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DAOs and the future of governance

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1 Abstract

A decentralized autonomous organization (DAO) is a type of autonomously functioning corporation that lacks a central governance structure. A prevailing belief (or hype) is that DAOs could revolutionize (corporate) governance thanks to built-in characteristics which makes them less susceptible to the pitfalls of principal-agent problems. This, allegedly, translates to an edge over traditional organizations. This thesis evaluates the validity of this belief through an integrative literature review, guided by agency theory perspective. Subsequently, a GICS-based industry-by-industry SWOT analysis is conducted on the suitability of DAOs. The findings reveal that DAOs' inherent characteristics are theoretically capable of overcoming agency problems such as opportunism, distrust, and misalignment of interests in a novel manner. Moreover, DAOs can preventively code (parts of) their complications away, enhancing their adaptability to several industries. DAOs are suitable for innovative, technological and consumer-oriented sectors, and for sectors that benefit from automation and blockchain features. Conversely, suitability diminishes for concentrated sectors and sectors exposed to regulatory risks. These results hold under the premise that complications concerning legal personality and qualification of tokens are solved by legislation. A crucial contribution of this thesis is a sectoral suitability matrix, which can serve as a baseline for governance theory-building in the future.

2 Introduction

‘Corporations organized the Industrial age, DAOs will organize the Internet Age’ – a statement made by Aaron Wright on Twitter in September 2021. The statement evoked incredulity among netizens at the time. The immediate reaction was understandable given the centuries-long dominance of the conventional conceptualization of corporations. Its premise stretches back to 2015, since when many DAOs (decentralized autonomous organizations) were created, with *the DAO* as a famous example (Morrison et al., 2020). Though initially a tech-related innovation, promises of the underlying concept have since generated considerable interest among researchers from many disciplines—including economics.

The self-explanatory naming of the DAO captures its definition well. A DAO is a type of autonomously functioning corporation that lacks a central governance structure. More specifically, it is a blockchain-based system that enables people to coordinate and govern themselves mediated by a set of self-executing rules deployed on a public blockchain, and whose governance is decentralized (i.e., independent from central control) (Hassan & de Filippi, 2021). *The DAO*, as an example, was an investment organization that was structured as a DAO. It granted its investors voting rights on the Ethereum blockchain according to their level of investment and managed their subsequent votes on investment proposals accordingly. In this way, every decision would be achieved through the consensus of the investors.

This new phenomenon has been picked up by economic researchers, with literature showing significant differences compared to traditional organizations (Wang et al., 2019) that can potentially solve several aspects of the agency problem (Morrison et al., 2020), a problem that is continuously sought solutions for. For instance, the decentralized nature of DAOs implies a bottom-up interaction, rather than a top-down hierarchy (Wang et al., 2019). This eliminates the need to trust a central management in their fulfilment of tasks (Morrison et al., 2020; Wang et al., 2019), potentially solving one of the core parts of agency theory: the principal-agent problem. This problem refers to a perennial constraint of contemporary firm governance structure, where the agent (the management) must be trusted by the principals (the investors) to fulfil its tasks in line with the interest of the principals (Shapiro, 2005). With DAOs, such fiduciary responsibility of a management for the investors’ interests does not exist. However, DAOs also encounter complications. By example, Ghiselli and Johnson (1970) suggest that a decentralized structure cannot be effective for relatively large companies. Angled from a traditional governance perspective, they expect that decentralization would only be effective and efficient in smaller companies - or within smaller departments of a company – because decision-making rights would not be spread too thin under such circumstances. It should, however, be borne in mind that this perspective – and agency theory as well - developed in an era where DAOs were not yet existent, indicating that more investigation is necessary to determine whether these underlying theories also hold for DAOs.

These examples indicate the importance of determining the comparative advantages and disadvantages of DAOs in comparison to traditional organizations. Therefore, the first aim of this thesis is to describe how agency problems that can be found in traditional organizations could either occur or be solved by incorporating a DAO structure. This provides clarification on how agency problems should be understood and could be solved in the context of digitalized organizations. The

second aim is to build a bridge between theory and practice. As it stands in this period of time, DAOs are mostly found in tech-related sectors (source: Crunchbase). However, the question remains whether these comparative advantages could allow DAOs to be suitable for the traditional sectors as well, and whether they could indeed effectively replace ‘normal’ corporations, like Aaron Wright suggested.

This thesis will address these questions by following the lead question ‘Are DAOs suitable for the traditional (GICS) industries, and under which premises are they future-proof?’ and will have the following structure. First, in the theoretical framework, further elaboration will be provided on the definition of a DAO and how it differs from a traditional organization. Second, I will dive deeper into agency theory and define what specific problems DAOs encounter or solve in comparison to traditional organizations from an agency theory perspective. In the light of those analyses, the first subquestion 1 (‘How are agency theory and DAOs linked?’) and subquestion 2 (‘In what way can a DAO overcome the agency problems that they are linked to?’) are answered. This will be followed by a short conclusion on what characteristics, advantages and disadvantages DAOs bear with them.

Thereafter, this theoretical framework will be brought into practice by building a suitability index in the form of a SWOT-analysis. To do so, I will elaborate on the industry division necessary to conduct this analysis, by answering subquestion 3: ‘What industry classification is recommended in relation to the suitability for DAOs in those industries, and what are the characteristics of those industries?’. To build the DAO-oriented SWOT analysis, the theoretical framework is used to determine the strengths, weaknesses, opportunities and threats of DAOs with respect to the listed industries to answer subquestion 4 (‘What are practical applications of DAOs at the current stage, and how feasible are they?’) and 5 (‘What industries do DAOs add value to compared to traditional governance frameworks?’). The analysis is finished with a conclusion on the suitability of the DAO structure for the various industries. This will be followed by a discussion on the limitations and practical use of the results, answering subquestion 6 (‘What are implications of this research?’): how can these results be used and considered in practice, and what is necessary to facilitate the implementation of DAO structures? Finally, the lead question (‘Are DAOs suitable for the traditional (GICS) industries, and under which premises are they future-proof?’) is answered, by taking all the results together and speculating on how the results could change the current scope of governance when the structure would actually be used in those industries for which it is a suitable structure.

The outcome of the investigative work in this thesis translates to the following contributions. On theoretical grounds, it updates and enriches the existing body of governance knowledge by synthesizing ways in which DAOs stand to disrupt the legacy governance systems rooted in traditional agency theory. For practitioners, a useful comparative tool is produced which provides a convenient snapshot of industries most suited for DAO disruption. Lastly, an educated speculation is offered on how DAOs may reshape governance in future firms through creation of an industry-wise suitability index. Implications of these findings extend to many academic disciplines and are believed to help policymakers come to better informed decisions. This could, by way of example, provide policymakers with a starting point for the creation of a regulatory framework that would be suitable for DAOs, or provide computer scientists with ideas for the coding of novel operating agreements/smart contracts for existing or new DAOs.

3 The DAO

It is of great importance to decide upon a more specific definition of a decentralized autonomous organization. There are many definitions circulating in both academic literature and the actual industries that DAOs operate in. Hassan and de Filippi (2021) have recently set out an overview of the circulating definitions, and restructured it to their own interpretation of those definitions, leading to the following definition: *A DAO is a blockchain-based system that enables people to coordinate and govern themselves mediated by a set of self-executing rules deployed on a public blockchain, and whose governance is decentralized (i.e., independent from central control).* Another definition that is of relevance is that of the underlying technology of DAOs – blockchain – which provides a distributed and digital ledger that records transactions in a transparent and immutable way (Nakamoto, 2008).

3.1 Alternative definitions

Interestingly so, Hassan & de Filippi make a reference to their previous definition for the DAO in one of their earlier papers (De Filippi & Hassan, 2018): *a self-governed organization controlled only and exclusively by an incorruptible set of rules, implemented under the form of a smart contract.* This adaption to the definition demonstrates that the DAO is a dynamic concept, which has been changing over time and has no solid definition. This pattern of change within the concept and definition of the DAO will likely continue, because the underlying technology will likely keep evolving and provide improvements for the structure as well.

Some other mentioned definitions in their paper are the following. First, Hiseh et al. (2018) determine DAOs as *non-hierarchical organizations that perform and record routine tasks on a peer-to-peer cryptographically secure, public network, and rely on the voluntary contributions of their internal stakeholders to operate, manager and evolve the organization through a democratic consultation process.* In that same year, Beck (2018) describes a DAO as *a decentralized, transparent, and secure system for operation and governance among independent participants, which can run autonomously.* Also, De Filippi and Wright (2018) mention that the DAO *represents the most advanced state of automation, where blockchain-based organization is run not by humans or group consensus, but rather entirely by smart contracts, algorithms and deterministic code.* Somewhat later in time, Singh and Kim (2019), who have a more technical perception of the DAO, define it as *an organization whose essential operations are automated agreeing to rules and principles assigned in code without human involvement.* Though, this definition has been challenged by Reijers et al. (2018), by adding the element of distinction between "on-chain" and "off-chain" governance in DAO governance. This discrepancy again shows that there is no single definition, but that the concept is open to interpretation. The recent definition of El Faqir et al. (2020) determines that the DAO consists of *people with common goals that join under a blockchain infrastructure that enforces a set of shared rules.* This again shows that there can be different perspectives, because this definition appears to contain a social understanding that the other definitions did not contain. Lastly, Virovets and Obushnyi (2020) also provide their readers with several different definitions in literature, after which they summarize those definitions to the following economic understanding of the DAO: *DAO can be scribed as a decentralized corporate ledger (created for the purpose of financial and/or technical cooperation, such as*

corporations and institutions) running entirely autonomously and decentralized due to the technology of blockchain, where all or most management decisions are made by smart contracts through a logic written in code.

3.2 Characteristics and definition development

Despite the fact that these definitions are all formulated differently, the most important lesson that can be drawn is that most of those definitions contain specific (economic) characteristics (Virovets & Obushnyi, 2020; Hassan & de Filippi, 2021). First of all, the most common - and arguably the most fundamental - characteristic, is *decentralization*. Virovets and Obushnyi define this as being composed of smart contracts built on decentralized infrastructure, governed by encoded rules that are executed automatically and existing on a decentralized infrastructure. Hassan and de Filippi (2021) determine that this characteristic inherently follows from the fact that DAOs rely on blockchain technology. Second, *independence* is an important characteristic. This implies that a DAO cannot be influenced by external factors and acts independently, because the smart contract is executed automatically and therefore does not need any human or physical interaction to enforce partnerships. A third characteristic is *autonomy*. It implies that the decision-making and governance are non-centrally controlled, so it is an entity that acts independently without any external forces. A fourth is *automatization*, meaning that operations within the DAO are executed automatically through execution of the program code. A fifth one is *intelligence*, which can be defined as a mechanism that can change the rules of operation. A sixth important characteristic is *transparency*. This aims at the fact that the open-source code of the DAO and its organization are fully transparent and incorruptible, and that it provides a transparent decision making process. This also is inherent to the fact that DAOs operate on blockchain technology (Hassan & de Filippi, 2021). A seventh characteristic is *omnipresence*. This means that a DAO can operate worldwide in a decentralized manner, without local incorporation and national location. An eighth characteristic is its *digital form*, implying that its organizational logic and operational rules are encoded in the form of smart contracts in a blockchain that can be easily set up as a global open to any one organization, operating using computer codes. A ninth one is *permanence*, described as a DAO with rules that are resistant to direct attacks and cannot easily be changed. Additionally, if the code allows for upgrades of the rules, the DAO code can automatically initiate changes in an irreversible way and write it into an immutable distributed ledger. This characteristic is particularly important, because the first DAO – which was called ‘the DAO’ – failed with a respect to this characteristic (Minn, 2019). A tenth characteristic is auditability. This means that every ledger is retraceable across its full history, verifiable and accountable. An eleventh characteristic is *interoperability*, which means that the DAO can automatically respond to input operations in accordance with programmed rules, as well as using fully autonomous sensors. Lastly, there is *anonymity*. This implies that the participants of a DAO have pseudonymous or anonymous access without disclosing real names and can transact without revealing their full identities. According to Hassan & de Filippi (2021), this is inherent to the fact that the DAO is based on blockchain technology.

In order to provide further clarification on these characteristics, they can be categorized in overarching characteristics, such that a well-founded and compact definition can be created (Hassan & de Filippi, 2021). They have come up with 6 overarching characteristics that complement each other. The first one is that *DAOs enable people to coordinate and self-govern*

themselves online. They make a reference to the earlier definition of El Faqir et al. (2020) to emphasize this characteristic, by stating that this refers to an organization in the sense of an entity comprising multiple people acting towards a common goal, instead of it referring to a legally registered organization. This is an important comment, because in the current state of the world DAOs are rarely recognised as an official legal entity – exceptions exist in some US states, including Vermont (Wright, 2021). The second characteristic is that the *source code of the DAO is deployed in a blockchain with smart contract capabilities like Ethereum*. An important additional comment they made on this characteristic is that this blockchain is arguably always a public blockchain (see also: Hiseh et al., 2018). Therefore the term public will be added to this the characteristics in the table below,. The third characteristic is that *a DAOs smart contract code specifies the rules for interaction among people*. An important mention is that DAOs do not specify whether other governance mechanisms are able to affect or overrule this code. However, this doubt can be found in the literature in general. As already mentioned, Reijers et al. (2018) proposed that there can be a difference between ‘on-chain’ and ‘off-chain’ governance, while Singh and Kim (2019) state the opposite, namely that the operations are automated agreeing to rules and principles assigned in code without human involvement. Therefore, this part of the definition remains open for discussion. The fourth characteristic is that *the rules are self-executed independently of the will of the parties*. This is explained as an inherent result of the rules of interaction being defined in a smart contract. The fifth characteristic is economically speaking very important, namely that *DAO governance should remain independent from central control*. This characteristic can be rephrased in different ways, for instance as self-governed (Hassan & de Filippi, 2018), self-organising (Singh & Kim, 2019), peer-to-peer and democratic control (Hiseh et al., 2018). The sixth, and last, characteristic is that *DAOs inherit blockchain properties*. For this characteristic, it is worth noting that this contains an aggregate of properties, rather than consisting of one explicit element. These properties include – amongst others - transparency, cryptographic security and decentralization. This is, logically speaking, a result of the fact that DAOs are based on blockchain theory.

Taking these ‘categories’ into account, it follows that the characteristics mentioned by Virovets and Obushnyi (2020) can be categorised in the following way, to fit in the definition formulated by Hassan and de Filippi (2021).

Category	Coordinate and govern online	Source code deployed on a (public) blockchain	Rules for interaction specified by a smart contract	Rules are self-executed, independent from parties' will.	Independent from central control	Characteristics inherent to its basis in blockchain
Decentralization		X	X	X	X	X
Independence			X	X	X	
Autonomy			X		X	
Automatization				X		
Intelligence				X	X	
Transparency		X				X
Omnipresence	X					
Digital form	X	X		X		
Permanence			X			
Auditability		X				
Interoperability			X	X	X	
Anonymity						X

Table 1: Definition elements (author's own contribution)

An even narrower scope of characteristics follows from Wang et al. (2019). They mention 3 main characteristics, the first of which being ‘distributed and decentralized’. DAOs differ from

traditional organizations due to their use of a bottom-up interaction, coordination and cooperation among distributed network nodes, rather than traditional top-down hierarchy with a centralized authority. This type of ‘hierarchy’, even though technically speaking it does not qualify as such, leads to different determinations of relationships between the nodes. Whereas such relationships would be determined by administrative affiliation in traditional organizations, DAOs allow for a different basis: relationships would be determined by principles of equality, voluntariness, reciprocity and mutual benefit, and they would be driven by the resource endowment and complementary advantage of the individuals. These principles will be elaborated on later. While these principles may sound new, they are already captured in the abovementioned table, since they are part of the characteristic ‘independent from central control’. They nevertheless offer an interesting new perspective on this characteristic, making it a worthy mention. The second characteristic following from this paper is ‘autonomous and automated’, meaning that *code is law*. This leads to the organization being distributed instead of pyramidal, the power being decentralized instead of centralized, and the management being a community autonomy rather than bureaucratic. This idea is captured within the parts ‘*rules for interaction specified by a smart contract*’ and ‘*independent from central control*’. The last set of characteristics is ‘organized and ordered’, meaning that the operational rules, participants responsibility and authority, and the rewards and penalty terms are open and transparent. The parameters of the company are accurately differentiated and dimensioned. These are captured within ‘*source code is deployed on a (public) blockchain*’ and ‘*characteristics inherent to blockchain*’. Additionally, Wenwen et al. (2019) use these same main characteristics, but add ‘*intelligence and tokenization*’ to the list. However, this characteristic aims to describe the technical structure of the DAO, an aspect that is not necessarily relevant for the determination of a proper economic definition.

Voshgmir is among the academics that does hold another view on the characteristics of DAOs: his statement that there is no such thing as a fully decentralized and autonomous organization, and that these characteristics should be perceived as relative, rather than as absolute (Voshgmir, 2019) goes against the absolute perception of DAO characteristics that can be found in the aforementioned papers. He states that there are different levels of decentralization, which depend on the installed governance rules. For DAOs, he states, the network might be geographically – as a subject to several jurisdictions - and architecturally decentralized – as it runs on independent actors that run different nodes - but the governance rules that are written in the smart contract or the blockchain will nevertheless remain a point of centralization and loss of direct autonomy. This results in DAOs being logically centralized by the protocol/smart contract. This centralization is due to the fact that questions regarding how and when to upgrade the code are often delegated to a set of experts on techno-legal intricacies of the code (Voshgmir, 2019). However, since this is a nuance, rather than a fundamental difference in view on the characteristics, this nuance is only used for the fundamental understanding of the DAO within agency theory, and is left out of the general definition of the DAO.

In light of the comparative analyses of the definitions above, this thesis operationalizes the one provided by Hassan & de Filippi (2021) since it ticks all the boxes: *A DAO is a blockchain-based system that enables people to coordinate and govern themselves mediated by a set of self-executing rules deployed on a public blockchain, and whose governance is decentralized (i.e., independent from central control).*

3.3 Comparing the DAO to a traditional organization

DAOs significantly differ from traditional organizations in several manners. Firstly, DAOs are inherently distributed and decentralized, indicating that the interaction is bottom-up instead of top-down (Wang et al., 2019; Bellavitis et al., 2022). Essentially this means, i that a traditional organization has a top-down hierarchy and (always) has a central authority, leading to the relationships between nodes within the companies being defined by administrative affiliation. This is visualized by the pyramid symbol on the left in the infographic below (figure 1). A DAO, on the other hand, has no central authority and has no specific hierarcical achitecture: it has a bottom-up interaction, coordination and cooperation among distributed network nodes. These relationships between these nodes, on their turn, are determined by the principles of equality, voluntariness, reciprocity and mutual benefit, and they are driven by the resource endowment and complementary advantage of individuals (Wang et al., 2019). This is vizualized on the right side in the infographic (figure 1) by the nodes, as well as by the different symbols used within the nodes. This eventually leads to a situation where the DAO members effectively have more decision-making power than shareholders would have in a traditional organization (Sims, 2019).

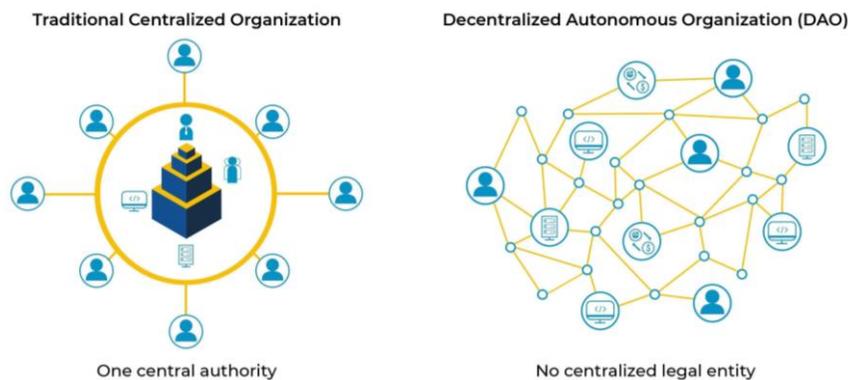


Figure 1: vizualization of a centralized and decentralized organization

Secondly, the autonomous and automatized nature of DAOs leads to the idea that code is law. This code is law principle, meaning that rules and collaboration patterns are defined by all stakeholders due to the distributed structure, creates an environment in which concepts such as consensus and trust are easier to achieve. This eventually benefits the corporation, because of the minimization of trust costs, communication costs and transaction costs. This idea will be discussed later on. Furthermore, this nature also contributes to the replacement of a pyramidal hierarchy with a distributed network, to power being decentralized instead of centralized, and that management is based on community autonomy, rather than on a bureaucratic system.

Lastly, the fact that DAOs are organized and ordered follows from the reliance on smart contracts in which the operational rules are determined. This leads to the openness and transparency of the participants' responsibility and authority, and of rewards and penalties terms.

4 The research problem

The theory behind (corporate) governance can traditionally be found in agency theory. Stated shortly, agency theory is a theory based on the ‘ideal’ situation in which an economic actor makes optimal decisions and executes them in case he acts as both principal and agent in his own interest. When more than one party is involved, and therefore multiple principals and agents are involved, the principal-agent problem will prevail when there is a separation of ownership and control: if there are no incentives for agents, they will pursue their own interests (opportunism), rather than the interests of the principals (Fama & Jensen, 1983; Shapiro, 2005). Following this definition of agency theory, specific characteristics of DAOs are substantially different from traditional organisations. Wang et al. (2019) addressed some inherent differences that can arguably be understood as ones that can change the perception of DAOs from an agency theory perspective. First of all, the decentralized structure of DAOs indicates a bottom-up interaction, instead of a top-down hierarchy, and its relationships are based on principles such as equality, voluntariness, reciprocity and mutual benefit. These principles, especially reciprocity and mutual benefit, can be seen as opposite to opportunism, where the person only considers its own or the group’s own benefit (Smith, 1935; Vafai, 2010). This leads to several unaddressed problems regarding whether the decentralization aspect alone is capable of reducing the opportunism of individuals, and can solve this aspect of agency theory.

Another difference regards the fact that DAOs find their basis in the *code is law* principle. This leads to an environment where consensus and trust are easier to achieve: this is the opposite of the situation in a traditional organization where, according to agency theory, principals and agents distrust each other because their interests are not aligned. Again, the question raises whether this characteristic could be the solution for this portion of the agency problem. Wang et al. (2019) suggests that it does provide a solution by the minimization of agency costs such as trust costs, communication costs and transaction costs, but further investigation and grounding is necessary.

These possible solutions reach the curiosity and the question whether the use of DAO structures can actually solve aspects of agency theory, and whether this could be the reason for DAOs to become more mainstream and be used in the traditional industries, next to the industries that they already operate in. Investigation is necessary on whether these ‘promising characteristics’ can actually form solutions for (a part of) the problems that are defined in agency theory. Furthermore, investigation on whether these ‘promising’ characteristics of DAOs are genuine rather than overhyped merits a close scrutiny is necessary. For example, they might bring their own complications that outweigh their advantages. Following these results, it is the question whether these presumed advantages can lead DAOs to be the future of governance: can they be used in practice, and in what industries might they have added value, compared to traditional governance forms.

The reasonings above lead to formulation of the following overarching research questions: are DAOs suitable for the traditional (GICS) industries, and under which premises are they future-proof? This thesis will attempt to answer this question by addressing four further (theoretical) sub-questions (a) How are agency theory and DAOs linked? (b) In what way can a DAO overcome the agency problems that they are linked to? (c) What industry classification is recommended in relation to the suitability for DAOs in those industries, and what are the characteristics of those industries? (d) What are practical applications of DAOs at current stage, and how feasible are they?

- (e) What industries do DAOs add value to compared to traditional governance frameworks? And
(f) What are implications of this research?

5 Methodology

The purpose of this research is to – from an agency theory perspective - in how far DAOs could be a suitable governance structure for traditional (GICS) industries, and under which premises they are future-proof. This goal is achieved through rely on an integrated literature review methodology. Methodological literature documents extensive use of this approach in assessing, critiquing and synthesizing the existing literature in a way that enables new theoretical frameworks and perspectives to emerge (Snyder, 2019). This method is known for being the right fit for research with newly emerging topics and subjects with scarce data available for empirical investigations. It is also ideally suited for creating initial or preliminary conceptualizations and theoretical models, in contrary to the other methods that are more focused on reviewing old models, by critically analysing and examining the literature and the main ideas and relationships of an issue (Snyder, 2019). The topic at hand, DAOs, is a new phenomenon. Understanding the suitability of DAOs in firm governance requires combining ‘older’ theories (agency theory) with this new phenomenon. Hence, integrative literature review is a good fit.

The search strategy that used for the integrative literature review is the following. Search terms such as ‘decentralized autonomous organization(s)’, ‘DAO(s)’, ‘DAO governance’, ‘decentralized governance’, ‘autonomous organization’, ‘IT-governance’, ‘blockchain governance’, ‘traditional governance’, ‘traditional company structure’, ‘flat hierarchy governance’, ‘digital governance’, ‘self-governance’, ‘agency theory’, ‘agency problem’, ‘separation of ownership and control’, ‘principal-agent problem’, ‘DAO and agency theory’, ‘SWOT’, ‘SWOT-Analysis’, ‘SWOT-suitability matrix’, ‘suitability matrix’, ‘industry division’, ‘industries’, ‘GICS’, ‘GICS-industry division’, ‘*Industry X* strengths’, ‘*Industry X* positive’, ‘*Industry X* upside’ ‘*Industry X* weakness’, ‘*Industry X* downside’, ‘*Industry X* negative’, ‘*Industry X* opportunities’, ‘*Industry X* threats’, ‘*Industry X* characteristics’, ‘DAO industries’ and ‘DAO industry’ are used. The searches have been conducted on RuQuest, Radboud Repository, SAGE Research Methods, JSTOR, Google Scholar and Crunchbase. In case an article was not available in English, DeepL was used to translate it to English. In such cases, extra carefulness is needed when reading the article, to make sure any translation errors do not influence the quality of the thesis. Furthermore, the reference section of the literature is used to find further relevant papers.

As to exclusion and inclusion criteria, the first criterion is that the papers flow from high-quality journals and books. For instance, the journal ‘Organization Science’ has a SJR ranking of 6.96, an AI of 3.5 and an IF of 2.8, which are far above average, and is therefore considered a journal of great quality. Something similar counts for the journals under IEEE. In general, journals with at least an average SJR (1 or higher), SNIP (1 or higher), AI (1 or higher) and EF (high percentile) are preferred. However, DAOs are a fairly new phenomenon and not much literature exists on the topic, so there are reasons to consider journals with somewhat lower rankings when no other journals have articles available on the topic. Another aspect to take into account is that for DAO literature to be relevant, only articles from 2015 on are used, since before that time frame DAOs did not exist in the current or in a comparable form. For agency theory literature, however, a time limitation is not set, as this theory has existed for decades and there is no reason to narrow it down to recent findings. Another exclusion criterion for agency theory literature is that it should be about the governance aspect of agency theory. Agency theory has many types of implications, but the articles to be used must be aimed at the explanation of the general idea of the theory, or angled

specifically at (corporate) governance, because that is the scope of this thesis. For DAOs, the articles are limited to definitions of DAOs and articles on its governance: articles about the technology behind it (blockchain) will be in essence excluded, since the technical background is not of relevance for the economic perspective. Regarding the SWOT-analysis and suitability matrix more specifically, I will only use sources that describe the methodology of a SWOT and suitability matrix in general are used, and sources that regard industry-level analysis. When it regards company-level explanations, the source is excluded. Furthermore, regarding the industry division, I will only make use of industry divisions that are general – such as GICS – or that are specific to DAOs or other governance structures are included: for instance, papers that describe the possible relevant industries for DAOs are included. When having gathered this information based on these criteria, I describe this process of inclusion and exclusion is described a Prisma Diagram, to prevent any indistinctness.

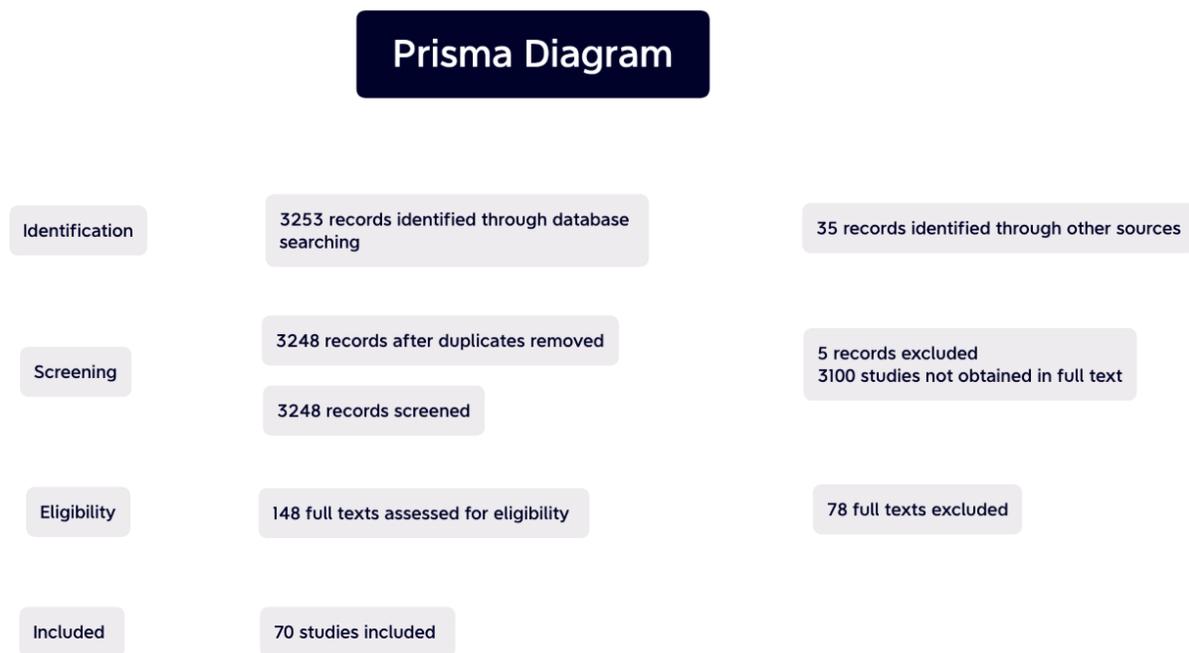


Figure 2: Prisma Diagram

The next phase is the data analysis: for this, Atlas.ti is used to code, categorize and summarize the gathered literature. When finished, the results are interpreted and analyzed. This will be followed by a discussion on the limitations and a conclusion.

6 Agency theory and governance

Agency theory has dominated literature on corporate governance a major part of the era of traditional corporations. This is a logical result of the often-unresolved discrepancy between the interests of managers and shareholders that has been dominating the governance literature (Jensen & Meckling, 1976). The theory follows from agency relationships, which are contracts under which one or more persons (the principals) engage another person (the agent) to perform some service on their behalf which involves delegating some decision-making authority to the agent (Jensen & Meckling, 1976), and describes several components such as information asymmetry, adverse selection, moral hazard, trust, embeddedness, the principal-agent problem, alignment of incentives, opportunism, monitoring and agency costs. These concepts are highly relevant for determining the comparative advantages (and disadvantages) that DAOs carry in comparison to traditional organizations, because the key differences can justly be found in those concepts, most prominently in the lacking of a principal-agent relationship in the traditional corporate understanding of such a relationship (management – shareholder). The lacking of such a traditional relationship, however, does not prevent DAOs to be analysed in an agency theory context, as the theory of agency costs applies to any situation in which a cooperative effort by two or more people is involved (Jensen & Meckling, 1976). Since DAOs are essentially a cooperative of members, they qualify as such.

The principal-agent problem, i.e. the misalignment of interest of principal and agents, is one of the most profound issues in agency theory. One of the reasons of the misalignment can be *opportunism* of the agents, meaning that they pursue their own interest first and put in the least effort possible, which is not in line with the interest of the principals. This issue can be solved by aligning their interests. Common remedies discussed in literature include offering incentives (executive compensation) or *monitoring* (Jensen & Meckling, 1976). *Monitoring* can for instance be achieved by internal or external auditors, compliance officers, internal affairs departments, government regulators, insurance companies, investment advisors or rating agencies. This, however, leads to *agency costs* (Shapiro, 2005; Jensen & Meckling, 1976). Agency costs often occur from agency problems, including monitoring, bonding costs, which are resources spent on preventing actions of agents that are not in the principals' interest, and residual loss (Jensen & Meckling, 1976). They can also include recruitment costs (*information asymmetry and adverse selection*), costs of adverse selection (afterwards), specifying preferences (*information asymmetry, principal-agent problem, misalignment of interests*), *moral hazard* (afterwards), or *monitoring*. Explicit examples are the implementation of checks and balances to prevent opportunism, the implementation of reporting requirements, rotating employees, fragmentation of responsibilities and the implementation of supervision (Shapiro, 2005).

Next, *information asymmetry* indicates that the different parties involved have different information. One classic example is that shareholders (principals) hire managers (agents) for their specific knowledge. These agents act on their knowledge and fulfil their tasks, while the principals have no knowledge over what the agents are exactly doing. Therefore, the principals and agents have different information on how the agents fulfil their tasks. A phenomenon that might appear at an even earlier stage in this process is *adverse selection*. This indicates that due to *information asymmetry* regarding inter alia the (necessary) skills of agents or the quality of the services the

agents provide, principals might choose the candidate that they actually did not want to hire (Shapiro, 2005). A possible solution to these issues can be the development of professional skills, because it can improve selection procedures by means of, for instance, offering training to improve principals' ability to prevent *adverse selection* from happening. It can also lead to protocols, ethics codes and best practices within the profession to limit agent discretion and *opportunism*, or to professions providing insurance against malpractices of agents. One last option is providing standards within the profession to determine the quality of the service the agents provide. This can for instance be achieved through profession associations or disciplinary bodies, since principals can have issues with identifying the quality, leading to *information asymmetry* and *adverse selection* (Shapiro, 2005).

Embeddedness and trust are closely related to the issue of *information asymmetry* and *adverse selection*. These concepts can solve these issues by keeping agency relationships within a structure of personal relationships, since these principals then know who the agents are by knowing their track-records and/or reputation. Furthermore, when being part of the same 'trusted network', the principal and agent are more likely to share the same values and interests, decreasing the likelihood and extent of misalignment of interests and opportunistic behaviour. This likelihood of opportunism decreases even more when trust is part of the equation: when the principal and agent already have a trust-based relationship, they are likely willing to keep that trust by acting less opportunistic. This effect can be strengthened by the effects of social sanctions such as reputation damage. It should be taken into account that such solutions raise agency costs in the form of bonding costs (Jensen & Meckling, 1976). The risk, however, is that principals are more likely to just select agents from their (trusted) network, leading to weaker choices when not considering potentially strong candidates from outside that network, leading to yet another form of *adverse selection*. This can also lead to a certain way of *free riding/moral hazard* – meaning that they take more risks than accepted according to general standards - by agents, since they are rewarded for their actions anyway, as the principals already trust them and are not incentivised to limit agent behaviour that is opportunistic (Shapiro, 2005).

The significance of agency theory in dominating the discourse in modern governance can be understood in its elegant framing of self-interest and rationalism in neoclassical sense. For instance, this theory deals with an 'ideal' situation whereby an economic actor makes optimal decisions and executes them in two capacities simultaneously: a principal and an agent. When more than one party is involved, and therefore multiple principals and agents are involved, the principal-agent problem will prevail when there is a separation of ownership and control, where the ownership lies with the shareholders and the control lies with the management. If there are no incentives for agents, they will pursue their own interests, rather than the interests of the principals (Fama & Jensen, 1983; Shapiro, 2005). In a traditional organization with a traditional governance system, this is generally the case.

6.1 Agency theory and DAOs

Adoption of an agency theory perspective in analysing DAOs leads to several key observations. First among them is the ‘next-best-case’ phenomenon—a term coined by Morrison et al. (2020). The authors argue that DAOs possess multiple ways of overcoming many drawbacks linked to agency. The following paragraphs expound on these channels.

Hierarchy and trust / First of all, the hierarchy structure is different from traditional companies. DAOs have a flat hierarchy, meaning that there are multiple *entrepreneur-managers* who don’t need to trust each other, but may still function as a *single-minded entrepreneur-manager* (Morrison, Mazey & Wingreen, 2020). This goes against one of the foundational principles of ‘traditional corporate governance’, the allocation of managerial authority to the board of directors and its primacy (Wright, 2021). This can take away the misalignment of interest to a certain extent, because the entrepreneur-managers are both the principal and the agent, so that there is no possibility of misalignment: it regards the same group of people. The reason that this structure works, is because the participation of the members, and the demand for the incorporation of information and feedback from a wider group of stakeholders in a wider variety of situations and circumstances decreases the need for a central management (Wright, 2021).

Flat hierarchies, however, are not without opposition. A seminal paper within traditional governance scholarship by Ghiselli & Johnson (1970) argues that flat hierarchy can only function in smaller organizations or in individual units within larger organizations because the efficiency and the effectiveness of governance can decrease in quality when the decision-making rights are spread too thin. Whether this theory holds for DAOs is open for debate and can only be verified after the practice becomes widespread and open to empirical verification. Therefore, for now, it is important to consider that the bigger a DAO is, the more caution is warranted (Morrison, Mazey & Wingreen, 2020). It is equally important to recognize that the more members a DAO has, the more effort it takes to achieve consensus in the voting process. This is a two-way street: on the one hand, more frequent voting will provide incentives for the members to participate more actively in the DAO, as they will realize they actually have a say in the direction of the DAO. However, if the voting becomes more frequent, gathering all the information necessary to make well-informed decisions can become too time-consuming and complex for the members, thus leading to less incentives to participate in the voting process. This can massively decrease the efficiency of the governance structure for member-heavy DAOs (Wright, 2021). The first empirics show that there indeed is a tendency towards inactiveness and influence from large shareholders, increasing the risk of free-riding (Bellavitis et al., 2022). However, DAOs do have different types of voting processes which they can choose from, so there are solutions on the way to solve this vicious circle (Wright, 2021). Practice has shown, for instance, that DAOs can use a system in which the tokens – the DAO equivalent of shares – can have a specific worth attached to it, so that some people's tokens are worth more than others, potentially based on a reputation system in which members that contributed relatively much to the DAO have a higher worth attached to their token (Bellavitis et al., 2022). Whether this practice is desired, however, can be argued, because it could allow the tokenholders with the most power to exploit the members’ inattention to extrant private benefits of control. This allows for a move towards the manner in which traditional organizations work, leading to a situation in which the agency costs increase to a level that is close to that of a traditional organization (Bellavitis et al., 2022). Furthermore, DAOs can set requirements as to when a token

holds voting rights – for instance, only when the tokenholder is staking (Sims, 2019). The fact that such systems are not just hypothetical, some DAOs actually have them installed, confirms the idea that there is a tendency towards ‘mini-managements’, even though formally there is no management installed. It also confirms that DAOs can only be decentralized to a certain extent, and that the (voting) protocol leads to a certain amount of centralization (Voshmgir, 2019). This is even more true for DAOs that factually install oversight boards. Poulos, for instance, has a system in place that makes use of so-called archons, that can overrule decisions when the threshold of archons is reached. Even though a part of those archons are chosen democratically, and those archons only serve for a short period of time before there is a re-election, this leans towards a certain increase in centralization (Poulos, 2022).

A last phenomenon with regard to trust that could threaten the reduction in agency and monitoring costs, is the phenomenon of *forking*. Forking means that the platform will be replicated by an identical and competing ‘separate, backwards-compatible platform’, leading to a situation in which two similar DAOs are in operation. A ground analysis indicates that there is no comparable manner to duplicate a traditional organization: the minority shareholders that would be likely to fork an organization are often locked in and are unable to exit the company accompanied by the value of their shareholdings, not even when they are bought out. Organizations in the traditional worlds have significantly more power with respect to prohibiting others to use their name and resources. Within DAOs, however, forking is a relatively realistic threat: the Ethereum blockchain has been forked in 2016, when *the DAO* was hacked, leading to the current situation in which there are two versions of the Ethereum blockchain: Ethereum and Ethereum Classic (Sims, 2019).

Transparency / The underlying technology of DAOs, blockchain, provides the members with a larger amount of transparency in comparison to traditional organizations (Virovets & Obushnyi, 2020). Whereas the decision-making process is private within traditional organizations, the decision-making process of DAOs, regarding both which decisions were taken and how those decisions have been made, is publicly available knowledge (Bellavitis et al., 2022). Another phenomenon within the concept of transparency that could reduce agency problems, is the higher responsiveness of the decision-making process. The conducting and recording of voting by way of blockchain leads to more transparency and security, so that the registration on the blockchain decreases the opportunities for fraudulent behaviour. This transparency furthermore decreases costs: the voting is registered on the blockchain, so that no paper mailings or secure e-proxy services are necessary. These lower costs, on their turn, lead to more frequent voting, as the costs are not necessarily a burden anymore. Under such circumstances, members will eventually obtain an increasingly important role in the management of the DAO, and will have more impact on the direction of the DAO, thus offering them an incentive to participate in the voting processes, much more than in a traditional organization (Wright, 2021). Even though these phenomena can certainly solve parts of the information asymmetry problems and reduce their related agency costs, it must be borne in mind that DAOs have inherent issues with regard to transparency as well. Due to the opportunity to remain anonymous within DAOs, the members do not have information on the identity of other members, what their ambitions and motivations for participating are, and what their values and priorities are (Virovets & Obushnyi, 2020). If this type of information asymmetry leads to a certain lack of trust in the other members and their proposals, this could form an obstacle for effective and efficient voting, while there is no system that allows them to define, manage or control this type of conflict (Morrison, Maze & Wingreen, 2020).

Smart contracts, costs and trust / DAOs merely function on the basis of smart contracts that autonomously execute the contracts, so that the parties can always be sure that the contract is executed following the conditions in the agreement made. This automation significantly reduces transaction costs (Bellavitis et al., 2022). As soon as a condition in the contract is fulfilled, the contract executes the action that should be following the fulfilment. Examples could be the payment of salary, or the delivery of a service as a reaction on the payment made by the counterparty. Such contracts require less trust than the ‘natural language equivalent’, because of the aforementioned execution method by computer code. Furthermore, it bears fewer monitoring costs, so that it reduces agency costs (Lumineau et al., 2021). The natural language equivalent, on the contrary, requires trusted parties such as lawyers or legal practitioners for their interpretation, monitoring and enforcement as a result of the inherent subjectivity that natural language bears. Sims (2019) highlights that smart contracts replace the task of observing the terms of a contract for enforcement, resulting in DAOs carrying significantly lower transaction costs than ‘regular’ firms. Furthermore, DAOs are not familiar with the concept of efficient breach, which essentially means that parties are ‘allowed’ to breach a contract if that would lead to a better outcome for the parties. This lowers transaction costs that follow from the uncertainty around efficient breach: as soon as the possibility occurs that one of the parties might breach the contract, the risk related to the contract increases, leading to an increase in transaction costs, because those represent the risk premium. If the opportunity for efficient breach is eliminated as a result of the usage of smart contracts, the risk involved decreases, so that the transaction costs decrease accordingly (Sims, 2019). The major advantage following from this difference is that there is no - or at least less - need for conflict resolution when working with smart contracts, since there cannot be any misinterpretation – in theory (Morrison, Mazey & Wingreen, 2020). If this theory holds in practice, this would lead to less enforcement costs, and with that less agency costs (Lumineau et al., 2021). Nevertheless, this can at the same time be perceived as a weakness for DAOs: if a dispute rises, the organizational structure of the DAO cannot react as fast and efficiently as a traditional organization, especially in disputes or events where time is valuable (Morrison, Mazey & Wingreen, 2020).

Another phenomenon that occurs with the use of self-governed smart contracts is the *theory of incomplete contracts*, which anticipates situations where the resolution of contractual disputes without a neutral third-party would lead to inefficient and inequitable outcomes (Minn, 2019). This especially occurs when there can be several interpretations to a certain clause: normally a neutral third-party, such as a court, would consider the custom or trade usage to interpret the clause ‘correctly’. However, if such a party is not involved, the party with greater bargaining power will be able to force its own interpretation of the contract, so that they cannot fairly construe ambiguous clauses (Minn, 2019). Even if such ‘vague’ clauses are not present, this issue following from the greater bargaining power of one of the parties can occur in for instance the enforcement of the contract, especially when contracts require one of the parties to commit to sunk costs. If that is so, that party will consider the enforcement of the contract as more important, so that it may be willing to accept worse enforcement terms from the other party (Minn, 2019). More specifically relating to DAOs, the party with the superior technical knowledge will have bargaining power over the party that invested in the DAO: this party cannot freely withdraw its investment, so that they might accept a less worthy deal to withdraw the investment (Minn, 2019). Minn therefore argues that a neutral third-party should be used by DAOs for dispute resolution purposes, due to the risk of abuse of the ever so slightly ascendancy in power by DAO members. However, the potential cost increase

that is accompanied with the involvement of a third-party, should be taken into account, slightly decreasing the strength of the argument of cost-reduction.

Opportunistic behaviour and misalignment of interests | Wright (2021) observed that blockchain based smart contracts have the inherent ability to reduce the likelihood of self-dealing and opportunistic behaviour amongst the parties involved, because those are governed by rigid rules that are defined in the code. This leads to the structure of the firm being more deterministic, since those rules following from the code determine how members agree to cooperate. Additionally, they add a layer of accountability: the organizational rules are untethered from the control of the organization and thus cannot be modified, avoided or comprised by any of the involved parties. Therefore, none of the involved parties has the ability to transfer funds or defraud the organization of collected assets, unless they are the sole member participating in the decision-making process (Wright, 2021). This construction increases the trust that the members have in each other, because the lower the likelihood of self-interested behaviour, the lower the likelihood that members might not trust each other, regardless of the fact that members might not know each other. Taken this together, the DAO structure will offer competitive advantages and the production of more wealth. This increase in trust then decreases monitoring and enforcement costs, which can be considered a reduction of agency costs (Wright, 2021).

Incentives and trust / In traditional organizations, the corporate governance mechanisms aim at distributing risk, decision rights and residual claims (Morrison et al., 2020), as well as of accountability (Baker & Anderson, 2010). This can be achieved through explicit or implicit contracts, where explicit contracts include the specific terms in written language and require the parties to trust another authority such as the legal system to resolve disputes, and become valueless as soon as the legal environment is untrustworthy. Implicit contracts, on the other hand, require trust in each of the parties, meaning that they should trust each other in that they act in the way agreed in the contract, where there is no mechanism to ensure that the contractual duties such as the work are accomplished. As soon as one of the parties is not to be trusted, because the person in question is, for instance, not good on his word, the implicit contract is valueless. These issues do not occur when smart contracts are used to code contracts in blockchain, instead of in written language. This can turn implicit contracts into explicit contracts when the parties agree to trust the coding, a third-party mediator, resulting in the situation that parties need to trust the coding or the mediator, rather than each other (Morrison et al., 2020). Minn, however, would prefer the third-party mediator to be an actual mediator or legal entity: a platform such as the JUR Court Layer could be a blockchain-based alternative to a court that is still less of a risk than only trusting the smart contract (Minn, 2019; Sims, 2019). As mentioned before, the third-parties proposed by Minn are external parties, effectively increasing the cost related to the mediation.

7 Conclusion on agency theory

To sum up, DAOs appear to have significant potential in overcoming agency problems as a result of their inherent characteristics: the use of a decentralized structure can decrease opportunism concerns, and their autonomous and automatized nature can decline the amount of distrust, misalignment of interests and, eventually, agency costs. More specifically, the flat hierarchy of DAOs indicates that all investors act on the same level, so that there are no principals and agents: each agent is both a principal and an agent. This could decrease – or fully abolish - the misalignment of interests and the necessity for trust, because there is no principal or agent to misalign interests with or that should be trusted, besides the other investors that operate in the same position. However, there are indications that such a flat hierarchy may not be as beneficial as it seems on the surface: the bigger the corporation is, the less likely that such a hierarchy is effective and efficient – at least, for traditional organisations. There is no striking evidence that this issue has occurred within DAOs as well, but the illustrated examples show that DAOs can creatively design their governance process to become – ever so slightly – more centralized to overcome scaling concerns. In that context, Voshgmir’s observation that decentralization should be perceived relative rather than absolute (Voshgmir, 2019) is justified. Moreover, the transparency that is inherent to blockchain technology decreases concerns with regard to distrust: the fact that the blockchain is open source indicates that investors (and often the public) can always access the underlying processes of the DAO (Bellavitis et al., 2022) – that is to say the code underpinning the DAO is open for audit and evaluation.

Furthermore, use of smart contracts within DAOs reduces agency costs in several manners. The contract executes itself as soon as predetermined requirements are met, which reduces the need for trust, since the contract will execute itself and no person needs to be trusted for this action. It thus decreases monitoring costs, as nobody needs to keep an eye on whether the predetermined requirements are met. Moreover, since computer language is crystal clear and does not allow subjectivity, there is less need for interpretation by legal professionals and less likelihood that any type of conflict resolution is necessary due to subjectivity or uncertainty, resulting in a reduction of monitoring and enforcement costs. With that, agency costs are lower and there is less distrust, providing a partial solution for agency problems. However, it must be borne in mind that in case a dispute does arise, the organizational structure of DAOs is not particularly built for dispute resolution, leading to relatively high costs in comparison to the costs traditional organizations would bear in such circumstances. Therefore, several authors suggest to involve a neutral third-party in case a dispute rises. Keeping this nuance in mind is important because this will allow code creation with prevention in mind rather than *ex-post* troubleshooting. Nonetheless, this matter is common to all technology-based solutions and as such DAOs alone cannot be blamed for this vulnerability.

To briefly conclude, DAOs are essentially different to traditional organizations because they use *ex ante* governance mechanisms, rather than *ex post* monitoring and enforcement (Wright, 2021). This is the key to reduce agency costs by increasing trust. This shows that DAOs have much potential for solving agency problems, but it must be borne in mind that this is no green card: there are also risks regarding the efficiency and effectiveness of DAOs.

8 Industry division

To determine which industries stand to gain the most through DAO-led disruption, it is helpful to compartmentalize the universe of firms into manageable chunks. This allows separate assessment of characteristics common to firms operating in a particular sector of the economy. A good body of industry and academic literature is devoted to industry classification, leading to many proprietary and open systems. For instance, the Global Industry Classification Standard (GICS) developed by MSCI is a common form of industry classification. However, this classification is based on the ‘physical’ trading environment and not so much on the ‘digital’ trading environment that DAOs are designed for. Therefore, it is worthy to investigate whether some significant adjustments are necessary. This is done by considering one approach each from the traditional and the modern camps.

8.1 Traditional: GICS

The Global Industry Classification Standard (GICS) provides an overview of the current state of industries in global investment markets. Some seminal papers show that the GICS classification explains better market movements, sector-wide variations in stock prices, accounting ratios, and both actual and forecasted growth rates (Bhojraj et al., 2003). Considering that bulk of the research and innovation in the DAO-sphere is being spearheaded at the industry/start-up level, the GICS system offers more advantages than alternatives like Fama-French classifications which are more commonly seen in academia. This classification criteria comprises the following sectors: energy, materials, industrials, consumer discretionary, consumer staples, healthcare, financial, information technology, communications, utilities, and real estate. Appendix 1 accompanying this thesis documents the specifics of each sector.

8.2 Modern: Alternatives

In light of DAOs’ unique properties, some authors have proposed alternative frameworks to evaluate their suitability. For example, Virovets & Obushnyi (2020) refer DAOs’ ability to record, broadcast and verify transactions in a transparent manner and suggest this attribute as a yardstick for prospective disruption. They also link the same to the potential for strengthening global financial systems in real time by obtaining the risk-monitoring data. This leads to the following categories: financial services, Internet of Things and internet value, global supply chain integration, sustainability, digital identity and consumer privacy management services, blockchain-based prediction of markets and gambling, oracles and notary services with optimization with data inputs, digital universities and education, qualification of professional ratings and conflict resolution and arbitration with a system of experts.

Another alternative is offered by Ledger Academy (Your DAO Guide - The Most Important DAO Categories Defining the Space, 2022), in which they predict that DAOs can be of use in the following industries/categories:

AMM (Protocol) DAOs | AMM (automated market maker) DAOs use smart contract protocols to bring decentralized financial services to users.

Grant/fundraising DAOs | One of the earliest use cases of DAOs is Grants. In a Grant DAO, the community donates funds into the grant pool and collectively votes on allocating and distributing the funds. The purpose of these DAOs is to fund innovative new DeFi projects, with organizations submitting funding applications.

Social DAOs | Social DAOs have objectives such as preserving arts and culture or pursuing projects alligned with the values of the community that its built for.

Collector DAOs | Collector DAOs have the purpose of acquiring (cultural) collectibles for its for its community, distributing ownership of various high-ticket digital assets equally among all community members.

Venture/Investment DAOs / Venture/Investment DAOs offer tools to democratize investments.

Media DAOs / Media DAO allow content to be driven by the community, rewarding content creators in the native token, and remove advertisers from the equation.

Social Media DAOs / Social Media DAOs create a hub to come together and socialize without the constraints of targeted Ads and politically-charged news feeds.

Entertainment DAOs / This includes storytelling and gaming.

However promising these modern alternative may sound, their categorization is limited and highly focused on the digital industries. Considering that this thesis is aiming to analyze whether DAOs could become the future of governance in the operating economy, following the defined industries – or in GICS terminology: sectors – in the current operating economy would be the most sensible decision. Furthermore, many of these modern alternatives – if not all – can arguably be categorized within the traditional GICS sectors. Therefore, the use of the GICS does not disregard the importance of these industries that DAOs could potentially be suitable for.

9 SWOT-analysis

The SWOT-analysis is the process of exploring the internal and external environments of an organization and extracting convenient strategies based on its strengths, weaknesses, opportunities and threats (Ghazinoory et al, 2011).

More specifically, a SWOT-analysis concerns internal factors that are within the control of the organization, which include – but are not limited to – finance, operations and marketing. A SWOT also contains external factors, which are out the organizations control. Those can include economic and political factors, new technologies, and the competition. These external factors can be further specified by a PEST/PESTEL/STEEPLED analysis (Jurevicius, 2022).¹ A PEST analysis is an analysis of the political, economic, social and technological factors in the external environment of an organization – in this case an industry - which can affect its activities and performance (Thompson & Martin, 2010). The PESTEL analysis also includes environmental, legal and ethical aspects, and the STEELED analysis additionally includes demographic aspects (Jurevicius, 2022).

Before diving into the industry SWOTs, it is of relevance to determine practical implications of DAOs that could possibly apply to several industries. The agency theory-related implications are previously discussed, so only the practical implications will be elaborated on in this section. Even though DAOs might seem somewhat difficult to implement in the ‘classic’ GICS industries, it must be noted that DAOs can be quite versatile in their implementations, and the founders of the DAO can design it so that it can fit the goal of the company.

9.1 Possible strengths and opportunities

Participatory vs. algorithmic DAOs – streamline group decision-making | Depending on the goal of the organization, the founders choose between operationalizing a participatory or an algorithmic structure. The algorithmic structure implies that the underlying smart contracts dictate the entire functionality of the DAO. This is a truly autonomous structure, and defers entirely to software to structure and coordinate the interactions. These generally rely on Bitcoin, Ethereum and other decentralized blockchain-based protocols, and on additional non-upgradable smart contract protocols. Even though this structure can be favored due to its tamper-resistance and the possibility to design it to be autonomous, this structure also has its particular downsides. Since smart contracts are inherently difficult to modify and change once they are deployed to a blockchain, a characteristic that can be emphasized by the fact that it can be designed to be autonomous, it can cause regulatory challenges and it can make it difficult for its users to modify the smart contract if there is a bug, issue or regulatory concern. Especially the fact that it cannot be modified to comply with (new) regulations once it is deployed to the blockchain, this form might be way less future-proof than the participatory structure (Wright, 2021). If an algorithmic DAO would indeed not allow modifications to its operating agreement, this furthermore immediately rules out the possibility to file the DAO with the Wyoming Secretary to become a legally recognized DAO LLC, according to the Decentralized Autonomous Organizations supplement 2021 (WY) s. 17-31-106

(U.S.) (Bellavitis et al., 2022). The same holds for the State of Tennessee, according to chapter 48-250 of the Tennessee Code (TN) s. 48-250-104 (U.S.). Further notes with regard to legal personality will be discussed later on. Another question that might be raised regarding to this type of DAO, is who should be in charge of the creation and adaption of the smart contract. This is especially a concern when it regards the adaption of a smart contract, because the person that has access to the key of the smart contract potentially has a lot of power. This person can change the entire smart contract, and with that the entire manner of operation of the DAO, on its own. To prevent centralization to happen, this is something that should be carefully looked at.

The participatory structure, on the other hand, is managed by distributed consensus, meaning that the DAO makes use of smart contracts to aggregate the votes or preferences of the members (Wright, 2021). This structure is most commonly used to engage in traditional commercial endeavors, as it explores how to manage open-source technology involving an (upgradable) smart contract that runs on the Ethereum blockchain. This upgradability can counter the aforementioned issue that algorithmic DAOs bear, because the initial developers of the smart contract-based protocol can transfer ongoing decision-making to a disparate group of DAO members, as these members have the power to set parameters needed by the underlying smart contract and also have the ability to update the smart contract itself. This process can be achieved through ‘Governance Tokens’ that allows a token-holder to vote on (possibly smart contract-altering) proposals. This token-based system also prevents the smart contract developers from taking actions that would not benefit the smart contract-users/DAO members, resulting in a situation where the developers have way less power than in algorithmic DAOs, where the contract-version set by the developer cannot be changed. Furthermore, it also makes it possible to comply with (new) regulatory requirements or complex technical or organizational issues that may emerge over time (Wright, 2021).

Voting process | DAOs offer secure digital voting because of the use of blockchain-based systems. Furthermore, this offers the opportunity to cryptographically verify the results of member votes, and depending on whether identities are correlated with the addresses used for voting, who voted and how. This also allows the DAO members’ decisions to be open for public audit by all members of the organization, and potentially even the public. This creates clarity on whether the procedural rules for decision-making have been followed and is decreases the potential risks of miscalculated votes. This security, transparency and (in a sense) autonomous character makes DAOs more responsive than classic existing legal entities, while at the same time avoiding opportunities for contested decision-making, fraudulent behavior and simple mistakes (Wright, 2021; Bellavitis, 2022).

Another advantage would be that DAOs are digital in nature, so that the mechanics of voting are streamlined and less cost-intensive than for classic companies. As these votes are registered on the blockchain, no more paper mailings or secure e-proxy services are required, decreasing the costs. This cost decrease allows DAOs to hold voting procedures more often and in a more flexible way than classic companies – who generally vote at predetermined times of the year – resulting in more privately-ordered, firm-specific allocations of decision-making power. Therefore, DAO members perceive that they have a greater role in the management of the DAO that they are a member of, resulting in DAOs being exclusively steered by member input (Wright, 2021; Bellavitis, 2022).

Lastly, the voting process allows for the incorporation and feedback from a wider group of stakeholders in a wider variety of situations and circumstances. This phenomenon – ‘wisdom of

the crowd’ - provides DAOs with a comparative advantage. Communities are highly efficient in predicting events (Ray, 2006) in a way that is different from experts (Mollick & Nanda, 2015). As can be seen in the literature, the wisdom of the crowd has been proven effective for the development of new products (Afuah & Tucci, 2012; Poetz & Schreier, 2012) and for the funding of technology-based start ups (Mollick, 2014) and scientific research (Franzoni and Sauermann, 2014). It has also been proven effective on platforms such as Wikipedia (Bellavitis et al., 2022). If this principle works out correctly within DAOs – which is expectedly the case when members are sufficiently actively participating in the decision-making process – this decreases or even abolishes the need for central managers. This could represent a natural evolution of crowd-based decision-making (Bellavitis et al., 2022), which questions a foundational principle of corporate governance, being the allocation of managerial authority to the board of directors and its primacy. However, it should be borne in mind that this voting contains a human element. This concern will be elaborated on in the section on weaknesses and threats.

Much variety in governance structures possible | An promising possibility that flows from this structure, is that the governance structure is open to much variety. There are DAOs that offer a structure in which two groups vote separately, with a certain group having slightly more power than others, and work with a system of advisors that could overrule the majority rule (Polemos, 2022). Another variation would be a DAO that contains sub-DAOs that are angled at certain ‘subsections’, so that the decision-making process could become more efficient and more specialistic regarding those subsections (IDLE Finance, 2022). Especially the structure that Idle uses can solve the scaling issues that theorists are concerned about, as it allows for a certain extent of delegation, without losing the characteristic that the community keeps its power. Unlike in traditional organizations, league members are elected by the community, and their election only holds for 3 months. Therefore, it prevents non-productive members from a certain security, making it more likely that they will work productively in order to be rechosen. It should be borne in mind that this structure is still a tradeoff: being elected for just 3 months might decrease efficiency if there is a voting delay or if a decision cannot be executed within this 3-month period. It is also known that some DAOs attach a higher worth to votes of members that have been supporting a proposal for a longer time, to make the decision-making process more efficient (Wright, 2021; Bellavitis et al., 2022). Another option would be a reputation system, where people’s votes can become worth more, according to their contributions to the DAO (Sims, 2019). A last striking option would be market prediction, where whilst voting, members can stake tokens on the outcome. The amount that is staked is pooled, as is the amount staked against. If the proposal passed, all those who predicted in favor will receive a pro rata share of the amount that has been staked against it passing and vice versa (Sims, 2019).

Digital Assets | Because DAOs use digital assets, their participants can join as members within a few clicks on their phone or blockchain-based wallet by transferring digital assets. This makes it a fairly quick and easy process to join a DAO, as blockchain technology offers the possibility to transfer the assets in a matter of seconds – if not quicker in the near future – while not having to deal with layers of financial institutions. This allows DAOs to enable disparate groups of people to pool capital quite easily (Wright, 2021). A nuance that should be made, is that participation inherently raises participation costs, consisting of the effort that individuals need to put into understanding and entering the market (Allen & Santomero, 1997). Cumming et al. (2022) state that the highly technological nature of DAOs and the high variety of possible governance designs results in high costs with regard to familiarization. Furthermore, this highly complex nature could

potentially lead to the need for reintroduction of some degree of intermediation or hierarchy in order to prevent non-informed decisions from disrupting the organization and its success (Cumming et al., 2022).

Internal control over assets | The smart contracts that DAOs run on offer new ways to improve internal control over collected or earned assets. While some traditional organizations struggle with finding appropriate safeguards to protect against the misappropriation or the misuse of funds, DAOs have been able to fix this issue in a relatively efficient way. The general solution, being the mitigation of the risk by segregating duties between different parties within the organization to ensure that it is not possible for one person to unilaterally transfer or expand asset is not necessary for DAOs. The reliance on blockchain-based smart contracts inherently decreases the likelihood of self-dealing and opportunistic behavior, and the rules in such contracts are rigid, so that it is possible to structure an organization in a more deterministic manner with code detailing the rules for how members agree to cooperate. For instance, a common way for a DAO to solve the issue is to divide organizational duties between members and to deploy a smart contract with code that bars any DAO-related transaction from occurring without the express approval of multiple members. This adds a layer of accountability, while also not being related to the organization, so that it cannot be modified, avoided or comprised by an insider. Furthermore, participatory DAOs generally require a voting procedure for funds to be deployed (Wright, 2021; Bellavitis et al., 2022).

The ease of leaving a DAO / Rage quitting | Rage quitting means that if a DAO no longer serves a member's purpose, they can receive back all or a portion of any contributed assets. Many DAOs offer members the control over any assets they themselves deposited into the DAO by offering smart contract-enforced mechanisms to withdraw their capital in a matter of seconds. This offers a strong downside risk protection, as well as a certain control over any funds deposited into a DAO. This also provides members with a certain level of trust, because they know that someone is in the DAO because they want to, not because they cannot get out (Wright, 2021; Earth, 2022).

Tokenization | When companies raise money from the public, they generally issue securities such as common stock, preferred stock, bonds or convertible bonds, all forms of debts, equity or a combination. Blockchain-based tokens, however, offer novel ways of selling tokens to the public that combine rights such as economic rights, governance rights and utility rights (Wright, 2021; Bellavitis et al., 2022). Tokenization also offers the possibility of airdrops, meaning that tokens are given away for free. This can be done for either decentralization reasons – so that as many different people as possible own a part of the DAO – or for network reasons – a person owning a token is more likely to participate, and the more participants, the stronger the DAO (Sims, 2019). Another advantage would be the possibility to distribute profit by offering token holders new tokens, which they can liquidate if they wish (Sims, 2019).

Access by cryptocurrencies | A novel advantage follows from the ability to access a DAO without FIAT money. As seen in the Russian/Ukrainian war, governments have the ability to deny countries or banks access to SWIFT, so that they are not able to transfer money the usual way (Hotten, 2022). Cryptocurrencies, however, are not transferred through the SWIFT system, indicating that if anyone owns cryptocurrency, the opportunity arises to enter or create a DAO without any major issues. Despite the fact that any of these bans on SWIFT might (likely) be justified, there always remains a small group of people that are unjustified victims of such bans. These people could be provided with DAOs as an alternative to building a traditional company.

Transparency | The use of DAOs (and tokenization in general) offers individuals a refreshing amount of transparency within an organization. It enables them to embed their rights and duties and define the token attributes to reflect their ownership record. Members are furthermore familiar with the involved terms and conditions and the source of their purchase, decreasing the amount of uncertainty involved in either participating in or transacting with a DAO (Bellavitis et al., 2022; Wright, 2021).

Participation/worker collectives | The participatory structure of DAOs can have a significant influence on the participation of members – or effectively, employees. Since the ‘employees’ are members of the DAO, they are ensured of receiving a fair share in the profit that a DAO makes due to the fair distribution of profits among members. Furthermore, the possibility to participate within the decision-making process and the – justified – perception that they have an active influence on the projects that the collective takes on will increase the commitment of ‘employees’ to the organization. Another advantage of this structure, is that it provides the members with an option to switch between tasks. Even though several traditional companies allow their employees to switch between departments, or offer then a combination of functions, this is likely not as effective as in a DAO worker collective. In such a collective, members are not restricted by their job titles, so that they are able to switch between ‘positions’ and specialize in several fields as much as they would like. This also provides employees the possibility to work whenever they want, without being tied to the contractual hours, so that they work more effectively (Glaveski, 2022).

Legal personality | Even though the uncertainty regarding the legal qualification of DAOs could be perceived as a threat, it could provide with opportunities in the jurisdictions that allow DAOs to register and be legally recognized (Bellavitis et al, 2022). A few jurisdictions introduced legislation that offer DAOs legal personality, among which are Vermont, Wyoming, Delaware, Tennessee and Malta, and there might be more jurisdictions to follow (Mienert, 2021). If a DAO is granted legal personality based on such legislation, several opportunities arise. First and foremost, it limits the risks that DAOs carry by limiting the liability of members. Otherwise, members are jointly and severally liable for the debts of the DAO, because unregulated DAOs qualify as general partnerships - a theory that has recently been confirmed by the Californian Court (Zaslawski, 2022). Being provided with limited liability indicates that the members will only put at risk the amount that they invested in the DAO, rather than all their personal assets. This protection will limit the risk of members becoming untraceable as soon as they might need to pay debt, a realistic concern due to many DAO members operating anonymously (Wright, 2021). Another advantage that follows from legal personality, is the opportunity to interact and transact with traditional organizations and individuals. When a DAO has been granted legal personality, it is granted the possibility to take part in business transactions, to hire employees and to clarify accountability. It furthermore provides DAOs with more legitimacy, so that DAOs will not be perceived as a high-risk counterparty within transactions (Bellavitis et al, 2022). Furthermore, but this is a future-oriented note, if DAOs will be able to be granted legal personality in different countries based on similar models, working with different clients and members all over the world would be much simpler. A last noteworthy point is that wealthy DAOs already have possibilities to build their own limited liability on chain by the use of smart contracts, so they already limit this risk. However, building on Web3 and paying the developers that can build such on-chain protection is very expensive. Therefore, this option is only available for the rather wealthy DAOs (Mienert, 2021).

Disintermediation | The decentralized nature of DAOs can not only be found within the organization itself: DAOs could – theoretically – be capable for disintermediating and decentralizing markets, industries and economies. This is a highly promising opportunity, because this could form the next evolutionary step towards the disruption of the economy by the introduction of a decentralized platform-based economy. This evolution would be in contrast with the current trend towards a centralized platform-based economy with high-power platforms such as Facebook and Amazon (Bellavitis et al., 2022). This evolution would decrease the concentration and the economic power within sectors that are currently led by a handful of powerful companies. This would particularly be an advantage, because it would prevent the power-related behavior of becoming less supportive towards complementors and suppliers to from occurring (Rietveld et al., 2020). Furthermore, if the involvement of centralized platforms would – theoretically speaking – be reduced, DAOs could reduce transaction costs within the sectors and create network effects without the necessity to incur monopoly costs. This effect follows from the fact that DAOs do not provide the possibly for any single entity to accumulate monopolistic power. Therefore, all the DAO members could benefit from the network effects, because of which their transaction possibilities, cooperation and community building enlarges (Calatini & Gans, 2019; Bellavitis et al., 2022).

Innovation | DAOs could be well-fitting for innovation-related industries. Theorists traditionally agree upon the fact that firms could benefit from leveraging cooperation with external firms to innovate (Chesbrough, 2004). DAOs generally contain of a relatively diversified community, the members of which can all contribute towards innovative goals and projects, sharing knowledge, resources and ideas. This improves community building, a phenomenon that can be highly beneficial for the creation of sustainable ecosystems. Even though the idea behind community building has been circulating for a while, DAOs revolutionize the idea by facilitating interaction, alignment of interests, trust and transparency in a novel way (Fisch and Momtaz, 2020). Since DAOs do not have a controlling party, they allow for open access and permissionless innovation. This will stimulate developers to experiment with new products and ideas without fearing repercussions from a central governing entity. This will eventually lead to unique and innovative contributions to the organization and the products and services that the organization is involved with (Bellavitis et al., 2022).

9.2 Possible weaknesses and threats

Governance | Despite the possibility of sending centralized managers away, it is still necessary to deal with the challenges related to governance, such as the social and the political dimensions. It should be noted that humans do not have an infinite capacity for information storage and exhibit well-understood bounds to rationality. This prevents them from fully engaging in the governance of the DAO. This would most likely to occur in participatory DAOs, since those are reliant on group consensus, whilst it can be difficult for members to remain involved and active all the time. Empirics have shown that this is a realistic concern, which can cause pseudo-centralization of the active member community and freeriding behavior (Bellavitis et al., 2022). Therefore, if it takes too much effort to form consensus, this might (counter-effectively) increase the costs of decision-making, especially when it regards time-critical decisions (Sims, 2019; Bellavitis et al., 2022; Momtaz, 2022). If decisions are not made in time, this can harm the organization in terms of their operations, but also in terms of security: if a bug shows up, but no consensus can be found on the

removal of the bug, this could provide opportunity to misuse the vulnerability of the code (Bellavitis et al., 2022). For algorithmic DAOs, the governance decision refers to whether to participate in the DAO by agreeing with the rules. Furthermore, challenges arise when a bug, mistake or other vulnerability occurs, because they can only decide to stop participating in the DAO, or they can modify the software by setting up a ‘fork’ of the DAO with modified rules (Sims, 2019). For the latter option, it is necessary that the members move their attention and assets to the new implementation of the DAO.

Legal Wrapper | DAOs still lack formal legal recognition in most jurisdictions, and therefore qualify as a ‘general partnership’ (Mienert, 2021; Zaslawski, 2022). This implies that DAO members would be jointly and severally liable for the DAOs liabilities with their personal belongings, exposing them to the organization’s liabilities and responsibilities. To reduce these liability-related risks, a legal expertise would be required to design waterproof agreements with members, but that runs against the purpose of DAOs of privately ordering their affairs. Furthermore, the lack of legal personality prevents DAOs from entering in business transactions for two reasons: (1) the counterparty could perceive the DAO as a high-risk counterparty, increasing the contracting terms and the searching costs, the latter following from the fact that risk-averse counterparties might not be willing to enter in a contractual relationship with a DAO; and (2) DAOs are – in the basis – not able to transact in FIAT-currencies, since they cannot open a traditional bank account without legal personality. Nevertheless, a few jurisdictions initiated legislation that can grant DAOs legal personality, indicating that a solution is emerging for an increasing number of jurisdictions. It is also feasible to work around the lack of legal personality by building on-chain limited liability, or by making use of offshore structures to circumvent such risks (Mienert, 2021; Bellavitis et al., 2022), but those possibilities are relatively expensive and go beyond the scope of this thesis.

Anonymity | A concern that is highly related to the concern of a lack of a legal wrapper, is the issue of anonymity: members are technically allowed to remain an anonymous member within the DAO. This could result in traceability issues when members find out that the DAO is in debt. In such cases, members are jointly and severally liable, but if they remain anonymous it could be difficult to trace them. This could create an environment in which members remain anonymous for the purpose of evading liabilities. Furthermore, traditional industries likely value to know who is part of the organization. If this is not necessarily a possibility, this could harm the credibility of DAOs (Wright, 2021).

Tokenization | Even though tokenization has its clear upsides, it also occurs with legal uncertainties. The question is raised whether they would qualify as a security, or as something different, especially if the tokens do not offer a part of the profit, but only governance rights by use. This unclarity can also raise information costs when investors want to determine what a token actually means and when it tries to determine whether it is priced correctly. Another issue would be that governance conditions are provided in a ‘take-it-or-leave-it’ form, rather than then being negotiable, a phenomenon that puts the investors in a vulnerable position (Abrol, 2022). This concern could potentially be nuanced for the United States, because the SEC declared that DAO tokens can be treated as securities in the United States (SEC, 2017).

Absence of a code of conduct | DAOs generally work with digital assets. However, a risk that is related to that use is the fact that there is no common standard for the creation and regulation of

such digital assets. The absence of such a code of conduct can eventually end up in undesired practices by malicious users.

Security | DAOs generally make use of blockchain technology. A worthy mention is that blockchain is also prone to online attacks and cybercrime, despite the reduction of that risk in the past years.

Fluctuation of cryptocurrencies | Since most DAOs make use of tokens and cryptocurrencies, it should be borne in mind that these tokens and means of payment are relatively unstable in comparison to traditional companies that operate with FIAT-money (Bellavitis et al., 2022). As long as a DAO has not been granted legal personality, and as long as it has not found a manner to obtain a bank account to obtain FIAT-currency, there might be doubts with regard to the certainty of the profits or payouts by its members. Even though many of the current DAO members originate from the crypto-community and would not mind this feature too much, it could make an entrance of DAOs in the real world more difficult due to this uncertainty. Consumers might also be hesitant about converting their FIAT-currency to cryptocurrencies in order to pay for a DAO's products and services, making it even more difficult for DAOs to make a stable entrance. There have, however, been initiatives for stablecoins, the value of which is backed by traditional currencies such as the US Dollar (*What Are Stablecoins and How Do They Work?*, 2022), indicating that there are relatively low-risk alternatives to cryptocurrencies such as Ethereum or Bitcoin.

9.4 Energy Sector

The Energy Sector concerns companies that are engaged in exploration & production, refining & marketing and storage & transportation of oil & gas, and coal & consumable fuels. It also includes companies that offer oil & gas equipment and services (Appendix 1).

9.4.1 Strengths

No FIAT-money requirement | DAOs provide the opportunity to enter the organization without FIAT-money. When looking at the current events in the world, it has become clear that political entities are able to deny persons – or as it currently shows, entire countries – access to the SWIFT system (Holten, 2022). Even though such denial can be justified, and since it has far-reaching consequences for the people that the measure is aimed at, a close eye should be kept on this type of measure. There might come a time in which such a measure is carried out unjustified, or innocent people are becoming a victim of it. Since the most ‘questionable’ governments are leading countries that are very involved in the energy industry, this characteristic might be a great strength of DAOs. For instance, the ban is currently focused on Russia, which is a major producer of Energy (SCFF, 2022). If innocent citizens of Russia would still like to trade in energy, they might be able to do so through cryptocurrencies and a DAO structure.

Voting Process | The Energy sector is getting more and more critiqued for being conservative, too tied to governments, too centralized and climate-unfriendly (SCFF, 2022). The infrastructure of DAOs can work around these issues, because it allows for a more transparent, secure and less costly decision-making mechanism. As already discussed, this could therefore reduce agency costs. This is particularly a strength, because it allows the outside world to understand the energy companies way better, so that there is more tolerance towards the industry. The industry has a major economic and social impact, so there is much pressure for it to be performing in line with community values (SCFF, 2022; Spendedge, 2020). In such a case, allowing a community of people to be involved within the decision-making process might allow for more acceptance of the society with regard to the choices made (Wright, 2021).

This strength can be backed by the transparency that DAOs provide (Wright, 2021; Bellavitis et al., 2022). As mentioned, the energy industry is known for being conservative, and for that it has been difficult for the outside world to trust its decisions. The DAO structure, however, offers the outside world an insight in its organization: any proposal and voting procedure can be read by at least the members, and favorably by the full public outside the organization as well. Furthermore, any type of fraudulent behavior would show up within these public records, so that there is less of a chance to (secretly) conduct such behavior. This provides more trust within the industry, especially when it regards the concerns on climate change and prices. This way, the public can actually see whether a company is trying their best to be climate-friendly, or whether it just claims to do so, while denying most of the proposals on the matter. This decreases the agency costs with regard to external information asymmetry.

Furthermore, a DAO structure allows everyone to hand in and vote for proposals, so that there might be a better chance for innovative proposals to come up and pass the process (Chen & Bellavitis, 2020; Bellavitis et al., 2022). As anyone can become a member of a DAO by buying

themselves in with a (governance) token, there is more chance that innovative ideas come up compared to the conservative organizations, because it allows for a more diversified member-community. Individuals who initially would not try to become a part of an energy company for whichever reason, now have the opportunity to join the industry and submit original proposals, without having to commit for a long time by becoming an employee. This helps the industry, because the more innovative ideas become reality, the more climate-friendly the company and the industry will become, so that the industry will be more tolerated again. Since the industry is already getting used to the more common adoption of better and more energy-efficient technology to use for the sector, the industry could potentially be rather welcoming with regard to such proposals, especially if they are less costly than the traditional ideas on the matter (SCFF, 2022).

Use of digital assets | Yet another strength that DAOs can offer to the industry, is that of the ease that comes with the use of digital assets (Wright, 2021). The energy industry has been quite conservative, so that it might have appeared as rather inaccessible up till now. However, DAOs are known for their accessibility. Due to the use of digital assets, it anyone can buy a token and obtain governance rights within a matter of seconds, or can learn more and become part of the community without buying a token by accessing the organization through their often-used structure of the Discord channels. This also makes it quite easy to raise capital for the organization. This is something that is particularly interesting for this industry, because there appears to be a rising rate of investment in renewable energy (SCFF, 2022). Therefore, there is a higher chance for investors being willing to try out this structure to raise much capital and make their investment more successful, and therefore more profitable. Furthermore, this idea provides more trust between the members, because the use of digital assets also implies the possibility of rage-quitting, where you leave the community as easy as you entered it. This makes the community trust in the fact that the members are part of it out of willingness, rather than out of obligation (Wright, 2022; Earth, 2022).

International nature | The fact that DAOs generally operate internationally could be a strength for the sector, since they are not tied to a specific country or currency. Even if a DAO would decide to obtain legal personality, there are provisions that state that the DAO is not tied to the jurisdiction that it is registered in with regard to its operations (Decentralized Autonomous Organizations supplement 2021 (WY) s. 17-31 (U.S.)). This could rise a strength, because the energy sector has a relatively high foreign revenue exposure for the larger companies within the sector (<https://www.spglobal.com/spdji/en/documents/education/education-sector-primer-series-energy.pdf>), meaning that the sector earns its revenue outside of the United States more often than the other sectors (source: S&P Global). This could indicate that the industry is relatively internationally oriented, something that would fit well with the international dimension of DAOs.

Decentralized payout | A last strength that can follow from the DAO structure, is that of its decentralized nature. DAOs are known for their nature of not having a centralized board. This can be a boost for the industry, in terms of that this structure inherently prevents discussions around executive compensation. Normally, the board and the managers of an energy company would be granted bonuses for their involvement in the company, but with a decentralized structure, such as a DAO, this is much less of a concern. Profits get 'fairly' distributed among its members based on token values, so that there is much more equality. This is especially a strength, because the energy industry has been outperforming the overall market for a couple of years already, a trend that started with the COVID-pandemic, and because crude oil is trading at 14-year highs (SCFF, 2022). Another circumstance that helped the oil prices increase was the reopening of the global economy

and the restrictions on oil imports from Russia, because of which the demand for oil has increased, whereas the inventories decreased. A last relevant set of circumstances for the growth of profit might be the seasonal increase in the days with sunlight and the lifted bans on offshore-drilling, because of which the production of (renewable) energy has become more effective, leading to more energy to be sold and, therefore, more profit to be made (Spendedge, 2020). Such circumstances, in which the profit can increase, can be boosted by the DAO structure because of the profits only being distributed fairly.

9.4.2 Opportunities

Governance process | The community has a lot of freedom with regard to the structure of the DAO. For this particular industry, a participatory DAO would be a good opportunity for the industry becoming more accessible and inclusive. As already mentioned within the strengths section, such accessibility would make it possible to bring new and innovative ideas to the industry, to make it a more tolerable industry again (Chen & Bellavitis, 2020; Bellavitis et al., 2022). This would also allow for more participation from its members/employees, so that they are more committed to their work, which raises the quality of the products and services. This could be particularly helpful for this industry, because it suffers from employee attrition (Spendedge, 2020). Providing them with the opportunity to become more involved, more influential and more invested in the success might help with ending this trend of attrition (Spendedge, 2020). If employees feel like their contributions are valued, they might suspect less misalignment of interests, so that the costs for aligning them would be reduced.

Another opportunity can be found in the possibilities to solve issues such as scalability, lack of expertise and the lack of legal personality by designing a specific governance structure. A DAO can merge its DAO structure for governance with a traditional company that would cover transactions with the FIAT-based world. Furthermore, scalability and expertise issues could be solved by applying a system in which there are so-called sub-DAOs that take care of certain aspects of the organization, such as HR, communications, etc. There is also an option to only grant legal personality to one specific sub-DAO and leave the others entityless (IDLE Finance, 2022; Bellavitis et al., 2022).

Decentralization, power and competition | DAOs could decrease the chance of a couple of people being in power of the direction and the prices in the industry, something that can be desirable with respect to fair competition (Bellavitis et al., 2022). The sector is the second most concentrated among all GICS sectors (Appendix 3). As soon as there is no centralized power, there could be potential for fairer commercial terms (Bellavitis et al.), something that the economy could benefit from. This is the more the case, because energy is something that drives our society: we cannot live without it. This is particularly the case when an operating agreement/smart contract contains provisions on the prevention of centralization: a possible manner to avoid just a small group of people to gain power within (and outside) the organization, would be to implement a quorum with regard to how many different members should vote for a voting round to be valid. Furthermore, there could potentially be limitations set on the ownership percentage that one could obtain, for instance maximizing it on 49%.

Legal personality | Another opportunity could arise if legal personality would be granted to a DAO within this industry. This could limit the liability of the members, so that there is less risk involved in their membership and participation in the DAO: they would only be held liable in exceptional cases (which goes beyond the scope of this thesis), so that they would act more freely. Furthermore, it would make interacting with the real, FIAT-based world easier. As previously explained, real-world entities expect their counterparties to be a legal entity, and if that is not the case, they likely perceive them as a risk. As soon as a DAO is granted legal personality, it would be able to interact with these traditional organizations without being perceived a risk. It also enables DAOs to open a general bank account to use FIAT money, so that general customers might trust the company more easily, than if payments would have had been required in cryptocurrencies. A last positive that would rise from the legal personality, is that the organization would be able to hire people without any risk involved, so that it could go beyond just trading products, and actually produce the energy as well (Wright, 2021; Bellavitis et al., 2022; Mienert, 2021).

In case that legal personality would be granted to a DAO, the more ‘general’ regulatory opportunities rise as well. If a DAO is recognized as a legal entity, they might be eligible advantages such as subsidies that can encourage greater adoption of renewables (SCFF, 2022; Spendedge, 2020). Such subsidies might help DAOs with many innovative proposals to grow and allows them to have a bigger impact on the industry. With that said, it could also rise the incentives to produce energy-efficient automobiles, due to the increased tax incentives that companies are eligible for. However, it should be borne in mind that if there is no legal personality granted, this opportunity becomes a threat, because in such cases DAO would be the less preferred structure over a ‘traditional’ company that would be eligible for those advantages (SCFF, 2022; Spendedge, 2020).

Familiarity with data collection and exchange within the sector | The industry is already becoming more familiar with data collection and exchange (Spendedge, 2020). This openness to technology might make it easier for DAOs to blend into the industry, because it is becoming more familiar with technology, so that the use of blockchain technology might be a smaller step than it might have been a couple of years ago.

9.4.3 Weaknesses

Voting and governance | Even though DAOs tend to bring great opportunities in terms of participation, practice does not always align with that idea. Taking into account that the energy sector is highly technical and complex, especially when innovative ideas might be raised, there is a risk that members might not be able to process all the information. The more proposals are brought in, the more time it will take to process them, and the more likely it will be that members need to make decisions with regard to which proposal they will invest time to understand the full message. The more that happens, the less effective the governance structure would become, decreasing the strength of the agency-theory argument that decision-making would become more efficient and less costly (Wright, 2021; Bellavitis et al., 2022).

Forking | Despite the fact that forking is not very much of a concern just yet, apart from ‘The DAO’ (Sims, 2019), it is a weakness that might occur with regard to this industry. The energy sector is

highly influenced by matters regarding climate change, while there is still little consensus within the world on how to properly deal with the matter. If this polarization also starts to exist within the community of an energy-related DAO, there might be a risk that one of the groups will fork the DAO and form a community with its own rules and proposals that are more or less climate-change-friendly. If such a fork would occur on a relatively regular basis in comparison to other industries, this might damage the image of the industry by it appearing to be a polarized industry, making the industry less suitable for a DAO structure in which such a polarization shows easier to the outside public.

Lack of a code of conduct / Security | The lack of a code of conduct within DAOs is also a concern. Industries tend to work based on a code of conduct that works well for the industry. However, with DAOs there is no such restriction on the creation and regulation of the digital assets involved. This incorporates the risk of malicious users misusing this fact. The same holds for security: even though blockchain technology is considered rather secure, it is not entirely free of risks regarding online attacks and cybercrime. Since it is energy that is involved in this industry, something that is a basic necessity for almost the entire population, such risks are not desired.

Anonymity | Since the industry is considered rather conservative, it is used to having a certain amount of transparency regarding the people that are part of the industry. In DAOs, however, many stakeholders could operate anonymously. This can also be a risk as soon as liabilities show up, as it makes it rather difficult to reach all the members to be held liable for any debt. Such risks can reduce the trust in the community, so that there would occur more trust-related agency costs. This would, again, reduce the strength of the agency theory arguments that have been made so far.

9.4.4 Threats

Lack of a legal wrapper | While legal personality is an opportunity in so far that it would be granted, it remains a risk until that point. The lack of legal personality raises liability questions, because any member of the DAO could then be jointly and severally liable for any kind of debt that the DAO has. Since there is no way to work around this, other than creating a legal wrapper of some sort, this brings major risks to the investors that are part of the DAO, as they can be held liable with respect to their private belongings if the DAO itself does not have enough resources to pay off its debts. Within the energy sector, there are currently more and more lawsuits with respect to climate-unfriendly business. Such cases can result in major amounts of damages for companies (France 24, 2022). If such a case would be successful against a DAO, the members are severally liable with regard to the full amount. Even though it should technically be possible to request a proportionate amount back from every member, many members operate anonymously and might be difficult to trace for such a request. Therefore, this is a risk that should (and will) be considered carefully by investors prior to joining a DAO, making the use of DAOs relatively unattractive (Bellavitis et al., 2022; Mienert, 2021; Wright, 2021). Furthermore, S&P 500 analysis (Appendix 2) shows that the energy sector is the biggest risk-carrier amongst all the GICS-sectors. The more risk involved in a sector, the more likely that negative returns show up – the unadjusted and the risk-adjusted returns for the industry are all negative – leading to a scenario where raising debts are a realistic possibility.

Another concern regarding the lack of legal personality might be that it will be difficult to interact with the real world. This lack of a legal framework makes DAOs a relatively risky counterparty when it comes to agreements. As previously mentioned, traditional persons and companies expect their counterparties to have a certain legal precedent. If that is not the case, they are perceived risky (Bellavitis et al., 2022). In case of DAOs, many of them do not have this type of precedent, so that two major concerns arise. The first concern is the difficulties that DAOs might face with regard to finding feasible counterparties to interact with. Since the energy industry is highly reliant on products and trade, especially between parts of the chain, it is necessary to have a counterparty to sell your products and services to. Second, if it has been possible to find a counterparty, the other issue is the lack of trust that the counterparty might have. This can result in disproportionate terms with regards to enforcing the agreement, which might actually be a fair fear when the point with regard to the anonymity of many members is taken into account. Such heavier contractual terms might also raise the enforcement costs, because the counterparty might want to be more certain about the DAOs' involvement in the agreement. For this reason, DAOs might not be a desired model in case legal personality is not yet obtained.

Qualification of tokens | Even though the SEC has implied that DAO tokens can be considered securities (SEC, 2017), and even if that judgement would be binding, there are still many jurisdictions in which this point is not yet clear. Since many DAOs operate internationally, with members being spread all over the world, it would be difficult for members to be certain about their membership without having certainty about how their token would be classified. This might be a reason for investors to be more cautious about entering a DAO (Bellavitis et al., 2022).

Use of cryptocurrencies | Cryptocurrencies are fluctuating quite much and it is difficult to achieve a so-called 'stablecoin', which should have a stable inflation (BRON). This might raise uncertainty with regard to the stability of the profits that flow from the ownership tokens. Furthermore, it creates a certain barrier of trust from the perspective of individuals that are not experienced with regard to cryptocurrencies. When instantly needing to understand how these currencies work, and suddenly facing the risks of such fluctuations, this might hold many individuals back from actually considering a membership in a DAO. It must be borne in mind that such concerns can be limited when a DAO obtains legal personality: in such a case a DAO can gain access to a FIAT-bank account to ensure its crypto-averse members payments in FIAT-currencies.

Regulatory risks /The regulatory risks from a threat within the energy sector. There is a chance that harsh regulations will be put in force with regard to renewable energy, which energy companies should comply to (Spendedge, 2020; SCFF, 2022). This is not just an issue for DAOs to become attractive, due to the fact that the general community behind DAOs wishes to stay away as far as possible from governmental regulations. This is also an issue, because it led to the industry becoming one of the worst longer-term performers, as it loosened the historical relationship with the price of oil (which is increasing). This made the traditional companies to not bring up the capital expenditures with regard to renewable energy, whereas they should have done so with the increasing oil prices (SCFF, 2022). If this performance keeps being disadvantageous, DAOs might not be willing to invest in the industry, as it would not be an interesting and promising investment for them. Another reason for this profit to be a risk, is that the increasing oil prices might actually get to weigh on the economy, which is something that is already showing (SCFF, 2022), and the demand for oil (SCFF, 2022).

Regulatory, sector-specific and societal (price) uncertainty | The general uncertainty within the industry can also be considered a major threat. The events regarding the Russia/Ukraine war and the political reactions on that war have disadvantaged the outlook on equity sectors, as well as the major rise in commodity prices and the weakening of the Chinese economic growth. Such events have made the economic and market landscape highly uncertain and increased the volatility of the prices within the sector, so that it becomes more of a risk for investors to engage in this industry (SCFF, 2022). In such a case, it could be difficult for a DAO to obtain members and pool capital, so that the benefits of the structure would fade in comparison to the advantages.

Cyclical sector | One other performance-related threat, regards the chance of the tightening of financial conditions in the sector and of the economy in general, which also includes interest rate hikes by the federal reserves. In case this would go so far that a recession would be reached, there would be less demand of oil – leading to less profits – which makes the industry less attractive to invest in. Furthermore, the industry is very cyclical, so that it would generally perform worse in weak economic times (SCFF, 2022). Since DAOs are often investor based, the investor-based DAOs would likely stay away from the industry. It wouldn't, however, be as much of a threat when it concerns worker collective DAOs.

Accessibility (OPEC) | A last relevant threat within the industry, is the accessibility of the industry, as the sector is the second most concentrated among all GICS sectors (BRON). Even though DAOs could potentially improve that accessibility, it should nevertheless be borne in mind that collectives such as the OPEC have a major influence within the industry and might restrict the influence that DAOs could potentially have within the industry. This is strengthened by the fact that much infrastructure within the industry is already established and solid (Spendedge, 2020; SCFF, 2022), strengthening the effect of the influence of the major collectives such as the OPEC and the US. Since these collectives are not necessarily interested in a quick shift to renewable energy, this might make the industry appear to be less innovative, and therefore less interesting for DAO investors (BRON).

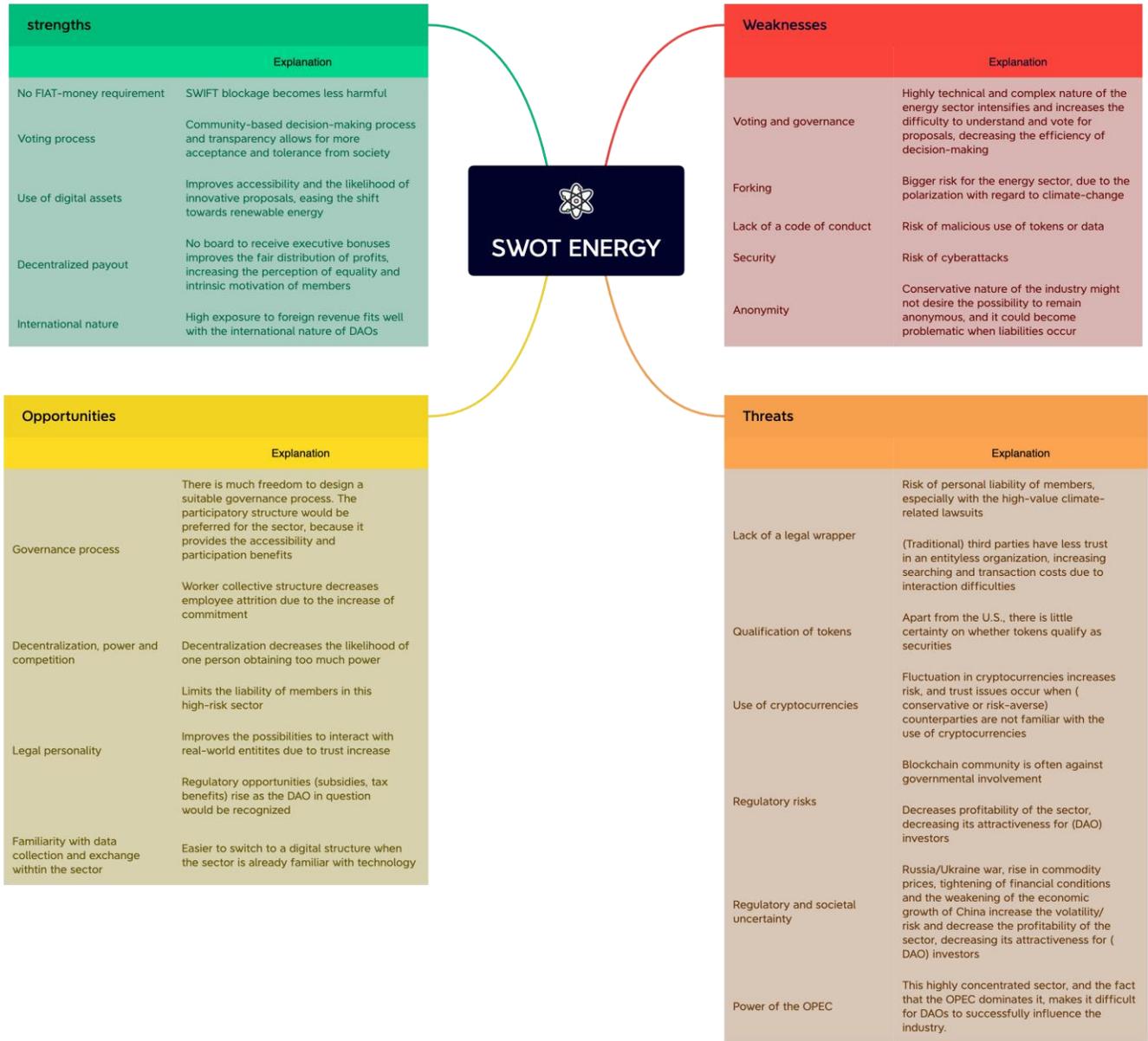


Figure 3: SWOT Energy Sector

9.5 Materials Sector

The Materials Sector includes companies that manufacture chemicals, construction materials, glass, paper, forest products and related packaging products, and metals, minerals and mining companies, including producers of steel. (Appendix 1).

9.5.1 Strengths

International nature | The fact that DAOs generally operate internationally could be a strength for the sector, since they are not tied to a specific country or currency. Even if a DAO would decide to obtain legal personality, there are provisions that state that the DAO is not tied to the jurisdiction that it is registered in with regard to its operations (Decentralized Autonomous Organizations supplement 2021 (WY) s. 17-31 (U.S.)). This rises a strength, because the materials sector has a relatively high foreign revenue exposure, meaning that the sector earns its revenue outside of the United States more often than the other sectors (source: S&P Global). This could indicate that the industry is relatively internationally oriented, something that would fit well with the international dimension of DAOs.

No FIAT-money requirement | The materials sector is, as mentioned, a worldwide-spread sector. As the current events within the Russia-Ukraine war show, political entities can deny persons or entire countries access to the SWIFT system. If it would occur that such a measure would not be justified and it would victimize innocent people, it would still be a possibility to start or join a DAO and base the entrance on cryptocurrencies, instead of on FIAT-currency, if such a person would still want to conduct business.

Voting process | The voting procedure of DAOs allows for more involvement, security and transparency. This would, on its turn, lead to a more efficient decision-making mechanism, reducing agency costs. Since the materials sector is criticized due to climate change (BRON), however slightly less active than the energy sector, this transparency with regard to the mass public could increase the justification of the use of certain climate-unfriendly techniques. Furthermore, the allowance of community-based decision making could increase acceptance of such techniques, because such decisions have been made on a community level and are free for audit, rather than it being 'secretly' decided by an executive board consisting of elite managers. This also reduces agency costs with regard to monitoring, information asymmetry and trust: as explained earlier, there is less concern for fraudulent or opportunistic behavior from the executive board with such transparency (Wright, 2021; Bellavitis et al., 2022).

With regard to the more climate-friendly governance, however, DAOs could be a good fit as well. The first reason would be that the voting process within DAOs allows all its members to hand in proposals. In a traditional company, such options generally don't exist, as you need to be hired for such a position or you need to have quite some experience within the company. Those requirements, however, could lead to a certain tunnel vision on the current techniques and products that the company uses. When everyone would be allowed to hand in proposals of an innovative kind, there might be a bigger chance that a high-quality proposal would be handed in and would pass the procedure, so that it can be implemented. This could also lead to a more diversified set of

proposals. A second reason would be that anyone can buy a (governance) token, providing them with the ability to hand in proposals and vote for proposals. This strengthens the argument of the more diversified set of proposals, because a more diversified set of members can hand in proposals (Chen & Bellavitis, 2020; Bellavitis et al., 2022). A member can commit to a DAO just for the purpose of handing in a proposal, while in a traditional company such a practice would not be imaginable: you should either be an employee or a shareholder to be able to hand in proposals.

Use of digital assets | The ease that comes with the use of digital assets strengthens the previous argument. As explained, it allows members to become a tokenholder within a matter of seconds, which on its turn allows to DAO to pool capital rather quickly. It also increases trust between members – decreasing agency costs that are trust-related – because a member is never obliged to stay within a DAO: due to the phenomenon of rage-quitting it is as easy to leave a DAO as to enter it. This indicates that the members of a DAO are actually committed, rather than being there out of obligation (Wright, 2021; Bellavitis et al., 2022).

Decentralized payout | DAOs do not encounter the same issues with regard to (executive) compensation as traditional organizations: DAOs don't have a management board, and therefore don't have to consider executive bonuses. Furthermore, such bonuses could not be paid out without consent of the community, making any profit-payout more transparent and justified. Since the industry is currently doing well, this will be elaborated on in the opportunities section, it would be advantageous to also decrease agency costs following from non-consensus to keep the profit margin as high as possible, by consensus-based payments leading to less discussion on the matter.

9.5.2 Opportunities

No FIAT-money requirement | The first opportunity of the DAO structure with regard to the materials sector, is that of the use of cryptocurrencies, rather than it being fully reliant on FIAT-money. The materials sector is known for being highly sensitive to fluctuations in the US dollar, interest rates and inflationary pressures (SCFF, 2022b). However, if the industry could in part be driven by cryptocurrencies that are less often connected to the US dollar – exceptions exist with regard to so-called stablecoins – there might be an opportunity for the industry to become slightly less tied to it. If that happens, the industry could - possibly - become therefore less dependent.

Boost industry performance | The commodity and chemical/fertilizer in the materials sector are currently relatively high, which is due to the fact that the economy is (still) doing well, and due to the supply disruptions as a result from the sanctions on Russia (SCFF, 2022b). Furthermore, the valuations are attractive in comparison to other sectors, the clean-energy and infrastructure spending in the United States could drive up the demand for the products in services within this industry, and the earnings and growth expectations have increased as a result of the strength in the metal and agricultural prices (SCFF, 2022b). These positives within the industry makes it attractive to invest in the industry, as the profits are likely to be high. Since the DAO structure allows for such quick and possibly large-scale investments, it could be a good fit.

Governance process | For the materials sector, in which much work is based on trading and providing services, a participatory DAO might be the right choice. It allows the members to discuss

the direction of the organization, and it also provides the possibility to hand in innovative proposals (Chen & Bellavitis, 2020; Bellavitis et al., 2022). The latter reason is especially suitable for the sector, because it is one of the industries that is strongly involved in climate-change discussions. Furthermore, for the service-based organizations, a worker collective DAO could be preferred over an investment-based DAO. Since quality of work could be dependent on the commitment of the employees, it would be advantageous to stimulate this commitment. This can be achieved by the worker collective structure, because (only) the ‘employees’ are part of the decision-making chain. Therefore, they have significant influence on the direction of the company and the work they are doing, and it allows them to have a more diverse set of proceedings if they would desire that. Furthermore, there are also options to design the voting process in a different manner, for instance by allowing members to delegate their votes in case it would require too much expertise to determine what they should vote for. This could on its turn increase efficiency, reducing agency costs. In that manner, a DAO could provide an opportunity for the sector (Wright, 2021).

Legal personality | Another opportunity could follow from legal personality being granted to a DAO. Since this could limit the liability of DAO members, this could significantly increase the attractiveness of the DAO structure within the sector, especially because the sector involves relatively much risk in comparison to the other GICS sectors (BRON/Appendix). This could also increase the ease with which DAOs can interact with persons and organizations within the ‘FIAT-based world’. As mentioned, this does not only limit the risks for members with regard to liabilities, but the DAO itself would also be perceived less risky to trade with, making it easier to find counterparties and to enter agreements with more favorable terms. In such cases, in which there is more trust in a DAO, there will likely be less monitoring required, which decreases the agency costs. The legal personality furthermore allows DAOs to open a bank account in order to make use of FIAT-currencies for payment purposes. This could make interactions with non-DAO customers and possible employees easier, because they are not required to pay in cryptocurrencies anymore. With regard to the employees, legal personality also grants DAO the ability to hire employees with stable payments in FIAT-currency if that is the employee’s preference, it would allow them to externally hire someone in an easier manner as the DAO is now able to contract, preventing the situation in which the employee would be liable for the DAOs debt by becoming a member in a DAO without legal personality, would it ever lose legal personality (Bellavitis et al., 2022; Mienert, 2021; Wright, 2021).

This variety also concerns the variety in combinations between the DAO structure and traditional organizations: there are possibilities to solve issues such as scalability, lack of expertise and the lack of legal personality in this manner. For instance, a DAO can combine its DAO structure for governance with a traditional company that would cover transactions with the FIAT-based world. Furthermore, scalability and expertise issues could be solved by applying a system in which there are so-called sub-DAOs that take care of certain aspects of the organization, such as HR, communications, etc. There is also an option to only grant legal personality to one specific sub-DAO and leave the others entityless (Mienert, 2021).

9.5.3 Weaknesses

Voting and governance | A weakness of DAOs could in this regard be that the governance could potentially lead to inefficiency. As mentioned, practice shows that the participation in DAOs is not

always as frequent and effective as it should be: members are not always experts on all the voting-topics, because of which it requires much time and effort to understand the matter and make a decision on what to vote. In such a case, this would either lead to delay, decreasing the efficiency and therefore increasing the agency costs, or it would lead to members not voting on the matter at all. Since the materials industry could become complex in nature when it regards innovative proposals, this is a realistic weakness. This issue can, however, be solved when delegating votes would be allowed. Additionally, this issue is more likely to occur in investor-based DAOs, as investors are generally less invested in the company itself compared to the members worker collectives. Those members have much more expertise with regard to their work and the company's tasks, so that it would require less effort to process the information with regard to the voting-topics (Wright, 2021; Bellavitis et al., 2022).

Since the materials sector is, however less than the energy sector, subject to attention with regard to climate change, forking might become a concern (Sims, 2019). Since there still is little consensus on how climate change should be handled, this lack of consensus could also occur when many proposals with regard to climate change are introduced in the DAO. If polarization starts to occur, there is a risk that one of the 'groups' might fork the DAO and continue the DAO in a manner that is more in line with their view on climate change. As mentioned, regularly occurring forks within a sector might damage the reputation of that sector, so that an organizational structure that is less public could be a better fit.

Lack of a code of conduct / Security | Another weakness of the industry regards the security standards and the lack of a code of conduct. As explained before, DAOs don't have a code of conducts with regard to the creation and regulation of the digital assets used, so that there is a risk for malicious use. Furthermore, blockchain is secure, but not waterproof: there is still a risk for online attacks and cybercrime. These risks regarding misuse might make DAOs the less attractive option in comparison to a traditional, off-chain, organization.

Anonymity | A last weakness concerns the anonymity of members that DAOs allow for: as soon as the DAO will be held liable, and the members will become personally liable, it might be rather difficult to track the members. This could result in a situation with free-riders, increasing agency costs due to information asymmetry and the decrease in trust in the members.

9.5.4 Threats

Lack of a legal wrapper | The materials sector could also perceive the lack of formal legal personality of DAOs as a threat if it would not be granted to the DAO in question. As mentioned in the previous sections, this could lead to various issues. Firstly, it could lead to the aforementioned liability concerns. The materials sector appears to have a slightly higher-than-average risk exposure on both the short term and the long term (Appendix 2). This could potentially raise the chance on liabilities, meaning that the tokenholders would not only have to take a higher risk-exposure into account, but also a higher risk for being held liable with respect to their private belongings. This could make using the DAO structure relatively difficult to execute, since it would be relatively difficult to find investors and members that would be willing to take the risk of getting into the DAO, when they could also invest in a less risky sector or work at an organization that has legal

personality to protect them from being personally liable for the organization's debts (Bellavitis et al., 2022; Wright, 2021; Mienert, 2021).

Another concern that could follow from this lack of formal legal personality is that of the possibility to interact with the real world (Bellavitis et al., 2022). As mentioned, DAOs could be perceived risky when they don't have legal personality, raising two major concerns. The first concern regards the difficulty of finding feasible counterparties to interact with, and the second concern would be the lack of trust that a counterparty might have. This lack of trust could on its turn lead to disproportionate terms in the agreements and an increase in the enforcement costs, making a DAO the less efficient choice in cases that legal personality is not yet obtained. This could especially be a problem for the materials sector, because this sector is highly reliant on trade and transactions.

Cyclical sector | A threat for the materials sector with regards to its performance, is that even though the industry is currently doing well, the industry is still a so-called cyclical-value sector. This indicates that the sector's value is highly dependent on the current state of the economic growth and the interest rates. Since this appears concerns a not just a jurisdiction-, but a globally-related dependency, and since there are already signs of slowing economic growth, this should be perceived as a threat, as it will lead to more risk due the lack of stability of the value (SCFF, 2022b).

Regulatory, sector-specific and societal (price) uncertainty | Another performance-related threat is that of the current supply chain bottlenecks. These could potentially constrain the industry's growth, something that makes the industry less interesting to invest in. Furthermore, the slow recovery in the oil rig count and the high energy prices increased the cost of the production of oil-fracking chemicals and chemical production in general, potentially leading to a lower profit margin. Furthermore, the general economic uncertainty as a result of the Russia/Ukraine war also plays a role in this threat. Such uncertainty-increasing events increase the volatility of the prices within the sector, resulting in the industry being perceived riskier (SCFF, 2022b). Even though investment-related arguments are mostly relevant for investment-based DAOs, rather than for the worker collective kind of DAOs, this should still be perceived a relevant threat.

Use of cryptocurrencies | With respect to volatility, there is yet another threat: many DAOs base their operations on cryptocurrencies, but these currencies are currently fluctuating a lot. As mentioned, it is difficult to achieve a so-called 'stablecoin' with stable inflation, so that the ownership tokens that are based on cryptocurrencies are likely volatile in their value (Bellavitis et al., 2022). Potential members that are relatively risk-averse and experience a barrier of trust with regards to cryptocurrencies could use this fact as a reason not to join or start a DAO, which might limit the possibilities for DAOs to expand to the real world. However, legal personality could solve this issue.

Regulatory risks | Another treat concerns the potentially stringent environmental regulations that are coming. As previously mentioned, DAO members are generally starting their organization on a blockchain, as they would like to avoid as many government-involvement as possible. Therefore, such regulations could make the current DAO community somewhat averse with regard to entering this industry with a DAO structure. Furthermore, such regulations could also demand a certain innovation within the sector, and it might take more time and effort to comply to these regulations, with the increase of agency/compliance costs as a result, decreasing the agency theory argument with regard to efficiency and cost reduction (SCFF, 2022b).

Qualification of tokens | There is a lack of regulation and certainty regarding the question whether DAO tokens are considered securities. Furthermore, since many DAOs operate worldwide, there should be clarity in every jurisdiction to make the structure appealing for a worldwide public, rather than only in the United States (SEC, 2017). As long as there is no certainty with regard to the classification of the tokens, DAOs might not be attractive for risk-averse persons (Bellavitis et al., 2022).

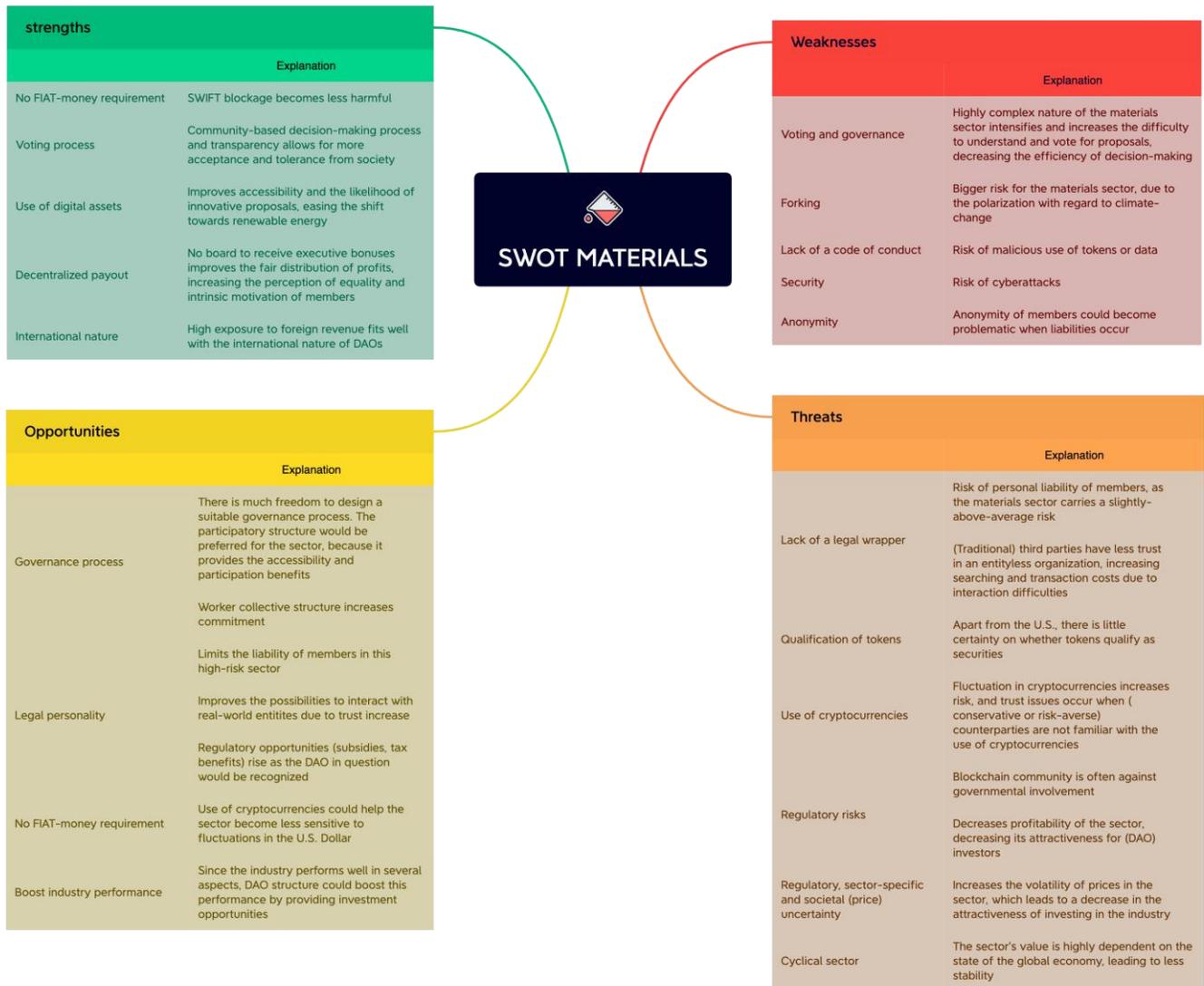


Figure 4: SWOT Materials Sector

9.6 Industrials Sector

The Industrials Sector includes manufacturers and distributors of capital goods such as aerospace & defense, building products, electrical equipment and machinery and companies that offer construction & engineering services. It also includes providers of commercial & professional services including printing, environmental and facilities services, office services & supplies, security & alarm services, human resource & employment services, research & consulting services. It also includes companies that provide transportation services. (Appendix 1).

9.6.1 Strengths

International nature | One of the strengths of the DAO structure is that of its international nature, as it is not tied to a specific country or currency. As mentioned, legal personality would likely not restrict this strength, as it still allows DAOs to operate in any jurisdiction (Decentralized Autonomous Organizations supplement 2021 (WY) s. 17-31 (U.S.)). As it turns out, the industrials sector has a slightly-above-average foreign revenue exposure, especially for the larger companies within the sector (source: S&P Global). This means that the industry is less insulated from regions outside the United States in comparison to the average of the industry. Since DAOs operate internationally and are not tied to a specific jurisdiction such as the United States, this structure could benefit companies within this sector.

No FIAT-money requirement | Since the industrials sector is a rather internationally oriented sector, it could be beneficial not to be fully reliant on FIAT-currencies, in case (innocent) persons or entire countries would be denied access to SWIFT (Holten, 2022). DAOs allow these persons to still be able to conduct business or invest by means of cryptocurrencies, rather than by means of FIAT-currencies, by joining or starting a DAO.

Voting process | the voting procedure of DAOs allows for more involvement, security and transparency. This would, on its turn, lead to a more efficient decision-making mechanism, reducing agency costs. Furthermore, the community-based decision making generally increases the acceptance of the decisions, because such decisions have been made on a community level and are free for audit, rather than it being ‘secretly’ decided by an executive board consisting of elite managers. This also reduces agency costs with regard to monitoring, information asymmetry and trust: as explained earlier, there is less concern for fraudulent or opportunistic behavior from the executive board with such transparency (Wright, 2021).

This voting procedure and the use of digital assets could also be beneficial for the sector, due to relatively accessible possibility to hand in proposals and be an active part of the community. This could especially be interesting when it regards environmental and engineering services, because those appear to be the most innovative subsectors. DAOs allow for an operating manner that is less likely to suffer from tunnel vision, because any member can hand in proposals of which they think that they might add value to the organization, no matter what experience or role the member has within the organization. This could increase the chances of high-quality and a more diversified set of proposals that has not been considered by people that have been working in the sector for quite a while already. This could increase the quality of such companies, making it more likely for them

to prevail over the more traditional companies (Chen & Bellavitis, 2020; Bellavitis et al., 2022). This community-based decision making makes it more likely that the interests of the members are aligned with the interests of the DAO, so that there are less agency costs needed to control whether these interests are still aligned (Wright, 2021).

Use of digital assets | Furthermore, the use of digital assets allows people to access a DAO within a matter of seconds, possibly only for the purpose of handing in a proposal, something that is unimaginable in a traditional company. This makes it easier for DAOs to obtain new members and ideas, as well as to pool much capital in a short period of time. This makes it easier to fund these 'new' ideas, so that they can actually be implemented and improve the quality of the supply. Furthermore, the use of digital assets also allows members to leave the DAO within a matter of seconds. This creates more trust between the member in terms of the trust in their commitment, so that there are less agency costs with respect to monitoring the members in making sure that their interests are aligned with those of the company (Wright, 2021; Bellavitis et al., 2022).

Decentralized payout | As explained, DAOs do not encounter the same issues with regard to (executive) compensation as traditional organizations due to their decentralized nature: there is less need to pay out executive bonuses due to the lack of a managerial board, and if there would be bonuses to be paid, the community-based decision-making allows for more acceptance, transparency and justification for those decisions. This would likely decrease agency costs with respect to misalignments of interest.

9.6.2 Opportunities

Boost industry performance | A first opportunity concerns that the DAO structure could work rather well for a sector that is currently having good expectations and performance. Even though it depends on the global economic growth, the capital expenditures within the sector are likely to increase. Furthermore, the earnings expectations are growing and the fundamentals of the companies that expect such growth are solid. After the pandemic, online shopping has become more popular and global trade has strengthened, so that there would be a higher demand for transportation services with regard to transporting these traded products. This could increase the earnings expectations. Lastly, the current geopolitical risks are likely to increase the defense spending, and the increase in infrastructure and clean-energy investments will likely support some of the subsectors, including the machinery and building material sectors (SCFF, 2022c). This can make it attractive to invest in the sector, as the profits are likely to be high(er). Since the DAO structure allows for such quick and possibly large-scale investments, it could be a good fit.

Governance process | A second opportunity concerns the variety of options with regard to a DAO its governance process. Since the industrial sector is highly reliant on trade and services, rather than on automated processes, there might be a preference for a participatory DAO. Especially in the services side of the sector, the member interaction and their influence on the direction of the organization can be highly valued, especially because they could be more involved with regard to raising new ideas by handing in proposals. This side of the sector could also particularly benefit from a worker collective structure, because it would increase the commitment of its members even more so by allowing them to participate in the organizations successes in a broader sense than in a

traditional company. Providing them the option to be part of several teams, depending on their preferences, could improve their commitment even more (Glaveski, 2022). Since this higher rate of commitment would increase the alignment of interests between the work someone is doing and the success of the organization, there is less likelihood of misalignment of interest, so that the agency costs as a result thereof would be reduced. Furthermore, if they experience difficulties with decisions to be made with regard to voting, it could be beneficial to allow them to delegate their vote to someone they consider to have more expertise on the matter. This could highly increase the efficiency, so that agency costs are reduced.

Legal personality | A third opportunity can be found in the possibility for a DAO to be granted legal personality. Even though the sector only faces a (long-term) average amount of risk (BRON/Appendix), it could still be advantageous to limit this risk for the members by granting them limited liability. This allows members to make safer investments, and prevents them from being jointly and severally liable in case the DAO obtains debt. The legal personality furthermore grants DAOs more opportunities with regard to trade: as the sector is relatively trade- and service based, and will likely interact much with traditional companies, consumers and governments, it would be advantageous not to be perceived a risky counterparty, so that there is a better chance of finding a good counterparty and good agreement-terms, decreasing searching and transaction costs. Legal personality also allows DAOs to trade in FIAT-currencies as a result of being able to open a traditional bank account, so that there is less risk with regard to the value of the payments in comparison to payments in cryptocurrencies. The same advantage holds for paying contractors or employees, as the DAO is now able to set up these contracts and hire them. This also allows the employees to be hired in a rather safe way, as they are not having the risk of becoming jointly and severally liable for the DAOs debt as a member (Mienert, 2021; Bellavitis et al., 2022; Wright, 2021).

Even in case legal personality would not be possible, DAOs have several options to structure a DAO in such a way that issues with regard to liabilities, interaction, scalability, lack of expertise and lack of legal personality can be solved. As mentioned before, a DAO can use an offshore structure to combine the benefits of a DAO with the benefits of a traditional company, such as being able to transact with FIAT-currencies. Furthermore, the DAO could make use of a governance structure that is more fragmented and expertise-based, and it also makes it possible to grant only one sub-division legal personality to have a bigger chance at keeping the community content (Mienert, 2021).

9.6.3 Weaknesses

Voting and governance | The materials sector can also encounter weaknesses of DAOs. First, the governance of DAOs have the inherent weakness that participation can be more difficult to achieve than it might seem at first. The lack of expertise on every voting topic could, as explained in the previous SWOTs, be less efficient and more costly than expected (Bellavitis et al., 2022). Some parts of the sector, such as the engineering sector, are highly complex and could therefore turn this risk into a realistic weakness, especially when there is a high ratio of investors involved in comparison to employees. Employees tend to have more expertise on the topic than outside investors, so that this risk becomes even higher in such DAOs.

Forking / Lack of a code of conduct / Security | Even though forking is way less of a risk in the industrials sector than in the previous sectors, it should be taken into account, especially for the defense sector. The defense industry is a rather sensitive industry, especially when taking into account the current geopolitical risks. It would therefore not be desirable to have this subsector open to anyone entering the sector. Furthermore, in a traditional company it is the practice that an employee that does not function properly can be fired. However, if a group of persons functions problematically in a DAO, they could technically fork the DAO and continue with their own adjusted set of rules. The lack of a code of conduct and the lack of security could strengthen this risk even more, because this could provide possibilities for malicious use of the DAO. This could be major concern, because when defense products end up in the hands of the wrong person, major damage can be caused, raising safety concerns. Therefore, even though DAOs could potentially suit the rest of the sector, a DAO within the defense sector should be considered very carefully. Even though the lack of a code of conduct and the (cyber)security issues could also become problematic for the other subsectors, they would not be as risky as for the defense subsector.

Anonymity | A last weakness concerns the anonymity of members that DAOs allow for: as soon as the DAO will be held liable, and the members will become jointly and severally liable, it might be rather difficult to track the members. This could result in a situation with free-riders, increasing agency costs due to information asymmetry and the decrease in trust in the members.

9.6.4 Threats

Lack of a legal wrapper | The materials sector could also perceive the lack of formal legal personality of DAOs as a threat if it would not be granted to the DAO in question. As mentioned before, this could lead to various issues. Firstly, it could lead to the aforementioned liability concerns. Even though the industrials sector has an average (long-term) risk exposure, it is still high enough to be concerning when considering that the members would be personally liable in case of a downfall (BRON/Appendix). This could decrease the attractiveness of DAOs, as investors and members might be more cautious when entering or starting a DAO in an industry with such risk. Another threat following from the lack of legal personality concerns the possibility to interact with the real world. As previously discussed, when DAOs are perceived risky due to not having legal personality, a lack of trust raises and agency costs raise due to higher searching costs and transaction costs. Since the industrials sector is highly reliant on the trade of goods and services, especially with commercial parties such as companies and individuals, this is a realistic threat (Wright, 2021; Mienert, 2021; Bellavitis et al., 2022).

Cyclical sector | The cyclical nature of the industrials sector raises another threat. Since the sector's value is highly dependent on the current state of the economic growth and the interest rates, there will be more volatility in the value of the sector, following economic growth-trends. Since this dependency is global, and since there are already signs of slowing economic growth, this should be perceived as a threat, as it will lead to more risk due the lack of stability of the value (SCFF, 2022c). There can also be found a threat in the performance of the industrials sector. Currently, the higher fuel costs are causing issues in the transportation and the air freight industries, likely reducing the profit margins (SCFF, 2022c). Furthermore, even though the aircraft demand is

picking up, the supply issues persist, so that this demand cannot be capitalized on. This also forms a headwind for the sector (SCFF, 2022c). Additionally, the general economic uncertainty as a result of the Russia/Ukraine war also plays a role in this threat. These uncertainty-increasing events increase the volatility of the prices within the sector, resulting in the industry being perceived riskier, causing a major issue when liability concerns rise or when investments are involved. Even though such investment-related arguments are mostly relevant for investment-based DAOs, rather than for the worker collective kind of DAOs that are likely more suitable for this sector, this is still a realistic threat.

Use of cryptocurrencies | Another threat concerns the use of cryptocurrencies by DAOs. Cryptocurrencies are fluctuating a lot, increasing the risk involved in these transactions. Since the industrials sector likely involves relatively much interaction with individuals, governments and commercial parties, this could become a major limitation for DAOs to be functional in the real world. These parties are generally more risk-averse and used to transacting with FIAT-currencies, and would therefore be relatively risk-averse in that respect. However, it should be noted that this threat could be fixed when legal personality would be granted (Bellavitis et al., 2022).

Qualification of tokens | A last threat concerns tokenization. As previously mentioned, the uncertainty regarding the classification of DAO tokens as securities is – apart from the United States (SEC, 2017) – a worldwide uncertainty, so that (potential) members from any jurisdictions might be cautious about joining or starting a DAO (Bellavitis et al., 2022).

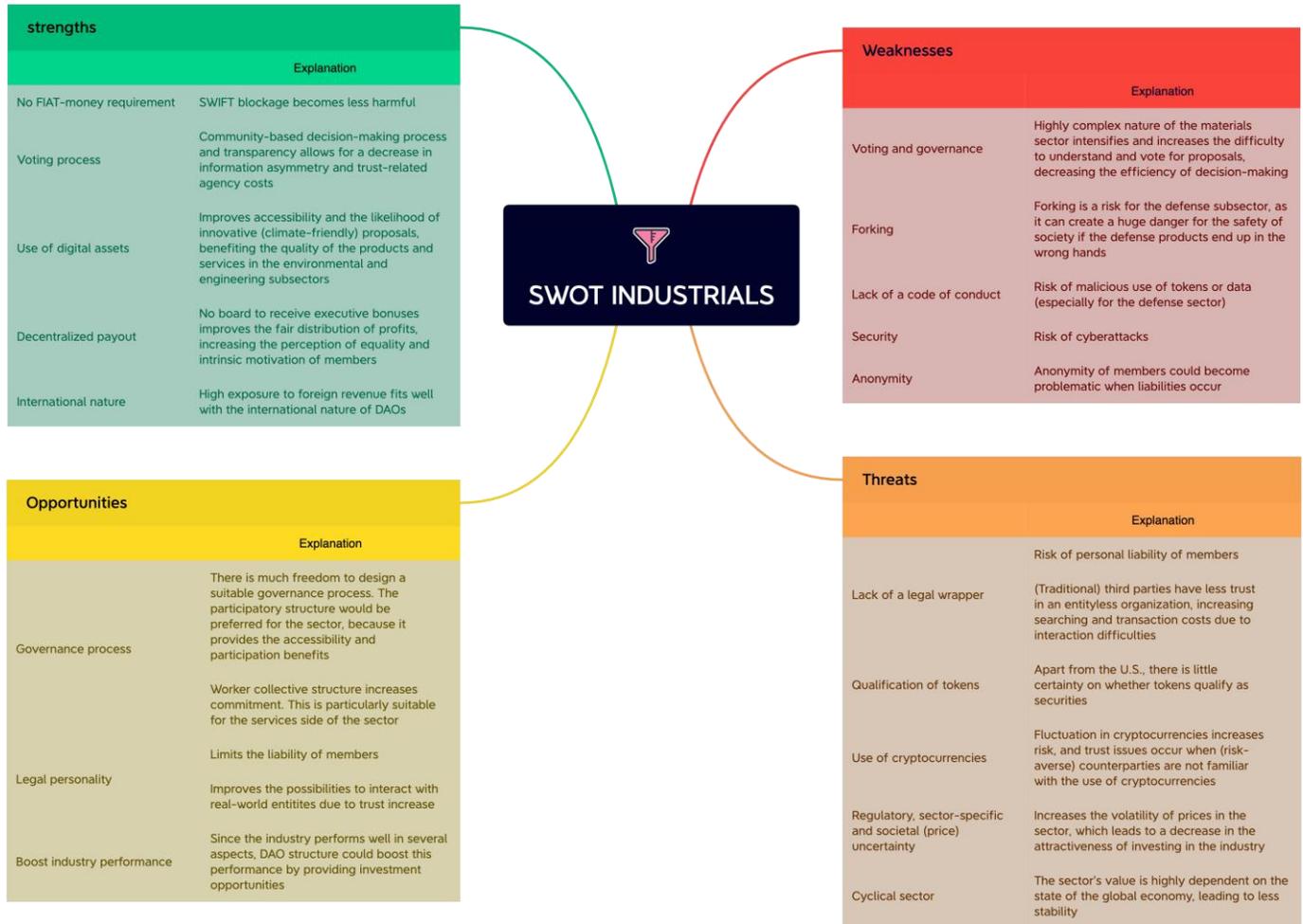


Figure 5: SWOT Industrials Sector

9.7 Consumer Discretionary Sector

The Consumer Discretionary Sector encompasses those businesses that tend to be the most sensitive to economic cycles. Its manufacturing segment includes automotive, household durable goods, leisure equipment and textiles & apparel. The services segment includes hotels, restaurants and other leisure facilities, media production and services, and consumer retailing and services. (Appendix 1).

9.7.1 Strengths

No FIAT-money requirement | A first strength, which can be found in all sectors, is that of DAOs making use of cryptocurrencies. It could be beneficial to use a DAO structure, because they are not fully reliant on FIAT-currencies when (innocent) persons or entire countries would be denied access to SWIFT. DAOs allow these persons to still be able to conduct business or invest by means of cryptocurrencies, rather than by means of FIAT-currencies, by joining or starting a DAO.

Voting process | A second strength concerns the voting procedure of DAOs. As mentioned, the voting procedure of DAOs allows for more involvement, security and transparency. This would, on its turn, lead to a more efficient decision-making mechanism, reducing agency costs. Furthermore, the community-based decision making generally increases the acceptance of the decisions, because such decisions have been made on a community level and are free for audit, rather than it being 'secretly' decided by an executive board consisting of elite managers. This also reduces agency costs with regard to monitoring, information asymmetry and trust: as explained earlier, there is less concern for fraudulent or opportunistic behavior from the executive board with such transparency. Having this voting procedure could especially be interesting when persons who are normally consumers would take part, because that is the actual target of the industry. If they can directly vote on proposals and hand in proposals on the products and services, the products and services might become more suitable to the demand in the target group, since they would likely only go onboard for the product/service development that they would themselves appreciate, leading to a more effective and successful business model. Furthermore, this could possibly decrease costs with respect to market research, because a part of the target market is within the organization already (Afuah & Tucci, 2012; Poetz & Schreier, 2012). Lastly, this community-based decision making makes it more likely that the interests of the members are aligned with the interests of the DAO, so that there are less agency costs needed to control whether these interests are still aligned.

Use of digital assets | This use of digital assets could also be beneficial for the sector, due to relatively accessible possibility to hand in proposals and be an active part of the community. As already elaborated on, this could especially be interesting when consumers would demand for a specific product, service, or an adaption to one of those, because they can easily join a DAO and hand in their proposal. Such proposals could help the sector, and the specific DAO, to better suit their goods and services to the demand in society. This option to enter a DAO and to hand in a proposal is relatively easy in comparison to the options within traditional companies, because bureaucracy might prevent your suggestion from being actively considered when you suggest it as a consumer of the company, and entering the company by becoming an employee is a way more

far-reaching means to achieve the same goal. Furthermore, the use of digital assets also allows members to leave the DAO within a matter of seconds. This creates more trust between the member in terms of the trust in their commitment, reducing the agency costs with respect to monitoring the members in making sure that their interests are aligned with those of the company (Wright, 2021; Bellavitis et al., 2022).

Decentralized payout | As explained, DAOs do not encounter the same issues with regard to (executive) compensation as traditional organizations due to their decentralized nature: there is less need to pay out executive bonuses due to the lack of a managerial board, and if there would be bonuses to be paid, the community-based decision-making allows for more acceptance, transparency and justification for those decisions. This would likely decrease agency costs with respect to misalignments of interest.

9.7.2 Opportunities

Boost industry performance | A first opportunity concerns that the DAO structure could work rather well for a sector that is currently having good expectations and performance. As it stands, the sector is one of the best long-term performers in terms of risk-adjusted annualized returns (Appendix 2). Furthermore, the fact that consumers are returning to work and the economy is currently expanding are raising the expectations for the sector. Due to the reopening of the economy, the biggest part of the sector has recovered (almost) all of the pandemic-related losses. The pandemic also increased the home improvement and e-commerce spending, indicating that those profits have been higher and will remain higher as the high wages and the pandemic-related high levels of savings and are currently showing its effect. Another positive influence is that the house prices are rising, as a result of which the home improvement and overall retail sales are increasing (SCFF, 2022d). This can make it attractive to invest in the sector, as the profits are likely to be high. Since the DAO structure allows for such quick and possibly large-scale investments, it could be a good fit.

Shift from brick-and-mortar stores to online retail | A second opportunity for the sector is that there is an ongoing shift away from brick-and-mortar stores in the sector. This has the consequence that there is more fundamental for online retailers. DAOs generally operate digitally, so that they would fit the online retail environment much better than the physical environment. Furthermore, DAOs such as Fries DAO have shown that it is possible to run physical stores and restaurants by means of a franchise structure, so that DAOs would also be able to operate physically if necessary. However, the fact that this shift is going in the digital direction could make a DAO an increasingly good fit for the sector (SCFF, 2022d).

Governance process | Since the consumer discretionary sector is highly reliant on trade and services, rather than on automated processes, there might be a preference for a participatory DAO. Because members are likely targets of the organizations, their interaction and influence on the direction of the organization can be highly valued, especially because they could be more involved with regard to raising new ideas by handing in proposals, as discussed in the strengths section. An algorithmic DAO could, however, also be of interest. There could be an interesting structure in which investors could invest in a hotel that operates entirely digital, in which they would automatically gain revenue for the 'room' they invested in when it would get booked for a night.

This could cut many types of costs with respect to employees, nodes, etcetera, which makes it an interesting structure.

Legal personality | Another opportunity can be found in the possibility for a DAO to be granted legal personality. Since the sector faces a relatively high amount of risk (BRON/Appendix), it could be beneficial to limit this risk for the members by granting them limited liability. This allows members to make safer investments, and prevents them from being jointly and severally liable if the DAO obtains debt. The legal personality furthermore grants DAOs more opportunities with regard to trade: as the sector is relatively trade- and service based, and will likely interact much with traditional companies and consumers, it would be advantageous not to be perceived a risky counterparty, so that there is a better chance of finding a good counterparty and good agreement-terms, decreasing searching and transaction costs. Especially consumers, the main target of the industry, would likely prefer to deal with a trustworthy party, so that this benefit would be very relevant. Legal personality also allows DAOs to trade in FIAT-currencies as a result of being able to open a traditional bank account, so that there is less risk with regard to the value of the payments in comparison to payments in cryptocurrencies. The same advantage holds for paying contractors or employees, as the DAO is now able to set up these contracts and hire them. This also allows the employees to be hired in a rather safe way, as they are not having the risk of becoming jointly and severally liable for the DAOs debt as a member (Bellavitis et al., 2022; Wright, 2021; Mienert, 2021).

Even in case legal personality would not be possible, DAOs have several options to structure a DAO in such a way that issues with regard to liabilities, interaction, scalability, lack of expertise and lack of legal personality can be solved. As mentioned before, a DAO can use an offshore structure to combine the benefits of a DAO with the benefits of a traditional company, such as being able to transact with FIAT-currencies. Furthermore, the DAO could make use of a governance structure that is more fragmented and expertise-based, and it also makes it possible to grant only one sub-division legal personality to have a bigger chance at keeping the community content (Mienert, 2021).

Decentralization, power and competition | Another opportunity rises with respect to competition-considerations. The consumer discretionary sector is currently dominated by Amazon (Jeff Bezos) and Tesla (Elon Musk), which raises questions with regard to fair competition. DAOs, on the other hand, use decentralization, so that there cannot be one person who will become very powerful (Bellavitis et al., 2022). The smart contracts or the operating agreement can prevent such events from happening by adding a provision in which a quorum would be required for a vote, or in which the ownership percentage of a single actor could be maximized on for instance 49%. This might be interesting as it would be less of a risk if a DAO would become a successful organization, remaining the competition fair.

Decentralization and international nature | A last opportunity follows from the fact that DAOs operate decentralized and internationally. As can be seen in practice, a few DAOs are trying to make use of decentralized ownership for restaurants or homes. FriesDAO (FriesDAO, 2022), for instance, makes use of the franchise structure to buy restaurants. This could open up possibilities for individuals to be a (partial) owner of a restaurant or hotel. Since DAOs generally operate internationally and are not tied to a specific country, it could make it easier for them to spread a certain restaurant brand over an (international) area fairly quick.

9.7.3 Weaknesses

Voting and governance | The consumer discretionary sector might also encounter weaknesses of DAOs. First, the governance of DAOs have the inherent weakness that participation can be more difficult to achieve than it might seem at first. The lack of expertise on every voting topic could, as explained in the previous SWOTs, be less efficient and more costly than expected. As consumers could potentially enter the DAO, hand in proposals and vote on those, an issue could arise. Consumers are possibly not necessarily owning expertise on the topics, otherwise than having a specific preference for a new product, service or adaption. Therefore, if voting is required for topics other than those regarding their preferences, their lack of expertise might decrease the efficiency of the decision-making process, reducing the agency theory argument on agency cost reducing as a result of an increased efficiency (Wright, 2022; Bellavitis et al., 2022).

Lack of a code of conduct / Security | The lack of a code of conduct and (cyber)security concerns could also rise concerns. Since it currently often occurs that personal data of customers are stored after a purchase, it could become problematic if it turns out that the data is at risk of becoming the target of a cyberattack. In such a case, there should either be a manner in which that security risk would be decreased, or the DAO should consider not making use of this personal data in the manner that traditional companies do. If the latter happens, the DAO could – in comparison to the other companies in the sector – gain the consumers preference, as it provides them with more privacy, rather than less privacy.

Anonymity | A last weakness concerns the anonymity of members that DAOs allow for: as soon as the DAO will be held liable, and the members will become jointly and severally liable, it might be rather difficult to track the members. This could result in a situation with free-riders, increasing agency costs due to information asymmetry and the decrease in trust in the members.

9.7.4 Threats

Lack of a legal wrapper | The consumer discretionary sector could also perceive the lack of formal legal personality of DAOs as a threat if it would not be granted to the DAO in question. As mentioned before, this could lead to various issues. Firstly, it could lead to the aforementioned liability concerns. As mentioned, the consumer discretionary sector encounters a relatively high (long-term) risk, so that it would be concerning when considering that the members would be personally liable in case of a downfall (Appendix 2). This could decrease the attractiveness of DAOs, as investors and members might be more cautious when entering or starting a DAO in a sector with such risk involved. Another threat following from the lack of legal personality concerns the possibility to interact with the real world. As previously discussed, when DAOs are perceived risky due to not having legal personality, a lack of trust raises and agency costs raise due to higher searching costs and transaction costs. Since the industrials sector is highly reliant on the trade of goods and services, especially consumers who might be even more risk-averse with regard to transacting with a party than commercial parties, this is a realistic threat (Wright, 2021; Bellavitis et al., 2022; Mienert, 2021).

Use of cryptocurrencies | A threat related to this note, is that of the use of cryptocurrencies by DAOs. Cryptocurrencies are fluctuating a lot, increasing the risk involved in these transactions. Since the consumer discretionary sector involves relatively much interaction with consumers, this could become a major limitation for DAOs to be functional in the real world. Consumers are generally more risk-averse and used to transacting with FIAT-currencies, and would therefore be relatively risk-averse in that respect. The chance that a consumer would be willing to obtain cryptocurrency to enter in a transaction with a DAO is therefore relatively low, which is a limitation for the potential success of DAOs within this sector. However, it should be noted that this threat could be fixed when legal personality would be granted (Bellavitis et al., 2022).

Cyclical sector | The cyclical nature of the industrials sector raises another threat. Since the sector's value is highly dependent on the current state of the economic growth and the interest rates, there will be more volatility in the value of the sector, following economic growth-trends. Since this dependency is global, and since there are already signs of slowing economic growth, this should be perceived as a threat, as it will lead to more risk due the lack of stability of the value (SCFF, 2022d).

Regulatory, sector-specific and societal (price) uncertainty | There can also be found a threat in the performance of the sector. The valuations within the industry appear to be stretched, and the earnings growth has flattened recently. Furthermore, the semiconductor shortages that are relevant for auto and consumer electronics production (one of the most important subsectors) are countering a shortage, making the production more of an issue. Lastly, the higher interest rates and the fuel prices are starting to weigh on the confidence of consumers, so that the consumption might become suppressed soon. Additionally, the general economic uncertainty as a result of the Russia/Ukraine war also plays a role in this threat (SCFF, 2022d). These uncertainty-increasing events increase the volatility of the prices within the sector, resulting in the industry being perceived riskier, causing a major issue when liability concerns rise or when investments are involved.

Qualification of tokens | Another threat concerns tokenization. As previously mentioned, the uncertainty regarding the classification of DAO tokens as securities is – apart from the United States (SEC, 2017) – a worldwide uncertainty, so that (potential) members from any jurisdictions might be cautious about joining or starting a DAO (Bellavitis et al., 2022).

Accessibility | A last threat concerns the accessibility of the sector. As mentioned, Amazon and Tesla have much power within the sector (SCFF, 2022d). Such companies own fifty percent of the market cap in the sector. Therefore, it could be difficult for new DAOs to enter the market and be successful, given the fact that consumers are already buying most of their products with the powerful companies within the sector.

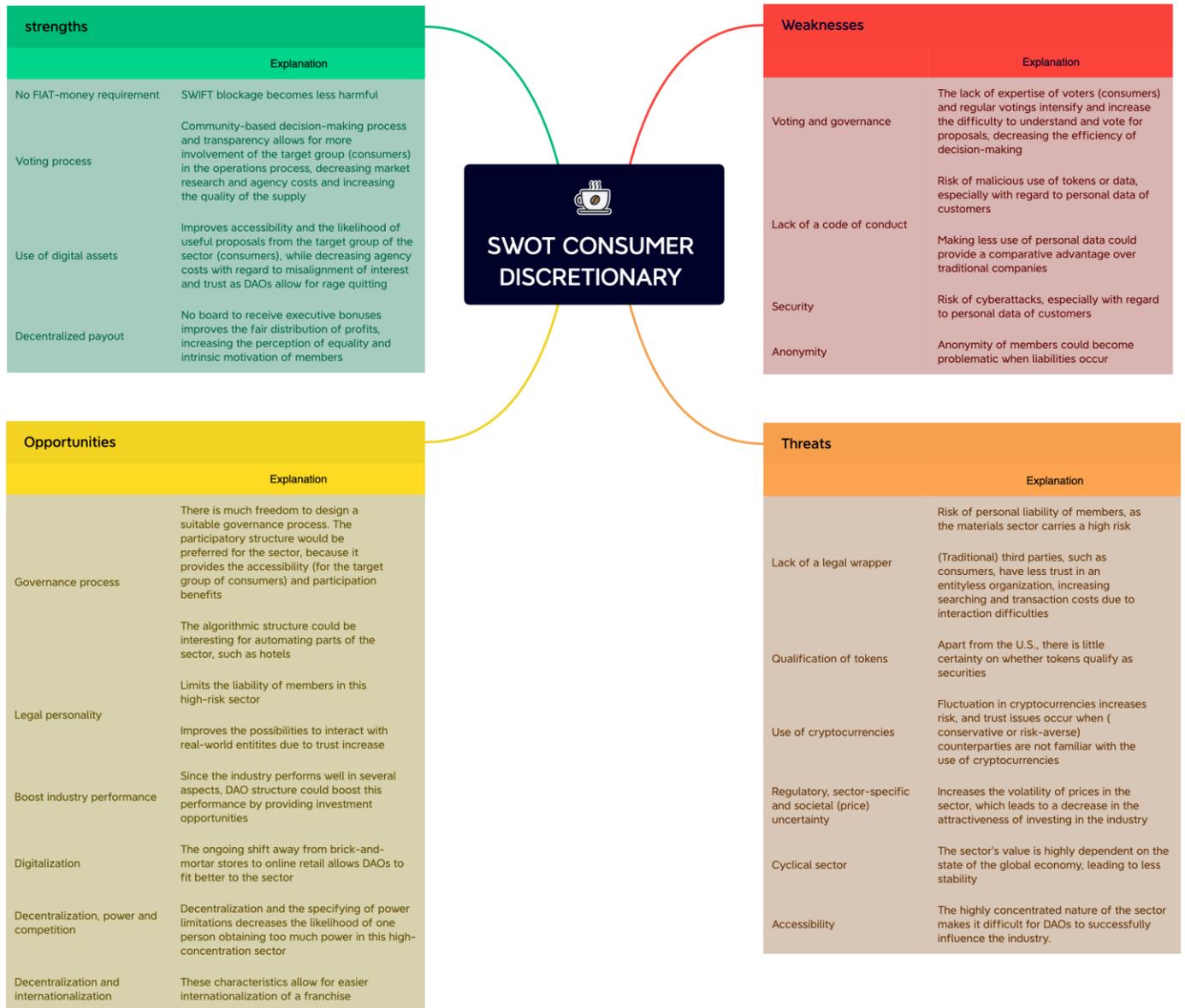


Figure 6: SWOT Consumer Discretionary Sector

9.8 Consumer Staples Sector

The Consumer Staples Sector comprises companies whose businesses are less sensitive to economic cycles. It includes manufacturers and distributors of food, beverages and tobacco and producers of non-durable household goods and personal products. It also includes food & drug retailing companies as well as hypermarkets and consumer super centers. (Appendix 1).

9.8.1 Strengths

No FIAT-money requirement | The first strength, which is in line with the other sectors, can be found in the use of cryptocurrencies. It could be beneficial to use a DAO structure, because they are not fully reliant on FIAT-currencies when (innocent) persons or entire countries would be denied access to SWIFT. DAOs allow these persons to still be able to conduct business or invest by means of cryptocurrencies, rather than by means of FIAT-currencies, by joining or starting a DAO.

Voting process | A second strength concerns the voting procedure of DAOs. As mentioned, the voting procedure of DAOs allows for more involvement, security and transparency. This would, on its turn, lead to a more efficient decision-making mechanism, reducing agency costs. Furthermore, the community-based decision making generally increases the acceptance of the decisions, because such decisions have been made on a community level and are free for audit, rather than it being 'secretly' decided by an executive board consisting of elite managers. This also reduces agency costs with regard to monitoring, information asymmetry and trust: as explained earlier, there is less concern for fraudulent or opportunistic behavior from the executive board with such transparency. This sector in particular could benefit from this strength, because it concerns a sector with consumers as targets (Afuah & Tucci, 2012; Poetz & Schreier, 2012). As elaborated on in the previous sector, the DAO structure allows anyone to join, and to hand in and vote for proposals. Since there is a relative low bar for consumers to do this, this could increase the quality of the products and services provided by the organizations within the industry, as they could be closer to the actual demand that consumers have. Additionally, this method could lower market research costs and costs with regard to misalignment of interests (Wright, 2021; Bellavitis et al., 2022).

Use of digital assets | Similar to the consumer discretionary sector, the consumer staples sector could benefit from the use of digital assets in terms of accessibility and participation in the community. Similarly, this allows consumers to express and pursue their demands for products and services in a more successful way, while at the same time the sector would be helped by being able to match their products and services better with the target's demand. The nature of digital assets allows them to enter the DAO without bureaucratic burdens or far-reaching requirements such as becoming an employee. The possibility of rage quitting strengthens this effect, because a member is not tied to the DAO for a predetermined period. This possibility also increases trust, as members are part of the DAO because they actually want to, reducing agency and monitoring costs with regard to misalignment of interests (Wright 2021; Bellavitis et al., 2022; Earth, 2022).

Decentralized payout | Lastly, DAOs do not encounter the same issues with regard to (executive) compensation as traditional organizations due to their decentralized nature: there is less need to pay out executive bonuses due to the lack of a managerial board, and if there would be bonuses to be paid, the community-based decision-making allows for more acceptance, transparency and justification for those decisions. This would decrease agency costs with respect to misalignments of interest.

9.8.2 Opportunities

Boost industry performance | A first opportunity concerns that the DAO structure could work rather well for a sector that is currently having good expectations and performance. As it stands, the sector is highly ranked in terms of risk-adjusted annualized returns (BRON/Appendix). Additionally, the sector has a stable earnings profile, making it relatively safe to invest in. Also, companies in the sector have been passing along higher costs to consumers so that costs would stay acceptable, and they have been engaging in aggressive cost-cutting, increasing the profit margins. Furthermore, the reopening of restaurants after the pandemic measures is supporting the wholesale food demand. Lastly, the sector faces some upside risks, such as that it might perform better than expected if inflationary pressures enable significantly more pricing power, and that it might be supported more than expected by risks in the economy, such as the pandemic, interest rate hikes and inflation concerns. This can make it attractive to invest in the sector, as the profits are likely to be high, especially since the risks are upside, rather than downside risks (SCFF, 2022e). With a DAO structure, quick and large-scale investments in the sector could be realized, so that it could be a good fit.

Governance process | A second opportunity concerns the variety of options with regard to a DAO its governance process. Since the consumer staples sector is highly reliant on trade and services, rather than on automated processes, there might be a preference for a participatory DAO. Similar to the consumer discretionary sector, DAO members are likely also targets of the organizations within the sector, so that their interaction and influence on the organization's direction would be of high relevance. However, algorithmic DAOs, or the installation of an algorithmic sub-DAO, could potentially be interesting as well. As we currently see, there is an increase in automated stores and restaurants (Amazon, 2022). For such a model, the algorithmic structure could be more fitting, as there is barely any human interaction necessary, other than designing the code and the manufacturing and transport process. An interesting structure could be an overarching participatory DAO, but an algorithmic sub-DAO for the store running.

Legal personality | Another opportunity can be found in the possibility for a DAO to be granted legal personality. The consumer staples sector faces a relatively high amount of risk (Appendix 2), it could be beneficial to limit this risk for the members by granting them limited liability. As it turns out, a part of the risks is of an upside nature (SCFF, 2022e), but limiting the downside risk is still of value to protect the members. This allows members to make safer investments, and prevents them from being jointly and severally liable if the DAO obtains debt. The legal personality furthermore grants DAOs more opportunities with regard to trade: as the sector is mostly trade- and service based, and will likely interact much with traditional companies and consumers, it would be advantageous not to be perceived a risky counterparty, so that there is a better chance of finding

a good counterparty and good agreement-terms, decreasing searching and transaction costs. Especially consumers, the main target of the industry, would likely prefer to deal with a trustworthy party, so that this benefit would be very relevant. Legal personality also allows DAOs to trade in FIAT-currencies as a result of being able to open a traditional bank account, so that there is less risk with regard to the value of the payments in comparison to payments in cryptocurrencies. The same advantage holds for paying contractors or employees, as the DAO is now able to set up these contracts and hire them. This also allows the employees to be hired in a rather safe way, as they are not having the risk of becoming jointly and severally liable for the DAOs debt as a member (Mienert, 2021; Bellavitis et al., 2022; Wright, 2021).

Even in case legal personality would not be possible, DAOs have several options to structure a DAO in such a way that issues with regard to liabilities, interaction, scalability, lack of expertise and lack of legal personality can be solved. As mentioned before, a DAO can use an offshore structure to combine the benefits of a DAO with the benefits of a traditional company, such as being able to transact with FIAT-currencies. Furthermore, the DAO could make use of a governance structure that is more fragmented and expertise-based, and it also makes it possible to grant only one sub-division legal personality to have a bigger chance at keeping the community content (Mienert, 2021).

Decentralization, power and competition | Another opportunity rises with respect to competition-considerations. The consumer staples sector is relatively concentrated in comparison to other sectors – it ranked fifth - (Appendix 3), which raises questions with regard to fair competition. DAOs, on the other hand, use decentralization, so that there cannot be one person who will become very powerful. The smart contracts or the operating agreement can prevent such events from happening by adding a provision in which a quorum would be required for a vote, or in which the ownership percentage of a single actor could be maximized on for instance 49%. This might be interesting as it would be less of a risk if a DAO would become a successful organization, remaining the competition fair (Bellavitis et al., 2022).

9.8.3 Weaknesses

Voting and governance | The weaknesses of the consumer staples sector are also rather similar to those of the consumer discretionary sector. The weaknesses regarding the participation in the governance of DAOs is one of the major weaknesses in this sector if consumers would get involved within the DAO, as explained for the consumer discretionary sector. They might lack expertise for some of the voting topics, which might decrease the efficiency and increase the costs (Wright, 2021; Bellavitis et al., 2022).

Lack of a code of conduct / security | Similarly, the concerns about the lack of a code of conduct and security are comparable: counterparties, such as consumers, generally provide personal data which will be stored after a purchase. The issue raises when such data is not stored carefully, or when there is a higher risk for security of the data. As explained, this is something that can be worked around when making less use of personal data or increasing security, but it is less of a concern in this sector because there is less online retail involved.

Anonymity | A last weakness concerns the anonymity of members that DAOs allow for: as soon as the DAO will be held liable, and the members will become jointly and severally liable, it might be rather difficult to track the members. This could result in a situation with free-riders, increasing agency costs due to information asymmetry and the decrease in trust in the members.

9.8.4 Threats

Lack of a legal wrapper | Since the consumer staples sector is a relatively risky sector (Appendix 2), the lack of formal legal personality of DAOs could be a major threat, especially regarding liability issues. As mentioned, the consumer staples sector encounters a relatively high (long-term) risk. Despite the fact that a part of that risk is an upside risk, the downside risk likely still exists, so that it should still be borne in mind that a downfall would be problematic for the members in terms of them becoming personally liable. This could decrease the attractiveness of DAOs, as investors and members might be more cautious when entering or starting a DAO in a sector with such risk involved. Another threat following from the lack of legal personality concerns the possibility to interact with the real world. The consumer staples sector interacts a lot with consumers and traditional companies within the sector, who are rather risk-averse. If DAOs are perceived risky due to not having legal personality, this lack of trust raises and agency costs raise due to higher searching costs and transaction costs (Mienert, 2021; Bellavitis et al., 2022; Wright, 2021).

Use of cryptocurrencies | A similar threat can be found in the use of cryptocurrencies. These currencies are highly fluctuating, which increases the risk around these transactions. Since the consumer staples sector involves relatively much interaction with (risk-averse) consumers and traditional companies, this could become a major limitation for DAOs to be functional in the real world. Furthermore, these parties are generally used to transacting with FIAT-currencies (Bellavitis et al., 2022). The chance that a consumer would be willing to obtain cryptocurrency to enter in a transaction with a DAO is therefore relatively low, which is a limitation for the potential success of DAOs within this sector. However, it should be noted that this threat could be fixed when legal personality would be granted.

Regulatory, sector-specific and societal (price) uncertainty | There are also threats regarding the performance of the sector. The sector performs worse in periods of economic growth, which can become an issue with respect to investments. In such periods, investors become a bit more risk-averse, as they have less money to invest with, so that they should make more careful decisions. Furthermore, this sector can be more expensive to invest in, because the input costs regarding commodities and transport are higher than in other sectors – though it is possible to raise prices to avoid this issue. These events increase the volatility of the prices within the sector, resulting in the industry being perceived riskier, causing a major issue when liability concerns rise or when investments are involved (SCFF, 2022e).

Qualification of tokens | Another threat concerns tokenization. As previously mentioned, the uncertainty regarding the classification of DAO tokens as securities is – apart from the United States (SEC, 2017) – a worldwide uncertainty, so that (potential) members from any jurisdictions might be cautious about joining or starting a DAO.

Accessibility | A last threat concerns the accessibility of the sector. As mentioned, the consumer staples sector is ranked fifth in the most concentrated sectors (Appendix 2), so it could be difficult

for new DAOs to enter the market and be successful, given the fact that consumers are already buying most of their products with the powerful companies within the sector.

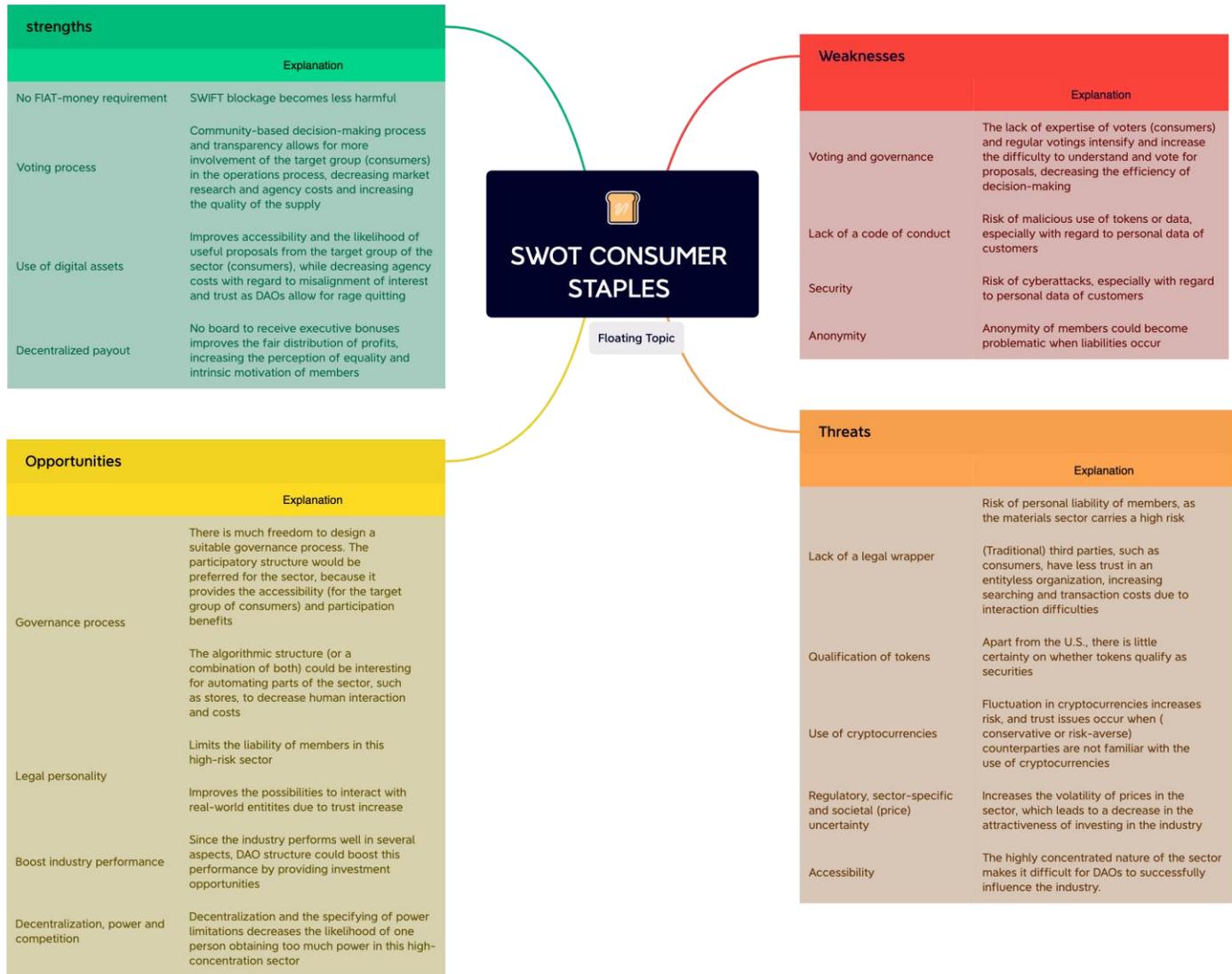


Figure 6: SWOT Analysis Consumer Staples Sector

9.9 Health Care Sector

The Health Care Sector includes health care providers & services, companies that manufacture and distribute health care equipment & supplies, and health care technology companies. It also includes companies involved in the research, development, production and marketing of pharmaceuticals and biotechnology products. (Appendix 1).

9.9.1 Strengths

Voting process / use of digital assets / transparency / accessibility | The Healthcare sector, in particular when it concerns the research and development of such products, could benefit from the DAO structure in several ways. The most important benefit would be the accessibility of the industry. Currently, the healthcare industry is known for its prestige and monopolistic nature (SCFF, 2022f). As it stands now, the industry has been a common target of anti-competitive regulations due to this issue. It should, however, be noted that this regards the products, rather than the companies within the sector. As can be seen, the sector is only ranked tenth out of the eleven GICS sectors in terms of concentration. DAOs could increase this accessibility in a couple of ways. The first manner would be to reduce the costs of investments in medical research, which is generally described as the valley of death (Molecule DAO, 2022), by standardizing legal agreements and creating public and liquid markets for funding. The DAO structure is particularly suitable for this, because it can easily pool much capital due to the use of digital assets and tokens. This system also allows for an easier sharing of ownership and outcomes of the project, such as intellectual property rights, royalties and data. Furthermore, the automation within DAOs and the possibility of the use of smart contract can automate a big part of the process, so that such costs are reduced. Since DAOs are already used to working with smart contracts, the step towards this use would be smaller than for traditional companies (Bellavitis et al., 2022).

This strength can be backed by the strengths that come with the voting system of DAOs. Most importantly, the use of digital assets can increase the accessibility and participation in the community. Anyone can become a member in a matter of seconds and propose a specific research topic, or vote on the research topics that have been proposed by others. With that, the decision on whether or not your project would be executed is not dependent on a prestigious board, but on the community. If the lack of expertise of a community would be a concern, there are possibilities to set a certain advisory board to oversee such decisions, but this possibility will be elaborated on in the opportunities section. Furthermore, the possibility of rage quitting will increase the trust between members, so that the agency and monitoring costs with regard to misalignment of interest will be reduced (Bellavitis et al., 2022; Wright, 2021).

Additionally, the voting procedure of DAOs allows for more involvement, security and transparency. This would, on its turn, lead to a more efficient decision-making mechanism, reducing agency costs. Information on the proposals and the voting results can be found on the blockchain, so that the decision can be perceived more acceptable by the researcher that proposed a certain project. This reduces the issues regarding monitoring, information asymmetry and trust-related issues regarding fraudulent and opportunistic behavior from executive board members (Bellavitis et al., 2022; Wright, 2021).

The next manner that DAOs could help with this industry-related concern, is by providing more transparency. DAOs make use of blockchain technology, so that every transaction is registered on the blockchain. It is therefore clear how much money has been involved in a certain project, which data has been used, etcetera. This would limit the concerns with regard to the claimed high investment costs that could potentially justify the high prices after obtaining a monopoly on a certain product (Wright, 2021).

International nature | DAOs are rather international in nature, as the structure is not tied to a specific country or currency. Legal personality would likely not restrict this strength, as it still allows DAOs to operate in any jurisdiction. The health care sector has a slightly-above-average foreign revenue exposure for the larger companies in the sector (source: S&P Global). This means that the industry is less insulated from regions outside the United States in comparison to the average of the industry. Since DAOs operate internationally and are not tied to a specific jurisdiction such as the United States, this structure could benefit companies within this sector.

No FIAT-money requirement | Another strength, which is a more general strength and occurs in all sectors, can be found in the use of cryptocurrencies. It could be beneficial to use a DAO structure, because they are not fully reliant on FIAT-currencies when (innocent) persons or entire countries would be denied access to SWIFT. DAOs allow these persons to still be able to conduct business or invest by means of cryptocurrencies, rather than by means of FIAT-currencies, by joining or starting a DAO. Since the healthcare sector is one of the most important ones for human kind, such unrestricted access would be highly relevant.

Decentralized payout | Lastly, DAOs do not encounter the same issues with regard to (executive) compensation as traditional organizations due to their decentralized nature: there is less need to pay out executive bonuses due to the lack of a managerial board, and if there would be bonuses to be paid, the community-based decision-making allows for more acceptance, transparency and justification for those decisions. This would decrease agency costs with respect to misalignments of interest. It could be especially of relevance in the health care sector, because the profits are really high and generally non-transparent, so that there would be more tolerance for the prices and how those lead to profits.

9.9.2 Opportunities

Use of Blockchain | The first opportunity for the industry concerns the use of blockchain within DAOs. As DAOs are built on blockchain, they can make use of the blockchain technology for other purposes as well, without it being as much of a burden as for the more traditional companies that do not use blockchain just yet. Firstly, this allows DAOs to use NFTs more easily than traditional companies. The use of NFTs can make licensing of intellectual property rights easier by issuing an NFT on the product or method in question. This could potentially decrease costs in comparison to drafting a licensing contract for every licensee. Furthermore, blockchain allows for a more secure and use of data, so that the regulation of sensitive patient and healthcare organizations data can be stored more safely. Another advantage of blockchain is its anonymity, due to which it might be easier to find participants for medical experiments: patients might be more willing to participate if

they remain anonymous. This could increase the success of the research projects (Molecule DAO, 2022).

Boost industry performance | Another opportunity follows from the fact that the sector is currently performing well. The health care sector is among the best performers in terms of annualized returns, in both the regular and risk-adjusted statistics. The sector has strong balance sheets, and has much cash available for dividends and M&A. As mentioned, the DAO structure could improve this fact by not needing to pay out executive bonuses from these cash reserves. Furthermore, the sector has a positive outlook, as the long-term demographic trends are beneficial, as the global population is aging and the middle class is growing. They will demand more extensive drug treatments and medical care over time, increasing the outlook for the sector. There also is a return in demand for elective procedures, drug sales, medical equipment and diagnostics, possibly increasing earnings, and the supreme court recently rejected the case to dismantle the affordable care acts in the United States. Lastly, the sector will likely profit from the peaking economic growth. The DAO structure allows for quick and large-scale investments in the sector could be realized, capitalizing on the attractive performances, so that it could be a good fit (SCFF, 2022f).

Governance process | Since the health care sector will likely benefit from more participation and suggestions when it regards research purposes, rather than from automation, the participatory structure might be the most beneficial. For this, it could be useful to install a (democratically chosen) oversight committee, to make sure that proposals are reviewed with respect to feasibility, so that the chances of success increase. However, when it concerns the production or distribution processes, an algorithmic DAO might be of benefit to cut as many costs as possible with regard to human interaction to keep the services affordable. A combination of both with respect to an overarching participatory DAO, and an algorithmic sub-DAO for the automated processes could be of benefit as well.

Legal personality | Another opportunity can be found in the possibility for a DAO to be granted legal personality. Even though the health care sector carries a relatively low amount of risk (Appendix 2), it could still be beneficial to limit this risk for the members by granting them limited liability. If a costly project would then fail, they are not personally liable for the losses made. The legal personality also grants DAOs more opportunities with regard to the distribution and interaction with real-world parties: as soon as you developed a certain drug or equipment product, it is necessary to be able to sell the product or the results. Even though NFTs provide a licensing option, it would still be good to have a FIAT-based alternative for the more conservative or risk-averse customers that are not willing to trade by means of cryptocurrencies. Additionally, a DAO would be perceived less risky in such a case, so that unnecessary high costs with regard to searching a counterparty and agreement terms would be avoided, cutting the costs in the sector even more. Lastly, it would provide the possibility to contract employees in an easier and more secure manner, as they are not personally liable, and as they can be paid out in FIAT-currencies if they would prefer so (Wright, 2021; Bellavitis et al., 2022; Mienert, 2021).

Even in case legal personality would not be possible, DAOs have several options to structure a DAO in such a way that issues with regard to liabilities, interaction, scalability, lack of expertise and lack of legal personality can be solved. As mentioned before, a DAO can use an offshore structure to combine the benefits of a DAO with the benefits of a traditional company, such as being able to transact with FIAT-currencies. Furthermore, the DAO could make use of a

governance structure that is more fragmented and expertise-based, and it also makes it possible to grant only one sub-division legal personality to have a bigger chance at keeping the community content (Mienert 2021).

Decentralization, power and competition | Another opportunity rises with respect to competition-considerations. Even though the health care sector is not concentrated in comparison to other sectors – it ranked tenth - (Appendix 10), it is still the target of anti-competitive regulations due to their power with respect to pricing and their monopolies following from their patents (BRON). DAOs are decentralized, so that there cannot be one person who will become very powerful. The smart contracts or the operating agreement can prevent such events from happening by adding a provision in which a quorum would be required for a vote, or in which the ownership percentage of a single actor could be maximized on for instance 49%. Furthermore, as explained, DAOs are able to cut costs, so that it might be easier to remain the prices lower, and thus fairer. This might be interesting as it would be less of a risk if a DAO would become a successful organization, remaining the competition fair (Bellavitis et al., 2022).

9.9.3 Weaknesses

Voting and governance | A first weakness for the health care sector regards the fact that governance of DAOs could be less effective that it appears in the first place. The health care sector is highly technical in nature, so that reading and understanding proposals might be more difficult than expected. This effect could be strengthened when many complex proposals should be voted on, as this could increase the time and effort that should be put in, increasing the possible delay or nonchalance with regard to voting. This would decrease the efficiency of the decision-making process in the DAO, which would increase agency costs (Wright 2021; Bellavitis et al., 2022).

Lack of a code of conduct/ security | Furthermore, the health care sector also faces concerns with regard to the lack of a code of conduct and security. Even though blockchain appears to be one of the safest options with regard to data storage, there still prevails a risk of a cyberattack. Since the health care sector often works with personal and medical data of individuals, it could be relatively harmful if that information would be stolen and made public due to a cyberattack. Furthermore, the lack of a code of conduct increases this concern: there is no code of conduct as to how the DAO should handle the personal and medical data, so that there is a higher risk with regard to malicious use of the data.

Anonymity | A last weakness concerns the anonymity of members that DAOs allow for: as soon as the DAO will be held liable, and the members will become jointly and severally liable, it might be rather difficult to track the members. This could result in a situation with free-riders, increasing agency costs due to information asymmetry and the decrease in trust in the members.

9.9.4 Threats

Lack of a legal wrapper | Even though the health care sector bears a relatively low risk in comparison to other sectors (Appendix 2), the lack of formal legal personality of DAOs could be a

major threat, especially regarding liability issues. Since medical research generally involves high research and development costs, the liabilities would be high when a project would fail, even if the chance of that project failing is low. Since this would lead to the members being jointly and severally liable, in the worst case for their personal properties, this could lead to major problems for the members. This could decrease the attractiveness of DAOs, as investors and members might be more cautious when entering or starting a DAO in a sector with such risk involved. Another threat following from the lack of legal personality concerns the possibility to interact with the real world. The health care sector deals with many types of customers, most of which might be rather conservative or risk-averse. As already mentioned in the opportunities sector, DAOs are perceived risky if they lack legal personality, so that it might become more difficult to find parties to interact with, increasing searching costs, and that the terms of agreement might be more expensive due to distrust, increasing the transaction costs (Wright 2021, Bellavitis et al., 2022; Mienert, 2021).

Use of cryptocurrencies | Another threat can be found in the use of cryptocurrencies. These currencies are highly fluctuating, which increases the risk around these transactions. Since the counterparties in the health care sector are likely conservative and risk-averse, this could create a huge limitation. This effect is strengthened by the fact that the transactions in the health care sector are generally of huge values, so that a sudden increase in value of a currency could increase the transaction value significantly. This is not desired, as the amounts to be paid are already high, and since it concerns the health care sector it is very important to remain the products affordable. Since the goal of DAOs should be to cut costs, increasing them would be uncalled for. However, it should be noted that this threat could be fixed when legal personality would be granted.

Regulatory, sector-specific and societal (price) uncertainty | There are also threats regarding the performance of the sector. First, the costs in extended-care facilities might increase due to virus mitigation requirements. Second, the surge in COVID-19 variants could reduce the demand for elective medical care, decreasing the earnings in that part of the sector. Furthermore, the general economic uncertainty as a result of the Russia/Ukraine war also plays a role in this threat. Such uncertainty-increasing events increase the volatility of the prices within the sector, resulting in the industry being perceived riskier (SCFF, 2022f). These events could decrease the profitability of the sector, decreasing the attractiveness of the sector for investors and investor-based DAOs.

Regulatory risks | Another threat related to legislation and regulation. First, it is important to mention that DAOs follow from the blockchain community, the members of which are known for their aversion towards regulation. Therefore, that could on itself be a reason for the community to stay away from the sector. Furthermore, these regulations aim to control drug prices or raise corporate taxes, which could decrease the profit margins of the companies in the sector (SCFF, 2022f). The anti-competitive regulations also limit the sector in its operations, increasing compliance costs, which also weigh on the profit margins. Therefore, this could be a threat for DAOs to be a good fit for the sector.

Qualification of tokens | Another threat concerns tokenization. As previously mentioned, the uncertainty regarding the classification of DAO tokens as securities is – apart from the United States (SEC, 2017) – a worldwide uncertainty, so that (potential) members from any jurisdictions might be cautious about joining or starting a DAO (Bellavitis et al., 2022).

Accessibility | A last threat concerns the accessibility of the sector. As mentioned, the health care sector is not among the most concentrated sectors, but this could potentially change with the introduction of Amazon Care (Amazon, 2022). This is a hybrid telehealth/in-person health care offering. Since Amazon has proved to be powerful in other sectors, this could potentially become the case for this sector as well. If that would happen, it could be difficult for new DAOs to enter the market and be successful. However, this is a future threat, rather than a current concern.

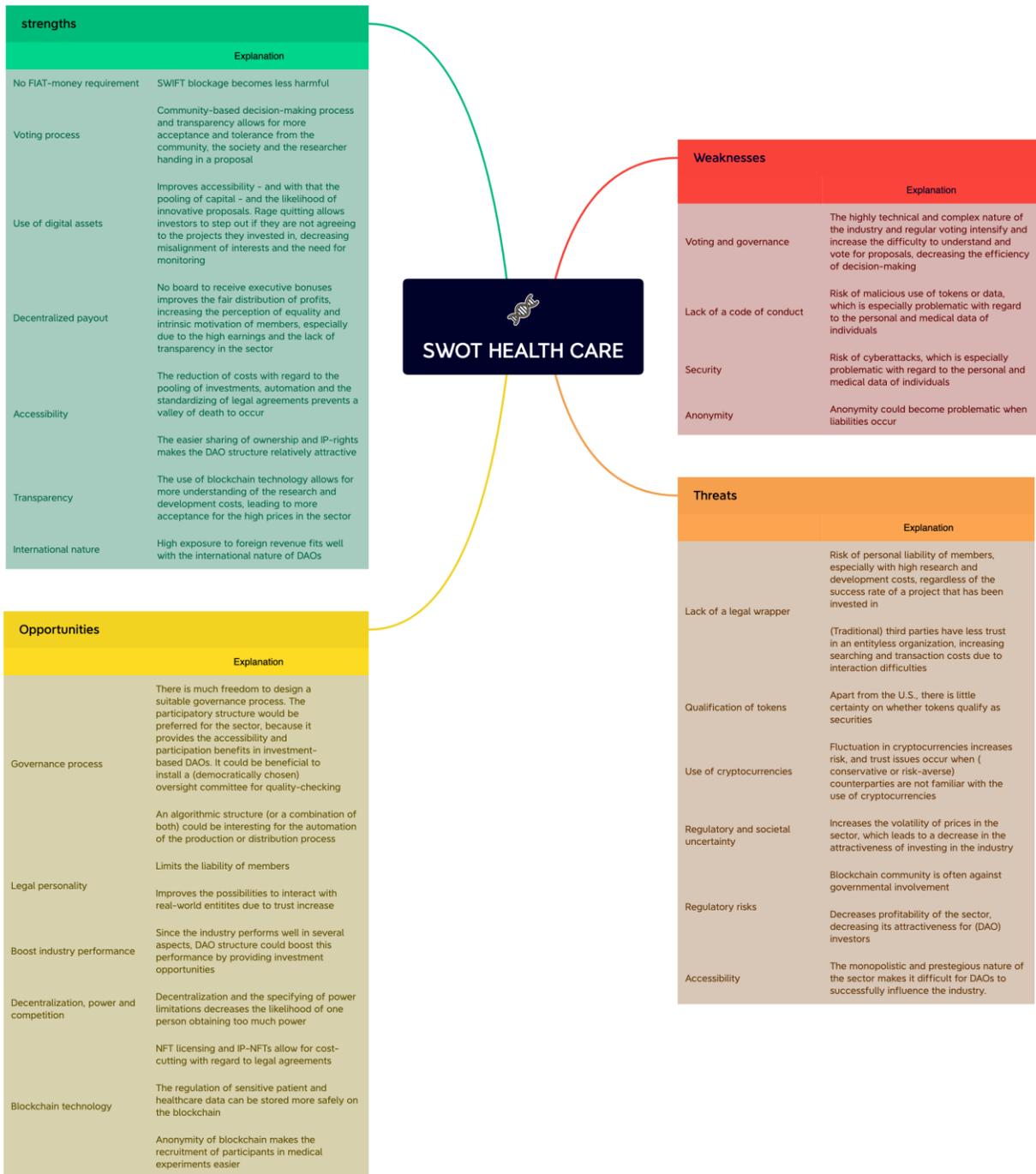


Figure 7: SWOT Health Care Sector

9.10 Financials Sector

The Financials Sector contains companies involved in banking, thrifts & mortgage finance, specialized finance, consumer finance, asset management and custody banks, investment banking and brokerage and insurance. It also includes Financial Exchanges & Data and Mortgage REITs. (Appendix 1).

9.10.1 Strengths

No FIAT-money requirement | A first strength, which can be found in all sectors, is that of DAOs making use of cryptocurrencies. It could be beneficial to use a DAO structure, because they are not fully reliant on FIAT-currencies when (innocent) persons or entire countries would be denied access to SWIFT. DAOs allow these persons to still be able to conduct business or invest by means of cryptocurrencies, rather than by means of FIAT-currencies, by joining or starting a DAO. However, for this particular industry, it could also provide a specific opportunity. This will be elaborated on in the opportunities sector.

Voting process | A second strength concerns the voting procedure of DAOs. As mentioned, the voting procedure of DAOs allows for more involvement, security and transparency. This would, on its turn, lead to a more efficient decision-making mechanism, reducing agency costs. Furthermore, the community-based decision making generally increases the acceptance of the decisions, because such decisions have been made on a community level and are free for audit, rather than it being ‘secretly’ decided by an executive board consisting of elite managers. This also reduces agency costs with regard to monitoring, information asymmetry and trust: as explained earlier, there is less concern for fraudulent or opportunistic behavior from the executive board with such transparency. Note should be taken of the fact that this community-based voting system would mostly be beneficial for the subsectors that regard investments, rather than for the subsectors that solely provide finance without investment purposes. For the latter, it would make more sense to have a fully automated DAO with a smart contract that states the requirements for finance, rather than having a community deciding on whether someone is eligible for finance. For the investment banking DAOs, however, it could be beneficial, because community-based decision making makes it more likely that the interests of the members are aligned with the interests of the DAO and its investment purposes, so that there are less agency costs needed to control whether these interests are still aligned. This has been proven effective in practice, as there are a lot of (mostly venture capital) DAOs that are booking successes. These successes are often due to the ease with which someone can hand in a proposal for a new project (Wright 2021; Cumming et al., 2022; Bellavitis et al., 2022).

Use of digital assets | This use of digital assets could also be beneficial for the sector, as it makes the sector more accessible due to the quick and easy manner to become a DAO member. First, this provides the advantage that a huge amount of capital can be pooled within a relatively short period of time. This can be a major benefit when it regards investment banking/venture capital DAOs. However, this could be beneficial for any financing DAO – even if it would be designed to be automated – as capital and liquidity form the basis of the financial sector (BRON). Furthermore, this allows a broader group of investors to become a part of the sector, without the bureaucratic burdens that they would face in the traditional organizations in the industry. Lastly, the use of

digital assets also allows members to leave the DAO within a matter of seconds. If a member is not agreeing with the project that a DAO invests in, this member can easily leave the DAO and – often – regain its deposit. This creates more trust between the member in terms of the trust in their commitment, reducing the agency costs with respect to monitoring the members in making sure that their interests are aligned with those of the company (Wright, 2021; Bellavitis et al., 2022).

Decentralized payout | As explained, DAOs do not encounter the same issues with regard to (executive) compensation as traditional organizations due to their decentralized nature: there is less need to pay out executive bonuses due to the lack of a managerial board, and if there would be bonuses to be paid, the community-based decision-making allows for more acceptance, transparency and justification for those decisions. This would likely decrease agency costs with respect to misalignments of interest. Furthermore, since the financial sector has been criticized for executive compensation for years already, this structure could potentially improve the image of the industry.

9.10.2 Opportunities

Boost industry performance | A first opportunity concerns that the DAO structure could work rather well for a sector that is currently having good expectations and performance. The rising interest rates for both the long- and the short-term would provide a good outlook for the sector. Furthermore, the sector has a strong financial position, has attractive valuations, and will release high loan loss reserves as a result of low default rates due to a strong economic growth. This will support the earnings growth of the sector. This can make it attractive to invest in the sector, as the profits are likely to be high (SCFF, 2022f). Since the DAO structure allows for such quick and possibly large-scale investments, it could be a good fit.

Governance process | The financial sector provides varying types of services, so that it is convenient that there are many possibilities that can each be tailored to the type of service provided. For investment banking/venture capital purposes, a participatory DAO would be the most beneficial. For such projects, the community must decide on which projects to fund, so that it makes sense to stimulate this interaction, especially with regard to the ease with which a more diversified group of people can hand in proposals for new projects to invest in. For the solely finance-based subsectors, however, an algorithmic DAO might be preferred. As mentioned in the strengths section, there are quite some subsectors in which the organization decides on whether or not someone obtains finance. It would not be desired if that can be decided by the community in every case, especially not when it regards governments or consumers. Therefore, an algorithmic structure that provides these funds automatically on the basis of pre-determined requirements could prevail. Furthermore, it could be possible to (democratically) appoint an expert or group of experts to decide on discretionary cases. This prevents the community from becoming too powerful over the funding of such ‘vulnerable’ groups.

Legal personality | Another opportunity can be found in the possibility for a DAO to be granted legal personality. Since the sector faces a relatively high amount of risk (Appendix 2), it could be beneficial to limit this risk for the members by granting them limited liability. This allows members to make safer investments, and prevents them from being jointly and severally liable if the DAO

obtains debt. The legal personality furthermore grants DAOs more opportunities with regard to interaction: if finance DAOs can also work with FIAT-currencies, it makes it easier to obtain a sufficient amount of customers, especially when it regards mere funding without project-investment purposes. Furthermore, it would lead to the DAO being perceived less risky, leading to lower searching and transaction (agreement terms) costs. The same advantage holds for paying contractors or employees, as the DAO is now able to set up these contracts and hire them. This also allows the employees to be hired in a rather safe way, as they are not having the risk of becoming jointly and severally liable for the DAOs debt as a member (Wright, 2021; Bellavitis et al., 2022; Mienert, 2021).

Even in case legal personality would not be possible, DAOs have several options to structure a DAO in such a way that issues with regard to liabilities, interaction, scalability, lack of expertise and lack of legal personality can be solved. As mentioned before, a DAO can use an offshore structure to combine the benefits of a DAO with the benefits of a traditional company, such as being able to transact with FIAT-currencies. Furthermore, the DAO could make use of a governance structure that is more fragmented and expertise-based, and it also makes it possible to grant only one sub-division legal personality to have a bigger chance at keeping the community content (Mienert, 2021).

(Familiarity with) blockchain technology | A last opportunity follows from the fact that DAOs make use of blockchain technology. As recently came out, Russia is already working on a blockchain payment system that could replace SWIFT (Blockchain Counsel, 2022). This shows that there is opportunity with regard to the usage of blockchain for payments. As can be found in its characteristics, blockchain allows for secure, transparent and permanently remaining transactions. This could benefit the sector, because this furthermore allows for a quicker transfer of funds (BRON). This can make the transfer of money become seamless and automated through smart contracts, which increases the efficiency and significantly cuts costs with regard to employees, time and contract drafting. The anonymity of blockchain can also make it easier for consumers to request finance, than if their name would be tied to the loan. The fact that blockchain has already been used in the financial sector, as the sector already considers the risk of financial technology companies taking over market share from traditional banking companies (BRON) shows that the sector has gotten used to this type of finance, cryptocurrencies and the related crypto-exchanges (BRON). This makes it possible to make an easier shift to DAOs than sectors that have no experience with the usage of blockchain technologies.

9.10.3 Weaknesses

Voting and governance | One of the most occurring weaknesses, which also holds for this sector, would be that of the governance process. Even though the idea behind participation and voting is appealing, practice has shown that the voting could be less efficient and more costly than expected, especially when there are many different types of projects to vote on or when agreements that are highly technical should be agreed upon in a voting procedure. This could increase the time and research that members should dedicate to the voting process, leading to delay or non-voting. On its turn, this could decrease the efficiency of the decision-making process, reducing the agency theory

argument on agency cost reducing as a result of an increased efficiency (Wright, 2021; Bellavitis et al., 2022).

Lack of a code of conduct / Security | The lack of a code of conduct and (cyber)security concerns could also rise concerns. Since it currently often occurs that personal data of customers are stored for financing purposes, and because their money is stored in the DAO in case of savings, these concerns could become very problematic. If a cyberattack occurs, this is a realistic risk, the money could be stolen or personal data and financial information could leak, which is highly undesirable. Furthermore, the lack of a code of conduct creates concerns with regard to the issuance of tokens and the potential of malicious use of these tokens: it could become a concern when one member would obtain a majority of the total token value without a code of conduct stopping this person from obtaining the power of the full amount of funds and data within the DAO.

Anonymity | A last weakness concerns the anonymity of members that DAOs allow for: as soon as the DAO will be held liable, and the members will become jointly and severally liable, it might be rather difficult to track the members. This could result in a situation with free-riders, increasing agency costs due to information asymmetry and the decrease in trust in the members. Furthermore, such anonymity might not be desired when it regards the finance of individuals or governments: it could become problematic when it is unclear who obtains access to (financial) data on individuals.

9.10.4 Threats

Lack of a legal wrapper | One of the most important threats concerns the lack of formal legal personality. Firstly, it could lead to the aforementioned liability concerns. As mentioned, the financial sector encounters a relatively high (long-term) risk, so that it would be concerning when considering that the members would be personally liable in case of a downfall (Appendix 2). This could decrease the attractiveness of DAOs, as investors and members might be more cautious when entering or starting a DAO in a sector with such risk involved. Another threat following from the lack of legal personality concerns the possibility to interact with the real world. As previously discussed, when DAOs are perceived risky due to not having legal personality, a lack of trust raises and agency costs raise due to higher searching costs and transaction costs. Even though the financial sector might also gain a subsector with a full focus on cryptocurrencies, making this less of an issue, it would still be a problem when such an organization would like to expand to a full-service investment or banking organization, as that would likely require the possibility to work with FIAT-currencies (Wright, 2021; Mienert, 2021; Bellavitis et al., 2022).

Regulatory, sector-specific and societal (price) uncertainty | There can also be found a threat in the performance of the sector. The current high cash levels and low loan demand hamper the revenues for a while, but it should be noted that this issue is seeming to resolve soon. Furthermore, the financial conditions are tightening and the risk to economic growth is increasing – weighing on the long-term interest rates - due to the Russian/Ukraine war. The raise in the short-term interest rates by the Federal Reserve is also reducing economic growth. These uncertainty-increasing events increase the volatility of the prices within the sector, resulting in the industry being perceived riskier, causing a major issue when liability concerns rise or when investments are involved (SCFF, 2022f).

Regulatory risks | Another threat related to legislation and regulation. First, it is important to mention that DAOs follow from the blockchain community, the members of which are known for their aversion towards regulation. Therefore, that could on itself be a reason for the community to stay away from the sector. Furthermore, these banking regulations could increase compliance costs, as time and effort should be put in understanding and complying to these regulations, which also weigh on the profit margins. Therefore, this could be a threat for DAOs to be a good fit for the sector (SCFF, 2022f).

Qualification of tokens | Another threat concerns tokenization. As previously mentioned, the uncertainty regarding the classification of DAO tokens as securities is – apart from the United States (SEC, 2017) – a worldwide uncertainty, so that (potential) members from any jurisdictions might be cautious about joining or starting a DAO (Bellavitis et al., 2022).

Use of cryptocurrencies | A less relevant threat can be found in the use of cryptocurrencies. This is only relevant when it concerns finance operations that are not crypto-related. As cryptocurrencies are highly fluctuating, which increases the risk around these transactions. When these will be involved in transactions with counterparties that are risk-averse, such as consumers or governments, this could create a huge limitation. If their deposits or loans value suddenly drop or rise significantly, that could increase the discontent and the certainty around those deposits or loans: they would not be happy if they would suddenly owe the financial organization much more money than anticipated on. However, it should be noted that this threat could be fixed when legal personality would be granted, because in such cases the risk-averse parties could choose to work with FIAT-currencies rather than with cryptocurrencies (Bellavitis et al., 2022).

Target group | A last threat would be that of the question whether DAOs would be the right structure for consumer- and governmental related finance. As mentioned, if a DAO provides finance to such parties, it has a certain power over those finance-requesters by deciding on whether and how much finance they receive. It is questionable whether such decisions should be up to a community vote, and if such data should become available to members that are anonymous. This could, however, be fixed by initiating a fully algorithmic DAO or an appointed counsel/expert. Furthermore, this is much less of a concern for the investment banking and venture capital side of the sector.

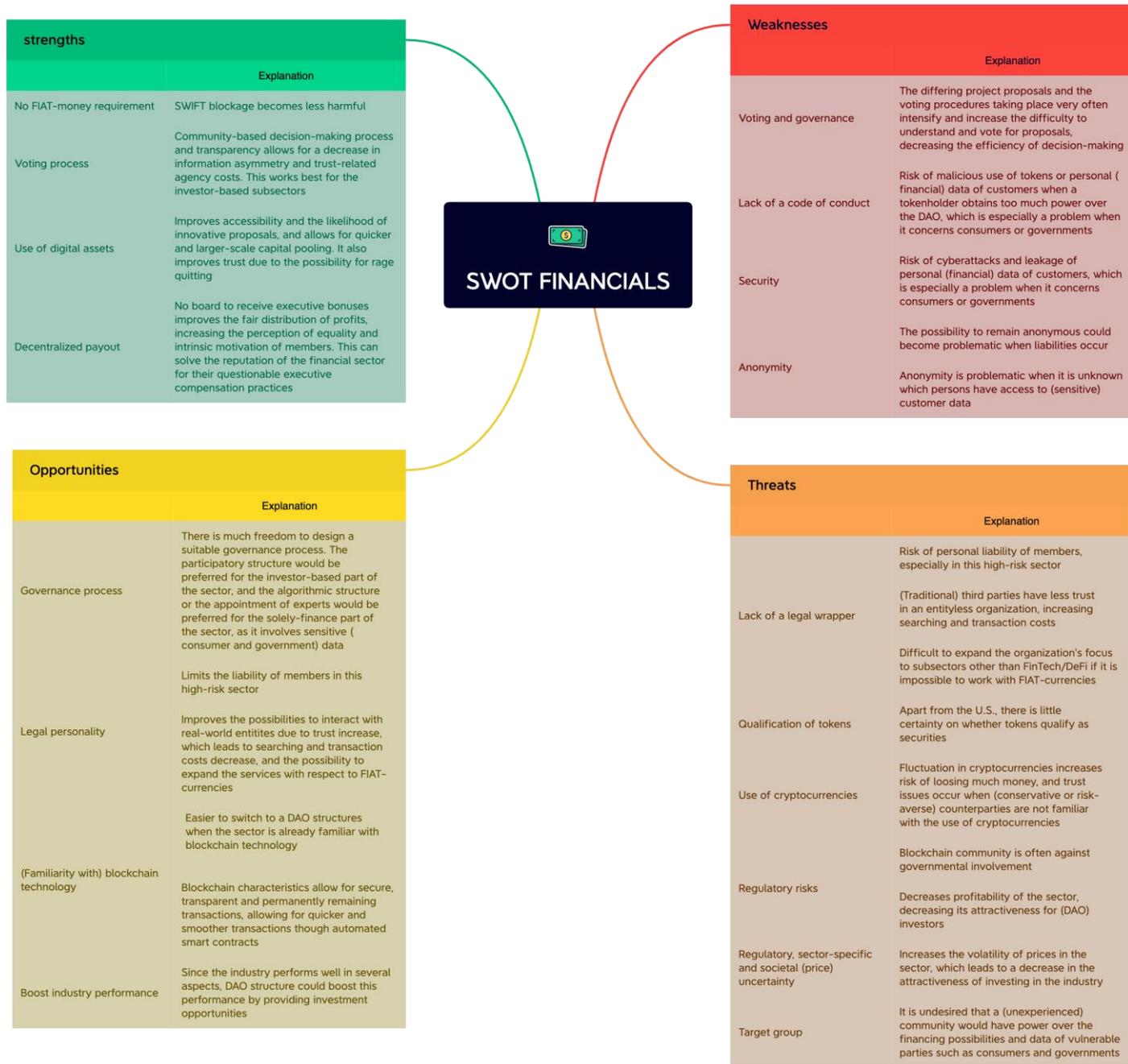


Figure 8: SWOT Financials Sector

9.11 Information Technology Sector

The Information Technology Sector comprises companies that offer software and information technology services, manufacturers and distributors of technology hardware & equipment such as communications equipment, cellular phones, computers & peripherals, electronic equipment and related instruments, and semiconductors. (Appendix 1).

9.11.1 Strengths

No FIAT-money requirement | The first strength for the IT sector, is that of the use of cryptocurrencies. DAOs are not fully reliant on FIAT-currencies when (innocent) persons or entire countries would be denied access to SWIFT. DAOs allow these persons to still be able to conduct business or invest by means of cryptocurrencies, rather than by means of FIAT-currencies, by joining or starting a DAO. However, for this particular industry, it could also provide a specific opportunity. This will be elaborated on in the opportunities sector.

Voting procedure | A second strength concerns the voting procedure of DAOs. As seen in the previous SWOTs as well, the voting procedure of DAOs allows for more involvement, security and transparency. This would, on its turn, lead to a more efficient decision-making mechanism, reducing agency costs. Furthermore, the community-based decision making generally increases the acceptance of the decisions, because such decisions have been made on a community level and are free for audit, rather than it being ‘secretly’ decided by an executive board consisting of elite managers. This also reduces agency costs with regard to monitoring, information asymmetry and trust: as explained earlier, there is less concern for fraudulent or opportunistic behavior from the executive board with such transparency. The fact that the persons diving in the IT-sector are generally familiar with blockchain technologies or functioning in the digital space strengthens this argument, because it would take comparably less time to get familiar with the voting process, decreasing the decision-making costs even more (Wright, 2021; Bellavitis et al., 2022).

Use of digital assets | The sector could furthermore benefit from the use of digital assets. First of all, this increases the accessibility of the sector. The highly concentrated sector (BRON/appendix) could benefit from having new people joining the sector, which is possible DAOs allow members to become a member by buying a token within a matter of seconds. This could, on its turn, benefit the sector by the increased ease of pooling much capital to fund (innovative) projects in a relatively short time frame. Furthermore, a more diversified group of members is allowed to hand in proposals and vote for them. This increases the participation of members, as well as the possibility of new, innovative and high-quality proposals. Lastly, the use of digital assets also allows members to leave the DAO within a matter of seconds. If a member is not agreeing with the project that a DAO invests in, this member can easily leave the DAO and – often – regain its deposit. This creates more trust between the member in terms of the trust in their commitment, reducing the agency costs with respect to monitoring the members in making sure that their interests are aligned with those of the company (Wright, 2021; Bellavitis et al., 2022).

Decentralized payout | As explained, DAOs do not encounter the same issues with regard to (executive) compensation as traditional organizations due to their decentralized nature: there is less

need to pay out executive bonuses due to the lack of a managerial board, and if there would be bonuses to be paid, the community-based decision-making allows for more acceptance, transparency and justification for those decisions. This would likely decrease agency costs with respect to misalignments of interest.

Compatibility and adaptability | A last strength, that is highly sector-related, is that of the compatibility and the adaptability. The IT sector often creates and works with digital technologies, including blockchain, so that it is easier for the sector to get used to, understand and adapt to the DAO structure. As it turns out, there are quite a lot of DAOs already that develop DAO tools or Web3 products, products that are highly related to this field of technology. This does not only, as mentioned, increase the ease in which organizations in the sector could adapt to the structure, but also their understanding of the structure. This decreases the time and effort they should put in to get familiar with the structure, decreasing costs related to the familiarization process.

9.11.2 Opportunities

Boosting industry performance / A first opportunity concerns that the DAO structure could work rather well for a sector that is currently having good expectations and performance. The introduction of 5G and onshoring trends support the fundamentals of the sector. Furthermore, the balance sheets and earnings growth potential are fairly positive, while the funding costs within the sector are low. The long-term growth perspective is also positive, because businesses are likely to enhance their productivity with tech investments due to the pandemic, the higher wages, labor shortages and input inflation. The chip industry is also showing much revenue growth. Lastly, the capital expenditures are optimizing, especially with regard to the higher technology infrastructure spending. This concerns, for instance, the increase in investments in robotics and automation, the transformation towards big data and cloud computing, software and artificial intelligence, smartphones, tablets and network interfaces (SCFF, 2022g). If more DAOs are put in place, who need this technology infrastructure, these numbers would increase even more. This can make it attractive to invest in the sector, as the profits are likely to be high. Since the DAO structure allows for such quick and possibly large-scale investments, it could be a good fit.

Governance process / The IT sector provides both products and services, because of which it is advantageous that there are many possibilities with regard to the governance design. Since many IT-companies also have experience with the underlying technology, they are likely to get the most out of these structural possibilities, as they know the pros and cons of the systems. If the DAO aims at investments, a general participatory DAO could be valuable, as it allows the community to decide on which projects are worth funding. This improves the interaction and participation of members. If an IT-organization would choose to be a non-investor DAO, but rather a community of ‘employees’, a worker collective structure could be of interest. Since the quality of the products and services could be dependent on the commitment of the employees, it would be advantageous to stimulate this commitment. Since (only) the ‘employees’ are part of the decision-making chain, they have significant influence on the direction of the company and the work they are doing, it allows them to feel more involved in the organization’s successes, and it allows them to have a more diverse set of proceedings if they would desire that. If the employees are content and motivated, this could on its turn increase efficiency and alignment of interests, reducing agency

costs. In that manner, a DAO could provide an opportunity for the sector (Wright, 2022; Glaveski, 2022).

Legal personality | Another opportunity can be found in the possibility for a DAO to be granted legal personality. Since the sector faces a relatively high amount of risk (Appendix 2), it could be beneficial to limit this risk for the members by granting them limited liability. This allows members to make safer investments, and prevents them from being jointly and severally liable if the DAO obtains debt. The legal personality furthermore grants DAOs more opportunities with regard to interaction: if finance DAOs can also work with FIAT-currencies, it makes it easier to obtain a sufficient amount of customers, especially when it concerns traditional customers that are only getting the product or service because they are not familiar with the technology themselves. Furthermore, it would lead to the DAO being perceived less risky, leading to lower searching and transaction (agreement terms) costs. The same advantage holds for paying contractors or employees, as the DAO is now able to set up these contracts and hire them. This also allows the employees to be hired in a rather safe way, as they are not having the risk of becoming jointly and severally liable for the DAOs debt as a member (Wright, 2021; Mienert 2021; Bellavitis et al. 2022).

Even in case legal personality would not be possible, DAOs have several options to structure a DAO in such a way that issues with regard to liabilities, interaction, scalability, lack of expertise and lack of legal personality can be solved. As mentioned before, a DAO can use an offshore structure to combine the benefits of a DAO with the benefits of a traditional company, such as being able to transact with FIAT-currencies. Furthermore, the DAO could make use of a governance structure that is more fragmented and expertise-based, and it also makes it possible to grant only one sub-division legal personality to have a bigger chance at keeping the community content. The IT-sector will likely be able to benefit from these alternatives the most, because they are the most familiar with building such models on-chain (Mienert, 2021).

Decentralization, power and competition | A last opportunity follows from the decentralized nature of DAOs. The IT-sector is among the most concentrated sectors, with tech-giants such as Apple and Microsoft. Since this could raise concerns for fair competition, this is not necessarily a desirable situation. DAOs, however, use a decentralized structure, which prevents specific persons to obtain too much power. Since this concerns the IT-sector, these developers likely know how to develop a governance model that does not allow a member to obtain too much power – preventing power concerns from happening – by adding clauses to the smart contract that block a token transaction when it would result in a member obtaining 50% or more of the total token value. Furthermore, DAOs are able to cut costs in several aspects, so that there is less likelihood to ask unreasonably high prices, decreasing the competition concerns even more. If enough DAOs would follow this and enter the sector, the sector might reduce its reputation of being a highly concentrated sector, reducing the antitrust risk (Bellavitis et al., 2022).

9.11.3 Weaknesses

Voting and governance | One of the most occurring weaknesses, which also holds for this sector, would be that of the governance process. Even though the idea behind participation and voting is appealing, practice has shown that the voting could be less efficient and more costly than expected,

especially when there are many different types of projects to vote on or when agreements that are highly technical should be agreed upon in a voting procedure. This could increase the time and research that members should dedicate to the voting process, leading to delay or non-voting. Since the IT-sector concerns highly technical products and services, it would become difficult to understand for investors that do not have a technology-related background, which makes this a realistic weakness for the more investor-based DAOs. On its turn, this could decrease the efficiency of the decision-making process, reducing the agency theory argument on agency cost reducing as a result of an increased efficiency. This could, however, be less of a weakness for the worker collective DAOs, as they are generally familiar with the highly technical terms in the proposals (Wright, 2022; Bellavitis et al., 2022).

Lack of a code of conduct / Security | The lack of a code of conduct and (cyber)security concerns could also rise concerns. The lack of a code of conduct creates concerns with regard to the issuance of tokens and the potential of malicious use of these tokens: it could become a concern when one member would obtain a majority of the total token value without a code of conduct stopping this person from obtaining the power of the full amount of funds and data within the DAO. The cybersecurity risk, however, could be less of a risk in comparison to other industries, because technology-related organizations are likely able to spot bugs and security concerns quicker than those in sectors that have little familiarity with the underlying technology of DAOs.

Anonymity | A last weakness concerns the anonymity of members that DAOs allow for: as soon as the DAO will be held liable, and the members will become jointly and severally liable, it might be rather difficult to track the members. This could result in a situation with free-riders, increasing agency costs due to information asymmetry and the decrease in trust in the members. However, again, this is less of a risk for worker collective DAOs, because those DAOs tend to be smaller and a closer community, so that it is less likely that members will remain anonymous.

9.11.4 Threats

Lack of a legal wrapper | One of the most important threats concerns the lack of formal legal personality. Firstly, it could lead to the aforementioned liability concerns. As mentioned, the IT sector encounters a high (long-term) risk, so that it would be concerning if the members would be personally liable in case the DAO gets in debt (Appendix 2). This could decrease the attractiveness of DAOs, as investors and members might be more cautious when entering or starting a DAO in a sector with such risk involved. Another threat following from the lack of legal personality concerns the possibility to interact with the real world. As previously discussed, when DAOs are perceived risky due to not a lack legal personality, a lack of trust raises and agency costs raise due to higher searching costs and transaction costs.

Use of cryptocurrencies | A related threat can be found in the use of cryptocurrencies. As cryptocurrencies are highly fluctuating, this increases the risk around these transactions. The IT-sector might be less influenced by this threat, because many of their customers are likely familiar with technology and cryptocurrencies, and would be willing to make these payments in cryptocurrencies. However, when they want to expand their business to the ‘traditional’ world, they will be involved in transactions with counterparties that are risk-averse, such as consumers or

governments, this could create a huge limitation. This could decrease the trust even more. However, it should be noted that this threat could be fixed when legal personality would be granted, because in such cases the risk-averse parties could choose to work with FIAT-currencies rather than with cryptocurrencies (Bellavitis et al., 2022).

Regulatory, sector-specific and societal (price) uncertainty | There can also be found a threat in the performance of the sector. Firstly, the valuations of IT-companies are relatively stretched in comparison to the historical average, so that the increase in interest rates could be a headwind for the sector. Furthermore, semiconductors are in short supply due to low inventories and a strong demand. Furthermore, there is uncertainty due to the Russian/Ukraine war (SCFF, 2022g). These uncertainty-increasing events increase the volatility of the prices within the sector, resulting in the industry being perceived riskier, causing a major issue when liability concerns rise or when investments are involved.

Regulatory risks | Another threat related to legislation and regulation. First, DAOs follow from the blockchain community, the members of which are known for their aversion towards regulation. Therefore, that could on itself be a reason for the community to stay away from the sector. Furthermore, the sector is often the target of antitrust/competition laws due to the high concentration in the sector. Even if the DAO would not necessarily breach those laws as they are not as big as the other players in the sector, there might be a higher surveillance on the sector. This could increase the necessity to put in time and effort to understand and comply to these regulations, increasing compliance costs, which also weigh on the profit margins. Therefore, this could be a threat for DAOs to be a good fit for the sector (SCFF, 2022g).

Qualification of tokens | Another threat concerns tokenization. As previously mentioned, the uncertainty regarding the classification of DAO tokens as securities is – apart from the United States (SEC, 2017) – a worldwide uncertainty, so that (potential) members from any jurisdictions might be cautious about joining or starting a DAO (Bellavitis et al., 2022).

Accessibility | A last threat concerns the accessibility of the sector. As mentioned, the IT sector is among the most concentrated sectors, Therefore, it could be difficult for new DAOs to enter the market and be successful. However, it should be taken into account that the biggest players are not in the field of building DAO tools for instance, so that there is some discretion with regard to the subsectors possible.

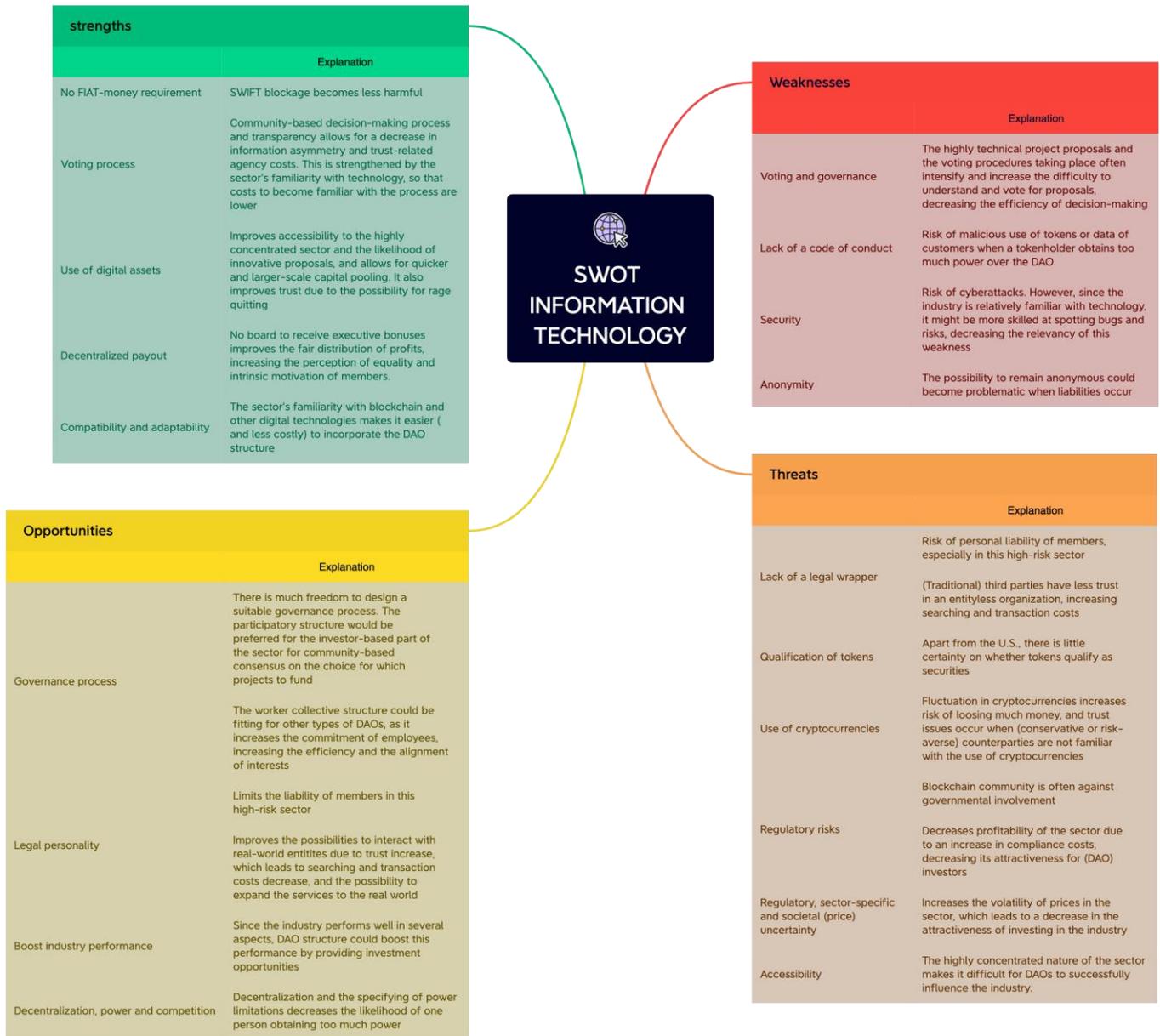


Figure 9: SWOT Information Technology Sector

9.12 Communication Services Sector

The Communication Services Sector includes companies that facilitate communication and offer related content and information through various mediums. It includes telecom and media & entertainment companies including producers of interactive gaming products and companies engaged in content and information creation or distribution through proprietary platforms. (Appendix 1).

9.12.1 Strengths

No FIAT-money requirement | The first strength for the communications services sector, is that of the use of cryptocurrencies. DAOs are not fully reliant on FIAT-currencies when (innocent) persons or entire countries would be denied access to SWIFT. DAOs allow these persons to still be able to conduct business or invest by means of cryptocurrencies, rather than by means of FIAT-currencies, by joining or starting a DAO.

Voting process | A second strength concerns the voting procedure of DAOs. As seen in the previous SWOTs as well, the voting procedure of DAOs allows for more involvement, security and transparency. This would, on its turn, lead to a more efficient decision-making mechanism, reducing agency costs. Furthermore, the community-based decision making generally increases the acceptance of the decisions, because such decisions have been made on a community level and are free for audit, rather than it being ‘secretly’ decided by an executive board consisting of elite managers. This also reduces agency costs with regard to monitoring, information asymmetry and trust: as explained earlier, there is less concern for fraudulent or opportunistic behavior from the executive board with such transparency. What is particularly interesting, is the possibility for members or the outside public to read and understand the decisions that are made by the organization. Society has been criticizing a part of the sector for its lack of transparency on, for instance, the algorithms. If such proposals for algorithms are introduced to a DAO, these remain open for everyone to see – to a certain extent – so that there might be more tolerance and acceptance towards the usage thereof (Wright, 2022; Bellavitis et al., 2022).

Use of digital assets | The sector could furthermore benefit from the use of digital assets. First of all, this increases the accessibility of the sector. The highly concentrated sector (BRON/appendix) could benefit from having new people joining the sector, which is possible DAOs allow members to become a member by buying a token within a matter of seconds. This could, on its turn, benefit the sector by the increased ease of pooling much capital to fund (innovative) projects in a relatively short time frame. Furthermore, a more diversified group of members is allowed to hand in proposals and vote for them. This increases the participation of members, as well as the possibility of new, innovative and high-quality proposals. This could in particular be interesting for the sector, because its target group (the users of the communication services) could become a member of the DAO and hand in proposals about what kind of content they would like to see. This could potentially decrease the necessity for privacy-invading algorithms. This, opportunity however, will be discussed further in the opportunities sector. Lastly, the use of digital assets also allows members to leave the DAO within a matter of seconds. If a member is not agreeing with the project that a DAO invests in, this member can easily leave the DAO and – often – regain its deposit. This creates more trust between the member in terms of the trust in their commitment, reducing the agency costs with respect to

monitoring the members in making sure that their interests are aligned with those of the company (Wright 2021; Bellavitis et al., 2022).

Decentralized payout | As explained, DAOs do not encounter the same issues with regard to (executive) compensation as traditional organizations due to their decentralized nature: there is less need to pay out executive bonuses due to the lack of a managerial board, and if there would be bonuses to be paid, the community-based decision-making allows for more acceptance, transparency and justification for those decisions. This would likely decrease agency costs with respect to misalignments of interest.

Compatibility and adaptability | A last strength, that is highly sector-related, is that of the compatibility and the adaptability. The communications sector has been working online for a while already, making it slightly easier for the sector to adapt to new technologies in comparison to the other sectors. This decreases the time and effort they should put in to get familiar with the structure, decreasing costs related to the familiarization process.

9.12.2 Opportunities

Boost industry performance | A first opportunity concerns that the DAO structure could work rather well for a sector that is currently having good expectations and performance. First, the 5G rollout could boost the growth potential of the sector, and the government infrastructure investment should ease the 5G capital expenditure burden. Furthermore, the pandemic increased stay-at-home behavior, which has led to an increased use of social media and demand for streaming entertainment. This can make it attractive to invest in the sector, as the profits are likely to be high. Since the DAO structure allows for such quick and possibly large-scale investments, it could be a good fit (SCFF, 2022i).

Governance process | A second opportunity lies in the variety of options with regard to the governance process of DAOs. The IT sector provides both products and services, because of which it is advantageous that there are many possibilities with regard to the governance design. Since the sector could, as mentioned, benefit from suggestions from its targets (consumers), a participatory DAO would be preferred over an algorithmic DAO, as it allows the community to decide on which projects are worth funding. This improves the interaction and participation of members. Furthermore, it increases the likelihood that the services provided by the organizations will be positively received by the targets, as they were able to propose their desired content. This would reduce market research costs, because relevant suggestions have already been done by the members. Additionally, it could reduce the necessity of using privacy-invading algorithms. It should, however, be borne in mind that this last suggestion might not be fully optimized, since it could threaten the success of the market leaders (Facebook and Google (SCFF, 2022h)) due to consumers not appreciating the privacy-invading algorithms. Also, the less data will be collected, the less revenue that can be made with ad-based deals. Therefore, this could become a consideration which could fall out either way. Anyhow, the participatory structure would already provide the DAOs with the advantage of cutting the aforementioned (agency) costs (Wright 2022, Bellavitis et al., 2022).

Legal personality | Another opportunity can be found in the possibility for a DAO to be granted legal personality. Even though this sector carries low risk (Appendix 2), it could be still beneficial to limit this risk for the members by granting them limited liability. This allows members to make safer investments, and prevents them from being jointly and severally liable if the DAO obtains debt. This could also make it more attractive for consumers to enter the DAO to hand in proposals that could optimize the business of the organization, as those will likely only enter if the risk is limited. The legal personality furthermore grants DAOs more opportunities with regard to interaction: if organizations can also work with FIAT-currencies, it makes it easier to obtain a sufficient amount of customers, especially when it concerns traditional customers. This is especially important, because a part of the sector is reliant on subscriptions: this requires a longer-term commitment and therefore a longer-term trust. If customers would be able to pay in FIAT-currencies for the services, this would make the DAO appear more trustworthy, increasing the chances that a potential customer will subscribe for the service. This perception can be strengthened by the general idea behind being a formal legal entity. These circumstances can lead to lower searching and transaction (agreement terms) costs. The same advantage holds for paying contractors or employees, as the DAO is now able to set up these contracts and hire them. This also allows the employees to be hired in a rather safe way, as they are not having the risk of becoming jointly and severally liable for the DAOs debt as a member (Wright, 2021; Mienert, 2021; Bellavitis et al., 2022).

Even in case legal personality would not be possible, DAOs have several options to structure a DAO in such a way that issues with regard to liabilities, interaction, scalability, lack of expertise and lack of legal personality can be solved. As mentioned before, a DAO can use an offshore structure to combine the benefits of a DAO with the benefits of a traditional company, such as being able to transact with FIAT-currencies. Furthermore, the DAO could make use of a governance structure that is more fragmented and expertise-based, and it also makes it possible to grant only one sub-division legal personality to have a bigger chance at keeping the community content. The IT-sector will likely be able to benefit from these alternatives the most, because they are the most familiar with building such models on-chain (Mienert, 2021).

Decentralization, power and competition | A last opportunity follows from the decentralized nature of DAOs. The communications sector is among the highly concentrated. Since this could raise concerns for fair competition, this is not necessarily a desirable situation. DAOs, however, use a decentralized structure, which prevents specific persons to obtain too much power, for instance by adding clauses to the smart contract that block a token transaction when it would result in a member obtaining 50% or more of the total token value. Furthermore, DAOs are able to cut costs in several aspects, so that there is less likelihood to ask unreasonably high prices, decreasing the competition concerns even more. If enough DAOs would follow this and enter the sector, the sector might reduce its reputation of being a highly concentrated sector, reducing the antitrust risk (Bellavitis et al., 2022).

9.12.3 Weaknesses

Governance process | One of the most occurring weaknesses is that of the governance process. Practice has shown that the voting could be less efficient and more costly than expected, especially when there are many different types of projects and proposals to vote for. This could increase the

time and research that members should dedicate to the voting process, leading to delay or non-voting. This effect could be strengthened, since this sector could attract its target group to become a member. This target group, mostly consisting of consumers, tends to have a lower expertise on the background of the services. They have expertise on the end products, but any other part of the process might take more time and effort to understand and decide on. This could decrease the efficiency of the decision-making process, reducing the agency theory argument on agency cost reducing as a result of an increased efficiency (Wright, 2021; Bellavitis et al., 2022).

Lack of a code of conduct/ Security | The lack of a code of conduct and (cyber)security concerns could also rise concerns. The lack of a code of conduct creates concerns with regard to the issuance of tokens and the potential of malicious use of these tokens: it could become a concern when one member would obtain a majority of the total token value without a code of conduct stopping this person from obtaining the power of the full amount of funds and data within the DAO. The risk for cyberattacks rises concerns with respect to the leakage of data and the loss of funds. A more specific concern with regard to this sector, is that of the information and data that is available on social media: if those data gets leaked, the sector might suffer from major reputation damage.

Anonymity | A last weakness concerns the anonymity of members that DAOs allow for: as soon as the DAO will be held liable, and the members will become jointly and severally liable, it might be rather difficult to track the members. This could result in a situation with free-riders, increasing agency costs due to information asymmetry and the decrease in trust in the members.

9.12.4 Threats

Lack of a legal wrapper | One of the most important threats concerns the lack of formal legal personality. Firstly, it could lead to the aforementioned liability concerns. Even though the communications services sector encounters a low (long-term) risk, it would still be concerning if the members would be personally liable in case the DAO gets in debt (Appendix 2). This would be even more concerning, because a part of the members might just be in for proposing a new type of entertainment they would like to see, having sufficient funds to handle the debts of the DAO jointly and severally. This could decrease the attractiveness of DAOs, as investors and members might be more cautious when entering or starting a DAO in a sector with such risk involved. Another threat following from the lack of legal personality concerns the possibility to interact with the real world. As previously discussed, when DAOs are perceived risky due to not a lack legal personality, a lack of trust raises and agency costs raise due to higher searching costs and transaction costs (Wright, 2021; Mienert, 2021; Bellavitis et al., 2022).

Use of cryptocurrencies | A related threat can be found in the use of cryptocurrencies. As cryptocurrencies are highly fluctuating, this increases the risk around these transactions (Bellavitis et al., 2022). Since this sector is highly focused on general consumers, which are perceived to be rather risk-averse, this could significantly decrease the success chances for DAOs. Since a big part of the sector is subscription-based, it would make the DAOs success even more difficult to achieve, because it would require long-term trust in both the DAO and the stability of cryptocurrencies. However, it should be noted that this threat could be fixed when legal personality would be granted, because in such cases the risk-averse parties could choose to work with FIAT-currencies rather

than with cryptocurrencies. Another way to work around this could be for the DAO to gain ownership in a communication services company, so that they have the power over the company, but don't encounter the limitations of the lack of legal personality.

Regulatory, sector-specific and societal (price) uncertainty | There can also be found a threat in the performance of the sector. First, the sectors market capitalization is highly concentrated in Facebook and Google. Their movements can significantly influence the sector. Furthermore, streaming services risk market saturation. Also, the antitrust regulatory trends can negatively affect the search engine and social media companies, making those types of organizations less attractive to invest in, and Apple's ad-blocking feature could weigh on advertisement revenues for social media companies. Lastly, there is uncertainty due to the Russian/Ukraine war (SCFF, 2022h). These uncertainty-increasing events increase the volatility of the prices within the sector, resulting in the industry being perceived riskier, causing a major issue when liability concerns rise or when investments are involved.

Regulatory risks | Another threat related to legislation and regulation. A first important note is that DAOs follow from the blockchain community, the members of which are known for their aversion towards regulation. Therefore, that could on itself be a reason for the community to stay away from the sector. Furthermore, the sector is a common target for antitrust and social media regulation, so that it would take more time and effort to stay compliant, which increases the compliance costs (SCFF, 2022h). Therefore, this could be a threat for DAOs to be a good fit for the sector.

Qualification of tokens | Another threat concerns tokenization. As previously mentioned, the uncertainty regarding the classification of DAO tokens as securities is – apart from the United States (SEC, 2017) – a worldwide uncertainty, so that (potential) members from any jurisdictions might be cautious about joining or starting a DAO (Bellavitis et al., 2022).

Accessibility | A last threat concerns the accessibility of the sector. As mentioned, the communications services sector is highly concentrated. Therefore, it could be difficult for new DAOs to enter the market and be successful, especially because Facebook and Google tend to highly influence the sector (SCFF, 2022h). Therefore, the influence that DAOs can have on the sector could be limited. However, disintermediation, as mentioned in section 10.1, could be an opportunity for this sector, because it is already relatively platform-based (Bellavitis et al., 2022).

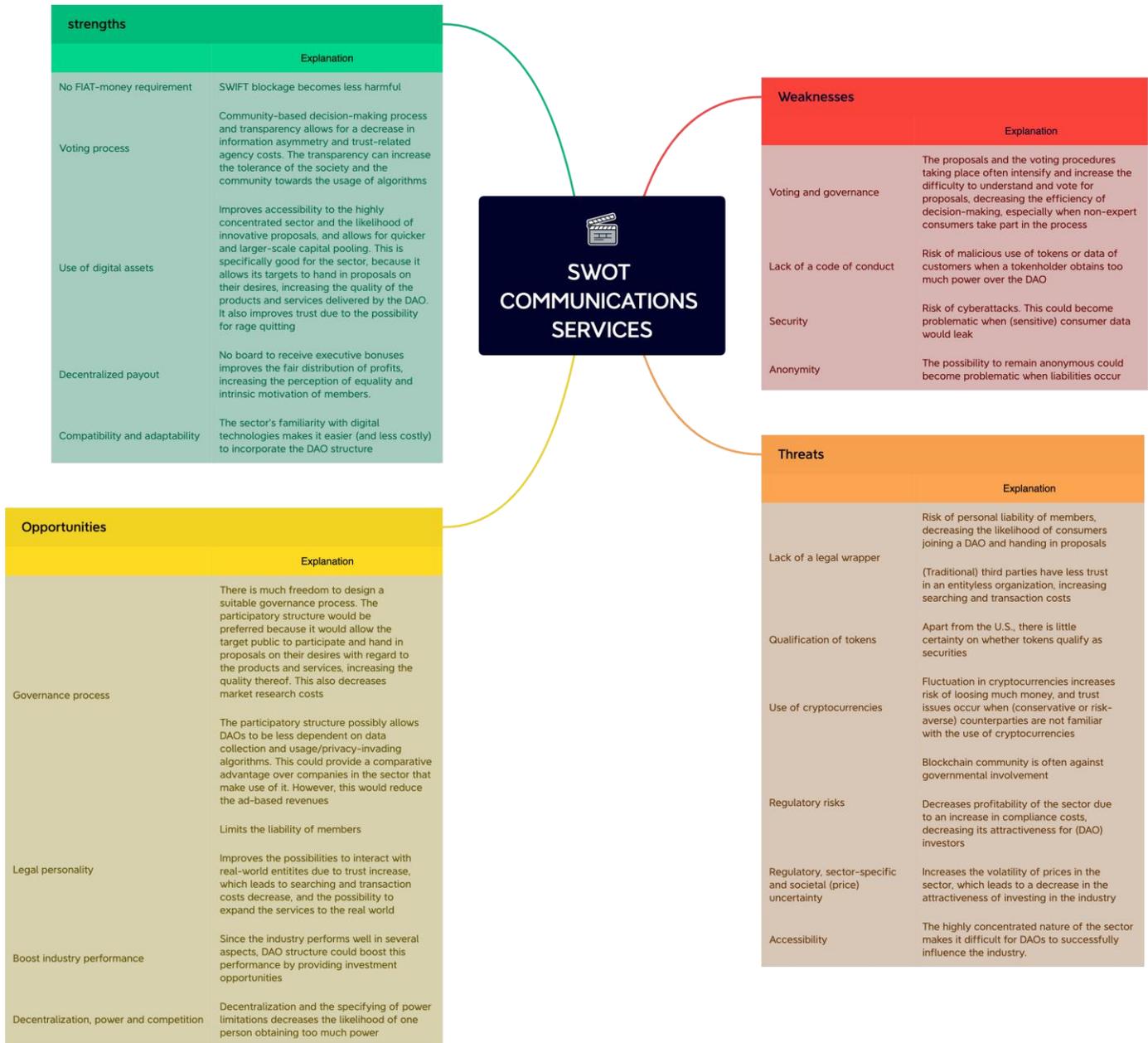


Figure 10: SWOT Communications Services Sector

9.13 Utilities Sector

The Utilities Sector comprises utility companies such as electric, gas and water utilities. It also includes independent power producers & energy traders and companies that engage in generation and distribution of electricity using renewable sources. (Appendix 1).

9.13.1 Strengths

No FIAT-money requirement | One of the general strengths that holds for all sectors, is that of the possibility to make use of cryptocurrencies when interacting with DAOs, rather than only with FIAT-money. The current situation in the world shows that it is possible to be denied access to the SWIFT-system (and probably any similar payment system). The use of the DAO structure could therefore be advantageous with regard to keeping the sector available at any time.

Voting process | Another strength concerns the voting process of DAOs. Currently, a part of the utilities sector is moving towards renewable energy (SCFF, 2022j). The infrastructure of DAOs can boost this mission, because it allows for a more transparent, secure and less costly decision-making mechanism. As already discussed, allowing a community of people to be involved within the decision-making process might allow for more acceptance with regard to the choices made. This leads to a relatively efficient decision-making mechanism, because the community-based voting system is free for audit by all members or even the outside public. This, on its turn, reduces agency costs regarding monitoring, information asymmetry and trust, as this transparency reduces the chance of fraudulent and opportunistic behavior (Wright, 2021).

Use of digital assets | Furthermore, the use of digital assets increases the accessibility and participation within the organization, reducing the administrative burdens that are present in traditional companies in the sector. This is something that could benefit the sector, because it would allow more investors to become part of the organization, and with that of the sector, so that there is a bigger pool of investors – and with that more funds – available. Furthermore, it allows a more diverse group of people to hand in proposals, so that there is a higher chance of a high-quality or innovative proposal regarding renewable energy showing up and passing. The fact that rage quitting is a possibility also improves the trust between members and the acceptance of decisions: if an investor does not agree with a decision or investment project, this person is generally able to leave. This reduces agency and monitoring costs regard to misalignment of interests (Wright, 2021; Bellavitis et al., 2022).

Decentralized payout | Lastly, DAOs do not encounter the same issues with regard to (executive) compensation as traditional organizations due to their decentralized nature: there is less need to pay out executive bonuses due to the lack of a managerial board, and if there would be bonuses to be paid, the community-based decision-making allows for more acceptance, transparency and justification for those decisions. This would decrease agency costs with respect to misalignments of interest.

9.13.2 Opportunities

Boosting industry performance | A first opportunity follows from the fact that the sector is currently performing well. The revenues are generally stable, decreasing the risk involved in the sector. Furthermore, the price momentum has recently improved, and the low yields provide low funding costs for this capital-intensive sector. Lastly, the fact that a part of the sector focuses on renewable energy leads to the possibility of government funding as a part of the clean-energy initiatives. Therefore, this sector could be interesting to invest in, especially when the interest rates are low, as those are negatively correlated with the dividends in the sector (SCFF, 2022j). If investors indeed invest in this sector, this performance could be boosted by the new capital.

Governance process | For the utilities sector, a participatory structure would be preferred. This structure could increase accessibility and participation in comparison to traditional investment companies in the sector, leading to the aforementioned benefits with regard to the higher chances for high-quality, innovative proposals by a more diverse group of members. This idea is even more valuable, because the sector is generally perceived rather conservative, so that there are new chances for more innovative people to enter the sector. When it concerns the production companies, a worker collective structure could be of interest, as it could raise the commitment of the employees, raising the quality of the products.

Legal personality | Yet another opportunity follows from the legal personality that could be granted to a DAO. First, this could limit the liability of the members in case liabilities show up: even though the sector is not necessarily risky in comparison to other sectors in the long term (BRON/Appendix), limiting the liability of its members could be beneficial when gaining investors, as an average risk does not exclude the chance of projects failing. Secondly, the legal personality could ease the interaction with real-world entities by allowing the DAO to use FIAT-currencies and become more trustworthy. This is especially relevant for this sector, because utilities are (also) sold to governments and consumers, parties who are generally perceived as conservative and risk-averse. This reduces searching and transaction costs in the way explained in the previous SWOTs. If this interaction becomes easier, this could fairly improve its presence on the market (Wright, 2021; Mienert, 2021; Bellavitis et al., 2022).

Another opportunity can be found in the possibilities to solve issues such as scalability, lack of expertise and the lack of legal personality by designing a specific governance structure. A DAO can merge its DAO structure for governance with a traditional company that would cover transactions with the FIAT-based world. Furthermore, scalability and expertise issues could be solved by applying a system in which there are so-called sub-DAOs that take care of certain aspects of the organization, such as HR, communications, etc. There is also an option to only grant legal personality to one specific sub-DAO and leave the others entityless (Mienert, 2021).

9.13.3 Weaknesses

Voting and governance | One of the weaknesses that DAOs can cause in relation to the utilities sector, is that of governance. This could be worse when it concerns the more investor-based DAOs that could enter the sector, as for those DAOs, the participation rate could be lower than desired. When many projects are featured, investors might skip some of the voting rounds out of time considerations as reading and understanding proposals might be more difficult or time-consuming

than expected. This would decrease the efficiency of the decision-making process in the DAO, which would increase agency costs (Wright 2021; Bellavitis et al., 2022).

Lack of a code of conduct / Security | Secondly, the lack of a code of conduct within a DAO could also be a weakness: investment DAOs are based on tokens, but there are no rules as to the issuance of those tokens. There is no control over the number of tokens that could technically be issued, raising concerns for when too many tokens are issued or if there would be malicious use of that issuance. Furthermore, there might be security concerns: even though blockchain technology is relatively safe, there still are risks for cyberattacks. If those occur and would burden the production or trade of utilities, that would become a major issue, because utilities are a necessity for the whole society.

Anonymity | A last weakness concerns the anonymity of members that DAOs allow for: as soon as the DAO will be held liable, and the members will become jointly and severally liable, it might be rather difficult to track the members. This could result in a situation with free-riders, increasing agency costs due to information asymmetry and the decrease in trust in the members.

9.13.4 Threats

Lack of a legal wrapper | The first threat for the utilities sector regards the lack of legal personality. While the sector is relatively riskless in comparison to other sectors (BRON/appendix), regard should still be taken that if organization would get in debt, the members would be jointly and severally liable. This threat should be taken seriously, because as it currently stands, the balances in the sector are weakening and the debts are rising (SCFF, 2022j). Therefore, investors might prefer the traditional organization structure over the DAO structure if there is no legal wrapper to limit their liability, even with a lower amount of risk. The lack of legal personality could also raise problems with (especially, but not only) the trading side of the sector. To conduct business, interaction with counterparties in terms of contracting and trade is necessary, but DAOs might be perceived risky if they have no formal legal entity. Therefore, searching and transaction costs might increase, especially because a major part of the customers will likely be risk-averse parties such as governments and consumers. Since that decreases the strength of the agency theory argument that DAOs could be more effective, the structure could be less suitable than it might appear to be. However, these threats can be solved by obtaining legal personality (Wright, 2021; Mienert, 2021; Bellavitis et al., 2022).

Qualification of tokens | A third threat regards the legal uncertainty around tokenization. The SEC (United States (SEC, 2017)) has recognized that DAO tokens can be qualified as securities, but most jurisdictions have not clarified this issue yet. Since DAOs operate internationally with members being spread all over the world, it would be difficult for members to be certain about their membership without having certainty about how their token would be classified. This might be a reason for investors to be more cautious about entering a DAO (Bellavitis et al., 2022).

Use of cryptocurrencies | Another threat would be the cryptocurrency-based practice of DAOs. As mentioned, cryptocurrencies are fluctuating quite much. This might raise uncertainty with regard

to the stability of the profits that flow from the tokens, and about the risks around sudden high rent payments if those were to be paid in cryptocurrency. Furthermore, it creates a certain barrier of trust from the perspective of individuals that are not experienced with regard to cryptocurrencies. Since the utilities sector mostly involves interaction with the rather risk-averse and traditional parties, such as governments and consumers, this threat is highly relevant. It must, however, be noted that such concerns can be limited when a DAO obtains legal personality (Bellavitis et al., 2022).

Regulatory, sector-specific and societal (price) uncertainty | The general uncertainty within the industry can also be considered a major threat. The events regarding the Russia/Ukraine war and the political reactions on that war have disadvantaged the outlook on equity sectors, and the major rise in commodity prices also increased uncertainty. Such events have made the economic and market landscape highly uncertain and increased the volatility of the prices within the sector, so that it becomes more of a risk to engage in the sector. Furthermore, it is unclear whether the legislation around clean-energy will rise costs and prices or benefit organizations within the sector. Additionally, the higher interest rates decrease the dividends in the sector, making it less attractive to invest in, and the valuations are weakening (SCFF, 2022j). These downfalls and uncertainties make it difficult for a DAO to obtain members and pool capital, so that the benefits of the structure would fade in comparison to the advantages.

Regulatory risks | Lastly, there is a threat legislation and regulation. It has already been discussed in the performance-related threat, but regulations on clean-energy are evolving. Since DAOs follow from the blockchain community, and the members thereof are known for their aversion towards regulation, those regulations could on itself be a reason for the community to stay away from the sector. Furthermore, the more regulation occurs, the higher the compliance costs will be, especially when the regulation could possibly increase costs in general. As this would weigh on the profit margins, this could be a threat for DAOs to be a good fit for the sector (SCFF, 2022j).

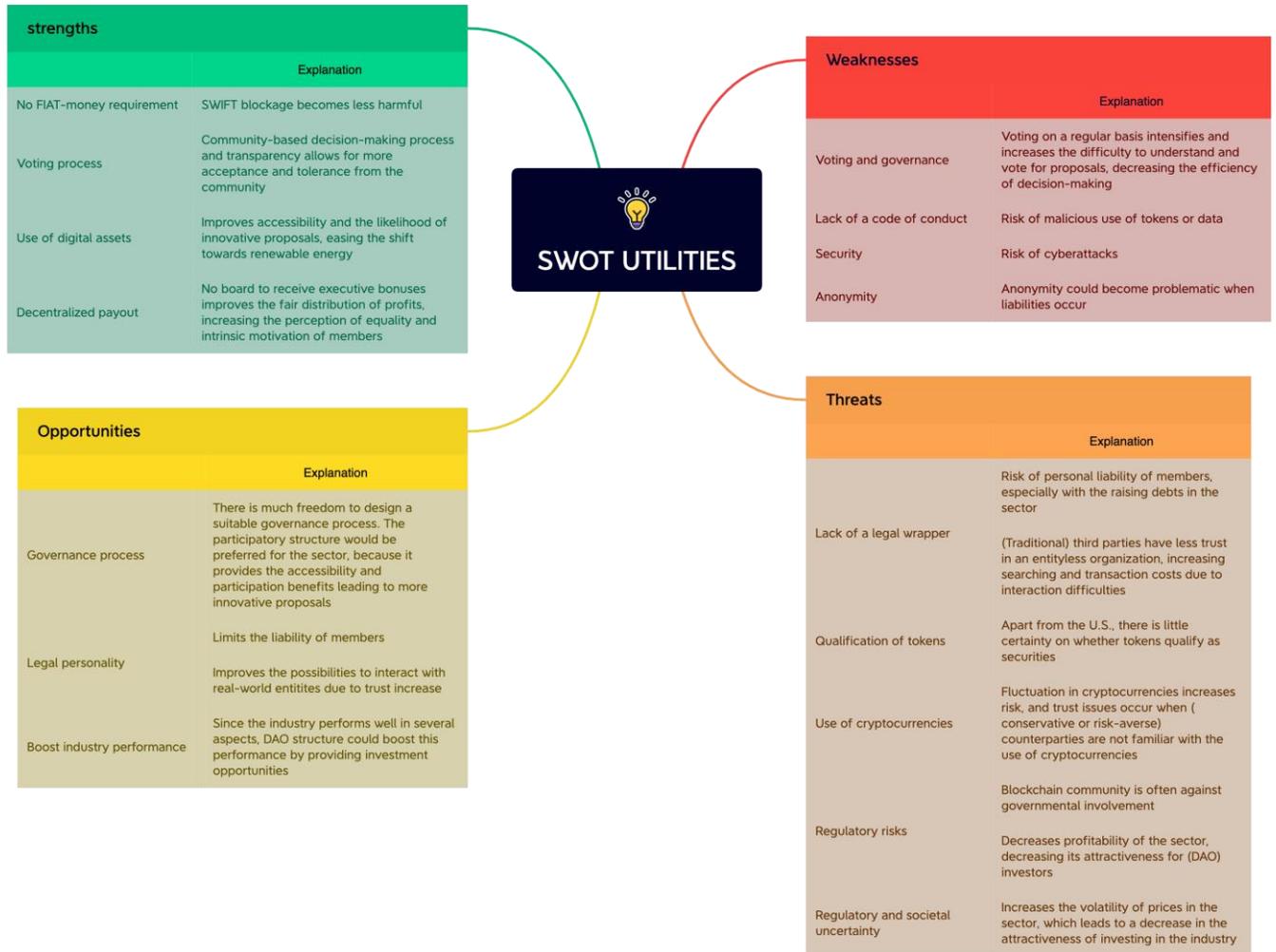


Figure 11: SWOT Utilities Sector

9.15 Real Estate Sector

The Real Estate Sector contains companies engaged in real estate development and operation. It also includes companies offering real estate related services and Equity Real Estate Investment Trusts (REITs). The latter allows investors gain indirect exposure to the real estate market and has recently grown into a very important sub-sector of financial markets (Appendix 1).

9.15.1 Strengths

No FIAT-money requirement | One of the general strengths that holds for all sectors, is that of the possibility to make use of cryptocurrencies when interacting with DAOs, rather than only with FIAT-money. The current situation in the world shows that it is possible to be denied access to the SWIFT-system (and probably any similar payment system). Since real estate is one of the most fundamental sectors, people need housing and need to interact with a real estate agent to get a house, it is important that the sector can be interacted with at any event. In that respect, the use of the DAO structure could be advantageous with regard to keeping the sector available at any time.

Voting process / As elaborated on in the previous SWOTs, this allows for more involvement, security and transparency in the decision-making process. This leads to a relatively efficient decision-making mechanism that raises more acceptance, because the community-based voting system is free for audit by all members or even the outside public. This, on its turn, reduces agency costs regarding monitoring, information asymmetry and trust, as this transparency reduces the chance of fraudulent and opportunistic behavior. This could in particular be interesting for the real estate sector, because this sector is relatively investment-based, so that there is much money involved. If investors have more of a say or a better understanding of the decisions that have been made, they would be more acceptant of the results (Wright 2021; Bellavitis et al., 2022).

Use of digital assets | Furthermore, the use of digital assets increases the accessibility and participation within the organization, reducing the administrative burdens that are present in traditional companies in the sector. This is something that could benefit the sector, because it would allow more investors to become part of the organization, and with that of the sector, so that there is a bigger pool of investors – and with that more funds – available. This benefits the sectors' growth and performance. Another boost would follow from everyone being able to hand in a new proposal, so that more innovative ideas might come up than in a traditional organization. The fact that rage quitting is a possibility also improves the trust between members and the acceptance of decisions: if an investor does not agree with a decision or investment project, this person is generally able to leave. This reduces agency and monitoring costs with regard to misalignment of interests (Wright 2021; Bellavitis et al, 2022).

Decentralized payout | DAOs do not encounter the same issues with regard to (executive) compensation as traditional organizations due to their decentralized nature: there is less need to pay out executive bonuses due to the lack of a managerial board, and if there would be bonuses to be paid, the community-based decision-making allows for more acceptance, transparency and justification for those decisions. This would decrease agency costs with respect to misalignments of interest.

9.15.2 Opportunities

Boosting industry performance | A first opportunity follows from the fact that the sector is currently performing well. The low interest rates are positive for the funding rounds, and those make the traditionally high dividends in REITs attractive for investors. Furthermore, the real estate companies for warehouse, data centers and telecom towers are benefiting from the current trends in technology and e-commerce, as there is a high demand for such buildings which increases the rent. The REITs regarding homes have been profiting as well as a result of higher rents, mostly due to the increased demand following from the low interest rates in combination with de-urbanization. This outlook for the future remains positive if the economic expansion continues, workers return to offices and interests stay relatively low. Lastly, the mass vaccinations and the relaxed restrictions on public gatherings have reduced the pessimism among investors, boosting the attractiveness of the sector. These points taken together increase the attractiveness of the sector for investors, making it a sector that investor-based DAOs could do well in, as they can expand this profitability in line with the mentioned strengths and opportunities. As soon as there are more investors in the sector, the liquidity of the sector will improve, providing yet another boost for the sector (SCFF, 2022k).

Governance process | DAO structures are not static, so that there are many possibilities with regard to structuring the DAO and its governance. For the real estate sector, both a participatory and an algorithmic DAO could be interesting. With regard to the purely investment DAOs, a participatory structure could increase the value due to the increased accessibility and participation in comparison to traditional investment companies in the sector. However, the algorithmic structure, as a fully functional DAO or as a sub-DAO of an overarching participatory DAO, would also be considerable. For instance, it could be interesting to see a fully on-chain real estate project, in which on the one side, customers can rent the building on chain – in the sense that it would be registered on the blockchain, potentially based on a separately qualified rental token - while investors gain their investment back based on the rental of their assigned part of the building. This could function fully automated based on the underlying operating agreement/smart contract, which could be a massive cost-cutter. Another reason for such a structure to be appealing, is the elimination of intermediaries in the process: investors and renters are directly linked to each other, cutting the costs of intermediaries as well.

Legal personality | Yet another opportunity follows from the legal personality that could be granted to a DAO. First, this could limit the liability of the members in case liabilities show up: even though the sector is not necessarily risky in comparison to other sectors in the long term (BRON/Appendix), limiting the liability of its members could be beneficial when gaining investors, as an average risk does not exclude the chance of projects failing. Secondly, the legal personality could ease the interaction with real-world entities by allowing the DAO to use FIAT-currencies and become more trustworthy. This reduces searching and transaction costs in the way explained in the previous SWOTs. If this interaction becomes easier, this could fairly improve its presence on the market.

The opportunity can be strengthened by the possibilities to solve issues such as scalability, lack of expertise and the lack of legal personality by designing a specific governance structure. A DAO can merge its DAO structure for governance with a traditional company that would cover transactions with the FIAT-based world. Furthermore, scalability and expertise issues could be

solved by applying a system in which there are so-called sub-DAOs that take care of certain aspects of the organization, such as HR, communications, etc. There is also an option to only grant legal personality to one specific sub-DAO and leave the others entityless (Mienert, 2021).

9.15.3 Weaknesses

Voting and governance | One of the weaknesses that DAOs can cause in relation to the real estate sector, is that of governance. Especially when it concerns an investor-based DAO, which is the most likely one to be used, the participation rate could be lower than desired. Especially when many projects are featured, investors might skip some of the voting rounds out of time considerations as reading and understanding proposals might be more difficult or time-consuming than expected. This would decrease the efficiency of the decision-making process in the DAO, which would increase agency costs (Wright, 2021; Bellavitis et al., 2022).

Lack of a code of conduct/ Security | Secondly, the lack of a code of conduct within a DAO could also be a weakness: investment DAOs are based on tokens, but there are no rules as to the issuance of those tokens. There is no control over the number of tokens that could technically be issued, raising concerns for when too many tokens are issued or if there would be malicious use of that issuance. Furthermore, there might be security concerns: even though blockchain technology is relatively safe, there still are risks for cyberattacks. If those happen, housing data might be exposed or tokens – with a high value – could be stolen. As an investor or renter, these risks are not desired.

Anonymity | A last weakness concerns the anonymity of members that DAOs allow for: as soon as the DAO will be held liable, and the members will become jointly and severally liable, it might be rather difficult to track the members. This could result in a situation with free-riders, increasing agency costs due to information asymmetry and the decrease in trust in the members.

9.15.4 Threats

Lack of a legal wrapper | The first threat for the real estate sector regards the lack of legal personality. While the sector is relatively riskless in comparison to other sectors (Appendix 2), regard should still be taken of the unattractiveness of the fact that if the organization would get in debt – if a major project fails for instance – the members would be jointly and severally liable. Therefore, investors might prefer the traditional organization structure over the DAO structure if there is no legal wrapper to limit their liability. Another threat that follows from a lack of legal personality, is the difficulties around interaction with real-world parties. As mentioned before, DAOs might be perceived risky if they have no formal legal entity. Therefore, searching and transaction costs might increase. Since that decreases the strength of the agency theory argument that DAOs could be more effective, the structure could be less suitable than it might appear to be. However, these first two threats can be solved by obtaining legal personality (Wright 2021, Bellavitis et al., 2022).

Qualification of tokens | The SEC (2017) has recognized that DAO tokens can be qualified as securities, but most jurisdictions have not clarified this issue yet. Since DAOs operate

internationally with members being spread all over the world, it would be difficult for members to be certain about their membership without having certainty about how their token would be classified. This might be a reason for investors to be more cautious about entering a DAO (Bellavitis et al., 2022; Abrol 2022).

Use of cryptocurrencies | As mentioned, cryptocurrencies are fluctuating quite much. This might raise uncertainty with regard to the stability of the profits that flow from the tokens, and about the risks around sudden high rent payments if those were to be paid in cryptocurrency. Furthermore, it creates a certain barrier of trust from the perspective of individuals that are not experienced with regard to cryptocurrencies. It must be noted that such concerns can be limited when a DAO obtains legal personality (Bellavitis et al., 2022; Abrol 2022).

Regulatory, sector-specific and societal (price) uncertainty | The general uncertainty within the industry can also be considered a major threat. The events regarding the Russia/Ukraine war and the political reactions on that war have disadvantaged the outlook on equity sectors, as well as the major rise in commodity prices. Such events have made the economic and market landscape highly uncertain and increased the volatility of the prices within the sector, so that it becomes more of a risk for investors to engage in the real estate sector (SCFF, 2022k). This effect could be strengthened if the interest rates would rise, as the real estate sector would be disadvantaged by such a rise. Another uncertainty follows from the uncertainty around working from home: if workers would permanently work from home more often, the demand for office real estate would reduce, reducing the profits in that part of the sector. This trend is already happening in the retail REIT, where e-commerce tends to replace (a part of) the brick-and-mortar stores). These downfalls and uncertainties make it difficult for a DAO to obtain members and pool capital, so that the benefits of the structure would fade in comparison to the advantages (SCFF, 2022k).

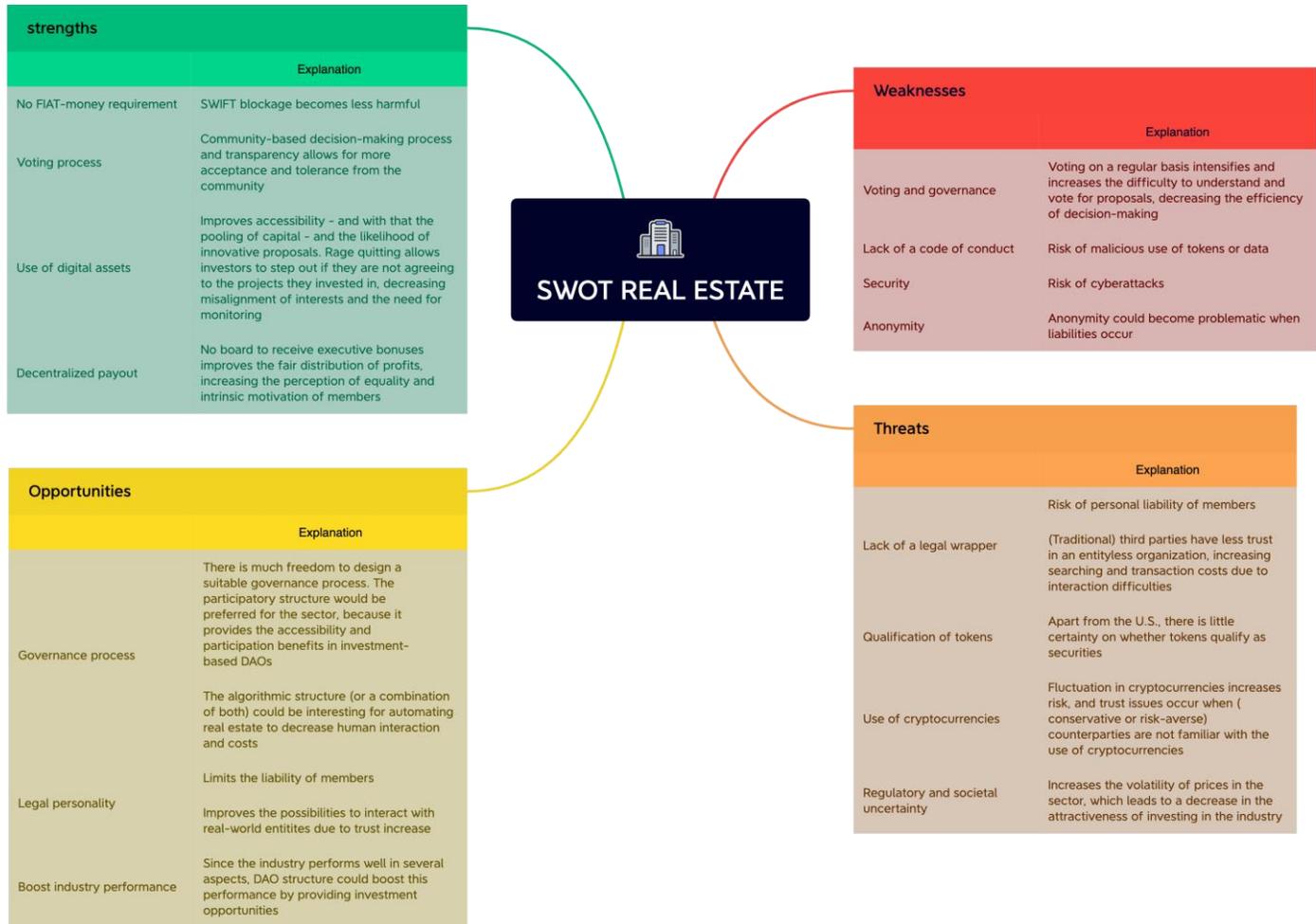


Figure 13: SWOT Real Estate Sector

10 Suitability

As can be concluded from the SWOT-analyses, some sectors could benefit more from the introduction of the DAO structure than others. However, five main themes appear to be the ground reasoning for sector-specific suitability.

Shift towards clean/renewable energy (Energy, Materials, Industrials & Utilities) | DAOs are relatively accessible in comparison to traditional organizations. If an individual comes up with a groundbreaking or innovative idea for renewable energy, which is in itself an innovative concept, it is possible to become a member of a DAO and hand in a proposal that contains this idea. Due to the fact that such membership can be constituted (and be reversed) in a matter of seconds, there is hardly an obstacle to become a member, especially if it would be possible to become a member by buying a token with FIAT-currency rather than cryptocurrency. This, however, is only an option when a DAO would be granted legal personality. If this option is often used, there is a higher chance for innovative proposals to be handed in and successfully pass the voting procedure, so that the shift towards clean/renewable energy can be executed in an easier manner. In traditional organizations, these proposals are generally coming from people from within the company that might have a tunnel vision, or it could even be the case that the team is not necessarily welcoming those renewable energy proposals, so that it would be slightly more difficult to achieve the shift. Interestingly so, the financing of projects on clean energy start-ups have also been mentioned in previous papers as the sectors that should be prioritized for DAOs' private sector development, likely being a confirmation of this finding in the SWOTs (Virovets & Obushnyi, 2020). A similar judgement can be found in the findings of Bellavitis et al. (2022).

Suitable due to the existing familiarity with (blockchain) technology (financials, information technology, communications services) | For some industries, the DAO structure would be particularly suitable due to the fact that they are already familiar with the technology. Such familiarity would strengthen the (agency) cost-reduction argument, because it would take relatively little time, effort and training to get used to the DAO format.

The possibility for the target group to weigh in (consumer discretionary, communications services, consumer staples) | The accessibility of DAOs also benefits the organizations in another manner: it allows for the target groups of certain sectors to weigh in. Normally, the consumer-aimed sectors are basing their product/service development and supply off of experiences and (market) research. However, with a DAO structure, the target group itself could become part of the organization to hand in proposals about what products/services they wish to see from the particular DAO. This could be an interesting manner to optimize the process of creating supply, especially in comparison to traditional startups. Furthermore, this could possibly rule out the necessity for mass data storage of clients through algorithms in the communications services sector. However, the future should tell whether that would be profitable, since less data storage also reduces the ad revenues that can be made by providing the data to the advertisement companies.

Automation (consumer discretionary, consumer staples, real estate) | Making use of an algorithmic DAO structure could rise interesting opportunities with regard to automating the service processes. As mentioned, this could regard shops, hotels or real estate rental, but the horizon might be way broader than just these options. Such automation could be an innovative way of decreasing the need

for human interaction in these (service) processing, cutting salary costs for instance. Furthermore, the automation of the contracts for hotels or rentals would decrease legal uncertainties and misinterpretation regarding the contracts, decreasing costs to solve such issues as well.

Suitable due to the advantages of blockchain technology (health care and financials) | For some sectors, blockchain technology has already been proven effective. For the financial sector, blockchain can significantly improve the ease and certainty around transacting. For the health care industry, it can increase the safety and efficiency of data storage, increase the efficiency of shared ownership (usage of NFTs), and increase the trust in the sector's choices as a result of the transparency that blockchain provides. Such benefits can result in (agency) cost reduction, resulting in suitability.

Disintermediation (consumer discretionary, consumer staples, communication services) | DAOs could form the next evolutionary step towards the disruption of the economy by the introduction of a decentralized platform-based economy. This evolution would decrease the concentration and the economic power within sectors that are currently led by a handful of powerful companies. This would particularly be an advantage, because it would prevent the power-related behavior of becoming less supportive towards complementors and suppliers to from occurring. Furthermore, if the involvement of centralized platforms would – theoretically speaking – be reduced, DAOs could reduce transaction costs within the sectors and create network effects without the necessity to incur monopoly costs. The urgency of this advantage is also underlined by Bellavitis et al. (2022). Some of the sectors also have sector-specific causes for non-suitability. The main sector-specific reasons concern the following.

Regulatory risks (energy, materials, health care, financials, information technology, communication services, utilities) | For the mentioned sectors, it should be taken into account that there might be an increased regulatory risk in comparison to the other sectors. While regulations are generally undesired from a blockchain-community perspective, which could on itself be a reason for DAOs to avoid the sector, these regulatory risks could also raise compliance costs.

Accessibility (energy, consumer discretionary, consumer staples, health care, information technology, communications services) | For the mentioned sectors, accessibility might be problematic for DAOs: those sectors are relatively concentrated, so that it would be difficult to become an influential organization within the sector. With that, the growth opportunities could be less attractive than for the other sectors, making it less sustainable, and therefore less suitable for the DAO structure. This is mostly the case, because if members start to leave the DAO because there is no growing horizon anymore, the DAO could lose its value due to the members getting their money out of the organization whilst redeeming their membership.

The suitability can be observed in the following suitability matrix. The suitability is determined by the amount of causes for suitability (+) and non-suitability (-)

		S	W	O	T	
	Characteristics	Strengths	Weaknesses	Opportunities	Threats	Suitable?
Energy	Risk: very high (1st), above S&P 1200 Concentration: Very high (2nd)	No FIAT-money requirement Voting Process Use of digital assets Decentralized payout International nature	Voting and governance Forking Lack of a code of conduct Security Anonymity	Governance process Decentralization, power and competition Legal personality Familiarity with data collection and exchange within the sector	Lack of a legal wrapper Qualification of tokens Use of cryptocurrencies Regulatory risks Regulatory, sector-specific and societal (price) uncertainty Accessibility (OPEC)	(+/-)
Materials	Risk: very high (2nd), above S&P 1200 Concentration: low (8th)	No FIAT-money requirement Voting Process Use of digital assets Decentralized payout International nature	Voting and governance Forking Lack of a code of conduct Security Anonymity	Governance process No FIAT-money requirement Legal personality Boost industry performance	Lack of a legal wrapper Qualification of tokens Use of cryptocurrencies Regulatory risks Regulatory, sector-specific and societal (price) uncertainty Cyclical sector	(+/-)
Industrials	Risk: average (6th), above S&P 1200 Concentration: very low (11th)	No FIAT-money requirement Voting Process Use of digital assets Decentralized payout International nature	Voting and governance Forking Lack of a code of conduct Security Anonymity	Governance process Legal personality Boost industry performance	Lack of a legal wrapper Qualification of tokens Use of cryptocurrencies Regulatory, sector-specific and societal (price) uncertainty Cyclical sector	(+)
Consumer Discretionary	Risk: average (5th), above S&P 1200 Concentration: high (3rd)	No FIAT-money requirement Voting Process Use of digital assets Decentralized payout	Voting and governance Lack of a code of conduct Security Anonymity	Governance process Decentralization, power and competition Legal personality Boost industry performance Shift from brick-and-mortar stores to online retail Decentralization and international nature	Lack of a legal wrapper Qualification of tokens Use of cryptocurrencies Regulatory, sector-specific and societal (price) uncertainty Cyclical sector Accessibility (Amazon/Tesla)	(+++/-)
Consumer Staples	Risk: very low (11th), below S&P 1200 Concentration: average (5th)	No FIAT-money requirement Voting Process Use of digital assets Decentralized payout	Voting and governance Lack of a code of conduct Security Anonymity	Governance process Decentralization, power and competition Legal personality Boost industry performance	Lack of a legal wrapper Qualification of tokens Use of cryptocurrencies Regulatory, sector-specific and societal (price) uncertainty Accessibility (general concentration)	(+++/-)
Health Care	Risk: low (9th), below S&P 1200 Concentration: very low (10th)	No FIAT-money requirement Voting Process Use of digital assets Decentralized payout	Voting and governance Lack of a code of conduct Security Anonymity	Governance process Decentralization, power and competition Legal personality	Lack of a legal wrapper Qualification of tokens Use of cryptocurrencies Regulatory risks	(+/-)

		International nature Accessibility Transparency		Boost industry performance Blockchain technology	Regulatory, sector-specific and societal (price) uncertainty Accessibility (monopolistic and prestigious sector)	
Financials	Risk: high (3rd), above S&P 1200 Concentration: low (9th)	No FIAT-money requirement Voting Process Use of digital assets Decentralized payout	Voting and governance Lack of a code of conduct Cybersecurity Anonymity	Governance process (familiarity with) blockchain technology Legal personality Boost industry performance	Lack of a legal wrapper Qualification of tokens Use of cryptocurrencies Regulatory risks Regulatory, sector-specific and societal (price) uncertainty Target group	(++/-)
Information Technology	Risk: high (4th), above S&P 1200 Concentration: high (4th)	No FIAT-money requirement Voting Process Use of digital assets Decentralized payout Compatibility and adaptability	Voting and governance Lack of a code of conduct Cybersecurity Anonymity	Governance process Decentralization, power and competition Legal personality Boost industry performance	Lack of a legal wrapper Qualification of tokens Use of cryptocurrencies Regulatory risks Regulatory, sector-specific and societal (price) uncertainty Accessibility	(+/-)
Communication Services	Risk: low (8th), above S&P 1200 Concentration: very high (1st)	No FIAT-money requirement Voting Process Use of digital assets Decentralized payout Compatibility and adaptability	Voting and governance Lack of a code of conduct Cybersecurity Anonymity	Governance process Decentralization, power and competition Legal personality Boost industry performance	Lack of a legal wrapper Qualification of tokens Use of cryptocurrencies Regulatory risks Regulatory, sector-specific and societal (price) uncertainty Accessibility	(+++/-)
Utilities	Risk: very low (10th), below S&P 1200 Concentration: average (7th)	No FIAT-money requirement Voting Process Use of digital assets Decentralized payout	Voting and governance Lack of a code of conduct Cybersecurity Anonymity	Governance process Legal personality Boost industry performance	Lack of a legal wrapper Qualification of tokens Use of cryptocurrencies Regulatory risks Regulatory, sector-specific and societal (price) uncertainty	(+/-)
Real Estate	Risk: average (7th), above S&P 1200 Concentration: average (6th)	No FIAT-money requirement Voting Process Use of digital assets Decentralized payout	Voting and governance Lack of a code of conduct Cybersecurity Anonymity	Governance process Legal personality Boost industry performance	Lack of a legal wrapper Qualification of tokens Use of cryptocurrencies Regulatory, sector-specific and societal (price) uncertainty	(+)

10.1 Legislation

One of the most important lessons that can be drawn from both the SWOTs and the literature, is that legislation on DAOs and DAO-related topics could reduce a big part of the threats and weaknesses, and strengthen the opportunities. The lack of a legal wrapper is one of the biggest threats in every sector, while this could ‘easily’ be taken away by creating a legal wrapper through use of legislation, such as the Wyoming DAO supplement or the Vermont BLLC regulations (Mienert, 2021). These laws allow DAOs to obtain legal personality, so that legal wrapper-related issues could be deducted from the list of threats. This contains the concerns with regard to limited liability, the ability to contract with third parties and the usage of FIAT-currencies. However, it should be borne in mind that these regulations are U.S.-based, so that the organization should be willing to be registered in the United States. Some other jurisdictions, such as Switzerland or the Cayman Islands, do offer alternative structures (Mienert, 2021), but those are likely not as effective as the U.S.-based versions that are specific to DAOs. Virovets & Obushnyi (2020) go somewhat further and suggest that this type of legal recognition should only be the first of many steps. They suggest that DAOs should be applied with fulfilment of certain criteria that lead to clarification of their legal status, which would eventually allow DAOs to mitigate the legal risk for creators and members under tax and criminal law. For that, they suggest that the state should be able to intervene in DAOs and their smart contract, possibly by adding a requirement that legal personality would only be granted if state intervention based on newly developed technologies would be possible. A note should be made about the effectiveness of such requirements: if such requirements would indeed be installed, this would go against the idea of DAOs, and the blockchain technology in general, to operate in a digital economy that is free from state control and intermediaries, so that the benefits of using a DAO could slowly fade away. On the other hand, such recognition would make the structure more feasible and operatable, which could provide new horizons for the use of blockchain technology and DAOs. The future should tell which of the strategies would be followed, but from the community perspective the looser option without the direct state intervention in the smart contracts would likely be the preferred option if that is the only option that would be used by DAOs.

Legislation could also solve the problem of anonymity (Virovets & Obushnyi, 2020). The recognition of instruments for identification in the digital world could improve the operatability of DAOs. For instance, the EU has a regulation (Regulation of the European Parliament No 910/2014 on electronic identification and trust services for electronic transactions in the internal market and repealing) that allows for the usage of electronic identification for trust services such as electronic signatures. If such electronic signatures can be used, DAOs and DAO members could digitally sign legal documents using these digital instruments, without the necessity to hand sign a document.

The other legislation-related issue regards the qualification of securities. The United States have taken some initiative to clarify this concern, but that only holds for U.S. Citizens. The Lummis-Gillibrand Responsible Innovation Act ([Lummis-Gillibrand Responsible Innovation Act \(U.S.\)](#)) is an initiative to clarify which digital assets qualify and commodities and securities, and create clarity on the taxation of such assets. Furthermore, the bill states how DAOs should be considered for tax purposes, something that has not been clarified in another jurisdiction just yet. Such clarifications allow for more certainty of investors and DAO members. However, it should be borne in mind that

this only takes away uncertainty for the United States: this issue could carry on until all countries would provide some clarification through either legislation or clarifying statements or jurisprudence. The European Union is also working on clarifying the legal framework for crypto-assets with the MiCAR regulation, but this framework appears to be less specific to DAOs.

One note that should be made, is that tax considerations have not been taken into account in the SWOT analysis. The reason would be that even though it currently creates uncertainty, as it is hardly clear how DAOs or their members should be taxed – apart from the provisions that can be found in the Lummis-Gillibrand Responsible Innovation Act – both sides could be defended. It is currently not entirely clear whether this provides an advantage or a disadvantage: in fact, uncertainty could be a disadvantage in the same way as the uncertainty among securities could be a disadvantage. However, practice shows that this tax unclarity could also be considered an advantage, because it would mean that DAOs are not taxable. Clarity of the matter would be highly desired to avoid uncertainty, but it is out of the scope for the suitability matrix due to the unclarity over whether it provides an opportunity or a threat.

12 Conclusion/discussion

Concluding, DAOs could become a feasible governance structure, at this point in time and also in the future. The inherent characteristics, such as decentralization, autonomy and transparency, of DAOs allow them to overcome a mix of practical and agency problems in a way that is not feasible for traditional organizational structures. There is opportunity to decrease opportunism, distrust, misalignment of interests and agency costs. A key discovery of this thesis has been the ability of DAOs to code their problems away. For instance, if scaling becomes an issue, a DAO can choose to democratically choose (a group of) counsels or install sub-DAOs to take care of certain processes. Furthermore, the use of (automated) smart contracts significantly decreases the enforcement, monitoring and trust costs. In terms of weakness, a major limitation of DAOs is the relative inability to deal with disputes. Since conflict resolution was not in mind at the design stage, the costs could be relatively high because there would be much unclarity over how to solve the dispute and by what means. However, the freedom in the design of the DAO would also allow a DAO to create code that contains rules on dispute resolution, whether that would be on-chain dispute resolution or the involvement of a neutral third party. This constitutes an advantage of the current systems. These possibilities allow code creating with prevention in mind, rather than ex-post troubleshooting. The same prevention-based view holds for the governance mechanism of a DAO in general. Another note regarding this complication is that this is inherent for technology-based (governance) solutions, so that DAOs cannot be blamed for this vulnerability.

The more practically oriented characteristics can be found in the democratic voting procedure, the use of digital assets, tokenization, the use of cryptocurrencies, the choice to obtain legal personality or a general legal wrapper, competition-oriented coding, (cyber)security, anonymity, the lack of a code of conduct and forking. These DAO-related characteristics form the final elements for the reasoning behind how DAOs could influence the future of governance. A detailed version of the result is in the suitability matrix (. This shows the main GICS '(sub)sectors' that could benefit from the structure: (1) subsectors shifting to clean/renewable energy (Energy, Materials, Industrials & Utilities), (2) subsectors that are already familiar with (blockchain) technology (financials, IT & communication services), (3) sectors in which the involvement of the target group would be highly beneficial and novel (consumer discretionary, consumer staples & consumer discretionary), (4) subsectors that could benefit from automation (consumer discretionary, consumer staples & real estate) (5) subsectors that could benefit from disintermediation and (6) subsectors that would particularly be advantaged by blockchain characteristics such as the transparency, security and efficiency (health care & financials). Furthermore, subsectors that struggle with regulatory risks (energy, materials, health care, financials, IT, communication services and utilities) and accessibility due to concentration in the sector (energy, consumer discretionary, consumer staples, health care, IT and communications services) could potentially be a slightly less good fit. However, for most of these (sub)sectors, the benefits could likely outweigh the burdens, especially when taking into account that comparative advantages could eventually decrease accessibility concerns if the DAO becomes successful.

A worthy mention is the fact that many non-sector specific downfalls, such as the lack of a legal wrapper or uncertainty with regard to token qualifications and cryptocurrencies, could be taken away by legislation. For other jurisdictions, however, it is noteworthy that such threats could still exist, especially regarding the threats on the individual level, such as the qualification of tokens as

securities. Whereas U.S. legislation could lead to any DAO being filed as a legal entity, because it can still operate anywhere in the world upon registration (BRON), this does not hold for securities or tax considerations. Therefore, it would be worthy for legislators from all over the world to consider either clarifying how the current legislation applies to DAOs, or to introduce new DAO-specific legislation to allow for this structure to blend into the traditional corporate world.

Therefore, to stay within the terminology of Aaron Wright, DAOs could become the organizations to rule the internet era in the way corporations ruled the industrial era, by being highly efficient and less cost-intensive. DAOs have significant comparative advantages regarding to the acceptability and efficiency of decision-making, transparency, and the decrease of agency problems such as distrust and misalignment of interests. However, this potential could only be fully achieved under the prerequisite that governments will lend a helping hand in the development of this trend. Therefore, future researchers should dive into the legal frameworks of jurisdictions to find out how DAOs could be assisted by those existing frameworks, and determine whether and in which form DAO-specific legislation could help this trend grow even further. account should be taken of the fact that legislation should not become too restrictive, as it would go beyond what a DAO is made for: operating in a digital economy that is (relatively) free from state control and intermediaries. If this would not be taken into account, the benefits would slowly fade away, and the promising emergence of DAOs would eventually come to an end.

The limitations of this research can be found in the fact that the DAO is still a highly evolving concept, so that the literature available is not fully in consensus just yet. Furthermore, the novelty of the topic limited the availability of literature. Therefore, ongoing research on the matter would be highly recommended. However, overall, the findings of this thesis contribute to scholarly theory and practice in multiple ways. This work is among the first attempts to appraise the suitability of DAOs through the lenses of an established corporate governance theory. Further value addition occurs through synthesis of the strengths, weaknesses, opportunities, and threats in a matrix format, which can serve as a baseline for theory-building in future. After all, DAOs represent a disruptive innovation in the way organizations operate. Thus, it is logical to assume that newer governance theories need to be devised in future to cater for the structure and dynamics of a new generation of firms. That is, of course, not possible at this stage. Nevertheless, this study's findings can serve as a platform for future theory building. Additionally, the SWOT matrix helps academics and practitioners to separate some genuine characteristics and prospects of DAO-based governance as opposed to the massive hype prevalent in popular media. Further practical implications are: individuals or communities that consider starting a new company could use the suitability matrix to determine whether the DAO structure could provide their start-up with a comparative advantage over starting a traditional company. Furthermore, it allows existing (traditional) companies to thoughtfully consider a shift to a DAO structure, something that is factually possible in Wyoming, where an LLC can be legally shifted to a DAO LLC. Lastly, it provides researchers and legislators with a starting point for the establishment of a clear legal framework suitable for DAOs, whether that is a new framework or the existing one.

13 Bibliography

Abrol, A. (2022, June 22). *The Complete Guide for Asset Tokenization on Blockchain*. Blockchain Council. <https://www.blockchain-council.org/blockchain/asset-tokenization>

Afuah, A., & Tucci, C. L. (2012). Crowdsourcing As a Solution to Distant Search. *Academy of Management Review*, 37(3), 355–375. <https://doi.org/10.5465/amr.2010.0146>

Allen, F., & Santomero, A. M. (1997). The theory of financial intermediation. *Journal of Banking & Finance*, 21(11–12), 1461–1485. [https://doi.org/10.1016/s0378-4266\(97\)00032-0](https://doi.org/10.1016/s0378-4266(97)00032-0)

Atzori, M. (2015). Blockchain Technology and Decentralized Governance: Is the State Still Necessary? *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.2709713>

Baker, H. K., & Anderson, R. (2011). *Corporate Governance: A Synthesis of Theory, Research, and Practice*. Wiley.

Beck, R. (2018). Beyond Bitcoin: The Rise of Blockchain World. *Computer*, 51(2), 54–58. <https://doi.org/10.1109/mc.2018.1451660>

Beck, R., Müller-Bloch, C., & King, J. L. (2018). Governance in the Blockchain Economy: A Framework and Research Agenda. *Journal of the Association for Information Systems*, 1020–1034. <https://doi.org/10.17705/1jais.00518>

Bellavitis, C., Fisch, C., & Momtaz, P. P. (2022). The Rise of Decentralized Autonomous Organizations (DAOs): A First Empirical Glimpse. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.4074833>

Bhojraj, S., Lee, C. M. C., & Oler, D. K. (2003). What's My Line? A Comparison of Industry Classification Schemes for Capital Market Research. *Journal of Accounting Research*, 41(5), 745–774. <https://doi.org/10.1046/j.1475-679x.2003.00122.x>

Chen, Y., & Bellavitis, C. (2019). Blockchain Disruption and Decentralized Finance: The Rise of Decentralized Business Models. *SSRN Electronic Journal*.

<https://doi.org/10.2139/ssrn.3483608>

Chesbrough, H. (2004). Managing Open Innovation. *Research-Technology Management*, 47(1), 23–26. <https://doi.org/10.1080/08956308.2004.11671604>

Chohan, U. W. (2017). The Decentralized Autonomous Organization and Governance Issues. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3082055>

Cryptopedia. (2022). *What Are Stablecoins and How Do They Work?*. Gemini. <https://www.gemini.com/cryptopedia/what-are-stablecoins-how-do-they-work>

Cumming, D. J., Dombrowski, N., Drobetz, W., & Momtaz, P. P. (2022). Decentralized Finance, Crypto Funds, and Value Creation in Tokenized Firms. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.4102295>

Ding, W. W., Liang, X., Hou, J., Wang, G., Yuan, Y., Li, J., & Wang, F. Y. (2021). Parallel Governance for Decentralized Autonomous Organizations enabled by Blockchain and Smart Contracts. *2021 IEEE 1st International Conference on Digital Twins and Parallel Intelligence (DTPI)*. <https://doi.org/10.1109/dtpe52967.2021.9540069>

Ding, W. W., Wang, S., Li, J., Yuan, Y., Ouyang, L., & Wang, F.Y. (2019). Decentralized Autonomous Organizations: the state of the art, analysis framework and future trends. *Chinese Journal of Intelligent Science and Technology*, 1(2), 202-213. <https://doi.org/10.11959/j.issn.2096-6652.201917>

Earth, F. F. (2022, June 30). *the ways of the DAOs / Part 1 - Setting off with Intention* [Video]. Vimeo. <https://vimeo.com/697093608>

El Faqir, Y., Arroyo, J., & Hassan, S. (2020). An overview of decentralized autonomous organizations on the blockchain. *Proceedings of the 16th International Symposium on Open Collaboration*. <https://doi.org/10.1145/3412569.3412579>

Ethereum Foundation. (2014, May 6). *DAOs, DACs, DAs and More: An Incomplete Terminology Guide*. Ethereum Foundation Blog. <https://blog.ethereum.org/2014/05/06/daos-dacs-das-and-more-an-incomplete-terminology-guide/>

Fama, E. F., & Jensen, M. C. (1983). Separation of Ownership and Control. *The Journal of Law and Economics*, 26(2), 301–325. <https://doi.org/10.1086/467037>

de Faria, P., Lima, F., & Santos, R. (2010). Cooperation in innovation activities: The importance of partners. *Research Policy*, 39(8), 1082–1092. <https://doi.org/10.1016/j.respol.2010.05.003>

Filippi, D. P., & Wright, A. (2018). *Blockchain and the Law: The Rule of Code*. Harvard University Press.

De Filippi, P., & Hassan, S. (2016). Blockchain technology as a regulatory technology: From code is law to law is code. *First Monday*. <https://doi.org/10.5210/fm.v21i12.7113>

Fisch, C., & Momtaz, P. P. (2020). Institutional investors and post-ICO performance: an empirical analysis of investor returns in initial coin offerings (ICOs). *Journal of Corporate Finance*, 64, 101679. <https://doi.org/10.1016/j.jcorpfin.2020.101679>

Franzoni, C., & Sauermann, H. (2012). Crowd Science: The Organization of Scientific Research in Open Collaborative Projects. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.2167538>

Ghiselli, E. E., & Johnson, D. A. (1970). Need satisfaction, managerial success, and organizational structure. *Personnel Psychology*, 23(4), 569–576. <https://doi.org/10.1111/j.1744-6570.1970.tb01373.x>

Ghazinoory, S., Abdi, M., & Azadegan-Mehr, M. (2011). SWOT methodology: a state-of-the-art review for the past, a framework for the future. *Journal of Business Economics and Management*, 12(1), 24–48. <https://doi.org/10.3846/16111699.2011.555358>

Glaveski, S. (2022, April 7). *How DAOs Could Change the Way We Work*. Harvard Business Review. <https://hbr.org/2022/04/how-daos-could-change-the-way-we-work>

Hackl, C. (2022, May 16). *What Are DAOs And Why You Should Pay Attention*. Forbes. <https://www.forbes.com/sites/cathyhackl/2021/06/01/what-are-daos-and-why-you-should-pay-attention/>

Hassan, S., & de Filippi, P. (2021). Decentralized Autonomous Organization. *Internet Policy Review*, 10(2). <https://doi.org/10.14763/2021.2.1556>

Hotten, B. R. (2022, May 4). *Ukraine conflict: What is Swift and why is banning Russia so significant?* BBC News. <https://www.bbc.com/news/business-60521822>

Hsieh, Y. Y., Vergne, J. P., Anderson, P., Lakhani, K., & Reitzig, M. (2018). Bitcoin and the rise of decentralized autonomous organizations. *Journal of Organization Design*, 7(1). <https://doi.org/10.1186/s41469-018-0038-1>

Idle DAO - Idle Finance. (2022). IDLE Finance. <https://docs.idle.finance/governance/idle-dao>

Jensen, M.C. & Meckling, W.H. (1976). Theory of the firm: managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3(4), 305-360.

Johnson, G., Whittington, R., & Scholes, K. (2008). *Exploring Corporate Strategy* (8th ed. ed.). FT Prentice Hall.

Jones, K. (2019). Blockchain in or as governance? Evolutions in experimentation, social impacts, and prefigurative practice in the blockchain and DAO space. *Information Polity*, 24(4), 469–486. <https://doi.org/10.3233/ip-190157>

Jurevicius, O. (2021, November 11). *SWOT Analysis – How to Do It Properly*. Strategic Management Insight. <https://strategicmanagementinsight.com/tools/swot-analysis-how-to-do-it/>

Jurevicius, O. (2022, January 27). *PEST & PESTEL Analysis*. Strategic Management Insight. <https://strategicmanagementinsight.com/tools/pest-pestel-analysis/>

Kaal, W. A. (2020). Decentralized Corporate Governance via Blockchain Technology. *Annals of Corporate Governance*, 5(2), 101–147. <https://doi.org/10.1561/109.00000025>

Kouroche, V. (2010). Opportunism in organizations. *Journal of Law, Economics, & Organization*, 26(1), 158–181.

Leonhard, R. D. (2017). Corporate Governance on Ethereum’s Blockchain. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.2977522>

Lumineau, F., Wang, W., & Schilke, O. (2021). Blockchain Governance—A New Way of Organizing Collaborations? *Organization Science*, 32(2), 500–521. <https://doi.org/10.1287/orsc.2020.1379>

Mienert, B. (2021). How Can a Decentralized Autonomous Organization (DAO) Be Legally Structured? *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3992329>

Minn, K. T. (2019). Towards enhanced oversight of “self-governing” decentralized autonomous organizations: case study of the DAO and its shortcomings. *NYU Journal of Intellectual Property and Entertainment Law*, 9(1), 140–178.

Mollick, E. R., & Nanda, R. (2014). Wisdom or Madness? Comparing Crowds with Expert Evaluation in Funding the Arts. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.2443114>

Mollick, E. R. (2012). The Dynamics of Crowdfunding: Determinants of Success and Failure. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.2088298>

Momtaz, P. P. (2022). How Efficient is Decentralized Finance (DeFi)? *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.4063670>

Morrison, R., Mazey, N. C. H. L., & Wingreen, S. C. (2020). The DAO Controversy: The Case for a New Species of Corporate Governance? *Frontiers in Blockchain*, 3. <https://doi.org/10.3389/fbloc.2020.00025>

Nabben, K. (2021). *Is a DAO a Panopticon? Algorithmic governance as creating and mitigating vulnerabilities in “Decentralised Autonomous Organisations.”* Elsevier BV. <https://doi.org/10.2139/ssrn.3907693>

Nakamoto, S. (2008). Bitcoin: A Peer-to-Peer Electronic Cash System. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3977007>

Poetz, M. K., & Schreier, M. (2012). The Value of Crowdsourcing: Can Users Really Compete with Professionals in Generating New Product Ideas? *Journal of Product Innovation Management*, 29(2), 245–256. <https://doi.org/10.1111/j.1540-5885.2011.00893.x>

Polemos. (2022, April 20). *Whitepaper / Polemos - Metaverse-spanning, GameFi Ecosystem*. Polemos.

Reijers, W., Wuisman, I., Mannan, M., de Filippi, P., Wray, C., Rae-Looi, V., Cubillos Vélez, A., & Orgad, L. (2018). Now the Code Runs Itself: On-Chain and Off-Chain Governance of Blockchain Technologies. *Topoi*, 40(4), 821–831. <https://doi.org/10.1007/s11245-018-9626-5>

Rietveld, J., Ploog, J. N., & Nieborg, D. (2020). The Coevolution of Platform Dominance and Governance Strategies: Effects on Complementor Performance Outcomes. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3615719>

Rikken, O., Janssen, M., & Kwee, Z. (2019). Governance challenges of blockchain and decentralized autonomous organizations. *Information Polity*, 24(4), 397–417. <https://doi.org/10.3233/ip-190154>

Rothaermel, F. T. (2012). *Strategic Management: Concepts and Cases*. McGraw-Hill/Irwin.

Shapiro, S. P. (2005). Agency Theory. *Annual Review of Sociology*, 31(1), 263–284. <https://doi.org/10.1146/annurev.soc.31.041304.122159>

Schwab Center For Financial Research. (2022). *Energy Sector Rating: Marketperform*. Schwab Brokerage. <https://workplace.schwab.com/content/energy-sector>

Schwab Center For Financial Research. (2022b). *Materials Sector Rating: Marketperform*. Schwab Brokerage. <https://workplace.schwab.com/content/materials-sector>

Schwab Center For Financial Research. (2022c). *Industrials Sector Rating: Marketperform*. Schwab Brokerage. <https://workplace.schwab.com/content/industrial-sector>

Schwab Center For Financial Research. (2022d). *Consumer Discretionary Sector Rating: Marketperform*. Schwab Brokerage. <https://workplace.schwab.com/content/consumer-discretionary-sector>

Schwab Center For Financial Research. (2022e). *Consumer Staples Sector Rating: Marketperform*. Schwab Brokerage. <https://workplace.schwab.com/content/consumer-staples-sector>

Schwab Center For Financial Research. (2022f). *Consumer Health Care Rating: Marketperform*. Schwab Brokerage. <https://workplace.schwab.com/content/healthcare-sector>

Schwab Center For Financial Research. (2022g). *Financials Sector Rating: Marketperform*. Schwab Brokerage. <https://www.schwabassetmanagement.com/content/financial-sector>

Schwab Center For Financial Research. (2022h). *Information Technology Sector Rating: Marketperform*. Schwab Brokerage. <https://workplace.schwab.com/content/information-technology-sector>

Schwab Center For Financial Research. (2022i). *Communication Sevices Sector Rating: Marketperform*. Schwab Brokerage. <https://workplace.schwab.com/content/communications-sector>

Schwab Center For Financial Research. (2022j). *Utilities Sector Rating: Marketperform*. Schwab Brokerage. <https://www.schwabassetmanagement.com/content/utilities-sector>

Schwab Center For Financial Research. (2022k). *Real Estate Sector Rating: Marketperform*. Schwab Brokerage. <https://www.schwabassetmanagement.com/content/real-estate-sector>

SEC.gov / SEC Issues Investigative Report Concluding DAO Tokens, a Digital Asset, Were Securities. (2017a, July 25). SEC.Gov. <https://www.sec.gov/news/press-release/2017-131>

Shermin, V. (2017). Disrupting governance with blockchains and smart contracts. *Strategic Change*, 26(5), 499–509. <https://doi.org/10.1002/jsc.2150>

Sims, A. (2019). Blockchain and Decentralised Autonomous Organisations (DAOs): The Evolution of Companies? *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3524674>

Singh, M., & Kim, S. (2019). Blockchain technology for decentralized autonomous organizations. *Advances in Computers*, 115–140. <https://doi.org/10.1016/bs.adcom.2019.06.001>

Smith, T. V. (1935). Opportunism. *International Journal of Ethics*, 45(2), 235–239.

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, 104, 333–339. <https://doi.org/10.1016/j.jbusres.2019.07.039>

Spendedge. (2020, October 1). *SWOT Analysis of the Power Sector, Energy Sector*. <https://www.spendedge.com/blogs/swot-analysis-power-sector>

Thompson, J., & Martin, F. (2010). *Strategic Management: Awareness & Change* (6th ed. ed.). Cengage Learning EMEA.

Virovets, D., & Obushnyi, S. (2020). Decentralized Autonomous Organizations as the New Form of Economic Cooperation in Digital World. *The USV Annuals of Economics and Public Administration*, 20(2), 41-52.

Wang, S., Ding, W., Li, J., Yuan, Y., Ouyang, L., & Wang, F. Y. (2019). Decentralized Autonomous Organizations: Concept, Model, and Applications. *IEEE Transactions on Computational Social Systems*, 6(5), 870–878. <https://doi.org/10.1109/tcss.2019.2938190>

Whittemore, R., & Knafl, K. (2005). The integrative review: updated methodology. *Journal of Advanced Nursing*, 52(5), 546–553. <https://doi.org/10.1111/j.1365-2648.2005.03621.x>

Wright, A. (2021, June 30). *The Rise of Decentralized Autonomous Organizations: Opportunities and Challenges* . Stanford Journal of Blockchain Law & Policy. <https://stanford-jblp.pubpub.org/pub/rise-of-daos/release/1>

Ying-Ying, H. (2018). The Rise of Decentralized Autonomous Organizations: Coordination and Growth within Cryptocurrencies. *Electronic Thesis and Dissertation Repository*, 5593. <https://ir.lib.uwo.ca/etd/5393>

Your DAO Guide - The most important DAO categories defining the space. (2022, June 22). Ledger. <https://www.ledger.com/academy/your-dao-guide>

Zaslowsky, D. (2022, May 9). *Lawsuit to Recover Stolen Crypto Asserts Novel Theory Against a DAO.* Blockchain. <https://blockchain.bakermckenzie.com/2022/05/09/lawsuit-to-recover-stolen-crypto-asserts-novel-theory-against-a-dao/>

14 Appendix 1: GICS Industry Classification

Energy Sector | The Energy Sector comprises companies engaged in exploration & production, refining & marketing, and storage & transportation of oil & gas and coal & consumable fuels. It also includes companies that offer oil & gas equipment and services.

Materials Sector | The Materials Sector includes companies that manufacture chemicals, construction materials, glass, paper, forest products and related packaging products, and metals, minerals and mining companies, including producers of steel.

Industrials Sector | The Industrials Sector includes manufacturers and distributors of capital goods such as aerospace & defense, building products, electrical equipment and machinery and companies that offer construction & engineering services. It also includes providers of commercial & professional services including printing, environmental and facilities services, office services & supplies, security & alarm services, human resource & employment services, research & consulting services. It also includes companies that provide transportation services.

Consumer Discretionary Sector | The Consumer Discretionary Sector encompasses those businesses that tend to be the most sensitive to economic cycles. Its manufacturing segment includes automotive, household durable goods, leisure equipment and textiles & apparel. The services segment includes hotels, restaurants and other leisure facilities, media production and services, and consumer retailing and services.

Consumer Staples Sector | The Consumer Staples Sector comprises companies whose businesses are less sensitive to economic cycles. It includes manufacturers and distributors of food, beverages and tobacco and producers of non-durable household goods and personal products. It also includes food & drug retailing companies as well as hypermarkets and consumer super centers.

Health Care Sector | The Health Care Sector includes health care providers & services, companies that manufacture and distribute health care equipment & supplies, and health care technology companies. It also includes companies involved in the research, development, production and marketing of pharmaceuticals and biotechnology products.

Financials Sector | The Financials Sector contains companies involved in banking, thrifts & mortgage finance, specialized finance, consumer finance, asset management and custody banks, investment banking and brokerage and insurance. It also includes Financial Exchanges & Data and Mortgage REITs.

Information Technology Sector | The Information Technology Sector comprises companies that offer software and information technology services, manufacturers and distributors of technology hardware & equipment such as communications equipment, cellular phones, computers & peripherals, electronic equipment and related instruments, and semiconductors.

Communication Services Sector | The Communication Services Sector includes companies that facilitate communication and offer related content and information through various mediums. It includes telecom and media & entertainment companies including producers of interactive gaming products and companies engaged in content and information creation or distribution through proprietary platforms.

Utilities Sector | The Utilities Sector comprises utility companies such as electric, gas and water utilities. It also includes independent power producers & energy traders and companies that engage in generation and distribution of electricity using renewable sources.

Real Estate Sector | The Real Estate Sector contains companies engaged in real estate development and operation. It also includes companies offering real estate related services and Equity Real Estate Investment Trusts (REITs).

15 Appendix 2: Historic Performance of S&P Global 1200 Sector Indices

Exhibit 8: Historic Performance of S&P Global 1200 Sector Indices

Index Name	1-Year	3-Year	5-Year	10-Year
Annualized Return (%)				
S&P Global 1200	-3.1	10.7	10.6	10.5
S&P Global 1200 Communication Services	-21.3	5.9	5.6	6.3
S&P Global 1200 Consumer Discretionary	-16.3	7.7	9.4	11.3
S&P Global 1200 Consumer Staples	8.3	9.1	7.6	9.0
S&P Global 1200 Energy	50.8	7.8	7.1	3.3
S&P Global 1200 Financials	-3.0	6.6	6.8	9.2
S&P Global 1200 Health Care	7.1	14.2	12.2	13.4
S&P Global 1200 Industrials	-8.4	7.1	7.6	9.8
S&P Global 1200 Information Technology	-3.4	21.0	21.0	17.9
S&P Global 1200 Materials	0.5	14.4	11.8	6.8
S&P Global 1200 Real Estate	5.8	8.0	8.3	8.9
S&P Global 1200 Utilities	4.8	9.3	9.6	8.7
Annualized Risk (%)				
S&P Global 1200	14.0	17.8	15.5	13.3
S&P Global 1200 Communication Services	16.4	17.9	16.2	14.0
S&P Global 1200 Consumer Discretionary	17.3	21.0	18.4	15.5
S&P Global 1200 Consumer Staples	11.3	13.0	12.1	11.2
S&P Global 1200 Energy	22.8	34.9	29.2	23.8
S&P Global 1200 Financials	15.9	23.3	20.2	17.4
S&P Global 1200 Health Care	16.0	15.1	13.9	12.8
S&P Global 1200 Industrials	15.2	21.0	18.6	15.3
S&P Global 1200 Information Technology	20.3	21.2	19.0	16.1
S&P Global 1200 Materials	16.4	21.3	18.3	17.5
S&P Global 1200 Real Estate	17.2	17.8	15.6	14.3
S&P Global 1200 Utilities	15.8	15.7	13.7	12.6
Annualized Risk-Adjusted Return				
S&P Global 1200	-0.2	0.6	0.7	0.8
S&P Global 1200 Communication Services	-1.3	0.3	0.3	0.5
S&P Global 1200 Consumer Discretionary	-0.9	0.4	0.5	0.7
S&P Global 1200 Consumer Staples	0.7	0.7	0.6	0.8
S&P Global 1200 Energy	2.2	0.2	0.2	0.1
S&P Global 1200 Financials	-0.2	0.3	0.3	0.5
S&P Global 1200 Health Care	0.4	0.9	0.9	1.0
S&P Global 1200 Industrials	-0.6	0.3	0.4	0.6
S&P Global 1200 Information Technology	-0.2	1.0	1.1	1.1
S&P Global 1200 Materials	0.0	0.7	0.6	0.4
S&P Global 1200 Real Estate	0.3	0.5	0.5	0.6
S&P Global 1200 Utilities	0.3	0.6	0.7	0.7

Source: S&P Dow Jones Indices LLC. Data as of April 29, 2022. The S&P Global 1200 Real Estate was launched Sept. 19, 2016. All data prior to index launch date is back-tested hypothetical data. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Index Education

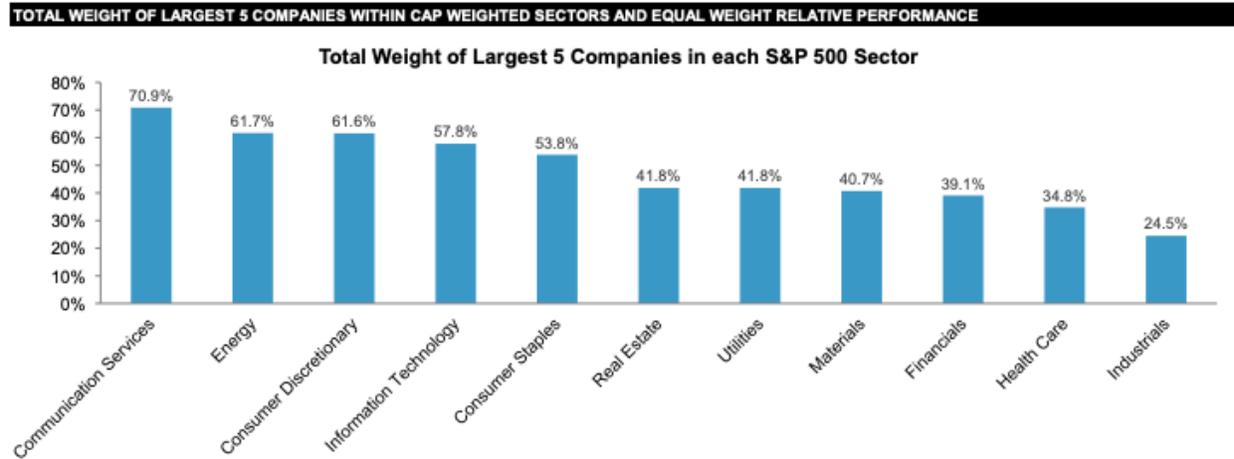
10

For use with institutions only, not for use with retail investors.

Source: S&P Global

I use the S&P 1200, because it does not only consider the United States (S&P 500), but takes into account seven regional indices and all GICS sectors (U.S., Hong Kong, Singapore, South Korea, Taiwan, Australia, Eurozone, Denmark, Norway, Sweden, Switzerland, U.K., Brazil, Chile, Colombia, Mexico, Peru, Japan and Canada),

16 Appendix 3: the top 5 largest companies within the cap weighted sectors and equal weight relative performance



Source: S&P Global