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S.S. Boranbay[1*], G.A. Ilyassova[2]

[1,2] *Karaganda Buketov University, Karaganda, Kazakhstan*
(E-mail: sapar_s@mail.ru, g.iliasova@mail.ru)

[1]*ORCID ID: 0009-0004-8961-606X*
[2]*ORCID ID: 0000-0002-8843-2515, Scopus Author ID: 56192012500, WOS Researcher ID: AAR-6742-2020*

Legal regulation of smart contracts in Switzerland and the United Kingdom: a comparative legal analysis

This paper presents an analysis of the legal regulation of smart contracts in Switzerland and the United Kingdom — two leading countries in the field of digital technologies. The study examines the key approaches to the formation and execution of smart contracts, their place within the law and legislation, as well as their influence on the development of IT technologies. The central issue in regulating smart contract-related relations lies in the ambiguity of their legal nature and the lack of regulatory provisions in legislation, particularly in the Civil Code of the Republic of Kazakhstan. Special attention is given to legislative initiatives in both countries. The research shows that Switzerland has successfully integrated blockchain technologies into its legal system through the adoption of specialized legal frameworks. In contrast, the United Kingdom emphasizes the adaptation of common law to the challenges of the emerging digital economy. The article compares the two countries' approaches in the definition and application of smart contracts, their legal status, taxation issues and data protection. In Switzerland, this is the Law on Distributed Registries (DLT Act), and in the UK, the recommendations of the Law Commission of England and Wales. The paper also focuses on security issues (cyber threats and data protection), potential risks and the cross-border use of smart contracts. A comparative analysis of both jurisdictions' approaches is presented, along with their potential for further development, including participation in global standardization initiatives. In conclusion, the authors underscore the necessity of establishing international legal standards for the effective and secure use of smart contracts.

Keywords: smart contracts, blockchain, legislation, legal regulation, Switzerland, the United Kingdom, digital economy, cross-border transactions, judicial practice, Anglo-Saxon legal system, continental legal system.

Introduction

The United Kingdom and Switzerland are actively developing countries in terms of scientific and economic innovation, with a high level of advancement in digital technologies. Both states are witnessing significant progress in areas such as artificial intelligence, fintech, cybersecurity, 5G and smart cities. In Switzerland, the "Digital Switzerland" program is being implemented, aimed at fostering the digital economy and supporting technological startups [1]. In the United Kingdom, a similar initiative is being pursued through the "UK Digital Strategy" [2].

Smart contracts are an essential component of the digital economy, which ensure transparency and automation of transactions. While the legal status of smart contracts in the CIS countries raises numerous questions, European jurisdictions have made notable progress in this area. The United Kingdom and Switzerland, as leading hubs of financial technology, demonstrate differing approaches to legal regulation. These two countries have different legal systems, which is certainly important in the context of smart contracts.

In order to improve domestic legislation and for the development of Kazakh legal science, we believe that it will be useful to learn about the legal regulation of smart contracts in these two leading jurisdictions, about their features and differences in this area.

The purpose of this article is to conduct a comparative legal analysis of the legal regulation of smart contracts in the United Kingdom and Switzerland, to explore their features and development prospects. After finishing one part of the article, the authors used methods of comparative legal analysis, the study of judicial practice and regulations. This article may also be of interest due to the fact that the United Kingdom follows the Anglo-Saxon (common law) legal tradition, while Switzerland adheres to the Romano-Germanic (continental) legal system.

* Corresponding author's e-mail: sapar_s@mail.ru

Methods and materials

The sources for this article include official documents such as the reports of the Law Commission of the United Kingdom (2019), the Swiss Blockchain Act (2021), in addition, scientific publications and data from international organizations were used. The research used methods of comparative analysis, examination of case law, normative legal framework and doctrinal sources. The primary materials include legislative acts, scientific papers on topic of blockchain and smart contracts, as well as reports from governmental commissions.

The comparative analysis was conducted with due consideration of the specific features of the legal systems of Switzerland and the United Kingdom. In order to assess the prospects for the application of smart contracts, a systemic approach was adopted, which involves the analysis of the interaction between legal and technical aspects.

The principal research methods of the article are methods of comparative legal analysis, synthesis, deduction, induction and systematization. Since the topic of smart contracts affects many areas and industries, general scientific, private scientific and private legal methods were used in this study.

Results

Smart contracts represent a form of software code that is executed automatically upon the occurrence of certain predefined conditions. This unique type of agreement is based on distributed ledger technology (DLT), which ensures immutability, transparency and decentralization [3]. The main characteristics of smart contracts include:

1. automatic execution: the absence of human involvement reduces the risks of delays and errors. For example, in the insurance sector, smart contracts can autonomously issue compensation upon the occurrence of an insured event. According to Swiss Re, such solutions have reduced processing time by up to 50 % [4].

2. independence from third parties: according to PwC data, intermediaries are no longer required, which allows for cost savings of up to 30 % in transaction expenses [5].

3. transparency: all operations and contractual terms are accessible to the contracting parties. For instance, in supply chain management systems such as IBM Food Trust, smart contracts have enabled the tracking of product origin to be reduced from several days to several seconds [6].

Nevertheless, the legal nature of smart contracts remains a subject of ongoing debate. One of the central issues is whether smart contracts can be recognized as legally binding agreements.

Switzerland

Switzerland has established itself as one of the global leaders in the regulation and development of blockchain and related technologies. The country benefits from progressive legislation, a favorable tax policy and strong support for innovation. As a result, Switzerland has succeeded in attracting a significant number of blockchain startups and companies operating in the field of digital assets. The so- called “Crypto Valley”, located in the canton of Zug, is widely known as a hub for leading blockchain enterprises. Notable organizations based there include the Ethereum Foundation, Cardano, Tezos, and others [7]. The blockchain industry plays a particularly important role in the Swiss economy. According to the Swiss Blockchain Federation, more than 1,000 blockchain companies were registered in the country in 2023, supporting over 6,000 workplaces.

Key sectors of blockchain application include:

1. financial technologies (FinTech) — decentralized finance (DeFi), crypto-banking, tokenized assets.

2. supply chains and logistics — product tracking using blockchain technology (e.g., IBM Food Trust projects).

3. insurance — automated insurance payouts using smart contracts (for instance, Swiss Re).

4. public administration — pilot projects applying blockchain technology in electronic voting and land registry systems.

In the canton of Zug, known as “Crypto Valley”, blockchain startups attracted over USD 4 billion in investments between 2017 and 2023 [8].

Switzerland was among the first countries to introduce legislative changes aimed at regulating blockchain technologies. In 2021, the country adopted the Blockchain Act, which clarified the legal status of digital assets, regulated the use of smart contracts in the financial sector, and established safeguards for the protection of counterparties’ rights. Under Swiss law, if smart contracts meet the general requirements for contracts as defined by the Swiss Civil Code, they may be recognized as legally binding agreements. These

requirements include the mutual consent of the parties, the lawfulness of the subject matter, and the legal capacity of the parties to enter into a contract [9]. Although the Swiss Law on Distributed Ledger Technology (DLT) does not contain a direct definition of smart contracts, it nevertheless creates conditions for their recognition and use in a legal context. In particular, legislative adaptation has eliminated legal uncertainties associated with the transfer of assets and rights via blockchain technology. A practical example of such implementation is the development of an integrated certified electronic signature for smart contracts based on blockchain technology, designed by the Zurich University of Applied Sciences (ZHAW) in collaboration with the telecommunications company Swisscom. An example of practical implementation is the development of an integrated certified electronic signature for a blockchain-based smart contract, which was invented by the Zurich University of Applied Sciences (ZHAW) together with the telecommunications company Swisscom. This solution provides legal authentication of smart contracts and complies with Swiss legal requirements for written form in contracts involving the transfer of certain rights.

Thus, Switzerland actively promotes the integration of smart contracts into its legal system, ensuring their legitimacy and support at the legislative level [10].

For instance, according to data from the Swiss Blockchain Federation, 70 % of smart contracts in Switzerland are used in the financial sector, thereby underscoring their legal significance [11]. Moreover, Swiss authorities actively engage with representatives of the private sector to strike a balance between innovation and the protection of market participants' interests. One of the key features of smart contracts is their application in the field of asset tokenization, which significantly simplifies the processes of asset transfer and accounting. Switzerland is also actively developing a legal framework for working with decentralized finance (DeFi) platforms, thus facilitating the integration of smart contracts into the banking sector. Financial institutions and banks in the country are increasingly adopting blockchain technologies to reduce transaction costs and ensure transparency in operations.

Switzerland offers favorable tax conditions for the use of blockchain technologies. Smart contract used in financial transactions may fall under the scope of the Financial Services Act (FinSA). For example, from 2018 to 2023, tax incentives in the canton of Zug attracted more than 960 blockchain startups [12].

If smart contracts process personal data, the Federal Act on Data Protection (FADP) applies, which imposes additional obligations on users and developers. The risk of data breaches is reduced due to the fact that companies commit to storing transaction data in encrypted form [13].

The Swiss Federal Act on Data Protection (FADP) governs the processing of personal data of individuals and guarantees their security and confidentiality. An updated version of the Act came into force in 2023, aligning the legislation with modern standards [14]. Key provisions of the FADP include:

1. the Act applies to companies that process personal data in Switzerland or those that have Swiss clients;

2. data processing must comply with the principles of lawfulness, proportionality, and transparency;

3. individuals have the right to access, rectify or delete their personal data and to object to its processing;

4. organizations are required to notify data security breaches, maintain a record of processing activities and appoint data protection officers;

5. cross-border data transfers are permitted only to countries with an adequate level of protection or with the use of specific safeguards (e.g., standard contractual clauses);

6. liability for non-compliance: stricter sanctions have been introduced, including fines of up to CHF 250,000 for individuals.

The United Kingdom

The United Kingdom is rapidly developing blockchain technologies with the ambition of becoming a global hub for digital assets and decentralized finance (DeFi). Through flexible regulation, a high concentration of tech startups, and government support, the country has created favorable conditions for the integration of blockchain across various sectors of the economy.

Blockchain plays a significant role in the United Kingdom economy, particularly in the field of financial technologies (FinTech). According to the United Kingdom Blockchain Association, over 500 blockchain companies operated in the country in 2023, providing more than 3,000 workplaces. The four primary areas of blockchain application in the United Kingdom include:

1. financial sector — digital payments, tokenized assets, and decentralized finance (DeFi);

2. public administration — pilot projects using blockchain for land registries and digital identity systems;

3. legal technologies (LegalTech) — automation of transactions through smart contracts;

4. supply chains — product tracking using blockchain (e.g., Walmart and IBM projects).

The capital, London, remains the leading European center for FinTech innovation, attracting billions of dollars in blockchain startup investments [15].

The United Kingdom is also actively developing a legislative framework for digital technologies. In 2019, the Law Commission of England and Wales published a report confirming that smart contracts may be recognized as legally binding agreements under the current legal framework.

In this country, smart contracts are governed by the principles of common law. The aforementioned report confirmed that smart contracts meet the essential elements of contract law. Key aspects include the possibility of using code to demonstrate the parties' intentions and interpreting the terms of the agreement in light of their digital execution [16].

British case law demonstrates flexibility in addressing matters involving digital assets. In a 2019 case, cryptocurrency was recognized as property, thereby paving the way for the use of smart contracts in commercial transactions [17].

The United Kingdom is also actively developing software standards applicable to smart contracts, including code transparency requirements, data protection controls, and cybersecurity standards. Under English law, smart contracts are treated as valid agreements provided, they meet the following conditions: the intention to create legal relations; the presence of offer, acceptance, consideration; the requirements correspond to good faith [18].

For example, in 2022, 60 % of companies using smart contracts in the United Kingdom implemented them in supply chain management, resulting in a 20 % reduction in administrative costs.

Smart contracts used in the financial sector fall under the scope of the Financial Services and Markets Act (FSMA) and the relevant regulations issued by the Financial Conduct Authority (FCA). According to the Bank of England, integrating smart contracts into banking operations has reduced transaction processing costs by 15 % [19].

The General Data Protection Regulation (GDPR) applies in the United Kingdom and imposes strict requirements on the processing of personal data, which also extends to smart contracts. Particular attention is paid to anonymity and security issues. For instance, 25 % of data breaches in the financial sector in 2021 were attributed to inadequate protection of smart contract systems [20].

Comparative Analysis

The key distinction between the approaches of the United Kingdom and Switzerland lies in the degree of legal formalization. Switzerland aims to develop specialized legislation, whereas the United Kingdom emphasizes the adaptation of existing legal norms. Each of these approaches has its advantages: the Swiss model offers a high degree of legal certainty, while the British model provides flexibility and universality.

It is also worth noting that both countries are actively engaged in the development of global standards for the regulation of smart contracts. They participate in the work of the European Commission and the International Chamber of Commerce [21].

The Swisscom project is an example of successful smart contract integration in Switzerland, utilizing blockchain technology to manage digital assets. The United Kingdom, on the other hand, has implemented projects such as TradeLens, which applies smart contracts to automate logistics processes — resulting in a 30 % reduction in port delays [22].

While both jurisdictions follow progressive approaches, certain unresolved issues remain. For instance, according to reports from the European Blockchain Observatory, approximately 35 % of all smart contract incidents are due to code vulnerabilities, underscoring the need for the development of robust security standards. From a legal standpoint, the cross-border use of smart contracts poses significant challenges: differences in legal systems create barriers to their widespread application [23].

Discussion

We made a comparative analysis of the legal regulation of smart contract in two jurisdictions, and this helped to identify both common features and significant differences in the approaches of both states. Both Switzerland and the United Kingdom recognize the legal force of smart contracts, however, their integration into existing legal systems involves distinct characteristics.

Legal recognition. According to the conclusions of Müller and Kramer, in Switzerland, a smart contract is considered legally binding if it complies with the requirements of the country’s civil legislation. The Swiss Law on Distributed Registries (DLT Act) creates a favorable climate for their integration, particularly

in the financial sector [24]. In the United Kingdom, if digital contracts meet the fundamental principles of contract law-namely, the presence of offer, acceptance, and consideration-the Law Commission of England and Wales acknowledges the possibility of treating them as legally binding agreements [25].

Impact of regulation on the Financial Sector. Switzerland actively employs smart contracts in the banking sector and among fintech startups, as evidenced by the high concentration of blockchain companies in the canton of Zug ("Crypto Valley") (Schär, 2022) [26]. The United Kingdom, for its part, regulates smart contracts in financial services through the Financial Conduct Authority (FCA), ensuring compliance with the Financial Services and Markets Act (FSMA) (Jones, 2022) [27].

Taxation prospects. Patel and Williams (2023) note that Switzerland offers more flexible tax conditions, including exemptions from value-added tax (VAT) for certain digital asset transactions [28]. In contrast, the United Kingdom applies stricter tax regulations, though it offers tax incentives for innovative blockchain companies and startups (Johnson & Smith, 2023) [29].

Data Protection and Privacy. Data protection is a key issue for both countries. Switzerland has enacted the Federal Act on Data Protection (FADP), adapted to the particularities of blockchain technologies (Müller, 2023) [30]. In the United Kingdom, GDPR standards are applied, imposing strict requirements on the processing of personal data within smart contracts (Brown, 2022) [31].

Several authors suggest possible **directions for further improvement of smart contract regulation**: Taylor (2022) advocates for the introduction of audit and certification mechanisms for smart contract code [32]; White & Green (2023) argue for the development of international regulatory standards for smart contracts [33].

As for scholars from Kazakhstan, G.A. Ilyassova and B.Zh. Aitimov argue that a national regulation on personal data protection should be adopted based on blockchain technology [34]. M.M. Bazarov and R.A. Tokatov assert that the legal validity of smart contracts, including their definitional regulation, must be comprehensively examined by legal experts. It is believed that the experiences of these two countries may help address such challenges [35].

Based on this research, we further suggest the following additional areas for improvement: creation of legal mechanisms for user protection in the event of disputes; expanded use of regulatory sandboxes to test new smart contract models.

Overall, the comparative analysis of smart contract regulation in the United Kingdom and Switzerland demonstrates that both countries are striving to create and implement favorable conditions for the application of blockchain technologies. It should also be emphasized that the continued development of regulatory frameworks and the harmonization of international norms will contribute to building trust in smart contracts and promoting their widespread adoption.

Conclusions

The United Kingdom and Switzerland demonstrate different approaches to the regulation of smart contracts, reflecting the specific features of their respective legal systems. While Switzerland focuses on the development of specialized legal norms governing smart contracts and blockchain, the United Kingdom relies on the general principles of common law. Despite the divergence in regulatory models, both jurisdictions support the growth of the digital economy and ensure protection for contracting parties.

Based on the analysis and research, the following conclusions can be drawn:

1. Both countries demonstrate progressive and peculiar approaches to regulating smart contracts and their legal systems are different and have their own peculiarities;

2. The main issues that both countries need to address are technical risks, cross-border regulation and the need to harmonize global standards.

In the future, research can be directed to the study of cross-border aspects of the use of smart contracts, as well as their implementation in international law, which is especially relevant in our time of global economy, trade and the growing number of digital transactions. In addition, it is important to take into account the problems of data security and the prevention of cyber threats associated with the use of smart contracts.

In conclusion, the further development of smart contracts will require enhanced cooperation between jurisdictions and the establishment of universal international standards.

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С.С. Боранбай, Г.А. Ильясова

Швейцария мен Ұлыбританияда смарт келісім-шартын құқықтық реттеу: салыстырмалы-құқықтық талдау

Мақалада Ұлыбритания мен Швейцарияда смарт келісім-шарттарды құқықтық реттеу ерекшеліктері талданған. Бұл екі мемлекет цифрлық технологиялар саласында көшбасшы болып саналады. Мәселен, смарт келісім-шартты пайдалану кезіндегі қатынастарды реттеудің басты проблемасы, оның құқықтық мәнінің анықталмауында, заңнамада, атап айтқанда, Қазақстан Республикасының Азаматтық кодексінде реттелмеуінде болып отыр. Екі елдің заңнамалық бастамаларына ерекше назар аударылды. Смарт келісім-шарттарды жасау, орындау тәсілдері, олардың құқық жүйелеріндегі орны және цифрлық экономиканың дамуына әсері қарастырылған. Зерттеу барысында Швейцарияда блокчейн технологияларды ұлттық заңнамаға белсенді түрде енгізіп, арнайы құқықтық негіздер ұсынатынын, ал Ұлыбританияның цифрлік дәуірдің талаптарына жалпы құқықты бейімдеуге баса назар аударып жатқанын байқай аламыз. Екі елдің смарт келісім-шарттарды анықтау және қолдану тәсілдері, құқықтық мәртебесі, салық салу және деректерді қорғау сұрақтары талданды. Ұлыбританиядағы «Англия мен Уэльс заң комиссияның ұсыныстары» мен Швейцариядағы «Таратылған тізілімдер туралы» Заңы (DLT Act) сияқты заңнамалық бастамаларға салыстырмалы-құқықтық талдауға ерекше назар аударылды. Смарт келісім-шарттардың шекарааралық қолданылуы, қаржы технологияларындағы рөлі және деректерді қорғау, киберқауіптерге байланысты тәуекелдер мәселелеріне ерекше көңіл бөлінген. Бұл зерттеуде, сондай-ақ екі юрисдикцияның тәсілдерін салыстырмалы талдау және әрі қарайғы даму перспективалары, соның ішінде стандартқа келтіру бойынша жаһандық бастамаларға қатысу сұрақтары ұсынылған. Авторлар смарт келісім-шартты қауіпсіз және тиімді пайдалану үшін халықаралық стандарттарды құру қажеттілігі туралы қорытындыға келді.

Кілт сөздер: смарт келісім-шарттар, блокчейн, заңнама, құқықтық реттеу, Швейцария, Ұлыбритания, цифрлық экономика, трансшекаралық мәмілелер, сот практикасы, ағылшын-саксондық құқықтық жүйе, континенттік құқық жүйесі.

С.С. Боранбай, Г.А. Ильясова

Правовое регулирование смарт-контракта в Швейцарии и Великобритании: сравнительно-правовой анализ

В данной работе был произведен анализ особенностей правового регулирования смарт-контрактов в Швейцарии и Великобритании, в двух ведущих странах в области цифровых технологий. Были рассмотрены ключевые подходы заключения и исполнения смарт-контрактов, их место в праве и в законодательстве, влияние на развитие IT-технологии. Так как, главной проблемой регулирования отношений по использованию смарт-контракта становится неясность его юридической сущности, отсутствие регламентации в законодательстве, в частности в Гражданском кодексе РК. Особенное внимание было уделено законодательным инициативам двух стран. Исследование показало, что Швейцария успешно интегрирует блокчейн-технологии в свое законодательство, путем внедрения специализированных правовых рамок. В свою очередь, Великобритания делает упор на адаптацию общего права к вызовам новой эпохи цифровой экономики. Было проведено сравнение подходов двух стран в определении и применении смарт-контрактов, правового статуса, вопросы налогообложения и защиты данных. В Швейцарии это закон о распределенных реестрах (DLT Act), а в Великобритании рекомендации Юридической комиссии Англии и Уэльса. Также было уделено особое внимание вопросам безопасности (киберугрозы и защита данных), потенциальным рискам, трансграничному использованию смарт-контрактов. Был представлен сравнительный анализ подходов двух юрисдикций и возможности их дальнейшего развития, в том числе участие в глобальных инициативах по стандартизации. Авторы, подводя итоги, отметили о необходимости создания международных правовых стандартов для эффективного и безопасного использования смарт-контрактов.

Ключевые слова: смарт-контракты, блокчейн, законодательство, правовое регулирование, Швейцария, Великобритания, цифровая экономика, трансграничные сделки, судебная практика, англо-саксонская правовая система, континентальная система права.

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Information about the authors

Boranbay Sapar Serikuly — Master of Juridical Sciences, Teacher of the Department of Civil and Labor Law, Faculty of Law, Karaganda Buketov University, Karaganda, Kazakhstan; e-mail: sapar_s@mail.ru

Ilyassova Gulzhazira Aktureevna — Candidate of Juridical Sciences, Full Professor, Research Professor at the Department of Civil and Labor Law, Karaganda Buketov University, Karaganda, Kazakhstan; e-mail: g.iliasova@mail.ru