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# LEX CRYPTOGRAPHICA ЯК ДЖЕРЕЛО ПРАВОВОГО РЕГУЛЮВАННЯ ВІДНОСИН НА РИНКУ ВІРТУАЛЬНИХ АКТИВІВ

**Анотація.** *Дослідженням виявлено, що із появою цифрових технологій, та, зокрема блокчейну, виник особливий набір правил – lex cryptographica, який можна визначити як сукупність норм, які встановлюються та забезпечуються програмними обмеженнями коду в мережі блокчейн. Концепція lex cryptographica пропонує інноваційний підхід до регулювання відносин у цифровому середовищі. Її унікальність полягає у використанні алгоритмічних обмежень як механізму впровадження та дотримання встановлених правил. Зроблено висновок, що ця автономна регуляторна система має паралелі з середньовічною lex mercatoria, проте її практичне застосування супроводжується суттєвими викликами та обмеженнями. По-перше, технологічна природа lex cryptographica унеможливлює її використання як самостійного інструменту для вирішення правових спорів чи забезпечення юридичної відповідальності. Алгоритмічні норми, закладені в програмному коді, не враховують соціальну складність і контекст конкретних ситуацій, що обмежує їх здатність вирішувати конфлікти. По-друге, у сучасних правових системах lex cryptographica залишається поза межами юридичного визнання. Суди керуються чинними нормативно-правовими актами, тоді як автономні правила, створені через програмний код, не мають легального статусу. Це обмежує її інтеграцію в правове поле та створює виклики для застосування в міжнародному контексті. По-третє, ефективність lex cryptographica залежить від її гармонізації з традиційним законодавством. Для забезпечення взаємодії між алгоритмічними нормами та правовими системами необхідно розробити спеціальні механізми правової інтеграції. Це включає створення нових стандартів і гібридних моделей, які об'єднають сильні сторони коду та нормативно-правового регулювання. Водночас концепція lex cryptographica відкриває перспективи для вдосконалення правового регулювання ринку віртуальних активів. Зокрема, можливе: – впровадження гібридних правових моделей, які інтегрують кодові обмеження та традиційні правові механізми (наприклад, угода на блокчейні може автоматично виконувати умови (смарт-контракти), але в разі спору задіюється традиційна судова система, або «регульовані токени» (regulated tokens), які відповідають вимогам фінансових регуляторів, утім функціонують на основі децентралізованих блокчейн-протоколів; – розробка універсальних стандартів для глобального ринку цифрових активів, що враховують технологічні особливості та забезпечують міжнародну взаємодію, зокрема визначення чіткої класифікації токенів (платіжні, інвестиційні, утилітарні) для однакового застосування в різних юрисдикціях; установлення мінімальних технічних вимог до блокчейн-протоколів, таких як прозорість алгоритмів, захист даних тощо. Таким чином, у статті доводить-*

ся, що lex cryptographica має потенціал стати ефективним інструментом у сфері цифрових технологій. Її успіх залежатиме від здатності держав і міжнародної спільноти адаптувати алгоритмічні норми до чинних правових систем, зберігаючи баланс між інноваціями та юридичною безпекою.

**Ключові слова:** *ринок віртуальних активів; ринок цифрових активів; криптовалюта; технологія розподіленого реєстру; lex cryptographica; lex mercatoria; правове регулювання.*

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# LEX CRYPTOGRAPHICA AS A SOURCE OF LAW GOVERNING RELATIONSHIPS IN THE VIRTUAL ASSETS MARKET

**Abstract**. *The study found that with the advent of digital technologies, and blockchain in particular, a special set of rules has emerged – lex cryptographica, which can be defined as a set of rules established and enforced by software code restrictions in the blockchain network. The concept of lex cryptographica offers an innovative approach to regulating relations in the digital environment. Its uniqueness lies in the use of algorithmic constraints as a mechanism for implementing and complying with the established rules. It is concluded that this autonomous regulatory system has parallels with the medieval lex mercatoria, but its practical application is accompanied by significant challenges and limitations. First, the technological nature of lex cryptographica makes it impossible to use it as an independent tool for resolving legal disputes or ensuring legal liability. The algorithmic rules embedded in the program code do not take into account the social complexity and context of specific situations, which limits their ability to resolve conflicts. Second, in modern legal systems, lex cryptographica remains outside the scope of legal recognition. Courts are guided by existing legal acts, while autonomous rules created through program code have no legal status. This limits its integration into the legal field and creates challenges for its application in the international context. Thirdly, the effectiveness of lex cryptographica depends on its harmonization with traditional legislation. To ensure the interaction between algorithmic norms and legal systems, special mechanisms of legal integration should be developed. This includes the creation of new standards and hybrid models that combine the strengths of code and regulation. At the same time, the concept of lex cryptographica opens up prospects for improving the legal regulation of the virtual asset market. In particular, it is possible to: – introduction of hybrid legal models that integrate code restrictions and traditional legal mechanisms (for example, a blockchain transaction can automatically fulfill the terms and conditions (smart contracts), but in case of a dispute, the traditional judicial system is involved, or «regulated tokens» that meet the requirements of financial regulators, but operate on the basis of decentralized blockchain protocols; – development of universal standards for the global digital asset market that take into account technological features and ensure international interaction, including the definition of a clear classification of tokens (payment, investment, utilitarian) for the same application in different jurisdictions; establishment of min-*

*imum technical requirements for blockchain protocols, such as transparency of algorithms, data protection, etc. Thus, the article proves that lex cryptographica has the potential to become an effective tool in the field of digital technologies. Its success will depend on the ability of states and the international community to adapt algorithmic norms to existing legal systems, while maintaining a balance between innovation and legal security.*

**Keywords:** *virtual assets market; digital assets market; cryptocurrency; distributed ledger technology; lex cryptographica; lex mercatoria; legal regulation.*

## INTRODUCTION

The regulatory framework for virtual assets is insufficient globally. As J. Szczotka noted «There are always events, often suddenly emerging, including discoveries and inventions that were even previously unimaginable, and which rapidly or gradually change the «history of the world», the fate not only of individuals or nations, but of all humankind. Each such case stimulates people to introduce new non-standard solutions, including in the sphere of legal structures» [1, p. 338]. The development of appropriate legal regulation for virtual asset markets is a challenge faced by countries across the globe. Policymakers integrate technology in response to global trends and environmental demands [2, p. 7]. However, not only legislative or other normative legal measures can address this issue. R. Prylutskyi supports this stance, highlighting that: sources of law may come in various forms, not limited to normative legal acts enacted by state entities. They include other means and instruments which can give rise to specific relations, regulate them, and serve as a sufficient basis for settling any disputes that may arise from such relations [3, p. 27]. Henceforth, it is debatable whether the virtual assets market, which operates on the Blockchain distributed ledger technology, can be regulated by any other source of law besides regulatory legal acts. P. De Philippi and A. Wright contend that the value of Blockchain technology lies in its capacity to enable the development of steadfast and automated code-based systems that offer individuals novel financial and contractual instruments. Using the Blockchain, individuals can establish their own regulations and participate in smart contracts facilitated by the network's fundamental protocol. The Blockchain maintains order through specific rules when legal regulations are absent [4, p. 5]. Researchers defined such set of rules as lex cryptographica [5, p. 48]. In this context L. Green discovered that: «Law can also be made unintentionally: a custom may emerge by invisible hand mechanisms» [6, p. 3].

The above mentioned provides a basis for analysing lex cryptographica as a source of law that governs virtual assets market relationships.

The purpose of the article is to specify scientific provisions regarding the possibility of considering a source of law governing relationships in the virtual assets market.

## 1. LITERATURE REVIEW

Scholarly interest in the lex cryptographica has been steadily increasing in recent years, which is naturally explained by the active integration of technologies into the global economy.

The origins of lex crypto lie in L. Lessig 's famous statement: «Code is law» [7, p. 191]. Thus, the scholar noted that we have a fairly developed tradition of thinking about direct regulation of relations by law. However, the time is coming when direct legal regulation will be one of the least important ways of regulation. L. Lessig insists that in the virtual space, regulation is carried out by means of code – software and hardware [8, p. 5]. Supporting Lessig's opinion, W. Mitchell also argued that: «Out there on the electronic frontier, code is the law» [9, p. 110].

P. De Filippi and S. Hassan, developing this idea, note that regulation by code can impose restrictions on certain actions, preventing misbehaviour. Certain specialists in technical fields may find ways around such restrictions, but most people – those without certain knowledge or resources – have no choice but to follow the code's rules. This is different from regulatory regulation, which gives people the ability to decide whether or not to break the rules and rely on law enforcement or the courts to enforce the law [10, p. 6].

P. De Filippi concludes that blockchain technology has given rise to another source of law, a new coordination mechanism that also relies on technical means to coordinate behaviour – lex cryptographica [11, p. 23–24]. However, unlike lex informatica, whose rules are ultimately dictated by a centralised operator, the rules established by the blockchain network protocol are set by and for the community and must be applied through a distributed consensus mechanism involving all network participants. In other words, lex cryptographica is characterised by a set of rules that is implemented through smart contracts and decentralised networks [5, p. 48].

As K. Becker noted that it is not accurate to believe that lex cryptographica is limited to its virtual space of application unless it is acknowledged by the real world. Even in its virtual and disembodied dimension, it has relevance to what is referred to as the real world [12, p. 126].

M. Schilling believes that the formulation of a lex cryptographica requires a fundamental rethinking of the role of law in society. According to the scholar, self-regulation through customary rules and technical standards developed for internal use by members of the community could be seen as «a natural extension of lex mercatoria» [13, p. 42]. G. Dimitropoulos defines two layers of interaction between traditional law and blockchain: the law within blockchain, which has been termed lex cryptographia, and the law of the interaction between the real world and the online world [14, p. 1123].

At the same time, no separate study has been conducted in legal science regarding lex cryptographica as a source of law governing relationships in the virtual assets market. This highlights the significance of the issue raised.

## 2. MATERIALS AND METHODS

The research methodology is based on an interdisciplinary approach that integrates legal, economic and technological aspects to analyze the phenomenon of lex cryptographica. Both general scientific and special research methods were used in the course of the study, which allowed for a comprehensive assessment of the specifics of this phenomenon, its legal nature and impact on regulatory systems.

One of the key methodological elements was the application of the historical and legal approach, which provided an analysis of the genesis of lex cryptographica through the prism of the development of other non-standard legal systems, in particular lex mercatoria and lex informatica. This made it possible to identify commonalities as well as unique features of the digital legal reality that affect modern approaches to regulation.

The systematic approach became the basis for studying the structure of lex cryptographica, its relationship with international legal standards and domestic regulation. This helped to identify potential conflicts between decentralized norms and current legislation, as well as to suggest ways to harmonize them.

The technological aspect of the study was taken into account by analyzing the technical basis for the functioning of lex cryptographica, including blockchain technologies, smart contracts, and algorithmic regulation. This approach allowed us to identify unique risks and challenges that arise in the process of their legal recognition and integration into existing regulatory systems.

## 3. RESULTS AND DISCUSSION

### 3.1 Blockchain and lex cryptographica

Lex cryptographica, as a set of rules, is implemented within the blockchain technology, which determines the analysis of certain aspects of the functioning of blockchain technology. The first mention of the «chain of blocks» was published in the paper by Satoshi Nakamoto, dedicated to the principles of the functioning of the cryptocurrency bitcoin [15]. Subsequently, «chain of blocks» became «blockchain». M. Swan defined the blockchain as a public ledger of all bitcoin transactions that have ever been executed. A blockchain is a chain of blocks of data that is constantly growing as miners add new blocks with records of recent transactions. Blocks are recorded in the blockchain in chronological order. The scientist also came to the conclusion that: «A blockchain is quite literally like a giant spreadsheet for registering all assets, and an accounting system for transacting them on a global scale that can include all forms of assets held by all participants worldwide. Thus, the blockchain can be used for any form of asset registry, inventory, and exchange, including every area of finance, economics, and money, hard assets (physical property); and intangible assets (votes, ideas, reputation, health data, etc.)» [16, p. 10]. The emergence of smart contracts has led to an increased use of blockchain technology in society [17, p. 278].

While analysing the legal aspects of blockchain functioning, J. Naves and co-authors came to the conclusion that «The decentralized nature of Blockchain technology means it is not possible to determine which laws apply generally to Blockchain, because every legal area sets the conditions for applicability within its domain». They also noted that «At the transaction level, it is usually quite clear which laws apply. However, international private law will have to determine which civil law applies to a transaction between parties from different countries» [18, p. 91]. Regulators are facing other problems. Regulator are facing problems Regulators are facing additional problems

related to understanding the technology. As A. Walch wrote, it remains challenging to follow the discussion and practices around blockchain technology, even several years after it appeared on regulators' radar screens. This is due to the malleability and potential for misleading vocabulary associated with the technology. How can regulators (or anyone else) even tell whether people are discussing the same topic or manifestation of technology when people explain the technology, its risks, and its potential benefits using divergent terminologies? The industry has only recently begun to realize that vocabulary may be causing and concealing misunderstandings about technology [19, p. 729].

The above indicates the existence of certain problems in the development of the relevant legal regulation.

According to R. Brownsword and M. Goodwin: «When we say that emerging technologies should be understood as being situated in a particular regulatory environment, the essential idea is that, when we act – whether we act as developers and commercial exploiters, or as users and appliers, of particular technologies – we do so in a context that has a certain coding for action, a coding that signals whether various acts are permitted (even required) or prohibited, whether they will be viewed positively, negatively or neutrally, whether they are incentivised or disincentivised, whether they are likely to be praised or criticised, even whether they are possible or impossible, and so on» [20, p. 27].

In the context of governing blockchain with traditional law M. Swan stated: «However, just as there might be both centralized and decentralized models to coordinate our activities in the world, there could likely be roles for both and new forms of blockchain-based government. There could be hybrid governments in the future, like other industries, where automation is the forcing function, and the best «worker» for the job is a human/algorithmic pairing.» [16, p. 88].

O. Konashevych noted that the functioning of the blockchain does not require centralised management. Since the technology is based on software code, it makes sense to develop the appropriate legal regulation in this context. In other words, the rules are not written on paper, but they are developed in the form of an electronic program with algorithms [21, p. 5].

C. Poncibò notes: «fragmented nature of national laws constitutes in itself an irremediable limit for an efficient discipline of these networks, whose a-temporal and a-spatial connotations (as before mentioned) make it substantially detached from any attempt at regulation, which can be considered endowed with the characteristics of effectiveness and transactional uniformity. These considerations are at the basis of the reflections of legal scholars, which has identified in the lex cryptographica the most suitable tool for regulating blockchain networks across borders. They argue that it has a high degree of flexibility, which makes it compatible with the structural and functional peculiarities of the network» [22, p. 146].

Summarising the above, it can be concluded that regulatory acts are not the exclusive source of law for regulating relations on the virtual assets market and indicate the

existence of a certain set of rules, «blockchain law» – lex cryptographica, which regulates relation relations are on the virtual assets besides legal acts.

In this context, it is necessary to find out whether lex cryptographica be considered as a source of law, and in order to achieve this goal, it seems appropriate to first examine the genesis and nature of the emergence of lex cryptographica.

### 3.2 From lex mercatoria to lex cryptographica

Lex cryptographica is often considered as a modern pattern of the medieval lex mercatoria [11, p. 23–24; 13, p. 42], which provides grounds for analysing the transformation of lex mercatoria into lex cryptographica.

A. Smityukh noted that lex mercatoria developed in the Middle Ages when, after the decline of the VI–X centuries, there was a renaissance of trade. After the codifications of the XIX century in continental Europe and the adoption of lex mercatoria by the English common law, the unified institutions of lex mercatoria were established differently in different countries, whose national law for some time contained all the rules of lex mercatoria and began to develop them as a part of domestic legislation. A. Smityukh also argues that we can now observe the revival of lex mercatoria, which he defines as a set of extra-national norms based on custom, and thus a source of law [23, p. 5–6, 13].

According to R. Reátegui and co-authors: «globalization has brought about a profound change in the legal phenomenon: there has been an approximation of rules sometimes imposed by a single coercive actor, sometimes produced by a coherent development, other times adopted by consensus. Among the most exciting aspects of this path, we can mention the development and codification of a modern lex mercatoria more adequate to a transnational reality and govern by technology and the market» [24, p. 4].

Later, lex mercatoria was transformed into lex informatica. The first most fundamental study on this topic is the work of J. Reidenberg «Lex Informatica: The Formulation of Information Policy Rules Through Technology». The scientist noted that for the information infrastructure, the rules of its operation are as important as lex mercatoria was for traders hundreds of years ago. In his research, the scientist proves that technological capabilities and algorithms of the system impose rules on its users. The researcher concluded that a set of rules for information flows imposed by technology and communication networks forms lex informatica [25, p. 553–555]. In turn, E. Giorgini (2019), supporting this thesis, also believes that the internal architecture of software and hardware carries out a kind of regulation [26, p. 136].

E. Priowirjanto drew attention to the close connection between lex informatica and market self-regulation (in particular in the field of e-commerce). The scientist noted that lex informatica regulates e-commerce transactions through smart contracts concluded by business entities and consumers on the basis of agreement on the content of the contract, as well as trust formed by two parties who did not meet face to face when concluding an electronic contract [27, p. 146].

The researchers note that, like lex mercatoria, lex informatica ultimately relies on self-regulation: it is a system of customary rules and technical standards developed by those who interact on the Internet. The system operates transnationally, regardless of national borders and national legislation [11, p. 23–24].

In light of the above, it seems that by restricting the actions that can be taken on a digital platform, lex informatica implements a system of technical rules that do not directly express the will of the people, but rather the will of those responsible for the digital support of the platform.

To summarise, with the advent of digital technologies, and blockchain in particular, a special set of rules has emerged – lex cryptographica, which can be defined as a set of rules established and enforced by software code restrictions in the blockchain network.

This system originates from the medieval lex mercatoria. At the same time, both lex mercatoria, which was developed by the international community of traders to meet their own needs for certain rules that are the same for everyone, and lex cryptographica were actually developed by the blockchain community to regulate social relations by introducing a specific set of opportunities and restrictions.

*3.3 Consideration of features of lex cryptographica in the context of lex mercatoria*
As already mentioned, there is a lack of research on lex cryptographica in legal science and legal doctrine has not yet formed an opinion on whether lex cryptographica can be considered as a source of law. At the same time, the fact that lex cryptographica is a modern descendant of lex mercatoria gives grounds to believe that certain features inherent in lex mercatoria may also be inherent in lex cryptographica. At the same time, there are numerous studies in legal science that indicate that lex mercatoria is a source of law.

Thus, Y. Ostapenko notes: «lex mercatoria can confidently be called the source of international economic law – the law of international commercial transactions (international contract law, currency and transport law, intellectual property law, international commercial arbitration)» [28, p. 103]. It is interesting to note the opinion of O. O. Merezhko that the fact that, from the point of view of such a theory as legal positivism, lex mercatoria has a dubious origin does not mean that modern jurisprudence should limit itself to purely positivist methods and ideas in an attempt to reveal the content of the concept of lex mercatoria. The author stresses that legal positivism, like any other theory, is ultimately only an abstract model of reality, and if this model fails to adequately reflect and explain any manifestations of the real world, then it is necessary to turn to new, more adequate theoretical models and constructs, rather than ignoring reality. The scholar also notes that, in connection with the development of information technology and the Internet, «lex mercatoria is proposed as a conceptual model for regulating electronic commerce and contracts in cyberspace» [29, p. 19–20].

R. Prylutsky noted that with the development of market relations and further integration of Ukraine into the international economic space, the understanding of law

is changing, the means, forms (instruments) of regulation of social relations, including in the sphere of business, are expanding. In particular, commercial contracts and business practices are gaining in importance as regulators of economic relations. Contracts and customs, together with commercial regulations, are becoming important sources of commercial law (as well as a number of other branches of law). In this sense, commercial law should be developed and modernised in the same way [30, p. 68].

V. S. Milash comes to the conclusion that in a market economy the use of the regulatory capabilities of legal norms is significantly reduced, since they cannot provide for all the details of relations arising within the framework of commercial transactions. At the same time, «micronorms» (individual norms coming from the participants of social relations themselves) have become widespread in the field of market relations. As a result of monotonous repetition of a number of micro-norms (homogeneous application practices) by the participants of market relations, independent extra-legal forms of law (customs, established order, «formular law») were formed, the scope of which today is not limited to contractual activities (well-known international organisations generalise the standards existing in different countries for the implementation of certain types of business activities and prepare corresponding codes of conduct, which have the character of international customs – a component of lex mercatoria) [31, p. 87].

In light of the above, it seems that lex cryptographica is actually also a «micronorm» (individual norms that come from the participants of social relations themselves). This is because the very nature of lex cryptographica requires participants to act within the possibilities and limits set by the software code. In light of the above, and using the analogy with lex mercatoria, it is possible to consider lex cryptographica as a source of law governing virtual assets market.

It is also worth noting that I. A. Dikovska, while studying the possibility of applying lex mercatoria in international commercial arbitration, concluded that arbitrators are generally entitled to apply lex mercatoria as the applicable law only if the parties have authorised them to act as friendly arbitrators or have agreed that the dispute shall be resolved in accordance with lex mercatoria, general principles of law, customs applicable in international trade. Regarding this feature of lex mercatoria, it should be noted that it cannot be inherent in lex cryptographica, since the rules are already laid down in the code itself, and it seems impossible for a court to apply lex cryptographica after the offence has been committed. Instead, it seems that unlawful interference with the blockchain network will constitute a criminal offence [32, p. 22].

## 3.4 Will traditional legislation be replaced by lex cryptographica?

The emergence of blockchain has led to significant challenges for the law. States are facing great difficulties in developing legal regulation of relations in the market for virtual assets, and are choosing different paths: from a complete ban on the use of virtual assets to complete permissiveness in their circulation. It seems that a total ban on the circulation of virtual assets violates human rights, since O. Petryshyn and O. Hyliaka

call the «right to take part in property turnover in the digital sphere» one of the fundamental human rights in the digital age. At the same time, the absence of legal regulation of social relations in the virtual asset market creates complete permissiveness, which has a negative impact on the respect of the rights of market participants. However, it seems that even despite the absence of traditional legal regulation of the virtual asset market within a particular jurisdiction, relations in this market still remain regulated to some extent by lex cryptographica, since this study has identified a conceptual possibility to consider lex cryptographica as a source of legal regulation of relations in the virtual asset market [33, p. 18].

J. Cohen recognizes a significant distinction between perceiving code as a form of regulation that can supplement traditional legal regulation and perceiving it as a form of development that triggers profound structural transformations of legal institutions that have been established over centuries. He supports the latter perspective [34, p. 1020].

However, it appears that lex cryptographica would not substitute conventional legal regulation. In consideration of the scrutinised nature of lex cryptographica, it is evident that the latter fosters legitimate conduct of the virtual asset market's stakeholders by curbing their behavioural alternatives via software and guarantees the operation of rules in the market, thwarting the perpetration of violations. Nonetheless, it does not permit its enforcement post a dispute or an offence. The code's algorithm implementing lex cryptograpica does not necessitate further consolidation within present legislation, as it is the foundation of the code itself. Additionally, when settling conflicts concerning virtual assets, courts cannot hinge on lex cryptograpica but must apply the regulations and laws of the jurisdiction in which they operate. T. Schrepel's opinion is also noteworthy: «if citizens were to prefer the lex cryptographia ecosystem, it would be rather interesting to watch if the States would let them move into it, without constraint. Indeed, let us first recall that it would imply the voluntary waiving of certain fundamental rights as we have shown that the ability to enforce them against others is mostly non-existent on blockchain. Second, it would mean that some of the core functions of the State would be replaced by technology. For these two reasons, one may doubt that States will let citizens be governed by the lex cryptographia ecosystem as they wish» [35, p. 381–382].

As M. Blaszczyk wrote, according to mature advocates of lex cryptographica, technological private ordering is unlikely to replace traditional law. Instead, it is seen as shifting the balance between law and technological architecture towards alternative regulatory mechanisms based on technical code. In this way, the claims of an alternative reality are reduced to the «utopian visions of cloud communities… such as those expressed by the Bitnation project… [which] engage in self-governance by providing themselves with identity services or property rights regimes», assuming that their private ordering creates a Kelsenian coherent system of on-chain rules to which any off-chain interference, whether through a hack or the intrusion of traditional law, seems antithetical [36, p. 38].

## CONCLUSIONS

The advent of digital technologies, and blockchain in particular, has given rise to a novel set of rules, known as lex cryptographica. This term refers to a set of regulations established and enforced by software code restrictions within the blockchain network. The concept of lex cryptographica presents an innovative approach to regulating relations in the digital environment. Its distinguishing feature is the utilization of algorithmic constraints as a mechanism for implementing and adhering to the established rules.

While it is posited that this autonomous regulatory system bears resemblance to the medieval lex mercatoria, it is acknowledged that its practical application is accompanied by significant challenges and limitations.

First, the technological nature of lex cryptographica makes it impossible to use it as an independent tool for resolving legal disputes or ensuring legal liability. The algorithmic rules embedded in the program code do not take into account the social complexity and context of specific situations, which limits their ability to resolve conflicts.

Second, in modern legal systems, lex cryptographica remains outside the scope of legal recognition. Courts are guided by existing legal acts, while autonomous rules created through program code have no legal status. This limits its integration into the legal field and creates challenges for its application in the international context.

Thirdly, the effectiveness of lex cryptographica depends on its harmonization with traditional legislation. To ensure the interaction between algorithmic norms and legal systems, special mechanisms of legal integration should be developed. This includes the creation of new standards and hybrid models that combine the strengths of code and regulation.

At the same time, the concept of lex cryptographica opens up prospects for improving the legal regulation of the virtual asset market. In particular, it is possible to:

– introduction of hybrid legal models that integrate code restrictions and traditional legal mechanisms (for example, a blockchain transaction can automatically fulfill the terms and conditions (smart contracts), but in case of a dispute, the traditional judicial system is involved, or «regulated tokens» that meet the requirements of financial regulators, but operate on the basis of decentralized blockchain protocols;

– development of universal standards for the global digital asset market that take into account technological features and ensure international interaction, including the definition of a clear classification of tokens (payment, investment, utilitarian) for the same application in different jurisdictions; establishment of minimum technical requirements for blockchain protocols, such as transparency of algorithms, data protection, etc.

Therefore, lex cryptographica possesses the potential to become an effective instrument within the domain of digital technologies. Its success will be contingent upon the capacity of states and the international community to adapt algorithmic norms

to existing legal systems, while preserving a balance between innovation and legal security.

## RECOMMENDATIONS

The article may be of interest to researchers, educators, students, practitioners, and individuals with a general curiosity about innovative approaches to researching the regulation of crypto assets market.

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