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Artificial Intelligence – A Legal Perspective with Special Regard to Contract Law and Smart Contracts**

ABSTRACT: *The rapid evolution of information technology in the past century has led to the emergence of increasingly complex contractual relationships, prompting legal scholars to explore the intersection of automation and contracts. With the emergence of Artificial Intelligence (AI), the legal landscape faces new challenges and opportunities, particularly regarding smart contracts. This paper outlines the legal framework governing AI in the European Union and delves into the implications of technological developments for contract law, focusing on smart contracts in Hungarian and Serbian law. The European Union has taken proactive steps in regulating AI in alignment with societal welfare, fundamental rights, and ethical considerations. In Hungary and Serbia, the legal recognition of electronic contracts lays the foundation for integrating advanced technologies like smart contracts. Serbian legislation has made significant strides in explicitly permitting and regulating smart contracts through the Act on Digital Property. The emergence of smart contracts presents novel challenges to traditional contract law, including issues of code interpretation, accountability for coding errors, and the need for regulatory frameworks to oversee implementation. Despite these challenges, the adoption of smart contracts offers streamlined execution, transparency, and increased efficiency in contractual processes, paving the way for a more digitally driven legal landscape.*

KEYWORDS: *Artificial Intelligence, Smart Contracts, Blockchain, E-contracts, IT in Contract Law, Contractual Relationships, Legal Framework.*

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1. Introduction

Rapid changes in information technology and in society as a whole over the past century have given rise to more intricate contractual relationships, prompting interpreters to explore the connection between automation and contracts, as well as new legal categorisations of contracts, resulting in proposals for new types of juridical acts.¹

Although Artificial Intelligence² has gained a significant importance only in recent years, its genesis traces back to the 1950s, most notably to the seminal contributions of Alan Turing, who laid the foundations of machine learning through the Turing-test, published in his study “Computing Machinery and Intelligence”.³

In the contemporary landscape, the burgeoning potential of AI and its data-processing capabilities has generated substantial interest and investment from large enterprises and research institutions, driving further advancements and investment in the field.⁴ AI now integrates seamlessly into the digitalised economy of the globalised era, with effects increasingly evident across numerous domains, from financial markets to innovative healthcare solutions, and software capable of generating artistic and literary content.⁵

Moreover, as the emergence of the Internet revolutionised numerous aspects of society and science, including contract law, the widespread adoption of electronic contracts became possible through established and detailed legal regulations.⁶ At the same time, there is a growing trend towards integrating advanced technologies such as AI and blockchain into contract formation, leading to the development and increasing use of so-called smart contracts across various contractual relationships.⁷

Artificial Intelligence represents a complex realm, encompassing a broad spectrum of theories and applications, which makes its comprehension challenging even as it increasingly shapes legal frameworks and systems.⁸ As technology progresses rapidly, there is an ever growing need to comprehend its potential, particularly in legal contexts.⁹

1 Stazi, 2021, pp. 9–10.

2 Hereinafter referred to as: AI.

3 Netz, 2022, p. 98. <http://doi.org/10.62733/2025.1.5-15>

4 Ibid., p. 96.

5 Ibid.

6 Juhász, 2021a, pp. 48–49.

7 Ibid.

8 Magnusson Sjöberg, 2019, p. 177.

9 Ibid.

Furthermore, legal theory has ventured into examining whether AI systems can participate in contractual relationships as individuals, i.e. whether they possess the cognitive capabilities to do so.¹⁰ Two different assessments arise: the first approach considers AI an ‘agent in contract law’; the second approach involves AI as a party to a contractual relationship.¹¹

In the first case, AI functions as a tool used by contracting parties to expedite the conclusion of contracts, enhance security, and improve overall contractual outcomes.¹² For instance, AI may analyse human behaviour in detail, providing sellers with information based to estimate customers’ willingness to pay the price for specific products.¹³ AI may also automatically execute obligations deriving from contractual relationships, an increasingly common use in connection with smart contracts.¹⁴

Exploring the alternative approach, which entails the independent role of AI in contractual relationships, requires intricate philosophical assessment of human cognitive functions and the concept of a conscious ‘artificial mind’.¹⁵

Given the complexity and highly theoretical nature of such questions, this paper shifts focus. The following sections explore the impact of technological development on contract law, with particular attention to the emergence of smart contracts.

The aim of this paper is to outline the various effects of technological advancements, particularly regarding smart contracts. As technological evolution accelerates, comprehending and staying abreast of these advancements becomes increasingly vital. By concluding this assessment, the paper endeavours to enrich the comprehension of the intersection between technology and contract law, elucidating its implications for legal practices and frameworks.

By analysing the legal frameworks of Hungary and Serbia concerning smart contracts, the paper attempts to shed light on the evolving regulatory framework of contract practices in the digital age and legal responses to technological innovation. After presenting an overview of the legal framework regarding AI in the European Union, smart contracts in general, and their implementation in Hungarian and Serbian law, a brief comparative summary will follow.

10 See: more Linarelli, 2019, p. 340; Malinowska, 2022, p. 90.

11 Ebers, Poncibò and Zou, 2022, p. 7.

12 Ebers, 2022a, p. 21.

13 Ibid., p. 22.

14 Ibid., p. 23.

15 Linarelli, 2022, p. 72.

2.

Short Overview of the Legal Framework Governing AI in the European Union

To ensure that AI serves the welfare of humanity, it is imperative to instil trust in it by grounding AI development in core values, fundamental rights, human dignity, and privacy protection.¹⁶ In this regard, legal regulation plays a pivotal in establishing the necessary framework for responsible AI deployment.¹⁷

The regulation of Artificial Intelligence can occur at various legislative levels, with states remaining the primary regulators, while international norms are likely to remain exceptions due to limited regulatory capabilities.¹⁸ Nonetheless, international regulatory frameworks can facilitate coordination among states and guide policymaking.¹⁹

Numerous countries are now formulating of national plans to facilitate and utilise AI systems. Some have delineated comprehensive strategies, incorporated AI technologies into broader national technology agendas, or crafted respective national strategies for AI research.²⁰

Despite these attempts at the national level, it is important to emphasise the intensive activity of international organisations aiming to establish a global legal framework. Among these organisations, the European Union stands out as the most proactive regulator, incrementally advancing towards comprehensive regulatory measures.²¹

Amidst these attempts, the European Commission's Communication 'Artificial Intelligence for Europe'²², the High-Level Expert Group on AI's 'Ethics Guidelines for Trustworthy AI',²³ and the 'Policy and Investment Recommendations for Trustworthy AI'.²⁴ These documents served as a basis for further regulatory development.²⁵ Notably, the European Commission released a *White Paper on Artificial Intelligence*²⁶ in 2020, aiming to balance the encouragement investment in the AI industry with

16 Tóth, 2020, p. 4.

17 Ibid.

18 Hárs, 2023, p. 126.

19 Ibid.

20 Ebers, 2022b, pp. 323–324.

21 Hárs, 2023, p. 131.

22 COM/2018/237 final.

23 Ethics guidelines for trustworthy AI, 2019.

24 Policy and investment recommendations for trustworthy AI, 2019; Ebers, 2022b, p. 325.

25 Ibid.

26 White Paper, 2020.

the creation of a secure environment for its application.²⁷ This was succeeded by a Commission report on the safety and liability implications of Artificial Intelligence, the Internet of Things, and robotics.²⁸

The most significant advancement came in 2021, when the Commission published its proposal for the so-called Artificial Intelligence Act.²⁹ Despite critical opinions³⁰ expressed by some scholars, the European Parliament approved the Artificial Intelligence Act on 13 March 2024.³¹ This Regulation aims to enhance the internal market by establishing a consistent legal framework for the development, market entry, deployment, and utilisation of AI systems within the European Union. It encourages the adoption of human-centric and trustworthy AI while safeguarding health, safety and fundamental rights.³² It also seeks to foster innovation and facilitate the unrestricted movement of AI-based goods and services across borders, preventing Member States from imposing limitations on the development, commercialisation, or use of AI systems unless explicitly authorised by the Act.³³

Regulating AI is crucial due to its diverse impact and potential risks: AI technologies, spanning robotics to intelligent algorithms, require clear legal frameworks to address security, privacy, and ethical concerns.³⁴

A further dimension concerns the ethical and liability aspects of AI and smart contracts in contractual contexts. While this paper has so far focused primarily on AI as a tool, questions surrounding responsibility for damage caused by autonomous AI decisions cannot be overlooked. These issues cut across tort law, product liability, and consumer protection, and raise broader ethical issues regarding transparency, accountability, and fairness.

27 Auer, 2021, p. 109.

28 COM/2020/64 final; Monot-Fouletier, 2022, pp. 164–165.

29 Mezei, 2023, p. 56.

30 For example, members of the Robotics and AI Law Society (RAILS) expressed concerns about the clarity and scope of the proposed AI regulation. They questioned, for example, whether Member States can deviate from its requirements and whether the legislative basis used is appropriate. Additionally, they highlighted the broad definition of 'AI systems' and the lack of clarity regarding the treatment of AI components, academic research and open-source software. (For more see: Ebers et al, 2021.) Similarly, without raising objections against the Commission's attempts to develop a comprehensive AI regulatory framework and acknowledging the positive aspects, such as its commitment to addressing AI risks and protecting fundamental rights, a group of researchers responded to the European Commission's Proposal for an Artificial Intelligence Act, pointing out several deficiencies. These included unclear scope and inadequate safeguards against AI-related harms, recommendations for refining definitions and strengthening protection against AI manipulation and biometric identification. (For more see: Smuha et al, 2021.)

31 EP Resolution, 2024.

32 Artificial Intelligence Act, 2024, Para. (1).

33 Ibid.

34 de Almeida, dos Santos ad Farias, 2021, p. 506.

A central challenge arises from the so-called black-box phenomenon. Unlike traditional software, where rules and decision pathways are explicitly coded, machine-learning algorithms can generate solutions that are neither anticipated nor fully explicable *ex ante* or *ex post*.³⁵ This lack of transparency undermines two foundational pillars of liability law: intent and causation.³⁶ Doctrines relying on foreseeability of harm or purposeful design become difficult to apply when even a system's creators cannot trace why or how an outcome was reached.³⁷ In such circumstances, tests of intent (whether an actor aimed to bring about a certain effect) and causation (whether the harm was a foreseeable result of the conduct) risk collapsing, as the AI's reasoning cannot be reconstructed in a manner courts can evaluate.³⁸

This analysis reinforces the argument that negligence-based liability may prove insufficient for AI-related harms. When the chain of decision-making is inaccessible, strict or alternative liability regimes may be necessary to ensure compensation and accountability, while still maintaining incentives for innovation. In this context, several liability models have been proposed in legal scholarship and policy debates, each with distinct advantages and drawbacks.

Strict liability, i.e. holding the operator or deployer of an AI system liable regardless of fault, borrowing principles from dangerous activity doctrines, ensures compensation for victims but risks deterring innovation by assigning excessive responsibility.³⁹

Product liability, which treats AI as a product and places responsibility on manufacturers for defects in design, coding, or deployment. This perspective is reflected in European Commission proposals to amend the Product Liability Directive to cover digital technologies.⁴⁰

Taken together, these approaches underline that liability solutions alone are not sufficient. To complement them, proactive regulation is essential to mitigate biases, discrimination, and cybersecurity threats associated with AI, while ensuring consumer protection and fostering innovation.⁴¹ Overall, effective regulation is therefore vital for navigating the evolving landscape of AI and safeguarding societal values and interests.

With regard to smart contracts, there is growing interest in establishing uniform legislation to address the challenges posed by blockchain and smart contracts, which

35 Bathaee, 2018, p. 907.

36 *Ibid.*, pp. 906, 922.

37 *Ibid.*, pp. 902–903.

38 *Ibid.*, pp. 906–908.

39 *Ibid.*, p. 931.

40 Proposal for a Directive of the European Parliament and the Council on adapting non-contractual civil liability rules to artificial intelligence (AI Liability Directive), 2022.

41 Bathaee, 2018, p. 931.

resulted in various initiatives launched to study these issues and promote cross-border cooperation.⁴² The European Parliament has stated that where challenges arise in the digital single market with the use of smart contracts, appropriate measures should be implemented, including potential legal coordination or mutual recognition among Member States.⁴³ In this regard, Malta has been notably proactive in enacting legislation defining smart contracts and providing for their legal enforceability.⁴⁴

In the subsequent sections, an in-depth assessment will be conducted to elucidate the multifaceted impacts of technological advancements, particularly focusing on the emergence and implications of smart contracts within contemporary contract law frameworks.

3.

Impacts of Technological Development on Contract Law

The adoption of digital technologies has significantly influenced the evolution of contract practices and has affected the progression of contract law by transforming the methods and tools involved in contractual relationships through AI technology.⁴⁵ However, AI remains only partially regulated, primarily within specific institutes and legal frameworks concerning areas such as copyright and personal data protection etc.⁴⁶

One of the cornerstones of technological development is the emergence of so-called smart contracts. They autonomously fulfil contractual obligations as agreed by the involved parties, with execution⁴⁷ governed exclusively by the uploaded code into the blockchain.⁴⁸ Smart contracts are particularly useful when trust between contracting parties is limited or where they are geographically distant, an increasingly relevant consideration for international agreements.⁴⁹

With regard to their definition, emphasis should be placed on the work of Nick Szabo, a computer scientist and legal scholar who “defined smart contracts as “machine-readable transaction protocols which create a contract with pre-determined terms”.⁵⁰

42 Stazi, 2021, pp. 92–93.

43 Ibid., p. 93.

44 Ibid.

45 Schulze and Zoll, 2021, p. 35.

46 Andonović, 2020, p. 114.

47 The program being the code of the smart contract itself, integrated into a blockchain. See: Cvetković, 2020, p. 82.

48 Cvetković, 2020, p. 82.

49 Stazi, 2021, p. 76.

50 Lauslahti, Mattila and Seppala, 2017, p. 3.

However, Szabo's original formulation differs from its current broader usage, which relies on complex technology of blockchain, requiring deep technical understanding.⁵¹ Smart contracts, described as “self-executing or self-enforcing contracts that can be stored and duplicated in a blockchain”⁵², leverage direct representation of their terms in code. They enable automatic execution of predefined rules encoded in software,⁵³ transcending conventional contract types, facilitating online conclusion and performance, entirely in virtual space with blockchain-based security.⁵⁴ Importantly, smart contracts do not entail the involvement of conscious AI in contractual relationships, as blockchain merely provides the platform for preserving and protecting the contractual content.⁵⁵

Taking into account their distinctive characteristics, the legal relevance of smart contracts has been extensively examined in legal literature.⁵⁶ Some scholars argue that smart contracts lack legal significance strictly in technical terms, particularly when viewed merely as computer code.⁵⁷ They are not universally perceived as a legal matter, especially within the context of blockchain technology.⁵⁸ Nonetheless, smart contracts are not isolated from legal implications: once they involve legally significant actions, the relevant legal regulations apply.⁵⁹

A comparison between legal regulation and computer code reveals significant differences. Law and computer code operate as autonomous systems regulating distinct spheres, where law regulates social behaviour, whereas code governs IT processes. Their interaction can introduce complexities and potential legal issues.⁶⁰ In this context, Professor William J. Mitchell emphasises the role of code as the “law”⁶¹ governing cyberspace, highlighting the interplay between legal norms and computational systems.⁶² Recognising the legal significance of computer code underscores the need to establish connections between both systems to ensure compliance and resolve legal ambiguities.⁶³

Understanding the distinction between “smart contract” and “smart legal contract” is crucial, as it illustrates how software-based agreements can bridge the gap

51 Juhász, 2021b, pp. 43–44.

52 Essebir and Wyss, 2017, p. 8.

53 Ibid.

54 Juhász, 2021b, p. 46.

55 Poncibò, 2022, p. 202.

56 In this regard see: Juhász, 2021b, pp. 41–53; Woebbeking, 2019, pp. 106–113; Jaccard, 2018; Linarelli, 2019, pp. 330–347.

57 Woebbeking, 2019, p. 109.

58 Ibid.

59 Ibid.

60 Jaccard, 2018, p. 8.

61 Mitchell, 1995, cited in Lessig, 1999, p. 6.

62 Jaccard, 2018, p. 9.

63 Ibid, p. 8.

between legal regulation and computational systems, facilitating smoother interaction and mitigating legal complexities.⁶⁴ Thus, a smart legal contract, embedded within a software, signifies legal obligations among parties, with the computer ensuring automated execution upon activation of the agreement.⁶⁵ On the other hand, smart contracts as mere computer codes do not inherently establish legal obligations or possess enforceability.⁶⁶ They are commonly utilised for executing transactions on decentralised cryptocurrency platforms or facilitating online gambling.⁶⁷ This conceptual distinction is not merely theoretical; it increasingly appears in judicial settings.

Although judicial practice in this area is still developing, existing cases already emphasise their legal consequences and risks. In *Van Loon v Department of the Treasury*⁶⁸ (2024), the United States Court of Appeals for the Fifth Circuit addressed the sanctioning of Tornado Cash, a decentralised crypto-mixing protocol based on unchangeable smart contracts, under United States law of sanctions. The Court held that immutable smart contracts cannot be considered “property” of a foreign national or entity under the International Emergency Economic Powers Act,⁶⁹ and thus cannot be prohibited through administrative means. This ruling illustrates both the novelty of blockchain-based contractual mechanisms and the challenges of fitting them into prevailing statutory concepts of property and enforcement.

Another instructive case is *Nguyen v Barnes & Noble, Inc.*⁷⁰ (2014), regarding the enforceability of an online “browwrap” agreement. The Ninth Circuit ruled that placing a hyperlink to Terms of Use on the bottom of the webpage was insufficient to establish constructive notice, rendering the arbitration clause unenforceable. This ruling underscores a fundamental principle: mutual assent remains essential for smart contracts, where consent may be automated or implied, raising questions about whether traditional doctrines of notice and assent can adequately safeguard parties.

Both regulatory and academic interest continue to increase. *The Tornado Cash* case and *Nguyen* ruling have received wide analysis, underlining conflicts between technical innovation, consumer protection, and regulatory compliance. In particular, industry analysis focuses on how Tornado Cash illustrates the challenge of reconciling privacy with anti-money-laundering risks in decentralised infrastructure.

64 Sokolov, 2018, p. 14.

65 Ibid.

66 Juhász, 2021b, p. 48.

67 The Law Commission, 2021, p. 1.

68 *Van Loon v Department of the Treasury*, 2024.

69 Casey et.al., 2025.

70 *Nguyen v Barnes & Noble, Inc.*, No. 12-56628 United States Court of Appeals for the Ninth Circuit, 2014.

Collectively, these cases demonstrate that, even in jurisdictions without explicit statutory provisions governing smart contracts, regulators, and courts are actively grappling with questions of validity, enforceability, and potential misuse of electronic contracts.

In the following section of this paper, the legal frameworks of Hungary and Serbia concerning smart contracts shall be analysed.

3.1. Hungary

Understanding how technological innovations align with existing legal structures and regulatory frameworks is essential for ensuring clarity and consistency in legal practices within the Hungary.

Legal literature identifies a precursor to smart contracts: the so-called Ricardian contract, which enabled parties to register documents and securely connect them to other systems, such as accounting.⁷¹ Its primary aim was to codify the elements of a legal agreement in a format that could be elaborated and executed by software before the execution of the contract.⁷² This means that parties could therefore express their intentions digitally, although execution only occurred once specified conditions were met.⁷³

One of the initial steps towards technological advancement of contract law was the introduction of contracting by electronic means, marking a technical shift in how contracts are concluded.⁷⁴

Following the enactment of the Directive on electronic commerce⁷⁵, Hungary adopted Act No. CVII of 2001⁷⁶ to ensure compliance and address consumer protection in electronic contracts.⁷⁷ The Act mandates service providers to disclose terms and provide specific information before online contract conclusion, with greater flexibility afforded to non-consumer contracts.⁷⁸

Further regulation is provided by the Hungarian Civil Code,⁷⁹ which incorporates similar provisions governing e-contracts, with exceptions for individual electronic

71 Stazi, 2021, p. 90.

72 Ibid.

73 Ibid.

74 Juhász, 2020, p. 64.

75 Directive 2000/31/EC

76 Act No. CVII of 2001

77 Juhász, 2020, p. 65.

78 Ibid.

79 Hereinafter referred to as: HunCC.

communications, while are generally non-mandatory, deviations are prohibited in consumer contracts.⁸⁰

When considering the integration of smart contracts into Hungarian contract law, it is important to distinguish between smart contracts and smart legal contracts. As previously noted, smart contracts are “computer programs which run automatically, in whole or in part, without the need for human intervention”⁸¹. Within their various applications, they may execute legally enforceable contracts, forming a specific category known as “smart legal contracts”.⁸²

This distinction is of particularly importance in Hungarian legislation, where the right to claim performance is indispensable for contract formation.⁸³ Under the Hungarian Civil Code, a contract constitutes the mutual and unanimous declaration of intent by the parties, resulting in obligations and the corresponding right to claim performance.⁸⁴ Where legal enforceability is absent, smart contracts (being computer codes, do not inherently establish legal obligations) may therefore be considered as *naturalis obligatio*.⁸⁵ At the same time, the lack of enforceability stems from their automated nature, which theoretically minimises enforcement issues or disputes.⁸⁶

Different considerations arise when analysing smart legal contracts. According to the Commissioners of the Law Commission for England and Wales, a smart legal contract has three key attributes:⁸⁷ First, the automatic execution of some or all contractual obligations via computer program;⁸⁸ Second, it holds legal enforceability; and third, the computer program powering the contract operates on a distributed ledger.⁸⁹

In this regard, a further issue concerns the form in which the smart legal contract appears: in the form of code, as the encrypted version of a natural-language contract;⁹⁰ or in hybrid form that encompasses both⁹¹.

For instance, parties participating in algorithmic trading, may draft the foundational terms of their agreement in a natural-language “master agreement”,⁹² while the specific terms for individual trades are encoded in software, with the master

80 Juhász, 2020, pp. 65–66.

81 The Law Commission, 2021, p. 1.

82 Ibid.

83 Vékás, 2016, cited in Juhász, 2020, p. 74.

84 § 6:58 of the HunCC.

85 Juhász, 2021b, p. 48.

86 Juhász, 2020, p. 74.

87 The Law Commission, 2021, p. 11.

88 Ibid.

89 Ibid.

90 Juhász, 2020, p. 73.

91 Cieplak–Leefatt, 2017, cited in Juhász, 2020, p. 73.

92 The Law Commission, 2021, p. 28.

agreement clarifying that these transactions form part of the overarching legal relationship.⁹³

Scholarly views diverge on the issue of “lack of legal enforceability”,⁹⁴ which in smart legal contracts stems from their automated execution, rendering enforcement unnecessary since contract terms are designed to executed themselves.⁹⁵ Others contend that element of enforceability remains a core characteristic⁹⁶ of smart legal contracts⁹⁷, and that parties retain access to judicial remedies to enforce their claims.⁹⁸

At present, the issue of whether smart contracts are legally enforceable in Hungary remains unresolved.⁹⁹ It would be premature to definitively ascertain the enforceability or non-enforceability, given the lack of legislative measures of the topic.¹⁰⁰ Although smart contracts and blockchain technology are widely discussed in legal theory, and distributed ledger technology is used in practice, dedicated legislation or established judicial precedents addressing their legal implications are yet to be established.¹⁰¹

From a *de lege ferenda* perspective, Hungary may draw inspiration from the developing regulatory framework of the European Union, and from the regulatory solutions adopted in neighbouring jurisdictions. Several Central and Eastern European jurisdictions have introduced provisions or guidelines regarding the recognition and enforceability of smart contracts, thereby offering models for adaptation to the Hungarian context. By examining these regional approaches – whether statutory definitions, validity requirements, or supervisory mechanisms – Hungary could develop a coherent regulatory framework aligned with European standards and regional best practices.

Some potential legislative actions may include: introducing a clear statutory definition of smart contracts and explaining their relationship to electronic contracts under the Civil Code; recognising smart contracts as a legitimate contractual form within specific domains (i.e., pledge agreements, transactions involving digital assets); establishing mandatory disclosure and consent rules for smart contract-using service providers, making things transparent to users; designating a supervising authority responsible for overseeing the deployment of smart contracts in financial and commercial activities.

93 Ibid.

94 Juhász, 2020, p. 74.

95 Ibid.

96 Labancz, 2018, p. 155.

97 For more see: Stefán, 2021, p. 306.

98 Ibid.

99 Juhász, 2021b, p. 48.

100 Stec et al., 2022, p. 51.

101 Ibid.

Such steps would close existing legal loopholes and align Hungarian law with broader European trends.

3.2. Serbia

Similar to Hungarian law, the Serbian legislation and legal theory enshrine the possibility of concluding contracts by electronic means. In this regard, the Act on Electronic Commerce is of particular importance. It delineates electronic contracts as contracts, concluded between a provider of information society services and a service user by electronic means.¹⁰²

However, the Act on Electronic Commerce excludes various types of contracts from electronic conclusion.¹⁰³ These primarily include contracts in which the prescribed form is deemed essential for their valid conclusion, as the legislator has determined that significant legal consequences may arise for one or both contracting parties, or even for public interests.¹⁰⁴

Another significant legal act governing electronic contracts is the Act on Electronic Document, Electronic Identification and Trust Services in Electronic Business,¹⁰⁵ which regulates, among other matters, the electronic signature – an essential requirement for concluding contracts in electronic form.¹⁰⁶

It is noteworthy to consider the Obligations Act¹⁰⁷, which, through its provisions on the written form of contracts, allows for electronic conclusion by stipulating that written form is observed if the parties exchange letters or agree by teleprinter or other means.¹⁰⁸

In contrast with Hungary, where smart contracts lack specific norms, Serbia has embarked on the initial steps toward regulating this domain. A notable development is the recognition of smart contracts in the Act on Digital Property¹⁰⁹. The *travaux préparatoires* reveal that the key motivations for adopting this Act were the regulation and growth of the digital-asset market, the prevention of criminal abuse, the facilitation of token-based financing, the advancement of the capital market through digital technologies, and strengthening measures against abuse, including money laundering and terrorism financing.¹¹⁰ This legislative also aims to

102 Art. 3, Para. 1, subpara. (5) of Act on Electronic Commerce, 2019.

103 Art. 10 of Act on Electronic Commerce, 2019.

104 Radovanović and Mišćević, 2018, p. 1652.

105 Act on Electronic Document, 2021.

106 Radovanović and Mišćević, 2018, p. 1654.

107 Art. 72, Para. (3) of Obligations Act, 2020.

108 Ibid., p. 1656.

109 Act on Digital Property, 2020.

110 Proposal of the Act on Digital Property, 2020, p. 72.

enhance the business environment, propel digitalisation, and align Serbia with global digital business trends, while promoting IT entrepreneurship.¹¹¹

According to the Act on Digital Property, a smart contract is defined as a computer program or protocol, based on distributed database technology or similar technologies, which entirely or preponderantly automatically executes, controls, or documents legally relevant events and actions in accordance with an already concluded contract, and whereby that contract may itself be concluded electronically through that program or protocol.¹¹²

Following the same analogy used in the Hungarian legislation concerning the distinction between smart contracts and smart legal contracts, it could be concluded that although the Serbian legislator uses the term 'smart contract' [*pametna ugovor*],¹¹³ the legal provision in fact refers to smart legal contracts, as it regulates situations connected to the execution of previously concluded contracts.

In addition to the definition, the Act on Digital Property also features a distinct article¹¹⁴ on smart contracts. It stipulates that the use of smart contracts in the secondary trading of digital assets is permitted.¹¹⁵ However, where a digital-asset service provider offers services involving smart contracts, it must obtain the consent of its users for their use.¹¹⁶

Moreover, the Act on Digital Property explicitly permits the conclusion of a contract of pledge¹¹⁷ through a smart contract. Such a contract may be concluded in paper or electronic form, or on a durable medium capable of storing and reproducing the original data in an unchanged format.¹¹⁸ The supervisory authority may prescribe additional requirements to be incorporated in pledge agreements involving digital assets facilitated through a smart contract.¹¹⁹

Considering that Serbian legislation regulates smart contracts in connection with pledge agreements, the question logically arises regarding the feasibility of legal enforcement. In this context, legal enforcement may be unnecessary¹²⁰ due to the self-executing nature of smart contracts.¹²¹ A pledgee may include in the contract of pledge the right to retain the pledged asset; thus, if the pledger fails to meet their

111 Ibid.

112 Art. 2, Para. 1, subpara. (39) of Act on Digital Property, 2020.

113 Ibid.

114 Art. 37 of Act on Digital Property, 2020.

115 Art. 37 Para. 1 of Act on Digital Property, 2020.

116 Art. 37 Para. 2 of Act on Digital Property, 2020.

117 Wherein the object of the pledge is a digital asset according to art. 98. Para. 1 of Act on Digital Property.

118 Art. 98. Para. 4 and 5 of Act on Digital Property, 2020.

119 Art. 98. Para. 6 of Act on Digital Property, 2020.

120 Tešić, 2023, p. 1167.

121 Ibid.

commitment within a given time limit, the contractual mechanism is triggered automatically, transferring control of the encumbered asset¹²² to the pledgee and rendering judicial enforcement unnecessary.¹²³

At the time of writing this paper, Serbian legislator has thus far exclusively addressed smart contracts within the framework of contracts on pledge. Consequently, comprehensive evaluation of other categories of smart contracts remain largely theoretical.

4. Concluding Remarks

Nick Szabo's characterisation of smart contracts as transaction protocols encoded for machine interpretation has become a cornerstone for comprehending their capabilities. Smart contracts, defined as self-executing agreements encoded on a blockchain, offer several advantages. Firstly, they enhance efficiency by automating contractual performance, eliminating intermediaries, and reducing administrative costs. Moreover, they ensure accuracy and transparency through their immutable nature, fostering trust among parties and mitigating fraud risks.

However, the adoption of smart contracts also presents notable challenges. Their development and implementation require technical expertise in coding and blockchain systems, posing difficulties for individuals and organisations that lack such proficiency. Furthermore, the irrevocable nature of smart contracts raises concerns about error correction and dispute resolution, highlighting the need for comprehensive legal frameworks.

Given the often-international character of smart contracts, applicable law and jurisdiction may pose additional challenges. Parties may mitigate these by specifying the applicable law in advance or by including arbitration clauses and mechanisms for performance recovery or automatic interruption.¹²⁴ Such safeguards help minimise reliance on judicial authorities and facilitate the execution of arbitration or judicial decisions.¹²⁵

The legal status of smart contracts remains uncertain, with varying interpretations across jurisdictions. Although blockchain technology provides robust security features, smart contracts, and the presence of AI within contract law, are not immune to vulnerabilities or coding defects that may expose parties to financial or confidentiality risks.

122 Which in this case would be a digital asset of the pledger.

123 Tešić, 2023, p. 1167.

124 Stazi, 2021, p. 97.

125 Ibid.

For example, concerns have been raised about the use of Artificial Intelligence in the insurance sector for risk assessment. Insurers' fidelity and transparency have been questioned in circumstances where AI autonomously gathers data from external sources unbeknownst to the insured, thereby challenging the principle of good faith.¹²⁶ The complexity of establishing breaches of obligations by the insured further escalates when AI is involved, as establishing causality between erroneous data and risk assessment becomes more challenging.¹²⁷

Ensuring that AI aligns with societal welfare, fundamental rights, and ethical standards is therefore paramount. Grounding AI development in values such as human dignity and privacy protection is crucial for fostering trust. Legal regulation plays a pivotal role in establishing the framework for responsible AI deployment, addressing security, privacy, and ethical concerns.

At different regulatory levels, efforts are present at different levels, but the proactive approach of the European Union deserves special emphasis. Notably, the recent enactment of the Artificial Intelligence Act by the European Parliament marks a significant milestone in regulating AI within the EU.

Considering the national legislation of Hungary and Serbia, several conclusions emerge. Both countries recognise the validity of contracts concluded by electronic means, albeit with some distinctions. Both also provide legal rules governing electronic signatures, an essential element for electronic contracting, ensuring their legal recognition.

Furthermore, both jurisdictions acknowledge the importance of aligning technological innovation with existing legal structures, recognising the need to adapt their legal frameworks to accommodate advancements such as smart contracts.

While Serbia, like Hungary, acknowledges electronic contracts, it has taken additional steps to regulate emerging technologies such as smart contracts. The Act on Digital Property constitutes a significant milestone in this regard, explicitly permitting the use of smart contracts and outlining their legal parameters, whereas Hungary currently lacks regulatory landscape for smart contracts.

Serbia's regulation of smart contracts appears to be more comprehensive, encompassing matters such as secondary trading of digital assets and the use of smart contracts in pledge agreements. The Act emphasises the importance of user consent when smart contracts are used for digital-asset transactions, underscoring a commitment to transparency and user protection. These initiatives aim to support Serbia's digitalisation, foster a conducive environment for digital commerce, and safeguard against potential risks. By contrast, Hungary's emphasis remains on

126 Malinowska, 2022, p. 89.

127 Ibid.

electronic contracting more broadly, without providing a dedicated regulatory framework for smart contracts.

Serbia explicitly regulates the enforceability of smart contracts in the context of pledge agreements, whereas in Hungary this issue remains unresolved and subject to continued debate.

Thus, both Hungary and Serbia recognise the importance of integrating technology into contract law; Serbia appears to have made more progress in specifically regulating smart contracts; Hungary's approach has primarily focused on electronic contracting, with less emphasis on the regulatory aspects of smart contracts.

Comparative insights from other jurisdictions highlight similar challenges. For instance, a recent judgment of the German Federal Court of Justice¹²⁸ addressed a lease agreement for electric car batteries, where the lessor had inserted a clause allowing remote blocking of the battery's charging function upon termination. Although the Court did not explicitly label the mechanism as a smart contract, it acknowledged that digital or automated interventions are legally equivalent to manual ones. The clause was ultimately held invalid because it unfairly prejudiced the lessee and violated principles of German property law, particularly the prohibition of unlawful interference.

This case illustrates that technologically advanced contractual mechanisms cannot override fundamental doctrines of property protection and fairness. For jurisdictions like Hungary and Serbia – approaching smart contracts differently – the German example underscores the importance of ensuring that technological innovation remains consistent with foundational legal principles.

Overall, these developments highlight the transformative impact of technological innovation on traditional legal frameworks.¹²⁹ This convergence of technology and contract law necessitates ongoing scrutiny and adaptation to ensure legal certainty and safeguard the interests of all stakeholders.¹³⁰

128 Smart Contracts work – but do they hold up in court?, 2022.

129 Tajti, 2019, p. 418.

130 Ibid.

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