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TECHNOLOGIES AT THE WORKPLACE: LEGAL PROBLEMS
Master thesis

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LIST OF ABBREVIATIONS

AI - artificial intelligence

BaFin - The German Federal Financial Services Supervisory Authority

CISG - The Vienna Convention on Contracts for the International Sale of Goods

DAO - decentralised autonomous organisations

DDoS-attacks - Distributed Denial-of-service attack

DHT - Distributed Hash Table

DLT - Distributed ledger technology

EU - European Union

GDPR - The EU General Data Protection Regulation

IBA - International Bar Association

ICO - initial coin offering

ILO- International Labour Organisation

IOE- International Organisation of Employers

IP - Internet Protocol

ITF- International Transport Workers' Federation

OECD - The Organisation for Economic Co-operation and Development

SAC - Smart Arbitration Contract

SAMBA - Smart Arbitration and Mediation Blockchain Application

SC - Smart contract

sMPC - secure multi-party computation

TPS - transactions per second

UNCITRAL - United Nations Commission On International Trade Law

UNIDROIT - the International Institute for the Unification of Private Law

VAT - value added tax

WHO - World Health Organization

ZPK - zero knowledge proof

INTRODUCTION

Relevance of the final thesis and legal researched problem

In response to recent events, when the WHO declared the pandemic of the COVID-19 and the countries was required to suspend all of the economic, educational, and social processes, for the world-wide community for the first time in the history has left no alternative but to digitalise. The coronavirus crisis will have an enormous impact on the labor market, conditions of work and further evolvement of the industrial relations overall. In nowadays realities, employees are conducting their work functions from home distantly and separately from their workplace, the labour contracts in cross-boarder relationships are concluded from different places through technological means, all possible human interaction went digital, which completely substitutes traditional labour relations. In its turn, the law, in order to effectively perform its regulatory and protective function, must respond quickly to the changes in the society. That is why, nowadays, as never before, the matter of the utmost urgency is to adopt new legislation on the national and international level, as well as carry out reforms needed to protect the rights of the employees in the modern technology-driven challenges. The world in which we live today already inhere in transformation period. Big data analyses and intelligent algorithms are increasingly replacing humans in various sectors. One of the most important technological advances in recent years is blockchain technology, which, according to experts, by 2025 will become widespread in most countries[1]. During the St. Petersburg International Economic Forum in 2016, blockchain was recognised as one of the most promising technologies in the world[2], which by 2025 will acquire a mass character and become an integral part of global capital, significantly changing a number of industries (including banking, insurance, contracts, etc.)[3]. A similar opinion is reflected in the Harvard Business Review magazine, where blockchain is also named as one of the most important technological advances in recent years[4]. This technology appeared on the market relatively recently and, with its innovativeness, it attracted the attention

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[1] World Economic Forum «A New Age for Trade and Supply Chain Finance» Trade Tech, Accessed 10 May 2021 http://www3.weforum.org/docs/White_Paper_Trade_Tech_report_2018.pdf

[2] St. Petersburg International Economic Forum, Accessed 10 May 2021 http://tass.ru/pmef-2017/ articles / 4271147 (date accessed: July 28, 2018).

[3] "Blockchain Technology: Preparing for Change" Accenture July 28, 2018. Accessed 10 May 2021 https://www.accenture.com/pl-en/~/media/ Accenture / next-gen / top-ten-challenges / challenge4 / pdfs / Accenture-2016-Top-10-Challenges-04-Blockchain-Technology.pdf

[4] *A. Webb* "8 Tech Trends to Watch in 2016" Harvard Business Review. June 28, 2018. https://hbr.org/ 2015/12/8- tech-trends-to-watch-in-2016

of representatives of completely different fields. The blockchain technology has the potential to change almost everything around us due to its peculiarities: it is a decentralised technology, that concludes transactions by electronic means, providing for better security and immutability as well as faster settlements. The use of blockchain technologies in the field of labour law will allow companies to more clearly coordinate work processes, increase employee engagement and objectively assess work performance. In particular, blockchain can be useful for solving the following tasks[5]:

1. Recruiting. Storing education certificates and data on labor achievements in a decentralised verification system guarantees the reliability of information and reduces the time spent searching for the most suitable employees.

2. Automation of cumbersome personnel management processes, such as payment of wages, VAT administration, attendance control, through the use of smart contracts.

3. Implementation of a business model for collaboration with freelance contractors based on transparency and trust of all stakeholders.

4. New means of dispute resolution through the automated system.

In connection with numerous of changes brought about by the use of blockchain technology, the main questions of this research are: Whether the law is ready to the era of blockchain? What are the main legal problems worth attention while applying blockchain technology nowadays?

Novelty and originality of the final thesis

This thesis provides an overview of the main legal problems arising from the application of the blockchain technology in the contractual area, dispute resolution under blockchain, an overview of the confidentiality of the data as well as the analysis of the relevant legislation regarding labour issues and recognition of the blockchain worldwide, which gives the whole picture as to the gaps in legislatures and shows what steps are needed to quick adaption of the society to such transformation.

Level of the analysis of a researched problem of the final thesis

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[5] А. Б. Вайман "Блокчейн и трудовое право" Контентус № 3 (2020): 10 – 18

Since the beginning of the digital revolution, which started with the invention of the first microprocessor[6], that consequently leaded to the creation of such already well-known technologies as computer, mobile phone and the Internet didn't make it long to conclude that new era is already began and is ready to confidently take lead in the progress of economy. Certainly, such changes primarily affected workers as the driving force of all economic processes, that immediately found its response in scientific works. The greatest researches was conducted by such scientist, economists, business analytics and lawyers as: S. Haber, W.S. Stornetta, T. Hardy, P. Polanski, J.R. Reidenberg, A. Mefford, P. de Filippi, L.E. Trakman, A. Savelyev, W.M. Hewlettand many others who invested a lot into the problematic of the technologies and labour, which works will be analysed further in this research. Also, the a huge contribution in the evolvement of this topic made international organisations: OECD, International Organisation of Employers, International Bar Association, International Labour Organisation.

Significance of the final thesis

This research contains an overview of the main problems caused by the implementation of the blockchain technology in the labor relationship that affect labour regulation and proposals of new means of protection of the workers' rights in the digital era aiming to improve the existing legislation. Therefore, this research will be useful for further scientific discussions by scholars and practitioners as well as for practical implementation in further reforms by policymakers. Additionally, this thesis can be useful for the students who are interested in the research on such topics as technologies, blockchain, smart contracts, contract law, labor law, arbitration and effect of recent technological changes on future regulations.

Aim of research is to determine the main legal problems, which arise in connection with the rapid evolvement of blockchain technology in the labour sphere.

Objectives of research

The steps for the achievement of the aim of research are the following:
1. To reveal the concept of the Smart Contract and its application in labour relations.
2. To analyse the legal regulation of the Blockchain technology worldwide to the appropriateness of the practical usage.

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[6] Ulrich Walwei "Digitalization and structural labour market problems: The case of Germany" ILO Research Paper №17. September 2016.: 34

3. To identify the core legal problems that may arise in connection with practical application of the Smart contract.

4. To explore ways of dispute resolution arising under the Smart Contract.

Research methodology

To achieve the aim of this research the following methods are
used:

1. Historical method are used for identifying the dynamic and impact of the blockchain technology on labour and social changes.

2. Analytical method is used for identifying main problems in the labour law concerning blockchain application and for evaluating the possible solutions to them.

3. The method of data collection and system analysis is applied to explore and analyse the legal regulations, case studies as well as scholar's articles.

4. The linguistic method is used for understanding of such concepts as "smart contract", «lex cryptographia», etc.

5. Comparative method is applied to analyse and compare the international, EU and national labour rules for their effectiveness for practical usage.

6. Logical method to make the complete vision of a problematic aspect and solutions to them.

Structure of research

The research consist of General and Special parts.

In the first part, the evolution of the blockchain technology is described, that takes roots from the creation in 2009 the first cryptocurrency in the world - the Bitcoin. Although, the technology that was meant to create an independent financial space, ended up giving to the world something more - the most prominent technology that can be used to facilitate different areas of the life, including the law. Further, the study learns a form of agreement conducted as a coded mathematical algorithms, the arrangement, change, display and distribution of which is only possible within the Internet, called Smart contract, and how the application of it will change the labour relations. Next, the legal recognition and regulation of Smart contracts worldwide is analysed.

In the second part, firstly, the attention is paid to the legal problems arising in the contract formation of the Smart contract such as offer and acceptance, jurisdiction and applicable law, invalidation of the provisions and mistake, modification of the contract, content and interpretation, execution, performance and liability under the Smart contract. In the second sub-chapter, the problem of compliance to the requirements of confidentiality of the The EU General Data Protection Regulation ("GDPR") and its effect on the future application of blockchain is analysed as well as current confidential technology under the smart contracts that helps to reduce the risks of fraudulent actions of transactions. In the third sub-chapter, is described how the arbitration under Smart contracts is conducted.

Defence statements

1. Blockchain as a technology has a significant potential for expanding the scope of its application in the fields of law and therefore development of national and international legislation is needed to provide an adequate level of protection.
2. Complexity of the Smart contracts creates certain legal problems that should be learned and taken into account at practice.
3. Use of Smart contracts can lead to the conflict between the regulation of private data as well as data protection and specifics of the essence of smart contract itself.
4. The new dispute resolution system should be undertaken to comply with specifics of blockchain technology.

I. EVOLUTION, PLACE AND REGULATION OF THE TECHNOLOGIES IN LABOUR LAW

1.1. Digitalisation and its Effect on Labour Relations

The concept of "digitalization" is derived from the noun "digit" or the adjective "digital", therefore, this term is due to the introduction into all spheres of society and the economy of digital technologies, data streams, as well as digital transmitting devices (computers, smartphones, tablets, TVs, smart watches, etc.)[7]. Digitalization is one of the brightest trends that have a direct impact on the nature of labor relations: their greater flexibility, displacement with civil law relations, state of employment in various states and regions and on the gradual transition from the industrial to the postindustrial era of the development of society. Currently, the world labor market is undergoing global transformations, when certain types of professions (typists, translators of printed texts, assembly line workers) have either disappeared or are in danger of extinction, as they are being replaced by robots or computer programs. Digitalization is transforming existing jobs, requiring workers to acquire new skills to perform new tasks, which necessitate continuous professional development, gaining new knowledge throughout their lives, skills in using new software, new automated and robotic technological processes.

Moreover, digitalization leads to the spread of such atypical forms of employment as telecommuting and freelancing, which makes it possible to perform it outside the employer's location, as well as to the work on the basis of Internet platforms (vivid examples are drivers working on the Uber platform, Yandex taxi, etc.). The problem arises on the determination of the status of those who work under such conditions and whether they can be considered as employees, whether this work can be performed under labor or civil law contracts. According to the scientist Lyutov: "it is important not only that certain professions are becoming a thing of the past, and new ones are emerging, but also that traditional approaches to labor relations are becoming less and less applicable"[8]. As digitalization and the emergence of the digital economy have created new atypical forms of employment (teleworking, freelancing, online work based on Internet platforms, etc.), they have had a serious impact on the way work is organized and how employers and workers interact with each other. Galina Golovenchik writes: "The development of labor re-

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[7] Томашевский К. Л «Цифровизация и ее влияние на рынок труда и трудовые отношения (теоретический и сравнительно-правовой аспекты)» Вестник СПбГУ. Право. Т. 11. Вып. 2 2020. https://dspace.spbu.ru/bitstream/11701/18620/1/398-413.pdf

[8] Лютов, Никита «Адаптация трудового права к развитию цифровых технологий: вызовы и перспективы». Актуальные проблемы российского права 6(103): 98–105. 2019 https://doi. org/ 10.17803/1994-1471.2019.103.6.098-107

lations in the digital economy leads to the replacement of permanent staff with temporary workers, while many types of work can be performed thousands of kilometers from the office and even beyond national borders"[9].

Currently in the world, on the agenda is the issue of introducing digital work books or an electronic register, where the periods of work of employees will be recorded; monitoring of the work of employees; organising remote work; documentary recording of disciplinary offences; finding out and proving in the court the evidences; fixing working time, etc.

Therefore, the rapid transition of the entire civilised world to the digital space requires a full-scale reform of the legal system, which is hopelessly behind technical progress, with the help of new technologies, methods and understanding of jurisprudence in another direction. This poses new challenges for professionals in the field of labor law. With the development of legal relations, existing legal institutions cease to meet the needs of modern society, fail to provide comprehensive regulation in cases of dynamic variables. Therefore, businesses are looking for more optimal forms of regulation of employment relationships, which will be faster, more economical and more mobile in a technocratic economy. The most appropriate in this case is the use of the blockchain mechanism. Currently, this technology covers almost all areas, from education, science, agriculture, banks to government agencies and private enterprises.[10]

Blockchain is the most prominent modern technology that in nearby future will have an enormous effect on our lives by generating qualitative changes in the economy on a global scale, leading to the emergence of a second generation economy[11]. Nowadays, more and more companies start working with blockchain, a technology that allows restructuring human economic activity, making this industry more efficient. Despite the fact that the technology has been on the market for about five years, it is only at the beginning of its formation and popularisation.

The creation of this technology goes back to the 1991, when Stuart Haber and W. Scott Stornetta introduced what many people have come to call blockchain. Their first job involved working on a cryptographically secure blockchain in which no one could falsify any temporary document marks. In 1992, they upgraded their system to include Merkle trees, which increased

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9 Головенчик, Галина «Трансформация рынка труда в цифровой экономике». *Цифровая трансформация* 4(5), 2018: 24

10 Олена Середа "Сучасні тенденції розвитку трудового договору" Актуальні проблеми трудового права та права соціального забезпечення, Юрайт, 2019: 255-258: 12

11 Wenbo Mao Hewlett, *Modern cryptography: theory and practice.* Prentice Hall PTR, 2005, http://index-of.co.uk/Hacking-Coleccion/Modern%20Cryptography%20-%20Theory%20&%20Practice.pdf: 3

efficiency, allowing more documents to be collected in a single block.[12] However, it is in 2008 the history of blockchain becomes extremely relevant, thanks to the work of the person or a group of people named Satoshi Nakamoto, who is considered the brain of blockchain technology because of their work on Bitcoin - the first application of digital ledger technology.[13] Satoshi Nakamoto released the first technology white paper in 2009, in which he described on how well the technology was equipped to increase digital trust, given the aspect of decentralisation, which meant that no one would ever control anything.[14] In business terms, blockchain is a platform where people are allowed to conduct any kind of transaction without the need for a central or trusted arbiter. From the point of view of the government, this technology may claim the right to be called the one undermining the state's monopoly on moderation and regulation of public and private relationships by the transmission and storage of data based on the principles of decentralisation, transparency and security of the data entered. The created database is shared by the network participants in a transparent way, so that everyone can access its contents and is managed autonomously using peer-to-peer networks and a time stamp server. Each block in the blockchain is organised in such a way that it refers to the content of the previous block.[15] The blocks that create the blockchain contains transactions approved by the network participants. Each block comes with a cryptographic hash of the previous block in the chain. Blockchain is a distributed database with no storage devices connected to a common server. Thus, the participants in the relationship do not feel the need for the services of a centralised operator, having the technical ability to interact directly with each other. Moreover, what is very important, the technology allows to interact in this way within the framework of one transaction to an unlimited number of its participants (theoretically there are limitations, but their numerical values clearly exceed the number of inhabitants of the Earth).[16]

Currently exist several types of blockchain:

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[12] Лана Губанова "История Технологии Блокчейн: Необходимо Знать Хронологию" 101 Blockchains. December 21, 2018.

[13] Iredale , Gwyneth «History Of Blockchain Technology: A Detailed Guide» Accessed May 10, 2021. https://101blockchains.com/history-of-blockchain-timeline/

[14] Лана Губанова "Полный Гид По Технологии Блокчейн.Революция Для Изменения Мира." 101 Blockchains, September 15, 2018

[15] Iredale , Gwyneth «History Of Blockchain Technology: A Detailed Guide» Accessed May 10, 2021. https://101blockchains.com/history-of-blockchain-timeline/

[16] К.Е Сигалов и П.Б. Салин и А.С. Чувальникова "Применение технологии Blockchain в законодательстве, политике и государственном управлении" Вестник РУДН. Серия: Юридические науки. Т. 22. No 4. (2018): 565–580. http://journals.rudn.ru/law/article/download/21148/16952: 15

1. Public blockchain: Such a blockchain network is completely open to everyone. No one needs any permission or request to participate in the public blockchain. Any transactional process through such a blockchain is approved for everyone. Everyone has every right to download code and run any public node on their own device. Everyone can even check their current status and also decide to add any blocks to the network.[17]

2. Federated (merged) blockchains: The leadership group controls all of its consensus processes. This is done very quickly. Typically, banking, insurance, energy sectors, use federated blockchains. With this blockchain network, no one is allowed to enter and participate in the system without any permission. Before you can participate in any process of this network, you need to obtain the appropriate permission. Such a system replaces outdated systems: removes data redundancy and forces people to deal directly with documents. There are no strict governance mechanisms.[18]

3. Private blockchains: the main characteristic is that the creation of blocks is centralised and all rights to conduct operations belong to one organisation, while the general public can only read information. The advantages of such blockchain are follow: 1. Low cost of transactions, since they are validated by trusted and high-performance nodes instead of thousands of user devices. 2. In private the TPS (TPS - transactions per second) are much higher than in public ones. 3. Greater control over the system by the company, including the opportunity to update functionality quickly.[19] Therefore, it provides for a controlled and predictable environment[20]. "Private blockchains provide interesting opportunities for businesses by allowing transparent technology to be applied internally," said Dan Wasyluk, CEO of Syscoin.

One of the first areas where blockchain technology was applied appeared to be law. If we translate into the language of law the advantages that the use of blockchain technology gives, then, for example, if the terms of the transaction are confirmed, there is no longer any need for the services of the state as a registrar and depository of the agreement - these functions are performed by the parties to the relationship themselves (technology does not allow one of them to

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[17] Лана Губанова "Полный Гид По Технологии Блокчейн.Революция Для Изменения Мира." 101 Blockchains, September 15, 2018

[18] Лана Губанова "Полный Гид По Технологии Блокчейн.Революция Для Изменения Мира." 101 Blockchains, September 15, 2018

[19] «Differences, advantages, disadvantages: public and private blockchains» Bitfury Groups blog, Accessed May 10, 2021 https://sudonull.com/post/72343-Differences-advantages-disadvantages-public-and-private-blockchains-Bitfury-Groups-blog

[20] Wenbo Mao Hewlett, *Modern cryptography: theory and practice.* Prentice Hall PTR, 2005, http://index-of.co.uk/Hacking-Coleccion/Modern%20Cryptography%20-%20Theory%20&%20Practice.pdf: 8

make changes unilaterally). At the same time, the need for such a function of the state as forcing one of the parties to fulfil the terms of the transaction, does not disappear anywhere. However, when applied to the purely managerial functions of a modern state, in the context of which it fully embodies its service model, the technology under consideration opens up opportunities for streamlining the legal system and bringing it to a relatively stable state. [21] An analysis of the existing practice of introducing blockchain technology into the field of law and public administration makes it possible to establish that, usually, the use of blockchain technology concerns the participation of the state in civil legal relations. In this case, most often we are talking about the use of blockchain technology for the registration of civil contracts, for example, this technology is already quite widespread when creating databases of real estate owners, for example, in February 2018, the first contract of equity participation in construction using blockchain technology was registered in Russia.[22] Also, it found its implementation in political processes that are particularly important for the state and society, for example, the first vote in the world using blockchain technology was held by the Danish political party Liberal Alliance in the spring of 2014 at the internal elections[23] and in 2018, the African country of Sierra Leone held a presidential election in which the blockchain was involved for the first time in the history, but very limitedly: it was used only to verify paper ballots. For this, the capacities of the Swiss company Agora were involved.[24]

Although, this technology also extends to those areas of registration of contractual relations that have a public component and are regulated not only by civil law, but also by other branches of law, for example, the registration of employment contracts. At the same time, the goals pursued by the introduction of blockchain into the sphere of relations regulated by labor legislation can be different: both state and public, as evidenced by foreign practice. In particular, in March 2018, it was announced that the American food company CocaCola, together with the US Department of State and two companies, are launching a project using blockchain technology

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[21] Laurie Beer and JP Morgan "Blockchain will become the main technology in the coming years" RBC-Crypto, August 28, 2018.

[22] "Первый ДДУ с применением блокчейна зарегистрирован в РФ" Индикаторы рынка недвижимости. Февраль 7, 2018.

[23] Сергей Володенков"Выборная цепочка" Известия, Ноябрь 6, 2018. Accessed 10 May 2021 https://iz.ru/806672/sergeivolodenkov/vybornaia-tcepochka

[24] Yomi Kazeem "The world's first blockchain-supported elections just happened in Sierra Leone" Quartz Africa, March 13, 2018. Accessed 10 May 2021, https://qz.com/africa/1227050/sierra-leone-elections-powered-by-blockchain/

to create a register of workers.[25] This is how the company intends to fight forced labor. With the help of blockchain technology, the company intends to increase transparency in the organisation of work. The register will contain information about employees, including their employment contracts. Electronic notary services will be used to protect information. In Russian Federation, The Russian Pension Fund plans to introduce smart contracts between employer and employee signed by electronic signature. It is proposed to use blockchain technology to track information about contracts. However, the introduction of blockchain technology into the sphere of labor legal relations will pursue more the state than the public interest. So, the advantage of using this technology for storing information about contracts will be useful because it will make it impossible to make changes to documents retroactively. At the moment, data on tax deductions and insurance premiums of employers are stored on the servers of the department. The implementation of smart contracts into labor relations will allow in the future to abandon the mandatory signature of them in paper form, but ensure having the information about them at any time, as it happens today in the real estate industry.[26] Significant role in the legal implementation of the blockchain technology also plays Chinese government: limiting the circulation of cryptocurrencies in its territory in every possible way, Beijing consistently prescribes the development of blockchain technologies in program documents as basic goals, for example, in the main strategic document - China's 13th five-year development plan from 2016 to 2020[27].

Consequently, blockchain as a technology has a very significant potential for expanding the scope of its application in the fields of law and public administration, the mechanism of which is the best fit for the sphere of decentralised regulation, the subject of which in law is civil and labor relations, which will be proved by the practice of the upcoming years.

1.2 The Concept of the Smart Contract in the Employment Relationship

1.2.1 Understanding of the Smart Contract

The blockchain technology found its application in the field of the employment contracts in view of so-called Smart contracts. Smart contract is an agreement on the redistribution of val-

[25] "Coca-Cola will use blockchain to combat forced labor" Technology and media, RBC, March 17, 2018. Accessed 10 May 2021, https://www.rbc.ru/rbcfreenews/5aac70179a79473e9b59b205

[26] P. Panov "The Russian Pension Fund switches to blockchain" Izvestia, August 29, 2018 Accessed 10 May 2021 https://iz.ru/781475/pavel-panov/kontraktnaia-tcep-pensionnyi-fond-rossii-perekhodit-nablokchein

[27] Sergey Baloyan «China Launches State Cryptocurrency: How It Could Change the Financial World» Accessed 10 May 2021 https://vc.ru/finance/122749-kitay-zapuskaet-gosudarstvennuyu-kriptovalyutu-kak-eto-mozhet-izmenit-finansovyy-mir

ues between contractors, which provides for a strict and unambiguous task, automation of implementation processes and minimisation of the involvement of trustees[28]. An important condition for the creation and use of smart contracts is the presence of the following elements: first, it is the digital identification of all parties to the contract; secondly, to create a smart contract requires a decentralised environment that can store data in blocks; third, the subject of the contract and the tools necessary to fulfil the obligation (for example, crypto-wallets, if the transaction involves settlements); fourth, these are specifically described conditions of execution, which are reflected in a specially created formula, which is confirmed by both parties.[29] If you compare smart contracts with paper counterparts, you can find the following advantages:

1. Autonomy. This technology gives independence in concluding a contract - the mediator is excluded from the process of concluding a contract, ie the services of lawyers, brokers, banks, notaries will no longer be needed.

2. Reliability. Cryptography, data encryption and blockchain storage are responsible for storing documents - the data are in thousands of copies in "thousands of electronic safes" and synchronously change in real time, which prevents forgery or loss of data at the current level of technical development of mankind.

3. Speed. A lot of time is spent on working with paper documents and their support. The smart contract allows to automate a large number of processes, which makes it an incredibly flexible tool and allows to focus on more important issues, and the function of simultaneous change of information in all units simultaneously, which takes place in real time.

4. Saving. Using smart contracts will save a lot of money, as the intermediary is excluded from the draft process.

N. Sabo formulated the key difference of the new type of consolidation of the will of the parties as follows: "New institutions and new ways of formalising the relations of these institutions became possible due to the digital revolution. I call these contracts "smart" because they are more functional than their inanimate paper ancestors. The use of artificial intelligence is not provided. Smart contracts are a set of promises in digital format, including the protocols by which the parties fulfil these promises.»[30]

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[28] Bashir Imran *Mastering Blockchain: A deep dive into distributed ledgers, consensus protocols, smart contracts, DApps, cryptocurrencies, Ethereum, and more, 3rd Edition.* Packt, 2020:7

[29] Середа, Олена "Сучасні тенденції розвитку трудового договору" Актуальні проблеми трудового права та права соціального забезпечення, Юрайт, 2019: 257

[30] N. Szabo "Smart Contracts: Building Blocks for Digital Markets" Alamut. June 22, 1986. http://www.alamut.com/subj/economics/nick_szabo/smartContracts.html.

The elements of smart contracts include[31]:

- subject of the contract. The program must have access to the goods and services that are the subject of the contract and be able to automatically provide or close this access to the counterparty;

- digital signatures. The parties certify the agreement with their own secret digital keys generated by a single technology;

- the terms of the contract, set out in the exact sequence of operations, ie in the form of an algorithm, and agreed by the parties;

- decentralised platform. Recording, storage and enforcement of a smart contract takes place on a resource independent of the parties.[32]

Basically, smart contracts have a certain system in which the generated code allows you to debit funds from the account, or change the owner of the item, or lead to the fixation of any other legal fact. Today, such a system is Ethereum - a platform based on blockchain technology and within which the parties, using a certain cryptocurrency, can enter into a programmed relationship.

1.2.2 Smart Contract as a tool for Employment agreement

The question of the relevance of using such a complex tool as a blockchain in labor law is worth exploring, because usage of smart contracts is more spread in the business to business sphere. Nevertheless, it is seen that the implementation of a smart contract is the most harmonious way of development of labour relations. One of the problems that the blockchain technology could help to resolve is the complete fixation of the proposals in the labor market by increasing the efficiency of building and maintaining public databases[33]. First, the information will not be forged. Secondly, such a database copes quite well with DDoS-attacks and other popular ways of disrupting work. The introduction of this technology will ensure reliable data synchronisation[34]. Employers will be able to add all the data regarding the criteria of personal qualities, certain skills of the future employee in this blockchain database, that ensure access to anyone who are willing to find such proposal and feedback with their application electronically. The blockchain hash will be printed on the sheet - a unique identifier in the blockchain database and

[31] Bashir Imran *Mastering Blockchain: A deep dive into distributed ledgers, consensus protocols, smart contracts, DApps, cryptocurrencies, Ethereum, and more, 3rd Edition.* Packt, 2020: 13

[32] A. Tar "Smart Contracts, Explained" Cointelegraph, October 31, 2017 https://cointelegraph.com/explained/smart-contracts-explained.

[33] "Smart contracts: Is the Law Ready?» Smart Contracts Aliance, Chamber of digital commerce, 2018. https://digitalchamber.s3.amazonaws.com/Smart-Contracts-Whitepaper-WEB.pdf: 21

[34] Cappiello Benedetta and Carullo Gherardo *Blockchain, Law and Governance.* Springer, 2021: 6

code that will verify the accuracy of the information in the statement in a very easy way by entering a hash or downloading an electronic version on a special web page[35]. In this way, the information becomes as transparent as possible, false job offers will be cut off, data on certain working conditions will not be added, and no additional criteria will appear during the interview due to the employer's personal attitude to the interviewee. At the same time, the future employee will have the opportunity to research the history of a company, career prospects, a complete list of requirements for employees, the opportunity to work with foreign companies, choose the best employment option, for example, using statistics on who, with what education and skills, where and how was employed. On the other hand, the information provided by the future employee will not be falsified as well. For example, Member of the Bundestag Petra Hinz left her post in 2016 because it turned out that she had falsified the data on the matriculation certificate and law degree[36]. Two years earlier, a scandal erupted in Australia: Andrew Flanagan, a top manager at retail company Myer, had lied about his work experience[37]. According to Careerbuilder.com as of September 2017, 75% of job seekers post false information on their resume[38]. Over the past few years, the Russian Dissernet has identified several cases in which diplomas and scientific degrees of politicians and businessmen turned out to be fakes[39]. Blockchain is a distributed database protected by encryption - a "log of records" maintained by millions of participants simultaneously. Records can contain information about career events - fines, violations, etc. Verification of experience and education, registration of labor relations and personnel management are the first among the tasks where blockchain is useful as recruiters lack credibility in the relationship between employer and employee or candidate. Equally important is the resolution of labor disputes. Current practice shows that courts quite often satisfy employees' claims for illegal dis-

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[35] Filippi de P. *Blockchain and the Law: The Rule of Code.* Harvard University Press, 2018 https://www.amazon.com/Blockchain-Law-Rule-Primavera-Filippi/dp/0674976428\: 34

[36] Carlo Angerer «German Lawmaker Petra Hinz Admits Faking Law Degree on Resume» NBS News, July 21, 2016 Accessed 10 May 2021 https://www.nbcnews.com/news/world/german-lawmaker-petra-hinz-admits-faking-law-degree-resume-n613931

[37] Steve Butcher «Disgraced Myer executive Andrew Flanagan who faked CV ripped off other companies» Dailymail, August 7, 2015 Accessed 10 May 2021 https://www.dailymail.co.uk/news/article-2800107/man-conned-way-job-myer-lied-four-companies-getting-mates-pretend-former-bosses.html

[38] Ben Goldberg «75% Of Employers Have Hired the Wrong Person, Here's How to Prevent That» Careerbuilder, November 17, 2016, Accessed 10 May 2021 https://resources.careerbuilder.com/news-research/prevent-hiring-the-wrong-person

[39] Lucy Shirshova «8 high-profile stories about fake scientific degrees and their consequences» Dissernet, April 29, 2016 Accessed 10 May 2021 https://www.dissernet.org/publications/8story_phalsh.htm

missal on behalf of employer.[40] Also, recently there have been atypical forms of employment, such as on-call workers, freelancers, the regulation of relations with which requires some regulatory clarification. For universities, eminent graduates are a matter of reputation. MIT Media Lab and Holbertson School in the USA, Ngee Ann Polytechnic in Singapore already store their alumni information on the blockchain[41]. A blockchain-based service for verifying diplomas and certificates is jointly created by Recruit Technologies and Ascribe. With the blockchain, a new format of business relationships has appeared - a smart contract executed under agreed conditions: an automated process protects the interests of both parties. The DAO company formalises relations with employees in smart contracts[42]. Chronobank, a platform for short-term hiring in e-commerce: cleaning, warehousing, industry, construction and freelancing, which deals with exchange of labor hours for goods and services, also works on smart contracts[43]. Companies cooperating with it issue tokens tied to the average hourly wage in a specific country and provided with a labor force. In 2018, the startup plans to create a decentralised exchange with employee information and employer reviews. The Russian company SuperJob is implementing a blockchain solution synchronised with 1C systems, the Pension Fund and the tax service[44]. Sharing employee information between businesses and government agencies requires serious efforts from the parties.

Despite the numerous laws on non-discrimination, there are many cases of its violation in employment. In the unified state register of court decisions, it is possible to find many cases of refusal to hire because of gender, weight, appearance, etc. With a blockchain, for example, the employer will not know specific information, so discrimination will be eliminated. One of the latest and the most interesting projects in the field of blockchain is Aeron. This is a service that plans to make civil transportation safer, as it will record data on flight quality from three stake-

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[40] Катерина Шаповалова "Інститут блокчейну як механізм вдосконалення регулювання правовідносин у сфері трудового права та права соціального забезпечення" Electronic National University Odessa Law Academy Institutional Repository (2018) http://hdl.handle.net/11300/9698: 18

[41] Marija M. Altman «Exploring Blockchain in Education» MVP Workshop, March 26, 2019 https://medium.com/mvp-workshop/exploring-blockchain-in-education-783b88cbaf44

[42] «Testing Ethereum smart contracts using the DAO as an example» Accessed 10 May 2021 https://habr.com/ru/post/321362/

[43] "Cryptocurrency Enabled ChronoBank Blockchain Platform Prepares to Launch LaborX Exchange» ChronoBank, January 20, 2017, Accessed 10 May https://www.prnewswire.com/news-releases/cryptocurrency-enabled-chronobank-blockchain-platform-prepares-to-launch-laborx-exchange-300394394.html

[44] "SuperJob summed up the results of 2017» SuperJob, 26 December 2017, Accessed 10 May 2021 https://retail-loyalty.org/news/superjob-podvel-itogi-2017-goda/

holders - passengers, pilots and airlines. Despite the fact that aviation is the safest mode of transport, accidents still occur. According to the Aeron service, in more than half of the cases (57%) the cause is the human factor - corrupt flight schools, too much raid on pilots (which leads to fatigue and mistakes), inexperienced pilots, etc. In the service, each party will record information about the quality of the flight, the number of flight hours, etc. This will avoid the loss of information or its substitution[45]. The idea introduced in this startup can similarly be used in blockchain technology in the field of labor law. Accordingly, it will be possible to create a kind of "book of reviews" about a particular employee and employer. For example, using this "e-book", each previous employer will be able to leave information about the quality of work performed by the employee. Moreover, the blockchain excludes the possibility of non-compliance with the requirements of the law on the conclusion of a written employment contract, because with the help of this technology it is possible to record data on employment starting from pre-contractual relations and continuing to the moment of their termination.

The employment of young people deserves special attention. Youth represent 25% of the total working age population. Globally, almost one in 7 youth are looking for work[46]. Youth employment remains a global challenge and a top policy concern. More than 64 million unemployed youth worldwide and 145 million young workers living in poverty.[47] Exacerbation of socio-economic problems, imperfection of legal and regulatory framework, lack of effective mechanisms of state support for youth in the period of its social formation and development significantly complicates the processes of restoring intellectual potential, labor resources of the state, negatively affecting the financial situation of young families, health, physical and spiritual development of young citizens, lead to rising unemployment among young people, exacerbation of the criminogenic situation in society[48]. Young people often find themselves in a vicious circle when they are not hired due to lack of experience; at the same time, they cannot gain this experience because they have never worked. The introduction of blockchain may help to improve this

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[45] «Saving People's Lives. Blockchain for Aviation Safety» Aeron, Accessed 10 May 2021, https://aeron.aero/#en

[46] "YouthStats: Employment" Office of the Secretary-General Envoy on Youth, Accessed 10 May 2021 https://www.un.org/youthenvoy/employment/

[47] "Youth employment" International Labour Organization, Accessed 10 May 2021 https://www.ilo.org/global/topics/youth-employment/lang--en/index.htm

[48] О.М. Ярошенко "Проблеми та перспективи правового регулювання зайнятості та праці молоді" Вісник Академії правових наук України., Право X, 2004: 210. http://dspace.nlu.edu.ua/handle/123456789/4870

situation by allowing young people quickly, with minimal costs, to find certain volunteer programs in the specialty, internships at enterprises, institutions, organisations. Moreover, the selection of trainees will be as transparent as possible.

Labor functions and employee remuneration with the help of the blockchain can be easily spelled out in an algorithm that will ensure a transparent relationship, because all work will be read from trackers that track all information provided in the contract. Sometimes employers do not properly register an employee in accordance with the law in order to avoid paying taxes and the appropriate minimum wage. The widespread problem is the wages "in envelopes", which is a completely illegal phenomenon from the point of view of labor law. The implementation of blockchain means that the employee will receive fair remuneration for his work, and through the use of the blockchain mechanism, information cannot be falsified, which will protect both parties to the employment contract, the execution of labor contracts is automated and the employer cannot delay payments, all data on the employment history of the potential employee is permanent and impossible to delete or change, are available to any employer, which is of great importance, because currently there is not enough transparency in these question. Although, wage information requires certain levels of privacy. Due to the fact that Bitcoin and other cryptocurrencies are steady evolving, a large number of people around the world are using them for payments. According to the nature of blockchain-based transactions, even minor details of an individual's transactions and their spending habits will be publicly available to everyone[49]. In some cases, this violates the laws that protects the confidentiality of wages, however, it ensures a high level of transparency[50]. On the one hand, the payment of wages in bitcoins or other cryptocurrency will be able to significantly reduce the level of wages "in envelopes" and illegal workers and employees will be able to receive a guaranteed salary not lower than the minimum level. On the other hand, the blockchain can contain a huge amount of personal information and other related data. Most countries have laws that allow individuals to extract information from third-party databases under certain circumstances. However, the cornerstone of the blockchain and the key to its reliability is the consistency of the downloaded data. All users of the blockchain network must simultaneously agree to delete the data to comply with certain legal requirements, which is impossible. In addition, deleting a single piece of data will change all subsequent transactions on

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[49] "Cryptocurrencies, blockchain and macroeconomic stability" Eurasian Economic Commission, 2018, http://www.eurasiancommission.org/ru/act/dmi/workgroup/Documents

[50] Artzt Matthias and Richter Thomas *Handbook of Blockchain Law: A Guide to Understanding and Resolving the Legal Challenges of Blockchain Technology.* Wolters Kluwer, 2020.: 103

which it relies. Therefore, companies should consider the confidential consequences of implementing Blockchain technology[51]. However, it is possible to create blocks that require certain passwords, data, or information to access. For example, the employer will not know personal information, except for work experience, etc, until the employee provides access to them or offers to enter into an employment contract.

Another problematic issue in current labour relations is regulation of receiving of tips. Unclear possibility of including tips in employees' earnings, consideration by the employer of the possibility of receiving tips, due to which the establishment of wages at a minimum level to encourage employees to productively perform their duties with the help of the blockchain mechanism will improve.[52] In the presence of an electronic database, the employer will simplify the mechanisms of payment of wages, taxes, the actual number of tips will be fixed, that they will be automatically included in wages. It will be also possible to additionally regulate the payment of "tips" and "service fees».

Pension relations arise on the basis of pre-existing labor relations and also contains problems that could be resolved using blockchain technology. There are many cases of non-payment to pensioners who have moved abroad for permanent residence or who have worked in other countries, which violates their right to a pension. According to the judgment of the European Court of Human Rights in Pichkur v. Ukraine, which became final on 7 February 2014, it was stated that the right to a pension had become dependent on the applicant's place of residence. This led to a situation in which the applicant, having worked for many years in his own country and paid contributions to the pension organisation, was completely deprived of the right to a pension only on the grounds that he no longer resided in Ukraine. In its judgment, the European Court of Human Rights concluded that the applicant was in an almost similar situation to pensioners living in Ukraine as regards the right to a pension. The European Court of Human Rights stated that the above considerations were sufficient to conclude that the difference in treatment violated Article 14 of the Convention for the Protection of Human Rights and Fundamental Freedoms[53]. As a solution of this problem may be the possible formation of an autonomous pen-

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[51] Reidenberg Joel R., O*n-live services and data protection law; regulatory responses*. Office of Official Publications of the European Commission, 1998: 21

[52] М.В. Сорочишин «Оплата праці та чайові: перспективи розвитку правового регулювання» Правове забезпечення соціального забезпечення в умовах євроінтеграційних процесів: тези Всеукраїнських наук. конф., Жовтень 20, 2017: 134–135

[53] "Case of Pichkur v. Ukraine, No. 10441/06" European Court of Human Rights, (Award November 7, 2013) Accessed 10 May 2021, https://hudoc.echr.coe.int/rus#{"itemid":["001-127810"]}

sion fund based on the blockchain, which would provide for: providing retirees an opportunity to receive their due money in any part of the world, facilitating the finding a job abroad on legal terms; the possibility of a simplified scheme of contributions to the Pension Fund; the possibility of cooperation between states in the development of labor law on the new levels.

Trade unions are diverse in their organisation and can be organised around one central body or several federations of trade unions. The multiplicity of trade unions allows them to reach as many workers as possible, but at the same time significantly complicates their cooperation. It is possible that the blockchain could help unions to work more tightly and effectively. In particular, according to the International Transport Federation, the blockchain can be used to attract more employees[54]. It is often difficult for trade unions to find a balance between protecting the interests of existing members and actively engaging new ones. It is not enough to just create a union so that everyone can join it, trade unions constantly need to inform about themselves so that everyone knows about its existence. Also, workers can not join the union without the participation of the union itself. The blockchain protocol will not only increase the visibility of the trade union in today's digital world, but will also greatly simplify the attraction of new members, as everyone will be able to attract themselves. Moreover, the blockchain will help achieve greater transparency and independence in trade union funding. This will not only make the use of workers' contributions more visible, but will also simplify the financing of trade unions in countries suffering from corruption or anti-trade union practices[55]. And blockchain-based electronic voting, which is protected from fraud and outside influence, will allow anti-union workers to freely coordinate joint actions.

To sum up, the direct data exchange will simplify many procedures (including the resolution of labor disputes). An example of the positive consequences of the introduction of the blockchain in relation to employment is the overcoming of the shortcomings of the competitive selection of employees, namely: to accelerate the procedure for accepting documents for participation in the competition, organisational speed; achieving maximum objectivity in the selection of personnel instead of monopolising the management of the relevant procedure[56]. Another ad-

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[54] Микола Бакаєв "Блокчейн у сфері праці: хайп чи хоуп?" Політична критика, Листопад 5, 2020 https://politkrytyka.org/2020/11/05/blokchejn-u-sferi-pratsi-hajp-chy-houp//

[55] Олена Середа "Сучасні тенденції розвитку трудового договору" Актуальні проблеми трудового права та права соціального забезпечення, Юрайт, 2019: 255-258

[56] Т. М. Вахонева «Проблеми конкурентного відбору працівників» Правове забезпечення соціального забезпечення в умовах європейських інтеграційних процесів: тези всеукраїнських наук. конф., Жовтень 20, 2017: 68–71

vantage is that during the calculation formula you can enter an infinite number of variables that will be responsible for seniority, rank, employee qualifications, deadlines and more, which is limited only by the capacity of the blockchain network and the imagination of the authors of the contract. Although, there are also doubtful points in the implementation of smart contracts in the labor relationship. Firstly, it is an ethical question whether it is suitable to enter the data on material payments or recommendations into the blockchain. Secondly, not all employees are officially registered in their workplace, which means that their competence and experience cannot be confirmed. The employee's activity does not always correspond to the position and place of work - employment can be only formal, and the employee is engaged in other activities. Thirdly, the law prevents the introduction of blockchain into labor relations. An employment contract regulates the relationship between an employee and an employer enough precisely and different professions have their own specific features which makes it impossible to program all possible future situations. Moreover, the full use of the blockchain mechanism requires the introduction of a new type of workbook, as this institution of labor relations with its current form and zero functionality can not be integrated with a smart contract, and therefore there is a need to reform this institution.[57]

1.3. Legal Regulation of Smart Contracts Worldwide
1.3.1 Domestic regulation of the Smart Contracts

1.3.1.1. Ukraine

The Vienna Convention on Contracts for the International Sale of Goods of 1980, unifying the rules of international trade, in Articles 11-13 of the Convention did not require a single written contract in the form of a document, and allowed to derive the content of the contract from the offer and acceptance exchanged between the parties, including available means of communication, for example, telegraph, teletype. According to the civil law, for example, in Ukraine a contract as a type of transaction can be concluded in oral or written (simple or notarised, with state registration) form (Article 205), and, as in the Vienna Convention, the written form was considered complied with if the content of the transaction was recorded in one or more documents, letters, telegrams exchanged by the parties, as well as if the will of the parties was expressed by teletype, electronic or other technical means of communication (Article 207). The expanded capabilities of electronic communication and the latest technical and technological solutions that have emerged in the 21st century and have significantly changed business communi-

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[57] Олена Середа "Сучасні тенденції розвитку трудового договору" Актуальні проблеми трудового права та права соціального забезпечення, Юрайт, 2019: 256

cation have improved legal environment. In 2015, as a result of amendments to Art. 205-209 of the Civil Code of Ukraine, the electronic form of the transaction was equated to the written one, and when it became possible to use facsimile reproduction of the signature by means of mechanical or other copying, electronic-numerical signature or other analogue of handwritten signature.[58] The concept of electronic contract, as an agreement between two or more parties aimed at establishing, changing or terminating civil rights and obligations and executed in electronic form, is enshrined in paragraph 5 of Article 3 of the Law of Ukraine "On Electronic Commerce». In the legislation of Ukraine there are no definitions of the concept of a smart contract and the corresponding requirements to such contracts. Therefore, it is impossible to consider a smart contract as a kind of contract concluded in electronic form, because, in accordance with paragraph 3 of Art. 3 of the Law of Ukraine "On Electronic Commerce", the electronic form of presentation of information is the documentation of information that allows it to be reproduced in a visual form suitable for human perception. Meanwhile, a smart contract is drawn up using a programming language, and this form of presentation of information cannot be considered suitable for human perception. However, a smart contract can act as an automated system that operates to fulfil a contract concluded in another form (automated systems aimed at fulfilling contracts are now widely used by banks, telecommunications operators, etc.). Concluding a smart contract does not formally violate the provisions of current civil law of Ukraine, because it is in full compliance with the principle of freedom of contract, enshrined in Article 6 of the Civil Code: the parties are free to enter into a contract, choose a contractor and determine the terms of the contract, as well as requirements of reasonableness and justice.[59] Although, Ukraine is trying to keep up with the leading countries in terms of legal regulation of the use of distributed network technology and smart contracts. In January 2018, the Cabinet of Ministers of Ukraine approved the Concept for the Development of the Digital Economy and Society of Ukraine for 2018–2020, which defines the main tasks of the government[60]: removing legislative, institutional, fiscal and other barriers to the development of the digital economy; development of

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[58] Article 207 of the Civil Code of Ukraine (2003) Accessed 10 May 2021 https://cis-legislation.com/document.fwx?rgn=8896

[59] Article 627 of the Civil Code of Ukraine (2003) Accessed 10 May 2021 https://cis-legislation.com/document.fwx?rgn=8896

[60] "On approval of the Concept of development of the digital economy and society of Ukraine for 2018-2020 and approval of the action plan for its implementation: Order of the Cabinet of Ministers of 17.01.2018 No 67-r" Cabinet of Ministers of Ukraine (2018) Accessed 10 May 2021 https://www.kmu.gov.ua

incentives and motivations to encourage business and industries in general to implement digital technologies; creating demand for digital technologies from citizens through the implementation of large-scale digital transformation projects by the state, in particular, on the basis of modern models of public-private partnership; development and deepening of citizens' competencies to ensure their readiness to use digital technologies; development of digital entrepreneurship, creation of the necessary infrastructure for the development of innovation, introduction of financing, incentive and support mechanisms. The Concept defines a blockchain as a software-computer algorithm of a decentralised public or private registry, the operation of which is ensured by interaction via the Internet of a peer-to-peer network, which ensures proper cryptographic protection of all records, transactions made using appropriate technology. The concept assigns the main role of blockchain technology and smart contracts in the future transformation of public administration in such areas as registration of property rights, maintenance of state registers, justice, identification. As a technology of trust, the blockchain in the public sector will be used for electronic referendums, petitions, voting and other e-government services. In fact, today Ukraine is one of the world leaders in the number of blockchain initiatives at the state level. In May 2017, the government issued an order to transfer to the blockchain the State Register of Real Property Rights, the electronic auction system for the sale of seized property, and other registers of the Ministry of Justice of Ukraine[61]. In June 2017, the government adopted a resolution to transfer the State Land Cadastre to the blockchain[62]. At the same time, the right government initiatives do not have the desired positive effect due to slow implementation, partial use of the potential of this technology and lack of proper legal regulation.

The main problem is that cryptocurrency settlements are still outside the legal field of Ukraine, because in accordance with the provisions of Article 192 of the Civil Code of Ukraine, the only legal currency in Ukraine is the currency of Ukraine - the hryvnia; foreign currencies are used to a limited extent only in specially specified cases. An important area of improving the legal regulation of smart contracts in Ukraine is also to determine the legal status of cryptocurrency, which is a means of payment in a distributed network. In November 2017, the National

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[61] "Some issues of strengthening the security of storage and protection of information of the State Register of Real Rights to Immovable Property and the system of electronic bidding for the sale of seized property: Order of the Cabinet of Ministers of 24.05.2017 No 353-r" Cabinet of Ministers of Ukraine (2017) Accessed 10 May 2020 https://www.kmu.gov.ua/en/npas/250015228

[62] "Some issues of implementation of the pilot project on introduction of electronic land auctions and ensuring storage and data protection during their carrying out: Resolution of the Cabinet of Ministers of 21.06.2017 No. 688" Cabinet of Ministers of Ukraine (2017) Accessed 10 May 2020 https://zakon.rada.gov.ua/laws/show/688-2017-p

Bank of Ukraine (NBU), the National Securities and Stock Market Commission and the National Commission for Regulation of Financial Services Markets issued a joint clarification on the status of cryptocurrencies and determined that they do not comply with any of the legal regimes: "cash" - because cryptocurrency does not exist in the form of banknotes, coins, bank accounts; "currency" - because the cryptocurrency is not pegged to the currency of any country and are not currency values; "electronic money" - due to the fact that the cryptocurrency is not issued by the bank and is not a monetary obligation of a certain person; "securities" - because the cryptocurrency does not meet the criteria of the security, there is no legal relationship between the issuer of the cryptocurrency and its owner, there is no procedure for fulfilling obligations under such securities and the procedure for transferring them to others; "monetary surrogate" - given that the cryptocurrency is not a document in the form of banknotes, it has no issuer and illegal purpose of issue.[63] As a result, regulators have concluded that cryptocurrencies require the development of special legislation governing the issuance and use of cryptocurrencies. Domestic legislation should provide for separate regulation for cryptocurrencies as official means of payment and for tokens as a mechanism for conducting ICOs. Only cryptocurrencies that have become widespread (bitcoin, ETH and some others), as well as the national cryptocurrency to be issued by the NBU, should be recognised as official means of payment. For the second group, the legislation should provide for the possibility of issuing tokens by any company to finance business activities, subject to their registration with the National Commission on Securities and Stock Market. These tokens should not be a means of payment, but only a certificate of rights to receive products or services from their issuer. Their legal regulation should be similar to the regulation of debt securities. It is also necessary to amend the Civil Code and define a smart contract as a type of civil contract, which is expressed in the form of program code and is automatically executed in a distributed network in accordance with the actual circumstances of the programmed terms of the contract.

1.3.1.2. Belarus

Meanwhile, countries around the world treat smart contracts differently. It depends on the recognition of the circulation of the cryptocurrency in the relevant jurisdiction and the impera-

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[63] А. Толкачов "Позиції світових фінансових регулюючих органів щодо ICO та криптовалют: аналітичний огляд" Deloitte, 2018: https://www2.deloitte.com/ru/ru/pages/tax/articles/2017/ico-alert.html

tive nature of the law in a particular country or region[64]. Among the obstacles to the widespread use of a smart contract today are: uncertainty of legal regulation, difficulty in defining territory and jurisdiction, inconsistency of the legal structure of the classic contract with the program structure of the smart contract, lack of standard programming language and difficulty understanding the contract for the average user.[65]

According to a study conducted by the international audit company Deloitte, the world leader in legal support for the use of smart contracts and cryptocurrencies is Belarus[66]. On December 21, 2017, the President of Belarus signed Decree No. 8 "On the Development of the Digital Economy", which defines the concept of a smart contract, establishes rules for using blockchain technology, conducting ICOs, issuing tokens, cryptocurrency mining and others. The decree amended the civil law, which allows to regulate relations in the process of ICO, made amendments to tax and financial legislation, which made it possible to resolve conflicts with financial regulators, provided ICO participants with tax benefits and regulated the accounting of cryptocurrencies. Decree No. 8 defines a smart contract as a software code that provides automatic execution of agreements, as well as other legally significant actions[67]. A smart contract can be both a software supplement to a traditional agreement or a stand-alone agreement, the terms of which are spelled out in the program code. The decree stipulates that a person who has entered into an agreement using a smart contract is duly aware of its terms, including those expressed in the program code. In case of non-compliance of the provisions of the smart contract with the terms of the agreement, to which it is a supplement, the terms of the agreement have legal priority. At the same time, the person referring to these differences must prove that he did not know about them at the time of joining the smart contract. Decree No. 8 also recognises a token as an object of ownership, which is a record in any distributed network[68]. The transfer of ownership of

64 A. Толкачов "Позиції світових фінансових регулюючих органів щодо ICO та криптовалют: аналітичний огляд" Deloitte, 2018: https://www2.deloitte.com/ru/ru/pages/tax/articles/2017/ico-alert.html

65 L. Kukuetu «Problems and prospects of practical application of smart contracts» - Detailed analysis https: //ain.ua/2018/11/09/problemy-i- perspektivy-primeneniya-smart-kontraktov.

66 A. Толкачов "Позиції світових фінансових регулюючих органів щодо ICO та криптовалют: аналітичний огляд" Deloitte, 2018: https://www2.deloitte.com/ru/ru/pages/tax/articles/2017/ico-alert.html

67 "Cryptocurrencies, blockchain and macroeconomic stability" Eurasian Economic Commission, 2018, http://www.eurasiancommission.org/ru/act/dmi/workgroup/Documents

68 A. Толкачов "Позиції світових фінансових регулюючих органів щодо ICO та криптовалют: аналітичний огляд" Deloitte, 2018: https://www2.deloitte.com/ru/ru/pages/tax/articles/2017/ico-alert.html

the token occurs through its transfer - the implementation of the corresponding record in the distributed network. There are two types of tokens: tokens certifying civil rights (debt, equity and others) and tokens that are cryptocurrencies. Only tokens that have acquired the status of a universal medium of exchange worldwide are recognised as the latter. Tokens are negotiable objects and can be the subject of civil law agreements. Miners can receive tokens as a reward for verifying blockchain transactions. Tokens are recognised as assets in accounting. Individuals, regardless of their entrepreneurial status, have complete freedom to dispose of tokens: they can buy, sell, donate and bequeath them. Legal entities have access to the crypto market only through authorised intermediaries. Token transactions are exempt from VAT, income tax and income tax until 2023[69]. By introducing progressive legislation in the field of smart contracts and cryptocurrencies, Belarus is trying to formally resolve all possible negative consequences inherent in this area of activity. Banks, as well as cryptocurrency platform operators and cryptocurrency exchange operators, are required to evaluate and identify risky transactions in terms of combating money laundering, terrorist financing and proliferation of weapons of mass destruction. An important element of cyber activity control is the requirements for compliance of crypto market participants and ICO issuers with the following criteria:

1. Ensuring compliance with Belarus' international obligations to prevent money laundering, counter terrorist financing and the proliferation of weapons of mass destruction (identification of participants in smart contracts);

2. Providing solvency guarantees and covering possible losses that a participant in a smart contract or crypto market may cause to other parties;

3. Ensuring the requirements of technological security - protection against cyber attacks or other unauthorised interference, auditing of distributed networks.[70]

1.3.1.3. Russia

In Russia, the legal regulation of smart contracts and transactions with cryptocurrencies only start developing. On the January 1, 2021 The legislative proposals on the law "On digital assets" came into force. It gives a definition to cryptocurrency, but prohibits its use in Russia to pay for goods and services. According to the new law, digital currency is "a set of electronic data (digital code or designation) contained in an information system, which are offered and (or) can

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[69] Василь Варавка "Проблеми правового регулювання смарт-контрактів" Актуальні проблеми правознавства. 1 (21), (2020) http://appj.wunu.edu.ua/index.php/apl/article/viewFile/858/845

[70] Василь Варавка "Проблеми правового регулювання смарт-контрактів" Актуальні проблеми правознавства. 1 (21), (2020) http://appj.wunu.edu.ua/index.php/apl/article/viewFile/858/845

be accepted as a means of payment that is not a monetary unit of the Russian Federation, a monetary unit of a foreign state and (or) an international monetary or unit of account, and (or) as an investment and in respect of which there is no person obligated to each owner of such electronic data"[71]. Thus, cryptocurrency is defined as a digital code that is used as a means of payment and savings, as well as an investment. It introduces the need to file a tax return, which will reflect the very fact of owning digital currency, as well as transactions with it, which is a condition for judicial protection of such transactions. According to the law, cryptocurrency in Russia can be bought, issued, sold, and other transactions can be made, but Russian citizens cannot pay with it. In November, the Ministry of Finance prepared amendments to the Criminal and Criminal Procedure Codes of Russia, which provide for the imprisonment of digital currency owners for up to three years if they have not reported to the tax authorities at least twice in three years on transactions with digital currencies in the amount of 45 million rubles or more.[72] The ministry also developed amendments to the Tax Code, anti-money laundering legislation and the Code of Administrative Offenses in terms of regulation of digital currencies and digital financial assets. The definition of a smart contract is also regulated by this law and is understood as: "an agreement in electronic form, the fulfilment of rights and obligations under which is carried out by automatic execution of digital transactions in a distributed ledger of digital transactions in a strictly defined sequence and upon the occurrence of certain circumstances. Protection of the rights of participants (parties) to a smart contract is carried out in a manner similar to the procedure for protecting the rights of the parties to a contract concluded in electronic form"[73]. Based on this definition, the following features of a smart contract can be distinguished: 1. A smart contract is an agreement in electronic form that generates rights and obligations between participants in civil law turnover and is aimed at their occurrence, change and termination, subject to certain conditions; 2. The fulfilment of rights and obligations is carried out using a predetermined algorithm that allows automating the process of interaction between the parties under a smart contract[74].

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[71] Федеральный Закон "О цифровых финансовых активах, цифровой валюте и о внесении изменений в отдельные законодательные акты Российской Федерации» Государственная Дума, 22 июля 2020 года, Accessed 10 May, 2021 http://www.consultant.ru/document/cons_doc_LAW_358753/

[72] "Закон о цифровых активах вступил в силу. Что изменилось» Accessed May 10, 2021 https://www.rbc.ru/crypto/news/5fedaf549a794784d89eb416

[73] Федеральный Закон "О цифровых финансовых активах, цифровой валюте и о внесении изменений в отдельные законодательные акты Российской Федерации» Государственная Дума, 22 июля 2020 года, Accessed 10 May, 2021 http://www.consultant.ru/document/cons_doc_LAW_358753/

[74] Павлова, Д. А. «Смарт-контракт: правовое регулирование в Российской Федерации и за рубежом» Молодой ученый № 32 (322), 2020: 118-120. https://moluch.ru/archive/322/73061/

1.3.1.4. UK

In 2018, the LawTech Delivery Panel was created for the purposes of reviewing the national law on the subject of the legal regulation of cryptocurrency and appropriateness of the use of smart contract. In 2019 the UK Jurisdiction Taskforce published a Legal Statement on the status of cryptoassets and smart contracts under English law concluding that[75]: «1. Cryptoassets (including cryptocurrencies) should in principle be treated as property»; and 2. Smart contracts should be capable of satisfying the requirements for a binding contract in English law, and are thus enforceable by the courts[76]».

According to the document, there is no reason to treat smart contracts differently than regular contracts, considering that the law does not require contracts to be in any particular form; this contractual law concerns the fulfilment of promises; the defining characteristics such as offer, acceptance, intention to be legally bound, and consideration are present. Although, such conclusions do not have a binding legal force yet and was not confirmed by the case law yet.

1.3.1.5. Germany

Currently, there are no specific legislations regarding matters of Blockchain in Germany[77]. Although, legal regulation in different specific ares is conservative and aimed at protecting investors in ICO operations, mining and cryptocurrency trading. The German Federal Financial Services Supervisory Authority (BaFin) allows for two types of ICOs. As part of the first issue of tokens is carried out using a smart contract based on the existing blockchain. The second is to create a new blockchain.[78] At the same time, BaFin denies the possibility of applying shareholder law to the ICO. According to the legislator, the content of the rights granted by tokens is not regulated by law, but is determined by the issuer independently in the documentation to the ICO. BaFin emphasises that the difficulty of verifying the smart contract code, the possibility of software error, fraud and lack of legal regulation are a risk for investors. In April 2017, cryp-

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[75] Wackwitz Gwen «Status of cryptoassets and smart contracts under English law» White&Case, November 28, 2019. https://www.whitecase.com/publications/alert/status-cryptoassets-and-smart-contracts-under-english-law

[76] «Legal statement on cryptoassets and smart contracts» UK Jurisdiction Taskforce, November 2019, https://35z8e83m1ih83drye280o9d1-wpengine.netdna-ssl.com/wp-content/uploads/2019/11/6.6056_JO_Cryptocurrencies_Statement_FINAL_WEB_111119-1.pdf

[77] Karsten Wöckener, Daniel Gillenkirch, Daniel Sander «Germany: Blockchain» The In-House Lawyer, November 07, 2019, https://www.whitecase.com/publications/article/germany-blockchain

[78] А. Толкачов "Позиції світових фінансових регулюючих органів щодо ICO та криптовалют: аналітичний огляд" Deloitte, 2018: https://www2.deloitte.com/ru/ru/pages/tax/articles/2017/ico-alert.html

tocurrencies at the legislative level were equated to financial instruments, trading in them became a licensed activity. In February 2018, the German Ministry of Finance equated cryptocurrency with legal tender for tax purposes. Thus, all transactions with the use of cryptocurrency are subject to taxation and antitrust law on a general basis. At the same time, the issuance of tokens and cryptocurrency mining are not taxed.

1.3.1.6. France

French law, unlike the United Kingdom and Germany, is more loyal to the use of smart contracts and ICOs. The French financial market regulator AMF proposed that crowdfunding and securities legislation could not apply to ICOs and invited the public to jointly prepare proposals for the legal regulation on smart contracts, ICOs and the cryptocurrency market[79]. In December 2017, the French government adopted an Ordinance that allowed the accounting of securities confirming the rights to participate in the capital of joint stock companies, debt securities, units and shares of investment funds in the blockchain and equated the blockchain entries to traditional personal accounts[80]. The Ordinance provides for civil protection of property rights to securities accounted for in a distributed network. At the same time, France does not recognise cryptocurrency as a legal currency, but only as a movable intangible asset, transactions with which are generally taxed[81]. In the future, AMF intends to develop legal regulation of smart contracts in four areas: ensuring proper information to participants about the terms of the smart contract, transparency of token issuers, identification of investors, transparent pricing and protection against market manipulation, asset security.[82]

1.3.1.7. USA

The US experience of legal regulation of smart contracts and operations with cryptocurrencies is also worth of attention. In the United States, there is no general legislation governing blockchain technology. Currently, most of the legal regulation is coming from the federal administrative and departmental levels, which mostly is of recommendatory nature with a focus on the financial industry and cryptoassets, which includes the Securities and Exchange Commission,

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[79] V. Mytko "Where bitcoin is the national currency" *Howtobuycoin. com.* (2018) Accessed 10 May 2021 https:// howtobuycoin.com /bitcoin/bitcoin-official-cryptocurrency

[80] Gossa J. "Les blockhains et smart contracts pour les juristes» Dalloz IT/IP, No 7-8, 2018, p. 393—396

[81] Zolynski C. «Blockchain et smart contracts: premiers regards sur une technoligie disruptive» Revue de droit bancaire et financier, 2017, p.4

[82] Василь Варавка "Проблеми правового регулювання смарт-контрактів" Актуальні проблеми правознавства. 1 (21), (2020) http://appj.wunu.edu.ua/index.php/apl/article/viewFile/858/845

the Commodities and Federal Trading Commission, the Federal Trade Commission, the Department of Treasury, the Internal Revenue Services and the Financial Crimes Enforcement Network. However, the active attempts to bring blockchain bills to the Senate was made. In February 2019, a working group introduced to the House of Representatives Blockchain Promotion Act, which defines understanding of «blockchain». In April 2019, a draft of Token Taxonomy Act was introduced, which clarifies the status of transactions with cryptocurrency. In September 2020, the Blockchain Innovation Act was introduced to the House of Representatives[83].

Cryptocurrencies in the United States are not an official means of payment, but the US Legislative Unification Commission has developed a model law that is the basis for individual states to adopt their own legislation in the field of cryptocurrency regulation. In July 2017, the US Securities and Exchange Commission (SEC) published a report in the DAO case, which recognised that all transactions related to the issuance and exchange of tokens are subject to regulation as transactions in securities. Tokens must be registered with the SEC, and market participants must obtain the appropriate regulatory approvals. Sanctions for violations of regulatory requirements can reach $ 0.5 million. USA or even 5 years in prison. Issuers have the right not to register tokens with the SEC if they issue them only for crowdfunding, and if they plan to sell them outside the United States. Despite the exceptions, the practical experience of imposing sanctions on BitConnect, BitFunder and Manatee shows that in the US it is almost impossible to conduct an ICO without registration with the SEC[84]. Manchee Inc has organised an ICO to develop an application for the iPhone, which allows you to leave reviews about restaurants, as well as buy and sell goods and services[85]. Tokens were planned to be used as a means of payment within the application, as well as a means of motivating its users. The SEC recognized the ICO as an unregistered issue of securities and stopped it, the funds raised were returned to the buyers of tokens. The SEC justified its position by saying that the issued tokens were purchased solely for the purpose of their resale after the launch of the application and the increase in the price of tokens. Thus, buyers of tokens expected to receive income as a result of the actions of third par-

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[83] David J. Kappos, D. Scott Bennett, Michael E. Mariani «United States: Blockchain» The Legal 500, Country Comparative Guides, 2021, https://www.legal500.com/guides/chapter/united-states-blockchain/?export-pdf: 6

[84] A. Толкачов "Позиції світових фінансових регулюючих органів щодо ICO та криптовалют: аналітичний огляд" Deloitte, 2018: https://www2.deloitte.com/ru/ru/pages/tax/articles/2017/ico-alert.html l

[85] "The most successful ICOs in the history" *Habr.com*. (2017) Accessed 10 May 2021 https://habr.com/ru/post/339822

ties, which is one of the criteria of the investment agreement. An interesting fact in the development of cryptocurrencies is that the United States imposed economic sanctions on Venezuela, banning transactions with cryptocurrencies and tokens issued by the Venezuelan government[86]. This was in response to the Venezuelan government's issuance of its own oil-backed state cryptocurrency, EI Petro. This currency has been successfully used by the Venezuelan government to circumvent previously imposed US sanctions.

1.3.1.8. China and India

Along with countries that are developing legal regulation of smart contracts and cryptocurrencies, there are also those that prohibit their use by law. These include such huge countries as China and India. In September 2017, the Chinese central bank and major financial regulators recognised ICOs and cryptocurrencies as non-compliant with Chinese law, aimed at illegally raising funds from the public for fraudulent purposes[87]. All companies that have raised funds through the ICO must return them to investors and cease operations. Violation of these requirements is subject to criminal liability. The ban applies to both Chinese and foreign projects that raise funds in China. At the same time, in the future, the Central Bank of China is developing its own state cryptocurrency, which will be the official means of payment. Similar steps have been taken to ban the use of ICOs in India - cryptocurrencies are banned and all projects must shut down and return the funds raised.[88]

To summarise, we can make conclusion that the national law only become evolving in the sphere of Blockchain, therefore the appropriateness of such regulation will be seen in future within law enforcement by courts. Currently, we can notice that most of the jurisdictions try to regulate smart contracts as securities and financial instruments, which does not correspond to either the economic or legal content of the smart contract. Another important problem is the lack of a single international legal framework for the operation of smart contracts, given the cross-border nature of cyberspace transactions. In a situation where, for example, an ICO issuer is resident in the United States, a distributed network operates at computing facilities around the world, and token buyers are mostly residents of China, it is very difficult to determine which

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[86] А. Толкачов "Позиції світових фінансових регулюючих органів щодо ICO та криптовалют: аналітичний огляд" Deloitte, 2018: https://www2.deloitte.com/ru/ru/pages/tax/articles/2017/ico-alert.html l

[87] "Impact of digital innovations on the processing of electronic payments and contracting: an overview of legal risks" *European Central Bank* (2017) https://www.ecb.europa.eu/pub/pdf/

[88] Василь Варавка "Проблеми правового регулювання смарт-контрактів" Актуальні проблеми правознавства. 1 (21), (2020) http://appj.wunu.edu.ua/index.php/apl/article/viewFile/858/845

country's legislation will govern these transactions. Moreover, different countries will be in conflict over the right to regulate relations in cyberspace. Traditional systems of private international law created a lot of uncertainty[89]: the linking of law to the lex loci - some geographically determined place, in contractual relations, most often to the place of business, to the location of the party to the contract, which is significantly complicated in cyber business; the conflict of jurisdictions; the application of foreign law in the court in a proper way, which in cyber disputes can be further complicated by the absence in national law of norms regulating relations in cyberspace.[90] The application of the collisions of law to the regulation of relations in cyberspace is possible, but due to the large number of costs associated with the application of foreign law, as well as due to the fact that legal knowledge is required for its application, it is likely to be used by major e-commerce players rather than users in a relatively new segment of the "consumer economy"[91]. Such problems lead to the search for scientific prototypes with the aim of creation the actual regulatory environment of cyberspace.

1.3.2. Lex mercatoria, Lex informatica and Lex cryptographic.

At the end of the XX century a number of studies have emerged that draw parallels between the medieval lex mercatoria and modern regulators of the cyber environment[92]. For example, Trotter Hardy, an American professor of law, was one of the first to correlate Internet commerce with medieval commerce. Medieval Law Merchant, according to the author, was a set of customary practices that could be enforced in the courts, serving the interests of traders and fairly uniform in all jurisdictions where fair trade was carried out. Two key properties of the Law Merchant are relevant in our time: it was not generated by Parliament or other authoritative official body; it existed in a sense autonomously and in addition to the law[93]. The Law Merchant made no attempt to supplant existing rules promulgated by the jurisdiction in which the fair trade was conducted, it only supplemented those rules with specific rules applicable to merchants'

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[89] Polanski P. P. "Towards a supranational Internet law" Journal of International Commercial Law and Technology, Vol. 1, Iss. 1, 2006 https://www.neliti.com/publications/28672/towards-a-supranational-internet-law

[90] T. Lowery "Human to Human - Collaboration Is the New Competition" Huffpost, December 06, 2018 https://www.huffpost.com/entry/human-to-humancollaborati_b_4696790

[91] "Impact of digital innovations on the processing of electronic payments and contracting: an overview of legal risks" *European Central Bank* (2017) https://www.ecb.europa.eu/pub/pdf/

[92] D. Johnson, D. Post "Law and Borders - The Rise of Law in Cyberspace" Stanford Law Review, Vol. 48 No. 5, 1996, https://www.jstor.org/stable/1229390?seq=1: 56

[93] Hardy I. T. "The Proper Legal Regime for «Cyberspace»" University of Pittsburgh Law Abstract Vol. 55. (1994): 1019

transactions[94]. And the Law Merchant norms were applied by special commercial courts. All of this has strong parallels with cyberspace. And the coexistence of Law Cyberspace with existing laws would be an extremely practical and efficient way of doing business in the online world[95]. Common practice on the Internet can be seen as the beginning of the formation of a body of norms, independent of national legal systems, which will be used on the Internet in general and in international electronic commerce in particular[96]. Internet commerce is an example of an environment in which, in the absence of agreements or written law, rights and obligations can be derived from normal e-commerce practices or customs. The latter can be considered the basis of another reincarnation of the Law Merchant idea - the modern Internet lex mercatoria, which can be seen in the formation of an autonomous, competing with the law or even equated to positive law system of norms, which is called cyber law, supranational Internet law - lex informatica[97]. P. Polanski, defending the concept of supranational Internet law, names cases when a system of norms corresponding to it can be applicable: to resolve Internet disputes in cases where the parties to the contract either did not choose the national applicable law, or chose lex mercatoria in as such; to fill gaps in international and national instruments; as a basis for the development of national acts, regional and international treaties; for the harmonisation of Internet law; in the interpretation of both treaty gaps and gaps in national or supranational regulation[98]. The above cases are similar to the grounds for the application of one of the key sources of modern lex mercatoria - the UNIDROIT Principles of International Commercial Contracts. Joel R. Reidenberg, a professor at Fordham University, takes a "tech" stance on lex informatica, interpreting the latter as a comprehensive source of information policy rules in global networks. The author argues for the

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[94] М. В. Мажорина "О коллизии права и "неправа", реновации lex mercatoria, смарт-контрактах и блокчейн-арбитраже" Киберпространство No 7 (152) Июль 2019: 93-107 https://cyberleninka.ru/article/n/o-kollizii-prava-i-neprava-renovatsii-lex-mercatoria-smart-kontraktah-i-blokcheyn-arbitrazhe/viewer

[95] Hardy I. T. "The Proper Legal Regime for «Cyberspace»" University of Pittsburgh Law Abstract Vol. 55. (1994): 1020

[96] М. В. Мажорина "О коллизии права и "неправа", реновации lex mercatoria, смарт-контрактах и блокчейн-арбитраже" Киберпространство No 7 (152) Июль 2019: 93-107 https://cyberleninka.ru/article/n/o-kollizii-prava-i-neprava-renovatsii-lex-mercatoria-smart-kontraktah-i-blokcheyn-arbitrazhe/viewer

[97] A. Mefford "Lex Informatica: Foundations of Law on the Internet" Indiana Journal of Global Legal Studies. Vol. 5. Iss. 1. Art. 11. 1997: 234.

[98] P. P. Polanski "Towards a supranational Internet law" Journal of International Commercial Law and Technology, Vol. 1, Iss. 1, 2006 https://www.neliti.com/publications/28672/towards-a-supranational-internet-law

need of changes in creation of legal norm: the promotion of technical standards developed by the relevant technological actors should be a key goal. Lex informatica can serve as a basis for the development of information policy norms and should shift the focus of policymakers towards more flexibility in regulation, which will reduce the problems in using traditional legal approaches to regulating the information society[99]. Aron Mefford, a scholar at Indiana University, views Net Law as the sum total of intense interactive discussion, basing its legitimacy on its recognition by the users of the network, that understands how cyberspace works, have significantly more opportunities to participate in its creation in comparison with the law of the physical world.[100] The author names two key areas of lex informatica regulation as a common part of network law: Internet commerce and cyber delicts. The key source of lex informatica is Net Custom, which is formed in a special way and at a much higher speed on the Web. The author makes an interesting comparison of the latter with the formation of Netiquette rules[101]. The evidence of the existence of network customs can be considered their inclusion in the Acceptable use policy applied by the authorities, businessmen or website administrators. According to A. Mefford, the main legal designators of network customs should be arbitrations, including virtual ones. The link between lex informatica and the national law of the physical world is carried out mainly through the use of mechanisms of the recognition and enforcement of foreign arbitral awards[102]. The second scientific approach to the norms of non-state regulation of relations in cyberspace is characterised by the fact that the concepts of e-merchant, Internet lex mercatoria and cyberlaw qualify as modernised patterns of the medieval lex mercatoria, which do not pretend to qualify as legal[103]. Primavera de Filippi, an expert on blockchain technologies, writes that within the development of the Internet and digital technologies, an alternative regulatory system began to form, a specific set of rules, spontaneously and independently developed by the international community of the Internet operators. Such set of norms, called lex informatica, is the most appropriate way

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[99] J. R. Reidenberg "Lex Informatica: The Formulation of Information Technology Rules Through Information Technology" Texas Law Review. Vol. 76. No 3, 1998: 591.

[100] A. Mefford "Lex Informatica: Foundations of Law on the Internet" Indiana Journal of Global Legal Studies. Vol. 5. Iss. 1. Art. 11. 1997: 227.

[101] A. H. Rinaldi "For ethical rules of conduct on the web" The Net: User Guidelines and Netiquette March 02, 2019 http://web.augsburg.edu/~erickson/edc220/netiquette/rinaldi.html

[102] A. Mefford "Lex Informatica: Foundations of Law on the Internet" Indiana Journal of Global Legal Studies. Vol. 5. Iss. 1. Art. 11. 1997: 231.

[103] L. E. Trakman "From the Medieval Law Merchant to E-Merchant Law" The University of Toronto Law Journal. Vol. 53. No. 3. 2003: 2028.

of regulating online transactions and to complement contractual rules, because its normative power arises directly from the technical design of the network infrastructure.[104] Lex informatica is a set of technical regulations that restrict users of a digital platform and are an expression of the will of those responsible for maintaining the platform, but not its users[105]. Thus, the development of trade with foreigners in the Middle Ages led to the emergence of lex mercatoria, the Internet gave birth to lex informatica. At the same time, the blockchain technology, according to P. de Philippe's views, made it possible to create another regulatory system - lex cryptographica, which also relies on technical means for coordinating behaviour, but the rules of which are set in the blockchain network protocol by the community and for the community and should be provided through a distributed ledger mechanism with the involvement of all network participants. An interesting opinion is expressed by Leon E. Trakman, professor at the Australian University of New South Wales, that sees the emergence of a multitude of online dispute resolution services as a result of the development of a new cyberspace Law Merchant, which is largely consistent with the notion of medieval lex mercatoria as a system of norms that unifies the practice of dispute resolution[106]. For example, online dispute resolution rules, enshrined in eBay or Priceline.com rules, serve as models of trading practice as well as a means of regulating trade with consumers. Despite the fact that the modern cyber-trader is somewhat different from the medieval merchant, the search for models of normative regulation of trade relations in the new "space" follows the same canons, although the modern cyber merchant is much more powerful due to the properties of cyberspace: for example, a cybersquatter can seriously affect the business of a multinational corporation by acquiring and using a well-known domain name[107].

Therefore, the emerging state of development of native legislation in countries, absence of the unified international framework creates lot of uncertainties in the widespread implementation of the Blockchain technology. Lex informatica and Lex cryptographic in the current circumstances help to fix gaps and provides an impetus for further development of the cyber relations,

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[104] *Dispute Resolution. The Kleros Handbook of Decentralized Justice.* Kleros.IO, https://ipfs.kleros.io/ipfs/QmZeV32S2VoyUnqJsRRCh75F1fP2AeomVq2Ury2fTt9V4z/Dispute-Resolution-Kleros.pdf

[105] P. de Filippi "From Lex Mercatoria to Lex Cryptographica. Dispute Revolution." The Kleros Handbook of Decentralized Justice April 15, 2019 https://blog.kleros.io/dispute-revolution-the-kleros-handbook-of-decentralized- justice/

[106] L. E. Trakman "From the Medieval Law Merchant to E-Merchant Law" The University of Toronto Law Journal. Vol. 53. No. 3. 2003: 2030.

[107] L. E. Trakman "From the Medieval Law Merchant to E-Merchant Law" The University of Toronto Law Journal. Vol. 53. No. 3. 2003: 2032.

encouraging governments and international organisation for implementation the customs in the legal binding documents. Although, it can not substitute law itself. Therefore, the development of international legal regulation of smart contracts and cryptocurrencies should be a priority of the world community, that would give example for implementation of common principles worldwide and provide for more certainty.

II. CONTRACT FORMATION, CONFIDENTIALITY PROTECTION AND DISPUTE RESOLUTION UNDER THE BLOCKCHAIN TECHNOLOGY IN THE EMPLOYMENT RELATIONS

2.1 Legal Issues in the Contract Formation of Smart Contract
2.1.1. Offer and acceptance

For the emergence of rights and obligations under a smart contract, like under any other contract, it is necessary to reach an agreement, which is expressed in the coinciding expression of the will of the parties. In practice, in smart contracts, an offer is a web page that contains an offer to conclude an agreement with a link to the program code signed with the offeror's private key and placed in a distributed registry[108]. The website is definite and complete, including the essential terms of the contract that can be considered an offer. An offer to conclude a smart contract, executed in the form of a web page without restricting access, can be recognised in some legal order as "public", that is, addressed to an indefinite circle of persons (for example, Russia, Germany, France). In this case, any person who has taken the necessary actions in order to accept the smart contract will be entitled to demand from provider to fulfil its contractual obligations[109]. Entrepreneurs using or planning to use smart contracts should take this circumstance into account and, if necessary, apply restrictions when accessing the web page on which it is located. After writing the program code, the smart contract can be deployed on the developer's local network and tested to minimise the system's incorrect interpretation of incoming data and signals[110]. The validity period of the smart contract offer is fixed on the page and is usually not difficult to determine. If the offer expires, the program code of the smart contract displays an error and, as a result, the smart contract cannot be concluded. The acceptance of a smart contract must be carried out in a form similar to the offer, that is, in the form of an electronic message signed with the acceptor's private key. Since the smart contract is created in the form of an accession agreement, the acceptance of a smart contract cannot change its program code, and, therefore, its conditions, therefore, there is no possibility of a counter offer. The moment when smart contract is concluded is important from the point of view of determining the time of acquisition of rights and obligations by its parties. The definition of the

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[108] Artzt Matthias and Richter Thomas *Handbook of Blockchain Law: A Guide to Understanding and Resolving the Legal Challenges of Blockchain Technology.* Wolters Kluwer, 2020.: 131

[109] Bashir Imran *Mastering Blockchain: A deep dive into distributed ledgers, consensus protocols, smart contracts, DApps, cryptocurrencies, Ethereum, and more, 3rd Edition.* Packt, 2020.: 78

[110] Никита Лукоянов "Правовые аспекты заключения, изменения и прекращения смарт-контрактов." Юридические исследования, 2018, 5. https://mgimo.ru/upload/iblock/522/28115.pdf

moment of concluding a smart contract differs both from the approach existing in the continental legal system (the moment the offeror receives an acceptance) and the Anglo-Saxon law approach (the moment of sending the acceptance, that is, the mail-box theory)[111]. The moment of the conclusion of the smart contract can be clearly defined, since the program code is activated only at the moment of making the corresponding entry on the acceptance of the offer in the next block of records in the distributed register. [112]

2.1.2. Content of the contract

The content of a smart contract also has certain peculiarities, which is explained by the strict formalisation of the programming languages used to write smart contracts. This leads to the fact that the terms of the contract in the smart contract must be expressed in conditional constructions[113]. Many standard terms can be structured in this way, but not all. At the moment, the program code cannot perceive abstract legal categories. Three conclusions follow from these premises:

1. The basis of the terms of smart contracts can be expressed in constructions «If - Then» which corresponds to the hypothesis and disposition in the structure of the legal norm.

2. There are contract conditions that cannot be stated in a programming language and, as a result, cannot be reflected in a smart contract. An example of such a condition is abstract categories such as reasonable time[114].

3. There are contract conditions that do not require execution, for example: preamble, description of the parties, choice of applicable law, and therefore they do not require expression in the programming language and can be entered into special blocks of smart contracts (similar to the comments of the program code) and used when interpretation, finding out the will of the parties, resolving disputes.

Therefore, although the content of a smart contract is not exhausted, it largely consists of encrypted code. On the one hand, it allows to raise the question of the possible transformation of

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[111] Cappiello Benedetta and Carullo Gherardo *Blockchain, Law and Governance.* Springer, 2021: 22

[112] Никита Лукоянов "Правовые аспекты заключения, изменения и прекращения смарт-контрактов." Юридические исследования, 2018, 11. https://mgimo.ru/upload/iblock/522/28115.pdf

[113] Никита Лукоянов "Legal tech: смарт-контракты сквозь призму современного частного права" Юридические исследования, 2018, 7. https://cyberleninka.ru/article/n/legal-tech-cmart-kontrakty-skvoz-prizmu-sovremennogo-chastnogo-prava

[114] Artzt Matthias and Richter Thomas *Handbook of Blockchain Law: A Guide to Understanding and Resolving the Legal Challenges of Blockchain Technology.* Wolters Kluwer, 2020: 133.

law in the future to simple algorithmic constructions, and, on the other hand, it provides for the evolution of the formation of lex electronica and lex cryptographia.

2.1.3. Interpretation

The issue of the content of a smart contract is closely related to its interpretation. The interpretation of a traditional contract is applied in order to fill its gaps. However, a smart contract, in contrast to a classical contract, differs in a higher degree of certainty, since the programming languages in which the terms of smart contracts are stated belong to the category of formal languages, and therefore the likelihood of a different interpretation of the content of the terms of a smart contract by the executor (computer) is practically excluded[115]. This makes it unnecessary to apply traditional means of treaty interpretation to it. So, any judge, as the main law enforcement officer, in the countries of Romano-Germanic law will seek to reveal the true will of the parties and find out whether the goal of concluding an agreement has been achieved by its execution[116]. In this case, a reasonable question arises: will the judge himself be able to understand and interpret the will of the parties, expressed in the code? This brings us back to the need to form a class of lawyers specialising in aspects of the emerging digital economy. In the Anglo-American legal tradition, the court will not be engaged in finding out the true will of the parties, since the interpretation is carried out using the fiction of understanding the contract by an average reasonable person - how would this reasonable person behave in a similar situation, and all the words, used in the contract are interpreted in their literal meaning[117]. In this situation, a similar question arises: how can an average reasonable person figure out a smart contract? In this regard, the general trend in the activities of states will be to increase the digital literacy of the population on a global scale.

2.1.4. Jurisdiction

It is also difficult to resolve the issue of the jurisdiction of legal relationship in a smart contract, especially when it comes to a transaction with assets that exist in the digital space - exchange of tokens for cryptocurrency. A complication of the issue of determining the law applicable to smart contracts may be due to the situation when a distributed ledger has network nodes

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[115] Bashir Imran *Mastering Blockchain: A deep dive into distributed ledgers, consensus protocols, smart contracts, DApps, cryptocurrencies, Ethereum, and more, 3rd Edition.* Packt, 2020.: 79.

[116] *Dispute Resolution. The Kleros Handbook of Decentralized Justice.* Kleros.IO, https://ipfs.kleros.io/ipfs/QmZeV32S2VoyUnqJsRRCh75F1fP2AeomVq2Ury2fTt9V4z/Dispute-Resolution-Kleros.pdf: 12

[117] Никита Лукоянов "Legal tech: смарт-контракты сквозь призму современного частного права" Юридические исследования, 2018-9. https://cyberleninka.ru/article/n/legal-tech-cmart-kontrakty-skvoz-prizmu-sovremennogo-chastnogo-prava

located in several jurisdictions: there will be no centralised register of registration of rights. In the absence of a clause on applicable law, a significant difficulty is the task of determining the applicable law, since the principle of the closest relation to the contract is not applicable due to the fact that information about the location of the parties to a smart contract, as well as who are these parties are often anonymised. According to the English theory, a contract's governing law can be: 1. a basis upon which jurisdiction is founded; 2. a factor in determining the comparative appropriateness of a particular court; or 3. a necessary precursor to identifying some other basis of jurisdiction (such as the contract's place of performance).[118] Therefore, relations regarding the conclusion, execution and termination of a smart contract are largely losing their connection with the state. Another problem arises in the situations where in the jurisdiction clause the reference is made to the law of the jurisdiction where there is no legal regulation of smart contracts and where cryptocurrency is not recognised as an object of civil law or is prohibited. In this regard, it is possible to predict two ways of developing conflict practice. The first can be conventionally referred to as a deliberate choice of jurisdiction. Therefore it is predictable that the parties will increasingly use their right to choose the applicable law in accordance with Art. 3 of the Rome I Regulation. Thus, in the long term, private international law will not only determine the law applicable to smart contracts, but also contribute to legal certainty, which facilitates the processes of reforming domestic legislation and ultimately lead to the improvement of legislation on smart contracts. And in this sense, we will observe the formation of a pool of jurisdictions that will become traditional for the regulation of smart contracts, which corresponds to the logic of the legal market and cross-border transactions. The second way is the development of non-state norms regarding the regulation of smart contracts and the choice by the parties of the relevant unofficial codifications as the applicable law. This path will be more effective if disputes arising from smart contracts are resolved through smart arbitration, blockchain arbitration and other non-state mechanisms.

2.1.5. Invalidation of the provisions

Of particular importance are the issues of invalidation of the provisions of smart contracts. Since they are executed automatically, it is possible to conclude such a contract for an object with limited circulation or directly prohibited by law, as well as with an unauthorised, underage or recognised incapacitated person. Often the parties are in good faith mistaken about the

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[118] «Smart contracts. Summary of call for evidence» Law Commission, December 17, 2020. https://s3-eu-west-2.amazonaws.com/lawcom-prod-storage-11jsxou24uy7q/uploads/2020/12/Smart-Contracts-summa-ry.pdf: 22

algorithms of the contract or are unaware of its hidden vulnerabilities[119] - under certain circumstances, this can be regarded as a deal made under the influence of delusion. In terms of structure and content, the obligation that forms the smart contract is a transaction. To avoid such situations a proper checking should be encrypted in the algorithms of the smart contract before its conclusion. Since the blockchain is distributed, the personal law of all participants in the smart contract is subject to equal application, and broadly interpreted, the right of the blockchain participant who sealed the transaction containing the smart contract in the blockchain is also applicable.[120]

2.1.6. Modification of the contract

In some cases, after the conclusion of the contract, it becomes necessary to modify it in connection with new circumstances or changed common will of the parties. The need to modify a smart contract may also be connected with a change in the applicable legal regulations. In this regard, when implementing smart contracts, it should be possible to adjust smart contracts, the execution of which is ongoing[121]. There are three ways to change a smart contract:

1) Terminate the current smart contract and conclude a new one with amended conditions;

2) Make changes to the program code of the smart contract without terminating it (if the device of the platform on which the smart contract is implemented allows such changes);

3) Obtain an update of applicable regulations from a special application programming interface library of contract law, created by government or individuals.

2.1.7. Performance

Legal facts important for the execution of smart contracts are recorded in a distributed ledger and processed by the smart contract program code. Therefore, if the conditions that govern the execution of a smart contract are met, it is automatically executed or, otherwise, the parties return to their original position (automatic restitution). Performance is the most legally desirable way of terminating a contractual obligation. The principle of pacta sunt servanda finds its highest expression in a smart contract, since after the conclusion of a smart contract, its execution does not depend on the will of the parties. The execution of a smart contract, like a tradi-

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[119] Елена Очкова "Можно ли законно получить $53 миллиона через смарт-контракт Ethereum" Июнь 21, 2016, Accessed 10 May https://vc.ru/16384-ethereum-law

[120] Роман Янковский "Проблематика правового регулирования децентрализованных систем на примере блокчейна и смарт-контрактов" Государственная служба, том 20, No 2. (2018): 64–68. https://cyberleninka.ru/article/n/problematika-pravovogo-regulirovaniya-detsentralizovannyh-sistem-na-primere-blokcheyna-i-smart-kontraktov

[121] Artzt Matthias and Richter Thomas *Handbook of Blockchain Law: A Guide to Understanding and Resolving the Legal Challenges of Blockchain Technology.* Wolters Kluwer, 2020.: 135

tional contract, can be carried out in full and in parts, which is recorded in a distributed ledger where the smart contract is deployed. The purpose of the contract is achieved only by proper performance, that is, performance that combines three parameters: a certain point in time, method and place. The due date is strictly controlled by the program code, both the delay and the performance are recorded in the distributed registry. The way a smart contract is executed is limited by its environment, however, it may be possible in the future to significantly expand the ways of execution by including execution information from the external environment in the distributed ledger[122]. These means that the decentralised consensus decision-making system has its limitations and is not universal and is operable only in those transactions that are carried out within the blockchain and affect only such information that is in the blockchain[123]. An example of how a consensus algorithm works is the execution of a smart contract that makes one cryptocurrency transaction dependent on another. Information about both transactions is inside the blockchain, and no additional data is required. A different situation arises when the execution of a smart contract is made dependent on an external factor[124]. For example, it contains payment for the delivery of goods under the transportation contract. The difficulty in such a contract may be the mechanism for determining the fact of delivery and checking the quality of the goods. Although these actions can be automated - for example, automatic tracking of a sea container and checking the quality of goods with a neural network based on video data, they still have a certain vulnerability: interference, targeted hacking, or misinterpretation of such information will terminate the execution of the smart contract.[125] On the other hand, the consensus systems applied in blockchains will also become more sophisticated over time. The place of execution of a smart contract can be discussed conditionally, since smart contracts are limited to the cyberspace. However, over time, the space for the implementation of smart contracts may go beyond the

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[122] Bashir Imran *Mastering Blockchain: A deep dive into distributed ledgers, consensus protocols, smart contracts, DApps, cryptocurrencies, Ethereum, and more, 3rd Edition.* Packt, 2020.: 82

[123] Cappiello Benedetta and Carullo Gherardo *Blockchain, Law and Governance.* Springer, 2021: 25

[124] Jeffrey D. Neuburger, Wai L. Choy, and Kevin P. Milewski «Smart Contracts: Best Practices» Practical law, Thomson Reuters (2019). https://prfirmpwwwcdn0001.azureedge.net/prfirmstgacctpwwwcdncont-t0001/uploads/dc2c188a1be58c8c9bb8c8babc91bbac.pdf

[125] Роман Янковский "Проблематика правового регулирования децентрализованных систем на примере блокчейна и смарт-контрактов" Государственная служба, том 20, No 2. (2018): 64–68. https://cyberleninka.ru/article/n/problematika-pravovogo-regulirovaniya-detsentralizovannyh-sistem-na-primere-blokcheyna-i-smart-kontraktov

digital sphere.[126] The termination of smart contracts by virtue of the law and decisions of state courts and other jurisdictional bodies is possible if the participants of the distributed register are subordinated to the jurisdiction of the state and these bodies are given appropriate powers - rights of a network administrator. However, distributed ledgers, based on the principle of voluntary association of enthusiasts from all over the world, were created in response to what they saw as excessive governmental regulation in order to move away from state jurisdiction into a space where state power does not have an effective enforcement mechanism[127]. There is pure self-regulation within the distributed ledger, which is supported by the participants themselves based on the principles and beliefs laid down in the construction of the distributed ledger system. Such a situation can lead to the impossibility of executing decisions of state bodies, and gives rise to the problem of ineffectiveness of the state mechanism of law enforcement in cyberspace.

2.1.8. Protection of the weak side

Another point is worth of attention. As noted by A. Savelyev, the computer is "indifferent" to the fundamental legal principles of law, such as legality, justice, protection of the weak side. Instead, certainty and efficiency become the main principles of forming the terms of the contract[128]. According to scientist, smart contracts do not provide protection for the weak side of a legal relationship, for example, a consumer or employee. It is argued that the legal provisions of consumer protection legislation and protection against unfair contractual terms do not apply to a smart contract. At the same time, smart contracts can provide consumers with additional leverage to protect their interests. Currently, consumers have no real choice about how to conclude or not conclude an agreement, what conditions to include in it. Even if a person understands these conditions, he does not have the negotiating power to change them. If he decides to switch to another seller, the result will be the same. With all the complexity of the judicial protection of the parties to a smart contract, the courts must react to the gross violations of the parties during its conclusion and execution, regardless of the correctness or incorrectness of the technical programs.[129] In particular, it is possible to apply the principle of good faith to the relations of the

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[126] Никита Лукоянов "Правовые аспекты заключения, изменения и прекращения смарт-контрактов." Юридические исследования, 2018, 11. https://mgimo.ru/upload/iblock/522/28115.pdf

[127] Bashir Imran *Mastering Blockchain: A deep dive into distributed ledgers, consensus protocols, smart contracts, DApps, cryptocurrencies, Ethereum, and more, 3rd Edition.* Packt, 2020.: 88

[128] А. Савельев "«Умные» контракты как начало конца классического договорного права." Договорное право 2.0, (2016):16–17.

[129] А.А. Волос "Некоторые проблемы защиты прав и законных интересов сторон смарт-контракта" Пермский юридический альманах 2, 2019: 396-402. https://www.elibrary.ru/item.asp?id=38548911

parties. The introduction into civil legislation of the criteria of good faith as applied to the law of obligations can remove the problem of the unpredictability of court decisions when applying the principle of good faith[130]. A special case of the application of the principle of good faith to the situation with smart contracts can be the contra proferentem principle, which assumes that if the terms of the contract are unclear and it is not possible to establish the actual general will of the parties to the contract, this condition is interpreted by the court in favour of the counter-party of the party who prepared a draft agreement or proposed the wording of an unclear condition.[131] With regard to the situation under consideration, that means that the subject responsible for the preparation of the program that created the programmed agreement bears the risk of ambiguity of certain provisions of the agreement. In particular, there has long been a practice of recognising as concluded and valid "clickwrap" agreements, according to which consumers on any site acquire a special button "I accept the agreement" introduced in Hill v. Gateway 2000, Inc., 105 F .3d 1147, 1150 (7th Cir. 1997). However, in some situations, when determining whether there was an agreement, the courts scrutinised whether the consumer received a notice of the terms of the agreement before agreeing to it as in case Inc. v. Verio, Inc., 356 F.3d 393, 403 (2d Cir. 2004). In addition, the use of the website to conclude a contract without explicit notification of the terms of use, which was simply posted on the home page, is also considered insufficient acceptance of these terms, especially if the consumer is a party to the contract (Ticketmaster Corp. v. Tickets.-com, Inc., No. CV-997654, 2003 WL 21406289 (CD Cal. Mar. 27, 2000)). The courts establish whether a party to the contract was given the necessary notification of its provisions, take into account how clearly the contractual obligations follows from the relations of the parties. However-er, past business relationships and industry practices may be relevant (Schnabel v. Trilegiant Corp., 697 F.3d 110, 121–22 (2d Cir. 2012)). For example, the US court held the insurance company responsible for the computerised recovery of the insurance policy, citing the following: "The computer operates only in accordance with the information and instructions provided by its

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[130] В. Голубцов "Принцип добросовестности как элемент правового механизма стимулирования должника к надлежащему исполнению обязательств и гарантирования интересов кредиторов: анализ судебно-арбитражной практики" Вестник Пермского университета. Юридические науки. Выпуск 32.П. 183. 2016: 175-184. https://cyberleninka.ru/article/n/printsip-dobrosovestnosti-kak-element-pravovogo-mehanizma-stimulirovaniya-dolzhnika-k-nadlezhaschemu-ispolneniyu-obyazatelstv-i

[131] А.А. Волос "Некоторые проблемы защиты прав и законных интересов сторон смарт-контракта" Пермский юридический альманах 2, 2019: 396-402. https://www.elibrary.ru/item.asp?id=38548911

human programmers. If the computer does not think like a man, it is man's fault " (State Farm Mut. Auto. Ins. Co. v. Bockhorst, 453 F.2d 533 (10th Cir. 1972)).[132]

2.1.9. Liability

Liability in terms of smart contracts surely contain liability for breach and non-contractual liability. Although, the main rules on liability require adaption when applied to smart contracts. As an example of non-contractual liability can be seen the situation when a party is liable for damages whenever acting negligently or breaching a reasonable duty of care. Due to smart contracts specifies it can be seen in routine technical infractions or due to the issues, arising from the specifies of the platform, for example, security breaches caused by failure to update software, identity theft, cybersecurity risks, etc[133]. Although it is worth noticing that a breach of the "duty of care" is very hard to prove in the software environment and current liability regimes governing intentional misconduct, negligence, and strict liability align poorly with algorithms and automated contracts.[134]

In respect of obligations from a smart contract, protection measures such as bilateral restitution, as well as compulsion to fulfil the obligation in kind, can be applied. The reverse transaction mechanism, which is provided in a smart contract, allows for two-way restitution. It is used in cases when execution was made from a smart contract, but an error was found in the contractual terms from the smart contract. Such a means of protection of rights as compulsion to fulfil an obligation in kind can be applied in cases where the failure was committed as a result of a technical error committed at the conclusion of the contract.[135] The peculiarities of the automated performance of obligations are manifested in the fact that the obliged party does not affect performance and cannot be held liable for software failures and errors in performance of the obligation. In this case, either an incident is possible when no liability arises, or tort liability of a party for deliberately changing the operation of technical devices.[136]

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132 «Smart Contracts: 12 Use Cases for Business & Beyond» Smart Contracts Alliance in collaboration with Deloitte, the Chamber of Digital Commerce, December 2016

133 "Smart contracts: Is the Law Ready?» Smart Contracts Aliance, Chamber of digital commerce, 2018. https://digitalchamber.s3.amazonaws.com/Smart-Contracts-Whitepaper-WEB.pdf

134 Yadav Yesha "The Failure of Liability in Modern Markets" Virginia Law Review Association, Vol. 102:1031 (2016). https://www.virginialawreview.org/wp-content/uploads/2020/12/Yadav_Online.pdf

135 Е.В. Сомова "Смарт-контракт в договорном праве" Журнал зарубежного законодательства и сравнительного правоведения No 2 (2019): 81. https://cyberleninka.ru/article/n/smart-kontrakt-v-do-govornom-prave

136 Mik E. "Smart Contracts: Terminology, Technical Limitations and Real World Complexity" Law, Innovation and Technology, no. 9, p. 10. (2017)

2.1.10. Force Majeure

Parties also should consider drafting force majeure concepts into their written code, which will be alble to recognize specified force majeure events through oracles and provide for the suspension of performance on the detection of a force majeure event in the smart contract environment. The parties should determine who will be responsible if the smart contract is penetrated by an unauthorized third-party; whether the smart contract should contemplate a reversion to a traditional contract system in the event of technology failure.[137]

To sum up, in view of the above difficulties in the application of law the recommendation for the smart contract drafting should include the precise reference in the code of such provisions:

• Governing law,

• Jurisdiction,

• Dispute resolution,

• Force majeure,

• Amendment procedure,

• Risk allocation,

• Indemnification and other remedies for: coding errors or oversights; erroneous oracles or external data sources; or other technological failings,

• Remedies in case of technology failure or error.

2.2 Confidentiality Protection
2.2.1. Legal means of the confidentiality protection under GDPR

The EU General Data Protection Regulation ("GDPR") started to apply in May 2018 has brought significant changes to EU data privacy rules impacting DLT-based systems[138]. The GDPR rules apply in the context of storing and processing personal data – i.e., information relating to an identified or identifiable natural person, such as a name or details of a transaction in which they have engaged. Depending on the situation, this could be, for example, name, address, job data, email or IP address. Interestingly, even a public key, provided that, together with other

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[137] Jeffrey D. Neuburger, Wai L. Choy, and Kevin P. Milewski «Smart Contracts: Best Practices» Practical law, Thomson Reuters (2019). https://prfirmpwwwcdn0001.azureedge.net/prfirmstgacctpwwwcdncont0001/uploads/dc2c188a1be58c8c9bb8c8babc91bbac.pdf

[138] Clifford Chance «Smart contracts: legal framework and proposed guidelines for lawmakers» European Bank for Construction and Development, 2018. https://www.ebrd.com

information, it helps to identify an individual, can be personal data according to the GDPR[139]. Although, the information that does not allow to identify an individual will not be considered as personal data. Therefore, the GDPR will not apply to projects that do not fall under the criteria of Article 3 of the GDPR and do not process personal data as understood in paragraph 1 of Article 4 of the GDPR.

According to the GDPR personal data subject is any person who is located in the EU, whose personal data is being processed, processing of personal data means any actions with personal data, including the collection of data, their use and transfer. The GDPR requirements applies if certain requirements are met[140]: if a company is a resident of the EU at the moment of processing personal data regardless of where the data is actually processed. If the companies registered outside the European Union, the Regulation applies to them only if they process personal data of entities located in the Union, and provided that such companies offer their goods or services or monitor the behaviour of the entities in the EU. The same rules apply to individuals, but on condition that the processing of personal data is related to professional or commercial activities (i.e., it is not carried out exclusively for personal purposes). The Regulation defines two key roles in data operation: operators and processors of personal data[141]. The operator is the person who determines how and why personal data is collected and processed. From the point of view of the blockchain, an operator can be considered a user who enters personal data into the blockchain. This is due to the fact that such a user independently decides to use the blockchain as a way to process data. Processor - a person who performs any actions with personal data at the direction of the operator and in his interests. From the point of view of the blockchain, a processor can be considered a miner who confirms a transaction with data on the network, as well as the owner of a smart contract that processes personal data[142].

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[139] Илья Шенгелия и Сергей Островский "Как работать с Blockchain в эпоху GDPR и защиты персональных данных" LawGeek by Aurum, April 15, 2019 https://medium.com/lawgeek-by-aurum/how-to-blockchain-in-gdpr-era-71e2759c63e3

[140] "Regulation (EU) 2016/679, on the protection of natural persons with regard to the processing of personal data and on the free movement of such data" (2016) Accessed 10 May 2021 https://eur-lex.europa.eu/legalcontent/EN/TXT/?uri=celex%3A32016R0679

[141] Віктор Бойко і Микола Василенко "Кібербезпека та захист персональних даних в ЄС: проблеми цифрового суспільства" Наукові праці НУ ОЮА, 2019: 34-47. http://dspace.onua.edu.ua/handle/11300/12580?locale-attribute=en

[142] Илья Шенгелия и Сергей Островский "Как работать с Blockchain в эпоху GDPR и защиты персональных данных" LawGeek by Aurum, April 15, 2019 https://medium.com/lawgeek-by-aurum/how-to-blockchain-in-gdpr-era-71e2759c63e3

The regulation provides subjects with an extensive set of rights, some of which can be easily implemented on the blockchain, for example, "the right to access" and "the right to transfer". The subject also has the right to demand the deletion or change of data about him, or completely prohibit their processing, which is contrary to the principles of blockchain operation. The task becomes technically impossible if the data is entered into a public Blockchain[143]. The GDPR guarantees subjects the right to human intervention in the processing of data that is processed automatically, for example, when the subject believes that the algorithms are not working properly with the data. In addition, the subject has the right to express his own point of view and challenge the decisions made. Smart contracts, which are an integral part of some blockchains (the most famous is Ethereum), may violate these rights, since full automation excludes the possibility of human intervention in the work of the contract or changes to the data[144]. Also, data transfers outside the European Union are only permitted to countries with an adequate level of personal data protection. For the transfer of data to other countries in relation to each recipient of data, it is necessary to use additional protection measures, for example, to conclude an agreement on the processing of personal data with Standard Contractual Clauses[145]. In the case of a public blockchain, these requirements cannot be met. In the case of a private blockchain, the simplest solution to this problem may be to restrict access to the network for individuals who are not in the EU or one of the countries with an adequate level of data protection. Otherwise, entering data into the blockchain is highly likely to violate the requirements of the GDPR[146].

According to the principle of limited storage, personal data should not be stored longer than is actually necessary for the purposes of their processing[147]. For example, if you have collected data in order to fulfill a contract, after the termination of the contract or the expiration of the statutory minimum retention period, the data must be deleted or anonymised. Therefore, in

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[143] Reidenberg Joel R., O*n-live services and data protection law; regulatory responses.* Office of Official Publications of the European Commission, 1998: 4

[144] Віктор Бойко і Микола Василенко "Кібербезпека та захист персональних даних в ЄС: проблеми цифрового суспільства" Наукові праці НУ ОЮА, 2019: 34-47. http://dspace.onua.edu.ua/handle/11300/12580?locale-attribute=en

[145] Van Eecke Patrick, Fehringer Sabine, Rataj Jan and Umhoefer Carol A. F «Data protection laws of the world» DLA Piper. https://www.lexology.com/library/detail.aspx?g=1a6e9e6c-affc-4e40-9270-7256ac9cf2a4: 22

[146] Александр Николайчук "Эксперты рассказали сможет ли GDPR убить блокчейн", Digital.Report, 2018. https://digital.report/ekspertyi-rasskazali-smozhet-li-gdpr-ubit-blokcheyn

[147] Reidenberg Joel R., O*n-live services and data protection law; regulatory responses.* Office of Official Publications of the European Commission, 1998: 7

the case of processing personal data using blockchain technology, it is necessary to have a real possibility of subsequent deletion or anonymization. It is prohibited to process data without reason. The most common grounds for data processing are the consent of the subject, the fulfilment of a contract or the legitimate interest of the operator[148]. The latter allows the operator to process data without the consent of the subject if he believes that his legitimate interest for processing outweighs the fundamental rights and freedoms of the subject.

Consequently, while working with personal data, the company must independently determine a specific list of measures that will allow it to be 'GDPR compliant'. In any case not to enter personal data into the public blockchain. The private blockchain, with the right approach, still allows to meet the requirements of the Regulation. Unless this is a real necessity, it is not necessary to enter personal data into the blockchain at all, at least in a "pure" form. For example, it is possible to use one of the following solutions[149]: 1. Commitment scheme. Data is entered into the blockchain in the form of a commit, which cannot be read without a key. 2. Hashing. Personal data is hashed, and only a hash is entered into the blockchain, confirming the correctness of the data and its existence. 3. Encryption. Data is entered into the blockchain in encrypted form and cannot be read without a key. 4. Anonymization of data. GDPR does not apply to anonymised data, so this can be a great solution for a blockchain project. It should be noted that quite high requirements are put forward for anonymization.

In the case of hashing, to delete data, it will be enough to delete the external data source, without which the hash does not matter. In the case of commitment and encryption, deleting data is equivalent to deleting a key that allows you to read data written to the network. In addition, to minimize risks in working with personal data, you can use the 'zero-knowledge proof' and 'secure multi-party computation' protocols, which allow to check the correctness of data without providing access to the data itself[150]. Summing up, not all projects using blockchain fall under the GDPR, and given existing technologies, blockchain may well be used to store personal data in accordance with the requirements of the GDPR. At the same time, most likely, both the legis-

[148] Van Eecke Patrick, Fehringer Sabine, Rataj Jan and Umhoefer Carol A. F«Data protection laws of the world» DLA Piper. https://www.lexology.com/library/detail.aspx?g=1a6e9e6c-affc-4e40-9270-7256ac9cf2a4

[149] Илья Шенгелия и Сергей Островский "Как работать с Blockchain в эпоху GDPR и защиты персональных данных" LawGeek by Aurum, April 15, 2019 https://medium.com/lawgeek-by-aurum/how-to-blockchain-in-gdpr-era-71e2759c63e3

[150] Александр Николайчук "Эксперты рассказали сможет ли GDPR убить блокчейн", Digital.Report, 2018. https://digital.report/ekspertyi-rasskazali-smozhet-li-gdpr-ubit-blokcheyn

lation (in particular the GDPR) and the blockchain will evolve and be refined to comply with each other.

2.2.2. Technological means of the confidentiality protection under the Hawk and the Enigma platforms

Another problem regarding the widespread use of smart contracts is the high risk of fraudulent actions that can be committed to the detriment of participants in such transactions. Therefore, with the use of smart contracts, cybersecurity issues become a priority. In 2016, the Decentralised Autonomous Organization (DAO) announced that the hacker had exploited a vulnerability in the Ethereum platform that uses blockchain, causing a total damage of about $ 150 million[151]. But the disadvantage was not in the blockchain platform itself, but in the presence of a loophole in the code of a smart contract, so the hacker managed to create a recursive sending of money in the contract. Despite the fact that in this particular case, the platform that uses the blockchain was beyond suspicion, the question of ensuring the reliability of its operation remains open. As an infrastructure framework for many smart contract applications, it must meet the increased requirements for reliability, continuity and resilience, as well as resilience to cyber threats. It is known that each node in the blockchain network stores huge amounts of the same data and, depending on the application of the blockchain, some of this data can be classified as personal data, which creates some difficulties with law enforcement in terms of preventing unauthorised and illegal processing of personal data and prevention of their accidental loss or destruction, as well as in terms of meeting the legal requirement for their removal[152].

Owing to numerous studies in the field of confidentiality when concluding smart contracts, many universities and research centres have launched the first projects implementing the confidentiality technology in recent years[153]. Currently the most widespread are tho the main ideas implemented in the most interesting projects - the Hawk platform, created on the basis of the Maryland and Cornell Universities (USA), and the Enigma platform, implemented by researchers from the Massachusetts Institute of Technology (USA).

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[151] K. Panetta "Why Blockchain's Smart Contracts Aren't Ready for the Business World" Gatner, June 26, 2017. Accessed May 10, 2021 http://www.gartner.com/smarterwithgartner/why-blockchains-smart-contracts-arent-ready -for-the-business-world

[152] L. Russell "Training and knowledge, features and articles. Blockchains: The legal landscape" Blakemorgan, December 5, 2016. https://www.blakemorgan.co.uk/training-knowledge/features-and-articles/blockchains-legal-landscape/

[153] А. А. Баринова, С. В. Запечников "Методы и средства обеспечения конфиденциальности смарт-контрактов" IT Security, Volume 24, No 2 (2017): 18. https://bit.mephi.ru

The main idea behind the Hawk confidential smart contract platform is to translate a common smart contract program into a cryptographic protocol of user interaction with a distributed ledger using its own compiler, which consists of two parts: open and closed[154] . The private part directly interacts with user data, and also performs calculations to determine payments between the parties to the contract. Its main function is to ensure the security of user data, as well as cash flows. The open source software part does not interact with user data. The execution of the smart contract program is controlled by a special party, called a manager, who has access to user input data and is obliged not to disclose it. However, it is very important to note that even if the manager arbitrarily deviates from the protocol execution or colludes with one of the parties, he cannot influence the correct execution of the contract. If the manager terminates the contract, he will be financially punished[155]. Each program on the Hawk platform uses a special timer, which determines the time and sequence of events. The confidentiality of contracts on the Hawk platform is ensured through the following features[156]:

1. The confidentiality of the data of each individual contract in relation to the external environment is ensured. Despite the fact that the parties to the contract exchange data with the registry, cash flows and transaction data from the closed part of the contract program are protected from the external environment by cryptographic methods. Encrypted information is sent to the distributed ledger, and a zero-knowledge proof ensures compliance with the correct execution of the contract and interaction with data[157].

2. Confidentiality of data is ensured within one contract. The Hawk platform assumes that the parties to the contract are protecting their own financial interests. In particular, they can arbitrarily deviate from a particular protocol or terminate the contract prematurely.[158] At the same time, Hawk ensures not only the confidentiality and authenticity of user data, but also finan-

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[154] Ahmed Kosba, Andrew Miller, Elaine Shi, Zikai Wen and Papamanthou Charalampos "The Blockchain Model of Cryptography and Privacy-Preserving Smart Contracts" University of Maryland (2016): 17

[155] Guy Zyskind, Nathan Oz, Alex Pentland "The Blockchain Model of Cryptography and Privacy-Preserving Smart Contracts" MIT Living Lab. (2015): 3

[156] А. А. Баринова, С. В. Запечников "Методы и средства обеспечения конфиденциальности смарт-контрактов" IT Security, Volume 24, No 2 (2017): 19. https://bit.mephi.ru

[157] Wenbo Mao Hewlett, *Modern cryptography: theory and practice* (Prentice Hall PTR, 2005), http://index-of.co.uk/Hacking-Coleccion/Modern%20Cryptography%20-%20Theory%20&%20Practice.pdf.: 33

[158] Kosba Ahmed, Miller Andrew, Shi Elaine , Zikai Wen, Papamanthou Charalampos "Hawk: The Blockchain Model of Cryptography and Privacy-Preserving Smart Contracts» University of Maryland and Cornell University https://eprint.iacr.org/2015/675.pdf: 43

cial fairness in case of interruption of transactions. This is achieved using a special mechanism for returning funds after reaching certain time stamps[159].

Enigma platform is a platform that is positioned by developers as a distributed computing platform with guaranteed confidentiality[160]. The main properties that the platform provides are as follows[161]:

1. Confidentiality with the help of secure distributed computing (sMPC - secure multi-party computation), work with data on this platform is carried out without the participation of a trusted third party at all. Data is shared between network nodes, and they perform operations only with their part of the data, which is only a meaningless fragment[162].

2. Scalability. Unlike the traditional form of a distributed ledger, the computations required to fulfil a contract are not duplicated at every node in the network, the data involved in the execution of the contract are not duplicated repeatedly. It allows the Enigma platform to perform calculations on encrypted contract data without access to plain text. The interpreter divides the process of executing a confidential contract, allowing to reduce execution time while maintaining confidentiality[163]. Enigma's proprietary data warehouse interacts with the distributed ledger using secret sharing and distributed computing schemes. To do this, a Distributed Hash Table (DHT) is used outside the blockchain, which is accessible through the registry. In this case, the registry no longer stores the data itself, but links to them. Personal data must be encrypted on the client side before interacting with the storage and executing access protocols. At the network level, the storage operates using the Kademlia DHT protocol[164] using broadcast communication channels and public key encryption schemes. A network built on the basis of Enigma can execute code without leaking the original data to any network node using a lin-

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[159] Guy Zyskind, Nathan Oz, Alex Pentland "The Blockchain Model of Cryptography and Privacy-Preserving Smart Contracts" MIT Living Lab. (2015): 6

[160] «Enigma: Decentralized Computation Platform with Guaranteed Privacy» Accessed May 10, 2021, http://enigma.media.mit.edu/enigma_full.pdf

[161] А. А. Баринова, С. В. Запечников "Методы и средства обеспечения конфиденциальности смарт-контрактов" IT Security, Volume 24, No 2 (2017): 20. https://bit.mephi.ru

[162] «Enigma: Decentralized Computation Platform with Guaranteed Privacy» Accessed May 10, 2021, http://enigma.media.mit.edu/enigma_full.pdf

[163] «Blockchain Enigma. Paradox. Opportunity» Accessed May 10, 2021, https://www2.deloitte.com/content/dam/Deloitte/uk/Documents/Innovation/deloitte-uk-blockchain-full-report.pdf

[164] «Decentralized networks: Kademlia DHT protocol» Accessed May 10, 2021, https://habrahabr.ru/post/107342/

ear secret sharing scheme[165]. For secure distributed computing, it is necessary that each node in the network interacts with another with communication complexity and with a constant number of rounds. In the case of linear secret sharing schemes, this computational complexity is mainly due to multiplication operations, while addition operations can be performed in parallel, without data exchange[166]. Enigma's proprietary data warehouse interacts with the distributed ledger using secret sharing and distributed computing schemes. A Distributed Hash Table (DHT) is used outside the blockchain, which is accessible through the registry. In this case, not the data itself is stored in the registry, but links to them. Personal data must be encrypted on the client side before interacting with the storage and executing access protocols[167].

Comparison of the two platforms of confidential smart contracts Hawk and Enigma allows us to draw the following main conclusions[168]:

1. The Zero-knowledge proof mechanism used by the Hawk platform is more suitable for use as a means of ensuring confidentiality compared to the linear secret sharing scheme in combination with secure distributed computing on the Enigma platform, since Zero-knowledge proof is a widely approved and easily implemented cryptographic primitive.

2. The basic scheme of creating and executing a contract in the Hawk and Enigma implementations is the same: the contract is programmed, cryptographic and other protocols for its implementation and user interaction are created, after which it is executed. However, the methods used differ at each step in this process. In the Hawk schema, the contract after creation is executed in a distributed ledger, while in the Enigma schema the contract is executed in a distributed manner and in two places: the distributed ledger and the Enigma store. At the stage of implementation of the Hawk contract, a special network participant plays an important role - a manager who ensures the correct execution of the contract, conducts basic operations with cryptocurrency, sends user data to a distributed registry and receives data from it. In the Enigma platform, the execution of the contract and the guarantee of its correct execution is

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[165] «Blockchain Enigma. Paradox. Opportunity» Accessed May 10, 2021, https://www2.deloitte.com/content/dam/Deloitte/uk/Documents/Innovation/deloitte-uk-blockchain-full-report.pdf

[166] «Enigma: Decentralized Computation Platform with Guaranteed Privacy» Accessed May 10, 2021, http://enigma.media.mit.edu/enigma_full.pdf

[167] «Shamir's Secret Sharing Scheme» Accessed May 10, 2021, http://point-at- infinity.org/ssss/ (

[168] А. А. Баринова, С. В. Запечников "Методы и средства обеспечения конфиденциальности смарт-контрактов" IT Security, Volume 24, No 2 (2017): 22. https://bit.mephi.ru

ensured through distributed computing and a special protocol that accompanies such calculations[169].

3. Unlike the data storage scheme in the Hawk platform, the Enigma scheme does not imply standard data storage - duplication of registry data for each network member. This fact allows to increase the performance of the Enigma platform due to the scheme for accessing data through a distributed ledger and a distributed hash table.

4. Unlike the Enigma platform, contracts on the Hawk platform can be programmed and maintained by people with no knowledge of cryptography and programming.

5. Financial equity is achieved in both schemes. The Hawk platform uses special time stamps and timers for this, which determine the events in the system and control the occurrence of new ones. The Enigma platform implements these characteristics through distributed computing.

2.3 Dispute Resolution Under Smart Contract

Despite the noted advantages of a smart contract in terms of the automated execution of contractual obligations, it is difficult to imagine that the smart contracts being concluded will not become a source of disagreements and disputes between the parties. It should be noted that the likelihood of such situations will be lower than that of traditional contracts, but according to experts, by 2025 the number of such disputes will increase 40 times[170]. Consequently, the question arises about the ways of resolving such disputes. If we admit the possibility of challenging them on the same grounds as for contracts in electronic form, we will inevitably face a lack of real leverage to enforce the contract and mechanisms for restitution under smart contracts. In this regard, some researchers talk about the "tokenisation" of law (when the existence of a right is determined by technology, and not vice versa)[171]. If the reversibility of smart contracts is ensured, then they will lose the advantage of automatic and unconditional execution. Of course, it cannot be argued that the problem of challenging smart contracts is fundamentally insoluble. The impossibility of executing a court decision is not a unique situation for civil law: for example, it is impossible to demand the transfer of a destroyed thing or to enforce an obligation related to the identity of the debtor. In fact, it is impossible to make a demand for compulsion to perform a

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[169] А. А. Баринова, С. В. Запечников "Методы и средства обеспечения конфиденциальности смарт-контрактов" IT Security, Volume 24, No 2 (2017): 22. https://bit.mephi.ru

[170] «According to experts, by 2025 the number of the disputes related to cryptocurrency will increase 40 times» Russian Union of Industrialists and Entrepreneurs Accessed 10 May https://ff.ru/4134 05.06 .2019

[171] А.И. Савельев "Некоторые риски токенизации и блокчейнизации гражданско-правовых отношений" Закон № 2, 2018: 36-5

corporate procedure[172]. The implementation of the demand, the fulfilment of which is impossible without the assistance of the debtor, can be provided by astrent, or the demand itself can be transformed into monetary.[173] Another issue is that because the Court will have to deal with not only legal, but also technical issues, which will create problems for both the court itself and the parties to the case, which is weaker in terms of technical capabilities. Secondly, some jurisdictions may not recognise in their legislations smart contracts and blockchain technology and therefore, if the choice of law or the rules of the private law will refer parties to such a jurisdiction with lack of legal framework, the parties will not be able to obtain sufficient protection of their rights by law. Thirdly, it should also be noted that usually judiciary has a heavy burden. For example, in Ukraine since the beginning of 2018, the Unified state register has received about 65,250 disputes arising from labor relations[174]. And this is not taking into account the cases when citizens did not apply for protection of their rights due to the cost of court fees, time constraints, etc. The process of dispute resolution under the judicial system is very timely, expensive and therefore impossible to provide for efficient protection. On the other side, if the parties decide to proceed the case in the arbitration institutions, the parties should make sure that they can establish the arbitration agreement, which may be a problem in circumstances where a smart contract is entered by a computer, is in code and does not create a legally binding contractual obligation under applicable law. It is also important to agree on a place for arbitration to avoid disputes regarding applicable location and procedural law. The parties should check that the legislation of the chosen location does not make the Smart Contract illegal or unenforceable and that the codified arbitration agreement in the question will be supported and executed by supervisory courts.

2.3.1. Off-chain arbitration

A possible ways to resolve disputes from smart contracts can be settlement of disputes by traditional arbitration institutions (off-chain arbitration) or creation of new mechanisms specifically designed to resolve disputes arising in a global decentralised environment - blockchain ar-

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[172] А.А. Телешинин и Р.М. Янковский "Вопросы понуждения к исполнению корпоративного договора" Акционерное общество No 12. (2017): 168–173. https://ao-journal.ru/journal/lib/ejournal/detail/ArticleID/1371/voprosy-ponuzhdenija-k-ispolneniju-korporativnogo-dogovora

[173] Роман Янковский "Проблематика правового регулирования децентрализованных систем на примере блокчейна и смарт-контрактов" Государственная служба, том 20, No 2. (2018): 64–68. https://cyberleninka.ru/article/n/problematika-pravovogo-regulirovaniya-detsentralizovannyh-sistem-na-primere-blokcheyna-i-smart-kontraktov

[174] Мамченко Наталья "Про що каже статистика: Касаційний цивільний суд ВС підбив підсумки за 2018 рік по всій юрисдикції" Судебно-юридическая газета Публыкации, 2019. Accessed 10 May 2021 https://sud.ua/ru/news/publication/134669-pro-scho-kazhe-statistika-kasatsiyniy-tsivilniy-sud-vs-pidbiv-pidsumki-za-2018-rik-po-vsiy-yurisdiktsiy

bitration (on-chain arbitration).[175] Special arbitration institutions on the Internet (Online dispute resolution) have a sufficient level of understanding of the specifics of relations on the Internet, in connection with which Internet users trust the decisions of such bodies, and the time and cost of resolving disputes are significantly reduced.

In the first case Smart contracts can operate within the framework of existing legal regulation, and disputes arising from them are subject to international commercial arbitration, acting according to the usual rules and regulations. At the same time, either a specialised arbitration institution is created to resolve digital disputes, or a corresponding collegium is formed within the framework of an already existing arbitration institution. For example, in 2018, an Arbitration Centre at the Chamber of Commerce for Blockchain and New Technologies was created in Poland, whose activities are aimed at resolving disputes related to digital technologies.[176] Disputes in this arbitration are settled on the basis of the 2019 Rules[177], which in many ways resembles the standard arbitration rules. A prerequisite for resolving a dispute is the existence of an arbitration agreement concluded in writing, and the dispute resolution process itself is carried out according to the standard arbitration scheme: in the event of a dispute, the party who considers its rights violated files a claim with the Arbitration Centre. The dispute is herd by the arbitrators elected by the parties, who must remain impartial and independent throughout the proceedings. After the formation of the arbitral tribunal, the parties exchange procedural documents, to which certified copies of all necessary documents and evidence are attached. If necessary, it is possible to appoint an emergency arbitrator or to take interim measures. The decision made by the arbitrators is final and not subject to revision. Although, the proceedings in this Arbitration Centre have some peculiarities. Firstly, the number of arbitrators hearing a dispute in typical proceedings is limited to 1 or 3 arbitrators, in case of dispute consisting blockchain it is possible to form a composition of 5 or 7 arbitrators. Secondly, unlike traditional arbitration, where the hearing ends without the announcement of the decision, which is subsequently sent to the parties, here, upon completion of the hearing, the arbitrators are obliged to announce the decision, as well as to

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[175] Szczudlik K. "On-chain and off-chain arbitration: Using smart contracts to amicably resolve disputes" Newtech.law, June 4, 2019. https://newtech.law/en/on-chain-and-off-chain-arbitration-using-smart-contracts-to-amicably-resolve- disputes/

[176] The Court of Arbitration of the Polish Blockchain and New Technology Chamber of Commerce Accessed 10 May 2021 https:// blockchaincourt.org/ 26.08.2019

[177] «The Rules of the Court of Arbitration of the Polish Blockchain and New Technology Chamber of Commerce» Accessed 10 May 2021 https://blockchaincourt.org/ 26.08.2019

voice its main motives. The text of the decision is sent to the parties in writing within two weeks from the date of its announcement.

The same approach includes the creation of specialised boards in the already existing arbitration institutions of general competence. For example, in 2018, the Arbitration Centre under the Russian Union of Industrialists and Entrepreneurs announced the creation of a Digital Economy Dispute Board[178], whose competence includes, among other things, disputes arising from smart contracts, including using information systems based on a distributed ledger - blockchain.[179] In the absence of special rules, the proceedings on such disputes will be conducted according to the Regulation on the Arbitration Centre at the Russian Union of Industrialists and Entrepreneurs[180]. Similarly, in 2018, an arbitration institute of general competence was created in Uzbekistan - the Tashkent International Arbitration Centre under the Chamber of Commerce and Industry of the Republic of Uzbekistan, whose competence also includes disputes related to new technologies[181]. As in the Arbitration Centre at the Russian Union of Industrialists and Entrepreneurs, there are no special rules in this arbitration to resolve digital disputes. As a consequence, such disputes will be handled according to the general rules established in the 2019 Rules of Arbitration of the Tashkent International Arbitration Centre[182]. Despite the fact that at present this particular approach is the most realistic, in the legal literature it is increasingly noted that it is unsatisfactory for resolving disputes arising in the global digital decentralised environment[183]. Instead, it is proposed to create special blockchain-based dispute resolution methods - blockchain arbitration.

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[178] Collegium for Disputes in the Digital Economy. Arbitration Center at the RUIE. Accessed 10 May 2021 https: // arbitration-rspp.ru/about/boards/digital-disputes/ 05.07.2019

[179] "Appendix No. 5 to the Regulation on the Arbitration Center at the RUIE. Competence of the Board of the Arbitration Center under the Russian Union of Industrialists and Entrepreneurs on disputes in the digital economy" (2019) Accessed 10 May 2021 https://arbitration-rspp.ru/documents/rules/statute/#pr5

[180] "Regulations of the Arbitration Center at the RUIE. Approved. by order of the President of the Russian Union of Industrialists and Entrepreneurs No. RP-5" Accessed 10 May 2020 (2018) https://arbitration-rspp.ru/documents/rules/regulation/

[181] "On the establishment of the Tashkent International Arbitration Center at the Chamber of Commerce and Industry of the Republic of Uzbekistan" (2018) Accessed 10 May 2020 http://uza.uz/ru/documents/o-sozdanii-tashkentskogo-mezhdunarodnogo-arbitrazhnogo-tsent-06-11-2018?Utm_source= uznet.press &utm_campaign=topic

[182] "Rules of Arbitration of the Tashkent International Arbitration Centre" (2019) Accessed 10 May 2020 https://static1. squarespace.com/static/5c02f6d29772ae05d0a897a8/t/5ca49a6be4966b6cccef1aea/ 1554291353473/ TIAC+Rules+of+Arbitration.pdf

[183] W. A Kaal., C. Calcaterra "Crypto Transaction Dispute Resolution" Business Lawyer. Vol. 73: 143

2.3.2. On-chain arbitration

There are currently over 20 projects using blockchain to automate dispute resolution. All of them are at different stages of implementation (from the beginning of development to the conduct of test proceedings) and have their own characteristics. All these projects can be roughly divided into two groups[184]:

1) projects that provide for the resolution of disputes through the creation of a special arbitration that combines the advantages of international commercial arbitration and blockchain technology (CodeLegit21, Cryptonomica, Juris, Mattereum, SAMBA);

2) projects involving the creation of a decentralized "quasi-judicial" system (Aragon, BitCad, CrowdJury, Confideal, Jur, Kleros, Oath).

The group of special arbitration includes projects that provide for the creation of arbitration specifically designed to resolve disputes arising from smart contracts. As a rule, they involve the automation of certain elements of the proceedings. However, the very mechanism of their action is similar to international arbitration, which is due to the fact that the rules of many such projects are based on the UNCITRAL Arbitration Rules. In this case, the decision made by the arbitrators is executed in the traditional way with the help of a state court or is automatically executed using a smart contract.

2.3.2.1. Juris project

One of the attempts to create such arbitration is the Juris project, which is an open source blockchain dispute resolution system that operates using the Juris Protocol Mediation and Arbitration[185]. A prerequisite for hearing a dispute is the presence of an arbitration agreement, fixed in the form of a code included in the smart contract, as well as the deposit of a certain number of tokens to the account of the corresponding smart contract. In the event of a dispute, the party initiates the protocol by filing a Formal Complaint. The system suspends further execution of the smart contract, generates a neutral blockchain wallet address, to which all funds

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[184] О. Ф. Засемкова "О способах разрешения споров, возникающих из смарт-контрактов" Частное право Jus Privatum, Том 73 No 4 (161), Апрель 2020: 9-12. https://lexrussica.msal.ru/jour/article/view/1236/868

[185] "Juris White Paper Version 2.0, July 2019. Accessed 10 May 2021 https://jur.io/wp-content/uploads/2019/05/jur-whitepaper-v.2.0.2.pdf

deposited to the smart contract account are transferred, and notifies the other party of a dispute. After that, one of three procedures is initiated[186]:

1) Self Mediation - through the Juris Dashboard parties have access to a number of tools specifically designed to resolve disputes on their own using the Self-Enforced Library Functions or Self layer. This tool allows to perform basic operations that change the result of a smart contract, for example, cancel a contract or transfer assets to another party. If it is impossible to resolve the dispute, the parties proceed to the second stage;

2) Simple Neutral Arbitrator Poll assumes hearing of a dispute by a pool of independent arbitrators who vote for one or another option for resolving the dispute. The results of the voting are communicated to the parties. Based on this information, the parties can still try to resolve the dispute using the Self layer. If this procedure did not lead to the settlement of the dispute, the parties proceed to the third procedure;

3) PANEL (Juris Peremptory Agreement for Neutral Expert Litigation) is an analogue of traditional arbitration proceeding based on the UNCITRAL Arbitration Rules. The dispute is considered by three arbitrators, selected based on their reputation and compliance with the requirements specified by the parties at the conclusion of the contract. After hearing the parties and considering the evidence - the most important of which are the history of transactions related to the smart contract and SNAP materials, the arbitrators make a decision within 30 days, which is binding and subject to automatic execution by means of smart contract.

At each of these stages, the dispute is considered by a certain category of arbitrators. Thus, Novice Jurists can take part in the discussion of a pending case at the SNAP stage, but do not have the right to vote. Good Standing Jurists take part in SNAP voting. Finally, High Jurists, who are experts in international arbitration or who have earned a good reputation from the SNAP voting, resolve the dispute at the PANEL stage. The selection of arbitrators at the PANEL stage has certain peculiarities[187]: in the event of a dispute, each of the parties is provided with a list of 10 arbitrators belonging to the High Jurists category. After that, the parties have 30 days to select 3 arbitrators each. If a party insists on the participation of an arbitrator who is not included in this list and does not have a relationship with the Jurist system, then within this period (30 days) he must register in the system and confirm his authority. The list of preferences is then sent to the

186 James Metzger «The current landscape of blockchain-based, crowdsourced arbitration» Macquarie Law Journal Vol 19, 2019, https://www.mq.edu.au/__data/assets/pdf_file/0010/866287/Blockchain-Based-Crowdsourced-Arbitration.pdf

187 Adam Kerpelman "Justice Everywhere, From Nowhere" White Paper, No 2, Juris, 18 September 2018) https://jur.io/wp-content/uploads/2019/05/jur-whitepaper-v.2.0.2.pdf

other party, which within 15 days can exclude from it two arbitrators indicated by the opposing party. The remaining candidates are nominated by the arbitrators and the third is elected by them as the chairman[188].

2.3.2.2. Smart Arbitration and Mediation Blockchain Application

SAMBA (Smart Arbitration and Mediation Blockchain Application), an application based on blockchain technology and specifically designed to resolve cross-border disputes, functions in a similar way[189]. This project was first presented on March 14, 2018 at the Global Legal Institute for Peace Conference in Sao Paulo. SAMBA consists of two main components: 1) a smart contract containing an arbitration clause fixed in the form of a code - Smart Arbitration Contract (SAC), and 2) a blockchain-based dispute resolution platform that is analogous to online arbitration and provides a document management system and an enforcement portal[190]. Parties wishing to resolve disputes through SAMBA conclude SAC. In the event of a dispute, the party fills out an Arbitration Application (Smart Arbitration Application) and sends it to the SAMBA portal. Evidence is submitted electronically through the Dropbox program and posted on the SAMBA portal. All parties involved in the proceedings and the arbitrators get access to the data on the portal, which helps to reduce the time and financial costs of sending documents. After the completion of the proceedings, the decision made by the arbitrators is posted on a portal that is accessible only to the parties to the dispute and is executed using a smart contract[191].

2.3.2.3. Mattereum project

Another project based on blockchain technology is Mattereum, which involves the creation of an infrastructure, right of ownership, its tokenisation and transfer are carried out entirely on the blockchain[192]. A special feature is the use of Ricardian Contracts, which are understood as cryptographically verified documents signed with a digital signature and available

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[188] О. Ф. Засемкова "О способах разрешения споров, возникающих из смарт-контрактов" Частное право Jus Privatum, Том 73 No 4 (161), Апрель 2020: 9-12. https://lexrussica.msal.ru/jour/article/view/1236/868

[189] Adam Kerpelman "Justice Everywhere, From Nowhere" White Paper, No 2, Juris, 18 September 2018) https://jur.io/wp-content/uploads/2019/05/jur-whitepaper-v.2.0.2.pdf

[190] A. Fischetti "Introducing the SAMBA: Project & Demo. Blockchain ADR Revealed." Conflict Resolution at the onset of the Fourth Industrial Revolution, 2018. http://glip.usp.br/complete-video-blockchain-adr-14- apr-2018/

[191] Uribarri Soares Fr. "New Technologies and Arbitration" Indian Journal of Arbitration Law, Vol. 7. Iss. 1, 2018: 93.

[192] R. Knight "Announcing the Mattereum summary White Paper" Mattereum, November 2, 2018. https://medium.com/humanizing-the-singularity/announcing-the-mattereum-summary-white-paper-36cb2a817a3a

for reading both in electronic and text form[193]. These contracts delegate legal authority to two external systems: a smart contract on the blockchain and arbitration, to which all disputes arising between the parties will be transferred[194]. The project involves the creation of a decentralised arbitration that meets the requirements of the 1958 New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards and, as a consequence, has the right to make legally binding decisions that will be executed in accordance with Convention[195].

2.3.2.4. Cryptonomica project

This group also includes the Cryptonomica project created by the Centre for International Arbitration and Cryptography. Its activities are governed by the Cryptonomica Arbitration Rules, based on the UNCITRAL Arbitration Rules, as amended to adapt them to online dispute resolution. According to this document, Cryptonomica is a permanent arbitration institution registered in the UK and provides for the resolution of disputes under the jurisdiction of UK[196]. The dispute resolution process is in many ways similar to traditional arbitration: a party sends a request to registrar@international-arbitration.org.uk with the indication "Cryptonomica", as well as a reference to its Rules[197]. In addition, the request must contain information[198]: about the parties to the dispute (their names and contact details); the arbitration clause and the contract in connection with which the dispute arose; the evidence; the requested remedies; the number of arbitrators (1 or 3); language and place of arbitration if not previously agreed; the evidence that a copy of the claim was sent to the defendant. Arbitration fees are paid in Bitcoins. After hearing the parties, the arbitrators approve the procedural timetable. The meetings are held via video-

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[193] James Metzger «The current landscape of blockchain-based, crowdsourced arbitration» Macquarie Law Journal Vol 19, 2019, https://www.mq.edu.au/__data/assets/pdf_file/0010/866287/Blockchain-Based-Crowdsourced-Arbitration.pdf: 98

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[197] "Cryptonomica Arbitration Rules" (2018) Accessed 10 May 2021 https://github.com/Cryptonomica/ arbitration-rules/blob/master/Arbitration_Rules/Cryptonomica/Cryptonomica-Arbitration-Rules.EN.clear-signed.md

[198] «IBA Rules on the Taking of Evidence in International Arbitration" International Bar Association (2010) Accessed 10 May 2021 https://www.ibanet.org/ENews_ Archive/IBA_30June_2010_Enews_Tak-ing_of_Evidence_new_rules.aspx

conferencing, and all documents are sent electronically, certified by an electronic signature, as well as electronic keys verified by arbitration. In relation to evidence, arbitration is governed by the International Bar Association's Rules for the Obtaining Evidence in International Arbitration 2010. The dispute is handled on the basis of the principles of good faith, as well as on the basis of the terms of the contract and the customs applicable to the contract. The decision is made in writing, is final for the parties and, unless otherwise agreed, can be published on github.com or cryptonomica.net.

2.3.2.5. Oath project

Projects involving the creation of a decentralised "quasi-judicial" system operate on a fundamentally different basis. These projects provide for the creation of fundamentally new and unique platforms based on blockchain technology and specifically designed to resolve disputes arising from smart contracts. Their essence lies in an attempt to create a quasi-judicial system, where users registered on the corresponding platform act as judges (members of the jury), who are elected using the method of generating random numbers and remain anonymous to the parties to the dispute[199]. The decision is taken by voting, and each of the judges votes separately and does not know what conclusion the other members of the jury made. After the completion of the voting, the system counts the votes and determines the outcome of the dispute, then the decision is automatically executed using a smart contract. A party who disagrees with a decision made usually has the opportunity to challenge it by filing an appeal. Another characteristic feature of such projects is that they involve the resolution of disputes on the basis of rules specially developed for this - codes of non-state regulation.

One such project is Oath - a blockchain dispute resolution protocol. It is based on the idea of a jury trial, which assumes that jury is randomly selected to resolve a dispute, who after listening to the parties to the dispute, make a decision using their common sense[200]. A random selection of jurors suggests that their opinion reflects the opinion of the whole society. The mechanism of action of Oath is as follows[201]: when concluding a smart contract, the parties can

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[199] О. Ф. Засемкова "О способах разрешения споров, возникающих из смарт-контрактов" Частное право Jus Privatum, Том 73 No 4 (161), Апрель 2020: https://lexrussica.msal.ru/jour/article/view/1236/868: 12

[200] "OATH Protocol. Blockchain Alternative Dispute Resolution Protocol. Version 2.6.0" Accessed 10 May 2021 https://oaths.io/ files/OATH-Whitepaper-EN.pdf

[201] James Metzger «The current landscape of blockchain-based, crowdsourced arbitration» Macquarie Law Journal Vol 19, 2019, https://www.mq.edu.au/__data/assets/pdf_file/0010/866287/Blockchain-Based-Crowdsourced-Arbitration.pdf: 99

use the template provided by Oath, which has a built-in dispute resolution protocol - Smart Arbitration Plan. A deposit is made to the smart contract account in the form of a certain number of tokens. In the event of a dispute, the protocol is converted into a case - Smart Arbitration Case, and the deposit is converted into an arbitration fee. After that, the parties set the parameters for resolving the dispute: the number of jurors (any odd number in the range from 11 to 101); percentage of votes required for a decision (from 51 to 100%). The jury is selected from among the users of the blockchain platform based on a random algorithm. The dispute resolution process takes 8 days: 5 days are given to the parties to present evidence, another 3 days are given for making a decision. The decision is made solely on the basis of common sense, based on the examination of the terms of the contract, testimony and other evidence. If the parties agree with the decision made, it is automatically executed using a smart contract. If the party does not agree with the decision, it has the right to appeal it within 5 days from the date of decision. In this case, the process is restarted, but with a different jury who is not aware of the earlier decision. If the party does not agree with this decision, it has the right to appeal it again. But the decision made at the end of the third trial will be final and cannot be challenged.

2.3.2.6. Jury.Online platform

On a similar basis operates Jury.Online - a platform that allows to conclude transactions and resolve related disputes through a special panel of judges. The mechanism is similar[202]: the parties enter into a smart contract. Funds intended to pay for goods or services under a transaction in the form of cryptocurrency are credited to the smart contract account and remain there until the transaction is completed. The dispute is considered by arbitrators, who are persons registered on this platform and having a corresponding rating. The proceedings are paid in tokens and the cost of the proceedings depends on the competence of the arbitrators. The commission charged by the system does not depend on the amount of the dispute and is charged from the arbitrators' fees in the following amounts: the first thousand disputes will be considered without commission, the next 9 thousand disputes assume a commission of 10%, and all subsequent disputes - 20 %[203]. An important feature of the project is that the decision is made in encrypted form, and the key to its decryption is shared between the parties to the dispute. Thus, in order to find out the solution, the parties must in turn share their part of the key with an opponent. If one

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[202] «The founder of Jury.Online spoke about the prospects for network arbitration on the blockchain» // Accessed 10 May 2021, forklog.com/osnovatel-jury-online-rasskazal-o-perspektivah-setevogo-arbitrazha-na-blokchejne/

[203] Jury.Online: justice on the blockchain. Accessed 10 May 2021, https://forklog.com/jury-online-pravo-sudie-na-blokchejne/

of the parties refuses to do so, it is considered to be the loser of the dispute, regardless of the decision taken by the arbitrators. Like other projects, Jury.Online provides an appeal option. Moreover, in the case of a repeated decision in favour of the same party, the case is closed, and the decision is automatically executed using a smart contract.

2.3.2.7. Aragon project

Another interesting project - Aragon - which is the first blockchain tool designed to achieve three goals[204]: 1) to provide a model for launching decentralised autonomous organisations (DAO); 2) to regulate the activities of these DAOs in accordance with the rules determined by the Aragon constitution; 3) to ensure the resolution of disputes in an anonymous and democratic manner. All DAOs that join the project must submit any disputes between them to the Aragon decentralised courts. The dispute resolution process is similar to other projects[205]: the user opens a dispute and publishes a certain amount (bond), which is blocked for the duration of the dispute and will be returned to him if a decision is made in his favour. The dispute is examined by Decentralized Court of Aragon Network Jurisdiction, which randomly select 5 arbitrators from those who have expressed a desire to act as such[206]. The decision is made by a majority vote. The party disagreeing with the decision has the right to appeal by posting its arguments and a larger amount. This will activate the second instance court - the Prediction Market Court, which adjudicates on the same principles as the first instance court. If a party disagrees with the decision of this court too, it has the right to submit another appeal to the so-called "Supreme Court" (Supreme Court of Aragon Network Jurisdiction), which consists of 9 judges with the highest ranking. The dispute resolution process is similar to the previous steps, but in this case the decision will be final and will not be a subject to appeal.

2.3.2.7. CrowdJury platform

Similarly, CrowdJury, an online platform that combines the benefits of crowdsourcing and blockchain to create a transparent and self-sufficient justice system. It is based on the idea that was used in Ancient Greece, when everyone interested could take part in the administration of justice, which made it possible to establish the truth, perform an educational function because

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[204] «Another lightning-fast ICO - the Aragon project raised $ 25 million in 15 minutes» Accessed 10 May 2021 https://forklog.com/ eshhe-odno-molnienosnoe-ico-proekt-aragon-za-15-minut-sobral-25-mln /

[205] James Metzger «The current landscape of blockchain-based, crowdsourced arbitration» Macquarie Law Journal Vol 19, 2019, https://www.mq.edu.au/__data/assets/pdf_file/0010/866287/Blockchain-Based-Crowdsourced-Arbitration.pdf: 101

[206] «Aragon Network Jurisdiction. Part 1: Decentralized Court» Accessed 10 May 2021, https:// blog.aragon.org/aragon-network- jurisdiction-part-1-decentralized-court-c8ab2a675e82/

the proceedings are carried out in public and the judges are aware of the need to state the reasons for their decision and to discipline judges, minimising the possibility of their bribery. Such system is based on two factors[207]: 1) gathering information and 2) applying experience or expertise to establish the truth. The main feature of this project is that the dispute is considered online, all evidence is open to the public and any person (not only a jury member) can ask questions to the defendant. The use of blockchain technology is applied in two aspects[208]: 1) the motivation to participate in the process for the jury is payments made by the parties in bitcoins; 2) creation of a bank of solutions available for review on the unchanged blockchain. CrowdJury system also promises to resolve disputes quickly and fairly through a combination of crowdsourcing and game theory. It is positioned as a free service for creating and securing smart contracts, as well as resolving disputes arising from them within 24 hours. This project is distinguished by the fact that the parties to the dispute themselves must propose solutions to the jury, and the jury, in turn, votes for one of the proposed options. The option with the most votes is considered as a decision to be enforced using a smart contract.

Despite significant differences between the reviewed projects, they are united by two main factors[209]. First, they all involve the creation of decentralised dispute resolution platforms. Secondly, as a result of the proceedings, an analogue of the arbitral award is issued, which is automatically executed through a smart contract and does not require any actions from the parties. Thus, these projects imply a virtually complete rejection of the traditional system of recognition and enforcement of arbitral awards provided for by the New York Convention. In this regard, the doctrine notes that in the future, blockchain technology can lead to the formation of a completely independent and self-sufficient arbitration that does not require interaction with a state court[210]. These projects have the greatest prospects in relation to the consideration of simple disputes of low cost cross-border disputes, which they are mostly focused on. Although, for the hearing of more complex disputes, it is more sufficient to use the projects that provide for the automation of

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[207] CrowdJury: A Justice System for the Internet Age. Accessed 10 May 2021, https://www.crowd-jury.org/

[208] Fr. Ast, S. Sewrjugin "The CrowdJury, a Crowdsourced Judicial System for the Collaboration Era" The CrowdJury, November 10, 2015. https://medium.com/the-crowdjury/the-crowdjury-a-crowdsourced-court-system-for-the-collaboration-era-66da002750d8

[209] О. Ф. Засемкова "О способах разрешения споров, возникающих из смарт-контрактов" Частное право Jus Privatum, Том 73 No 4 (161), Апрель 2020, https://lexrussica.msal.ru/jour/article/view/1236/868: 11

[210] P. Ortolani "The Impact of Blockchain Technologies and Smart Contracts on Dispute Resolution: Arbitration and Court Litigation at the Crossroads" Uniform Law Review, Vol. 24.Iss. 2, 2019: 435

individual elements of the proceedings, but at the same time assuring the possibility of executing decisions through the mechanism laid down in the New York Convention. However, their implementation raises questions[211]. First, according to Art. II of the Convention, the arbitration agreement must be concluded in writing. Does the arbitration clause, concluded in the form of a code included in the smart contract, comply with this requirement? There is currently no answer to this question. Similar doubts arise about the form of the decision. According to the requirements of the New York Convention, it should also be made in writing. Secondly, a distributed ledger may have nodes on the territory of several states. As a consequence, the question arises about the applicable law: should it be the law of a certain state, or the dispute can be resolved on the basis of rules specially designed for these purposes - lex cryptographica?[212] Despite the obvious significance of this question, only one draft, Cryptonomica, provides for an ex aequo et bono dispute resolution[213]. Thirdly, the unresolved issue remains the place of arbitration, on which the choice of the applicable procedural legislation depens, the competent forum for challenging the decision, etc. Only Cryptonomica pays attention to this issue: according to the rules, the place of arbitration is London (Great Britain). Fourth, disputes arising from smart contracts can fall into different categories, which implies the need to take into account the arbitrability of the dispute. But no project takes this aspect into account. In this regard, one should agree with P. de Filippi, who believes that blockchain arbitration has two possible development paths: 1) its adaptation to the existing legal regulation, primarily to the requirements The New York Convention; 2) creation of an independent decentralised system in which contact with legal regulation will occur only up to a certain point, and everything that goes beyond this will be regulated by the internal mechanism of the system and smart contracts[214]. Although, it is already clear that under the influence of new technologies, arbitration is gaining a new vector of development.

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[211] О. Ф. Засемкова "О способах разрешения споров, возникающих из смарт-контрактов" Частное право Jus Privatum, Том 73 No 4 (161), Апрель 2020, https://lexrussica.msal.ru/jour/article/view/1236/868: 11

[212] *Dispute Resolution. The Kleros Handbook of Decentralized Justice*. Kleros.IO, 7 https://ipfs.kleros.io/ipfs/QmZeV32S2VoyUnqJsRRCh75F1fP2AeomVq2Ury2fTt9V4z/Dispute-Resolution-Kleros.pd

[213] О. Ф. Засемкова "О способах разрешения споров, возникающих из смарт-контрактов" Частное право Jus Privatum, Том 73 No 4 (161), Апрель 2020,. https://lexrussica.msal.ru/jour/article/view/1236/868: 12

[214] *Dispute Resolution. The Kleros Handbook of Decentralized Justice*. Kleros.IO, 174 https://ipfs.kleros.io/ipfs/QmZeV32S2VoyUnqJsRRCh75F1fP2AeomVq2Ury2fTt9V4z/Dispute-Resolution-Kleros.pdf

CONCLUSION

1. Smart contracts are computer algorithms executed on a blockchain technology that are designed to enter into and to maintain contracts allowing to follow complex rules and exchange assets, avoiding the services of an intermediary. As a result of comparing smart contracts with paper counterparts the following advantages can be identified: autonomy of the transaction, as the mediator is excluded from the process of concluding a contract; enhanced reliability due to specifics of the blockchain technology that provides for storage of documents in thousands of copies in blocks which prevents forgery and loss of data; time efficiency due to automation of a large number of processes and as result expenses efficiency, enhanced confidentiality of data protection. Such mechanism on practice can solve the following problems in the employment relations: increasing the efficiency of building and maintaining public databases for job search, maintenance of the official records (fines, violations) and reviews about employers and employees, verification of experience and education, registration of labor relations, increase access to the resolution of labor disputes, automation and enhanced transparency of the remuneration and payments to the pension funds and the tax authorities, elimination of discrimination.

2. According to the conducted research of the legal regulation of blockchain technology in different countries it is possible to conclude that the national law of the researched countries is only at the beginning stages of development and therefore it has significant differences between national legal systems and almost complete absence of court precedents. One of the leading legal system in terms of support for the use of smart contracts and cryptocurrencies is Belarus.: it defines the concept of a smart contract and establishes rules for using blockchain technology. In its turn, USA and UK treats such transaction as a subject to the requirements of securities legislation, while France as a movable intangible assets. In Poland and Russia was created a special arbitration centres whose activities are aimed at resolving disputes related to blockchain. Therefore, it is predictable that legal issues will be resolved over the next few years, although currently most countries in the world try to regulate smart contracts by legislation on securities or financial instruments, which does not correspond to either the economic or legal content of the smart contract. Another important problem in the cross-border operations is the lack of a single international legal framework. Such situation gives a ground for the emergence of the modern law cyberspace, which can be seen as body of norms used on the Internet, independent from national legal systems, which coexistence with existing national laws and have a great practical use in cases where the parties did not choose the

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national applicable law, or chose lex mercatoria in as such, to fill gaps in international and national law, as a basis for the development of national acts, regional and international treaties, in the interpretation of both treaty gaps and gaps in national or supranational regulation.

3. From the standpoint of classical contractual law, it can be precisely determined that a smart contract is not a separate type of obligation or contract and should be understood as a form of contract or as a way to ensure the fulfilment of an obligation. Therefore the problems relating to the peculiarities of contract formation, content, interpretation, modification and invalidation, liability, determination of the governing law, jurisdiction, dispute resolution etc are relevant to explore. A complication of the issue of determining the law applicable to smart contracts may be due to the situation when a distributed ledger has network nodes located in several jurisdictions which creates difficulties with determination of the applicable law. In this regard, it is possible to predict two ways of developing conflict practice. The first can be conventionally referred to as a deliberate choice of jurisdiction, which will lead to the formation of a pool of jurisdictions that will become traditional for the regulation of smart contracts, which corresponds to the logic of the legal market and cross-border transactions. The second way is the development of non-state norms regarding the regulation of smart contracts and the choice by the parties of the relevant unofficial codifications as the applicable law. This path will be more effective if disputes arising from smart contracts are resolved through smart arbitration, blockchain arbitration and other non-state mechanisms.

4. A possible ways to resolve disputes from smart contracts can be settlement of disputes by traditional arbitration institutions or creation of new mechanisms specifically designed to resolve disputes arising in a global decentralised environment - blockchain arbitration. Special arbitration institutions ensures a sufficient level of understanding of the specifics of relations on the Internet, as well as time and cost sufficiency. Special arbitration includes projects that provide for the creation of arbitration specifically designed to resolve disputes arising from smart contracts, however, the very mechanism of their action is similar to international arbitration, which is due to the fact that the rules of many such projects are based on the UNCITRAL Arbitration Rules. In its turn, projects involving the creation of a decentralised "quasi-judicial" system operate on a fundamentally different basis, providing for the creation of new and unique platforms based on blockchain where users registered on the corresponding platform act as judges (members of the jury), who are elected using the method of generating random numbers and remain anonymous to the parties to the dispute.

RECOMMENDATIONS

1. To integrate the system of legal regulation of smart contracts into the traditional national legal system of states. To determine the legal status of a smart contract and to formulate the legal requirements to its form and content. Introduce at the legislative level the concepts of «Blockchain» and «Smart contracts» in the legal space of the states. Recognise a «Smart contract» as one of the ways to conclude an agreement and provide it with legal protection and protection in the state court. Define the concept and place of the blockchain in labor law, when concluding contracts as follows: The labor legislation uses the «Blockchain» - as a public or private register of all transactions and contracts in accordance with Labour Code; as proposed proposals at the stage of pre-contractual relations between the future employee and the employer in the implementation of their rights, freedoms and interests. «Entities that use the blockchain» - government agencies that guarantee the technical functioning of the system, individuals from the moment they look for work and enter into employment relations, employers, employees, bodies representing the interests of employees. Violation of the rules on the use of the blockchain in labor law entails liability under the law in the same way as in the case of violation of the rules of general institutions of labor law. To develop procedural legislation of litigation of disputes related to smart contracts.

2. Develop the necessary international draft laws on international cooperation in «blockchain» and «smart contract» matters to provide for legal certainty and regulation in question of return reference or reference to the law of a third state, absence of the regulation and facilitate the settlement of cross-boarder disputes.

3. Consider vulnerabilities of the «smart contract» at the stage of formation of the contract and therefore pay attention on the following issues to reduce legal risks: errors in the code, inadmissibility of the vague conditions and provisions in the contract, irreversible character of the smart contract, matters of confidentiality, clear determination of the governing law, jurisdiction and ways of dispute resolution. Establish the legal mechanisms for supervision of liability for breach of the terms of a smart contract and compensation for damages or errors in a computer program. Formulate the legal requirements to ensure the reliability of indication and recording of events or phenomena.

4. Resolve the conflict between the legal requirements restricting access to personal data, including the requirements of the GDPR and other sensitive information of the parties to the contract, which may be contained in it, and the openness of information on all transactions to all members of the blockchain network and its storage in each node of the blockchain chain.

Undertake legal regulation of cybersecurity, both software that supports the use of smart contracts, and software and hardware platforms on which this software is hosted. Solve by legal means the problem of the incomplete possibility for the parties to the contract to observe all the hidden actions of the software of a smart contract. Develop the legal mechanisms for verification of the parties to the contract carrying out the transaction at the time of its implementation.

5. Creation of an independent decentralised system of dispute resolution platforms that provides for resolving of simple disputes of low cost cross-border disputes, that are based on blockchain technology and blockchain arbitration and is ensured by automatically executed decision. Adaptation to the scope of the New York Convention legal relations based on the blockchain to ensure protection of the more complex disputes.

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ABSTRACT

At the times of the widespread digitalisation, the blockchain technology plays a leading role in ensuring cross-boarder operations between counter-parties and has a great potential for development in the field of labour relationship. The study learns the evolution of the blockchain technology, the definition of the smart contract and its application in labour relations, the legal regulation of the blockchain technology worldwide, the peculiarities of contract formation, and confidentiality protection as well as the ways of dispute resolution arising out of smart contract. The research shows that the main problem of the widespread introduction of the technology is the lack of legal regulation of the blockchain technologies on the national and international levels, which creates difficulties in legal protection and provides for development of the new mean of dispute resolutions and new types of customary law.

SUMMARY

Master thesis "Technologies at the workplace: Legal aspects" aims to determine the main legal problems, which arise in connection with the rapid evolvement of blockchain technology in the labour relations. For this reason such objectives of the research was established: to reveal the concept of the Smart Contract and its application in labour relations; to analyse the legal regulation of the Blockchain technology worldwide to the appropriateness of the practical usage; to identify the core legal problems that may arise in connection with practical application of the Smart contract; to explore ways of dispute resolution arising under the Smart Contract. The study is prepared in two main parts, both of which are divided by the researched topics in three sub-chapters.

In the first part, the evolution of the blockchain technology is described, that takes roots from the creation in 2009 the first cryptocurrency in the world. Further, the study learns a form of agreement conducted as a coded mathematical algorithms called Smart contract, and how the application of it will change the labour relations. Next, the legal recognition and regulation of Smart contracts worldwide is analysed. In the second part, firstly, the attention is paid to the legal problems arising in the contract formation of the Smart contract and peculiarities of its legal regulation. Consequently, the problem of compliance to the requirements of confidentiality of the The EU General Data Protection Regulation and its effect on the future application of blockchain is analysed as well as current confidential technology under the smart contracts that helps to reduce the risks of fraudulent actions of transactions. Lastly, it is described how the arbitration under Smart contracts is conducted.

Smart contracts are computer algorithms executed on a blockchain technology that are designed to enter into and to maintain contracts allowing to follow complex rules and exchange assets, which gives visible advantages in the area of labour relations. The main problem of the widespread introduction of the technology is the lack of legal regulation of the blockchain technologies on the national and international levels, which creates difficulties in legal protection, such as: peculiarities of contract formation, content of the contract, interpretation, modification and invalidation, liability, determination of the governing law, jurisdiction, confidentiality protection, dispute resolution etc; at the same time gives grounds for for the emergence of the modern law cyberspace, which can be seen as body of norms used on the Internet, independent from national legal systems, which coexistence with existing national laws and have a great practical use in the regulation of the relations, dispute resolution and law enforcement.

HONESTY DECLARATION

18/05/2021
Vilnius

I, _____ Pushkar Viktoriia _____, student of
                    (name, surname)

Mykolas Romeris University (hereinafter referred to University),
    Mykolas Romeris Law School, Institute of Private Law, European and International Business Law
                    (Faculty /Institute, Programme title)

confirm that the Bachelor / Master thesis titled

"TECHNOLOGIES AT THE WORKPLACE: LEGAL PROBLEMS:

1. Is carried out independently and honestly;
2. Was not presented and defended in another educational institution in Lithuania or abroad;
3. Was written in respect of the academic integrity and after becoming acquainted with methodological guidelines for thesis preparation.
    I am informed of the fact that student can be expelled from the University for the breach of the fair competition principle, plagiarism, corresponding to the breach of the academic ethics.

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