks, provided that a particular jurisdiction already provides for an entity form that can be reasonably adapted to accommodate the specific nature of DAOs, and that meaningful human control performed by identified and accountable persons is maintained. Overall, this shows that incorporated partnerships, and equivalent civil-law entity forms, may be the most suitable ones to accommodate DAOs, as they boast high requirements on engagement and responsibility of members who have voting rights.

Apart from that, I have analysed what the opinion of the blockchain community may be regarding granting DAOs legal personality and what the main stumbling blocks may be in, based on the available blockchain-related manifestos and similar documents. While no unanimous answers can be obtained therefrom, the analysis shows that the core notions of blockchain-related communities should not necessarily be understood dogmatically. Most of the points of trade-off which may be expected to occur once legal personality for DAOs starts to be considered appear to be at least basically manageable for potential founders and participants of DAOs.

What can be concluded from all this? Firstly, that the question of whether DAOs should be granted legal personality does not find a straightforward and unanimous answer. Rather, numerous aspects must be taken into consideration and costs must be weighed against gains in each particular jurisdiction, in order to make the right decision on doing or not doing so. Secondly, only certain types of DAOs appear to be plausible candidates for a separate legal personality. Indeed, it can be shown that the very notion of artificial legal personality presumes that an artificial legal person will be something which either consists of people or is created and/or maintained by a rather particular group of people, to serve those people’s interests, and which is under a substantial level of ultimately human control. This, typically, is not the case for archetypal DAOs, which will therefore be especially difficult to accommodate in the existing frameworks of traditional legal entities.
Further, examining the traditional notion of a legal entity, as well as common types of legal entities currently existing, along with the most prominent ideas on how to accommodate DAOs into existing frameworks of legal entities, it must be noted that a certain level of mismatch should be expected, at least in a high portion of cases. Traditional legal entities are subject to numerous, detailed regulations and requirements which do not seem to fit the overall idea of a DAO. Therefore, a different approach is needed, both on the part of the legislators and on the part of the founders and participants of DAOs. The result of such an approach is likely to be a trade-off solution. It has been shown that first attempts have been already made in some of the U.S. states which have introduced specific regulation of blockchain technology, starting from the concept of an LLC to create a version adapted for DAOs. Some of those laws were examined in this thesis to show that while they demonstrate some good points on one hand, on the other hand, they still have some noticeable imperfections and should be understood in terms that further development thereof is needed, rather than as being examples of an optimal solution every other jurisdiction should follow.

The need for international cooperation in blockchain matters has already been pointed out and this has been reflected here as well. Those appear to be of great importance for various reasons. One of them is that providing and enforcing a plausible legal framework for DAOs will inevitably incur a significant amount of effort and expense. It is impossible to imagine that all countries will be able and willing to expend those means to provide their own legal frameworks for DAOs. This, however, does not mean that they will not encounter the activity of DAOs taking effect on their territories.

Having a quick look in the EU, it must be noted that DAOs becoming legal persons would automatically mean them enjoying the benefit of mutual recognition under the EEC Convention on Mutual Recognition. It goes without saying that a harmonized and consensus-based approach to DAOs throughout the EU would then be vital in order to prevent the idea of DAOs as legal persons from becoming a disruptive element. It is far from

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505 European Communities, ‘Convention on the Mutual Recognition of Companies and Bodies Corporate (signed on 29 February 1968)’ Bulletin of the European Communities Supplement No. 2-1969, 7-16

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unreasonable to anticipate this. Having a closer look at the Maltese laws on digital innovation, which are able and even meant to cover DAOs, it may be speculated that the reason why the Maltese legislator decided to follow the pathway of approaching DAOs (and other innovative arrangements) by voluntary registration and linking them to a responsible person, rather than via a separate legal personality, is precisely that the idea of separate legal personality for DAOs does not easily fit the overall notion of a legal person, as understood in Europe.

However, this is not the only aspect of the question which should be weighed in this context. Taking into consideration both the borderless nature of DAOs and the general possibility of a legal entity setting up another legal entity, possibly in another country, we ought to think even beyond existing agreements on recognition of legal entities, which only take traditional legal entities into account. We should try to consider the following example: there might be a DAO incorporated and existing as a legal person, in a state which only provides a weak legal framework for DAOs. As a result, the DAO in question could exist without anyone (except for, perhaps, its coders) knowing whether it is compliant with the law and not serving illicit purposes. Such a DAO may be willing to set up another legal entity (not necessarily a DAO and possibly with the help of natural persons who would serve as founders/members/managers) in another country. Hence, the risk of straw-persons emerges, now in relation to persons who help to set up the offspring legal entity, while this may be actually governed, algorithmically, by the parental DAO. In such cases, an efficient piercing of the group structure is likely to become nearly impossible without being able to know who is in control of the parental DAO. Such cases could eventually undermine the entire concept of mutual recognition of legal entities.

Thus, the need for a thoughtful and precautionary approach to legal personality for DAOs appears to be very important for each jurisdiction which is contemplating doing so, as well as having a really strong international aspect. As a consequence, international cooperation in the field of blockchain-based establishments, even if only at a methodological and soft-law level, can be seen as a helpful tool, not only to share the best practice in the field, but also to support jurisdictions which themselves decide not to provide a legal framework for DAOs in
making informed decisions as to how to deal with activity of foreign incorporated DAOs which have effect within their territory or on their citizens.

Having mentioned the risk that it may be that nobody will be able to determine if an existing DAO is compliant with the laws of any country on whose territory its activity might take effect, it must be noted that the DAOs being given legal recognition would set high demands on enforcing their compliance with the law. Several subchapters of this thesis were devoted to selected particular fields, in which securing compliance with the laws, even at the level of a single state, may become difficult. All the issues discussed show to have one thing in common: automated electronic systems, contrary to people, do not respond to punishment.

Thus, it can be concluded that in the field of compliance, DAOs would need a different primary approach than traditional (human-managed) legal entities. This would be in great contrast with traditional legal entities, which can be characterized in general by rather basic constitutive requirements, with most of the applicable regulation being much more of a punitive nature. DAOs would need, in the first stage, an opposite approach, which would serve as an additional safeguard, balancing against the complex and slow-moving mechanism of making subsequent changes to them.

Surprisingly, this applies regardless of whether DAOs are granted separate legal personality, or any other kind of official recognition. A spectacular example of a duly careful and rigorous approach to this question can be found in Maltese law, which has been discussed several times throughout the thesis, and which provides a detailed set of requirements regarding technological solutions, such as DAOs, being registered and legally recognized, as well as for the safeguards and checks, so that the requirements are met and establishes administrative apparatuses to perform the control and supervision.

It is easy to imagine that if DAOs should become legal persons in any particular jurisdiction, there would be a need for elaborate constitutive requirements to be placed on them. The respective business registrars would have to check the source codes of DAOs to be registered, to verify whether those requirements are met. This, of course, requires a high level of rather specific expertise and will bring unprecedented costs.
On top of that, having briefly discussed the idea of an artificial legal person as such, it can be concluded that it does not seem a good idea to think about DAOs as legal persons, unless there is a reasonably firm, and visible, link between them and people who can either influence their functioning, or benefit from their operation. Thus, preventive control should not be seen as an absolute replacement for the engagement and responsibility of those who can have a practical impact on the actual condition of the DAO – namely of the holders of membership tokens connected with voting rights. On the contrary, it can be concluded that it appears desirable to adopt a certain standard of transparency and meaningful human control over DAOs, which would ensure that human actors behind any DAO which is granted legal personality are identifiable and can be held accountable for its activities in a similar way to the members and managers of a traditional legal entity.

Therefore, the form of legal entity chosen to accommodate DAOs should be one which provides a safeguard of responsible engagement of the holders of membership tokens in the DAO. An enforceable means of registration of token-holders should be put in place. Of course, this will be easier for some jurisdictions than for others and some adjustments are likely to be needed due to the technological nature of the DAOs. Blockchain-based LLC models, such as those which are emerging in some of the U.S. states, seem to be one of the options to do this, although they still seem to be in need of further development. Another plausible option may be basing an entity form suitable for DAOs on the forms for partnerships (or their equivalent in civil-law jurisdictions).

This may seem plausible with regard to the aims of preventing the incorporated DAOs from running away from human control, as well as providing another safeguard to enable them to be plausible subjects of the law. However, a weakness of such a solution can be seen, firstly, in the fact that the idea of recognition of a partnership entity as a separate legal person underlying the registration duties and constitutive requirements typical for legal entities is far from universal among national jurisdictions and, secondly, that it does not provide members with limited liability, which is likely to mean that fewer persons will be interested in setting up such an entity.
Based on the type and intended activity, of a DAO, legal personality based on a form of a trust or foundation also seems thinkable, but, again, has certain limitations in terms of what types of trusts/foundations a given jurisdiction supports and the extent to which the notion of trust/foundation can be plausibly interpreted in a way which would be able to accommodate a DAO.

A final question is left to be asked: Is it worth doing?

Trying to find the key to the answer, it may be useful to return to the moment when the other (blockchain-community) side was heard. As the core documents produced by the blockchain-relevant communities were assessed, the answer to the question of whether the founders of DAOs are likely to welcome their creations being recognized as legal persons appeared to be far from unanimous. The orthodox point of view may suggest that making DAOs subject to any national law goes against the very idea of blockchain communities, which is decentralization and independence from states. However, there are a number of DAOs incorporated under the laws of U.S. states which have already provided for this to be done. Thus, legal personality for DAOs appears to be accepted by the public, at least to some extent, although it seems unlikely that it will be possible to persuade all creators of DAOs to incorporate their arrangements.

Conclusions of my research suggest that offering a plausible and well-working form of legal personality to DAOs in any national jurisdiction needs further robust research, focused especially (but without limitation) on meaningful human control and on the possibility of preventative control being advanced into the stage of incorporation, as well as a preparedness to adopt comprehensive and expensive changes to the existing system.

In this context, some may ask: what can we do if legal personality for DAOs does not turn out to be a suitable response to the legal issues arising around DAOs? There are various answers possible. One option appears to be going the Maltese way, but even that may not be suitable for all jurisdictions, given the costs involved. A further possible approach is to be adopted by entrepreneurs themselves, rather than by legislators, and may rise from a still
rather new idea of a Cybernetic Organization (also abbreviated as BORG). This, however, would need more research and examination before being adopted as a functioning solution. On the other hand, ignorance of DAOs does not seem to be an option. DAOs do and will exist in fact. A well-governed society should respond to this fact. Thus, many may think about prohibiting DAOs, or about active prosecution of their founders under the unauthorized business laws as long as such exist in a given jurisdiction. This, however, also brings substantial issues. Unmasking the people behind a DAO, while they take measures to remain anonymous, requires an enormous amount of investigatory powers and is costly. An acceptable solution thus may reside in a ‘reduction of harm’ approach, particularly in educating the public about the risks of involvement in DAOs, to make sure that a majority of people, at least, are able to make informed decisions if exposed to an appealing offer to invest into a blockchain-based project. Because cryptocurrency trading is not for the faint-hearted.\footnote{Delphi Labs, ‘Assimilating the BORG: A New Framework for CryptoLaw Entities’ \textit{Medium} (20 April 2023) accessed 19 August 2023}
References


Austria, ‘Gesetz vom 6. März 1906, über Gesellschaften mit beschränkter Haftung’

- ‘Privatstiftungsgesetz’
- ‘Allgemeines Bürgerliches Gesetzbuch’
- ‘Unternehmensgesetzbuch’


247


BGH vom 13.10.2020 (VIII ZR 161/19)


248
‘Binance Ordered to Stop UK Activities’ *Global Banking News (GBN)*


Black BS, ‘The Principal Fiduciary Duties of Boards of Directors’ (Third Asian Roundtable on Corporate Governance, OECD, Singapore, 4 April 2001)


Blockchain Engineer, ‘Centralized vs Decentralized vs Distributed’


Bonello L, ‘How Smart Can a Contract Be?’ (24 July 2018)


Cambria E and others, ‘Common Sense Computing: From the Society of Mind to Digital Intuition and Beyond’ (Berlin, Heidelberg, 2009).

Cambridge Free English Dictionary (2023)


Conservative and Unionist Central Office v Burrell [1982] 1 WLR 522


Court of Appeal of the Republic of Singapore, Quoine Pte Ltd v B2C2 Ltd (2020) Quoine Pte Ltd v B2C2 Ltd [2020] SGCA(I) 02


Czech Republic, ‘zákon č. 586/1992 Sb., o daních z příjmů’

- ‘zákon č. 513/1991 Sb., obchodní zákoník’
- ‘Usnesení č. 2/1993 Sb., Usnesení předsednictva České národní rady o vyhlášení listiny základních práv a svobod jako součástí ústavního pořádku České republiky’
- ‘zákon č. 89/2012 Sb., občanský zákoník’
- ‘zákon č. 40/2009 Sb., trestní zákoník’
- ‘zákon č. 90/2012 Sb., Zákon o obchodních společnostech a družstvech’
- ‘zákon č. 563/1991 Sb., o účetnictví’
- ‘zákon č. 304/2013 Sb., o veřejných rejtřících právnických a fyzických osob’
- ‘zákon č. 455/1991 Sb., o živnostenském podnikání (živnostenský zákon)’
- ‘zákon č. 134/2013 Sb, o některých opatřeních ke zvýšení transparentnosti akciových společností a o změně dalších zákonů’
- ‘zákon č. 21/1991 Sb., o bankách’

Delphi Labs, ‘Assimilating the BORG: A New Framework for CryptoLaw Entities’ Medium (20 April 2023)

Digest of Justinian

Dujmovic J, ‘On-Chain AI May Be the Future of Crypto’ Weiss Ratings (9 January 2022)


Estonia, ‘Rahapesu ja terrorismi rahastamise tõkestamise seadus’


• ‘Proposal for a Regulation of the European Parliament and of the Council Laying Down Harmonised Rules on Artificial Intelligence (Artificial Intelligence Act) and Amending Certain Union Legislative Acts’ (COM/2021/206 final, Brussels 21 April 2021) COM(2021) 206 final -


• ‘Treaty Establishing the European Community (Nice consolidated version)’ [2002] OJ C 325/1


Farm Mutual Auto Ins. v. Bockhorst, 453 F 2d 533, 537 (10th Cir. 1972)


Filippi P de and McMullen G, ‘Governance of Blockchain Systems: Governance of and by Distributed Infrastructure’ (June 2018).


France, ‘Code Civil’
- ‘Code Monétaire et Financier’

Frankenfield J, 'Smart Contracts' Investopedia (8 October 2019)


Gaakeer J, “‘Sua cuique persona?’ A Note on the Fiction of Legal Personhood and a Reflection on Interdisciplinary Consequences’ (2016) 28(3) Law & Literature 287.


Germany, ‘Gesetz betreffend die Gesellschaften mit beschränkter Haftung’
- ‘Grundgesetz für die Bundesrepublik Deutschland’
- ‘Handelsgesetzbuch’


Indonesia, ‘Foundation Law No. 16/2001 dated August 6, 2001’


Italy, ‘Decreto Legislativo 25 maggio 2017, n. 90 Attuazione della Direttiva (UE) 2015/849 Relativa alla Prevenzione dell'Uso del Sistema Finanziario a Scopo di Riciclaggio dei Proventi di Attivita' Criminose e di Finanziamento del Terro...
(17G00104) (GU Serie Generale n.140 del 19-06-2017 - Suppl. Ordinario n. 28)

- ‘Codoce Civile’


Janssen A and Durovic M, ‘Formation of Blockchain-based Smart Contracts in the Light of Contract Law’ [2018] <https://pdfs.semanticscholar.org/d2b8/aedf3ceae1f244f3578fc05c78d3a55996a0.pdf>.


261


Kraus D, Obrist T and Hari O (eds), Blockchains, Smart Contracts, Decentralised Autonomous Organisations and the Law (Edward Elgar Publishing 2019).


Kundera M, Immortality (Faber and Faber Limited 1992).


LG München I vom 01.03.2018 (12 O 730/17)

Lichtenstein, ‘Token und VT-Dienstleister Gesetz’


Lutter M (ed), Legal Capital in Europe (De Gruyter 2006).


- ‘Digital Innovation Authority Act’

- ‘Innovative Technology Arrangements and Services Act’


• ‘The Financial Services and Markets Act 2000 (Regulated Activities) Order 2001’


Mango Labs, LLC v. Eisenberg, 1:23-cv-00665, (S.D.N.Y.)


Mexico, ‘Ley General de Sociedades Mercantiles’


Monaco, ‘Projet de loi No. 237 de M. Thierry Poyet relative à la blockchain’

• ‘Loi n° 1.491 du 23 juin 2020 relative aux offres de jetons ’
Monetary Authority of Singapore, ‘Guide to Digital Token Offerings’ (26 June 2020)


Niemeier W, ‘What Kinds of Companies will a “One-Euro-EPC” generate?’ in Heribert Hirte and Christoph Teichmann (eds), The European Private Company - Societas Privata Europaea (SPE) (De Gruyter 2012).


OLG München vom 10.01.2019 (29 U 1091/18)


‘PC Quest: What is blockchain? The Difference Between Public and Private Blockchain’ 0971216X (31 August 2018)


Reves v. Ernst & Young, 494 U.S. 56, 61 (1990)


Ripken SK, Corporate Personhood (Cambridge University Press 2019).


Roitblat HL, Algorithms are Not Enough: Creating General Artificial Intelligence (The MIT Press 2020).

Ruscoe v Cryptopia Limited (in liquidation) [2020] NZHC 728 (8 April 2020)


Salvador, ‘Decreto No. 57 – Ley Bitcoin’


SEC v. C.M. Joiner Leasing Corp., 320 U.S. 344, 351 (1943)

SEC v. Howey Co., 328 U.S. 293 (1946)


Shepherd and Wedderburn LLP, ‘Scottish Limited Partnerships (Scottish LPs): Particular Considerations where a Scottish LP Features as Part of a Fraudulent Scheme’ (2015)


Shevlin H and others, ‘The Limits of Machine Intelligence: Despite Progress in Machine Intelligence, Artificial General Intelligence is Still a Major Challenge’ (2019) 20(10) EMBO reports e49177.


Siegel D, ‘Understanding The DAO Attack’ CoinDesk (25 June 2016)

269
Silver D and others, ‘Mastering the Game of go with Deep Neural Networks and Tree Search’ (2016) 529(7587) Nature 484.

Singh S and others, ‘Convergence of Blockchain and Artificial Intelligence in IoT Network for the Sustainable Smart City’ (2020) 63 Sustainable Cities and Society 102364.


Switzerland, ‘Bundesgesetz betreffend die Ergänzung des Schweizerischen Zivilgesetzbuches (Fünfter Teil: Obligationenrecht)’

- ‘Bundesgesetz zur Umsetzung von Empfehlungen des Globalen Forums über Transparenz und Informationsaustausch für Steuerzwecke,’ BBl 2019 4489
- ‘Bundesgesetz zur Umsetzung von Empfehlungen des Globalen Forums über Transparenz und Informationsaustausch für Steuerzwecke,’ BBl 2019 4489

Tai-Wan, ‘Foundation Act’


The Holy Bible: Containing the Old and New Testaments (CollinsBible 2008)


Tribunale di Firenze, Sent. N. 18/2019 pubbl. 21/1/2019

Tulip Trading Limited (A Seychelles Company) v Bitcoin Association For BSV & Ors [2023] EWCA Civ 83, [2023] WLR(D) 62

Turing, Alan, M. ‘Computing Machinery and Intelligence’ (1950) 59(236) Mind, New Series 433.


UK, ‘Companies Act 2006’
• ‘Small Business, Enterprise and Employment Act 2015’
• ‘Partnership Act 1890’
• ‘Limited Partnerships Act 1907’
• ‘Legislative Reform (Limited Partnerships) Order 2009’

UK Law Commission, ‘Decentralised Autonomous Organisations (DAOs): Call for Evidence’ (November


‘UK’s FCA Blacklists Binance’ Global Banking News (GBN)

UN, ‘the United Nations Convention on the Use of Electronic Communications in International
Contracts’

Université Grenoble Alpes, ‘Smart Contracts: Les Contrats Autoexécutants sur la Blockchain Suivez-

U.S. Securities Act of 1934

U.S. Securities and Exchange Commission, ‘Report of Investigation Pursuant to Section 21(a) of the
16 August 2021.


U.S. State of Vermont, ‘Act №205, An act relating to blockchain business development (State of
Vermont Blockchain Act)’

• ‘Wyoming Utility Token Act’


Vorotyntseva v. Money-4 Ltd. (trading as Nebeus.Com) and others, [2018] EWHC 2596


