Department of Economics and Finance

Chair of Law and Economics (Corporate and Business Law; Antitrust and Regulation)

AN OVERVIEW OF BLOCKCHAIN APPLICATION IN THE FINANCIAL AND LEGAL SECTOR: A REGULATORY RIDDLE

Supervisor:
Professor Pierluigi Matera

Candidate:
Caterina Mainardi 245961

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ABSTRACT

There is a vast variety of different definitions of distributed ledger technology (DLT) systems. For that reason, a consistent definition for DLT has not been developed yet.

A broad definition of DLT refers to the technological infrastructure and protocols that allows simultaneous access, validation, and record updating in an immutable manner across a network that's spread across multiple entities or locations.[1]

Immediately under the DLT lies the Blockchain technology, a peer-to-peer network of nodes that jointly follow a protocol for validating new blocks of data: by doing so, they allow the transfer and preservation of digital files without necessarily having to rely on a central authority.

The applications of Blockchain are many, and they range through various markets. In the financial sector, industry in which the technology has been rapidly gaining acceptance, applications span from digital assets to smart contracts: in this dissertation I am going to focus on cryptocurrencies and tokens (more in particular on the difference between security v. utility tokens).

Lastly, this dissertation is going to address one of the most relevant cases of the past couple of years, which might change forever the world of cryptocurrencies: SEC v. Ripple (2020), in which SEC alleges that Ripple conducted an illegal security offering through sales of XRP, the world's sixth-biggest cryptocurrency.

[1] Distributed Ledger Technology, Investopedia (2021), https://www.investopedia.com/terms/d/distributed-ledger-technology-dlt.asp (last visited May 10, 2022)

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I. INTRODUCTION

Banking and Financial Law are radically changing due to recent technologies. Technological innovations keep having a strong impact, not only on the society and economy, but in particular on the legal and financial world. States from across the globe have to deal with the process of regulating these technological innovations quickly and efficiently. This is not an easy job to handle, given the fact that these technologies develop faster and faster, and they are not relying on State regulation but they themselves want to oversee the dynamics between subjects. Big data, cloud computing, robotics, artificial intelligence, and machine learning systems, are just some examples of this ongoing revolution.[2] But in the field of banking and financial law, the distributed ledger technologies are the actual innovation. Blockchain is surely the most known example of this technology. In this dissertation, I will try to offer a definition of DLT, blockchain and one of its many applications (crypto assets), looking at the key features of these new tools.

As of today, we are deep in the FinTech world, where the possibilities offered by the use of the distributed ledger technologies (DLTs) are many and of significant relevancy in the current economy. In other words, the blockchain is the leader of the transition from the "Internet of Information" to the "Internet of Value"[3], through which every type of asset - not just money, but also physical assets as well as intellectual property - can be collected, transferred, and organised in a decentralised manner, or without the need for intermediaries.

Judging from the blockchain core mechanism and its various applications – in particular, Initial Coin Offerings and crypto exchanges – it is important to define the potential costs and benefits within the financial context and not limiting ourselves to that. Blockchain technology – though still young and facing technical, commercial, and regulatory challenges – has the potential to change many aspects of the financial services sector and the broader economy.[4] The challenge is to reduce the cost of trust, to protect against criminal interference – money laundering and terrorism, for instance – to ensure that that the technology is appropriately adopted, utilised and governed. When and if these problems are solved, blockchains could supply enormous economic, social, and political benefits to society.

New ways to intermediate capital and risk are emerging, supplying a catalyst for change to incumbent financial sector firms. These technologies could improve automation across organisations and widen

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[2] Diritto del risparmio, SMART CONTRACTS AND BLOCKCHAIN (2019), https://www.dirittodelrisparmio.it/wp-content/uploads/2019/09/Casalini-Blockchain-and-smart-contracts-9_2019.pdf.

[3] *Id.*

[4] Mahmood H. Alnasser, What is blockchain technology and why might it be a catalyst for change for the financial sector? Medium (2021), https://medium.com/@mahmoodhalnasser/what-is-blockchain-technology-and-why-might-it-be-a-catalyst-for-change-for-the-financial-sector-7020d989d1ae (last visited May 5, 2022).

financial access.[5] However, the technical and social infrastructure underpinning the technology is still significantly underdeveloped. Numerous technical challenges must be overcome – including performance, scalability, privacy, security, interoperability, and governance – if it is to live up to any of its promise.

In the third chapter, I will go over the definitions of two of the most common and known uses of Blockchain in finance: Cryptocurrencies and Tokens. Not only focusing on their definitions and different types, but also on whether this innovative technology and its applications should be subject to the regulatory framework already in force in financial matters, or if they need new regulations and hence a new legislation to work. The various applications of technological innovations to financial industries affect economic structures, such as markets and financial intermediaries. Hence, it is important in order to reach a final decision regarding legislation that all countries come down to an agreement. Lastly, in the final chapter, I am going to analyse one of the most important and possibly revolutionary cases of the past couple of years: SEC v. Ripple (2020). The lawsuit, filed on 22 December 2020, alleges that Ripple raised over $1.3 billion of fundings through illegitimate sales. For the SEC, also Christian Larsen, Ripple co-founder, and Bradley Garlinghouse, the current Ripple CEO, are to be held accountable, since 'they made significant gains in the process'[6]. This case is determinant for the future of cryptocurrencies since, if the SEC wins the case, XRP (the native cryptocurrency of the Ripple Blockchain) will be considered a security rather than a currency in the US.[7] Then this would set a legal precedent that will result with similar cryptos being classified as securities as well. Therefore, the case against Ripple is important for all stakeholders within the crypto space, including investors, blockchain innovators and lawmakers worldwide.[8]

[5] Alnasser, *supra note* 4.

[6] SEC vs Ripple: Case Explained, cnbctv18.com (2022), https://www.cnbctv18.com/cryptocurrency/sec-vs-ripple-case-explained-13054042.htm (last visited May 12, 2022).

[7] *Id.*

[8] *Id.*

II. DLT & Blockchain

II.I *DLT – Distribution Ledgers*

Definition and characteristics

There is a vast variety of different definitions of distributed ledger technology (DLT) systems. For that reason, a consistent definition for DLT has not been developed yet.

Some definitions refer exclusively to 'blockchain technology' and do not differentiate between the two, when in reality, even though they may seem similar under certain aspects, they are totally different under others.

A broad definition of DLT is that it can be described as "an umbrella", under which lie multi-party systems that record the transaction of assets: in this digital system, the transactions and the details related to them are recorded in multiple locations at the same time. Unlike traditional databases, distributed ledgers don't have a central data storage or administrator: they operate in an environment with no central authority. It is decentralised in the sense that: there is no single device that record the data, they are distributed among the participants throughout the network; and transactions do not need to be approved by an authority, therefore making trust essential to reach a consensus.[9] Summing everything up, it can be added to its definition that DLT is a decentralised peer-to-peer system.

The concept of DLT systems can be traced back as far as the times of the Roman Empire[10], which held a banking system that allowed citizens to engage in transactions throughout other regions belonging to the empire. But the use of DLT has been slowed down due to an issue that had emerged: how was it possible to achieve consensus on the data in a decentralised, distributed and not trustworthy environment?

This problem has been conceptually analysed in 1982, theorised by Lamport et al. in *The Byzantine Generals Problem*: it is a hypothetical problem, whose purpose is to answer the question "how do different parties come down to a complete agreement on anything they do before any action is taken?", "how do they achieve complete consensus?". The paper described how "computers must handle [...] conflicting information in an adversarial environment"[11], and the fictitious story of

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[9] Claudia Antal, Tudor Cioara, Ionut Anghel, Marcel Antal and Ioan Salomie, *Distributed Ledger Technology Review and Applications Development Guidelines,* 7-32 (2021),

[10] Marco Del Negro & Mary Tao*, Historical Echoes: Cash or Credit? Payments and Finance in Ancient Rome - Liberty Street Economics Liberty Street Economics* (2022), https://libertystreeteconomics.newyorkfed.org/2013/02/historical-echoes-cash-or-credit-payments-and-finance-in-ancient-rome/#.V1GF-PkrLcs (last visited March 10, 2022).

[11] Leslie Lamport, Robert Shostak & Marshall Pease, *The Byzantine Generals Problem*, 4 ACM Transactions on Programming Languages and Systems 382-401 (1982).

Byzantine Generals' Problem is about a gathering of Generals, and their armies, that surround a royal palace that they want to invade. They study its moves, to choose the exact time of their attack and have the best chances of succeeding in their mission.[12]

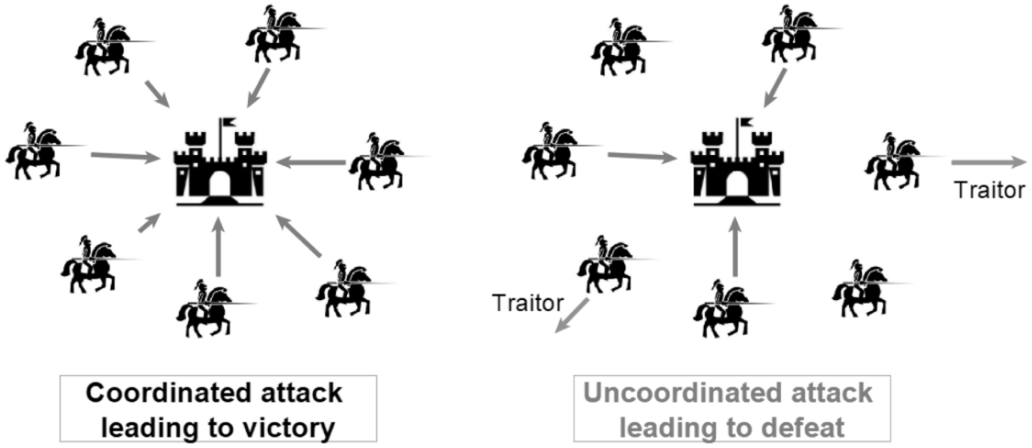

Figure 1. Representation of the Byzantine Generals Problem.

There are multiple Generals and multiple armies. They succeed in their mission only if at least half of them attack at the exact same time: if they don't cooperate and coordinate the timing of the attack, they will be defeated.[13]

But to make matters even more complicated, there are suspicions that some generals are traitors, that give misleading signals about the timing of the attack (thus increasing the chances of defeat).

Generals can communicate with each other only through their messenger and have no way of checking the authenticity of the message that they receive.[14]

How can an agreement be achieved under these circumstances?

This problem is widely used to explain the agreement prerequisite for DLT: to come down to an accord, a certain form of consensus algorithm had to be implemented for the nodes (i.e., machines actively participating in a network) to work together and efficiently update the ledger.

The research that followed *The Byzantine Ledger Problem* led to the rise of the first algorithm for "highly available systems that tolerate Byzantine faults"[15], and now, DLT promises to improve efficiency and transparency of collaborations between individuals and/or organizations based on fundamental characteristics such as tamper resistance and censorship resistance and democratization

[12] *Id.*

[13] *Id.*

[14] *Id.*

[15] Miguel Castro & Barbara Liskov, *Practical byzantine fault tolerance and proactive recovery,* 20 ACM Transactions on Computer Systems 398-461 (2002).

of data.[16] Because of that, an escalating number of DLT applications have been refined in different departments, such as law[17], finance[18], supply chain management[19], or health care[20]. What these different domains have in common is the way they make use of distributed ledgers: the technology is employed as a shared infrastructure that eases the process of storing data in a reliable and inviolable location, the processing of transactions (e.g., for the transfer of digital assets) and the instrumentation of business activities.[21]

There are a few key characteristics of DLT systems. The first, and most obvious, is that it is distributed: this specific feature allows for the scaling of nodes in a DLT network; the more nodes there are, the harder it is for a bad actor to impact the consensus protocol used by the DLT, thus making the barrier between the data and the attacker much more difficult to penetrate.[22]

The second one would be that it is shared: the ledger is shared amongst multiple nodes. Some of them, called full nodes, include a copy of the whole ledger while other nodes do not necessarily contain its full state: this characteristic provides transparency and efficiency across the participants in the DLT network.[23]

Another important characteristic that needs to be kept in mind is that it is immutable: DLTs are cryptographed in a specific way to make them safe, secure, and unchangeable. They ensure that the data contained within the ledger has not been interfered with, and that the data within the ledger has been verified.[24]

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[16] Steven R. Kursh & Natalia A. Gold, *Adding FinTech and Blockchain to Your Curriculum,* 8 Business Education Innovation Journal 6-12 (2016), http://www.busedinnovation.com/images/V8N2_draft81.pdf (last visited Mar 10, 2022).

[17] Nita Singer, Impact of Blockchain and the Distributed Ledger Technology on Global Markets Theimpactlawyers.com (2020), https://theimpactlawyers.com/articles/impact-of-blockchain-and-the-distributed-ledger-technology-on-global-markets (last visited Mar 10, 2022).

[18] Srikumar Ramanathan, Council Post: How DLT Can Improve Financial Services Forbes (2021), https://www.forbes.com/sites/forbestechcouncil/2021/08/20/how-dlt-can-improve-financial-services/?sh=3e0e982645ec (last visited Mar 10, 2022).

[19] Nihil Vadgama, Paolo Tasca, Peter Bambridge, Geri Cupi, Najib Rehman, Antony Welfare, *DLT in the Supply Chain.*

[20] Mae Losasso, The potential of DLT is key to the future of healthcare NS Healthcare (2022), https://www.ns-healthcare.com/analysis/the-potential-of-dlt-is-key-to-the-future-of-healthcare/ (last visited Mar 10, 2022).

[21] Ingo Weber et al., On Availability for Blockchain-Based Systems Ieeexplore.ieee.org (2017), https://ieeexplore.ieee.org/document/8069069 (last visited Mar 15, 2022).

[22] Dylan Yaga, Peter Mell, Nik Roby, Karen Scarfone, Blockchain Technology Overview*,* NISTIR 8202 (October 3, 2018), https://csrc.nist.gov/publications/detail/nistir/8202/final.

[23] *Id.*

[24] *Id.*

The last one is that a distributed ledger is 'append-only': what that means is that the ledger can be written onto with new information, but the previous information, that had already been stored, cannot be edited, adjusted, or changed.[25]

As I've have briefly mentioned before, when trying to define DLTs and/or Blockchain technologies, due to their many similarities, definitions often tend to overstep and mix up the two systems. In reality, there are several differences between them. To put it simply: Blockchain is a type of DLT, but not all distributed ledger technology uses blockchain technology.[26] Both can be used to create decentralised ledgers using cryptography, both can record unchangeable and immutable information, and both are considered nearly unhackable (thanks to their distributed nature). Both can be made public and open to anyone (e.g., bitcoin), or else they can be made private and restricted only to authorised users. The main difference between the two, however, is that Blockchain uses blocks of data that are linked together to create the distributed ledger (as it is described in its name). At the same time however, DLT also includes technologies that utilise other design principles to create a distributed ledger. Hence, to be considered a DLT, the technology does not necessarily need to have its data structured in blocks.[27]

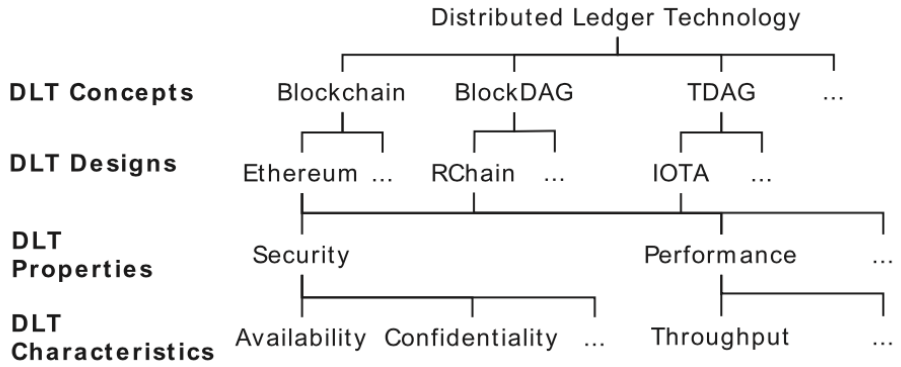

Figure 2. Hierarchical structure of DLT, subordinate DLT concepts and DLT design, properties, and characteristics.

Understanding the differences between the two can be helpful, especially for entrepreneurs and businesses, to better understand the potential use of DLT and to determine whether blockchain is the best method of distributed ledger organization.

Now that DLTs have been briefly introduced, I am going to focus more specifically on the Blockchain system, and the reasons why it is considered by many as one of the greatest 'life-changing' inventions.

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[25] *Id.*

[26] Volodymyr Babich & Gilles Hilary, *Blockchain and Other Distributed Ledger Technologies in Operations*, SSRN Electronic Journal (2018).

[27] Hossein Kakavand, Nicolette Kost De Sevres & Bart Chilton, The Blockchain Revolution: An Analysis of Regulation and Technology Related to Distributed Ledger Technologies (2022).

II.II *What is Blockchain technology?*

Definition, types of Blockchain

Blockchain is based on a peer-to-peer network of nodes that jointly follow a protocol for validating new blocks of data: by doing so, they allow the transfer and preservation of digital files without necessarily having to rely on a central authority. This is where it is possible to see the connection between the Blockchain technology and the distributed ledger technology.[28]

There are three different types of blockchain technology:

Permission less blockchain

The perfect example to define Permission less blockchain would be Bitcoin.[29] There is no limitation as to who can use it: anyone can run a node, anyone can access the network and write data on the transactions (still, however, following the rules of blockchain). These types of blockchains are open and characterised by transparency: anyone can review it at any point in time, hence the name they're known for, 'public blockchains'[30]. This blockchain network supports most of the digital currency sector (e.g., Bitcoin, Ethereum, Litecoin, etc...).

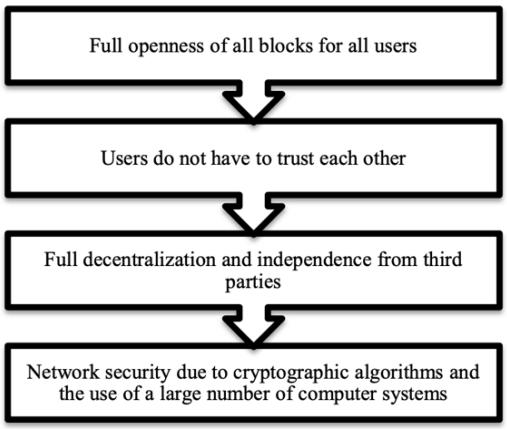

Figure 3. Main features of public blockchains.

Permissioned blockchain

Also known as 'private blockchain': this system works as a closed ecosystem where it is not possible for everyone to access the network, nor get access to the transactions archive if they've not been given some sort of permission to do so.[31] The blockchain belongs to either a private individual, or an

[28] Volodymyr Babich & Gilles Hilary, Blockchain and Other Distributed Ledger Technologies in Operations, SSRN Electronic Journal (2018).

[29] Harsh Sheth & Janvi Dattani, *OVERVIEW OF BLOCKCHAIN TECHNOLOGY*, 05 ASIAN JOURNAL OF CONVERGENCE IN TECHNOLOGY 1-4 (2019).

[30] *Id.*

[31] *Id*.

organisation where a central authority is present to look after the permissions.[32] However, the consensus mechanism used can be either the same as the public blockchain one, or some other similar one (e.g., ripple – blockchain based digital payment network and protocol with its own cryptocurrency, XRP[33]).

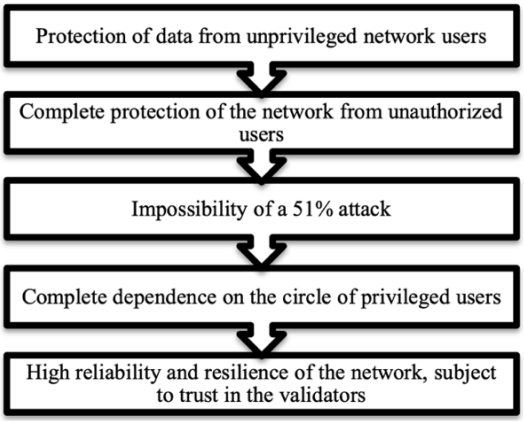

Figure 4. Main features of private blockchains.

Consortium or federated blockchain

In this type of blockchain, instead of having a single individual or organisation in charge, there are multiple people who form groups called consortium or federation, e.g., Quorum, Hyperledger, Corda.[34] Blockchain technology offers great potential to various sectors, thanks to its ability to be adapted to different environments and different needs[35]: for example, it is applicable to crowdfunding[36], tracking of supply chain goods[37], authentication[38], and many other sectors.

[32] *Id.*

[33] Ripple, Investopedia (2022), https://www.investopedia.com/terms/r/ripple-cryptocurrency.asp (last visited March 15, 2022).

[34] Dattani, *supra note* 21.

[35] Fran Casino, Thomas K. Dasaklis & Constantinos Patsakis, *A systematic literature review of blockchain-based applications: Current status, classification and open issues*, 36 Telematics and Informatics 55-81 (2019).

[36] Laurin Arnold et al., *Blockchain and Initial Coin Offerings: Blockchain's Implications for Crowdfunding*, Business Transformation through Blockchain 233-272 (2018).

[37] Thomas Hepp et al., Securing Physical Assets on the Blockchain | Proceedings of the 1st Workshop on Cryptocurrencies and Blockchains for Distributed Systems ACM Conferences (2018), https://doi.org/10.1145/3211933.3211944 (last visited Mar 15, 2022).

[38] *LVMH, Richemont and Prada unite behind a blockchain consortium.* (2021), available at https://www.nytimes.com/2021/04/20/business/lvmh-richemont-prada-blockchain.html

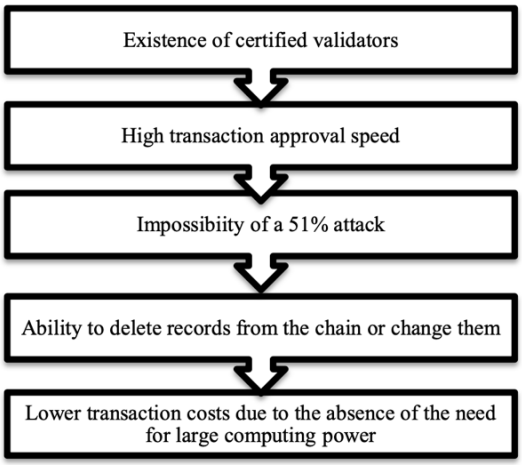

Figure 5. Main features of consortium blockchains.

Despite the different typologies, for clarity we can divide the uses of Blockchain into three main categories: storage of digital records (identities, assets, voting rights, etc); exchange of digital assets (via direct peer-to-peer transactions); recording and executing smart contracts (using code to embed contract rules into processes, hence creating automated selected functions).[39] There are four fundamental elements that characterise a blockchain system: its distributed nature, its standard rules, the privacy aspect, and the cryptographic algorithms that the security layer of the system is based upon.[40]

Distributed Nature

All users of a blockchain can access the entire system, the transactions included in the ledger, and the partners' records.[41] There is no central authority, and the truth of data is confirmed by consensus among all blockchain participants. Peers communicate with each other directly and not through nodes. Nodes store the data and spread information to other nodes.[42]

Standardised Rules

The blockchain mechanism requires following of a set of rules in every transaction process. Data cannot be falsified, deleted, or altered. This is due to the 'hashing' function[43] and the unique hash

[39] Vadgama*, supra note* 14.

[40] Wajde Baiod, Janet Light & Aniket Mahanti, Blockchain Technology and its Applications Across Multiple Domains: A Survey CSUSB ScholarWorks (2021), https://scholarworks.lib.csusb.edu/jitim/vol29/iss4/4 (last visited Mar 16, 2022).

[41] *Id.*

[42] *Id.*

[43] Hashing is the process of converting a given key into another value. A hash function is used to generate the new value according to a mathematical algorithm. The result of a hash function is known as a hash value or simply, a hash.

identifiers. However, immutability does not mean that new blocks of information can't be added to already recorded information.[44]

Privacy

It's an innate feature of the platform: users cannot be publicly identified. Each user can use the blockchain through a generated IP address that cannot reveal its origin nor identity.[45]

Auditability

Previous records can be easily verified and traced as transactions, since they are validated with a time stamp that allows data stored to be traced easily. Algorithms are employed to make sure that the recording of those transactions is placed in chronological order and made available to all network users (thus making the data irreversible).[46]

As I've said before, Blockchain is a form of DLT, hence, the fundamental structure behind the system is a distributed ledger that contains an escalating amount of data records (i.e., transactions) distributed in blocks. To verify the authenticity of the data contained in these blocks, their integrity is evaluated using digital signatures and cryptographic algorithms[47]. That's why the blockchain system brings several advantages in comparison to a traditional database: its main task is to make sure that the data used and contained in it are complete, correct, with no contradictions, that it is logically functional and that it is accessible to users.[48] The concept of integrity plays a main role here: thanks to its immutability, its append-only function, and its possibility of recording all transactions; the technology can provide transparency and therefore create a trustworthy environment.[49] Therefore, it is possible to say that Blockchain is transparent, since all transactions are traceable; reliable, since the technology is resilient and difficult to attack; efficient, since with the absence of an authority the transactions can be processed quickly directly from peer to peer; and last, it is potentially a low-cost solution to

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[44] Baiod, *supra note* 35.

[45] *Id*.

[46] *Id*.

[47] Cryptographic algorithms are sequences of processes, or rules, used to encipher and decipher messages in a cryptographic system. In simple terms, they're processes that protect data by making sure that unwanted people can't access it. These algorithms have a wide variety of uses, including ensuring secure and authenticated financial transactions.

[48] Miles Gietzmann, Francesco Grossetti, *Blockchain and other distributed ledger technologies: Where is the accounting*?, Journal of Accounting and Public Policy, Volume 40, Issue 5, 2021, 106881, ISSN 0278-4254, https://doi.org/10.1016/j.jaccpubpol.2021.106881.

[49] Stephan Leible et al. *A Review on Blockchain Technology and Blockchain Projects Fostering Open Science. Front. Blockchain 2:16. doi: 10.3389/fbloc.2019.00016*

complete back office processes (which normally require significant involvement of accountants, bookkeepers, auditors to ensure the reliability of the data conserved).[50] But how does it work?

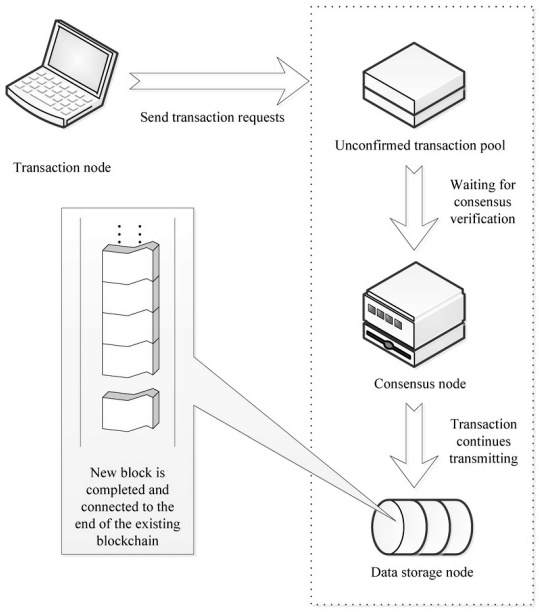

Figure 6. Operation mechanism of the Blockchain system.

Figure 3 demonstrates the operation mechanism of the Blockchain system, but for clarity, a practical example of how it operates with Bitcoin can be used, to better understand how the mechanism works. Let's assume that a Bitcoin block contains information about the sender, the receiver, and the number of bitcoins that are being transferred.

For example, the sender is Sam: he sends 200 bitcoins to the receiver, and the receiver is Peter.

This is the first block in the chain, and it's called the Genesis block. Each new block in the chain is linked to the previous one, and it contains the information of that block as well.[51]

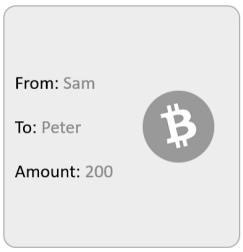

Figure 7. Bitcoin Block.

A block, however, also contains a hash. A hash can be comparable to a fingerprint, and like fingerprints are unique to every individual, hashes are unique to each block.

[50] Vadgama*, supra note* 14.

[51] Simply Explained, *How does a blockchain work – Simply Explained*, YouTube (2017), https://youtu.be/SSo_ElwHSd4

Each hash identifies a block and all the content inside of it, each with its own fingerprint. Hence, once a block is created, any new information that gets added to it will cause changes in its hash (and if the fingerprint of a block changes, it does not remain the same block).[52]

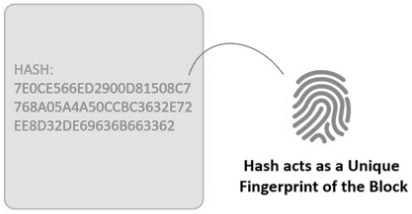

Figure 8. Example of a Hash.

Summing up, each block contains: data, a hash, and the hash of the previous block.
Since the first block doesn't have a predecessor, it contains just its own data. From the second block up until the last one, each block will contain its own information with the addition of the data from the previous block.

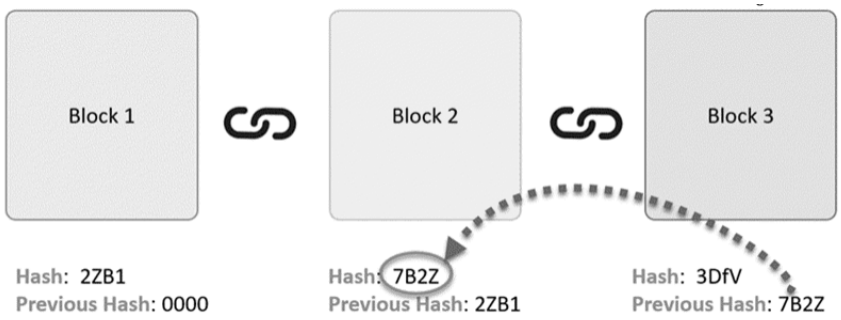

Figure 9. Structure of a Blockchain.

Hence, all blocks are contained in hashes of the previous blocks: this technique ensures the security and safety of Blockchain, but what would happen in case of an attacker?

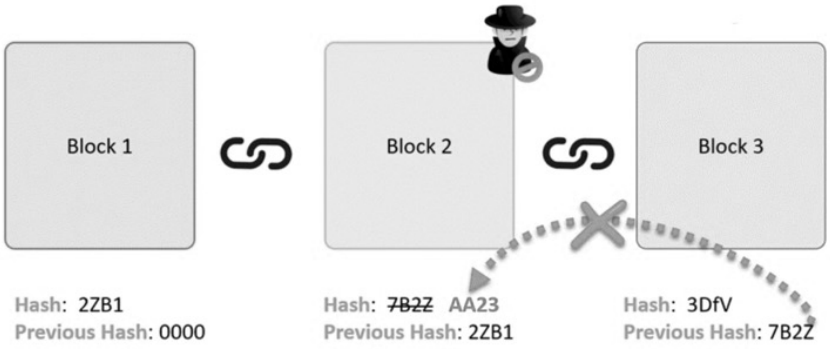

Figure 10. Example of an attack.

[52] *Id.*

Assume that an attacker changes the data present in the second block: its corresponding hash would change too. But the third block still contains the previous hash of the second block: this automatically makes the third block, and all the following ones, null, as they do not longer have the correct hash of the previous block.[53]

Changing a single block can quickly make all following blocks invalid.[54] Hence, despite hashes being an excellent mechanism to prevent tempering with the data, an attacker could still tamper with a block and then recompute the hashes of the other blocks to make the blockchain valid again.

That is why Blockchain technology uses the concept of 'proof-of-work'[55].

A proof-of-work is a form of cryptographic proof that requires members of a network to solve a difficult mathematical puzzle to prevent anybody from messing with the system. This kind of puzzle makes it quite complicated and time-consuming to alter the blocks; hence, hashing and proof-of-work mechanisms together ensure that the Blockchain system is safe.[56]

II.III *The limitations of Blockchain technologies*

The technology behind Blockchain is way ahead of our times. Hence, there are many prejudices that taint its reputation throughout organisations in all industry sectors. The principal challenge associated with Blockchain technology is a lack of awareness regarding it: many consider it a 'trustless' network[57], despite it being able to provide companies with not only a secure data encryption, but also high fraud protection.[58] It helps to minimise security-related risks, decrease operational costs, but still, the fact that this technology places trust and authority in a decentralised network rather than in a central institution upsets the sense of control in some industries. When a company finds itself in the position of deciding whether to totally shift away from the traditional way of doing things – hence by implementing a blockchain – it's important for them to note the challenges that lie behind this

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[53] *Id.*

[54] Akash Srivastava, Blockchain technology and Cryptocurrency : Explained in simple words Linkedin.com (2022), https://www.linkedin.com/pulse/blockchain-technology-cryptocurrency-explained-simple-srivastava (last visited May 6, 2022).

[55] Agostino Capponi, Sveinn Olafsson & Humoud Alsabah, *Proof-of-Work Cryptocurrencies: Does Mining Technology Undermine Decentralization?*, SSRN Electronic Journal (2021).

[56] *Id.*

[57] Nadya Knysh, Council Post: Introducing Blockchain: Six Limitations For Enterprises To Remember Forbes (2022), https://www.forbes.com/sites/forbestechcouncil/2021/11/22/introducing-blockchain-six-limitations-for-enterprises-to-remember/?sh=64c1c4a0313f (last visited Apr 16, 2022).

[58] *Id.*

technology. Vitalik Buterin, co-founder of Etherum, has in fact framed the problem of distributed networks as a trilemma: scalability, decentralisation, and security.[59]

These three features, also called The Blockchain Trilemma, represent the core characteristics of blockchain technology, or at least they should. However, since blockchain technology isn't perfect, often, blockchain developers are forced to trade-off between one 'aspect' for the sake of the other two. Starting from the scalability aspect: Blockchains should support a continuously increasing number of users and transactions, without losing their strength by raising their fees or transaction times.[60]

However, transaction speed depends to a great extent on network congestion, which means that the more people or nodes get involved, the slower the transaction processes are going to get. And even though many projects claim to have reached such a stage in which they are able to support a large user base, the reality is quite different. For example, when it comes down to centralised payments, there is no issue regarding the number of transactions being processed at the same time because in the centralised architecture the controlling unit does not need to notify the other members about transactions, thus increasing the speed of the process.[61]

With the Blockchain technology currently available, developers must sacrifice security to scale the network; to avoid this issue, they would have to switch from 'proof-of-work' to 'proof-of-stake'[62].

Also, when it comes down to the pricing issue, with an increasing network inevitably the nodes working behind it would demand higher transaction fees to process transactions on the Blockchain, making the benefit of 'lower operational costs' for companies not true anymore. Decentralisation as we all know is the first and most known feature implemented in Blockchain technology. But it is the main concern of one of the most recurring questions regarding the technology: without a central entity, how is it possible for Blockchains to work?

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[59] Usman W. Chohan, *The Limits to Blockchain? Scaling vs. Decentralization*, SSRN Electronic Journal 2-3 (2019).

[60] Joseph Abadi and Markus Brunnermeier*, Blockchain Economics.* 3-4 (2018)

[61] Nadya Knysh, Council Post: Introducing Blockchain: Six Limitations For Enterprises To Remember Forbes (2021), https://www.forbes.com/sites/forbestechcouncil/2021/11/22/introducing-blockchain-six-limitations-for-enterprises-to-remember/?sh=64c1c4a0313f (last visited Apr 16, 2022).

[62] Proof of Stake is a consensus mechanism that Ethereum developers sought to implement ever since the original network launched. In fact, the concept is far older than Ethereum, as PoS was mentioned for the first time in 2012. In PoS, validators would confirm transactions by staking instead of mining. The blockchain network prioritizes individuals who stake more coins, and the largest holders would have an easier time earning rewards. (The Shrimpy Team, 2021)

First, we need to take a step back to the different typologies of Blockchain: there are 'public' blockchains, 'private' blockchains, and 'consortium' or 'federated' blockchains. When it comes down to 'public' blockchains, also called 'permissioned' blockchains, nodes contribute by confirming transactions, and they do that because they can earn fees from the transactions that other users have to pay.[63]

Nodes are unique from one another, but they all do have the same privileges and the same powers: hence, control is shared equally between them and that's the reason why there is not a central authority that has the direct power to control the network; they all need to receive approval from other nodes.[64] This feature is a strong point for Blockchain: it is the main reason why many consider the technology as the 'main leader' of this technological revolution. However, it can have its downsides: despite it being quite easy to implement, with the possibility of increasing the size of the Blockchain in a project, developers are forced to sacrifice this unique aspect.[65] Not only that, but another element that needs to be considered is that, as it can happen in any democratic system, nodes can make mistakes when coming down to a decision; and the bigger the network becomes, the more dangerous it becomes for the nodes to make mistakes.

Finally, we have the security aspect. The main reason why Blockchains are considered to be less secure than centralized databases, is that decentralized technology is also open source[66]. Since every hacker can read the code, he can spend countless hours figuring out ways through which he can get access. Because Blockchains are decentralised, private keys owned by individuals may become a weak spot.[67] Once generated during a wallet creation, they provide access to all the data stored within the blocks. If stolen, it puts both sensitive data and finances in danger, and if lost, then wallet access is gone forever.[68] But as we have seen before, through hashing and the 'proof-of-work' technology, this is most unlikely to happen due to the number of hours of work that the attacker would need to lose solving the security puzzles implemented within the system.[69]

Coming down to a conclusion: is this trilemma solvable? Well, quite a few solutions have been proposed to improve some of these features. For example, 'proof-of-stake' is considerable one of the

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[63] The Shrimpy Team., *What is the Blockchain Trilemma?* (2021), https://academy.shrimpy.io/post/what-is-the-blockchain-trilemma

[64] *Id.*

[65] *Id.*

[66] *Id.*

[67] Knysh, *supra note* 55.

[68] *Id.*

[69] Simply Explained., *How does a blockchain work – Simply Explained*, YouTube (2017), https://youtu.be/SSo_ElwHSd4

most powerful and advanced solutions at the moment, and projects like Ethereum have even chosen to completely change their entire consensus from 'proof-of-work' towards the 'proof-of-stake' option in order to quickly solve the trilemma issue (differently from one of its main competitors, Bitcoin, which is still trying to find a solution that will reach the consensus). To make mistakes is human, and through improvement it is possible to reach perfection, in this case, it will be possible for Blockchain to prove that they will be capable of supporting a larger user base. But for now, it is still not possible to know for sure when the trilemma will no longer be an issue.

III. An application of Blockchain in Finance: Crypto assets

III.I *Types of digital assets*

The applications of Blockchain are many, and they range through various markets. In the financial sector, industry in which the technology has been rapidly gaining acceptance, applications span from digital assets (e.g., cryptocurrencies and tokens) to smart contracts: the focus of this chapter is going to be the distinction between different types of digital assets and their effect on financial services.[70]
The financial industry is acknowledging the innovative impact of blockchain technology to generate new revenue, deliver process efficiency, improve end-user experience, and reduce risk in business operations.[71] Even though the terms 'digital assets', 'cryptocurrencies' and 'tokens' are often used interchangeably, they are different in several ways.
Digital assets are digital representations of values that are not issued or guaranteed by a central bank or public authority and do not have the legal status of currency or money.[72] They are items that can be bought, sold, and stored electronically, but can't be physically seen or touched. As previously discussed, the most known examples of digital assets include cryptocurrencies and non-fungible tokens (NFTs).
Cryptocurrencies are digital currencies in which transactions are verified and recorded in a blockchain system (hence through a decentralized system) thanks to the use of cryptography, rather than being controlled by a central authority. Some of the most popular ones include Bitcoin and Ethereum, and they are appreciated in the financial world because of their special features: since Blockchain uses encryption to produce a unique and private key, the security that characterises the technology is what

[70] Blockchain in Finance & Fintech: The Future of Financial Services | ConsenSys, ConsenSys (2022), https://consensys.net/blockchain-use-cases/finance/ (last visited Apr 16, 2022).
[71] *Id.*
[72] Luis-Daniel Ibáñez, Michał R. Hoffman & Taufiq Choudhry, *Blockchains and Digital Assets*, 2-4 (2022).

makes it intriguing to the market[73]. Tokens, the other member of the 'digital assets' group, are essentially digital titles that represent various properties; but an important distinction within them must first be noted: the distinction between Non-Fungible and Security tokens (which I will be discussing later on in this chapter). Despite cryptocurrencies and tokens might seem similar, they are completely different from one another: while cryptocurrencies are the digital version of money, tokens represent deeds or assets. While the former work similarly to a physical currency, the latter is more used for payments and the signing of digital agreements.

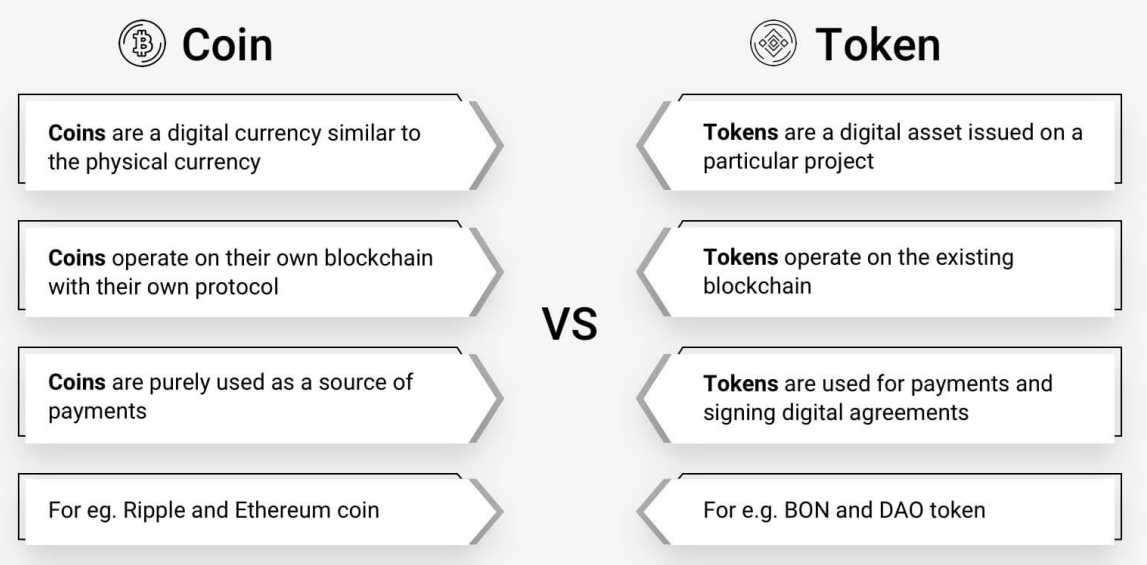

Figure 11. Difference between Coins and Tokens.

III.II *Cryptocurrencies: Definition*

To find an established definition of cryptocurrencies is not easy. Much like blockchain, cryptocurrencies have become a "buzzword" to refer to a wide assembling of technological developments that utilise cryptography. As said before, cryptography is the technique of protecting information by transforming it (i.e., encrypting it) into an unreadable format that can only be deciphered (or decrypted) by someone who possesses a secret key[74]: this technique is what secures the currencies in the network through public and private digital keys.

Since the rise of Bitcoin in 2009, many policy makers have scrutinised the subject and have given different points of view regarding it.

ECB

[73] Mirza Hedismarlina Yuneline, *Analysis of cryptocurrency's characteristics in four perspectives*, 26 Journal of Asian Business and Economic Studies 206-219 (2019).

[74] John Faulkner, Getting Started with Cryptography in .NET 50-53 (2016).

The European Central Bank ("ECB") has defined cryptocurrencies as a subset of virtual currencies. ("VIRTUAL ASSETS AND VIRTUAL ASSETS SERVICE PROVIDERS (VASPS ...") These are defined as a form of unregulated digital money, usually controlled by its developers, and used and accepted among the members of a specific virtual community.[75] Three types of virtual currencies can be defined depending on the relationship that they have with traditional currencies and the real economy: there are virtual currencies that can only be used in a closed virtual system; virtual currencies that are unilaterally linked to the real economy (since there exists a conversion rate to purchase said currency with traditional money, and later use the purchased money to buy virtual goods and services); and virtual currencies that are bilaterally linked to the real economy, with conversion rates both for purchasing virtual currency as for selling such currency (and the purchased currency can be used to buy both virtual as real goods and services)[76].

Cryptocurrencies are a part of the last category, since they can be bought with traditional money and sold against conventional money, and they can be used to buy digital and real goods.[77]

However, in 2015 the ECB put forward an alternative definition of virtual currencies: it defined them as digital representations of value, not issued by a central bank, credit institution or e-money institution, which in some circumstances can be used as an alternative to money.[78]

IMF

Just like the ECB, the International Monetary Fund ("IMF") has classified cryptocurrencies as a subspace of virtual currencies, which are described as digital representations of value, issued by private developers and denominated in their own unit of account.[79] According to the IMF, the idea of virtual currencies comprehends a wider assembling of 'currencies', going from simple IOUs ("Informal certificates of debt") by issuers such as Internet or mobile coupons and airline miles, to virtual currencies supported by assets such as gold and cryptocurrencies such as Bitcoin.[80]

BIS

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[75] ECB, Virtual Currency Schemes, https://www.ecb.europa.eu/pub/pdf/other/virtualcurrencyschemes201210en.pdf, 13. (2012)

[76] *Id.*

[77] Robby Houben, *Bitcoin: there are two sides to every coin*, 26 International company and commercial law review 194 (2015).

[78] ECB, Virtual Currency Schemes – a further analysis, https://www.ecb.europa.eu/pub/pdf/other/virtualcurrencyschemesen.pdf, 4. (2015)

[79] IMF Staff Discussion Note, Virtual Currencies and Beyond: Initial Considerations, https://www.imf.org/external/pubs/ft/sdn/2016/sdn1603.pdf, 7. (2016)

[80] *Id.*

The Committee on Payments and Market Infrastructures ("CPMI"), an institution of the Bank for International Settlements ("BIS"), has defined cryptocurrencies as digital currencies or digital currency stratagems, or schemes.[81] These stratagems show the following key features: first of all they are assets, and their value is determined by the supply and the demand for such assets; second of all they use distributed ledgers to allow remote peer-to-peer exchanges of electronic value through a consensus mechanism that removes the need for intermediaries; and lastly, they are not operated by any specific individual or institution.[82]

EBA

The European Banking Authority ("EBA"), differently from the institutions previously mentioned, has proposed the idea of referring to cryptocurrencies as virtual currencies, defined as digital representations of value that are neither issued by a central bank, nor by a public authority, nor necessarily attached to a bill of exchange, but that are utilised by natural or legal persons as trade-offs and can be transferred, conserved, or traded virtually.[83]

ESMA

The European Securities and Markets Authority ("ESMA") has recently also referred to cryptocurrencies as virtual currencies, in a message issued in collaboration with the European Insurance and Occupational Pensions Authority ("EIOPA") and the EBA.[84] As the EBA's definition, here as well virtual currencies are defined as digital representations of value that are neither issued nor guaranteed by a central bank or public authority and do not have the legal position of currency or money.[85]

World Bank

The World Bank has defined cryptocurrencies as a subset of digital currencies, which is itself described as digital representations of value designated in their own money of account, but different from electronic money (which is simply a digital payment mechanism, representing and denominated

[81] CPMI, Digital currencies, https://www.bis.org/cpmi/publ/d137.pdf (2015)

[82] *Id.*

[83] Andrea Enria, Designing a Regulatory and Supervisory Roadmap for FinTech, http://www.eba.europa.eu/documents/10180/2151635/Andrea+Enria%27s+speech+on+FinTech+at+Copenhagen+Business+School+ 090318.pdf, 5. (2018)

[84] ESMA, EBA & EIOPA, Warning on the risks of Virtual Currencies, https://www.esma.europa.eu/sites/default/files/library/esma50-164-1284_joint_esas_warning_on_virtual_currenciesl.pdf, 1.

[85] *Id.*

in fiat money.[86] Differently from most of the other policy makers, the World Bank has also defined cryptocurrencies themselves as digital currencies that rely on cryptographic techniques to achieve consensus.[87]

FATF

The Financial Action Task Force ("FATF") has addressed cryptocurrencies as a subset of virtual currencies, which are interpreted as digital representations of value that can be digitally exchanged and can be used as either a medium of exchange, a unit of account, and/or an asset; but they are not actually considered a currency (i.e., when offered to a creditor, they are a valid and legal offer of payment) in any jurisdiction.[88] It also indicates that virtual currencies can be divided into two basic types: the first one is based on interchangeable virtual currencies, which have an equivalent value in real-world currency and can be exchanged to-and-from real currency; and the second one includes non-convertible virtual currencies that are precisely referred to a particular virtual domain or world (e.g. a Massively Multiplayer Online Role-Playing Game like World of Warcraft[89]), and under the rules that regulate these domains, they cannot be exchanged for fiat currency. Cryptocurrencies like Bitcoin are virtual currencies of the first type, that can, as reported by the FATF, be described as analytical, decentralised convertible virtual coinage protected by cryptography[90]; and they can either be of a centralised or a decentralised nature.

All things considered it can be concluded that, despite all points of view sharing certain similarities, these statements do not come down to a generally accepted conclusion regarding a final definition of cryptocurrencies: either they go around the concept, or they don't even try to define it altogether. One characteristic of cryptocurrencies that most of them share is that they can be approached as a 'subset' or a form of 'virtual currency'.

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[86] World Bank Group, Distributed Ledger Technology (DLT) and blockchain, FinTech note, no. 1. Washington, D.C., http://documents.worldbank.org/curated/en/177911513714062215/pdf/122140-WP-PUBLIC-DistributedLedger-Technology-and-Blockchain-Fintech-Notes.pdf, IV. (2017)

[87] *Id.*

[88] FATF, Virtual Currencies – Key Definitions and Potential AML/CFT Risks, http://www.fatfgafi.org/media/fatf/documents/reports/Virtual-currency-key-definitions-and-potential-aml-cft-risks.pdf, 4. (2014)

[89] 11 in-game currencies you need to know about, Medium (2022), https://medium.com/ironsource-levelup/11-in-game-currencies-you-need-to-know-about-8775c6724bcb (last visited Apr 17, 2022).

[90] FATF, Virtual Currencies – Key Definitions and Potential AML/CFT Risks, http://www.fatfgafi.org/media/fatf/documents/reports/Virtual-currency-key-definitions-and-potential-aml-cft-risks.pdf, 5. (2014)

Trying to sum up all the above definitions, a good synopsis would be that a cryptocurrency is "a digital representation of value" that is intended to compose a peer-to-peer ("P2P") system different from government-issued currency, that can be used as an all-purpose circulating medium (that does not depend on any central bank), that is secured by a cryptographic mechanism, and that can be converted from and into currency.[91]

III.II.I *Regulatory framework for cryptocurrencies*

As cryptocurrencies spread across the world markets, also do the regulations created to control them. The scene of cryptocurrencies is in constant development and catching up with the rules in different global territories isn't easy, nor straightforward.

According to the World Economic Forum's Global Future Council on Cryptocurrencies[92], there still isn't an internationally agreed upon regulation of cryptocurrencies, although international committees have been working on determining risks and appropriate policy responses to the powerful growth of cryptos.

Across the whole globe, central banks and regulators already have been noticing this growing trend. Even though they share a similar goal, e.g., stabilizing their pecuniary systems and stimulating innovation and economic growth, countries everywhere have already started trying and implementing different regulatory options.

For all countries, their goals seem to vaguely coincide: first, the most important element is the protection of the consumer; then come other factors such as the prevention of illegal financing, the protection of the honesty of the market and lastly, the selling of innovation. However, each of them has their own approach to the matter.

While some jurisdictions, such as India, have adapted already existing laws to the system, others, like Liechtenstein, have proposed new demonstration models[93]. From another point of view of the matter, preferred by the European Union and UAE, suggests the creation and set up of completely new

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[91] Robby Houben & Alexander Snyers, *Cryptocurrencies and blockchain Legal context and implications for financial crime, money laundering and tax evasion*, 20-23 (2018), https://www.europarl.europa.eu/cmsdata/150761/TAX3%20Study%20on%20cryptocurrencies%20and%20blockchain.pdf (last visited Apr 17, 2022).

[92] Global Future Council on Cryptocurrencies, Cryptocurrencies: A Guide to Getting Started, https://www3.weforum.org/docs/WEF_Getting_Started_Cryptocurrency_2021.pdf (2021)

[93] Kathryn White, Arushi Goel & Sandra Waliczek, What is the current state of cryptocurrency regulation? World Economic Forum (2022), https://www.weforum.org/agenda/2022/03/where-is-cryptocurrency-regulation-heading/ (last visited Apr 17, 2022).

regulators to deal with the system in a more comprehensive way.[94] Another point of view regarding the whole 'regulation' matter comes from current U.S. President Joe Biden, who, on March 9, 2022, signed an Executive Order whose final goal is to implement a strategic plan to regulate cryptocurrencies. Since crypto has been growing in popularity, and their potential to damage traditional economy has been widely recognised, the President has decided to take the 'first ever, whole-of-government approach' to regulating cryptocurrency activities.[95] The order will focus on six main areas: first, the focus will go towards customer and investor protection; secondly, towards financial stability and systematic risk; then towards prevention of illicit finance, U.S. leadership and competitiveness, financial inclusion and responsible innovation.[96] However, despite the fact that the order represents a significant step 'in the right direction', towards the development of a comprehensive federal approach to crypto assets, in reality it does not actually prescribe a regulatory framework itself, nor does it issue new rules for regulation.

Going back to the larger picture, the differences regarding the jurisdictions' approaches to crypto laws across countries may become a double-edged blade; since on one hand they might offer jurisdictional investing opportunities, while on the other they may raise uncertainties and increase the burden for businesses operating in the sector. This situation is worsened by the fact that there is a lack of common standards and terminologies.

In order to reach a truly global organised approach, countries and international organizations must work together, taking advantage from the information they learn from each other.[97] As well as risk assessments and the establishment of common standards, there is also an urgent need to upgrade the technology itself to become a much better fit for the purpose and the inclusive solutions, with the help of public-private collaboration.[98]

III.III *Tokens: Definition, types of tokens*

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[94] Radio Davos, *Christine Lagarde: the ECB chief talks Covid, climate and crypto* (2021), https://open.spotify.com/episode/4xC0KYWlEEc5IBAGSXyd5r (last visited April 20, 2022)

[95] Sean Anderson et al., U.S. Crypto Regulation: Biden Signs Executive Order on Strategy to Regulate Crypto | JD Supra JD Supra (2022), https://www.jdsupra.com/legalnews/u-s-crypto-regulation-biden-signs-5184693/ (last visited May 10, 2022).

[96] *Id.*

[97] European Commission, Blockchain standards Shaping Europe's digital future (2022), https://digital-strategy.ec.europa.eu/en/policies/blockchain-standards (last visited Apr 17, 2022).

[98] *Id.*

Together with cryptocurrencies, tokens are a part of the digital assets family: they are essentially digital titles that represent a set of rules encoded in a smart contract, and each token belongs to a blockchain address.[99] Even though cryptocurrencies and tokens might seem similar, it's important not to confuse them, as there are fundamental differences that characterise each of them. Cryptocurrency and tokens are unique subsets of digital assets that use cryptography, an advanced encryption technique that guarantees the authenticity of crypto assets by getting rid of the possibility of counterfeiting or double spending.

The key differentiation between the two typologies of digital asset is that cryptocurrencies are the native asset of a blockchain, like Bitcoin or Ethereum; whereas tokens are created as part of a platform that is built on an already existing blockchain, like the many ERC-20 tokens that make up the Ethereum ecosystem.[100] For example, the Ethereum blockchain's home token is 'ether' (ETH). While 'ether' is the first cryptocurrency to the Ethereum blockchain, there are other different tokens that also use the Ethereum blockchain. Crypto tokens built using Ethereum include DAI, LINK, COMP, and CryptoKitties, among others[101]. These tokens can be used in multiple ways on the platforms for which they are built, including decentralised finance (DeFi) mechanisms, accessing platform-specific services, and even through some online games.

Tokens, which also be called crypto tokens, are elements of value that blockchain-based organisations or projects develop on top of already existing blockchain networks.

As new tokens are being developed to respond to the blockchain's continuously expanding use cases, the number of different tokens will continue to grow as fast as possible.

Usually crypto tokens are programmable, permissionless, trustless, and transparent.[102] Programmable merely means that they work through software agreements, which are on their behalf composed by smart contracts (e.g., programs stored on a blockchain with the purpose of automating the execution of an agreement) that indicate the characteristics and the tasks of the token and the network's rules of engagement. Permissionless refers to the fact that anyone can participate in the system without having

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[99] Kelly Clarke-Potter, What Is A Blockchain 'Token'? Is it Just Cryptocurrency? - Blockhead Technologies Blockhead Technologies (2020), https://blockheadtechnologies.com/what-is-a-blockchain-token-is-it-just-cryptocurrency/#:~:text=A%20token%20represents%20a%20set,as%20Bitcoin%20or%20Ether%20tokens. (last visited Apr 18, 2022).

[100] Cryptopedia Staff, Digital Assets: Cryptocurrencies vs. Tokens Gemini (2021), https://www.gemini.com/cryptopedia/cryptocurrencies-vs-tokens-difference (last visited Apr 17, 2022).

[101] Shreyan Srivastava, Untangling the Mystery of Virtual Digital Assets – Vinod Kothari Consultants Vinodkothari.com (2022), https://vinodkothari.com/2022/02/untangling-the-mystery-of-virtual-digital-assets/ (last visited Apr 18, 2022).

[102] Cryptopedia Staff, *supra note* 94.

special credentials. Trustless means that there isn't one single central authority which overviews the system; but instead, it works automatically on the rules predefined by the network protocol. And lastly, transparency means that the rules of the protocol and its transactions are known and verifiable by all that wish to gather such information. Crypto tokens, just like cryptocurrency, can hold value and be virtually exchanged; but they can also be planned to work as physical assets or more traditional digital assets, or even to represent a certain utility or service. For example, there exist crypto tokens that illustrate tangible assets as real estate and art[103], but there are also intangible assets such as processing power or data storage space[104]. Another type of token known as 'governance token' is used to represent voting on a blockchain by distributing the power of making platform decisions but from a centralised structure[105]. Hence, the procedure behind the creation of crypto tokens to be later used within these various functions is known as 'tokenization'.

As said before, with the continuous increase of the blockchain industry, the quantity of unique digital assets will only continue to grow in accordance with the multi-sided necessities of all ecosystems that participate in the technology, going from enterprise partners to individual users. Since creating new assets within the digital world is less restrictive than in the physical domain, these digital assets are expected to improve the way many if not all industries operate, interact, and generate value, hence allowing them access to a vast land of new social and economic possibilities.

III.III.I *Difference between Security and Utility tokens*

Tokens can be divided into two categories: utility tokens and security tokens.[106] More precisely, security tokens represent the ownership of a financial instrument, whereas utility tokens allow the purchase or use of a specific good or service.[107] To put it another way, it is possible to say that security tokens can represent digital ownership of a fraction of any valuable asset, such as corporate shares or

[103] Rosa M. Garcia-Teruel & Héctor Simón-Moreno, *The digital tokenization of property rights. A comparative perspective*, 41 Computer Law & Security Review 105543 (2021).

[104] *Id.*

[105] Johannes Rude Jensen, Victor von Wachter & Omri Ross, How Decentralized is the Governance of Blockchain-based Finance: Empirical Evidence from four Governance Token Distributions arXiv.org (2022), https://arxiv.org/abs/2102.10096 (last visited Apr 19, 2022).

[106] What is an STO? Security Token Offerings Explained (2022 Updated), 99 Bitcoins (2022), https://99bitcoins.com/security-token-sto/. (last visited Apr 23, 2022).

[107] Pierluigi Matera., *Blockchain, in* DIGESTO DELLE DISCIPLINE PRIVATISTICHE – SEZIONE COMMERCIALE, 23, 27-29 (2022)

a car[108]. Hence, security tokens are used as tokenized securities designed to function just like an investment[109]: from the moment that an investor buys a security token he/she knows that the ownership of the asset is conserved within the blockchain ledger. By tokenizing securities, start-ups (or companies seeking to raise money to create a new coin, app, or service) can launch an ICO (Initial Coin Offerings) as a way to raise funds[110]. But if a company issues security tokens, they will not be facing an ICO but an STO (Security Token Offering). That is because ICOs are largely unregulated, and that puts the investors at risk; hence, despite ICOs and STOs being similar, the latter is preferred since it is regulated[111].

STOs	ICOs
⊕ Protection against fraud	⊕ Extremely easy to set-up
⊕ Based on real, registered assets	⊕ Ultra-accessible (to a fault)
⊕ Compliant and fully-regulated	⊖ Investors hold all the risk
⊕ Incorporated into the greater securities market	⊖ Purely speculative & based on promises
⊖ Retail investors cannot apply	⊖ Legally dubious
⊖ Involves significant legal paperwork	

Figure 11. Differences between STOs and ICOs.

A utility token, on the other hand, is a digital cryptocurrency token that can be issued to fund the development of the cryptocurrency, and that can be later used to purchase a good or a service offered by the issuer of the said cryptocurrency (for example, as a method of fundraising for a start-up)[112].

[108] Deloitte, Security token offerings: The next phase of financial market evolution? (2020), https://www2.deloitte.com/content/dam/Deloitte/cn/Documents/audit/deloitte-cn-audit-security-token-offering-en-201009.pdf

[109] *Id.*

[110] Jake Frankenfield et al., Initial Coin Offering (ICO) Investopedia (2022), https://www.investopedia.com/terms/i/initial-coin-offering-ico.asp (last visited Apr 24, 2022).

[111] La regolamentazione di Security token offering STO, ICO, blockchain e smart contract in Italia – L'approccio Consob | Tayros Consulting, Tayros.bg (2022), https://tayros.bg/index.php/2022/03/15/la-regolamentazione-di-security-token-offering-sto-ico-blockchain-e-smart-contract-in-italia-lapproccio-consob/ (last visited Apr 24, 2022).

[112] Merriam-Webster, Utility Token Definition, https://www.merriam-webster.com/dictionary/utility%20token

Here, since utility tokens are used to finance the development of technological activities, an ICO can be used to achieve that goal. ICO managers would generate tokens according to the terms of the ICO, receive and distribute the tokens to the individual investors[113]; tokens which can be later used for the said purchase of a specific good or service offered by the company. But because ICOs are not regulated by financial authorities, funds lost because of fraud or similar causes may never be recovered[114].

Even though utility tokens are not currently classified as securities, rumors have spread around saying that one day they could be.[115] These tokens are not intended to represent an investment the way that security tokens are, but that's not what matters most to regulators (since, aside from regulatory challenges, the use of utility tokens is still challenged within technological and market issues)[116].

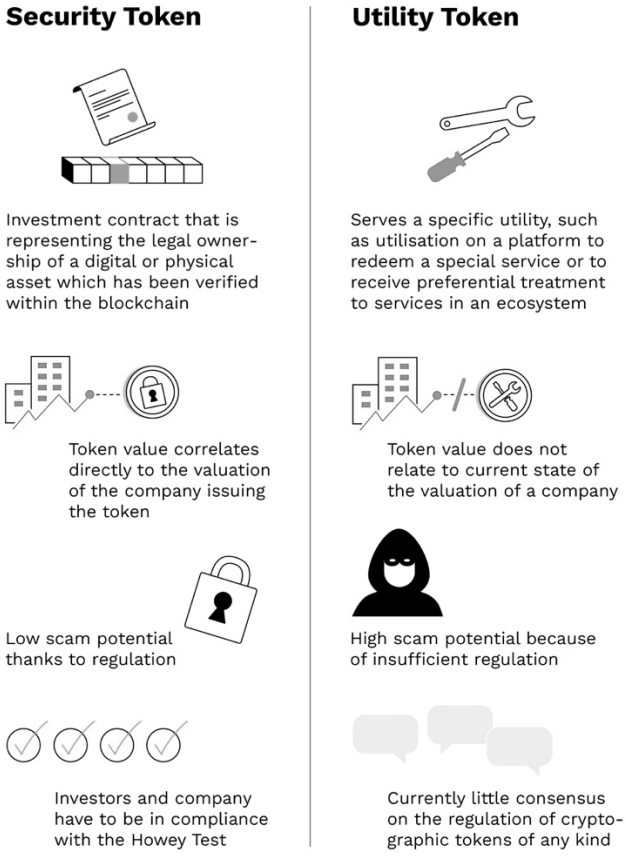

Figure 12. Differences between Security and Utility Tokens.

[113] Frankenfield, *supra note* 104.

[114] *Id.*

[115] Brian NIbley, What is a Utility Token? SoFi (2021), https://www.sofi.com/learn/content/what-is-a-utility-token/ (last visited Apr 26, 2022).

[116] *Id.*

IV. *The Case of SEC v. Ripple: A Regulatory Riddle*

IV.I *Order and Background*

In December 2020, the SEC sued Ripple Labs for issuing and selling unlicensed securities in the market. The Ripple vs SEC lawsuit is still ongoing, and its resolution will work as a bearing wall for the cryptocurrency industry's future guidelines. But how did the SEC decide to sue Ripple? In 2011, Ripple Labs launched alongside XRP, the namesake cryptocurrency. XRP, built to become the most practical cryptocurrency for applications across the financial services, has an initial ledger that consists of 100 billion XRP coins, directly released from Ripple, hence making mining[117] unnecessary[118]. Since anyone can consult the blockchain to see who owns what, but no coin needs to be mined, this feature made the XRP a target for speculators (who started increasing its price value).[119] The SEC claims that the Ripple executives held an initial public offering (IPO) of XRP, when it was still an unregistered security at the time of the first raising of funds[120], hence conducting an illegal offering of securities. But the claim over which Ripple is relying upon is that, according to them, XRP should be treated as a virtual currency rather than an investment contract; that is why they decided to fight SEC's decision rather than comply them.

For a little background information regarding the parties in question: Ripple was founded in San Francisco in 2012, and it describes itself as a "privately held payments technology company that uses blockchain innovation (including XRP) to allow money to be sent around the world instantly, reliably, and more cheaply than traditional avenues of money transmission."[121] In December 2012, 100 billion XRP on the Ripple protocol were created, and 80 billion XRP was transferred to Ripple, with the remaining 20 billion XRP transferred to three early employees.[122] The complaint goes as far back as February 8, 2012, and October 19, 2012; dates in which Ripple and Larsen received two legal memos

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[117] Bitcoin mining is the process of creating new bitcoins by solving extremely complicated math problems that verify transactions in the currency. When a bitcoin is successfully mined, the miner receives a predetermined amount of bitcoin.

[118] Julia Vasile, Everything You Need To Know About Ripple vs SEC BeInCrypto (2022), https://beincrypto.com/learn/ripple-vs-sec/ (last visited May 1, 2022).

[119] *Id.*

[120] Complaint at 20, Securities And Exchange Commission v. Ripple Labs, INC., Bradley Garlinghouse, and Christian A. Larsen, UNITED STATES DISTRICT COURT SOUTHERN DISTRICT OF NEW YORK, 4, Civ. 10832 (AT) (SN) (S.D.N.Y. Mar. 11, 2022)

[121] Enterprise Crypto and Blockchain | Ripple, Ripple.com (2022), https://ripple.com/company/ (last visited May 17, 2022).

[122] Rodrigo Seira & Nancy Wojtas, Alert: SEC v. Ripple | JD Supra JD Supra (2021), https://www.jdsupra.com/legalnews/alert-sec-v-ripple-8276325/ (last visited May 17, 2022).

from their lawyers which warned them that there was some risk that XRP would be considered a security.[123] Ripple argues this declaration stating "that any reasonable reader of the true and accurate contents of the memorandum dated October 19, 2012 would understand that counsel's ultimate conclusion was that Ripple Credits (as described) did not constitute 'securities' under the federal securities laws."[124] According to the complaint, the unregistered, hence illegal, securities offerings began in August 2013 with the selling of XRP in return of fiat currencies or digital assets. The SEC further claimed that these unregistered sales did not stop there but continued until 2017 when they rushed as Ripple started facing increasing operational costs and had limited alternative sources of revenue.[125] On top of that, Ripple has offered billions of XRP in exchange of non-cash services like market-making and labour with the goal of achieving widespread distribution of XRP.

IV.I.I *SEC's Claims*

According to the prosecutor, Ripple raised capital by selling XRP tokens in unregistered security offerings to investors in the United States and around the world.[126] According to the lawsuit, Chris Larsen, Ripple Lab's co-founder and former CEO, and Brad Garlinghouse, Ripple's current CEO, took hold of personal unregistered XRP transactions making a total of about $600 million[127], and assembled the XRP sales used to support the company's business.[128] In addition, the defendants have failed to register their XRP offers and sales, violating the federal securities laws' registration restrictions.[129] Since 2015, Ripple has been trying to convince banks to use XRP to transfer funds overseas. In 2016, Ripple hired former Yahoo COO, Brad Garlinghouse, to help them find a highly innovative use case for XRP, and he did so by setting up XRP as a bridge currency[130] for global

[123] Complaint at 20, Securities And Exchange Commission v. Ripple Labs, INC., Bradley Garlinghouse, and Christian A. Larsen, UNITED STATES DISTRICT COURT SOUTHERN DISTRICT OF NEW YORK, 4, Civ. 10832 (SN) (S.D.N.Y. Dec. 22, 2020)

[124] *Supra note* 120.

[125] Seira, *supra note* 122.

[126] *Id.*

[127] The SEC vs. Ripple lawsuit: Everything you need to know, Cointelegraph (2022), https://cointelegraph.com/cryptocurrency-regulation-for-beginners/the-sec-vs-ripple-lawsuit-everything-you-need-to-know (last visited May 2, 2022).

[128] *Id.*

[129] SEC.gov | SEC Charges Ripple and Two Executives with Conducting $1.3 Billion Unregistered Securities Offering, Sec.gov (2022), https://www.sec.gov/news/press-release/2020-338 (last visited May 2, 2022).

[130] Using XRP as a bridge currency for foreign exchange trading means that costs would be reduced by holding XRP instead of holding various global fiat currencies.

money transfers to financial institutions and banks. An advantage for the banks of doing so would be that they would not need to hold those fiat currencies for long periods of time: only momentarily, while simultaneously increasing XRP's liquidity and price.

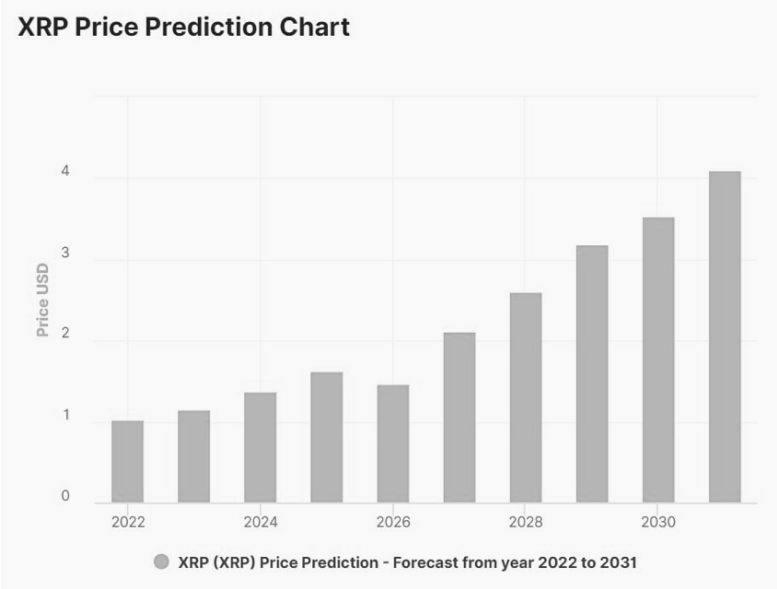

Figure 13. XRP Price

In order to determine whether a virtual currency counts as a security, the commission applies the "Howey test," based on the Supreme Court ruling on SEC v. W.J. Howey Co in 1946.[131] The test says that: if an asset is sold with the expectation of getting profits from other parties' efforts, then it counts as a security.[132] According to the SEC's current definition of XRP in their lawsuit, it would pass the Howey test, hence weakening Ripple's claim of XRP being a cryptocurrency rather than a security.[133] Ripple's fight against a lawsuit from the Securities and Exchange Commission has gone "exceedingly well," CEO Brad Garlinghouse said.[134] But the journey is nowhere near the finish line. However, in defence of Ripple's claim, what the SEC considers a 'security' is a grey area, given the fact that in 2019 the agency said that Bitcoin was not a security: "…[they] do not believe that current purchasers

[131] Howey Test, Investopedia (2022), https://www.investopedia.com/terms/h/howey-test.asp (last visited May 2, 2022).

[132] *Id.*

[133] The Howey Test: Is Your Crypto Token a Security?, Lexology (2022), https://www.lexology.com/library/detail.aspx?g=7b7c738c-10e4-4aea-9855-07b1399a26bc (last visited May 3, 2022).

[134] Ryan Browne, Crypto firm Ripple's court battle with the SEC has gone 'exceedingly well,' CEO says cnbc.com (2022), https://www.cnbc.com/2022/04/14/ripples-court-battle-with-sec-has-gone-exceedingly-well-ceo-says.html (last visited May 3, 2022).

of bitcoin are relying on the essential managerial and entrepreneurial efforts of others to produce a profit."[135]

In conclusion, before considering Ripple's point of view, it is relevant to note the plaintiff's argument: "If the SEC truly believed what it's alleged, why are Ripple and its co-founder allowed to continue to sell? If XRP traded in the secondary market is an investment contract with Ripple as the SEC claims, why didn't it seek a preliminary injunction to stop Ripple from continuing to sell? Why didn't it issue a cease and desist to others who weren't sued?" (John Deaton, attorney for 60.000 XRP Holders with frozen accounts).[136]

IV.I.II *Ripple's response*

Most of the time, the SEC decides to settle most of its lawsuits: in this case, Ripple decided not to.[137] They decided to go on and fight for what they think has been a 'biased view' coming from SEC over how they apply the definition of 'security' to cryptocurrencies.[138] In the case of this being true, the commission's authority would be undermined and not only that, but the whole case would lack credibility. Ripple lawyers claimed that the SEC never warned nor gave any notice to the organization.[139] The U.S. regulator also accepted that Ripple wasn't notified that XRP could be classified as a security.[140] In fact, looking backward, one of the most noticeable aspects of the complaint is its timing. According to the SEC, Ripple violated the Securities Act through repeated unregistered offerings of securities back in 2013, but somehow the SEC's complaint was filed more than seven years after.[141] In its answer, Ripple noted that "The SEC filed this Complaint 8 years after XRP was created, 5 years after the DOJ and FinCEN characterized XRP as a virtual currency, and after more than 2½ years of investigation during which the SEC allowed Defendants to continue to distribute XRP, allowed the XRP open market to grow, and allowed millions of market participants to rely on the free and efficient functioning of that market."[142] Another reason why Ripple thinks the SEC's decision was biased, is because of their view of another popular cryptocurrency: Ethereum.

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[135] Shawn Du'Mmett, Ripple vs SEC: Guidelines and Clarifications | Cryptopolitan Cryptopolitan (2022), https://www.cryptopolitan.com/ripple-vs-sec-guidelines-and-clarifications/ (last visited May 3, 2022).

[136] *Id.*

[137] Vasile, *supra note* 112.

[138] *Id.*

[139] Cointelegraph, *supra note* 116.

[140] *Id.*

[141] Seira, *supra note* 122.

[142] *Id.*

Ripple has specifically mentioned some of the links SEC members have had with the other crypto platform[143]; and even though there is currently no actual proof of these relationships, the commission has given Ethereum a pass on securities legislation, stating that it is working in a decentralised manner all while suing XRP, which indeed seemed suspicious.[144] Even more suspicious especially since Ethereum as well had initially funded its development through an ICO, which should mean that Ether would be considered a security as well.[145] Since the SEC has however claimed that Ethereum currently operates in a decentralised manner[146], Ripple questions why is XRP now being attacked. Is it because the SEC is biased? It is important to note that Ripple, differently from the 'non-security' Ether was initially founded through venture capital[147], and not an ICO; in addition, Ripple now claims that its operations are not materially different from those of Ethereum[148]. On top of all, it has been recognised that Ripple had no fair notice that what they were doing was in violation of securities law[149]. The SEC itself has admitted recently that no statement was made on whether XRP could be classified as a security before filing its case.[150] Hence, who is in the wrong? Who in the right?

IV.II *Where are we now?*

SEC has never been a supporter of cryptocurrency. And now, the case against Ripple and its executives has proven that crypto is currently at the top of the SEC's priority list.[151] Ripple Inc.'s legal battle with the U.S. Securities and Exchange Commission has been tumultuous. Over the past couple of months, Ripple has experienced its fair share of lawsuit-related troubles: from price drops, to being

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[143] SEC Declares Bitcoin and Ether as Non-Securities | Cassels.com, Cassels (2022), https://cassels.com/insights/sec-declares-bitcoin-and-ether-as-non-securities/ (last visited May 3, 2022).

[144] *Id.*

[145] *Id.*

[146] *Id.*

[147] Jessica Mathews, Amid SEC battle, crypto company Ripple Labs buys back its Series C investment Fortune (2022), https://fortune.com/2022/01/26/crypto-company-ripple-labs-buys-back-series-c-investment-tetragon-sec/ (last visited May 4, 2022).

[148] David Rodeck & John Schmidt, What Is XRP (Ripple)? Forbes.com (2022), https://www.forbes.com/advisor/investing/cryptocurrency/what-is-ripple-xrp/ (last visited May 4, 2022).

[149] Alexander C. Drylewski, Daniel MIchael & Stuart D. Levi, District Court Allows 'Fair Notice' Defense in SEC's Cryptocurrency Case Against Ripple Labs, But Denies Motions To Dismiss Skadden (2022), https://www.skadden.com/insights/publications/2022/03/court-allows-sec-to-press-claims (last visited May 4, 2022).

[150] Benjamin Pimentel, The Ripple-SEC legal brawl could be a game-changer for crypto Protocol (2022), https://www.protocol.com/fintech/ripple-sec-xrp-lawsuit-trial (last visited May 4, 2022).

[151] Nameet Potnis, Ripple vs. SEC; where are we now? Linkedin.com (2022), https://www.linkedin.com/pulse/ripple-vs-sec-where-we-now-nameet-potnis?trk=articles_directory (last visited May 10, 2022).

delisted from large and small exchanges.[152] In the possibility of the SEC winning the case, XRP will be classified as a security rather than a currency in the U.S. This could consist in a legal precedent for other cryptos to be categorized as securities, which would completely change the virtual currency market.[153] Consequently, this lawsuit against Ripple is of crucial importance for all crypto stakeholders, including investors, blockchain developers, and policymakers worldwide.[154]

The lawsuit is near a critical stage, nearly two years after it began. From the very beginning, the case moved as slowly as it could. Ripple CEO Brad Garlinghouse thought the involved parties would have reached court just immediately after the SEC sued Ripple, but now, a final verdict is unexpected before 2023.[155] The question that everyone keeps asking is: why did the SEC pick a legal feud with XRP specifically when there are so many other similar currencies in existence? Is it because Ripple is based in the U. S., making it much easier for the SEC to track it down[156] rather than other similar projects?[157] There is the speculation that the SEC is attempting to reach a settlement and obtain a considerable fund[158]: is the final goal to expand the regulatory operations? Or do the regulators merely want to bring down the gigantic crypto colossal to warn the rest of the industry, following everything with tighter cryptocurrency regulation?

The final verdict of Ripple v. SEC is yet to come and is continuously delaying because the court has been objecting many important propositions from both the Ripple lawsuit as well as the SEC lawsuit.[159] The proposition of SEC that the 'fair notice' defense of Ripple was to not be considered

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[152] Marco Cavicchioli, SEC-Ripple legal battles: XRP price drops Cryptomist (2022), https://en.cryptonomist.ch/2021/05/21/sec-ripple-legal-battles-xrp-price-drops/ (last visited May 4, 2022).

[153] David H. Freedman, Why Ripple's SEC lawsuit could have a lasting impact on crypto Fortune (2021), https://fortune.com/2021/07/29/ripple-xrp-sec-lawsuit-impact-on-crypto-industry/ (last visited May 5, 2022).

[154] *Id.*

[155] Jeff John Roberts, Ripple's Fight Against the SEC: How the Case Is Going and How it Might End - Decrypt Decrypt (2022), https://decrypt.co/98379/ripple-sec-case (last visited May 5, 2022).

[156] A divided Securities and Exchange Commission approved a plan to track all U.S. stock trading with a powerful computer system, the regulator's biggest step since the 2010 "flash crash" to get a better handle on the rapid-fire trading that has come to dominate U.S. markets.

[157] Jessica Holzer, SEC Arms Itself to Better Track Trades Wall Street Journal (2022), https://www.wsj.com/articles/SB10001424052702303919504577520723010703272 (last visited May 6, 2022).

[158] Rick Steves, Xrp Lawsuit: Sec Rather Settle With Ripple Than Hand Over Docs, Says Attorney, Finance Feeds (2022), https://financefeeds.com/xrp-lawsuit-sec-rather-settle-ripple-lawsuit-than-hand-over-docs-says-attorney/ (last visited May 6, 2022).

[159] Motions denied for both SEC and Ripple as battle continues, Cointelegraph (2022), https://cointelegraph.com/news/motions-denied-for-both-sec-and-ripple-as-battle-continues (last visited May 6, 2022).

has been denied,[160] and the same happened with the Ripple claim that there is 'no fair notice' to exhibit the illegal coin distribution within the highly unstable cryptocurrency market.[161] Some speculations have been made about the final verdict of Ripple v. SEC lawsuit, with even people making suppositions about the end of it all; but no specific date or month has been mentioned.[162] Supporters of the Ripple lawsuit are already hyped to win the case against the SEC lawsuit with the long delay in showing evidence from the SEC side.[163]

V. CONCLUSION

In conclusion, it is obvious that when it comes to blockchain technology there is great potential for both transformation and disruption. A lot of work needs to be done in order to prove that the technology can work and to develop more compelling use cases. It may not only refer to blockchain in particular, but big data, machine learning and the combination of these digital innovations in general that can be disruptive. Hence, the question is how widely will the application and impact of the technology be on the financial system, and where does it fit within it? Comparing the pros and cons of both centralised and decentralised systems, the solution comes down to a sort of mix up between the two, mostly hovering around permissioned blockchains. The discussion, however, still remains regarding policy. If there are people who are concerned and do not trust the system, it is necessary to build that trust, and for that to happen there is an urgent need for an adequate policy framework. This will bring together disruptors and incumbents, but also regulators and central banks. Blockchain technology is simply revolutionary. It will make life simpler and safer, changing the way personal information is collected and how transactions for good and services are made, since it creates a permanent and immutable record of every transaction. The effect that this impenetrable digital ledger has on fraud, hacking, data theft, and information loss is inimitable: no other entity in the world currently has the same level of security as this technology.

However, it is fundamental that an endogenous approach to regulation is followed: most importantly, a necessary reform in the approach of every regulation, but especially a reform of financial regulation. Taking bitcoin as an example, it is itself highly controversial, but the blockchain technology lying

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[160] *Id.*

[161] *Id.*

[162] Disha Sinha, Final Verdict Of Ripple V/S Sec Lawsuit: Settlement Case To End In 2022, Analyticsinsight.net (2022), https://www.analyticsinsight.net/final-verdict-of-ripple-v-s-sec-lawsuit-settlement-case-to-end-in-2022/#:~:text=The%20motion%20of%20SEC%20has,the%20highly%20volatile%20cryptocurrency%20market (last visited May 9, 2022).

[163] *Id.*

beneath it has been working flawlessly, and it has found a vast variety of applications in both the financial and the nonfinancial world. The main idea behind everything is that the blockchain creates a system of distributed consensus in the digital online world. By doing so, it allows participating entities to know for sure that a digital occurrence has happened by creating an undeniable record in a public ledger.[164] It allows the developing of a democratic open and scalable digital economy from a centralized one. As I've said before, the opportunities of this technology are various and can be tremendous; but the revolution in this space has just begun, and until a final agreement regarding its regulation is reached, there is no guarantee that the technology is going to completely revolutionise the technological industry.

[164] Ketki R. Ingole & Sheetal Yamde, *Blockchain Technology in Cloud Computing : A Systematic Review*, 5 International Research Journal of Engineering and Technology (IRJET) 2-4 (2022), https://www.irjet.net/archives/V5/i4/IRJET-V5I4428.pdf (last visited May 10, 2022).

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