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DECENTRALIZED AUTONOMOUS ORGANIZATION (DAO): UTOPIA OR EQUITABLE DISTRIBUTION?

Abstract

Simultaneously with the fall of the Berlin wall, we witnessed the process of general acceptance of the Internet as mainstream. Opportunities created in the last 30 years by the Internet, and particularly in the last 10 years with the dramatic increase in the number of smart devices, created new business model. Namely, internet giants such as Google, Facebook, Uber or Airbnb have created on-line platforms through which they aggregate the potential resources of a large number of individuals to provide services to even larger and a group of consumers. The previous business model was based on centralized organizations, often with a dominant position in the market in charge of providing services to a group of passive consumers. The new type of "dematerialized" organizations doesn't rely on ownership of property. However, the profit generated by this new model is not fairly distributed - mediators who manage and own on-line platforms retain the profits.

Recently new technology called blockchain emerged. The purpose of this new technology is to facilitating the exchange in a reliable and decentralized way without intermediaries. Blockchain technology allows substitution of hierarchical model of management with a computer system that is decentralized and distributed among individual participants. This concept can changes the way the profit is distributed, allowing people to work for creation of common good, whereby everyone will be appropriately rewarded for their labour and engaged resources. But when talking about new disruptive technologies we need to be careful due to the fact that at its creation the internet was intended to narrow the gap between small entities and large corporations, yet over time internet giants took control of the digital world.

The aim of this paper was to give an overview of the possibilities and challenges of blockchain technology. The paper will make a theoretical analysis of the relevant papers in the subject area and will present concluding observations regarding the dilemma whether this new technology is utopia that is in advance condemned to failure or will succeed in the intention of fair distribution. The conclusions suggest that organisation without hierarchy is utopian, but our finding shows that DAO is possible with using blockchain technology, although it raises many questions (liability, tax payments, jurisdiction etc.). But we need to be careful due to the fact that internet giants took control of the digital world. Finally, social relationships are aspect that will be big drawback for DAO.

Keywords: *DAO, Blockchain, distributed system*

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I. INTRODUCTION

The quest for finding origins of the blockchain technologies bring us back to the 15th-century Italian city-states. Since those times, books were used for recording of the activities of businesses, such as expenses, payments, income, or even the barter or trade of goods. But, for the last 600 years, the entries were in books-initially handwritten, later printed or typed. In the past period of last 50 years, computer technology replaced physical books, but the basic principle has remained mostly the same. Conceptually, blockchain technology represents form of ledger system for recording and managing transactions.

The invention of blockchain technology was closely related to the introduction of widely known cryptocurrency Bitcoin.[1] Bitcoin does not exist as physical form, but can be mined, purchased, spent, invested, or kept in so called "wallets." All the transactions are recorded on the publicly accessible bitcoin blockchain. There is a wide debate whether it is actual currency, but it is accepted by some merchants. As an investment bitcoin price is volatile and it use is controversial for a number of illegal drug and child pornography transactions estimated to around $76 billion worldwide.[2] This new blockchain technology has given rise to a number of declarations about the disruption, disintermediation and end of legacy corporate companies and the rise of new, equitable businesses. More efficient processes, stronger data security, and better interoperation will allow many of these new companies to cut away at the market share of incumbent economic behemoths. This concept can changes the way the profit is distributed, allowing people to work for creation of common good, whereby everyone will be appropriately rewarded for their labour and engaged resources. It has also been identified as a potential platform for a wide range of industry transactions from finance to law and even music. In his article for Writing for Law Technology Today, Caitlin Moon identifies several industries in which blockchain or smart contracts are already having an impact, including finance, energy, music, real estate, and healthcare. Furthermore, she concludes that using blockchain in legal transactions could provide five key benefits: reduced costs, increased speed, increased security, reduces fraud and reduces risk.[3]

DAO is one of the most exciting organizational innovations of the twenty-first century.[4] But when talking about new disruptive technologies we need to be careful due to the fact that at its creation the internet was intended to narrow the gap between small entities and large corporations, yet over time internet giants took control of the digital world.[5] Tim Wu in his book "*The Master Switch: The Rise and Fall of Information Empires*" examine the history of leading communications technologies and identifies a worrying pattern that he define as "the Cycle."[6] Namely, at the beginning new technologies emerge wrapped in the spirit of revolutionarily and utopianism. Later, consumers become dissatisfied with the quality or reliability of the new

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[1] S Nakamoto, ' Bitcoin: A Peer-to-Peer Electronic Cash System' [2008] White paper

[2] S Foley, R Karlsen, and T Putniņš, 'Sex, drugs, and bitcoin: How much illegal activity is financed through cryptocurrencies?' [2019] The Review of Financial Studi Volume 32, Issue 5 1798, 1799

[3] C Moon, 'Technology Law ' (Law Technology Today 2017) accessed 25 February 2020

[4] Ying-Ying Hsieh, Jean-Philippe Vergne, Philip Anderson, Karim Lakhani and Markus Reitzig, 'Bitcoin and the rise of decentralized autonomous organizations' (2018) Journal of Organization Design 7:14 < https://doi.org/10.1186/s41469-018-0038-1 > accessed 27 February 2020

[5] P De Filippi , 'What Blockchain Means for the Sharing Economy ' [2017] Harvard Business Review Digital Articles 2 , 3

[6] T Wu, The master switch: the rise and fall of information empires (1st, Vintage Books, New York 2011)

technology, and incumbents become concerned with the threat that the new technology posture to their revenues**.** This opens the possibility for a so called "mogul" to take control and make sure that it runs in well-organized way fashion, which introduce the golden age in the lifecycle of the new technology. Finally, the controls claimed by so called "mogul" who are attempting to reassert dominance, transforms the technology from open and free to purely control by a single corporation or cartel until some new form of innovative technology starts new cycle.

One more aspect needs special attention when analysing the potential of blockchain technology. Namely, face to face communication supports touch, shared activities, eating and drinking together, as well as informal interactions and attention management. These activities are crucial for sustaining the social relationships that make distributed work possible. What is even more important is the fact that social linkages are a precondition of information exchange. That's why this kind of organisation should take into aspect not just economical, legal and technical aspects.

Finally, blockchain technology is more than cryptocurrencies and payments. In fact, blockchain-based organizing and the resulting DAOs have the ability to replace centralized intermediaries in other applications requiring complex coordination such as asset ownership tracking, trade financing, digital identity provision, supply chain traceability, and more. DAOs are on the rise, and it is an exciting time for management and organizational scholars to address this emerging phenomenon with new theory and solid empirical research.[7]

The rest of this article is organized in a following manner. In Section 2, we present blockchain technology. In Section 3 we examine what is DAO and how it is regulated. Section 4 describes the level of development of the fintech in North Macedonia. The main conclusions are presented in Section 6.

II. BLOCKCHAIN TECHNOLOGY

To get more detailed understanding of DAO principles, we need previous comprehension on how blockchain technology is conceptualised and thus we need deeper knowledge of blockchain terminology. Blockchain technology refers to a specific digital ledger for recording of transactions, software, network, and protocols that provide the technological infrastructure. The blockchain infrastructure use open source software to create a database of data entries that are transactions distributed across large number of computer nodes.[8] But the true potential of blockchain perhaps derives from its structure that allows movement of data through the secured hash structure. Furthermore, blockchain technology can include other forms of data and self-executing commands so called smart contracts. Namely, smart contracts are computer coding in which the contract conditions are stored. These are used to carry out or monitor contracts fully automatically. These contracts in the blockchain take over functions performed by the managers. DAOs are generally referred to as smart contracts of the most complex form.

Regarding the conceptualisation blockchain technology is consisted of three major components. The first one is the ledger, which is the series of blocks that are the public record of the transactions and the order of those transactions. Second is the consensus protocol, which allows all of the members of the community to agree on the values stored in the ledger. Finally, there is the digital currency, which acts as a reward for those willing to do the work of advancing the

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[7] Ying-Ying Hsieh, Jean-Philippe Vergne, Philip Anderson, Karim Lakhani and Markus Reitzig, 'Bitcoin and the rise of decentralized autonomous organizations' (2018) Journal of Organization Design 7:14 < https://doi.org/10.1186/s41469-018-0038-1 > accessed 27 February 2020

[8] S Nakamoto , 'Bitcoin: A Peer-to-Peer Electronic Cash System' [2009] White paper

ledger. These components work together to provide a system that has the properties of stability, irreversibility, and distribution of trust.[9] On the other side there is blockchain terminology, let us briefly explain the most important terms.

1. **Hashing**. A hash function is a computationally efficient function, which maps binary strings of arbitrary length to binary strings of some fixed length, called hash-values. These hash functions are easy to compute but (at least to our current knowledge) impossible to reverse.[10] Hashing allows large blocks of content in a compressed format, to be moved around the internet. There are a lot of secure hashing algorithms, but blockchain uses SHA256. It is important to recognize that the amount of content that can be squeezed into this hash string can be with infinite length. Each hash is unique and repeatable. Transaction details are timestamped. The history of the document is preserved. Importantly, because each hash is just a string and one hash can hash another hash. This is the principle how every party can verify that the order and timestamps of the transactions haven't been tampered with.[11]

2. **Block**. The nucleus of the blockchain is the block. Blocks are created by adding up hashes into suited groups. The genesis block will contain the original asset. Every other block on the chain will be a transaction (a contract) regarding the original asset, for example, a sale. Recall from the hash example above that each hash is unique. Also recall the fact that a group of hashes can be hashed. There's more math behind how blocks are grouped on any particular blockchain, but what matters is that by verifying the final hash of a block, you can verify the history of the original content back to the genesis block.[12]

3. **Chain**. Blocks are assembled into a chain. The conflict at a later stage is avoided by accepting the 'Longest Version' of the chain available at any time.[13]

4. **Distributed Ledger**. One of the main goals of blockchain is to provide a public record or *ledger* of a set of transactions that cannot be altered once verified and agreed to. This was originally designed to keep users of electronic currency from double-spending and to allow public audit of all transactions.[14] The ledger is a record of what transactions have taken place, and the order of those transactions. The distributed ledger is actually the key to the trust of a large blockchain. Blockchain ledger is sequence of blocks, where each block is an ordered sequence of transactions of an agreed upon size (although the actual size varies from system to system).[15] Each participant has a complete copy of the ledger

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[9] J Waldo, 'A Hitchhiker's Guide to the Blockchain Universe' [2019] Communications of the ACM Vol. 62 | No. 3 38 , 39

[10] S Bakhtiari, R. Safavi-Naini and J. Pieprzyk, 'Cryptographic Hash Functions: A Survey' [1995] 1 , 3
[11] M Di Pierro, 'What Is the Blockchain?' [2017] Computing in Science & Engineering 92 , 93
[12] D Puthal, N Malik, S.P Mohanty, E Kougianos and G Das, 'Everything you wanted to know about the blockchain: Its promise, components, processes, and problems' [2018] IEEE Consumer Electronics Magazine, 7(4) 6, 6
[13] D Puthal, N Malik, S.P Mohanty, E Kougianos and G Das, 'Everything you wanted to know about the blockchain: Its promise, components, processes, and problems' [2018] IEEE Consumer Electronics Magazine, 7(4) 6, 11
[14] 14 J. Waldo, 'A Hitchhiker's Guide to the Blockchain Universe' [2019] Communications of the ACM Vol. 62 | No. 3 38 , 38
[15] J. Waldo, 'A Hitchhiker's Guide to the Blockchain Universe' [2019] Communications of the ACM Vol. 62 | No. 3 38 , 39

hashes. When the next transaction takes place, small software on each blockchain participant's node updates the distributed ledger. Any unauthorised ledger entries, even the change of a comma in the original asset, will completely defeat the blockchain, showing everyone in the chain that an error has occurred.

5. **Smart Contract**. Smart contracts are applications that run exactly as programmed without any possibility of downtime, censorship, fraud, or third-party interference.[16] Since recent times, contracts have been of reactive nature. Namely long as all parties agreed along the way, the contract was fulfilled successfully. But this process is not reversible. Disagreements on contracts generally only occur afterwards. Legal disputes are occurring after the injury of clauses agreed in the contract. Smart contracts could prevent this from occurring by pre-programed rules that fulfil automatically without interference from the involved parties. Additionally, with using the blockchain technology the fraud involving double selling can be restraint. A smart contract allows all parties to keep a running total relative to contract performance. If any parameter is exceeded, the distributed ledger is updated immediately, and the contract is void.

6. **Miners**. Miners are generally computer programs, motivated by the opportunity to be rewarded, basically to reach a "true" state at every step. These methods decide if a transaction is legitimate and can, therefore, be added to the blockchain. The *proof-of work* consists of a difficult and time-consuming mathematical puzzle, required to the networks nodes called "miners" as a condition to be reliable, verify the transactions of the network and get a reward. The whole process is called "mining". The *proof-of-work* is difficult to produce, but easy for other nodes to verify.

Blockchains can be separated in two fundamentally different categories, depending on whether they are permission-less (public) or permissioned (private).[17] At its foundation by introduction of Bitcoin, blockchain technology was modelled as a technology which would make central institutions obsolete, empowering all individuals that are part of the network and guaranteeing them anonymity. Those characteristics are considered crucial for certain types of blockchains, such as blockchains running cryptocurrencies, by those who think that no one should be denied access to this payment method.[18]

In the permission-less blockchain anyone can be a user or run a node, anyone can "write" to the shared state through invoking transactions, and anyone can participate in the consensus process for determining the "valid state".[19] There is no need of trusted a central institution, and the blockchain rely on the computer program that guarantee the proper execution of the transaction. Ledger of transactions made on permission-less blockchain is usually public and accessible to anyone, but users operate anonymously. According to coinmarketcap.com which lists over 3,000 cryptocurrencies, Bitcoin, Ethereum, and Ripple, and many other cryptocurrencies, are based on this type of blockchain.[20]

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[16] M Di Pierro, 'What Is the Blockchain?' [2017] Computing in Science & Engineering 92 , 95

[17] C Cachin and M Vukolić, 'Blockchain consensus protocols in the wild' [2017] arXiv preprint arXiv:1707.01873, 1

[18] D Massessi, 'Public vs private blockchain in a nutshell' [2018] Hentet 17, no. 2019

[19] C Cachin and M Vukolić, 'Blockchain consensus protocols in the wild' [2017] arXiv preprint arXiv:1707.01873, 1

[20] Coinmarketcap , accessed 02 March 2020 < https://coinmarketcap.com > accessed 27 February 2020

Permissioned blockchains, in contrast, is operated by known entities, where members or stakeholders in a given business context operate a permissioned blockchain network. This type of blockchain is reintroducing the concept of the "trusted third party". The central institution administers the users' access rights and has "means to identify the nodes that can control and update the shared state, and often also control who can issue transactions." Permissioned blockchains systems have means to identify the nodes that can control and update the shared state, and often also have ways to control who can issue transactions. [21] Consortium blockchain systems like R3 Corda; Iroha; Kadena; Chain; Quorum and many other are permissioned blockchains.

III. WHAT IS DAO AND HOW IS IT REGULATED?

A decentralized autonomous organization (DAO) as is an organization that uses software rules to execute organizational routines, plus votes from some class of members to alter and extend those routines and no direct management is required.[22] The name DAO was introduced by Vitalik Buterin, co-founder of Ethereum and Bitcoin Magazine, and it includes varying forms of blockchain-based organizations. [23] DAOs are entities, which are currently constituted of crypto assets managed through predefined governance rules. The aforesaid rules are inscribed on a series of smart contracts deployed on a blockchain. They provide the framework that defines how the participants of the DAO can spend the entity's assets and how they are organized within the entity.

As the name implies DAO is an organization. In the economic context, it is a company but not in a conventional understanding. The main difference between existing organisations is that no hierarchical management structure controls. It doesn't even have a real headquarters and only exists virtually on the many computers which are integrated as nodes in the blockchain. Technically a DAO is a collection of implemented Smart Contracts in the blockchain. Within a DAO, there is no such thing as this traditional form of the management hierarchy. Just as Bitcoin eliminates middlemen such as banks, middlemen (the management) are also superfluous in the DAO. The DAO itself cannot manufacture its own products or provide services. In order to go through value creation processes, DAO have the possibility to engage executive staff or external suppliers. Classic employment or supply contracts are obsolete. Smart Contracts are the basis of cooperation.

Previous argumentation raises many questions and most obvious are who determines the fate of the DAO and who decides in a DAO? In the founding phase of the company, there is the possibility to acquire shares within the framework of a so-called Initial coin offering (ICO). The invested money represents the capital of the company. ICO is a mechanism through which new ventures raise capital by selling tokens to a crowd of investors. ICOs represent an innovation in entrepreneurial finance. In an ICO, investors buy tokens directly from a new venture, but these tokens are intended to become functional future units of the venture's project.[24] The establishment of a DAO can be compared to crowdfunding, in which the investors are also

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[21] C Cachin and M Vukolić, 'Blockchain consensus protocols in the wild' [2017] arXiv preprint arXiv:1707.01873, 2

[22] Ying-Ying Hsieh, Jean-Philippe Vergne, Philip Anderson, Karim Lakhani and Markus Reitzig, 'Bitcoin and the rise of decentralized autonomous organizations' (2018) Journal of Organization Design 7:14 < https://doi.org/10.1186/s41469-018-0038-1 > accessed 27 February 2020

[23] V Buterin, 'A next-generation smart contract and decentralized application platform' [2014] White paper 3, no. 37

[24] C Fisch , 'Initial coin offerings (ICOs) to finance new ventures ' [2019] Journal of Business Venturing 34-1 1,4

involved in the management of the company. The fact that conventional management hierarchies do not find a place in a DAO reduces high costs.[25] Over the past year, we are witnessing elevated interest for ICO. In 2016, less than $100 million[26] in tokens were sold. By contrast in 2017, that number significantly increased to over $6 billion. Some of the ICO token sales raised over $230 million each,[27] with the large messaging platform. In 2018, Telegram completing a token sale of over $1.8 billion.[28] The exciting thing about DAO is that shareholders also have decision-making power and the amount of this authority depends on the number of shares acquired. The percentage of shares reflects your own influence as a voting shareholder. In groups with many hierarchical levels, the administrative cost block can account for a considerable amount of the total costs. But on other side, this type of crowdfunding through ICOs arises many risks. Given the intensity of interest, authorities in various jurisdictions have turned their attention to token sales. For example in July 2017, the SEC released a Report of Investigation finding a blockchain-based token qualified as a security requiring registration under section 5 of the Securities Act of 1933.[29] Other government regulators from Canada[30], China[31], Hong Kong[32], Malaysia[33], Russia[34], Singapore[35], and Switzerland[36] have acted with urgency, issuing statements. A limited number of the countries surveyed regulate initial coin offerings (ICOs), which use cryptocurrencies as a mechanism to raise funds. Of the jurisdictions that address ICOs, some (mainly China, Macau, and Pakistan) ban them altogether, while most tend to focus on regulating them. The regulation of ICOs and the relevant regulatory is predetermined on how an ICO is categorized. For instance, in New Zealand, particular obligations may apply depending on whether the token offered is categorized as a debt security, equity security, managed investment product, or derivative. Similarly, in the Netherlands, the rules depends on whether the token offered is considered a security or a unit in a collective investment, an assessment made on a case-by case basis. Not all countries see the advent of blockchain technology and cryptocurrencies as a threat, and some of the jurisdiction see a potential in the technology behind

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[25] S Adhami, G Giudici, and S Martinazzi, 'Why do businesses go crypto? An empirical analysis of initial coin offerings' [2018] Journal of Economics and Business 100 64, 65

[26] Cryptocurrency ICO Stats 2016, (COINSCHEDULE 2016) accessed 26 February 2020

[27] Cryptocurrency ICO Stats 2017, (COINSCHEDULE 2017) accessed 26 February 2020

[28] Cryptocurrency ICO Stats 2018, (COINSCHEDULE 2018) accessed 26 February 2020

[29] Section 21(a) Report: The DAO, Exchange Act Release No. 81,207, 117 SEC Docket 81207, at 2 (July 25, 2017), https://www.sec.gov/litigation/investreport/34-81207.pdf

[30] Staff Notice, Canadian Sec. Adm'rs, CSA Staff Notice 46–307: Cryptocurrency Offerings (Aug. 24, 2017), http://www.osc.gov.on.ca/documents/en/Securities-Category4/csa_20170824_cryptocurrencyofferings.pdf

[31] Notice, The People's Bank of China, Notice on the Prevention of Tokens (Sept. 4, 2017), http://www.pbc.gov.cn/goutongjiaoliu/113456/113469/3374222/index.html

[32] Press Release, Hong Kong Sec. & Futures Comm'n, Statement on Initial Coin Offerings (Sept. 5, 2017), http://www.sfc.hk/edistributionWeb/gateway/EN/news-and-announcements/news/doc?refNo=17PR117

[33] Press Release, Sec. Comm'n Malay., Media Statement: Initial Coin Offerings (July 9, 2017), http://www.mondovisione.com/media-and-resources/news/securities-commission-malaysia-media-statementinitial-coin-offerings/

[34] Press Release, Bank Rossii [Bank of Russia], Ob Ispoleovanii Chastnykh Virtualnykh Valot (Kriptovalot) [Use of Private Virtual Currencies (Cryptocurrencies)] (Sept. 4, 2017), https://www.cbr.ru/press/PR/?file=04092017_183512if2017-09- 04T18_31_05.htm

[35] Press Release, Monetary Auth. of Sing., MAS Clarifies Regulatory Position on the Offer of Digital Tokens in Singapore (Aug. 1, 2017), http://www.mas.gov.sg/News-and-Publications/Media-Releases/2017/MAS-clarifies-regulatory-position-onthe-offer-of-digital-tokens-in-singapore.aspx

[36] Press Release, Swiss Fin. Mkt. Supervisory Auth., FINMA Publishes ICO Guidelines (Feb. 16, 2008), https://www.finma.ch/en/news/2018/02/20180216-mm-ico-wegleitung/

it and are developing a cryptocurrency-friendly regulatory regime as a means to attract investment in technology companies that excel in this sector. In this class are countries like Spain, Belarus, the Cayman Islands, and Luxemburg.[37]

The first experiment for launching of DAO became total failure. Namely, the model of simplicity, around 900 lines of software source code was given the placeholder name of "The DAO." The DAO was launched in April, 2016, by several "anonymous" submissions associated with DAOhub, who executed the open-source bytecode on the Ethereum blockchain. The DAO went live with the equivalent of about US$250 million in funding, breaking all existing crowdfunding records. However, after two-weeks, The DAO's code was "exploited" by an unknown individual and rapidly drains the fund of millions of dollars' worth of ETH tokens.[38] Although The DAO was unsuccessful, entrepreneurs experimenting with blockchain thehnology were able to learn from the project's flaws and new DAO projects like Aragon and Gnosis, among others, have been developed since then.

Werbach, from the Wharton School, identified three points regarding the regulations of new technologies: (i) it is misunderstanding to assume that the online, digital world is inherently different from the offline world and that therefore we need a totally new set of rules; (ii) they challenges the assumption that innovation needs an environment with no regulation to thrive; (iii) the conscious choice by regulators of not imposing the full set of rules on a nascent technology can lead, as the technology gains pace, to a more mature and productive dialogue among innovative firms and regulator.[39]

One of the key law aspects that arise from blockchain is its nature. In particular, if a system may be broken or inaccurate or private data are stored via a distributed ledger, the legal question of who will be liable for losses will arise. But answering this question is not easy taking into consideration that DLT is a technological, not a legal, concept. First, only few countries have adopted law regulating blockchain, and thus applying law to DLT will implicate applying general principles in the absence of specific legislation. Second, DLT is not reviling the information of entities that are involved or their governance roles, and each DLT serves a certain use case which ranges from currency, pegged services, automatic execution of functions to permanent organizations. Third, DLT is a concept with multiple variations and each DLT serves a certain use case which ranges from currency, pegged services, automatic execution of functions to permanent organizations.[40]

From the legal point of view, it is important to take closer examination of whether "code is law". "Code is law" refers to the idea that, with the advent of digital technology, code has progressively established itself as the predominant way to regulate the behavior of Internet users.[41] Technological artefacts are not neutral, but inherently political, even if they are often defined as general-purpose technologies, their design will ultimately dictate the type of actions

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[37] Global Legal Research Center, 'Regulation of cryptocurrency around the world' [2018] The Law Library of Congress White Paper, 2

[38] Quinn DuPont, 'A history and ethnography of "The DAO," a failed decentralized autonomous organization' [2018] RIPE Series in Global Political Economy-Crypocurrencies, Blockchain, and Global Governance 157, 158

[39] K Werbach, 'How to Regulate Innovation – Without Killing It ' (Knowledge@Wharton 2017) accessed 18 November 2019

[40] Z Dirk, Ross Buckley and Douglas Arner, 'The distributed liability of distributed ledgers: Legal risks of blockchain' [2018] U. Ill. L. Rev 1361

[41] P De Filippi and S Hassan, 'Blockchain technology as a regulatory technology: From code is law to law is code' [2018] arXiv preprint arXiv:1801.02507

that they might enable or prevent.[42] The widespread adoption of information technologies and the Internet created a new environment, whose rules are mediated mostly by software code.[43] Just like any other technological artefact, this code might have political qualities, and its technological design might have important implications over the online experience of many individuals.[44] Code is the fabrics of Internet, and thus capable of constraining an individual's actions via technological means.[45] Depending on whether, and how, these technologies will be adopted, they could potentially have a significant impact on a very large number of individuals.[46] Three perspectives are relevant here. First, code design and structure will define the freedom of users: the code will determine what users are authorized and what they are limited to do, and what their permissions are when using the system, especially interactions often referred to as smart contracts. In turn, contract law applies to blockchain based contracts, removing any uncertainty and making it clear that any blockchain based agreement is fully enforceable in a court of law. The second dimension is the questions of ownership of the distributed ledger software code - this is issue of property or copyright law and the legal protection of designs. The third perspective is the question of cooperation underlying a distributed ledger and the legal treatment of the cooperation. Questions in this analysis include: are those cooperating in a system liable for failures, and who among all the various nodes bears the legal responsibility for system hacks?[47]

IV. THE DESTINY OF NEW DISRUPTIVE TECHNOLOGIES

History of technology, particularly those involving network effects, shows that decentralization is often accompanied by centralization simultaneously. The personal computer revolution democratized computing power into the hands of ordinary citizens and workers and yet simultaneously created the Microsoft monopoly. The promise of the decentralized internet with distributed content creation and consumption has come true, yet search has become a significant bottleneck with Google currently acting as a centralized gateway. Similarly, in social media, Facebook has enabled disparate communities and individuals to connect and share information, yet it has centralized the matching of friends and the connections. Blockchain technology also exhibits network effects, and many of the novel applications being developed require ecosystem coordination.[48] The need for trust, the cost of the trust, and the dependence on middlemen as the trusted party to provide it, is one reason why tech giants like Google, Facebook, and Amazon turn economies of scale and network-effect advantages into de facto monopolies. These behemoths, in effect, centralized ledger keepers, building vast records of "transactions" in what is today, the most important "currency" in the world: our digital data. In controlling those

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[42] Abbe Mowshowitz, 'Computers and the myth of neutrality' [1984] *Proceedings of the ACM 12th annual computer science conference on SIGCSE symposium*, 85-92

[43] P De Filippi and S Hassan, 'Blockchain technology as a regulatory technology: From code is law to law is code' [2018] arXiv preprint arXiv:1801.02507

[44] L Winner, 'Do artifacts have politics? ' [1980] Daedalus 121, 45

[45] P De Filippi and S Hassan, 'Blockchain technology as a regulatory technology: From code is law to law is code' [2018] arXiv preprint arXiv:1801.02507

[46] S Woolgar and G Cooper, 'Do Artefacts Have Ambivalence: Moses\' Bridges, Winner\'s Bridges and other Urban Legends in S&TS' [1999] Social studies of science 29.3 433

[47] Z Dirk, Ross Buckley and Douglas Arner, 'The distributed liability of distributed ledgers: Legal risks of blockchain' [2018] U. Ill. L. Rev 1361

[48] M. Iansiti and K. Lakhani, 'The Truth about Blockchain' [2017] Harvard Business Review 95 no. 1 118

records, they control us. Although there are still major obstacles to overcome before blockchains can fulfil the promise of a more robust system for recording and storing objective truth, these concepts are already being tested in the field.[49]

Actually, information industries pass through a life cycle that transition from open to closed and eventually back to open, with openness and closeness measured largely in terms of vertical integration**.** This argumentation can be observed in the theories exploring how the degree of vertical integration varies over the course of an industry's life cycle. The most known theory is presented by Nobel laureate George Stigler. Stigler argued that vertical integration in an industry follows a **"U"** shape over time, beginning as vertically integrated, transitioning to vertically disintegrate as the industry matures, and then returning once again to vertically integrate as the industry declines. Because young industries often employ new materials and technologies that are typically unavailable on the open market, firms operating in these industries must produce all of their key inputs themselves. As demand for the product becomes better established, production becomes sufficiently large, and risk drops to the point where third parties have strong incentives to begin providing these inputs. When the industry enters its decline phase, the decline in sales volume causes third-party input providers to disappear, and firms operating in this industry must once again provide these inputs for themselves."[50] There are many empirical studies validating Stigler's theory.[51] On other side there are also empirical studies drawing the contrary conclusion.[52]

Distributed ledgers can also find applications in traditional organizations, as a transparent means of decentralized task allocation, task division, reward distribution, and information flow. This could enable collaboration among people through peer-to-peer networks, although these individuals don't know each other well, without needing a common supervisor as an intermediary that is trusted. Transaction-cost economics suggests that the basic reason why organizations exist is to minimize transaction costs - if everybody could make, execute, and adjudicate contracts at low cost, that would be the most efficient way to manage the four basic functions of organization design and "smart contracts" can dramatically lower the cost of contracting and reduce the risk that people fail to deliver results. The promise of distributed ledger technology will lead to massive disintermediation and the supplanting of organizations with loose networks of contributors who are linked by contract, and DAO is a typical example.[53]

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[49] M Casey and P Vigna, 'MIT Technology Review MAY/JUNE' [2018] In blockchain we trust

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V. SOCIAL ASPECT OF DAO

Face to face communication supports touch, shared activities, eating and drinking together, as well as informal interactions and attention management. These activities are crucial for sustaining the social relationships that make distributed work possible. Social linkages are a precondition of information exchange.

Although smart contracts do have some features that might serve the goals of social justice and fairness, the critiques of blockchain based smart contracts argues that they are based on a thin conception of what law does, and how it does it. These smart contracts exclude the social contexts within which contracts operate, and the complex ways in which people use them. Namely, in the real world, enforcement of contractual obligations is done through various kinds of social mechanisms other than formal adjudication. Furthermore contracts serve many functions that are not explicitly legal in nature, or even designed to be formally enforced. Actually, there are three categories of contracting practices in which people engage (the inclusion of facially unenforceable terms, the inclusion of purposefully underspecified terms, and wilful non-enforcement of enforceable terms). The concept of smart contracts is underestimating the fact that people use contracts as social resources to manage their relations. Finally, smart contract design, and its inflexibility, can bring conflicts of social uses to which law is routinely put. Thus addressing the social and relational contexts of contracting are essential considerations for the discussion, development, and deployment of smart contracts.[54] Until now this social aspects are still limitation for smart contract.

Actually, organizations arise and persist for reasons that go beyond minimizing transaction costs. Some of these factors are shared purpose; identity, collective reputation and status, and the ability to habituate pro-social behaviours help explain why organizations last. Distributed-ledger technologies and tokens that will be able to utilise this factor will have the opportunity to make significant impact on organizations and exchange. Once a dominant design emerges and distributed ledgers become viable substitutes for other database architectures, tokens will also revolutionize the way organizations manage their routines while sustaining useful forms of central control.[55]

As an example we will again point out to first DAO experiment, The DAO. Immediately, after the The DAO's code was "exploited" by an unknown individual and rapidly drain the fund of millions of dollars, the leaders of the Ethereum platform, many of the cryptocurrency exchanges, and other involved steckholders stepped in to stem the damage – closing down "exits" through the exchanges, and launching counter-attacks. In this exact point we see the vision of future governance structures break down, and devolve into traditional models of sociality – using existing strong ties to negotiate and influence, argue and disagree – all with nary a line of code in sight. Finally, the project was break up, with an inglorious "hard fork" rolling back the supposedly "immutable" ledger.[56]

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VI. CONCLUSION

A virtual enterprise without any hierarchies is usually a utopian notion. The DAO shows that it is possible with blockchain technology. Namely, DAOs represent a new set of experiments in organizational design and management of complex activities. Studying the emergence, growth, sustainability, and failure of DAOs will offer us better understanding in changing landscape catalysed by new blockchain technology. However, we should be cautious and sceptical about the mirage offered by new disrupting technologies, due to the fact that internet giants took control of the digital world, and new technologies are passing through cycles from open to close and vice-versa. Even the concept of DAO is exciting many questions especially from legal point of view should be clarified before (liability, jurisdiction etc.) The aspect of social relationships is something that will be big drawback for DAO, and will need to be addressed. Finally, more analysis will have to be performed should in order to understand the possibilities under which the promise of decentralization can be achieved and the circumstances that lead to even more concentration, instead fulfilment of noble causes.

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