

UDK 347.23 : 004

004.65 : 336

Original scientific paper

Marta Hren, PhD student

Faculty of Law University of Zagreb, Croatia

marta.hren@student.pravo.hr

TOKENS AS OBJECTS OF PROPERTY RIGHTS - WITH NFT AS AN EXAMPLE

ABSTRACT

As blockchain-based technologies are projected to constitute around 10% of the world's GDP by 2027, understanding the legal implications of tokenization, as a mechanism of incorporating certain legal rights into digital tokens, becomes imperative. This paper delves into the intersection of digital assets and Croatian property law, looking to contribute to the ever-growing discourse on ownership rights concerning digital objects. It uses non-fungible tokens (NFTs) as a prominent example of digital assets to explore the feasibility of recognizing tokens, including NFTs, as objects of property within the existing legal framework. The unique properties of NFTs, such as transfer security, immutability, distinct identification, and above all non-fungibility, pave the way for their potential integration into the realm of property law. The objective of this paper is to shine a light on the essential technologies integral to understanding NFTs, their characteristics, and applications. After a comprehensive analysis of these features, a comparative assessment is conducted with existing legal institutes, aiming to align NFTs within the parameters of established regulatory framework. Recognizing NFTs as legal entities with distinct ownership and transfer characteristics, the paper engages with the fundamental question of whether intangible entities like NFTs can be subject to ownership rights, drawing inspiration from legal theory while acknowledging the need for nuanced exceptions. Specifically, by assessing whether the legal fiction of extending the status of a "thing" to immaterial objects can be employed in the case of digital tokens.

Keywords: Digital Assets, Tokenization, Non-Fungible Tokens, Property Law, Ownership Rights

1. INTRODUCTION

Considering the growing importance and prevalence of NFTs, the legal system should develop an adequate legal framework to protect the interests of all interested parties and to "legalize" the part of the economy related to digital assets and non-fungible tokens. As is always the case with new phenomena and institutes, especially those related to technology, there is no universally accepted

categorization of neither tokens, nor of non-fungible tokens(NFTs) as their subspecies.

Every new phenomenon brought about by the advancement of technology will not necessarily find its application in practice, or this application will be so narrow that it will not even enter the legislator's radar. The importance of a certain technological phenomenon and the need to regulate it depend, among other things, on the breadth of application, economic aspects, impact on the market, social elements, and the risk of misuse. When all these elements are met in the case of a technology, the necessity of legal regulation of such an institute arises. Non-fungible tokens are exactly in the described situation. They appeared in 2014, and their application gained momentum in 2021. They are currently in the development phase where new applications of NFT technology are being found, and concept of tokenization comes into play.

One of the primary legal considerations concerning tokens, particularly non-fungible tokens as their representative, revolves around property law and the associated inquiries. The pivotal question emerges: can tokens, as digital entities recorded on distributed ledger networks, constitute objects of ownership? This question gains additional significance in the context of NFTs, given their inherent promise of uniqueness, which aligns with the exclusivity inherent in property rights. As an object cannot be simultaneously owned by multiple competing entities, exploring the compatibility of tokens, especially NFTs, with property law becomes imperative. Consequently, this paper analyzes the underlying technological attributes before scrutinizing the principles of property law and the prerequisites for an entity to qualify as an object of rights *in rem*.

2. TOKENS AS OBJECTS OF PROPERTY RIGHTS – WITH NFT AS AN EXAMPLE

2.1. Blockchain technology

Centralized systems have long been the historical standard due to their efficiency, as they offer lower costs for system configuration, maintenance, and system adjustments, all because the work is done in one place. However, in the last few decades the situation is changing. Decentralized options offer a solution to certain problems that are characteristic of centralized systems, namely vulnerability due to the influence of a single source of failure on the entire system, and the scalability problem.

The most famous decentralized solution are *blockchains*.¹ In the simplest terms, a blockchain is a chronological database that contains a list of transactions that exist on a network of different computers. Each block² in the chain contains a reference to the block that precedes it. This reference is usually the hash of the previous block.³ Therefore, a block that has been stored on the blockchain for some time would be computationally difficult to modify because it would mean that all blocks added after it would have to be modified and a solution would have to be found for each individual hash, in other words decrypt - unlock each of the blocks that were added later. The mentioned characteristics lead to the fact that transactions on the blockchain are almost irreversible, they cannot be altered, and this leads to the trust of all network participants in the network, for which reason an intermediary is not needed.

Each blockchain transaction is generated from an address associated with a cryptographic currency, which represents a mathematical relationship between a private and a public key. Each transaction contains a digital signature that is generated from the combination of the transaction message and the user's private key. The security mechanism is realized in such a way that the signature in each message is different and in this way forgery and misuse are impossible without the original private key.⁴ After approval, transactions are recorded as a new changed state of data on the block chain, and the change is visible to all network participants.

¹ Wright, A., de Filippi, P., *Blockchain and the Law - The Rule of Code*, Cambridge, Mass: Harvard University Press, 2018, p. 5; Zetzsche, D. A.; Buckley, R. P.; Arner, D. W., *The Distributed Liability of Distributed Ledgers: Legal Risks of Blockchain*, University of Illinois, Law Review, no. 4, 2018, p. 1382-1402.; Perkušić, M., *Pravo elektroničkog plaćanja*, Školska knjiga, Zagreb, 2020, p. 317.

² Cunjak Mataković, I., Mataković H., *Kriptovalute - sofisticirani kodovi manipulacije*, International Journal of Digital Technology & Economy, 2018, p. 26; Bhaskar, N. D., Kuo Chuen, D. L., *Handbook of Digital Currency - Bitcoin, Innovation, Financial Instruments, and Big Data*, Sim Kee Boon Institute for Financial Economics, Singapore Management University, Singapore, 2015, p. 48; Buterin, V., *A next-generation smart contract and decentralized application platform - White paper*, Available at: https://blockchainlab.com/pdf/Ethereum_white_paper_next_generation_smart_contract_and_decentralized_application_platform-vitalik-buterin.pdf, Accessed on: 1 April 2024, p. 6

³ Nakamoto, S., *Bitcoin: A Peer-to-Peer Electronic Cash System*, 2008, <https://bitcoin.org/en/bitcoin-paper>, Accessed on: 1 April 2024, p. 3; Buterin, V., *op. cit.* note 2, p. 7.; Rachmawati, D.; Tarigan, J. T.; Ginting, A. B. C., *A comparative study of Message Digest 5 (MD5) and SHA256 algorithm*, Journal of Physics: Conference Series, Vol. 978, No. 1, 2018, p. 5; Kaselj, M., *Bitcoin*, master thesis, Josip Juraj Strossmayer University in Osijek, 2015, Available on <https://repozitorij.mathos.hr/islandora/object/mathos%3A24/datastream/PDF/view>, Accessed on: 1 April 2024, p. 19

⁴ Buterin, D.; Ribarić, E.; Savić, S., *Bitcoin – nova globalna valuta, investicijska prilika ili nešto treće?*, Veleučilište u Rijeci, No. 1, Vol. 3, 2015, p. 145-158.

Given that everyone has access to the entire database, it was necessary to prevent users from adding fraudulent transactions to the blockchain and/or modifying records already stored in the blockchain.⁵ The solution to this problem is a decentralized consensus mechanism, a process where most network participants agree on the state of the ledger. It is a set of rules and procedures that make it possible to maintain a coherent set of facts between multiple participating nodes. A fraudulent transaction cannot be added to the blockchain because most of the network would not verify it. Every blockchain needs an efficient consensus mechanism to ensure that every computer on the network has the correct version of the blockchain that remains consistent with other network participants over time.⁶

In recent years, several consensus mechanisms have been developed. Bitcoin, the most widely used cryptocurrency,⁷ uses a *Proof-of-Work* (PoW) consensus mechanism.⁸ A popular alternative is *Proof-of-Stake* (PoS), which is used by the Ethereum blockchain.⁹ PoS grants the ability to add new blocks to the network in proportion to the current stake ownership in the network.¹⁰ The advantage of this consensus mechanism is improved latency, i.e. faster transaction execution speed and lower energy consumption.¹¹

⁵ Fairfield, J., *Tokenized: The Law of Non-Fungible Tokens and Unique Digital Property*, Indiana Law Journal, Volume 97, Issue 4, p. 1269.

⁶ Swanson, T., *Watermarked tokens and pseudonymity on public blockchains* (unpublished article), 2015, p. 5 - 6, Available at: <http://www.ofnumbers.com/wp-content/uploads/2015/11/Watermarked-tokens-and-pseudonymity-on-public-blockchains-Swanson.pdf>, Accessed on: 1 April 2024; Fairfield, *Tokenized*, *op. cit.* note 5, p. 1269.

⁷ As of May 11, 2023, on the Bitcoin blockchain are contained and coded the data they have market capitalization greater than 550 billion dollars, Available at: <https://blockchain.info/charts/market-cap>, Accessed on: 1 April 2024; Perkušić, *op. cit.* note 1, p. 305, 311 – 326.

⁸ Saleh, F., *Blockchain Without Waste: Proof-of-Stake*, Review of Financial Studies, Volume 34, 2021, p. 7- 8; Bhaskar, N. D., Kuo Chuen, D. L., *op. cit.* note 2, p. 49.; Tasca, P., Tessone, C.J., *A Taxonomy of Blockchain Technologies: Principles of Identification and Classification*, Ledger, Vol 4, 2019, p. 10; López, P.; Montresor, A.; Datta, A., *Please, do not Decentralize the Internet with (Permissionless) Blockchains!*, Conference: IEEE 39th International Conference on Distributed Computing Systems, 2019, p. 6; Buterin, *op. cit.* note 2, p. 13.

⁹ Buterin, *op. cit.* note 2, p. 13; Antonopoulos, A., *Mastering Bitcoin*, 2nd Edition, O'Reilly Media, 2017, p. 232 - 233; Fairfield, J., *Tokenized*, *op. cit.* note 5, p. 1272; Wright, A., de Filippi, P., *op. cit.* note 1, p. 27.

¹⁰ Houy, N., *It will cost you nothing to 'kill' a proof-of-stake crypto-currency*, University of Lyon 2 - Groupe d'Analyse et de Théorie Economique (GATE), 2014, Available at: <http://dx.doi.org/10.2139/ssrn.2393940>, Accessed on: 1 April 2024, p. 3.

¹¹ Hurdle, W.K.; Harvey, C.R.; Reule, R.C.G., *Understanding Cryptocurrencies*, 2019, Available at: <https://ssrn.com/abstract=3360304>, Accessed on: 1 April 2024, p. 8.

Theoretically, to negatively affect the blockchain, an attacker would need to own more than half of the computing power of the entire network.¹² Decentralization in the recording the transactions data and the absence of control by a central body enables the bypassing of traditional intermediaries, as well as regulators.¹³

2.2. Non-fungible tokens

2.2.1. Definition of non-fungible tokens

Tokens¹⁴ have a specific meaning in distributed ledger technology (DLT) circles, they are records on DLT networks. Some consider any digital asset created on a network to be a token, with each network having specific standards for token creation.¹⁵ Perkušić notes tokens are a kind of bonds in electronic form stored within the blockchain system.¹⁶

For the purposes of this paper, tokens are sets of information on transaction systems based on reliable technologies, which sets of information may represent claims or membership rights against a person, property rights or other absolute or relative rights.¹⁷ While tokens can be classified from many different

¹² The Bitcoin network is currently worldwide recorder per collected computer strength. Cohen, R., Global Bitcoin Computing Power Now 256 Times Faster than Top 500 Supercomputers Combined, FORBES, <https://www.forbes.com/sites/reuvencohen/2013/11/28/global-bitcoin-computing-power-now-256-times-faster-than-top-500-supercomputers-combined/>, 2 April, 2024; Limer, E., *The World's Most Powerful Computer Network Is Being Wasted on Bitcoin*, GIZMODO, <http://gizmodo.com/the-worlds-most-powerful-computernetwork-is-being-was-504503726>, Accessed on: 2 April, 2024

¹³ Shein, E., *How Blockchain Changes the Nature of Trust*, <https://linuxfoundation.org/blog/how-blockchain-changes-the-nature-of-trust/>, 2 April, 2024; Nakamoto, *op. cit.* note 3, p. 2; Čulinović-Herc, E., *Zlouporabe blockchain tehnologije i utjecaj na trgovačka društva*, Zbornik Pravnog fakulteta Sveučilišta u Rijeci, vol. 43, no. 3, 2022, p. 698.

¹⁴ Token is defined by Black's Law Dictionary, 11th edition, 2019: "A sign or mark; a material evidence of the existence of a fact.", Available on: <https://thelawdictionary.org/>, 2 April, 2024

¹⁵ Digital Assets: Cryptocurrencies vs. Tokens, Cryptopedia, Available at: <https://www.gemini.com/cryptopedia/cryptocurrencies-vs-tokens-difference>, Accessed on: 2 April 2024; Moringiello, J.M., Odinet, C.K., *The Property Law of Tokens*, Florida Law Review, 2022, p. 628.

¹⁶ Perkušić, *op. cit.* note 1, p. 335.

¹⁷ The definition has been taken from of Liechtenstein Law on Tokens; Law on Tokens and TT Service Providers (Token and TT Service Provider Act; TVTG), art. 2 paragraph 1.c, Available at: https://www.lcx.com/wp-content/uploads/2020_Liechtenstein_Blockchain_Laws_Translation_English.pdf, Accessed on: 1 April 2024

perspectives,¹⁸I will focus on the basic classification based on fungibility – there are fungible tokens (also known as cryptocurrencies) and non-fungible tokens. The most prominent example of a cryptocurrency is Bitcoin.

There is no official or legal definition of non-fungible tokens.¹⁹ Unlike cryptocurrencies, they cannot be traded or exchanged at par. This represents the biggest difference between non-fungible and fungible tokens, like cryptocurrencies, which are identical to each other and can therefore serve as a means of payment.²⁰

At its core, an NFT is a record on the blockchain that contains two codes: a number (tokenId) and an alphanumeric code (the address code of the so-called smart contract). These two codes are stored on the blockchain, and the combination of such tokenId and address code is unique, which makes the NFT a unique original - thus "non-fungible". Non-fungible tokens are cryptographic records on the blockchain with a unique combination of identification codes that distinguish them from one another.

The key features of non-fungible tokens are: (i) transparency of registration and execution, (ii) availability and integrity of the system, (iii) resistance to unauthorized use (NFT metadata and trading records are permanently stored and cannot be manipulated after transactions are confirmed and written into the block), (iv) up-to-datedness of the registry, (v) independence from other tokens from that model (NFT trading can be done in a single atomic, consistent, isolated and permanent (ACID) transaction), (vi) tradability.²¹

¹⁸ Garbers-von Boehm, K.; Haag, H.; Gruber, K.; (for JURI), *Study on Intellectual Property Rights and Distributed Ledger Technology with a focus on art NFTs and tokenized art*, 2022, Available at: [https://www.europarl.europa.eu/RegData/etudes/STUD/2022/737709/IPOL_STU\(2022\)737709_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2022/737709/IPOL_STU(2022)737709_EN.pdf), p. 12.

¹⁹*Ibid.*, p. 9.

²⁰ Ante, L., *The non-fungible token (NFT) market and its relationship with Bitcoin and Ethereum*, 2021, Available at: <http://dx.doi.org/10.2139/ssrn.3861106>, Accessed on: 1 April 2024, p. 2.

²¹ Wang, Q.; Li, R.; Wang, Q.; Chen, S., *Non-fungible token (NFT): Overview, evaluation, opportunities and challenges*, 2021, Available at: <https://arxiv.org/abs/2105.07447>, Accessed on: 1 April 2024, p. 9.

2.2.2. Creating non-fungible tokens

The standard that is most often used for the creation of NFTs is the ERC-721 protocol.²² This is a technology standard that enables broad applicability and standardization in the creation of non-fungible tokens. The advantage of using a common protocol is that developers can write programs and applications that communicate with them, creating greater interoperability. We can say that ERC-721 produces tokens that differ from each other, have different value, different properties and are associated with different digital or tangible assets.²³ Although there are other blockchain networks that support the creation of NFTs (e.g. Cardano, Flow, Polygon, Solana, Tezos, Zilliqa), Ethereum is currently the most widely used.²⁴

According to the ERC-721 protocol, a smart contract executed for this purpose on the Ethereum blockchain must contain, among other things, a token identification code (tokenId)²⁵, information about the "holder" of the token, and a hash value that refers to the entity or authority being embodied. into a non-fungible token (e.g. the online location of a digital file - an image).

2.2.3. Emergence and application of non-fungible tokens

From the emergence of non-fungible tokens until present day, the token market has seen exponential growth.²⁶ Artist Beeple sold a collection of NFTs for a record \$3.5 million in 2020.²⁷ In February 2021, a print of an animated cat flying through with a rainbow trail was sold for about \$580,000, a month later Beeple sold one of his works for \$69.3 million.²⁸ Jack Dorsey, the former CEO of

²² See: <https://ethereum.org/en/developers/docs/standards/tokens/erc-721/>, Accessed on: 2 April 2024

²³ Fairfield, J., *Tokenized*, *op. cit.* note 5, p. 1272.

²⁴ Garbers-von Boehm, K.; Haag, H.; Gruber, K., *op. cit.* note 18, p. 10, 13.

²⁵ NFT contains a uint256 variable called tokenId. The paired uint256 tokenId and smart contract address are unique to the entire network and cannot be repeated. Another specific feature is that by entering this code (tokenId) in the online application, a certain graphic representation - a picture - can be generated. As in: Wang, Q.; Li, R.; Wang, Q.; Chen, S., *op. cit.* note 21, p. 8

²⁶ Moringiello, J. M.; Odinet, C. K., *op. cit.* note 15, p. 609.

²⁷ Williams, C., Cult Digital Artist Beeple Raises Record \$3.5 Million in NFT Auction, CRYPTO BRIEFING, <https://cryptobriefing.com/digital-art-auction-raises-record-million/>, Accessed on: 2 April 2024

²⁸ Griffith, E., Why an Animated Flying Cat with a Pop-Tart Body Sold for Almost \$600,000, Available at: <https://www.nytimes.com/2021/02/22/business/nft-nba-top-shot-crypto.html>, Accessed on: 2 April 2024; Reyburn, S., JPG File Sells for \$69 Million, as "NFT Mania" Gathers Pace, NY TIMES,

Twitter, sold an NFT of the first tweet for a staggering \$2.9 million, and a New York Times reporter sold an NFT related to a news story (about NFTs!) for \$560,000.²⁹

Although digital art initially served as a pioneering domain for NFT technology,³⁰ its application has significantly diversified across various sectors through tokenization. Tokenization involves linking a tangible or intangible asset with a digital item,³¹ establishing an identity connection with the asset via an entry on the blockchain - a process known as minting, with the resulting entry termed a token.³² The fundamental premise of tokenization lies in the acquisition of ownership of the underlying asset upon acquiring the token, with the primary benefit being the seamless transferability of tokens in secondary markets.³³ Moreover, transactions conducted through blockchain, and smart contracts entail minimal administrative burdens, leading to swift execution and reduced transaction fees.³⁴

<https://www.nytimes.com/2021/03/11/arts/design/nft-auction-christies-beeples.html>,
Accessed on: 2 April 2024

²⁹ Hackl, C., Five Things Brands Need to Know About NFTs (Non-Fungible Tokens), FORBES, <https://www.forbes.com/sites/cathyhackl/2021/03/04/four-things-brands-need-to-know-about-nfts-non-fungible-tokens/?sh=5f86139e222f>, Accessed on: 2 April 2024; Howcroft, E., Twitter Boss Jack Dorsey's First Tweet Sold for \$2.9 Million as an NFT, 2021, Available at: <https://www.reuters.com/article/us-twitter-dorsey-nft/twitter-boss-jack-dorseys-first-tweet-sold-for-2-9-million-as-an-nft-idUSKBN2BE2KJ>, Accessed on: 2 April 2024; Thompson, C., The Untold Story of the NFT Boom, 2021, Available on ; <https://www.nytimes.com/2021/05/12/magazine/nft-art-crypto.html>, Accessed on: 2 April 2024; Roose, K., Buy This Column on the Blockchain!, 2021, Available at: <https://www.nytimes.com/2021/03/24/technology/nft-column-blockchain.html>, Accessed on: 2 April 2024;

³⁰ Trautman, L.J., *Virtual Art and Non-fungible Tokens*, Hofstra Law Review, 2022, p. 371

³¹ Hackl, C., *op. cit.* note 29; Lund, J. et al., *The Digitization of Real-World Assets into Tokens on Blockchain*, 2018, Available at: <https://www.ibm.com/thought-leadership/institute-business-value/report/tokenassets>, Accessed on: 2 April 2024; How Blockchain is Making Car Ownership Easier, VINCHAIN, Available at: <https://vinchain.io/blog/how-blockchain-is-making-car-ownership-easier/296>, Accessed on: 2 April 2024

³² Moringiello, J.M.; Odinet, C.K., *op. cit.* note 15, p. 611.; Roose, K., *op. cit.* note 29; Burne, K., *Tokens of Appreciation?: The Benefits of Digitizing Assets Using Blockchain*, 2020, Available at: <https://www.bnymellon.com/us/en/insights/aerial-view-magazine/tokens-of-appreciation>, Accessed on: 2 April 2024; Laurent, P. et al., *The Tokenization of Assets Is Disrupting the Financial Industry. Are You Ready?*, 2018, p. 62, https://www2.deloitte.com/content/dam/Deloitte/cz/Documents/financial-services/Deloitte_Inside_19_CIO_Edition_Nov_2018.pdf.

³³ Laurent, P. et al., *Ibid.*, p. 63; Burne, K., *Ibid.* ("Here's how tokenization works: the digital token references someone's right to property or delivery of an asset. ")

³⁴ Moringiello, J.M.; Odinet, C.K., *op. cit.* note 15, p. 612.; Raskin, M., *The Law and Legality of Smart Contracts*, Georgetown Law Technology, Vol 1:2, 2017, p. 309.

The vision of the token economy hinges on the token's inherent capability to incorporate immutable and non-replicable information.³⁵ This feature extends beyond digital currencies and securities to encompass various assets and rights from the traditional legal framework. The token economy facilitates the digitization of physical assets, representing ownership or usage rights in a digital format.³⁶ This groundbreaking innovation, akin to the introduction of physical securities, is anticipated to instill unprecedented legal certainty in the digital economy.³⁷

One potential application lies in the realm of property ownership registration systems. Tokenizing real estate could establish the foundation for maintaining land registries within the blockchain, where each property would be linked to a non-fungible token (NFT), enabling seamless, rapid, and transparent transfers. This setup would eradicate the need for intermediaries, cut transfer expenses, and bolster transactional legal certainty.³⁸

Another envisaged use case involves voting systems. Assigning each eligible voter a unique NFT could unequivocally identify individuals with voting rights. Additional functionalities could include verifying the accuracy of votes cast. Conducting voting procedures on the blockchain network would facilitate real-time vote tallies, with blockchain's cryptographic solutions ensuring vote count precision and guarding against potential fraud or manipulation.³⁹

Furthermore, an example already tested in practice, is delivery of tokenized court documents. Official documents, like any tangible or digital asset, can be tokenized, as demonstrated in recent English court cases involving blockchain, tokens, and crypto assets. In the case of *Osbourne v. Unknown Persons*, where the petitioner sought redress against anonymous defendants in possession of "stolen" NFTs, the court endorsed an alternative delivery method. This method involved transferring NFTs containing web links to documents, delivered directly

³⁵Dünser, T., *Legalize Blockchain: How states should deal with today's most promising technology to foster prosperity*, 2020, Books on demand, p. 168.

³⁶ Tripathi, A., *NFTs Can Bring the Real World On-Chain*, Available at: <https://www.coindesk.com/business/2021/03/17/nfts-can-bring-the-realworld-on-chain/>, Accessed on: 2 April 2024

³⁷ Ferreira, A.; Sandner, P.; Dünser, T.; *Cryptocurrencies, DLT and Crypto Assets – the Road to Regulatory Recognition in Europe*, 2021, Available at: <https://ssrn.com/abstract=3891401> or <http://dx.doi.org/10.2139/ssrn.3891401>, p. 14 – 16.

³⁸ Savelyev, A., *Contract law 2.0: "Smart" contracts as the beginning of the end of classic contract law*, Basic research program working papers (National Research University Higher School of Economics, Moscow), 2016, Available at: <https://ssrn.com/abstract=2885241>, p. 6.

³⁹ Fairfield, J., *Tokenized*, *op. cit.* note 5, p. 1273.

to the defendants' crypto wallets, due to the challenges associated with traditional delivery methods stemming from blockchain network anonymity.⁴⁰

The many possible applications of the non-fungible tokens are the reason NFTs should not be taken lightly and should, in turn, be given the appropriate legislative attention. Tokens, as the common denominator for the fungible tokens – cryptocurrency, and the non-fungible tokens, must therefore be analysed from legal perspective, especially from the property law stance.

To enhance the clarity of this paper and to illustrate these abstract technological concepts more effectively, I will use non-fungible tokens as a case in point, representing tokens at large.

3. PROPERTY RIGHT AND TOKENS

The discourse on the future of law, especially regarding traditional legal institutions, is characterized by divergent views. Grant Gilmore's 1974 declaration of the "death" of the contract marked the beginning of discussions on ownership's decline and the evolution of classical contract law.⁴¹ Perzanowski and Schultz suggest a shift from ownership to access due to factors like the Internet of Things and digital rights management.⁴² Savelyev challenges the state's role in law enforcement with blockchain and smart contracts.⁴³ Conversely, some argue that classical legal frameworks are evolving, driven by globalization and regulatory changes.⁴⁴ All these trends and perspectives must be taken into account when embarking on a path to define and accommodate new occurrences, such as digital tokens.

⁴⁰ *Ibid.*, paragraph 44: *In the present case, the evidence continues to be that, with the exception of service by email on the Fourth Defendant, the Claimant had no other available method of conventional service on the Defendants of my order and supporting documents except service by NFT sent to the relevant wallets. This was proposed by way of nonfungible token airdrop, which had already been agreed by Lavender J and executed by the Claimant in relation to his order and supporting and related documents. In my judgment, that was a good reason for authorising service of these documents by NFT. Accordingly, I ordered that the Claimant could serve these documents (...) by updating the document repository located at the original web link/URL contained within the relevant Service NFT previously airdropped into that Wallet.*

⁴¹ Gilmore, G., *The Death of Contract*, Ohio State University Press, 1974, p. 65.

⁴² Perzanowski, A.; Schultz, J., *The End of Ownership - Personal property in the digital economy*, Cambridge, MIT Press, 2016, Available at: <https://www.perzanow.ski/>, p. 35.; Lessig, L., *Law regulating code regulating law*, Loyola University Chicago Law Journal, 2003, p. 1.

⁴³ Savelyev, A., *op. cit.* note 38, p. 4.

⁴⁴ van Erp, S., *Ownership of Data and the Numerus Clausus of Legal Objects*, Maastricht European Private Law Institute Working Paper No. 2017/6, Available at: <https://ssrn.com/abstract=3046402>, p. 2.

When we talk about non-fungible tokens, tokens, digital entities or "digital things", the first questions that arise are (i) whether they are things at all and (ii) whether ownership and other rights *in rem* can be held over them? The ancient Romans considered things to be pieces of external nature, spatially separated and accessible to people.⁴⁵ The emphasis was therefore on the physicality, i.e., corporeality, of things. The question of whether intangible property can be the subject of property rights is still relevant, and we can find the answer in historical discussions about the nature of intangible property.⁴⁶

In Germany, the provisions on ownership date back to the 19th century, so it is not unusual that only physical things are provided for as a possible object of ownership,⁴⁷ as only such objects existed at the time of drafting said provisions.⁴⁸ However, the situation has changed significantly in the last two centuries, which prompted the German legislator to review the original arrangement of property rights. In 2021, the first step was taken towards the dematerialization of property rights in the German legal system, it is now stipulated that electronic securities are considered objects in the context of the BGB and property rights.⁴⁹

The Dutch Civil Code defines ownership as the most comprehensive property right that a person, the 'owner', can have over a thing,⁵⁰ and defines a thing as a tangible object that people can control.⁵¹ The definition of property rights is directly related to the object of property rights, and Dutch law, modeled on German law, stipulates that the subject of property rights must be material, i.e. tangible.

French law takes a more flexible approach here, asserting that property rights in physical things are considered the model for all other types of property rights.

⁴⁵ Horvat, M., *Rimsko pravo*, Pravni fakultet Zagreb, 2008, p. 159; Radošević, P., *Rimski korijeni hrvatskog prava*, Pravni vjesnik Pravnoga fakulteta Sveučilišta Josipa Jurja Strossmayera u Osijeku, no. 3. – 4., 2009, p. 198.

⁴⁶ van Erp, S., *op. cit.* note 45, p. 16

⁴⁷ German Bürgerliches Gesetzbuch - BGB, Section 90, Available at: https://www.gesetze-im-internet.de/englisch_bgb/englisch_bgb.html#p0271, Accessed on: 1 April 2024

⁴⁸ Zech, H., *Information als Schutzgegenstand*, Mohr Siebeck, Tübingen, 2012; Lehmann, M., *Finanzinstrumente*, Mohr Siebeck, Tübingen, 2009, p. 267.; Lahusen, B., *Das Sachenrecht der elektronischen Wertpapiere Aufsatz*, RDI, 2021, p. 168.; Omlor, S.; *Elektronische Wertpapiere nach dem eWpG*, RDI, 2021, p. 240.

⁴⁹ Gesetz party Einführung electronic Wertpapiere – eWpG, article 2, paragraph 3., Available at: https://www.gesetze-im-internet.de/ewpg/index.html#BJNR142310021BJNE000101360_, Accessed on: 1 April 2024

⁵⁰ Article 5., Available at: www.dutchcivillaw.com/

⁵¹ *Ibid.*, Article 3, paragraph 2: 'Things' are tangible objects that can be controlled by humans.

Nevertheless, the difference between tangible and intangible assets is emphasized there as well.⁵²

The corporality is therefore the core attribute most civil law systems require from the objects of property rights.⁵³ Croatian system, as well, stipulates things are material pieces of nature. However, our legal system is in somewhat easier position, compared to legal systems presented above, given the fact that it contains a legal fiction that things are everything that is equated with things by the law.⁵⁴

The aim of the following paragraphs is to place non-fungible tokens - NFTs in the property law legal framework, to see if they fit into the existing regulation or should some legislative changes be introduced.

3.1. Principles of real legal regulation

Property law governs the belonging of things to people, whereby other entities, to which the law expressly grants this status, can be equated with things.⁵⁵ Apart from the general principles of civil law; there are four principles, characteristic only of rights *in rem*; the principle of private legal authority over things, a finite number of *in rem* rights, certainty and publicity.⁵⁶

The principle of private law authority over things is manifested through four elements: private law authority over things, direct authority, absolute action and relative permanence. Private law authority entails a relationship of legal equality, distinct from *de facto* possession.⁵⁷ Direct authority allows the holder of a subjective real right to exercise control directly over the object. Absolute action, crucial to ownership, mandates third parties to refrain from infringing on the owner's rights, enforceable through legal protection. Relative permanence ensures that real legal relationships endure over time, allowing repeated exercise

⁵² van Erp, S., *op. cit.* note 44, p. 17.

⁵³ Vizner, B., *Gradansko pravo*, 2nd edition, Štampa, Osijek, 1966., p. 120

⁵⁴ Croatian Zakon o vlasništvu i drugim stvarnim pravima, Official Gazette no. 91/1996, 68/1998, 137/1999, 22/2000, 73/2000, 114/2001, 79/2006, 141/2006, 146/2008, 38/2009, 153/2009, 90/2010, 143/2012, 152/2014, (hereinafter: Property Act) Available at: https://narodne-novine.nn.hr/clanci/sluzbeni/2015_07_81_1548.html, Accessed on: 1 April 2024, Art. 2 (2): „Uzima se da su stvari i sve drugo što je zakonom s njima izjednačeno.“

⁵⁵ Gavella, N.; Josipović, T.; Gliha, I.; Belaj, V.; Stipković, Z.; *Stvarno pravo*, prvi svezak, Narodne novine, Zagreb, 2007, p. 21. (footnote no. 30)

⁵⁶ *Ibid.*, p. 21.

⁵⁷ *Ibid.*, p. 21 – 26.

of authority without depletion. Classification of authority as real or mandatory depends on the parties' intentions, pivotal in determining the nature of contracts or transactions.⁵⁸

According to the principle of finite number of *in rem* rights, there are only those types of real rights that are provided for by law, *numerus clausus*. This principle implies the limitation of the types of subjective rights, the limitation of the content of each of these real and the indivisibility of the content of each individual subjective real right.⁵⁹For the purposes of this paper, the most important right is the right of ownership. It is the foundation on which other, limited *in rem* rights, rest. In this sense, the right of ownership is a unlimited right over a certain thing that authorizes its holder to do what he wants with the thing and to exclude everyone else from it, if this is not contrary to other people's rights and legal restrictions.⁶⁰All the presented postulates are in accordance with what would be desired and could be achieved if rights *in rem* were extended to digital entities, such as NFTs.

The principle of definiteness is twofold, it means the definiteness of the object of the real right - an individually determined thing or, when the law allows, an entity equated with a thing, but it also means the definiteness of the content of the subjective right.⁶¹The fulfillment of the application of this principle to NFTs is indisputable, non-fungible tokens are unique and individually determined.

The fact that there are one's subjective rights over things should be made known, externally visible, especially because real rights act *erga omnes*, so it is important that all interested parties are familiar with the assignees of real rights to certain things.⁶² The principle of publicity is adequately ensured by blockchain technology, which is actually a register of all transactions carried out on it.

3.2. Object of rights *in rem*—a thing

Things are the object of rights in hereditary and property law, and in law of obligations they are the object of claims.⁶³Therefore, the object of property rights

⁵⁸ *Ibid.*, p. 26.

⁵⁹ *Ibid.*, p. 26. – 33.

⁶⁰ Art. 30, Property Act

⁶¹ Gavella, N.; *et. al.*, *op. cit.* note 55, p. 33.

⁶² *Ibid.*, p. 34 – 37.

⁶³ Gorenc, V.; Slakoper, Z., *Obvezno pravo – opći dio*, Novi informator, Zagreb, 2009, p. 94.

plays a key role in the legal relationship, because the existence of an object is a prerequisite for one's subjective right to exist.⁶⁴

It became clear early on that there was a distinct legal concept of "things" distinct from their lay meaning. Roman law expanded this concept so that things included not only material objects (*res corporales*), but also abstract entities (*res incorporales*) such as subjective rights; claims, inheritance rights and servitude rights.⁶⁵

Some earlier legal systems broadly defined the term thing to include both tangible and intangible entities, i.e., property rights can exist over everything that is capable of being privately owned, including subjective rights and the so-called groups of things (*universitates rerum*).⁶⁶ For example, the Austrian legal system broadly defined things as including non-corporeal entities, but at the same time did not consider things in the legal sense to be things that are not useful for human use.⁶⁷

In the late 19th and early 20th centuries, the legal and philosophical perspective changed with the dominance of a positivist worldview and efforts were made to harmonize the legal concept of things with their physical meaning. The doctrine of the corporeality of things emerged and was widely accepted, especially in the German legal system. As a result, the German legislator faced numerous challenges. The Swiss legislator had a similar experience but choose to be pragmatic, and although adhering to the doctrine of corporeality, allowed the objects of real rights to be entities that, according to the doctrine of corporeality, are not things, such as ideal parts of real estate.⁶⁸

Drawing from past experiences, objects of subjective rights in rem should not be universally equated with physical things. Some things are not suitable as objects of subjective rights, while some entities that are not things can be objects of such rights. Consequently, some lawmakers, including the Croatian legislator, have opted for a compromise by defining "things" as elements of the material realm

⁶⁴ Gavella, N.; *et. al.*, *op. cit.* note 55, p. 64.; Vedriš, M.; Klarić, P., *Osnove imovinskog prava – Opći dio, stvarno, obvezno i nasljedno pravo*, Narodne novine, Zagreb, 1987, p. 58.

⁶⁵ Horvat, M., *op. cit.* note 45, p. 159.

⁶⁶ Gavella, N., *et. al.*, *op. cit.* note 55, p. 65; Vedriš, M.; Klarić, P., *op. cit.* note 64, p. 69.

⁶⁷ Allgemeines bürgerliches Gesetzbuch, § 285. *Alles, was von der Person unterschieden ist, und zum Gebrauche der Menschen dient, wird them rechtlichen Sinne eine Sache genannt.* Available at:

<https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=10001622>, Accessed on: 1 April 2024,

⁶⁸ Gavella, N. *et. al.*, *op. cit.* note 55, p. 66.

while also permitting certain intangible entities to be classified as such. Article 2 of the Property Act stipulates that the subject of property rights and other real rights can be any movable (movable) or immovable thing (real estate), except for those that are not capable of doing so.⁶⁹

In conclusion, the first and perhaps the most important element of a thing is its material existence. Other elements are possibility of individualization and subjection to human control.⁷⁰

3.2.1. Corporeality

According to the legal definition, things are corporeal parts of nature, different from people, that people can use. This relatively limited notion of things is expanded in our legal system by the legal fiction that things are also everything else that is equated with them by law.⁷¹ Here, it is of crucial importance that this legal fiction be expressly prescribed by law.

Art. 2 (6) of the Property Act stipulates that certain types of rights or anything else can be equated with things by the law. Interpreting the stated legal definition, some authors conclude that the Property Act accepted the division of things into corporeal and incorporeal.⁷² In contrast, other authors advocate the view that there are no incorporeal things, but only incorporeal entities that are treated as things.⁷³

This issue has also been discussed in comparative legal theory, so some believe that, for example, entities that exist in the digital world can be considered incorporeal things *-res incorporales*, in accordance with the ancient Roman division of things. Others point out that when Gaj introduced the division into corporeal and non-corporeal things, under non-corporeal things he meant rights, that is, actions, because he stated that these are things that cannot be touched, and which exist only in law. Although the first element coincides with the characteristics of digital entities, because they are an incorporeal phenomenon, the second element is not fulfilled because it is not true that digital entities exist only in law, they also exist online, on servers, in the digital sphere. Furthermore,

⁶⁹ Art. 2 (1), Property Act

⁷⁰ Gorenc, V., Slakoper, Z., *op. cit.* note 63., p. 95.

⁷¹ Property Act, Art. 2 (2): *It is assumed that things and everything else that is equated with them by law.*

⁷² Vedriš, M., Klarić, P., *op. cit.* note 64, p. 72.

⁷³ Gavella, N.; *et. al.*, *op. cit.* note 55, p. 67.; Gorenc, V., Slakoper, Z., *op. cit.* note 64, p. 96.

proponents of this theory state that digital entities are not rights but can be the object of rights that exist regardless of whether the legal order recognizes them or not.⁷⁴

I lean towards the latter way of thinking. Relevant parts of the Article "*considered to be a thing*" and "*equal to things*" are sufficient arguments for the conclusion that things are corporeal, and that the status of things can legally be attributed to some incorporeal entities as well. This is merely a theoretical disagreement, which in practice should not present difficulties in the application of the Property Act and other regulations that equate non-corporeal entities with things.⁷⁵

Non-Fungible Token (NFT) tokens are evidently distinct from physical objects. However, I assert that this disparity poses no inherent issue, as there exists the potential recourse of employing legal fiction. This entails explicitly defining, through legislation, that NFTs are to be treated equivalently to physical entities, thus affording them the status of things. All that is required is for legislators to acknowledge this requirement, recognizing the legal vacuum through an analysis of socio-economic indicators and the imperative of addressing it by enacting regulations for certain non-physical entities exclusive to the digital realm – tokens.

3.2.2. Possibility of individualization

When we say that items should be individualized, this means that they are clearly defined and distinguished from other items or entities. Each object of law must be sufficiently specific or identified in a way that allows it to be distinguished from other similar or related objects. Individualization enables legal clarity and discernment of what exactly is covered by certain legal rules or rights.

When we categorize things according to their inherent characteristics, we distinguish between generic things (*genus*) and individually defined things (*species*).⁷⁶ Generic things are those that are described in the trade by type, genus, number, quantity or measure (e.g. flour, corn, petroleum, oil). Individually defined things appear in legal transactions as unique examples within their category or are specifically defined by legal transactions between the parties.

⁷⁴ Radonjić, A., *Virtual things, virtual possessio and possessory protection thereof*, in Robbie, J.; Akkermans, B. (ed.); *Property Law Perspectives VII*, Eleven International Publishing, 2020, Maastricht, p. 34.

⁷⁵ Gorenc, V., Slakoper, Z., *op. cit.* note 63, p. 96.

⁷⁶ Horvat, M., *op. cit.* note 45, p. 164, 286.

Genericity encompasses multiple things that are interchangeable in an objective sense (because there are multiple similar things). Since generic things are usually fungible, this separation is often associated with the distinction between fungible and non-fungible things.⁷⁷ It is easy to see here that something called a non-fungible token in this context is an individually defined thing⁷⁸, clearly separated from other things of that kind (the higher term here is non-fungible tokens in general, and an even higher term would be tokens on a blockchain or other DLT network).

The non-fungibility and thus the individual determination of NFTs derives from their natural properties. NFTs are unique digital tokens on the blockchain with individual codes and meta data to distinguish them.⁷⁹ What gives and guarantees uniqueness to NFTs is the computer code, i.e. the smart contract by which the NFT was created and the blockchain technology, which is immutable, transparent, and decentralized. The sum of all the technological characteristics of non-fungible tokens and the capabilities and characteristics of its underlying technologies assures that each individual NFT is unique, non-fungible, non-replicable, and forever stored on the DLT network.

3.2.3. The possibility of subjection to human control

Regarding the aspect of being under human control, digital entities can indeed be controlled in this manner. Originating within human-developed environments and technology frameworks, digital entities lack independent existence post-creation, thus enabling them to be subject to human manipulation. However, a notable distinction between physical objects and digital entities lies in the mode of control; digital entities are indirectly controlled through user interfaces on computers or mobile devices.⁸⁰

⁷⁷ Gorenc, V., Slakoper, Z., *op. cit.* note 63, p. 100.

⁷⁸ I use the term "thing" here because we are talking about the categorization of things, and one of the elements that must be fulfilled in order for something to be considered a thing.

⁷⁹ Dowling, M., *Is non-fungible token pricing driven by cryptocurrencies?*, Finance Research Letters, Vol. 44, 2022, p. 6; Fairfield, J., *Tokenized*, *op. cit.* note 5, p. 1272.

⁸⁰ Radonjić, A., *op. cit.* note 74, p. 36 - 37

3.3. Terminology - digital things and tokens

After determining that: (i) NFTs could easily be equated with things, by applying the legal fiction, (ii) that they are sufficiently individualized and (iii) can be subject to human control, I conclude that non-fungible tokens can, in principle, be considered things. As stated earlier, in this analysis, the NFTs are used as a representative of a broader term – the tokens. What are tokens, how could they be subsumed or translated into legal language?

In this paper, I decided to use the concept of digital things. The intention behind the use of this term is the desire to preserve the reference to traditional, physical things and their position in the property law, but at the same time to clearly emphasize the difference between things and digital things. What are digital things? At first glance, the term seems too broad, and it is necessary to first demarcate what would possibly be included in it and what would not. But how does one even approach such a thankless and extensive task?

3.3.1. Comparative legal theory on terminology

I think a good starting point is the definition of virtual property given back in 2005 by the American scientist Joshua Fairfield.⁸¹ After conducting research, it seems that this definition is the most influential definition of virtual things. All other authors who published their work after Fairfield's seminal article rely on his definition, whether they agree with it, wish to complement it, or criticize it.

According to Fairfield, a virtual thing is a computer code characterized by permanence, rivalry⁸² (exclusivity) and connectivity.⁸³ He believes that the aforementioned characteristics are legally relevant and that virtual things share them with "real world" objects.⁸⁴ The first characteristic - durability, means that

⁸¹ Fairfield, J., *Virtual Property*, Boston University Law Review, Vol. 85, 2005

⁸² Rivalry is a familiar concept in German legal theory as well, serving as a prerequisite for something to qualify as the subject of property rights. Rivalry is evident in the incapacity of a single object to be utilized concurrently by multiple entities. Jacobs, M., Arndt, J., *Bitcoins in der Zwangsvollstreckung*, in the book *Festschrift für Karsten Schmidt*, 2019, p. 565; Linardatos, D., *Der Mythos vom "Realakt" bei der Umbuchung von Bitcoins - Gedanken zur dinglichen Erfassung von Kryptowährungen*, in *Jahrbuch Junge Zivilrechtswissenschaft*, 2020, p. 198.; Hoeren, T., Prinz, W., *Das Kunstwerk im Zeitalter der technischen Reproduzierbarkeit – NFTs (Non-Fungible Tokens) in rechtlicher Hinsicht*, CR, 2021, p. 569.

⁸³ Fairfield, J., *Virtual Property*, *op. cit.* note 81, p. 1054.

⁸⁴ In addition to these characteristics being legally relevant, they also have economic significance, that is, it is important for us that something over which we have control and

the virtual things exist on the server of the Internet service provider and do not disappear after the user stops using them or after the user turns off the computer. Another characteristic refers to the fact that when one person uses a virtual thing, no one else can use that virtual thing without the user's permission. In the American legal system, this characteristic is called rivalry,⁸⁵ and it corresponds to the principle of exclusivity in our legal system.⁸⁶ The third feature means that other people, not just the user, can experience the virtual thing.⁸⁷

Blazer adopts Fairfield's criteria and supplements them with secondary market existence and user-added value to assess digital assets. While acknowledging that a digital entity may exist without a secondary market, the presence of one reinforces its recognition as an asset. Similarly, user-added value suggests the necessity of digital property rights. These supplementary criteria enrich discussions on digital rights but don't redefine the core characteristics of digital entities.⁸⁸ Erlank explores the legal characteristics of real-world objects in South African law and compares them with digital entities, noting the primary disparity: digital entities lack physical presence. However, he contends that similarities in functionality and form support their classification akin to real-world objects.⁸⁹ Plaka critiques Fairfield's definition and introduces *res digitales* as objects existing in computer-controlled environments, comprised of bits stored on hardware, processed by software, and interacted with via user interfaces.⁹⁰

Following this definition, Serbian colleague Radonjić states that virtual things are objects that have the characteristics of durability, rivalry and connectivity, and which are built from bits stored on hardware, processed by software and

power has the described characteristics precisely for economic reasons. *Ibidem.*, p. 1054 – 1055.

⁸⁵ Merrill, T. W., *Property and the Right to Exclude*, Nebraska Law Review, Vol. 77, 1998, p. 730.

⁸⁶ On the principle of exclusivity in Gavella, N.; *et. al., op. cit.* note 55, p. 375 – 378.

⁸⁷ Fairfield uses the URL code as an example. Fairfield, J., *Virtual Property, op. cit.* note 81, p. 1054 – 1055.

⁸⁸ Blazer, C., *The Five Indicia of Virtual Property*, Pierce Law Review, Vol. 5, no. 1., 2006, Available at: https://scholars.unh.edu/cgi/viewcontent.cgi?article=1090&context=unh_lr, p. 142.

⁸⁹ Erlank, W., *Property in Virtual machine Worlds*, PhD Thesis, Stellenbosch University, South Africa, 2012, Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2216481, Accessed on: 1 April 2024, p. 293 – 294.

⁹⁰ Plaka, P., *Virtual Property. Towards a General Theory*, PhD thesis, EUI, Florence, 2017, Available at: <https://cadmus.eui.eu/handle/1814/49664>, Accessed on: 1 April 2024, p. 107, 147, 177.

subject to human control through a user interface whose existence depends on the action of a third party.⁹¹

3.3.2. EU legislative contribution

The European Commission has initiated efforts to define digital entities owned by individuals, particularly focusing on crypto-assets. Recognizing the necessity for a unified approach in defining and regulating crypto-assets within the EU, the Commission passed the Regulation of the European Parliament and of the Council on crypto-asset markets and amended Directive (EU) 2019/1937, known as MiCA. This regulation defines crypto-assets as digital representations of value or rights that can be electronically transferred and stored using decentralized transaction record-keeping technology or similar means.⁹²

However, MiCA explicitly excludes NFTs from its scope,⁹³ indicating that further evaluation and potential regulatory proposals are needed to address associated risks.⁹⁴ Despite acknowledging deficiencies in the current legal framework, MiCA fails to offer a thorough resolution for delineating digital entities. Although it introduces the notion of crypto-assets, it doesn't sufficiently harmonize with established legal principles. Consequently, it struggles to ascertain whether digital entities can be owned. The discrepancy arises from the fact that the term "crypto-assets" does not correlate with the term "things" (*Cro. stvar*), which is fundamental in most civil law property legislation.

The discrepancy likely stems from MiCA's financial services-centric approach, viewing digital entities primarily through the lens of financial instruments. Consequently, although MiCA marks a significant step toward regulating the digital market, it does not definitively address the question of digital entities' eligibility for being object of rights *in rem*. Thus, MiCA serves as an initial exploration into the concept of "digital ownership," leaving this question unanswered for now.

⁹¹ "Virtual things are rivalrous, persistent, inter-connected objects build up of bits stored on hardware, processed by software and susceptible to human control via user-interface whose existence is dependent upon third party action." Radonjić, A., *op. cit.* note 74, p. 37.

⁹² Art. 3 (1) point 2 MiCA

⁹³ Art. 2 (2a) MiCA; NFT - Legal Token Classification, Studija udruge EU Blockchain Observatory and Forum, Available at: <https://www.eublockchainforum.eu/research-paper/nft-legal-token-classification>, Accessed on: 1 April 2024, p. 4 – 5.

⁹⁴ Lučić, D., *Nova pravila EU o tržištima kriptovaluta (MiCA)*, br. 6795-6796, 2023., p. 19.

3.4. Definition of digital things and *de lege ferenda*

In this paper I will use the term digital thing rather than virtual thing, as suggested by Fairfield's seminal article. I think that the definition of the term *digital*⁹⁵ better corresponds to the meaning I want to convey, than the definition of the term *virtual*.⁹⁶ Furthermore, Fairfield himself opted for the term *digital property* in his later articles, instead of the initial term *virtual property*.⁹⁷

Finally, taking into account the definitions offered in comparative legal theory, I believe that digital things should be defined as computer codes, i.e. electronic records that are stored on hardware, processed by software and subject to human control through a user interface, whereby it is important that these codes, i.e., electronic records, have the properties of permanence, connection, and exclusivity, which is limited only by the technological aspects of the technology within which these digital things exist.

Furthermore, once the Property Act contains the definition of digital things, the next step would be to employ the legal fiction and expressly stipulate that digital things can be equated with things for purposes of and in the sense of the Property Act.

3.4.1. Non-fungible tokens as digital things

Now that the definition of digital things has been proposed, it is necessary to see whether NFTs, and tokens in general, are covered by it. Non-fungible tokens are codes, i.e. sets of information, which are created through the 721 protocol and smart contracts, and which have certain technological characteristics, the uniqueness from which rivalry arises, durability and immutability ensured by the decentralized blockchain network, and interconnection with other network users. In other words, NFTs fulfill the characteristics of virtual things, as described by Fairfield in his 2005 definition. Adding to it the attribute of being subject to

⁹⁵ Croatian language portal, Available at: <https://hjp.znanje.hr/>, Accessed on: 1 April 2024, Term *digitalni*, *adj.*, *inform.* the one that has data written in the form of electronic bits, binary, i.e. 0 and 1 and with which there are no losses during data transmission [*digital record*], *opr.* analogous

⁹⁶ Croatian language portal, Available at: <https://hjp.znanje.hr/>, Accessed on: 1 April 2024, Term *virtuālan* *adj.*, 1.a. which exists in appearance or arises from appearance and not from reality; unreal, fictitious b. *fil.* which is located or present in another reality c. *lingv.* which refers to language as a system (langue) as opposed to speech that belongs to actual reality (F. de Saussure) d. potential, possible; 2. *inform.* which is computer generated; artificial, apparent, of the internet.

⁹⁷ Fairfield, J., *Tokenized*, *op. cit.* note 5, p. 1279, 1294.

human control, we arrive at the answer that non-fungible tokens could be considered digital things, for which it was previously shown that they could fall under the status and position of the thing as an object of property based on the legal fiction pursuant to Article 2 (2) of the Property Act.

3.4.2. Ability to be the object of rights *in rem* - tradability

Furthermore, for an entity to be the subject of a subjective *in rem* rights, it must possess the property of tradability.⁹⁸ As I previously offered a definition of digital things, the following analysis refers to digital things – *res digitales*.

The general rule is that things (as physical parts of nature) can be the subject of subjective rights *in rem* unless their natural properties or legal provisions prevent them from belonging to an individual. The ability of things to be the subject of real rights (that is, the tradability of things) is the rule, while the inability to do so (the non-tradability of things) is present only if the thing does not meet the natural or legal criteria for this ability.⁹⁹

What is true for the things, also applies to entities that are equated with things by law. The tradability of things is not the same as the ability to trade, although they tend to coincide. The tradability of things is a prerequisite for legal transactions with things, therefore, for any establishment and acquisition of civil rights related to that thing. When the thing is not in circulation, it is impossible to acquire rights through legal transactions. In other words, only when the thing is in circulation on the market, the question arises whether it is capable of legal transactions, of transferring rights from one person to another based on the will of the first person. It is important to note that, as a rule, anything that possesses the property of tradability is also capable of being an object of legal transactions.¹⁰⁰

Since the capability of things is the rule and the inability is the exception, the reasons for the inability (such as unsuitability or non-transferability) are present only in specific cases. Therefore, the exception should be interpreted and applied very restrictively. Our legal theory considers that terminology related to the

⁹⁸ Vedriš, M.; Klarić, P., *op. cit.* note 64, p. 59.

⁹⁹ Gavella, N.; *et. al.*, *op. cit.* note 55, p. 67.

¹⁰⁰ The aforementioned properties have not always coincided throughout history and existed in parallel. In the regime of social ownership, things that had the property of being tradable were not capable of legal transactions because the authorizations on them were not transferable, the ownership of some negotiable things could not be transferred to legal entities. Gavella, N.; *et. al.*, *op. cit.* note 55, p. 67., Vedriš, M.; Klarić, P., *op. cit.* note 64, p. 60.

market (*res in commercium* and *res extra commercium*) is not entirely appropriate but is used nevertheless because of its deep roots.¹⁰¹ The natural criterion of capacity includes the requirements that the thing be individually determined, useful to people and different from people. The legal criterion of capacity means that the thing must not be deprived by law of the capacity to be an object of ownership or placed outside the scope of legal regulation. It has long been recognized that the tradability of things is not a permanent category that legal orders would have to recognize without exception, because the tradability of things reflects not only the natural properties of things but also social-economic and legal-political elements.¹⁰²

To conclude, this requirement is susceptible to change and therefore we should approach it with an open mind. In the words of a great Croatian theoretician, prof. dr. sc. Gavella: "*The development of science, technique and technology, causes an increase in the natural possibility for individuals to establish their power over many things that were once not suitable to be objects of rights in rem, and it is predictable that such development will continue.*"¹⁰³

3.4.3. The ability to be the object of ownership

The ground rule is that all things are capable of being the subject of property rights, unless their natural characteristics or legal provisions prevent them from belonging to an individual.¹⁰⁴ We can connect this provision with the provision that defines ownership and lists exclusivity as one of its main characteristics, i.e. the owner's authority enforceable *erga omnes*.¹⁰⁵ Are NFTs, as digital things, capable of being owned, or do their natural characteristics prevent them from belonging to an individual?

The holder of the NFT can use the NFT as he wishes, and exclude others, i.e. prohibit them from using that digital thing. It should also be emphasized that the power of this authorization is not threatened because the authorized person depends on the cooperation of the network.¹⁰⁶ Given that miners are rewarded for

¹⁰¹ Gavella, N. *et. al. op. cit.* note 55, p. 68.

¹⁰² Vedriš, M., Klarić, P., *op. cit.* note 64, p. 60.

¹⁰³ Gavella, N.; *et. al., op. cit.* note 55, p. 72

¹⁰⁴ Art. 3 (1), Property Act

¹⁰⁵ Art. 30. (1), Property Act

¹⁰⁶ Maute, L., *Responsio – Warum die Übertragung von Bitcoins kein dingliches Rechtsgeschäft required*, in *Jahrbuch Junge Zivilrechtswissenschaft*, 2020, p. 222.; Maume, P.; Maute, L., *Rechtshandbuch Kryptowerte*, Vahlen, Munich, 2020, § 4 para. 33., Guntermann, L. M., *Non Fungible Token als Herausdorff für das Sachenrecht*, RDİ, 2022, p. 206.

creating new blocks, thereby validating each individual transaction added to a new block, blockchain participants can trust that their transactions, if valid, will be executed. Thus, the participation of the network here can be compared with the participation of any third party that would otherwise be necessary to dispose of the subjective right of the authorized person. An example are land registers, which are a third party that is a key factor in the disposal of property rights because the registration of changes in subjective rights over real estate is constitutive and the transfer, establishment, termination of subjective rights cannot occur without registration.

One of the main characteristics of digital things is that they are present in the digital space, which is why they are easily portable, available to a wide range of subjects, can be effortlessly and quickly copied, and each of their copies is identical to the original. Due to this property of reproducibility, several subjects can simultaneously access and use the same data or information, the same digital thing. This is the reason some argue there is rivalry in use of such objects. Typically, ensuring the negative aspect of ownership rights over digital assets - specifically, the exclusion of others from accessing the same digital data - is challenging.¹⁰⁷ However, there are exceptions to this because certain digital assets possess the quality of non-fungibility, and the best example are the non-fungible tokens. Therefore, NFTs could be owned, because they have all the qualities an object of ownership should have.

Upon reaching this conclusion, we should consider specific authorizations encompassed by a particular token, and the contents thereof. Here, I will adopt the phrase and reasoning introduced by the Liechtenstein legislator in their token container model.¹⁰⁸ Firstly, tokens serve as containers and can store various information – authorizations – rights. Secondly, tokens can be linked to tangible material entities (i.e., things) or digital entities (i.e., digital things). If an NFT (a digital thing) is linked to another digital thing,¹⁰⁹ which is likely its most prevalent and consequential application, the non-fungible token can function as a certificate enabling the establishment of ownership over the underlying digital thing. By connecting the NFTs to digital things, those digital things are individualized and given the characteristics necessary for them to be objects of ownership. It could be said that NFTs are like securities (Cro. *vrijednosni papiri*,

¹⁰⁷ Wagner, G., *BGB* §823, rn. 245; Zech, H., *op. cit.* note 49, p. 117 – 119

¹⁰⁸ Lins, B., Praicheux, S., *Digital and Blockchain-based Legal Regimes: An EEA Case Study Based on Innovative Legislations – Comparison of French and Liechtenstein Domestic Regulations*, Financial Law Review, Issue 22, 2021, p. 5.

¹⁰⁹ To elaborate further, NFTs are digital things, but they are also other types of digital things. In proposed scenario, a non-fungible token is a digital thing that is used to incorporate certain rights over another digital thing, e.g., a graphic representation, a picture that exists only in a digital form.

Germ. *Wertpapieren*) that way, legal instruments that incorporate certain rights and obligation and can be object of property rights themselves.¹¹⁰

Each of the non-fungible tokens is unique,¹¹¹ and the owner of the token is a person who is precisely determined and indelibly recorded on the blockchain. Another important characteristic is that such tokens cannot be broken down into smaller token parts.¹¹² It is precisely the technological features of NFTs,¹¹³ provided by the technology of the decentralized system of block chains, that enable these digital things to be exclusivity, that is, they make NFTs as digital things can belong to an individual.

4. CONCLUSION

Blockchain technology, due to its decentralized nature, replaces conventional centralized databases and authorities responsible for transaction recording and management. This shift eliminates the need for trust in institutions, relying instead on mathematical algorithms and network security. Consequently, the widespread adoption of blockchain technology, as well as its rapid expansion, is unsurprising. According to a report by the World Economic Forum, by 2027, approximately 10% of the global GDP will be linked to blockchain-based technologies.¹¹⁴

Non-fungible tokens (NFTs) function as electronic records representing unique digital or physical items. Created through applications and smart contracts on blockchain networks, NFTs ensure uniqueness, authenticity, and immutability. Recognizing NFTs as possessing economic value, their market has grown substantially, rivaling more established and regulated markets.

¹¹⁰ Gorenc, V.; Slakoper, Z., *op. cit.* note 63, p. 577.

¹¹¹ The uniqueness of NFTs is related to decentralized ledger technology. Some authors point out that it is conceivable that a certain data holder or holder of intellectual property rights simultaneously creates several NFTs for the same subjective right or that a third party creates an NFT for a subjective right with which it has nothing to do. Guntermann, L.M., *op. cit.* note 106, p. 202, Hoeren, T., Prinz, W., *op. cit.* note 82, p. 571.

¹¹² *Ibid.*, p. 201, 203, 204.

¹¹³ Prinz, W., NFT - Was passiert da eigentlich ?, 12 April 2021, Available on: <https://www.linkedin.com/pulse/nft-passiert-da-eigentlich-wolfgang-prinz/>, Accessed on: 1 April 2024

¹¹⁴ Deep Shift, Technology Tipping Points and Societal Impact', World Economic Forum, Survey Report, 2015, Available at: [chrome-extension://efaidnbmninnibpcjpcglclefindmkaj/https://www3.weforum.org/docs/WEF_GAC15_Technological_Tipping_Points_report_2015.pdf](https://www3.weforum.org/docs/WEF_GAC15_Technological_Tipping_Points_report_2015.pdf), Accessed on: 2 April 2024, p. 24.

Contrary to some opinions,¹¹⁵ I advocate for the legal regulation of NFTs, suggesting they encompass elements falling under certain ownership aspects. Property law, which concerns subjects and objects, recognizes objects as "things" or entities equated with them. Unlike certain legal systems, the Croatian legal framework benefits from flexibility, allowing incorporation of incorporeal entities as "things" through legal fiction. Hence, it is crucial to acknowledge and legally recognize the capacity of certain non-physical entities, such as NFTs, to be considered as "things."

After extensively examining the principles of Croatian property law and the requisites for an entity to qualify as an object of ownership and other rights *in rem*, supplemented by comparative legal perspectives, I have concluded that non-fungible tokens could potentially be considered objects of property rights through the utilization of legal fiction inherent in the Croatian legal system. *De lege ferenda*, two essential steps are proposed. Firstly, the introduction of a legal definition for digital things – *res digitales* would be imperative. Subsequently, leveraging the legal fiction outlined in the Property Act to equate digital entities with tangible objects would enable them to be recognized as potential objects of ownership. This would be done by incorporation of a new provision into Article 2 of the Property Act expressly stating the equivalence of digital things to things.

REFERENCES

BOOKS AND ARTICLES

1. Ante, L., *The non-fungible token (NFT) market and its relationship with Bitcoin and Ethereum*, 2021, Available at: <http://dx.doi.org/10.2139/ssrn.3861106>
2. Antonopoulos, A., *Mastering Bitcoin*, 2nd Edition, O'Reilly Media, 2017
3. Bhaskar, N. D.; KuoChuen, D. L., *Handbook of Digital Currency - Bitcoin, Innovation, Financial Instruments, and Big Data*, Sim Kee Boon Institute for Financial Economics, Singapore Management University, Singapore, 2015
4. Blazer, C., *The Five Indicia of Virtual Property*, *Pierce Law Review*, Vol. 5, no. 1., 2006, p. 137 – 161
5. Buterin, D.; Ribarić, E.; Savić, S.; *Bitcoin – nova globalna valuta, investicijska prilika ili nešto treće?*, *Veleučilište u Rijeci*, no. 1, vol. 3, 2015, p. 145-158

¹¹⁵ Moringiello, J. M., Odinet, C.K., *op. cit.* note 15, p. 658.

6. Čulinović-Herc, E., *Zlouporabe blockchain tehnologije i utjecajna trgovačka društva*, Zbornik Pravnog fakulteta Sveučilišta u Rijeci , vol. 43, no. 3, 2022, p. 697-716
7. Cunjak Mataković, I.; Mataković H., *Kriptovalute – sofisticirani kodovi manipulacije*, International Journal of Digital Technology & Economy, 2018, p. 23 – 37
8. Dowling, M., *Is non-fungible token pricing driven by cryptocurrencies?*, Finance Research Letters, Vol. 44, 2022, p. 1 - 6
9. Dünser, T., *Legalize Blockchain: How states should deal with today's most promising technology to foster prosperity*, 2020, Books on demand
10. Erlank, W., *Property in Virtual machine Worlds*, PhD Thesis, Stellenbosch University, South Africa, 2012, Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2216481
11. Fairfield, J., *Tokenized: The Law of Non-Fungible Tokens and Unique Digital Property*, Indiana Law Journal, Volume 97 Issue 4, 2022, p. 1262 - 1313
12. Fairfield, J., *Virtual Property*, Boston University Law Review, Vol. 85, 2005, p. 1048 – 1102
13. Fairfield, J.; *Owned: Property, Privacy, and the New Digital Serfdom*, Cambridge University Press, 2017
14. Ferreira, A.; Sandner, P.; Dünser, T.; *Cryptocurrencies, DLT and Crypto Assets – the Road to Regulatory Recognition in Europe*, 2021, Available at: <https://ssrn.com/abstract=3891401> or <http://dx.doi.org/10.2139/ssrn.3891401>
15. Garbers-von Boehm, K.; Haag, H.; Gruber, K.; (for JURI), *Study on Intellectual Property Rights and Distributed Ledger Technology with a focus on art NFTs and tokenized art*, 2022, Available at: [https://www.europarl.europa.eu/RegData/etudes/STUD/2022/737709/IPOL_STU\(2022\)737709_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2022/737709/IPOL_STU(2022)737709_EN.pdf)
16. Gavella, N.; Josipović, T.; Gliha, I.; Belaj, V.; Stipković, Z.; *Stvarnopravo, prvisvezak*, Narodnenovine, Zagreb, 2007
17. Gilmore, G., *The Death of Contract*, Ohio State University Press, 1974
18. Gorenc, V.; Slakoper, Z.; *Obvezno pravo – opći dio*, Novi informator, Zagreb, 2009
19. Guntermann, L.M., *Non-Fungible Token als Herausforderung für das Sachenrecht*, RDi, 2022
20. Hoeren, T.; Prinz, W., *Das Kunstwerk im Zeitalter der technischen Reproduzierbarkeit – NFTs (Non-Fungible Tokens) in rechtlicher Hinsicht*, CR, 2021, p. 565 – 572
21. Horvat, M.; *Rimsko pravo*, Pravni fakultet Zagreb, 2008
22. Houy, N., *It will cost you nothing to 'kill' a proof-of-stake crypto-currency*, University of Lyon 2 - Groupe d'Analyse et de Théorie Economique (GATE), 2014, Available at: <http://dx.doi.org/10.2139/ssrn.2393940>

23. Hurdle, W.K.; Harvey, C.R.; Reule, R.C.G.; *Understanding Cryptocurrencies*, 2019, Available at: <https://ssrn.com/abstract=3360304>
24. Jacobs, M.; Arndt, J., *Bitcoins in der Zwangsvollstreckung*, in Festschrift für Karsten Schmidt, 2019
25. Kaselj, M., *Bitcoin*, master thesis, Josip Juraj Strossmayer Sveučilište u Osijeku, 2015, Available at: <https://repozitorij.mathos.hr/islandora/object/mathos%3A24/datastream/PDF/view>
26. Kaulartz, M.; Matzke, R.; *Die Tokenisierung des Rechts*, NJW - Issue 3278, 2018
27. Lahusen, B., *Das Sachenrecht der elektronischen Wertpapiere* Aufsatz, RDI, 2021, p. 161 – 169.
28. Lehmann, M., *Finanzinstrumente*, Mohr Siebeck, Tübingen, 2009
29. Lessig, L., *Law regulating code regulating law*, Loyola University Chicago Law Journal, Vol 35, 2003, p. 1 – 14
30. Linardatos, D., *Der Mythos vom "Realakt" bei der Umbuchung von Bitcoins - Gedanken zur dinglichen Erfassung von Kryptowährungen*, in: *Jahrbuch Junge Zivilrechtswissenschaft*, 2020
31. Lins, B., Praicheux, S., *Digital and Blockchain-based Legal Regimes: An EEA Case Study Based on Innovative Legislations – Comparison of French and Liechtenstein Domestic Regulations*, Financial Law Review, Issue 22, 2021, p. 1 - 17
32. López, P.; Montresor, A.; Datta, A., *Please, do not Decentralize the Internet with (Permissionless) Blockchains!*, Conference: IEEE 39th International Conference on Distributed Computing Systems, 2019
33. Maume, P., Maute, L., *Rechts handbuch Kryptowerte*, Vahlen, Munich, 2020
34. Maute, L., *Responsio – Warum die Übertragung von Bitcoins kein dingliches Rechtsgeschäft*, in: *Jahrbuch Junge Zivilrechtswissenschaft*, 2020
35. Merrill, T. W., *Property and the Right to Exclude*, Nebraska Law Review, Vol. 77, 1998, p. 730 - 755
36. Moringiello, J.M.; Odinet, C.K.; *The Property Law of Tokens*, Florida Law Review, 2022, p. 607 – 670
37. Omlor, S.; *Elektronische Wertpapiere nach dem eWpG*, RDI, 2021, p. 371 – 377
38. Perkušić, M., *Pravo elektroničkog plaćanja*, Školska knjiga, Zagreb, 2020
39. Perzanowski, A., Schultz, J., *The End of Ownership - Personal property in the digital economy*, Cambridge, MIT Press, 2016), Available at: <https://www.perzanow.ski/>
40. Plaka, P., *Virtual Property - Towards a General Theory*, doctoral thesis, EUI, Florence, 2017, Available at: <https://cadmus.eui.eu/handle/1814/49664>

41. Rachmawati, D.; Tarigan, J. T.; Ginting, A.B. C., *A comparative study of Message Digest 5 (MD5) and SHA256 algorithm*, Journal of Physics: Conference Series, Vol. 978, No. 1, 2018, p. 1 - 6
42. Radonjić, A., *Virtual things, virtual possessio, and possessory protection thereof*, in Robbie, J.; Akkermans, B. (ed.); Property Law Perspectives VII, Eleven International Publishing, 2020, Maastricht
43. Radošević, P., *Rimski korijeni hrvatskog prava*, Pravni vjesnik Pravnoga fakulteta Sveučilišta Josipa Jurja Strossmayera u Osijeku, no. 3. – 4, 2009, p. 193 – 217
44. Raskin, M., *The Law and Legality of Smart Contracts*, Georgetown Law Technology Review, Vol 1:2, 2017, p. 305 – 341
45. Saleh, F., *Blockchain Without Waste: Proof-of-Stake*, Review of Financial Studies, Volume 34, 2021, p. 1156 – 1190
46. Savelyev, A., *Contract law 2.0: "Smart" contracts as the beginning of the end of classic contract law*, Basic research program working papers (National Research University Higher School of Economics, Moscow), 2016, Available at: <https://ssrn.com/abstract=2885241>, p. 1 - 24
47. Swanson, T., *Watermarked tokens and pseudonymity on public blockchains* (unpublished article), 2015, Available at: <http://www.ofnumbers.com/wp-content/uploads/2015/11/Watermarked-tokens-and-pseudonymity-on-public-blockchains-Swanson.pdf>, p. 1 - 78
48. Tasca, P., Tessone, C.J.; *A Taxonomy of Blockchain Technologies: Principles of Identification and Classification*, Ledger, Vol. 4, 2019, p. 1 – 39.
49. Trautman, L.J., *Virtual Art and Non-fungible Tokens*, Hofstra Law Review, 2022, p. 361 - 426
50. van Erp, S., *Ownership of Data and the Numerus Clausus of Legal Objects*, Maastricht European Private Law Institute Working Paper, No. 6, 2017, Available at: <https://ssrn.com/abstract=3046402>, p. 1 - 23
51. Vedriš, M.; Klarić, P., *Osnove imovinskog prava – Opći dio, stvarno, obvezno i nasljedno pravo*, Narodne novine, Zagreb, 1987
52. Vizner, B., *Građansko pravo, drugo izdanje*, Štampa, Osijek, 1966
53. Wang, Q.; Li, R.; Wang, Q.; Chen, S., *Non-fungible token (NFT): Overview, evaluation, opportunities and challenges*, 2021, Available at: <https://arxiv.org/abs/2105.07447>, p. 1 - 22
54. Wright, A., de Filippi, P., *Blockchain and the Law - The Rule of Code*, Cambridge, Harvard University Press, 2018
55. Zech, H., *Information als Schutzgegenstand*, Mohr Siebeck, Tübingen, 2012
56. Zetsche, D. A.; Buckley, R. P.; Arner, D. W., *The Distributed Liability of Distributed Ledgers: Legal Risks of Blockchain*, University of Illinois Law Review, no. 4, 2018, p. 1382-1402

LEGAL ACTS

1. Liechtenstein Law on Tokens and TT Service Providers, Liechtensteinisches Landesgesetzblatt, no. 301, Available at: https://www.lcx.com/wp-content/uploads/2020_Liechtenstein_Blockchain_Laws_Translation_English.pdf
2. Croatian Zakon o vlasništvu i drugim stvarnim pravima, Official Gazette no. 91/1996, 68/1998, 137/1999, 22/2000, 73/2000, 114/2001, 79/2006, 141/2006, 146/2008, 38/2009, 153/2009, 90/2010, 143/2012, 152/2014, Available at: https://narodne-novine.nn.hr/clanci/sluzbeni/2015_07_81_1548.html
3. German Bürgerliches Gesetzbuch - BGB, dated 18 August 1896, Reichsgesetzblatt, no. 195, Available at: <https://www.gesetze-im-internet.de/bgb/>
4. German Gesetz party Einführung electronic Wertpapiere – eWpG, dated 3 June 2021, Bundesgesetzblatt, no. 1423, Available at: <https://www.gesetze-im-internet.de/ewpg/index.html#BJNR142310021BJNE000101360>
5. Dutch Civil Code, from 1 January 1992, Available at: www.dutchcivillaw.com/
6. Austrian Allgemeines bürgerliches Gesetzbuch, Justizgesetzsammlung no. 946/1811 et al., Available at: <https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=10001622>

COURT PRACTICE

1. Osbourne v. Persons Unknown and Others [2022] EWHC 1021 (Comm)

NETWORK RESOURCES

1. Black's Law Dictionary, 11th edition, 2019, Available at: <https://thelawdictionary.org/>
2. Burne, K., Tokens of Appreciation?: The Benefits of Digitizing Assets Using Blockchain, 2020, Available at: <https://www.bnymellon.com/us/en/insights/aerial-view-magazine/tokens-of-appreciation>;
3. Buterin, V., A next-generation smart contract and decentralized application platform, White paper, Available at: https://blockchainlab.com/pdf/Ethereum_white_paper_next_generation_smart_contract_and_decentralized_application_platform-vitalik-buterin.pdf

4. Cohen, R., Global Bitcoin Computing Power Now 256 Times Faster than Top 500 Supercomputers Combined, *FORBES* (2013), <https://www.forbes.com/sites/reuvencohen/2013/11/28/global-bitcoin-computing-power-now-256-times-faster-than-top-500-supercomputers-combined/>;
5. Deep Shift, Technology Tipping Points and Societal Impact, World Economic Forum, Survey Report, 2015, Available at: chrome-extension://efaidnbmnnnibpcajpcgglefindmkaj/https://www3.weforum.org/docs/WEF_GAC15_Technological_Tipping_Points_report_2015.pdf
6. Digital Assets: Crypto currencies vs. Tokens, Cryptopedia, Available at: <https://www.gemini.com/cryptopedia/cryptocurrencies-vs-tokens-difference>
7. Griffith, E., Why an Animated Flying Cat with a Pop-Tart Body Sold for Almost \$600,000, 2021, Available at: <https://www.nytimes.com/2021/02/22/business/nft-nba-top-shot-crypto.html>
8. Hackl, C., Five Things Brands Need to Know About NFTs (Non-Fungible Tokens), *FORBES* (Mar. 4, 2021), <https://www.forbes.com/sites/cathyhackl/2021/03/04/four-things-brands-need-to-know-about-nfts-non-fungible-tokens/?sh=5f86139e222f>
9. *How Blockchain is Making Car Ownership Easier*, VINCHAIN, Available at: <https://vinchain.io/blog/how-blockchain-is-making-car-ownership-easier/296>
10. Howcroft, E., Twitter Boss Jack Dorsey's First Tweet Sold for \$2.9 Million as an NFT, 2021, Available at: <https://www.reuters.com/article/us-twitter-dorsey-nft/twitter-boss-jack-dorseys-first-tweet-sold-for-2-9-million-as-an-nft-idUSKBN2BE2KJ>
11. <https://ethereum.org/en/developers/docs/standards/tokens/erc-721/>
12. <https://hjp.znanje.hr/>
13. Laurent, P. et al., The Tokenization of Assets Is Disrupting the Financial Industry. Are You Ready?, 2018, https://www2.deloitte.com/content/dam/Deloitte/cz/Documents/financial-services/Deloitte_Inside_19_CIO_Edition_Nov_2018.pdf
14. Limer, E., The World's Most Powerful Computer Network Is Being Wasted on Bitcoin, *GIZMODO* (2013), <http://gizmodo.com/the-worlds-most-powerful-computernetwork-is-being-was-504503726>
15. Lund, J. et al., The Digitization of Real-World Assets into Tokens on Blockchain, 2018, Available at: <https://www.ibm.com/thought-leadership/institute-business-value/report/tokenassets>
16. Nakamoto, S., Bitcoin: A Peer-to-Peer Electronic Cash System, 2008, <https://bitcoin.org/en/bitcoin-paper>
17. Reyburn, S., JPG File Sells for \$69 Million, as “NFT Mania” Gathers Pace, *NY TIMES* (Mar. 25, 2021), <https://www.nytimes.com/2021/03/11/arts/design/nft-auction-christies-beeple.html>

18. Roose, K., Buy This Column on the Blockchain!, 2021, Available at:
<https://www.nytimes.com/2021/03/24/technology/nft-column-blockchain.html>
19. Shein, E., How Blockchain Changes the Nature of Trust,
<https://linuxfoundation.org/blog/how-blockchain-changes-the-nature-of-trust/>
20. Thompson, C., The Untold Story of the NFT Boom, 2021, Available at:
<https://www.nytimes.com/2021/05/12/magazine/nft-art-crypto.html>
21. Tokenization: Opening Illiquid Assets to Investors, 2019, Available at:
<https://www.bnymellon.com/emea/en/insights/all-insights/tokenization-opening-illiquid-assets-to-investors.html>;
22. Tripathi, A., NFTs Can Bring the Real World On-Chain, Available at:
<https://www.coindesk.com/business/2021/03/17/nfts-can-bring-the-realworld-on-chain/>
23. Williams, C., Cult Digital Artist Beeple Raises Record \$3.5 Million in NFT Auction, CRYPTO BRIEFING (Dec. 14, 2020),
<https://cryptobriefing.com/digital-art-auction-raises-record-million/>