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"Smart Contracts: The Future of Contracting, Sustainability, and Digitization Internationally"

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ABSTRAKT

Die Digitalisierung hat zweifellos die Welt in der wir leben, verändert. Heutzutage ist die Welt mehr denn je miteinander verbunden. Die Informationen verbreiten sich mit Lichtgeschwindigkeit und machen die Welt zu einem globalen Dorf. Darüber hinaus erleben wir den Aufstieg innovativer Technologien, die darauf abzielen, ganze Branchen für immer zu verändern. Die Erscheinung von Elektroautos, selbstfahrender Technologie, FinTech-Unternehmen, Kryptowährungen und der Blockchain ist Teil der aufkommenden Innovationen, die zu einer nachhaltigeren und gerechteren Welt beitragen und somit die Effizienz bei der Ressourcenverteilung insgesamt steigern sollen.

Die technologischen Entwicklungen haben nachweislich die Effizienz in verschiedenen Branchen und in der Gesellschaft im Allgemeinen gesteigert, da der Informationsaustausch zugänglicher, zuverlässiger und präziser geworden ist. Außerdem haben Unternehmen und Menschen gelernt, die erhaltenen Informationen zu analysieren, zu strukturieren, zu gruppieren und aus solchen Analysen erforderliche Daten zu gewinnen. Daher sind viele Prozesse effizienter geworden, Dienstleistungen zugänglicher und erschwinglicher geworden, und die Wettbewerbsfähigkeit unter den Marktteilnehmern hat sich erhöht.

Abgesehen von den oben genannten Änderungen haben die juristischen Dienste im Allgemeinen nicht immer die Entstehung der Technologien verfolgt und sind etwas "traditionell" geblieben. Obwohl in letzter Zeit viele neue Rechtsdisziplinen und -kurse entstanden sind, bleibt der allgemeine Eindruck der Öffentlichkeit bestehen, dass dem Recht und den Rechtsdiensten Innovationen fehlen und ihnen die „neue Realität" fehlt. Darüber hinaus ist das Image von Anwälten als Innovatoren oder konstruktive Partner bei der Schaffung im Allgemeinen nicht günstig. Mit der Digitalisierung haben sich die Dinge sogar verschlechtert, da die Anwälte in der Regel Innovationen in der Technologie zurückhalten, anstatt Lösungen zu finden.

Obwohl es Gegenargumente für die oben genannten Behauptungen über Anwälte gibt, ist es zweifellos richtig, dass die Anwälte viel mehr tun können, zu einer bessere und gerechteren Gesellschaft beizutragen. Die Anwälte müssen ihre Energie und Anstrengungen investieren, um die Technologie zu verstehen und sie zur Lösung realer Probleme anzuwenden.

Die intelligenten Verträge können eine echte Veränderung bei der Weiterentwicklung der gesetzlichen Vorschriften und Rechtsdienstleistungen im Allgemeinen darstellen. "Intelligente Verträge" ist ein Begriff, der Computercode beschreibt, der einen Vertrag ganz oder teilweise

automatisch ausführt. Der Computercode wird normalerweise auf einer Blockchain-basierten Plattform gespeichert. Der Code kann entweder die einzige Manifestation des Vertrages zwischen den Parteien sein oder einen traditionellen textbasierten Vertrag ergänzen und bestimmte Bestimmungen ausführen, z. B. die Überweisung von Geldern von Partei A an Partei B. Der Code selbst wird über mehrere Knoten einer Blockchain repliziert und die Sicherheit, Nachhaltigkeit und Unveränderlichkeit, die eine Blockchain bietet, sind sichergestellt. Diese Replikation bedeutet auch, dass beim Hinzufügen jedes neuen Blocks zur Blockchain der Code tatsächlich ausgeführt wird. Wenn die Parteien angegeben haben, dass bestimmte Parameter erfüllt wurden, führt der Code den durch diese Parameter ausgelösten Schritt aus. Wenn keine solche Transaktion initiiert wurde, führt der Code keine Aktionen aus.

Intelligente Verträge können in der Tat den Beruf des Anwalts verändern und die Sicherheit bei der Ausführung der vereinbarten Geschäftsbedingungen verbessern. Anwälte müssen ihre Rolle bei der Weiterentwicklung der intelligenten Verträge einnehmen, indem sie diese der Öffentlichkeit zugänglich machen, womit gezeigt wird, dass Recht und Technologie zusammenarbeiten können, um Prozesse zu verbessern und einen Mehrwert für die Gesellschaft zu schaffen.

Table of Contents

Abbreviations

AI - Artificial Intelligence

B2B – Business-to-Business

BigTech - Big Technology Companies

CEO – Chief Executive Officer

DAO – Decentralized Autonomous Organizations

DLT - Decentralized Ledger Technology

EBP – European Blockchain Partnership

EBSI - European Blockchain Services Infrastructure

EFTA – European Free Trade Association

ESG - Environment, Social and Governance

EU - European Union

EV – Electric Vehicle

FinTech - Financial Technology

GDP – Gross Domestic Product

GIIN - Global Impact Investing Network Forum

GTC – General Terms and Conditions

IACCM- International Association of Contracts and Commercial Management

IRENA - International Renewable Energy Agency

IPCC - Intergovernmental Panel on Climate Change

KPI – Key Performance Indicators

Legal Tech – Legal Technology

MB – Management Board

NLP – Natural Language Processing

OECD - Organization for Economic Cooperation and Development

P2P – Peer-to-Peer

R&D – Research and Development

SC - Smart Contract

UK – United Kingdom

UKJT – United Kingdom Jurisdiction Taskforces

UN PRI - United Nations Principles for Sustainable Development

UN SDGs - United Nations Sustainable Development Goals

US – United States of America

1 Introduction

The ancient Romans said: "ius est ars boni et aequi"- the law is the art of the good and fair. Although many centuries have passed since the above taught, it is still a challenge for today's modern societies to implement it accurately throughout their legal systems. Even though humanity has seen enormous progress, especially in the past century, in terms of industrialization and technological development, the struggles for building sustainable economies and societies, decrease inequalities, and increasing efficiency overall remains to date. The 21st century has introduced cutting-edge technology that contributed to connectivity that has never been seen in the past.

The new millennium has also addressed challenging issues that didn't cause [notable] concerns in the past. For instance, we realized that the industrial revolution has contributed to climate change, the greenhouse effect, and air pollution. The economists called all these effects "externalities." The externalities refer to the consumption, production, and investment decisions of individuals, households, and firms that significantly affect people not directly involved in the transactions. One of the main reasons governments intervene in the economic sphere is, undoubtedly: the externalities. Technical externalities are the most common among various other types. The prior refers to the indirect effects impacting others' consumption and production opportunities. However, the final product's price does not consider externalities.

Consequently, there are differences between personal returns or costs and the returns or costs to society.[1] The externalities are closely linked with "sustainability." It can be defined as a requirement of the current generation to manage the resource base so all future generations can potentially share the average quality of life that the current generation experiences. The notion 'quality of life' includes all circumstances that influence people's lives. Hence, the notion consists of much more than pure material consumption. Extending the sustainability requirement to future generations yields the following definition of sustainable development: Development can be qualified as sustainable only if it leads to non-decreasing average life quality.

Furthermore, it places the following requirement on the current generation: The new generation's management of the resource base is sustainable if it constitutes the first part

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[1] 'Finance & Development' (*Finance & Development | F&D*, 2020)
<https://www.imf.org/external/pubs/ft/fandd/basics/external.htm> accessed 7 November 2020

of a feasible, sustainable development.[2] As emphasized above, the prevailing age is responsible for the progress in every regard, especially for leaving a solid base for future generations to thrive without investing additional energy to fix the legacy issues.

Contracts are one of the main instruments for governing various relations between individuals and corporations. Therefore, the prior play an essential role in numerous fields, such as procurement, sales, partnerships, joint ventures, employment, etc. At present, contracts are [mostly] paper-based, i.e., those are structured and drafted [primarily] by Lawyers, and their subsequent execution includes numerous stakeholders. However, the performances under the contracts are not usually measured during the actual execution. Furthermore, the implementation of the contracts is entirely dependent on the parties' disposition. Hence, should any of the parties fail to perform, its counterpart doesn't seem to have any other option but to negotiate, and finally, ask for court protection, should the bargaining fail. Besides, contracts are [customarily] dealing with the parties' prerogatives and commitments. The former doesn't consider the [potential] effects for third parties, such as technical externalities, mentioned in the preceding paragraph. The approach described above causes numerous struggles, such as loss of value due to improper execution of the agreed terms, litigation costs in case of performance failure, unfair treatment for the weaker party in the contract, etc. The latest technology advancements, such as blockchain and Smart Contract (SC), may help resolve [most of] the issues mentioned above, should the prior be adequately implemented.

The notion of the SC was first coined in 1994 by computer scientist and cryptographer Nick Szabo, who defined it as "a set of promises, specified in digital form, including protocols within which the parties perform on these promises."[3] The above definition of SC seems to describe its essence. Namely, the description refers to the performance of the parties' commitments under protocols. Hence, SC shall help parties perform their agreement and avoid any wrongdoing or failure to perform. The initial attempts to create a cryptographically secured chain of blocks started in 1991 by the industry pioneers Stuart Haber and W. Scott Stornetta and continued throughout the mid-2000s. Satoshi Nakamoto conceptualized the first blockchain in 2008, which was later implemented as a core Bitcoin

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[2] Geir B. Asheim, 'Sustainability Ethical Foundations And Economic Properties' (1994) 1302, 1 The World Bank Policy Research Department Public Economics Division

[3] 'A Brief History Of Blockchain, Smart Contracts And Their Implementation' (*blog.modex.tech*, 2018) <https://blog.modex.tech/a-brief-history-of-blockchain-smart-contracts-and-their-implementation-c3ac6f00f014> accessed 7 November 2020

component. Bitcoin was revolutionary, as it was the first decentralized cryptocurrency ever created. However, Bitcoin's most substantial contribution to the world [to date] is that it brought mainstream concepts like blockchain and SC.[4]

A blockchain is a digitized, decentralized, distributed database, commonly referred to as a distributed ledger that records all the information introduced in the blockchain network. The created database is then replicated and shared among the network participants. The above means that all members have access to the information, which provides a highly transparent environment.[5]

Under the above definitions of SC and the blockchain, at first glance, it seems that their applicability throughout the legal system can be colossal. When it comes to contracts, the laws are [usually] imposing an obligation for the parties to perform their duties stipulated in the contract. The concept is known under the Latin formula "pacta sund servanda"- agreements must be kept. It refers to the contractual parties' obligation to fulfill their promises towards the other contractual party. Although the above principle is regularly [explicitly] mentioned in the international treaties, it is also applicable to private contracts, as [most] legal systems worldwide would protect the contract's non-breaching party. The legal systems would usually allow enforcement proceedings to coerce the breaching party to perform under the contract. Besides, the law would customarily grant the non-breaching party an opportunity to penalize the breaching party, allowing the non-breaching party to compensate its losses stemming from the breach of the promises coined in the contract.

The legal principles described above aims at ensuring legal certainty in the society, thus contributing to building an ecosystem where the citizens and businesses can thrive by eliminating the unpredictability and deceptive practices. Still, the International Association of Contracts and Commercial Management (IACCM) estimates indicated that contracting's current pitfalls lead to value erosion of 9% or more throughout the commercial sectors.[6] Therefore, finding a solution that would eliminate or at least reduce value erosion in contracting would contribute to notable improvements in monetary and efficiency terms.

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[4] Ibid.
[5] Ibid.
[6] Rory Unsworth, 'Smart Contract This! An Assessment On Contractual Landscape And The Herculean Challenges It Currently Presents For "Self-Executing" Contracts', *Legal Tech, Smart Contracts and Blockchain* (1st edn, Springer 2019), 26

This thesis' core aim is to examine the potential of SC to contribute to resolving the world's most challenging issues, being the sustainability and digitization. Namely, SC are [mainly] built on a blockchain technology, which is immutable and decentralized. Furthermore, SC are designed to automatically enforce contractual clauses, without [human] intervention. The above SC [and blockchain] characteristics may be one of the key assets in the attempts to digitize the economy, and make the development sustainable, as those would potentially eliminate [every] attempt to circumvent the enacted rules or various power [mis]use to the detriment of the society.

Therefore, an attempt will be made, among other things, to answer the questions:
1) whether the SC can [completely] replace the current paper-based Contracts? 2) whether the SC can contribute to fairer, sustainable, and more efficient societies? 3) will the SC help make the contracting easier and more equitable? 4) will the SC increase contracting efficiency overall and contribute to the digitization and sustainable development goals? Justifying any answer to the above questions is not simple at all. Namely, whatever the answer is, there will be potential pitfalls and hurdles that need to be overcome. Bearing in mind that the SC's creation and execution involve lawyers and modern-day technology, like blockchain, decentralized ledger technology (DLT), Artificial Intelligence (AI), etc., the questions' antiphon becomes even more troublesome.

2 The Foundation of the Modern Contract law

Undoubtedly, the ancient Romans laid down the contract law's basics and principles. However, the current contract law was [further] developed in the 19th century. The trade and industry's expansion rocketed throughout the 19th century. The trade developments have triggered many commercial disputes, which have caused people to ask for court protection, aiming to safeguard their legal interests. On the other hand, the industry's advancements have also contributed to enlarging the court cases. The employees sought protection from employers when there was a violation of their labor rights. Back then, the dominant economic philosophy was the so-called "laissez-faire individualism," which prevented the governments from interfering in the business, thus leaving the individuals free to make their own choices.

The above philosophy has also influenced contract law by introducing two main principles: contract freedom and bargain powers equality. While the bargaining power balance assumed that [all] the parties had the same bargain capability, the freedom of contracting referred to the parties' freedom to choose the contracts they will enter and the terms and conditions of those contracts. The above theoretical views have triggered the codification of the contract rules worldwide. The courts were only required to enforce the parties' agreement, as the fairness was not disputable. This approach's economic justification was found in the following principle: the market that operates resources freely will always strive for the most valuable [resource] usage. The exchange between the parties will make them wealthier, thus increasing society's well-being. The prior principle would only work under the assumption that the exchange that is taking place between the parties will not reduce the non-participating parties' welfare more than the gains of the parties participating in the business. Furthermore, the above theory presupposed that people would behave rationally when maximizing their own wealth, thus responding to other individuals in a way that would exclusively increase their own benefits. This theory didn't assume that the individuals will selfishly pursue vaster individual capital.

The shortfalls of the above economic theory and the contract law principles have led to dissatisfaction, riots, and government interventions. Namely, the reality check has shown that [in most cases] the parties are not equal in bargaining powers. Consequently, the parties are not [in fact] free to choose the contracts they will enter into and [even less] the contracts' terms and conditions. The parties' inequality was the root-cause of government intervention in the sphere of contract law. Therefore, throughout time, the freedom of contracting has seen various modifications, as it became apparent that not all parties have equal bargaining capability. Those concerns have led to enacting statutes aiming to protect the contracting parties whose bargaining power was more moderate than their counterparts. For instance, today's legislation deals with consumer protection, as the consumer's bargaining power is significantly lower than the corporations' bargaining power. Besides, the labor laws impose obligations for the employers that cannot be altered by a contract, thus protecting the staff from misuse of the business' powers. Modern-day statutes also impose various rules for personal data protection, standard contractual clauses, compulsory opt-out options, etc., to safeguard the consumer's interest and prevent the abuse of its data.

Summing-up the precedent, it seems conceivable to conclude that although contracting freedom is still prevailing in the legal theory in most of today's modern legal systems, there

are some statutory limitations imposed by the public authorities. Those restrictions mainly refer to the prevention of the [economically] stronger party to benefit to the detriment of the weaker party in the contract and the public interest.

Following the explanation of the contract law 'evolution,' the logical question immense: what is the next stage in the contract [law] evolution? Will the SC manage to lead the next stage in the contracts' development and [r]evolutionize the contracting process overall and the contract law? An attempt to answer the above question will be made in the next chapters.

3 The Contemporary Technological Developments

3.1. Blockchain

Blockchain can be illustrated as an innovative system of information recordings that makes it difficult or [even impossible] to change, hack, or cheat the system. In other words, the blockchain is a new and innovative technology for data storage that performs its tasks via so-called DLT, which makes blockchain immutable and [almost] impossible to reverse. A blockchain is a digital ledger of duplicated transactions distributed across a network of computer systems connected in the chain. Every block in the chain contains many transactions. Each time a new transaction occurs on the blockchain, a record of that transaction is added to every participant's ledger. Blockchain is a type of DLT in which transactions are recorded with an immutable cryptographic signature called a hash.

Blockchain technology makes it possible to store tracking records for any data that one assumes valuable, [without] significant risks that the data stored can be tampered. Due to its characteristics, blockchain guarantees stability and anonymity to its users. The blockchain technology's stableness stems from its operational principle requiring each new transaction to be validated throughout the connected network nodes before being authorized. Once the new transaction is validated, the [new] block is created and added to the chain, forming part of the public ledger. Therefore, the blockchain offers an [affordable] option for collaboration between two parties that don't know each other well and would rather avoid engaging an intermediator whom they both trust.

As far as security is concerned, the blockchain is by far more secure than the centralized systems. Due to the DLT that it deploys, the unique way to hack the transaction is to notch the majority, i.e., most of the computers connected in the chain. The prior is also known as

"the 51% attack." The above features of the blockchain made it attractive for various industries, institutions, and processes, such as (i) finance; (ii) academic institutions; (iii) medical institutions; (iv) real estate business; (v) energy trading business; (vi) self-executable contracts, etc.

3.1.1. The Validation Process in the Blockchain

Blockchain is a type of log or spreadsheet that contains specific information about transactions. Each transaction generates a hash that represents a line of numbers and letters. Transactions are then entered in the order in which they occurred, and the hash depends not only on the transaction but the previous transaction's hash. The transaction can be written into a block only if the majority of the nodes approve the transaction. Therefore, each block is chained to all the preceding ones, creating an immutable chain. Blockchain is spread over the computers in the network. Each of the computers linked in the chain contains a copy of the blockchain. The computers are called nodes, and the blockchain registry updates itself every 10 minutes, making it extremely efficient and convenient.[7]

Blockchain is a fuse of various existing technologies. Although these technologies are not novel, the way they are combined and applied created the [innovation] called a blockchain. The technologies comprising blockchain can be broken down to:

- Private key cryptography;
- A distributed network that includes a shared ledger;
- Accounting means for the transactions and records related to the network.

The cryptographic key function can simply be explained by a model of a transaction between two parties. Each of the transaction parties holds two keys: one is private, and the other is public. By linking the public and private keys, cryptography enables the participants to create a safe digital identity indication position. The secured identity is a significant component of

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[7] Nikolaos I. Theodorakis, 'Blockchain Technology Regulatory Standards In The EU And U.S.: Smooth Sailing, Or Iceberg Ahead?' (2020) 3, 51 Transatlantic Technology Law Forum, Stanford Law School and University of Vienna School of Law

Huaging Wang, Kun Chen and Dongming Xu, '*A Maturity Model For Blockchain Adoption*' (1st edn, Springer Nature 2016), 1-5 <https://jfin-swufe.springeropen.com/articles/10.1186/s40854-016-0031-z> accessed 5 December 2020

blockchain technology. Both keys together generate a digital signature, which is then used to certify and control ownership.[8]

Once the digital signature is created, it is combined with the DLT segment. Blockchain technology works as a vast mesh of individuals who act as validators, aiming at reaching a consensus for numerous transactions. Mathematical affirmation is finally used to protect the network.

When two parties attempt to conduct an online transaction, each with a private and a public key, the blockchain allows the first party to use their private key to share data associated with the transaction to the other party's public key. When chained together, that information constitutes a block with a digital signature and timestamp, and additional relevant information about the transaction. Besides, the identities of individuals involved in the transaction are not disclosed in the network, as that information is pseudonymized. Following the block's creation, it is transmitted throughout the blockchain network to all nodes, or other constituent parts of the chain, which will after that act as validators for the transaction.

To wrap-up the precedent, the block in the chain can only be added if four events [subsequently] occur:

1.   A transaction shall be conducted (e.g., a request for online music streaming);

2.   The transaction has to be substantiated (the nodes connected to the chain shall perform the indispensable checks, and confirm that the transaction is valid, i.e., the details and time of purchase, purchase price, and availability details);

3.   The transaction shall be recorded in the block (following the agreement's validation, the transaction's monetary value, the digital signatures of the transaction's participants are all in a block). The transaction then joins numerous other transactions that are validated in the same fashion;

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[8] Nikolaos I. Theodorakis, 'Blockchain Technology Regulatory Standards In The EU And U.S.: Smooth Sailing, Or Iceberg Ahead?' (2020) 4, 51 Transatlantic Technology Law Forum, Stanford Law School and University of Vienna School of Law
Yong Yuan and Fei-Yue Wang, 'Blockchain And Cryptocurrencies: Model, Techniques, And Applications - IEEE Journals & Magazine' (*Ieeexplore.ieee.org*, 2018), 1421-1428
<https://ieeexplore.ieee.org/document/8419306/authors#authors> accessed 6 December 2020

4.   That block must contain a hash (a sole identifying code). The block can only be added to the blockchain once it is hashed. The new block then becomes publicly available, and anyone can see it.[9]

3.2. Artificial Intelligence (AI)

An AI system uses software to think intelligently as humans do and perform intelligent human functions. The AI system work by "assessing, inferring, and predicting" based on the entered data. Therefore, the AI system may be trained to recognize what is right and wrong and make its own choices, based on the previous experience that the machine has learned. The intelligence is artificial, as it cannot conclude without data being entered into it.

The AI system is set to make nexus and ties amongst the various data that it receives. Upon completing the relevant reasoning, the AI system will try to predict outcomes.

The AI system's operation becomes much more intricate when many users are involved, say hundreds of thousands, maybe even millions. The AI software has to process all the data entered in the environment and make deductions and predictions based on the information available. Under the above, a few other elements are worth mentioning. Primary, a defined space or an environment is indispensable for an AI software to work. A specific boundary for the AI system must be set, as it needs to know where and which data it should collect. Secondly, AI software cannot be constructed for the sake of being construed, i.e., there must be an aim, a question, or a problem that the AI system strives to solve. Even if the AI system does not receive a specifically tailored question, there must be a goal for the AI system. Finally, the AI system's ability to predict is contingent upon its ability to conclude, which in turn depends on the data fed to the AI system for assessment. The basic principle for deploying statistics to make predictions fall on the sample vastness – the larger the sample size, the accuracy is better. The same concept applies to AI systems alike – the larger the data set, the more accurate AI systems can be.[10]

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[9] Nikolaos I. Theodorakis, 'Blockchain Technology Regulatory Standards In The EU And U.S.: Smooth Sailing, Or Iceberg Ahead?' (2020) 5, 51 Transatlantic Technology Law Forum, Stanford Law School and University of Vienna School of Law
Witold Nowiński and Miklós Kozma, 'How Can Blockchain Technology Disrupt The Existing Business Models?' (2017) 173-178, 5 Entrepreneurial Business and Economics Review
[10] Irene Ng, 'The Art Of Contract Drafting In The Age Of Artificial Intelligence: A Comparative Study Based On US, UK And Austrian Law' (2017) 25, 26 Transatlantic Technology Law Forum, Stanford Law School and the University of Vienna School of Law

More pertinent in this case is whether the AI technology [in conjunction with the blockchain technology] can be deployed to [create] and execute a SC. As shown in section 7 of this thesis, the AI can be extremely helpful in executing a SC, especially when the SC is created in the environment where the parties cannot be acknowledged upfront, and numerous transactions [shall be] conducted when specific pre-conditions are met. The AI features described above, especially the ability of the AI systems to [accurately] predict future events based on the processed data can be extremely helpful in: (i) risk mitigation; (ii) execution of the SC terms correctly, i.e., when the execution is in the parties' best interests.

3.3. Smart Contracts

The idea for SC is not new. As already mentioned in the Introduction part of this thesis, the computer scientist Nick Szabo coined the concept back in 1994, i.e., 26 years ago. However, the world hasn't experienced large-scale SC deployment until the emergence of cryptocurrencies such as Bitcoin. Those cryptocurrencies are based on a decentralized platform, blockchain. The emergence of the DLT paved the way for the extensive application of SC. Although there isn't a commonly accepted definition for the SC, those can be described as "self-executing, autonomous computer protocols that facilitate, execute and enforce commercial agreements between two or more parties."[11] Another gripping portrayal of SC associated with blockchain is following "an agreement between two or more parties, encoded in such a way that the blockchain guarantees the correct execution."[12]

A simple, practical example for SC in its earliest and simplest form can be illustrated in the vending machine. The latter is designed to transfer the ownership of a good (e.g., a bottle of Coca-Cola) in exchange for money. As the vending machine controls the physical property (as it is physically sealed), it can enforce the contract. This kind of contract is a "contract with the bearer," as any person willing to pay can transact with the vendor.[13]

Nick Szabo extended the vending machine operation module's logic to a more complex [real-world] transaction; therefore, he suggested that a computer code can be deployed instead of vending machines. The coding can be invoked to negotiate more complex

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[11] 'The Blockchain Revolution, Smart Contracts And Financial Transactions | Insights | DLA Piper Global Law Firm' (*DLA Piper*, 2016) <https://www.dlapiper.com/en/uk/insights/publications/2016/04/the-blockchain-revolution> accessed 10 December 2020

[12] Roger Wattenhofer, *The Science Of The Blockchain* (1st edn, Createspace Independent Publishing Platform 2016), 88

[13] Josh Stark, 'How Close Are Smart Contracts To Impacting Real-World Law? - Coindesk' (*CoinDesk*, 2016) <https://www.coindesk.com/blockchain-smarts-contracts-real-world-law> accessed 10 December 2020

transactions, forging strategic relationships, and coordinating transactions under various jurisdictions. Hence, instead of transferring a bottle of Coca-Cola, the SC can transfer ownership of shares, immovable, IP rights, etc.[14]

Speaking in economic and efficiency terms, one of the most significant blockchain' and SC' advantages is reducing the transaction costs stemming from intermediary third parties. Under the same logic, blockchain accelerates the process and significantly reduces the transaction time, as it works continually, that is, 24/7/365. An illustrative example would be transferring money from one country to another, using Bank as an intermediary. The international money transfers are usually wire transfers, and those take a couple of days. Furthermore, the banking transactions also involve [significant] costs for both the sender and the beneficiary. Apparently, blockchain technology can eliminate most, if not all of the costs, and reduce the time for transferring the funds substantially, without harming the security in the transaction, and eliminating [almost] all risks stemming from fraud and deceptive practices. Nonetheless, the blockchain is a new and disruptive technology, and, as past experiences show, its large-scale implementation will require research, time, and training.[15]

4 A Brief Overview of the Recent Developments in Legislation Concerning Blockchain and Smart Contracts

4.1. The EU Efforts to Regulate Blockchain/Smart Contracts and Encourage Innovation

Despite the struggles associated with implementing the blockchain technology and the SC in practice, it is noticeable that many of the governments worldwide are initiating public debates, drafting regulations, and support regulatory sandboxes for testing and a better understanding of these technologies. For instance, the European Union (EU) has launched the EU Blockchain Observatory & Forum. The mentioned Forum is an "EU Commission initiative to accelerate blockchain innovation and the development of the blockchain ecosystem within the EU and help cement Europe's position as a global leader in this transformative new technology."[16]

The EU is also planning a Pan-European regulatory sandbox in cooperation with the European Commission for use cases in European Blockchain Service Infrastructure, including data

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[14] Ibid.
[15] Marcelo Corrales, Mark Fenwick and Helena Haapio, 'Digital Technologies, Legal Design And The Future Of The Legal Profession', *Legal Tech, Smart Contracts and Blockchain* (1st edn, Springer 2019), 19
[16] 'EU Blockchain Observatory & Forum' (*EUBlockchain*, 2020) <https://www.eublockchainforum.eu/> accessed 10 December 2020

portability, business-to-business (B2B) data spaces, SC, and digital identity (Self-Sovereign Identity) in the health, environment, mobility, energy, and other vital sectors.[17]

The current EU policy initiatives can be traced back to the Tallinn Declaration on eGovernment, signed in 2017 by the EU member states and the European Free Trade Agreement (EFTA) countries. The Tallinn Declaration stressed the significance of secure and efficient digital public services to reach the EU's Digital Single Market's full potential. Later on, in 2018, 21 EU member states and Norway signed a declaration creating the European Blockchain Partnership (EBP).[18] According to Mrs. Mariya Gabriel, EU Commissioner for Digital Economy and Society, "In future, all public services will use blockchain technology. Blockchain is a great opportunity for Europe and its member states to rethink their information systems, to promote user trust and the protection of personal data, to help create new business opportunities, and to establish new areas of leadership, benefiting citizens, public services and companies".[19]

Since its establishment in 2018, the EBP aims at developing European Blockchain Services Infrastructure (EBSI) with cutting-edge technology in terms of privacy, cybersecurity, interoperability, energy efficiency, and compliance with the EU Law.[20]

Under the EBSI, four areas were detected as use cases, i.e., notarization, education credentials, European self-sovereign identity, trusted data sharing among customs and tax authorities throughout the EU. The EBSI operates as a peer-to-peer (P2P) platform of interconnected nodes, whereas some of the nodes are controlled by the European Commission, and the EU member states control others. The nodes will be able to design and broadcast transactions that will update the ledger. The nodes included in the network will be synchronized, sharing the same state of the ledger and the off-chain transactions.[21]

However, not all EU member states have the same approach in passing [new] regulations concerning blockchain. Yet, it is worth noting that none of the EU member states has adopted unfriendly regulations against the blockchain. The European Commission identified three stages of the so-called regulatory maturity curve in various EU member states (the report also

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[17] 'Legal And Regulatory Framework For Blockchain - Shaping Europe'S Digital Future - European Commission' (*Shaping Europe's digital future - European Commission*, 2020) <https://ec.europa.eu/digital-single-market/en/legal-and-regulatory-framework-blockchain> accessed 10 December 2020
[18] 'EU Blockchain Ecosystem Developments' (European Commission 2020), 183
<https://www.eublockchainforum.eu/reports> accessed 10 December 2020
[19] Ibid.
[20] Ibid.
[21] Ibid.

included the UK and Switzerland). Stage I regulatory maturity refers to [EU member] states where no significant and detailed blockchain regulation exists. In countries belonging to this group, only warnings are issued by the authorities, aiming at investor protection or minor state initiatives. Stage II regulatory maturity includes States where significant signs of engagement in the field are noticeable, mainly through broader regulatory schemes or other specific measures. Those measures may consist of government-sponsored studies or government-sponsored pilot applications of the blockchain in the public domain. Stage III regulatory maturity entails states where either specific legislation for blockchain has been passed or published, and/or the authorities have announced a sovereign national strategy, specifically for blockchain or associated technologies. The strategy mainly refers to regulatory sandboxes, innovation hubs, and various other initiatives that include blockchain technology. The pilot projects are primarily introduced in the Banking and Financial Technology (FinTech) sector. The number of countries belonging to stage III is not large (only six EU member states belong to this group). However, it is worth noting that blockchain initiatives are gaining momentum throughout Europe. More and more countries are encouraging to take the regulation and the ecosystem to the next level by supporting and implementing the technology in public services.[22]

4.2. The US Initiative to Regulate Blockchain and Smart Contracts and Inspire Innovation

As far as the United States of America (US) is concerned, it is worth noting that several US states have passed laws associated with blockchain technology, notably Arizona, Delaware, Nevada, Tennessee, and Wyoming. The new regulations are expected to play a vital role, bearing in mind the projected blockchain spending in the US, which is expected to grow to US$ 41 to US$ 60 bn. by 2025. In July 2019, Wyoming passed 13 laws aiming to enable blockchain adopting the role of the "Delaware of digital assets law" and provide a framework in which blockchain users and creators have space that acknowledges their property rights and offers regulatory relief. The said legislation allows SC to be deployed to take control of digital assets. However, tokens are exempted from the State's securities laws.

Arizona's state legislators went further to define the SC as "an event-driven program, with the state that runs on a distributed, decentralized, shared and replicated ledger and that can take custody over and instruct transfer of assets on that ledger." Another exciting example is

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[22] Ibid., 184-186

Delaware, where SC is not explicitly mentioned, but the legislation has allowed companies to keep their shareholders' list on a blockchain. Delaware's move becomes even more relevant, bearing in mind that the majority of the Fortune 500 companies are incorporated in that US state.[23]

Although some US states have adopted specific regulations for SC, there are still struggles that should be overcome in the future, before SC is widely deployed, and [potentially] replace or at least supplement the [prevailing] paper-based contract. For instance, jurisdiction may be intricate in case of dispute, given the fact that the parties in the SC can decide to be anonymous. Hence, the important question arises: how will the plaintiff file a lawsuit if the prior doesn't know its counterpart? Nonetheless, blockchain pseudonyms are associated with real identities. However, the discovery process hasn't been decided yet and may appear to be complicated in practice. Another potential challenge concerning the legislation is the ever-changing parameters, infrastructure, and principles for blockchain and SC regarding coding rules and principles. Namely, the platforms and coding principles are unpredictable and volatile compared with the legislation, which is usually required to be stable and predictable. The above concerns caused Wyoming state to create blockchain task forces that would help in the decision-making process. Wyoming's purpose of creating blockchain regulation is, among other things, to attract companies wishing to deploy blockchain in their operations to incorporate there. However, those task forces didn't have many issues to solve.[24]

In contrast to the preceding, some field experts claim that the US's contract law in its current state is enough to cover SC. The blockchain supporters also hold that the field shall not be regulated; instead, it shall be left to thrive free of the statutory burdens, driven by market forces.

One of the field experts, Ms. Aparicio, lawyer, and former World Bank consultant, has stated, "the law is ready- we do not need specific legislation for the smart contracts by state law, under e-commerce laws."[25]

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[23] Sibilla Grenon, 'Codifying Code? Evaluating US Smart Contract Legislation' [2019] 6-7, International Bar Association, Legal Policy & Research Unit

[24] Ibid., 7-8

[25] Sibilla Grenon, 'Codifying Code? Evaluating US Smart Contract Legislation' [2019] 8, International Bar Association, Legal Policy & Research Unit

Aaron Stanley, 'Can Code Really Be Law? New Report Clarifies Smart Contract Misconceptions' (*Forbes*, 2018) <https://www.forbes.com/sites/astanley/2018/09/27/can-code-really-be-law-new-report-clarifies-smart-contract-misconceptions/> accessed 14 December 2020

Ms. Aparicio certainly had a point. Still, as the e-commerce laws were passed to address the developments in that area, those may not be appropriate or comprehensive enough to tackle the challenges stemming from the blockchain and SC application. Namely, the companies in the e-commerce business present the contract, i.e., the general terms and conditions (GTC) in a plain legal language that [most of] their customers don't understand, and truth been told, don't even bother to read. Besides, those GTC are drafted by legal professionals, and apart from the statutory obligations that protect customers, such as consumer protection laws, data protection, etc., the GTC's primary purpose is to protect the seller, rather than the shopper.

The disparity between e-commerce and SC may be illustrated in a practical example, such as the placement of a product order through a digital platform, e.g., Amazon. Usually, after the order placement, Amazon will charge its customer's credit card and issue a [projected] delivery time. Hence, the risk has now been shifted to the consumer. Namely, the consumer paid for the product, which hasn't been delivered yet. However, the merchant has collected the funds upfront. Theoretically, and sometimes, also in practice, the product may not be delivered, although the price has already been charged. In such a case, the regulations protect the customer, and the latter can initiate legal action if the product is not delivered; it would still be cost-intensive and time-consuming. So, sometimes customers opt to complain directly to the platform, aiming at resolving the issue. Failure to reach an agreement, the customer [may] decide not to proceed further with legal action, due to reasons mentioned above (time and costs).

Another issue may arise if the buyer receives the [ordered] product with a delay in delivery. Namely, once the customer places an order and gets a notification from the trader that the delivery will take place on a specific date, the prior expect accuracy, i.e., to have the product in its possession on the [promised] date.

Assume that under the platform's GTC, the shopper is eligible to receive monetary compensation in case of delays. In the current circumstances, those compensations are not paying automatically; that is to say, the merchant's bank accounts are not automatically charged, and funds aren't transferred to the customer's account. Therefore, if the consumer intends to enforce its rights stemming from the GTC should rely on the trader's corporate culture, or the courts, as a final instance. As already emphasized above, the second option is rarely considered in practice, as the court proceedings may be lengthy and costly, especially when the disputes refer to minor values.

In contrast to the above illustrations, the blockchain technology and the SC would automatically enforce the platform's GTC, or statutory obligations, should those be entered into the SC's code. Given that the SC's code usually invokes if…then… condition, the above situations would be [easily] resolved with coding into the SC.

Notably, if we use both examples mentioned above to explain the SC and blockchain functioning, the final outcome would differ substantially. If we consider the first situation, where the product is not delivered at all, the SC will prevent the dispute, as it wouldn't transfer the funds until the product is actually delivered. As the SC are [usually] developed on a blockchain, the prior would be well "aware" when the goods are delivered. Hence, the funds will be released to the merchant's bank account after receiving confirmation that the product has reached the desired destination. The SC will act as an escrow agent in this case, without extra charges for the service. In the second example, the SC would also preclude the litigation, as it would immediately charge the platform's bank account, in the amount equal to the consumer's compensation for late delivery, and transfer the funds to the latter's account. Even more, the SC may withhold the necessary portion of the funds (if those are not yet disbursed to the seller) and transfers those funds to the customer's credit card. In today's circumstances, there is still an option for safe payments in an e-commerce transaction, like, e.g., PayPal. Still, those are costly and involve an intermediary between the consumer and the seller.

Coming back to Ms. Aparicio's statement, it seems conceivable to assume that the current contract and e-commerce laws may not be enough in terms of comprehensiveness and robustness to address issues associated with SC and blockchain. The e-commerce regulations are tackling problems that are not [always] related to the SC and blockchain. Namely, as outlined above, the SC and blockchain legislation should address issues associated with the SC's errors in performing, identifying the parties, recognizing the parties' actual intention when they entered the relations in the absence of a paper-based contract, etc.

Summing-up the precedent, the development of [new] legislation, and especially enforcing the prior will undoubtedly be challenging for legislators worldwide. Needless to say, SC and blockchain are both new technologies, which require field knowledge and understanding, as well as the flexibility to be well understood and regulated. Finally, the regulations shall not be too stringent, preventing innovation and harming the entrepreneurial spirit. However, the law shall also protect the consumer, and prevent the risks being generated, thus spread in the markets. Fulfilling those missions is not an easy task, as the regulators will have to balance

between various [public] interests and navigate through unknown and volatile terrain. A self-regulation is a risky option, bearing in mind what happened in the Financial Sector back in 2008 and the scandals associated with the BigTech, such as abuse of personal data and abuse of dominance.

5 Smart Contracts Enforceability

As we've seen in the previous chapters, the regulations concerning blockchain and SC are in infancy, as these technologies are novel and not widely applicable yet. The issue of SC enforceability may be tricky, as SC is self-executing. Namely, the SC is written in a computer code set to execute certain operations once the necessary pre-conditions are fulfilled.

Therefore, at first glance, it may sound that the enforceability in the traditional [legal] sense of the term is not an issue associated with SC. Although it may sound tempting to conclude that SC is legally enforceable in terms of the law, just because it includes the word contract, that would be risky and [frequently] inaccurate. The case law is yet to be created, but the SC's enforceability would largely depend on the SC type, the actual matrix where it operates, and the applicable law under which the issue is to be resolved.[26]

The main concerns associated with SC's enforceability may be broken down to the following points:

- The electronic nature of contracting. These will probably not be an issue for [most of] the jurisdictions in instituting contractual arrangements.
- Assurance associated with the contract terms. Contractual terms are frequently a critical factor in establishing a legally binding contract in numerous jurisdictions.
- Follow-on contracting. Namely, if an earlier SC's performance brings about a separate "follow-on" contract, the prior may not lead to a legally enforceable contract in some jurisdictions.
- Technical requirements of the concerned jurisdiction's legal system. These imperatives may prevent SC intended to have a legally binding effect from rolling out.

Apart from the above-listed issues, there may be numerous other impediments for SC enforceability, given that common and civil law traditions have different approaches in regulating contracts and contract law and the court's approaches in applying the existing rules

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[26] Sean Murphy and Ronald David Smith, 'Can Smart Contracts Be Legally Binding Contracts?' [2016] 4, Norton Rose Fulbright

to a novel situation. Namely, at least for the time being, the judges will certainly have to figure out how to resolve a dispute arising from an SC with the current rules. In particular, the courtrooms will [probably] start to administer cases stemming from SC long before the new regulation is passed. The last will [probably] be the case, as the technology is advancing at a much faster pace than the legislation, and the courts cannot dismiss a claim brought to them just because there are no specific rules in place. Hence, the judges or arbitrators will have to listen to the parties' pleadings and hand-down verdicts or awards.

SC's enforceability doesn't have a straightforward answer, as there is a spectrum of those:

- A contract may be entirely coded, i.e., it may be solely written in a computer code.
- There can be a mix of computer code and natural language version. In this case, the computer code shall only reflect the natural language contract.
- A hybrid or split model. This type of contract entails a code that references a paper-based Master Agreement's terms and conditions.
- A traditional written contract with some performances encoded (e.g., the payment mechanism is entered into a computer code).[27]

The above list of SC variances is certainly not exhaustible, and there may be numerous other types of SC and combinations between SC and traditional contracts. However, the disputable issues that may emanate are dissimilar, and those mainly rely on the particular case at hand.

For instance, if the contract is fully coded, the parties may raise concerns if the code mirrors their actual intention and performs as it was supposed to. Namely, suppose the participants decide not to sign a paper-based contract, where they will express their preferences and the contract's subject, but they decide to opt for a computer code instead. In that case, the latter has to be written by a programmer that understands the coding. The software engineer is usually a professional hired by third parties to produce the client's product, being [customarily] the source code. Hence, the problems may begin when the program is put in production, i.e., when it has completed the testing stage and starts to perform real transactions. As the SC are usually coded in blockchain platforms, the transactions they perform are immutable. Therefore, if the SC transfers funds following certain conditions' fulfillment, the transfer command can't be reversed. The big question is: what if the coder has misunderstood the parties' intention and instructed the SC to perform under his understanding and not the

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[27] James Rogers, Harriet Jones Fenleigh and Adam Sanitt, 'International Arbitration Report, Arbitrating Smart Contract Disputes' [2017] 23, Norton Rose Fulbright

contractual parties' will. In this case, the court or the arbitrators will [probably] have to assess what was the parties' intention when they entered the contract, and unquestionably, the code itself. Namely, the judge or the arbitrator will have to look at the code and understand what it means, as it is the parties' volition that was put in a language that the machine can understand. Needless to say, the judge may not understand the code, as it requires specific skills, which only coding professionals possess. In such a case, the court will [presumably] engage an expert and ask for an interpretation of the coding language. The expert may "translate" the code and its actual performance in practice, but it will be up to the judge to ascertain the parties' original intentions and the transposition of those into the code. None of the above issues is neither easy nor straightforward to resolve. Hence, this case's enforceability will depend on the circumstance if the code possesses all the statutory requirements needed to conclude that there is a contract.

The second case seems more comfortable to tackle, as there are, so to say, primary and secondary sources. Namely, if there is a paper-based contract, the enforceability will [reasonably] be assessed under the terms agreed thereunder. On the other hand, the code will be tested against the natural language contract to determine if it has implemented the parties' agreement. The courts and the arbitral tribunals are experienced in interpreting the traditional contracts, so the standard rules will only be applied in this case.

The third example may be the most widely implemented in practice, as corporations frequently use Master Agreements to frame their future cooperation rules. Although the Framework Agreements are not as detailed as GTC or contracts governing particular business relationships between the parties, the initial set the basic principles and may be used as proof to testify the parties' intentions and the contract subject. Another common characteristic of the Master Agreements is their reference to one of the parties' GTC or some other source that shall be deployed if the earlier is silent on specific issues. Under the above, the courts would strive to interpret the Master Agreement, determine the parties' purpose, and test the code against the Framework Agreement. A potential issue that may arise in this case is the vagueness of the Master Agreement or the absence of clauses that regulate certain rights and duties. In such a case, the tribunals will have to rely on the code only, as there wouldn't be, so to say, written sources. The courts would probably have a tough job to rule if the code expresses the parties' intention when entering the agreement, as the primary should only rely on the code.

The fourth case would be more manageable to solve, as the major part of the contract is paper-based, and only [minor] parts of it are embedded in a computer code. For instance, let's assume that the parties' have arranged their relations and defined who does what under the contract. In such a case, it would be relatively straightforward to determine whether the automated payment should have occurred at a certain point or it was a machine's error to trigger the transfer of the funds at that point. In the event that the court finds the transaction took place without the agreed pre-conditions being met, it would declare the transfer void and compel the receiving party to return the funds to the payer. However, the actual enforcement will most probably have to take place off-chain, as the blockchain is immutable, and the transactions made on it cannot be reversed.

The analyzes listed above are basic illustrations that the case law may be challenging and cumbersome, even for experienced judges and arbitrators. Nevertheless, as with e-commerce, the legal practitioners will have to find out how to navigate this unknown field and create the precedent, even in the absence of specific standard rules.

5.1. The UK's Jurisdiction Taskforce Legal Standpoints

The United Kingdom (UK) has formed a jurisdiction taskforce (UKJT) for cryptoassets and SC. Although the UK is not the first country to create jurisdiction taskforces regarding cryptoassets and SC, the legal views of the UKJT are gripping in terms of preparedness of the UK legal system for enforcing SC.

A key finding in the UKJT Legal statement on cryptoassets and SC is that the latter can satisfy the requirements of English law contract formation principles; therefore, the SC can be interpreted and enforced under the well-established legal principles.[28]

Under the English law understanding, contract law is concerned with the enforcement of promises. Hence, given SC's automaticity and mechanical course of operation, a party doesn't have to promise performance or rely on the law to enforce a promise by their counterparty. The reason for the preceding is the fact that the code will do what it is programmed for. In other words, the code will enforce the counterparty promise and will, therefore, render the enforcement under the legal system fortuitous. The UKJT didn't see any particular reason to treat SC differently than the conventional contract. Namely, the prior is only capable of

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[28] United Kingdom Jurisdiction Task force, 'Legal Statement On Cryptoassets And Smart Contracts' (The LawTech Delivery Panel 2019), 31

automatically enforcing the promise and reducing legal intervention scope. Besides, SC may prevent intentional non-performance and avoid or limit factual and disputes about terms' interpretation.[29]

Under the English law rules, a three-tier test is performed to ascertain whether a contract is formed: (i) the agreement shall objectively be reached among the parties; (ii) the parties intended that they will be [objectively] bind under the agreement; (iii) there must be a 'consideration,' i.e., each party must give something or benefit. Hence, a promise with no return is, in general, not enforceable.

The agreement will be constituted if one person offers terms to another person, which will accept those terms by words or conduct. In a business sense, the contracts are usually made in writing and signed by authorized representatives of the parties. However, neither the written form nor the signature is indispensable for giving a contract a form or making it enforceable. The requirement for legal binding is an assumption. Therefore, it is presumable that the parties intended to be bounded by the contract unless one of them proves the contrary. However, it would be hard to prove that some party didn't intend to bind itself under the agreement. The prior is especially true in the business world, where it is usually expected that the counterparty planned to be bounded by its promises. Only too extraordinary circumstances may justify the escape from legal bounding. The consideration refers to exchanging values between the counterparties, e.g., one party shall deliver some product or service in return for cash. In this context, it is also worth mentioning the so-called unilateral contract. Under the unilateral contract, one party makes an offer, which can be enforced by anyone that complies with the terms specified thereof. Although most of the contracts are bilateral or multilateral, the unilateral contract may be relevant in SC terms, as the code may be structured so that any interested person can access and trigger its execution, provided that the embedded pre-conditions are met. Under the above listed English law requirements for contract formation, the SC shall be subject to the same rules regulating the traditional contracts. The prior would only be applicable as long as the parties engaging in smart contracting can reach an objective agreement in the sense of terms, intention to create a legally binding relationship, and satisfying the consideration requirement. The single disparity of the SC compared with the paper-based contract would be the automaticity of the prior.[30]

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[29] Ibid.
[30] Ibid., 32

Decentralized autonomous organizations (DAO) are another example of potential unfamiliar territory. Namely, if one person creates the code to set up a DAO, the prior may have no intention to engage in legally binding agreements with anyone. Instead, the creator simply deploys a platform on which another entity shall interact under the SC's terms running DAO. The potential issue that may arise in this situation is whether the parties performing transactions on the DAO, who doesn't have bilateral communication, can be deemed to have entered into a legally binding contract under their participation. If the answer of the prior is in the affirmative, the tricky question is: with whom? In UKJT's opinion, the contractual predicament is not new, although the situation is novel. The UKJT assumed that in such a case, the concept of unincorporated association might be invoked, whereby, although the association lacks legal status, its members are still bound by their rules by virtue of their memberships. The association members contract with the membership as a whole, whereby an agreement is [objectively] reached. The intention of being bound is evidenced by the member's decision to join the association, well aware of the rules. The prior is also presumed to be accurate, even if the member is not familiar with other members' identities. The UKJT concluded that the DAO's should be treated as unincorporated associations, and the same rules regulating the latter be applied to the prior.[31]

6 The issues of Equality and Sustainability - Are Those Solvable or Out of Our Reach?

The concerns associated with equality and sustainability are not novel. Those concerns are long debated and contemplated in the past. However, the progress in finding [appropriate] solutions remains somewhat modest. The most illustrative example associated with the above concern is the migration of industrial capacities from developed to developing countries.[32] Namely, the businesses, primarily the multinational corporations, have found how to circumvent or, better say, downplay various strict regulations enacted in the developed countries. For instance, those rules refer to labor laws, environment laws, tax codes, health and safety regulations, etc.

The international businesses are well organized and equipped with indispensable resources to identify and mitigate risks and enact strategies to maximize their shareholders' value. That said, the Management Boards (MB) are supposed to find the way forward to yield the best

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[31] Ibid., 34

[32] Kevin O'Rourke and Jeffrey Williamson, 'The Spread Of Modern Manufacturing To The Poor Periphery | VOX, CEPR Policy Portal' (*www.voxeu.org*, 2017) <https://voxeu.org/article/spread-modern-manufacturing-poor-periphery> accessed 19 December 2020

return for their stockholders. Translated into a practical example, the prior would justify the MB decision to close a factory in a developed country and open the same capacity in an emerging country if advantages outweigh the disadvantages. Namely, the MB shall only be able to verify that, e.g., the lower labor and environment costs would outweigh the upfront investment and other expenses, such as transportation of the goods to their final [consumer] destination. Hence, the MB shall only prepare the spreadsheets and the executive summary to be presented to the shareholders so that the latter can decide.

Bearing in mind that the stockholders are [only] concerned for their returns, the decision would be [mainly] driven by the profits attributable to the facility's migration. So far, there is nothing wrong or unethical in this process, neither by the MB nor by the shareholders. Nonetheless, the issue becomes more complicated and perplexing when externalities' analyses are to be made. The externalities' concerns are explained in the Introduction section of this thesis, and those refer to the costs not attributable to the product or service itself. Instead, to others, to entities not engaged in the [corporations] activities, neither in the benefits associated with the prior. In other words, the spreadsheets and the figures in them may [economically] justify the facility's transfer, but not the reasons behind it.

The developing countries [usually] have less strict rules in numerous spheres, including labor and environment laws and favorable tax regimes. For instance, labor laws are less protective in the developing countries in terms of payrolls, taxation, social contributions, health and safety standards, overtime hours, etc. The environmental laws, if enacted, are by far less strict compared with the developing countries, and that is even worse, lack enforcement, especially for the large companies, providing jobs to hundreds of thousands of people. Consequently, we are witnessing the shifting to numerous industries, notably, steel and cement manufacturing, textile and chemical industries, and waste treatment plants from high- income to low-income countries. The motives for the corporations, however, are diverse rather than uniform. Those involved, among other things, lower costs due to lower salaries and fewer investments in the protection of the environment. The ecological investments are not popular, as those only cause costs but yield no or petty returns. So, the above approach's consequences, such as climate change, became visible for all of us and became urgent and pressing, requiring immediate intervention. Failure to take action may cause severe effects even for the current generation and make the times to come hard for the next.

Climate change is causing a heating debate nowadays, especially in developed countries. The carbon tax proposals are now openly discussed, and the regulators are gaining support from various groups and activists. The current health and economic crisis caused by the COVID-19 has accelerated the processes of putting forward proposals associated with tackling climate change issues. The acceleration is mainly driven by the fear of the next pandemic and the need to balance the public finances, as the debt levels have soared due to the excessive government aid to the private sector. Notably, the EU has committed to proposing a draft-scheme for a carbon border adjustment mechanism by June 2021. In this regard, the EU Commission was given the task of preparing the draft and initiating the debate in public and before the Union's respective decision-making bodies.[33]

Nowadays, it is impossible to think about economic growth and ignore its most immediate implication, being climate change. Unquestionably, the earth will become warmer in the next century; the extent is the only uncertainty. The cost associated with climate change is dissimilar if the planet got warmer by 1.5° C or 2° C. The prevailing scientific consensus is that human activity has caused climate change, and the only way forward to avoid catastrophe is to reduce carbon emissions.[34]

Nations decided to collaborate in tackling the climate change challenge through the 2015 Paris Agreement. Under the above Treaty, countries have set ambitious goals to limit global warming to 2° C, with a more ambitious target of 1,5° C. According to the Intergovernmental Panel on Climate Change (IPCC) report[35] as of October 2018, and based on scientific research, if global warming is to be limited to 2° C, CO_2 equivalent emissions (CO_{2e})[36] shall be reduced by 25 percent until 2030 (with 2010 as a base year), and be decreased to zero by 2070. The 1,5° C target can only be reached if the CO_{2e} emissions go down by 45 percent by 2030 and to zero by 2050.

[33] European Commission, 'Recovery Plan For Europe (Financing The EU Long-Term Budget And Nextgenerationeu, Supra Note 5, A Clear Roadmap Towards New Sources Of Revenue To Help Repay The Borrowing)' (2020) <https://ec.europa.eu/info/strategy/recovery-plan-europe_en#financing-the-eu-long-term-budget-and-nextgenerationeu> accessed 19 December 2020

[34] Abhijit Vinayak Banerjee and Esther Duflo, *Good Economics For Hard Times* (Penguin Books 2020), 208

[35] Abhijit Vinayak Banerjee and Esther Duflo, *Good Economics For Hard Times* (Penguin Books 2020), 208
Nicholas Stern, 'Global Warming Of 1.5º C' (*www.ipcc.ch*, 2008) <https://www.ipcc.ch/sr15/> accessed 20 December 2020

[36] Abhijit Vinayak Banerjee and Esther Duflo, *Good Economics For Hard Times* (Penguin Books 2020), 208
CO_2 equivalent emissions refer to the emissions of greenhouse gas (CO_2, methane, etc.) expressed in a common unit by converting amounts of other gases to the equivalent amount of CO_2 with the same effect on global warming.

Another challenge associated with climate change – it is mostly inequitable. Most of the CO_2 emissions are being created in developed countries. Moreover, a massive amount of CO_2 generated in emerging countries is due to the production that is consumed in rich countries. However, the most significant portion of the cost is and [will] be experienced in developing countries. The IPCC report, as mentioned earlier, has listed the actions needed to be taken to cut emissions and limit warming to 1,5° C. Some steps may have already been implemented, such as switching to electric vehicles (EV), constructing energy-efficient and zero emissions buildings, developing hydrogen trains, [large scale] deployment of renewable energy sources, etc.

Although technological improvements and innovation can help, the bottom line is that the consumption shall be decreased; otherwise, any future economic growth will directly impact climate change. The interrelatedness between consumerism and climate change is pretty straightforward, i.e., with the rise of consumption, the world needs more energy to produce what is absorbed. There are numerous studies on the correlation between income increase and CO_2 emissions. One of those studies implies that when a person's income rises by 10 percent, its CO_2 emissions increase by 9 percent.[37]

Even though the consumption shall be reduced, switching to new technologies may make it possible to have [approximately] equal expenditure, without influencing global warming, which is also worth analyzing.

Renewable energy is an essential asset in reducing CO_2 emissions and preventing climate change. For instance, not so long ago, energy experts argued that renewable energy sources, such as wind power turbines and solar plants, are way too expensive and can't be deployed on a massive scale. The arguments invoked by the experts were primarily associated with the high production cost and low productivity of renewables, compared with more traditional energy sources, such as coal and nuclear power plants. Nowadays, solar and wind power plants are considerably cheaper due to technological progress in those areas, and market scalability reached due to investments in clean energy by citizens and businesses.[38] On the other note,

[37] Abhijit Vinayak Banerjee and Esther Duflo, *Good Economics For Hard Times* (Penguin Books 2020), 209
Lucas Chancel and Thomas Piketty, 'Carbon And Inequality: From Kyoto To Paris' [2015] Paris School of Economics
[38] Harry Kretchmer, 'Renewables Are Increasingly Cheaper Than Coal' (*www.weforum.org*, 2020)
<https://www.weforum.org/agenda/2020/06/renewable-energy-cheaper-coal/> accessed 20 December 2020

energy efficiency has considerably improved and will continue to amend due to investments and innovation in various fields, such as automotive, construction, and home appliances.

The UK government engaged the former Chief Economist of the World Bank, Lord Nicholas Stern, to prepare a report on climate change's economic consequences. In 2006, the Stern Review was published, which concludes:

"Yet despite the historical pattern and the business as usual projections, the world does not need to choose between averting climate change and promoting growth and development. Changes in energy technologies and economies' structure have reduced emissions' responsiveness to income growth, particularly in some of the richest countries. With strong, deliberate policy choices, it is possible to "decarbonize" both developed and developing economies on the scale required for climate stabilization, while maintaining economic growth in both."[39]

Besides, the Stern Report concludes that assuming a rate of technological progress in the "green sector" based on extrapolating from recent history, it would cost about 1 percent of world Gross Domestic Product (GDP) annually to stabilize emissions at the level necessary to stave off global warming.[40]

One percent of world GDP per annum is quite a modest cost to prevent a climate change threat. Research and Developments (R&D) may certainly help in tackling the global warming challenge. One hope is that the incentives for R&D may work. The cost for R&D is strongly influenced by the market scalability and market size for the innovation-seeking to be financed.

Namely, as past experiences show, innovation may simply not find its way on the market, or, more frequently, innovative companies can't finance the investments necessary to increase their market share. Finally, although conducive in a technological and environmental sense, innovative product's market deployment may be implausible due to the high price.[41]

Renewable energy is worth analyzing further, as electricity production, trading, and distribution systems are somewhat complicated and involve numerous stakeholders. The

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[39] Abhijit Vinayak Banerjee and Esther Duflo, *Good Economics For Hard Times* (Penguin Books 2020), 214
Nicholas Stern, 'The Economics Of Climate Change: The Stern Review' [2006] Cambridge University Press
[40] Ibid.
[41] Abhijit Vinayak Banerjee and Esther Duflo, *Good Economics For Hard Times* (Penguin Books 2020), 215
Daron Acemoglu and others, 'The Environment And Directed Technical Change' (2012) 131-166, 102 American Economic Review
D. Acemoglu and J. Linn, 'Market Size In Innovation: Theory And Evidence From The Pharmaceutical Industry' (2004) 1049-1090, 119 The Quarterly Journal of Economics

renewable energy producers were primarily backed by intense governmental subsidies to make the investment profitable in the long term. The subventions are granted in various forms, such as financial support of the up-front investment and guaranteed fixed sales price for a considerable period. The fixed sales price guarantee, however, is only applicable to businesses, not households. The prior are [usually] supported in the initial investment, as the primary goal is to produce energy that would satisfy the daily consumption. Besides, households can't store the electricity without considerable expenses. Namely, batteries that can store the power exist, but the small capacity and high price prevent their massive application. Hence, households have not much choice but to sell the excess of the energy generated from their renewables. At this stage, things starting to become complicated. Namely, the electricity can't simply be added to the grid, as it would distort the balance of the prior. Each distortion of the balance adds to the balancing and utilization cost of the power grid. Therefore, renewables owners are [usually] required to pay specific fees as a charge for the grid's balancing cost. The charges are typically paid to the company that is handling the power grid.[42]

Australia, for instance, didn't charge such a fee for a long time. Once it was announced that an additional fee for exporting electricity in the grid would start to apply, the solar panel owners backfired, arguing that they will disconnect the panels and cease using those in the future.[43] The argument invoked by the welfare group and transmission companies before the Australian Energy Markets Commission were numerous.

One of the views was that in the absence of fees for the owners of solar panels, households that don't possess solar panels could be unfairly burdened with the cost of augmenting the power network to cope with the rise of new panels.

Furthermore, those groups argued that the growing cost is already placing a strain on the grid in the territories where heavy solar panel penetration is applied.[44]

On the other hand, the power network company argued that the State's grid capacity might reach its limit to support solar panel owners, which causes actual customers to see their inverters turning off at some point due to voltage rising in the network. Besides, the concerns were rising that zero limits on new solar panel owners shall be imposed. The grid can accept

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[42] 'Electricity: Renewables And Smart Grids' (2010) DAF/COMP (2010) 13, 10 OECD Policy Roundtables

[43] Nick Harmsen, 'Should Solar Panel Owners Pay For The Privilege Of Selling Their Power?' (*www.abc.net.au*, 2020) <https://www.abc.net.au/news/2020-07-16/rooftop-solar-owners-could-be-charged-to-sell-energy-to-the-grid/12461748> accessed 21 December 2020

[44] Ibid.

the new customers; however, the latter wouldn't be able to export electricity at all. The novel, annual cost for the solar panel owners, was estimated between 10-30 AUD$.[45]

Summing-up the precedent, it is conceivable to conclude that the investors in renewable energy sources may easily be relented from their decision, even with a small rise in the cost for export of their product, being the electricity. The reasons may vary; those are probably associated with the household's expectations when the initial investment choice was made or with the frustration that they shall pay to export something that belongs to them. Regardless of the reasons, any additional cost may dissuade potential investors from pursuing renewable energy investments.

What if the lawyers and technologists can help in tackling this dilemma? What if an SC can be created to enable the owners of renewable energy to trade the electricity between themselves or sell the electricity to households that don't possess renewable energy sources? The P2P energy trading may [potentially] solve numerous conundrums associated with surplus [and shortfalls] in the energy stemming from renewables. The solution is not simple at all, and it would undoubtedly require in-depth analyses, regulatory sandboxes, and innovations to be built. However, it is for sure worth trying. Although the equation seems challenging, it may be solvable, and the solution may be compelling for wide application. Further analysis of the potential ways forward in this regard will be provided in the subsequent chapters of this thesis.

Apparently, future growth can be [more] sustainable; however, it won't happen by accident. A lot of ideas, hard work, innovation, and habits change will be needed to reach the desired goals.

Besides, significant investments are indispensable by the public and private sectors, and especially citizens. Unfortunately, not everybody has the [same] economic power to finance the purchasing cost. Also, the preferences and priorities vary; therefore, even businesses and people powerful enough to purchase less harmful products for the environment may opt for other priorities they consider more important than preventing climate change.

Governments worldwide have a robust instrument for re-directing the wealth, called redistribution. The redistribution is primarily exercised through taxation and transfers (allowances, subsidies, etc.). Nonetheless, inequality is on the rise, notably in the last couple of decades. According to the Organization for Economic Cooperation and Development (OECD), the 2007-2008 economic crisis has contributed to an increase in income inequality to

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[45] Ibid.

historically high levels throughout numerous OECD countries. Income inequality may lead to poor material conditions, slow the human capital formation, and access to opportunities for persons at the lower level of the income scale. Besides, it may cause distrust in the governments, as those with lower incomes would doubt the public authorities' capacities to enact policies that favor many over the few. A standard measure of inequality representing the population's income distribution within a given country is the Gini coefficient. It takes the value of zero when all households have identical income and one when one family has all the income. In 2016, on average, income inequality before taxes reached 0.47 in OECD countries and declined to an average of 0.32 after government intervention.[46]

Historical analysis of inequalities can also teach us a valuable lesson. In 1928, in the US, the wealthiest one percent captured 24 percent of the income. In 1979 that figure tripled. In 2017, the ratio went back, where it was in 1929. The increase in income inequality was followed by the rise in wealth inequality, being the fortune people have accumulated over the years. The top one percent of the US richest captured 39 percent of the wealth in 2014, compared with 1980 when that percentage was only 22.[47]

In continental Europe, the pattern is strikingly divergent. Before 1920, the top income shares in France, Germany, Switzerland, Sweden, the Netherlands, or Denmark didn't differ significantly compared with the US. However, in the years following 1920, inequality decreased in all of the above countries and remained low, unlike the US.[48]

The above data clearly show that redistribution policies are not [necessarily] effective and don't always deliver the desired outcomes. Economists and taxation experts are debating pre-distribution, a mechanism that may function opposite from the redistribution. In general terms, pre-distribution may be defined as a set of policies that may affect pretax income distribution. The redistribution includes an extensive collection of policies and institutions, including the education system (e.g., inequalities in educations expenses amongst various social groups), labor market regulations (e.g., minimum wage and different regulations for bargaining powers of employees), and other policies affecting the distribution of primary assets and capabilities

[46] 'Redistribution Of Income And Wealth | Government At A Glance 2019 | OECD Ilibrary' (*www.oecd-ilibrary.org*, 2020) <https://www.oecd-ilibrary.org/sites/79321fa3-en/index.html?itemId=/content/component/79321fa3-en> accessed 21 December 2020
[47] Abhijit Vinayak Banerjee and Esther Duflo, *Good Economics For Hard Times* (Penguin Books 2020), 238
Facundo Alvaredo and others, 'World Inequality Report Executive Summary' [2018] World Inequality Lab.
[48] Abhijit Vinayak Banerjee and Esther Duflo, *Good Economics For Hard Times* (Penguin Books 2020), 238
Thomas Piketty, Emmanuel Saez and Stefanie Stantcheva, 'Optimal Taxation Of Top Labor Incomes: A Tale Of Three Elasticities' (2014) 6 American Economic Journal: Economic Policy

(e.g., healthcare system, wealth and inheritance inequality, etc.). The taxation system influences pretax income as (i) tax incomes are necessary to finance publicly funded education, (ii) taxation may lead to a behavioral response, affecting labor and capital incomes, (iii) progressive taxation of income and wealth may also affect the creation of top-end compensation packages and wealth inequality.[49]

Income and wealth inequality were widely discussed and highlighted at the United Nations Principles for Sustainable Development (UN PRI) conference, the Global Impact Investing Network (GIIN) forum, and the World Economic Forum's annual meetings. The United Nations Sustainable Development Goals (SDGs) discuss the issue in the light of objectives involving poverty, economic growth, and inequality. Investors are becoming increasingly aware that economic inequality is a systemic risk that may [potentially] destabilize markets.[50]

Notwithstanding the growing concerns among Environment, Social and Governance (ESG) investors over the compensation ratios between average and executive staff and their contribution to income inequality, the fund managers' compensation wasn't on the stakeholders' radar. Nonetheless, the impact of fund managers' compensation may be tremendous.

Private equity firm usually charges two percent management fee, and [typically] collects 20 percent of profits from portfolio companies, commonly known as carried interest. Such compensation structure will bring more immense benefits to the fund manager than the portfolio companies' wealth attributable to workers or beneficiaries. The prior adds to wealth inequality rather than reducing it. Under the above, many concerns associated with wealth inequality arise. Most notably: (i) wouldn't it be better to share the wealth upfront, i.e., at the start of the financial cycle, by better remuneration for employees; (ii) would it work better if we try to reward the local communities for their share in the profits upfront, without reliance on redistribution through taxation, philanthropy, donations to the public sector, etc.[51]

Maybe, it is about time to consider new methods and systems to decrease income and wealth inequality. The above proposals are just a few, out of many, that may help assess the future of income and wealth distribution amongst various stakeholders. However, those proposals are

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[49] Antoine Bozio and others, 'Predistribution Vs. Redistribution: Evidence From France And The U.S.' (2018) 2020/22 World Inequality Lab

[50] Delilah Rotenberg, 'Investors Worried About Wealth Inequality Should Focus On Fund Manager Compensation (SSIR)' (*www.ssir.org*, 2019) <https://ssir.org/articles/entry/investors_worried_about_wealth_inequality_should_focus_on_fund_manager_compensation#> accessed 23 December 2020

[51] Ibid.

not perfect, neither final, as they need to pass the reality check by pilot projects and measurement of effects. Undoubtedly, those are worth the efforts. Again, law and technology may be of immense help in developing solutions.

For instance, an SC can be created to execute the payment towards workers once the profit and employee share in the prior are determined. Given the fact that most of the corporations have developed Key Performance Indicators (KPI), it seems conceivable to match those with SC, in addition to a lump sum for each employee, and disburse the funds to staff's bank accounts, or grant them stock options. A similar approach may work for local communities. Namely, an SC can be built to disburse funds to municipalities' accounts once the companies' profits are posted. Funds would be allocated to boroughs' where the firms are operating, and the criteria for participation in the profits would be set upfront, therefore, embedded into the SC. Such a solution may help manage the taxpayers' money and reduce the inequalities in both income and wealth.

Despite [p]redistribution, there are other interesting proposals underway for using cryptocurrencies, which, as already emphasized, are built on blockchain technology and SC, to fight inequality. The most recent proposition came from Brian Brooks, a top US banking regulator. In Mr. Brook's opinion, the wealth gap between developing and developed countries can be closed by deploying the concept of "country coin." The main idea behind the plan is to promote education and economic growth worldwide. The prevailing economists' opinion is that a higher literacy rate adds to GDP growth. Hence, incentivizing citizens to prolonged education would yield better productivity, personal well-being, and social prosperity.[52]

Numerous researches suggest the co-relatedness between the education level and GDP and individual well-being; however, the practical implementation lags. The nature of Mr. Brook's proposal and the enforcement mechanism is what makes the idea exceptional. Namely, the proposition invokes cryptocurrency tokens, which shall be distributed by the governments worldwide as a reward for citizens for their continued studying. The tokens have a specific name - "country coin." A student may earn the prior following the completion of an exam or passing online courses and tests. Such coins would essentially represent a share on a "trust fund" funded by the State. The coins are supposed to entitle their holder with a percentage of the higher GDP's rising tax revenue. Consequently, everyone should benefit, not only persons

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[52] Robert Hackett, 'Bank Chief Proposes Far-Out Crypto Idea 'That Should Be Next Nobel Prize' – Fortune' (*www.fortune.com*, 2020) <https://fortune.com/2020/12/15/crypto-country-coin-brian-brooks-comptroller-of-currency-learning-student-incentives/amp/> accessed 23 December 2020

who managed to get well-paid jobs once they completed their studies. Furthermore, the coins would be distributed to all students, regardless of their chosen field of study. That would erase discrimination amongst professions and dissimilar salaries professionals earn on the market.[53]

Undoubtedly, the proposal described above may change the income and wealth distribution system as we know it and pave the way for a more equitable distribution of wealth by granting all participants an equal chance to excel in their skills and participation in creating the GDP.

Besides, SC may be applied in numerous areas, contribute to enormous savings by cost-cutting, increase efficiency, and help the contract participants better understand their rights and obligations and benefits and consequences. An attempt to examine the SC's potential application in various commercial areas and solve [some of] the above challenges will be made in the next chapter.

7 Application of Smart Contracts - Good Use Case?

SC can be applied in various fields. However, their wide adoption will depend on the cost, which shall be significantly lower than the benefits the adoption brings. Therefore, corporations and governments would accept SC's adoption only if they see a great business case in it. By applying the economy of scale logic, it is conceivable to conclude that SC would generate more significant benefits in the complex contracting segment than everyday transactions.

On the other hand, creating an SC for complex transactions (e.g., electricity trading, large infrastructure projects, etc.) would be much costlier than simple and straightforward transactions (e.g., online sale of insurance policy, online sale of a book, etc.). However, benefits are always quantifiable, and, like any other investment, the adoption of SC would depend on the payback period and long-term gains for the investor.

One potential application of SC is in the insurance business, especially in the enforcement of insurance policies. An illustrative example may be the compensation that travelers are entitled to receive by airlines due to flight delays or cancelation. Most of the airlines are hedging this risk by insurance policies. The insurer shall pay the travelers' compensation if an insured event, being flight delays or cancelation, arose. For instance, the EU has strict rules on the above issue, enshrined in the Regulation (EC) No 261/2004.[54] Under that Regulation, airlines

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[53] Ibid.

[54] Regulation (EC) No 261/2004 of the European Parliament and of the Council of 11 February 2004 establishing common rules on compensation and assistance to passengers in the event of denied boarding and of cancellation or long delay of flights, and repealing Regulation (EEC) No 295/91 2004

registered within the EU are obligated to compensate their clients when a delay of more than two hours occurs, or when a flight is canceled for reasons that cannot be attributed to force majeure. In the current circumstances, if an insured event arises, the ticket owner shall file for compensation before the airline; the latter shall evaluate the motion and reply in due course for the admissibility and eligibility of the prior. Should the airline reject the request, the traveler shall initiate court proceedings to enforce its rights stemming from the above EU Regulation. Besides, there are numerous [specialized] mediators between the ticket holder and the airlines, providing various services for their clients, being the travelers whose flights are delayed or canceled. Those services mainly refer to initial evaluation of eligibility, legal advice in [eventual] court proceedings, etc. The mediators are charging significant fees for their services, thus decreasing the traveler's benefits, and as the case may be, increasing the costs for airlines.[55]

Deploying an SC may be a game-changer in the above case. Namely, the SC can be set to gather the data from the delayed or canceled flights, personal details for the passengers, and delay periods, and match those data against the Regulation. Hence, the SC will conclude if the travelers are eligible for compensation and transfer the funds to their respective bank accounts. Consequently, the necessity for filing a motion by the ticket owner would be eliminated, as well as the mediators. Nonetheless, a dispute may arise if, for instance, there is a bug in SC's code or if the SC has made some omissions due to errors in data entries.

However, such disputes wouldn't be so frequent, especially after SC is feed with indispensable data, and the AI systems develop certain algorithmic logic. In conclusion, SC would reduce the costs for both airlines and passengers and eliminate mediators' need, thus adding efficiency and accuracy. In this particular situation, the good use case is clear, as real problems are solved, and the results would [probably] be tangible. The solution requires further fine-tuning, especially for sensitive areas, such as personal data processing, automation of payments, etc. Still, as advantages outweigh disadvantages, efforts are cost-effective.

The above example is relatively mild. Yet, many other areas where SC can be implemented are much more complex and involve numerous stakeholders; that makes the work much more complicated and uncertain in terms of the [final] result. As already mentioned in chapter six of this thesis, electricity trading is one potential field where SC can be deployed. Its potential application may bring the cost down, increase efficiency, and yield a better return on

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[55] 'Airhelp'S Win-Win Service Fee' (*www.airhelp.com*, 2020) <https://www.airhelp.com/en-int/price-list/> accessed 23 December 2020

investments, especially for households investing in renewable energy sources, such as solar and wind power plants.

The idea for P2P electricity trading is currently under development, and numerous organizations worldwide are experimenting with bringing innovation to the market. According to the International Renewable Energy Agency (IRENA), P2P electricity trading would empower prosumers[56] and consumers, leading to increased renewable energy deployment and flexibility in the grid. Besides, P2P platforms aid in balancing and congestion management and providing ancillary services. The key enabling factors for P2P electricity trading are: (i) distributed renewable energy resources, (ii) digitalization, (iii) conducive regulatory framework. The P2P model forms an online marketplace where prosumers and consumers can trade electricity without an intermediary, by price agreed between the prior.[57]

The P2P electricity trading is a platform where market participants, being buyers and sellers, meet to transact. The membership on the platform is provided by paying a certain monthly subscription fee. Hence, the suppliers, being homeowners with renewable energy sources, would seek the highest possible price, considering their profit and cost. On the other hand, consumers would search for the lowest price, evaluating their needs and preferences. Currently, the common practice is that consumers purchase electricity from utilities or retailers under fixed tariffs or time-of-use-tariffs.

In contrast, prosumers sell excessive electricity back to the grid at a buy-back-rate. Consumer tariffs are much higher than the buy-back rates that prosumers can obtain from selling electricity back in the grid. The extra costs that are usually charged, e.g., the balancing cost for the grid, further reduce prosumers' benefits. Besides, the consumer tariffs don't account for the various gains that the renewable generators bring to the grid. For instance, a prosumer can charge its Electric Vehicle (EV) from the solar power plant on its house, whereas its neighbor that doesn't possess a renewable energy source would obtain the electricity for charging the EV from a distant centralized power plant. However, if the neighbor's EV can be charged from the solar panel's generated electricity, the prosumer would receive a buy-back rate for the electricity injected in the grid. The above example doesn't account for reducing transmission losses and congestion that the distributed generation provides for the network. Bearing in mind

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[56] The term "Prosumer" is to be understood as entity that produces and consumes certain product, being electricity in this particular case.
[57] 'Innovation Landscape Brief: Peer-To-Peer Electricity Trading' [2020] 3, International Renewable Energy Agency (IRENA)

that around 41,1 percent of a typical electricity cost stems from managing and maintaining the poles and wires that deliver generators' power to final consumers, the P2P electricity trading becomes even more exciting and conducive.[58]

The creation of an SC for P2P electricity trading is both conceivable and desirable. As already emphasized, the current electricity trading system is centralized and highly regulated. Also, it involves numerous stakeholders and mediators, which add to the final price paid by the consumers. In contrast, households that invested in renewables cannot sell their extra power directly to interested parties. Hence, the owners of renewables are coerced to sell the electricity back in the grid under strict rules, depriving them of the opportunity to benefit from their product, electricity, on a larger scale.

Electricity can be considered as a good or product, in a broad sense of the word. However, it is not tangible neither visible. Hence, it cannot be traded as other products with physical characteristics and handed over from one owner to another. Still, electricity is tradeable. Namely, power consumption and production are both measurable. Hence, the prosumer's electricity production and consumption can be measured as well as the consumer's expenditure. As the data for production and consumption are Sourceable, the SC can be set. There are many variances for creating an SC that can help in P2P electricity trading, and it is mainly dependent on the regulations and desires of prosumers and consumers. One possible example is that a local community sets specific terms and conditions for P2P electricity trading, which would be publicly disclosed, and accepted upon joining the platform.

The rules would regulate the basics for electricity trading, the price formation, and rights and obligations for the participants. The SC can then be set to match the household that generates a surplus of electricity and the house-owner that needs electricity at a particular moment. Furthermore, the SC can match both parties' price desires and execute the agreement once all the criteria are matched. Undoubtedly, a mini-grid shall be created, so all the participants from a particular neighborhood can participate and share their data on production and consumption. The SC can also charge the buyer's account and credit the sellers' account for the traded electricity. Even more, the SC can be set to keep the funds on behalf of individual participants, which in turn would be used for a specific purpose, e.g., investments in the local community's needs. An SC can also function as an escrow agent that would hold the funds to a particular account until the necessary pre-conditions are met. For instance, SC can keep a particular

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58 Ibid., 6-7

amount of cash stemming from P2P electricity sales on behalf of the prosumer, which would later be used to pay the prosumer's electricity bill, should the prior need extra power from the grid.

Despite the possibilities described above, SC can be built for P2P electricity trading between local communities. Suppose that there are numerous mini-grids in a city. Those networks generate a various amount of electricity during the day, and their consumption is also dissimilar. Hence, the surplus of electricity generated into one mini-grid can be transferred, i.e., sold to another mini-grid, preferably, in the closest neighborhood. By selling the extra power to the nearest grid, numerous costs would be saved, such as balancing and transportation, as well as congestion costs. Besides, efforts for balancing wouldn't exist, as the export and import would be made simultaneously. Payments may also be automated in this case, as the clearance would be made on a gross-basis between communities' accounts, which would then be disbursed to the owners of renewables, pro-rata, or per the power, they exported in the grid. Another possibility is that the funds be used for investing in the neighborhood's needs. Again, the benefits for the households possessing renewables and local communities are unquestionable. They can use the extra power, gain profits, increase sales price, and reduce export costs in the grid.

Finally, the deployment of AI in creating an SC for electricity trading may deliver excellent results. Namely, the AI software can help predict the electricity generation by solar panels by assuming the aggregate of the sunny days, based on the weather forecast data from previous years. The AI can therefore be deployed to understand the consumption habits of various households, and based on the historical data, to predict the average expenditure; then try to assume the quantity of the power necessary to cover all households' needs in the mini-grid. Hence, say that the AI system predicts that there will be a shortfall of power in the grid in some particular period. The prior may inform the other [neighboring] network and ask the latter if, [under its prognosis], it is expected to have an excess of electricity in the same period. If the answer to the previous question is positive, the AI system would book the [predicted] surplus of electricity and purchase it once it is available. Under an assumption that the AI's performance will be accurate, the utilization of the power produced and the grid would be significantly improved.

The above solutions require many pre-conditions to be implemented in practice, such as regulatory sandboxes to enable mini-grids' formation, arrangements with the grid operators,

setting the balancing rules, drafting of terms and conditions' legal text, etc. At first glance, there is no reason for delaying applying an SC in the electricity trading field, as the benefits would be infinite.

However, practical deployment may have other risks and challenges, which cannot be seen at the outset. But that's the case with every innovation. Those struggles may undoubtedly be overcome by an innovative approach and the development of new regulations that would be both flexible and prosumer, and consumer-friendly.

SC can also be useful for managing large infrastructure projects. Although creating an SC that would execute the terms of various complex agreements governing the relations of the parties in an infrastructure project would be a great challenge, there is no doubt that it can yield a good return and prevent risk materialization.

Governments usually fund infrastructure projects, and the suppliers are chosen through public tenders. The latter usually consists of numerous and complex conditions that the vendor shall satisfy to win the tender. Once the bidding process is completed, an agreement is concluded between the respective government agency and the best-ranked company in the bidding process. Those contracts contain complex clauses, terms and conditions, and obligations for the supplier to provide performance bank guarantees. Payments are made in installments, which are conditioned with completing certain stages of the project. The project phases' completion shall be confirmed by an independent third party hired by the governmental body.

SC can be of great use in managing the complex infrastructure building process. It would eliminate potential risks for the participants, such as failing to execute the payment in due course or missing the deadline for activation of the performance bank guarantee. For instance, SC can perform the payment once the independent third party supervising the vendors' activities on-site confirms that the supplier has completed a project phase. Besides, the SC can also penalize the defaulting party for failure to perform under the agreed terms, e.g., for not completing the stage in the agreed time. In the latter case, the SC can charge the vendors' bank account, transfer the funds to the counterparty, or calculate the penalties under a set upfront formula and offset the amount with the following payment.

Furthermore, if the vendor has provided a performance bank guarantee, the SC can activate it automatically once the pre-conditions are met. Namely, the SC can send an activation letter to the Bank that has issued the performance guarantee once the independent third party has confirmed that an event that triggers the activation has occurred. Finally, the SC can generate

useful information and charts for various suppliers and grade the prior by their actual performance in the projects.

Such information can be beneficial for the bidding processes, as it would measure the vendors' capacity to fulfill the obligations undertaken under the agreement.

As emphasized in the prior paragraphs, SC can be applied in numerous fields and deliver tangible results. That makes SC worth additional research, investments, and deployment. However, creating an SC involves technological skills, coding, machine learning, AI, etc., as well as legal skills, indispensable to instruct the technologist in writing the code or setting the algorithms. Hence, Lawyers certainly have a role to play in SC development and practical application. Furthermore, SC is not a silver bullet, neither a perfect solution for all challenges, as it has numerous shortfalls that shall be improved by further research. The SC weaknesses, and the potential involvement of legal professionals in SC creation and implementation, will be discussed in this thesis's next chapters.

8 Potential and Inherent Limitations of Smart Contracts

There is no doubt that SC can revolutionize contracting and help numerous businesses transform their procurement and sales processes through digitalization. Furthermore, SC can also help tackle sustainability issues, as described in the preceding chapter of this thesis. However, SC also has some limitations that prevent their widespread adoption at present.

For instance, SC [frequently] relies on off-chain resources to execute the code's embedded transactions. One of the numerous examples is an insurance policy in agriculture that involves an insured event associated with a certain degree of temperatures. Namely, an insurance company may issue an insurance policy stating that the prior will pay the farmer a certain amount of money, only if the temperatures are above 30° C in twelve months-period. If an SC is created on a blockchain, with the purpose of automation of payment if an event triggers the pre-conditions described in the insurance policy, the prior shall transfer the funds to the farmers' account immediately after the temperature exceed the above threshold. The main problem in this situation would be - how SC knows that the temperature has exceeded the threshold, i.e., that the triggering event has occurred? First, SC cannot pull data from off-chain resources. Hence, the data shall be entered into the SC. Second, suppose the data at issue are continually changing and that the code is replicated across multiple network nodes. In that case, various nodes may receive different information, even in very short time-sequences. In the above case,

the first node may retrieve information that the temperature is 29,9° C, whereas the second node may receive notification that the weather is actually 30°C. Assuming that the blockchain requires consensus across the nodes to validate a transaction, such variances may cause the condition to be deemed not satisfied. The solution may be found by hiring a so-called "oracle." The prior are trusted third parties supposed to receive off-chain information and insert it in the blockchain at a predetermined time. Although the solution seems simple and compelling, the fact remains that another party must be added to the process. Such a burden would somewhat diminish the decentralization benefits of SC. Besides, it encompasses various other risks, such as a system flaw experienced by the oracle, making the prior incapable of entering the blockchain's information, providing inaccurate data, or closing down the business.[59]

A key component of SC is its capability to execute the transactions automatically and relentlessly without human intervention involvement. Ironically, that characteristic, being the immutability and lack of opportunity for amending or termination, unless the parties have incorporated those capabilities, represents one of the most significant hurdles for widespread SC adoption. For instance, with a traditional contract, a party can easily opt to justify a breach by its counterpart by simply not enforcing the penalties, although the pre-conditions are fulfilled. If an important client is late with the payment for thirty days, the supplier may choose not to ask for a late fee, as the maintenance of a long-term business relationship may be found to be far more important than collecting a fee for the delays. However, if an SC is deployed on a blockchain and is programmed to automatically collect the fees or offset those against the next payment, it would be impossible to prevent the enforcement of penalties. Hence, SC's automated nature may be quite the opposite of how businesses operate worldwide. Likewise, in a paper-based contract, a party may decide to accept, as the case may be, partial performance as full performance. The reasons for the above may be multiple, such as long-term interest prevailing over the appeal stemming from the contract; partial performance may be more acceptable than no performance at all, etc. Undoubtedly, there are arguments in favor of SC's automated nature that may be invoked against the above reasoning. Those include, but are not limited to (i) prevention of discrimination and arbitrary decisions by Managers vis-à-vis clients;

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[59] Stuart D. Levi and Alex B. Lipton, 'An Introduction To Smart Contracts And Their Potential And Inherent Limitations' (*Harvard Law School Forum on Corporate Governance*, 2018) <https://corpgov.law.harvard.edu/2018/05/26/an-introduction-to-smart-contracts-and-their-potential-and-inherent-limitations/> accessed 24 December 2020

(ii) privileges may be granted in the later cooperation, should the non-defaulting party so decide, etc. However, it is also true that SC shall be improved to reflect business reality.[60]

Another benefit touted with the SC is the payment automation, meaning that those can automatically transfer funds between accounts, thus reducing collection costs and saving time for contractual parties. The prior is undoubtedly correct in more straightforward cases but may become less straight in complex commercial transactions.

Namely, companies are continually using their available funds to finance various projects. That said, the cash is not tied to a long-term contract to anticipate future payment demands. Hence, a corporation obtaining a Bank loan will probably not keep the full disbursed amount on a wallet linked to the SC. Instead, the borrower will use the funds on a revolving basis to fund the necessary payments as its liabilities fall due. Therefore, if a party that owes an amount under the SC fails to secure the funds in the wallet, the SC looking to transfer cash from the wallet upon a trigger event occurs may find that there are no requisite funds available. Another solution, such as enabling the SC to pull funds from another wallet or having the wallet fund itself from another source, wouldn't be appropriate if those wallets or fund sources also lack the desired payment amounts.[61]

However, there are potential solutions to the issues, such as (i) SC communicating with the financing Bank, and thus checking the utilization of the funds available from Framework Financing Facility; (ii) SC matching the data for the maturity of the following installment, and availability of funds from the borrowing pool, etc. Yet, those improvements would undoubtedly take time and enormous efforts to be resolved and implemented. One of the greatest challenges is that many stakeholders need to collaborate and share data and enable third parties to access their system software. The prior involves various cyber and data security risks that need to be considered when designing the SC.

Summing-up the precedent, it is quite apparent that SC is not the perfect solution, whose deployment will immediately solve the current challenges and make contracting easier and acceptable for the parties involved. Still, it is an innovative solution, worth giving a chance to revolutionize contracting and increase efficiency overall.

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[60] Ibid.
[61] Ibid.

9 Lawyers- Innovation Supporters or Opponents?

Legal Technology, or "Legal Tech," is a term that refers to the adoption of innovative technology and software to streamline and enhance legal services. Legal Tech companies are mainly startups founded with the particular purpose of disrupting the operation of the [traditionally conservative] legal profession.[62]

In general, three categories can be distinguished in the Legal Tech: (i) technologies facilitating access and processing of data; (ii) supporting technologies; (iii) substantive law solutions. The first type is the most common and consists of "enabling technologies," e.g., Cloud storage and cybersecurity, aiming to facilitate access to lawyers and legal data. The above category's primary goal is to support legal market competitiveness and research in the legal field. The second technology entails support process tools, aiming at more efficient case management and back-office systems to maximize a law firm's administration's potential. This category's processes vary, from human resources management to pure accounting, billing, payrolls, and similar administrative tasks. The third stream is substantially different than the first two, as it encompasses technologies that assist or [sometimes] replace legal advice from professional lawyers in performing specific legal tasks. The last category includes numerous subfields such as self-executable contracts, e-discovery, online dispute resolution, legal analytics, blockchain-based technologies, and SC.[63]

According to the Boston Consulting Group and Bucerius Law School's report, law firms must rethink two business models' elements to safeguard their market share and profitability in a market transformed by Legal Tech. First, law firms must rethink their value proposition (including service offering and revenue model). Second, the re-organization of the operating model is indispensable, including cost and organization structure.[64]

Even though digitization of legal data constitutes a megatrend and becomes increasingly crucial for reviewing and interpreting vast amounts of e-mails and legal documents, the number of law

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[62] Marcelo Corrales, Mark Fenwick and Helena Haapio, 'Digital Technologies, Legal Design And The Future Of The Legal Profession', *Legal Tech, Smart Contracts and Blockchain* (1st edn, Springer 2019), 1
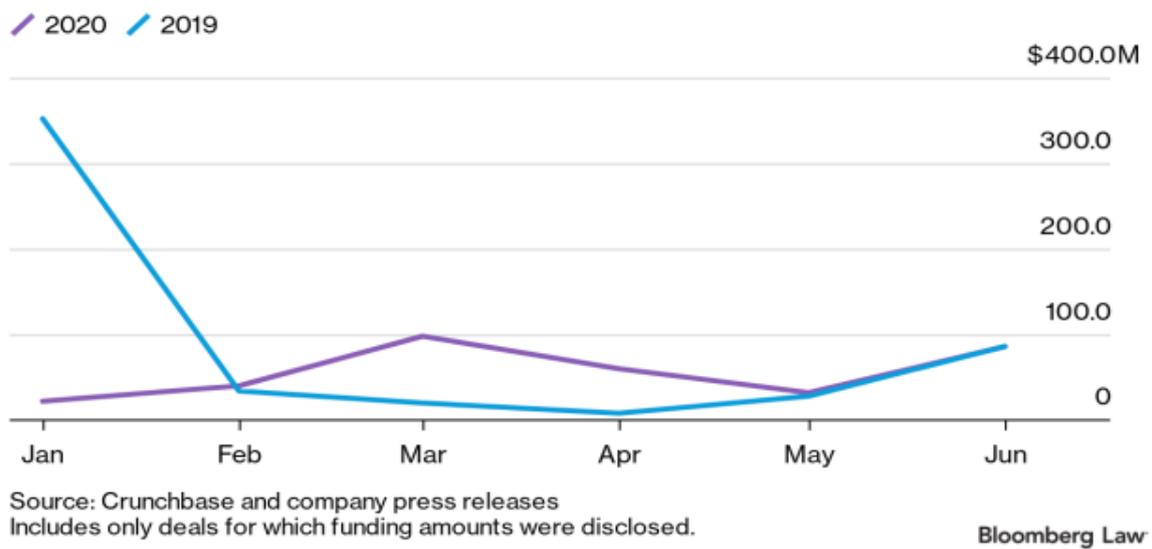[63] Marcelo Corrales, Mark Fenwick and Helena Haapio, 'Digital Technologies, Legal Design And The Future Of The Legal Profession', *Legal Tech, Smart Contracts and Blockchain* (1st edn, Springer 2019), 2
Micha Manuel Bues and Emilio Matthaei, *Legaltech On The Rise: Technology Changes Legal Work Behaviours, But Does Not Replace Its Profession* (Springer International Publishing 2019), 90
<https://www.springerprofessional.de/legaltech-on-the-rise-technology-changes-legal-work-behaviours-b/11239224> accessed 24 December 2020
[64] Christian Veith and others, 'How Legal Technology Will Change The Business Of Law' [2016] 2, Boston Consulting Group and Bucerius Law School

firms embracing new technology is insignificant. At present, many lawyers still use the traditional approach of screening documents manually. The reasons don't go beyond the law firms' business models, based on billable hours and profit-sharing agreements governing partnerships, which provide small or no incentive to invest in legal technologies. Whatever the reasons for resistance to new legal technologies are, the stakes for law firms are high, as the prior may lose corporate clients, or even worse, be entirely replaced by Legal Tech.

The investments in Legal Tech compared with other startups, e.g., FinTech, are still insignificant. The below chart presents the investments in Legal Tech in Q1-Q2 2020 vs. 2019.

Legal Tech Investment, Q1-Q2 2020 vs 2019

Source: Crunchbase and company press releases
Includes only deals for which funding amounts were disclosed.

Bloomberg Law

[65]

Investments in FinTech startups between April-June 2020 saw an increase of 17 percent, measured on a quarter-over-quarter basis, and stood at $9.29 billion, up from $7.947 billion in the first quarter of 2020.[66]

The above figures show the enormous differences in investors' and innovators' interest in Legal Tech compared with FinTech. Although the potential market for FinTech startups is much more

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[65] Meg McEvoy, 'ANALYSIS: Q2 Legal Tech Investment Reached $178 Million' (*www.bloomberglaw.com*, 2020) <https://www.bloomberglaw.com/product/health/document/XD4Q70AO000000?resource_id=c8ba85577e5d02 21f193fad2eac96e61> accessed 24 December 2020

[66] Rubby Hinchliffe, 'Fintech Funding Rebounds In Q2 But Deal Numbers Continue To Fall - Fintech Futures' (*www.fintechfutures.com*, 2020) <https://www.fintechfutures.com/2020/08/fintech-funding-rebounds-in-q2-but-deal-numbers-continue-to-fall/> accessed 24 December 2020

comprehensive than the one for Legal Tech startups, indeed, there is not much interest from law firms and Lawyers in general for applying innovative technology solutions.

According to entrepreneur and venture capitalist Steve Blank, Lawyers lack skills for running innovative companies, and they often hold back such companies. Furthermore, Mr. Blank claims that startups need to have a great lawyer, accountant, patent attorney, etc. But, founders should know how to ask for their advice and when to ignore it.[67]

Although there are pro and contra arguments for the above claim, it is undoubtedly true that some of the critics are backed by practice and individual experiences. Namely, Lawyers are frequently criticized because of over-lawyering, poor listening skills, failure to prioritize issues, creation of avalanche of meaningless information, creation of legal documents that are hard to be understood by non-lawyers, etc. There is no doubt that Lawyers have particular roles, regardless of whether they work in-house in small or large organizations or are engaged in law firms. Namely, Lawyers have to protect the interest of the company, and at the same time, protect the company from breaching the laws and regulations. Ironically, Lawyers sometimes have the awkward task of protecting the company from the MB, or even the Chief Executive Officer (CEO). Hence, when a Lawyer argues that some action can't be taken as it would constitute a breach of law or harm the company interests, in the long run, it is conceivable that it would destroy the CEO's odds of achieving the targets. Indeed, sometimes the organization should better miss a business opportunity than to engage in activity that may cause litigation in the future. Experiences to date show that numerous companies had hard times due to penalties associated with the personal data breach, abuse of dominance, etc. The line between the allowed and non-allowed activities, especially in the above areas, is frequently blurred. It is not always straightforward for a Lawyer to understand the risks and organizations' exposure. These issues constitute serious hurdles for Lawyers to comprehensively and concisely deliver their advice, allowing the corporations to thrive and prevent potential risks that may materialize in the future. Still, there is room for improvement, especially in deploying technology, aiming to understand the processes better and prevent potential disputes and hardships.

10 The Future of the Smart Contracts and the Legal Profession's role

At present, the drafting of contracts is a skill that is mastered by Lawyers. The advances in [legal] technology can make it possible for both contract drafting and contract execution to be

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[67] Steve Blank, 'Why Lawyers Don'T Run Startups' (*www.thinkgrowth.org*, 2018) <https://thinkgrowth.org/why-lawyers-dont-run-startups-25c5e0c877ed> accessed 24 December 2020

made by computers. However, machines have to be feed with data that would enable them to draft and execute contracts. Although we are probably far from a world where the software would create a contract and execute it subsequently, there is no doubt that the reality is changing. Technology will be able to complete numerous tasks that are currently performed by humans. The legal profession is not an exclusion. Technology will resume to disrupt the legal services industry and probably change how law firms and in-house lawyers operate in the future. Indeed, there are numerous technologies in the legal field that may help Lawyers improve their efficiency and accuracy. Still, SC is [probably] amongst the most important, as those aim to prevent disputes and reduce the number of mediators between participants, yielding enormous cost savings and simultaneously contributing to much more important goals, such as sustainability, digitization, and equality.

As far as contracts are concerned, one of the main issues is the Legal Design. The latter is a term for merging forward-looking legal thinking with design thinking. An interdisciplinary and proactive approach is needed for contracts and law to cover legal information and documents and legal services, processes, and systems.[68]

In the context of contracts, the main focus is on supporting collaboration, achieving desirable outcomes, creating opportunities, and preventing problems before they arise. The prior requires contracts that make sense for business and people for whom the arrangements are created. The needs of the contract users are not served the best with the present contracts' legal design. The former CEO of the IACCM, Tim Cummins, has described the current contracts as: "Impenetrable, incomprehensible, confusing and downright boring. These are a few of the words commonly associated with contracts. Whether it is the way they are designed or the way they are worded, the overwhelming majority of contracts merit those descriptions".[69]

The legal design aims at applying human-centered design to both prevention and resolving legal problems. The prior prioritizes the laws' users' standpoints, being business and citizens, not only pure traditional stakeholders, like Lawyers and judges. The approach is fundamental in terms of SC, as builders' and users' desired choices can greatly impact the processes,

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[68] Marcelo Corrales, Mark Fenwick and Helena Haapio, 'Digital Technologies, Legal Design And The Future Of The Legal Profession', *Legal Tech, Smart Contracts and Blockchain* (1st edn, Springer 2019), 6
[69] Marcelo Corrales, Mark Fenwick and Helena Haapio, 'Digital Technologies, Legal Design And The Future Of The Legal Profession', *Legal Tech, Smart Contracts and Blockchain* (1st edn, Springer 2019), 7
Rob Waller, Helena Haapio and Stefania Passera, 'Contract Simplification: The Why And The How' (*www.journal.iaccm.com*, 2017) <https://journal.iaccm.com/contracting-excellence-journal/contract-simplification-the-why-and-the-how> accessed 24 December 2020

systems, and outputs. Legal designers can open broad perspectives to SC planning and creating by tackling issues such as: (i) how can good SC be made? (ii) how can user-friendly systems and interfaces be built? (iii) how can stakeholders be sure that SC captures the parties' intent? (iv) how can Legal Tech be successfully implemented? (v) how can the current paper-based contracts be transformed in SC? (vi) how can powerful interface tools that empower individuals to make the best choices for them at the SC making and planning stage be built?[70]

When non-lawyers engage in initiating a contract preparation or translation of some contract obligations into action, the prior need to be aware of their roles and responsibilities and what and when they are supposed to perform. Interfaces that are easy to use and information that is easily understandable for non-lawyers can be priceless in preventing confusion and court cases. Legal information design entails organizing and displaying information in a manner that maximizes its clarity and understandability. It is focused on the users' necessities who need to understand both the big picture and the details and switch between the prior two views. Legal design is, therefore, focused on visualization. Visualizing helps people think more clearly, communicate, make assumptions visible, and assure understanding across various disciplines. In SC's case, visualization can help create functional, useful, and usable processes, systems, and outcomes. Furthermore, it can help Lawyers, technologists, and business people understand the big picture and communicate and share potential solutions.[71]

The next generation of contracts, where SC undoubtedly belongs, should alter the approach and perception by changing the legally perfect contracts designed to win the potential litigation into usable contracts that facilitate and guide the desired action and help implement the agreed terms between the parties. Besides, instead of the current approach of contracts' risk-allocation function, SC shall add value in the process, thus enabling the business to succeed and prevent problems and disputes. Finally, instead of the current, [exclusively] paper-based contracts, SC shall include text, code, visuals, even audio and video, or hybrids, upon users' desires.[72]

As underlined in the prior paragraphs, it is quite likely that an interdisciplinary approach will be essential in enabling the law to play a more proactive role than the traditional, reactive one, i.e., as a conflict-solving mechanism when things have already gone wrong. Numerous technological advancements can revert the conventional approach and transform the law into a

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[70] Marcelo Corrales, Mark Fenwick and Helena Haapio, 'Digital Technologies, Legal Design And The Future Of The Legal Profession', *Legal Tech, Smart Contracts and Blockchain* (1st edn, Springer 2019), 7
[71] Ibid.
[72] Ibid., 9

system aiming to prevent problems rather than curing them. Recent developments in AI can provide support in various legal areas, especially in SC's sphere. The new digital era involves, amongst other things, cognitive computing, based on data mining that could evolve into self-learning algorithms.[73]

Nonetheless, technology isn't created for the sake of technology. Apparently, it doesn't make sense to build advanced robots and machines, except if they don't serve humans to achieve some goal. For instance, legal persons weren't created for the law and the legal systems themselves; those were instead invented to help people organize their business and structure their partnerships in a conducive form. The rise of legal persons, especially the joint-stock company, has contributed to various advancements, from which humanity has benefited. Therefore, the rise of advanced technologies, such as AI, machine learning, Cloud computing, cognitive computing, etc., will also help people accomplish their desires, not the other way around.

In light of the above, SC shall not be created to replace the paper-based contracts, just because the prior may seem obsolete in the new digital era. Instead, SC shall have the human-centered approach, aiming to help people realize their goals, thus increasing efficiency and making contracts work for everyone.

Lawyers have an essential role in the new digital era. The legal profession should kick-start its reversal towards transforming societies and economies, where digitization and sustainable development will [hopefully] be the main drivers. Staying passive while the AI-based community emerges without human intervention and legal steering may expose individuals and organizations to serious risk. At the current stage, there are many more questions for the legal profession's role in SC's development to be asked rather than answered. Whatever the Lawyers' perception is, there is no doubt they can help develop more human-centered AI, and in that context, more workable SC. However, a paradigm shift will be crucial for the years to come. The challenges will mount, and the innovations will undoubtedly improve numerous processes, changing people's perception in various areas, including law.

Looking backward, one may think about people's understanding of a phone thirty years ago. It was a massive device hanging on the wall, which can only serve at home or in the office. Innovation made it possible to change that perspicacity, as nowadays, the phone's notion is

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[73] Cecilia Magnusson Sjöberg, 'Legal Automation: AI And Law Revisited', *Legal Tech, Smart Contracts and Blockchain* (1st edn, Springer 2019), 173

usually associated with a cell phone or smartphone. The latter is not assumed as a device from which only calls can be made; it is rather expected to perform numerous other tasks, such as digital payments, handling of e-mails, keeping records for multiple data, etc. Likewise, the contemporary perception for a contract, as a long-pages legal document, written in a plain legalese language, which only professional Lawyers understand, can and [probably] will change in the future, as the shift towards SC will gain momentum. Bearing in mind the changes experienced in the past decades, it is not unthinkable that the contracts will be written in a code, either supplementing or entirely replacing the current text-based contract. A couple of decades ago, it was not expected that contracts could be concluded in a virtual environment, being the Internet. From today's standpoint, it is quite ordinary to purchase some goods or services online by clicking buttons, where the contract is published on the seller's website, and the buyer shall only agree with the GTC before the orders are placed. It is also not unimaginable that robots having digital identities will transact in the future, gaining various rights and taking commitments.

Summing-up the precedent, there is no question that the changes in contracting and the legal professions' role in the prior will happen. The single concern is the speed of the swerving and its impact on people and organizations.

11 Conclusion

The contract law [and the law in general] has evolved throughout history. Ancient Romans created the basics of contracts' legal rules, which were upgraded continuously, even in the Roman empire. Eventually, the relations established through agreements were given binding effect, and the State was supposed to guarantee its enforcement, should any of the parties failed to perform. That was the crucial moment in history when contracts started to make sense and became a useful tool for people.

Later on, in the medieval ages, when the trade started to the upswing, new rules were imposed to tackle the new reality and business requisites. The emergence of maritime transportation and big ports contributed to raising commercial law, and various certificates were used to prove ownership over products. For instance, a document evidencing the quantity and quality of the goods in naval transportation was created, aiming at simplifying the transfer of title for the products. Therefore, contracting was simplified to meet the commercial demands and growing trade volumes in goods, the largest tradeable item at the time. Besides, contractual freedom also characterizes the antiquated period, as parties were free to contract whatever they deemed

desirable. For example, employers and employees were not restricted in setting the working hours, salaries, vacations, and various other conditions. The prior was due to the theory that everybody would act reasonably and wouldn't abuse their powers to improve their bargain position. However, that perception proved incorrect in most cases; that caused the next evolution in the contracting rules. The changes were mainly associated with imposing limitations to contractual freedom, especially for the parties whose negotiation position was by far more robust compared with their counterparts. The new laws aimed at decreasing the gap between the contractual parties' powers, thus hindering the more powerful partner from extorting the weaker one.

Nowadays, we have more advanced contracting rules, e.g., e-commerce regulations. Furthermore, there are numerous shields for various categories of persons and legal entities entering into contractual relations. For instance, there are multiple consumers, data protection, competition, cybersecurity regulations, etc.

One may argue that most of those laws constitute a restriction of contractual freedom. However, the values that regulations aim to protect justify the limitations. As an illustration, data protection regulations protect citizens against, among others, BigTech from abusing or selling the data they gain from their users. Although users frequently benefit from free of charge services, it is still not enough to allow companies to distort people's privacy. Consumer protection laws are protecting consumers from retailers and food producers to secure product safety. Even though it is true that shoppers are free to choose from an extensive palette of goods offered to the market, it cannot be invoked as an excuse for the companies if their products are not safe for consumption or if the content is not the same as the labels. The regulations described above represent the evolutionary process, where the change is the unique constant, as the societies' necessities and priorities change, as well as the approaches in coping with challenges.

Nowadays, modern technologies disrupt traditional approaches in various fields and professions, including legal. Like the industrial revolution, there is an information revolution going on, especially in the last couple of decades. The emergence of modern technologies, such as blockchain, AI, etc., is a logical consequence of the evolutionary process, especially the information revolution, gaining momentum as data becomes increasingly important in everyday life and business.

Consequently, the SC's appearance is a novelty that comes with evolving technology and increasing individuals' and businesses' demands. As time goes by and societies worldwide advance, the urgency for improving efficiency is rising proportionally. The prior is a driving force for the change, which is invariable. Therefore, SC shall be understood as a tool for improving efficiency, increasing digitization, and achieving sustainability. It is of utmost importance to use advancements to benefit society, not only certain [privileged] groups. Hence, SC's development and deployment must be structured carefully, considering various necessities and society's long-term goals.

As SC involves law and technology, it is quite apparent that collaboration will be indispensable in further improvement and making SC available for everybody. The cooperation may come in various forms. For instance, universities may start offering [more] joint degrees in law and technology. Law faculties may increase the technology courses, especially in those fields with the best odds to be applied in law, e.g., blockchain, data mining, AI, etc. Although the Lawyers aren't supposed to be technologists, the prior shall learn at least the basics for technology to understand how to apply it in solving legal problems.

Opposing or ignoring the emerging technologies or just staying idle while those penetrate the markets won't prevent future developments; they will happen, regardless of what the legal profession decides, i.e., to take an active approach or the opposite. Furthermore, Lawyers should embrace new technology, figure out the best possible solution for its wide application, and participate in resolving society's most essential issues. In general, [even in the ancient period] the legal systems and the law were created to bring justice and [legal] certainty to the community. Although capable of performing some of the lawyers' tasks, the new technologies aren't a threat to the legal profession but a tool to make things work better. Hence, the sooner Lawyers start to accommodate the new reality and find the way forward for using technological advancements, the better it would be for the legal profession and other stakeholders.

Even though SC was [mostly] popularized with the rise of cryptocurrencies, there is no doubt that the prior can be applied in numerous other areas, such as commercial contracting, P2P electricity trading, real estate transfer, pre-distribution of income, etc. The technology used to create SC, being the blockchain, significantly improves various processes through its immutability and decentralization, which in turn renders numerous mediators unnecessary. There is no doubt that SC is yet a "prototype"; therefore, it shall be better understood and further improved before its adoption. It is also unquestionably that SC is a novelty that can

reshape current contracting processes and the legal professions' role in the prior. As Stanford University computer scientists, and founder of the Institute for the Future, Roy Amara put it: "we tend to overestimate the short-term impact of a new technology, but underestimate its long term impact."[74]

The above observation may be confirmed with various examples, including the rise of cryptocurrencies, where SC plays a significant role. Namely, since the introduction of the first world cryptocurrency, the Bitcoin, which took place in 2009, there was a lot of skepticism for its functioning, the risks associated with the operation, and the threat of financial crimes, etc. However, at the time of writing this thesis, Bitcoin is still existing, and its value is, with a few minor exceptions in the past, continually rising. Furthermore, despite the initial doubts, governments and central banks worldwide started to impose regulatory sandboxes for cryptocurrencies, while some even passed regulations for the prior. Besides, the rise of cryptocurrencies has encouraged the forward-thinking for digitalization of various currencies. For instance, the European Central Bank (ECB) has started a project for introducing a digital euro. The President of the ECB, Christine Lagarde, has stated: "The Euro belongs to Europeans, and we are its guardian. We should be prepared to issue a digital euro, should the need arise".[75] Although we are probably still far from a world without fiat money, there are changes on the horizon. The probability that the world will experience substitution of the current monetary system is [presumably] high.

As the above examples confirm, the new technology, especially the new ideas, shall not be ignored. Those may either bring significant improvements or foster the debate for various issues, thus stimulating individuals to think about better ways to handle challenges.

In conclusion, SC shall not be ignored; at least the idea for using technology in tackling legal issues is not to be underestimated. Whatever the SC's current perception is, there is no doubt that those have the potential to [r]evolutionize contracting and bring the [much needed] change. Even though those changes may be seen as a simple replacement of the mediators at first glance, that is the least SC can bring. The most meaningful impact of the SC will be substantiated in their capacity to help individuals and businesses by improving the contracting

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[74] James X. Dempsey, 'Artificial Intelligence: An Introduction To The Legal, Policy And Ethical Issues' [2020] 2, Berkeley Center for Law and Technology

[75] European Central Bank, 'A Digital Euro' (2020) <https://www.ecb.europa.eu/euro/html/digitaleuro.en.html> accessed 27 December 2020

process, making the best choices, and finally, enhancing sustainability and decreasing inequalities.

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