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# Blockchain Technology and Decentralized Finance: Theory and Practice in Cryptocurrency Creation

**Summary:** *Blockchain technology represents a revolutionary concept in the field of digital economy, enabling security, transparency, and decentralization of data and transactions. This paper explores the fundamental principles of blockchain technology, the role of cryptocurrencies, and the development of decentralized finance (DeFi). It analyzes key differences between centralized and decentralized exchanges, as well as the significance of DeFi applications in the modern financial ecosystem. Additionally, through a case study, the paper presents the process of creating a new cryptocurrency—ELAB—including the implementation of a smart contract on the Binance Smart Chain network and token distribution. The main goal of the paper is to provide both theoretical and practical insights into the fundamental concepts of blockchain and its application in real-world systems. The study's results demonstrate how cryptocurrencies can be utilized in various contexts, including the educational system, where gamification through digital tokens can enhance student engagement.*

**Keywords:** *blockchain, cryptocurrencies, decentralized finance*

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## INTRODUCTION

Blockchain technology is one of the key innovations in the modern digital world, enabling security, decentralization, and transparency of data and transactions (Bogdanović et al., 2019). Structurally, blockchain is a distributed ledger that records transactions in linked blocks, ensuring resistance to forgery and censorship (Barney et al., n.d.). Its applications extend far beyond financial transactions, including healthcare, education, cybersecurity, and the entertainment industry.

A particularly significant application of blockchain is in the development of cryptocurrencies, digital assets that facilitate peer-to-peer transactions without intermediaries (Pernice & Scott, 2021). Cryptocurrencies such as *Bitcoin* and *Ethereum* form the foundation of the crypto economy, while new concepts like *StableCoins* and decentralized finance (*DeFi*) are redefining traditional financial models (Milutinović, 2018). DeFi allows users to access financial services such as lending, trading, and saving without intermediaries like banks or other centralized institutions, using blockchain-based decentralized applications (*dApps*) (Jensen et al., 2021; Johnson, 2021).

In addition to providing a theoretical overview of key blockchain and cryptocurrency concepts, this paper focuses on the practical aspect by presenting the creation of a new cryptocurrency—ELAB. Using *Binance Smart Chain* as a case study, it details the implementation of a smart contract, token creation, and distribution process. Furthermore, the potential application of such solutions in education is explored through the introduction of a blockchain-based reward system.

The following sections first review the literature and fundamental principles of blockchain technology and cryptocurrencies. Then, decentralized finance and its applications are discussed, followed by a case study on the creation and distribution of the ELAB cryptocurrency. Finally, the paper explores future possibilities for blockchain technology in education and other sectors.

## BLOCKCHAIN TECHNOLOGY

Blockchain can be defined as a digital *ledger* that records all transactions occurring within a network of computers, ensuring transparency, security, and immutability of recorded data (Bogdanović et al., 2019; Nofer et al., 2017). The term *blockchain* comes from the way transactions are stored in a network—blocks. Each individual block in the chain contains transactions, and whenever a new transaction occurs on the blockchain, it is recorded in the ledger of every participant. A database managed by multiple participants is called a decentralized database or *distributed ledger technology* (*DLT*) (Barney et al., n.d.) (Liu et al., 2020).

Blockchain technology provides a solution to the issues of centralized systems, which allow the most powerful users to control publicly visible information, thereby limiting

the system while other users make decisions solely based on available data (Bogdanović et al., 2019). If someone wanted to compromise a blockchain system, they would need to alter every block in the chain across all distributed versions of the ledger. To carry out such an attack, a hacker would need to control 51% of the entire chain, which is extremely difficult in well-developed blockchain networks (Ye et al., 2018).

There are two main types of blockchain networks—private and public (Bogdanović et al., 2019; Wegrzyn & Wang, 2021). Public or "permissionless" blockchains allow anyone to participate in financial transactions without requiring identification (Guegan, 2017). Public blockchains usually have a native cryptocurrency, and consensus is often achieved through economic incentives and the implementation of *Proof-of-Work* (*PoW*) (Montevirgen, 2022; Sriman et al., 2021).

On the other hand, private or "permissioned" blockchains require participant identity verification (Guegan, 2017; Hao et al., 2018; Wegrzyn & Wang, 2021). In private blockchains, interactions between a group of participants with a shared goal—but without complete trust in each other—can still be secured (e.g., transactions involving the exchange of goods, information, or assets). Blockchain technology has various applications, including the music industry, healthcare, education, cybersecurity, and many others (Hao et al., 2018; Wegrzyn & Wang, 2021).

## TOKENS AND CRYPTOCURRENCIES

Blockchain tokens are digital entities that facilitate ownership, transfer, and management of various assets, rights, or values within decentralized networks. (Bogdanović et al., 2019). These tokens operate based on distributed ledger technology (DLT) principles and can be used for a wide range of applications, including digital currencies, ownership instruments, access keys, and system rewards (Schwiderowski et al., n.d.).

There are several key categories of blockchain tokens (Oliveira et al., 2018):

- *Payment tokens* are used as digital money and enable direct peer-to-peer transactions without intermediaries, with Bitcoin and Ethereum being the most well-known examples.
- *Utility* tokens provide access to specific services or functionalities on blockchain platforms.
- *Asset* tokens represent digitalized forms of real-world assets, such as stocks, real estate, or artworks. This classification helps in understanding the different roles of tokens in the digital economy and enables regulatory bodies to apply appropriate legal frameworks.

One of the main challenges in the token economy is interoperability between different blockchain networks, which can affect token usability and value. While private

blockchain networks offer greater control over interaction and transaction rules, public blockchain systems provide higher transparency and decentralization but also present regulatory and scalability challenges (Sunyaev et al., 2021).

Payment tokens can be categorized as either native or tokenized (Oliveira et al., 2018; Schwiderowski et al., n.d.):

- Native tokens are the fundamental tokens of a blockchain network, serving as its primary medium of exchange and payment. They are directly linked to the blockchain on which they operate. *Bitcoin* (BTC) is the first and most well-known example of a native token, designed exclusively as a digital currency that enables *peer-to-peer* transactions without the need for centralized authorities. Similarly, *Ether* (ETH), while primarily used to execute smart contracts on the *Ethereum* network, also functions as a payment token to cover transaction fees (*gas fees*).
- Tokenized payment tokens are tokens created on existing blockchain networks using standardized protocols such as ERC-20 (*Ethereum*) or BEP-20 (*Binance Smart Chain*). These tokens do not have their own blockchain but instead utilize the infrastructure of existing networks to facilitate transactions. Examples include USDT (*Tether*) and USDC (*USD Coin*), which are *StableCoins* pegged to the value of traditional fiat currencies to reduce volatility.

The development of tokenized ecosystems creates opportunities for entirely new business models, including decentralized finance (DeFi), where tokens allow users to lend, invest, and insure assets without the need for traditional banking institutions. Additionally, the growing adoption of *non-fungible* tokens (NFTs) demonstrates how blockchain can transform the art and creative industries by enabling the creation of digital proof of ownership that is immutable and verifiable within blockchain networks (Schwiderowski et al., n.d.).

## Cryptocurrencies

Cryptocurrencies are digital or virtual forms of currency that use cryptography to secure payments and eliminate the need for intermediaries in transactions (Milutinović, 2018). These currencies can be obtained through *mining* on a blockchain network or by purchasing them on crypto exchanges. They rely on various encryption methods, such as public-private key pairs and *hash* functions (Pernice & Scott, 2021). Although cryptocurrencies like *Bitcoin* are rarely used for everyday purchases, they have gained popularity as financial instruments due to their increasing value and the ability to transfer funds across borders (Burniske & Tatar, 2018).

The blockchain infrastructure is responsible for the *Bitcoin* revolution (Tapscott & Kaplan, 2019). *Bitcoin* is a cryptocurrency that ensures security and trust through verification and validation programs for transactions (Lewis, 2018). Because blockchain networks

operate independently of any centralized institution, *Bitcoin* is not controlled by traditional central payment systems or banking authorities (Lewis, 2018; Pernice & Scott, 2021).

Leading blockchain technologies of major cryptocurrencies and their networks, such as *Bitcoin*, *Ethereum*, and *Binance*, continue to grow. As their adoption increases, new blocks are added to the chain, significantly enhancing the security of transaction records (Burniske & Tatar, 2018). As a cryptocurrency, *Bitcoin* uses decentralized cryptographic tools and a *peer-to-peer* system to allow users to transfer money without relying on centralized trusted entities like payment processors or banks (Lewis, 2018; Nakamoto, n.d.). On the other hand, *Ethereum*, as a platform for smart contracts, and its native cryptocurrency *Ether* (*ETH*), enables users not only to transfer money but also to develop and execute decentralized applications (*dApps*) without relying on centralized intermediaries such as traditional servers or financial institutions (Arslanian, 2022; Tikhomirov, 2018). Additionally, the *Binance* blockchain ecosystem and its cryptocurrency *Binance Coin* (BNB) utilize both decentralized and centralized infrastructures to facilitate value transfers, trading, and interaction with the *Binance Smart Chain* network. This provides users with options for transactions, payments, and launching decentralized applications, while also offering additional liquidity and services through the centralized *Binance* exchange (Cernera et al., n.d.; Kaur, 2023; Nugroho & Setiawan, 2023).

As of September 2024, the cryptocurrency market is in a stabilization phase. The total market capitalization of cryptocurrencies amounts to $2.2 trillion, according to https://coinmarketcap.com/.

Most popular cryptocurrencies have their own blockchain and native currency, such as *Bitcoin*, *Ethereum*, *BNB*, *XRP*, and *Solana*. In addition to these, there are also cryptocurrencies classified as *StableCoins*, such as *Tether* (*USDT*) and *USD Coin* (*USDC*). A *StableCoin* is a type of cryptocurrency that is usually pegged to a specific fiat currency, such as the US dollar, euro, or yen (Sidorenko, 2019). There are also special cases of *StableCoins* backed by gold or other cryptocurrencies, although they are less commonly used.

## DECENTRALIZED EXCHANGES AND DECENTRALIZED FINANCE

Crypto exchanges base their business on facilitating the buying and selling of cryptocurrencies while charging a transaction fee (Brasse & Hyun, 2023; Johnson, 2021). Larger exchanges also offer savings options, similar to traditional banking systems. In such systems, users receive interest on their savings, often at higher rates than those offered by traditional banks (Wembo, 2025).

The cryptocurrency market is highly dynamic and subject to significant changes due to its relatively short history. However, new laws and regulations help mitigate risks and fluctuations. Major crypto exchanges in the United States operate under the supervision of government agencies (Johnson, 2021).

*Centralized exchanges* (*CEX*) are organizations that coordinate large-scale cryptocurrency trading using a business model similar to traditional exchanges (George, 2023).

In contrast, *decentralized exchanges* (*DEX*) operate without central authority, but they remain less common than their centralized counterparts, which still account for approximately 90% of all crypto exchanges (George, 2023).

The largest exchange by transaction volume is *Binance*, processing around $20 billion in daily transactions (Brasse & Hyun, 2023). *Binance* operates as a centralized exchange but has also launched a decentralized division. It has its own cryptocurrency, *Binance Coin* (BNB), and a proprietary blockchain, *Binance Smart Chain* (BSC) (Kaur, 2023; Nugroho & Setiawan, 2023). By developing its own blockchain, *Binance* has actively entered the decentralized exchange market (Lehar & Parlour, 2021).

Originally, *Binance Coin* (BNB) was based on the *Ethereum* blockchain, following the *ERC-20* token standard (*ERC-20 Token Standard*, n.d.). It later became the native token of the *Binance* Chain. *BNB* was launched in July 2017, with an initial supply of 200 million tokens (Kaur, 2023).

Currently, *BNB* is the sixth-largest cryptocurrency by market capitalization, valued at approximately $91.7 billion (*Cryptocurrency Prices, Charts And Market Capitalizations | CoinMarketCap*, n.d.). *Binance's* growth has played a significant role in BNB's success.

*Binance DEX* is a decentralized exchange that aims to bring key features of the *Binance* platform into a decentralized environment, offering security and other *DEX* advantages (Asef et al., 2024). *Binance Chain* is the foundation of this exchange, with a primary focus on fast and efficient asset exchange management. Binance DEX enables the receiving and sending of Binance Coin (BNB) between different addresses (Asef et al., 2024; Brasse & Hyun, 2023; Cernera et al., n.d.). BNB has been converted into the native coin of the *Binance Chain*, increasing its use for fees and transactions (Kaur, 2023).

*Decentralized Finance (DeFi)* is a movement that promotes financial services such as lending and trading without centralized intermediaries (Jensen et al., 2021). These services are enabled through decentralized applications (dApps), most of which are built on the *Ethereum* platform. DeFi encompasses banking, bonds, money markets, and insurance, replicating traditional financial systems within decentralized networks (Jensen et al., 2021).

Key Categories of DeFi (Jensen et al., 2021):

1. *Decentralized Exchanges (DEX)*
   These platforms allow users to exchange cryptocurrencies without the involvement of any centralized third party, while also enabling them to retain full control over their digital assets. By not storing funds on centralized exchanges, users avoid the need to trust the solvency of those platforms.
2. *DeFi Lending and Borrowing*
   This type of lending allows users to deposit their own digital assets as collateral, in exchange for which they can obtain an appropriate loan. Digital assets can also serve as a means of saving, allowing users to participate in the lending market and earn interest on their deposits. This lending and borrowing system completely

eliminates the need for credit rating checks, creditworthiness assessments, or even bank accounts.

3. *Decentralized Stablecoins*
   A concept that addresses trust issues. *Stablecoins* are created using over-collateralization methods, recorded in decentralized ledgers, and managed by decentralized autonomous entities. The reserves of *StableCoins* are fully transparent and publicly available for verification.

In addition to these crucial factors, many others contribute to the growth of the decentralized sector, including payments, financial management, insurance or funds, derivatives, and various other elements (CoinGecko et al., 2021; Lau et al., 2021).

The sector of decentralized applications and organizations is showing a growth trend. Following the last recession, corrective and stabilization measures were implemented across the entire DeFi market, which currently has a capitalization of approximately $100.6 billion (*Total DeFi Market Cap Chart — TradingView*, n.d.).

The DeFi sector is continuously evolving, emphasizing accessibility and ease of creation, which attracts a significant number of new investors. Among the many functionalities this sector offers are (CoinGecko et al., 2021; Lau et al., 2021):

- Wallets – **Argent** provides a dramatically superior user-focused crypto wallet with state-of-the-art security, seamless local integration with DeFi decentralized applications such as *Compound* and others, as well as options that do not require *seed* keys.
- DeFi Portfolio Management – **Zapper** efficiently abstracts complex processes and steps involved in managing DeFi portfolios, applications, and products. Additionally, it enables users to easily access various financial assets within a single platform, significantly saving time and effort.
- Automated Transactions – **Gelato Finance** has introduced a mechanism known as an event-driven crypto transaction reactor. This tool allows users to define specific activities that will be executed automatically when certain conditions are met, such as "Buy Ether when the price reaches $200" or "Send cryptocurrency to Alice on her birthday."
- Insurance – **Nexus Mutual** serves as an example of guarantee and protection mechanisms. The platform allows users to secure their digital assets, functioning on a community-based model where members can invest in insurance and collectively decide on payouts covering potential incidents.

Given the expansion of this sector, proper regulations and easier user access are essential to ensure its continued growth (Bogdanović et al., 2019; Brasse & Hyun, 2023; Johnson, 2021).

## CASE STUDY - ELAB CRYPTOCURRENCY

The case study presented in the following section demonstrates the process of creating a cryptocurrency. When developing a cryptocurrency, it is necessary to write, develop, and test a smart contract on a blockchain network. Every transaction, including testing, requires the use of cryptocurrency in a specific amount. However, for testing purposes, a test network and test tokens provided by each blockchain network are used (Bogdanović et al., 2019; Gururaj et al., 2020; Nofer et al., 2017). These test tokens are obtained through *faucets* (*What Is a Crypto Faucet? | Coinbase*, n.d.).

Initially, it is necessary to create a digital wallet, which enables cryptocurrency transactions and storage, as well as the creation of a new cryptocurrency. A wallet can be either software-based or hardware-based and serves to store information about the owner's private blockchain keys, execute transactions on a blockchain network, and store information about the owner's cryptocurrencies (Mackay, 2019). For the purpose of this case study, a software cryptocurrency wallet—*Metamask*—was used.

The case study was implemented on the *Binance Smart Chain TestNet* blockchain network. Every major blockchain network has its own test version, which allows for testing decentralized applications without the need to spend real cryptocurrency assets. Migrating from a test network to a live network requires only a few additional steps in a standardized procedure.

The *Binance Smart Chain* network is based on the *Ethereum* blockchain, meaning that the *Solidity* programming language is used to create the smart contract, i.e., the cryptocurrency (koinmilyoner, 2023).

The process of creating a smart contract is illustrated in Figure 1.

```
contract ERC20 is Context, IERC20, IERC20Metadata {
    mapping(address => uint256) private _balances;
    mapping(address => mapping(address => uint256)) private _allowances;

    uint256 private _totalSupply;

    string private _name;
    string private _symbol;

    constructor(string memory name_, string memory symbol_) {
        _name = name_;
        _symbol = symbol_;
}
}
```

**Figure 1:** Smart Contract Creation

The provided code segment creates an ERC20 smart contract that defines the rules for token creation. The *_balances* mapping stores data on each user's balance, indicating how many tokens each address (user) owns. The *_allowances* mapping keeps track of how many tokens one address (user) is allowed to spend on behalf of another address (user). The *_totalSupply* variable specifies the total amount of tokens issued within the system.

The *_name* and *_symbol* variables store the token's name and symbol, which are used to identify the token in the market.

The constructor is called when the contract is deployed on the blockchain network. It takes two parameters for token identification and initializes them with specific values.

After creating the contract, functions are programmed to provide specific functionalities within the system. Figure 2 shows a function that retrieves the balance, i.e., the account status, of a specific user.

```
function balanceOf(address account) public view virtual override
returns (uint256) {
return _balances[account];
}
```

**Figure 2:** Current Account Balance

```
function transfer(address to, uint256 amount) public virtual override
returns (bool) {
address owner = _msgSender();
_transfer(owner, to, amount);
return true;
```

**Figure 3:** Fund Transfer

```
function _transfer(
    address from,
    address to,
    uint256 amount
) internal virtual {
    require(from != address(0), "ERC20: transfer from the zero address");
    require(to != address(0), "ERC20: transfer to the zero address");

    _beforeTokenTransfer(from, to, amount);

    uint256 fromBalance = _balances[from];
    require(fromBalance >= amount, "ERC20: transfer amount exceeds balance");
    unchecked {
        _balances[from] = fromBalance - amount;
    }
    _balances[to] += amount;
    emit Transfer(from, to, amount);

    _afterTokenTransfer(from, to, amount);
}
```

**Figure 4:** Implementation of the Fund Transfer Function

Figure 3 represents a function that allows a specific address (*owner*) to send a certain amount of cryptocurrency (*amount*) to another address (*to*). The condition for successfully executing this function is that the amount of cryptocurrency being sent must be non-negative.

The *_transfer* function shown in Figure 4 contains the logic behind transferring funds from one address to another. The function verifies that sending to or from the null address is not allowed, as it may lead to fund loss, and it triggers the *_beforeTokenTransfer* function, which contains code segments for validation and transaction tracking before the actual transfer. The function then checks whether the sender has enough tokens, deducts the transferred amount from the sender's balance, and increases the recipient's balance by the same amount. Finally, the function calls *_afterTokenTransfer*, which may also contain logic for tracking transactions or gathering transaction statistics.

```
contract Token is ERC20 {

constructor () public ERC20("ELAB", "ELAB") {
    _mint(msg.sender, 1000000000 * (10 ** uint256(decimals())));
}

}
```

**Figure 5:** ERC20 Contract

A specific instance of the ERC20 contract used to create the Elab cryptocurrency with an issuance of one billion units is shown in Figure 5. After completing the coding phase, *deployment* is required to release the newly created cryptocurrency into circulation (Figure 6). Deploying the cryptocurrency and making it available for use requires paying blockchain network fees (Figure 7).

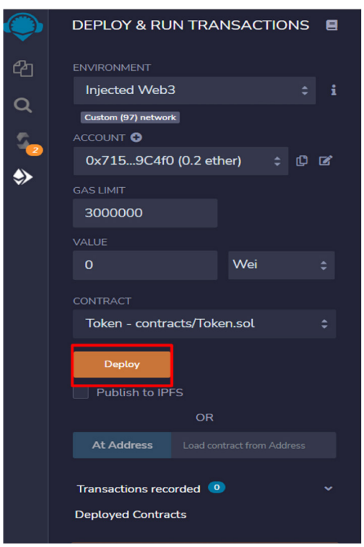


**Figure 6:** Cryptocurrency Deployment

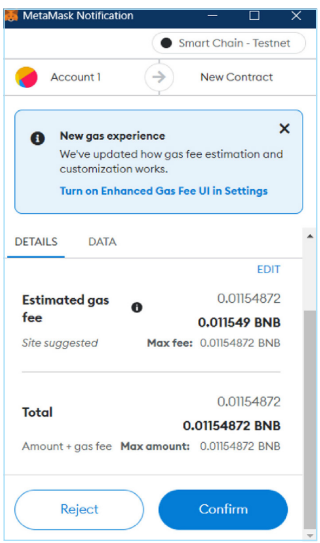


**Figure 7:** Fees for Creating and Deploying the Cryptocurrency

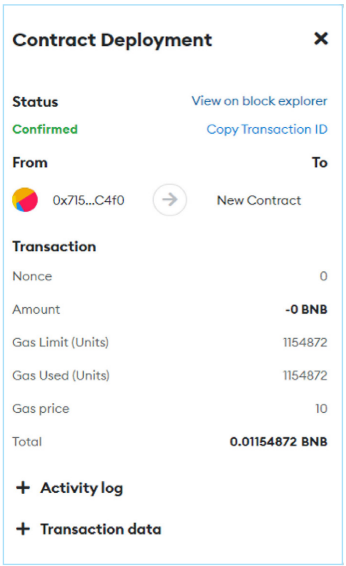


**Figure 8:** Successful Smart Contract Deployment

After successfully paying the required fees, we receive a confirmation message indicating the successful deployment of our smart contract (Figure 8).

## DISCUSSION

The process of creating the ELAB cryptocurrency in this research demonstrates how blockchain technology can enable the development of customized digital tokens with specific functionalities. Using smart contracts on the Binance Smart Chain network allows for efficient and transparent management of token distribution, while digital wallets like MetaMask provide an easy way to store and use them. This process highlights that cryptocurrency creation is not limited to global financial institutions but can also be applied in specialized sectors such as education, financial instruments, and digital identities.

The distribution of cryptocurrency is based on a simple principle, considering that a specific number of created ELAB tokens is initialized to the primary address. All that is needed for distribution are the recipient addresses to which specific amounts of the token should be sent.

The potential use of ELAB tokens remains open for further discussion. One proposed application scenario is in the education system, where tokens could serve as a tool for gamifying the learning process. Students could use the ELAB cryptocurrency as a reward system for academic achievements or as a means of validating participation in courses and projects. Such a model could enhance student engagement and increase the transparency of assessment and certification processes.

However, questions regarding the further development and integration of such systems arise. Could these tokens hold value beyond the internal ecosystem, and would regulatory frameworks recognize them as legitimate means of exchange? Additionally, how can the long-term sustainability of tokens be ensured, preventing speculation and potential regulatory hurdles? Further research is needed to test the stability, acceptance, and security of such models in real-world applications.

## CONCLUSION

This study explored the fundamental concepts of blockchain technology, cryptocurrencies, and decentralized finance, with a particular focus on the process of creating and distributing customized tokens. Through a detailed literature analysis and the ELAB cryptocurrency case study, the research demonstrated the practical application of smart contracts and decentralized technologies in the development of digital assets.

The main contribution of this work lies in connecting theoretical foundations with a practical experiment in cryptocurrency creation, providing insights into the possibilities that blockchain offers beyond traditional financial flows. The case study highlights the potential application of tokens in education, enabling greater transparency and efficiency in evaluation through decentralized reward systems.

The obtained results open up numerous new questions and directions for future research. Further work could include analyzing the regulatory aspects of token creation, testing tokenization models in various sectors, and exploring the long-term sustainability of such systems. Blockchain technology continues to evolve, offering new opportunities for the digitalization of financial and non-financial resources, and such experiments contribute to a better understanding and adaptation of this innovative approach across different domains.

## References

Arslanian, H. (2022). Ethereum. *The Book of Crypto*, 91–98. https://doi.org/10.1007/978-3-030-97951-5_3

Asef, M. A., Mojtaba, S., & Bamakan, H. (2024). *From x*y=k to Uniswap Hooks: A Comparative Review of Decentralized Exchanges (DEX)*. https://arxiv.org/abs/2410.10162v2

Barney, N., Troy, S., & Pratt K., M. (n.d.). *What is distributed ledger technology (DLT)? | Definition from TechTarget*. Retrieved February 11, 2025, from https://www.techtarget.com/searchcio/definition/distributed-ledger

Bogdanović, Z., Radenković, B., Despotović-Zrakić, M., Barać, D., Labus, A., & Naumović, T. (2019). BLOKCHAIN TECHNOLOGIES: CURRENT STATE AND PERPECTIVES. *Zbornik Radova Međunarodne Naučne Konferencije o Digitalnoj Ekonomiji DIEC*, *2*(2), 1–12.

Brasse, A., & Hyun, S. (2023). Cryptocurrency exchanges and the future of cryptoassets. *The Emerald Handbook on Cryptoassets: Investment Opportunities and Challenges*, 341–353. https://doi.org/10.1108/978-1-80455-320-620221022/FULL/XML

Burniske, C., & Tatar, J. (2018). *Cryptoassets : the innovative investor's guide to bitcoin and beyond*. 325. https://www.oreilly.com/library/view/cryptoassets-the-innovative/9781260026689/

Cernera, F., Morgia, L., Mei, A., & Sassi, F. (n.d.). *Token Spammers, Rug Pulls, and Sniper Bots: An Analysis of the Ecosystem of Tokens in Ethereum and in the Binance Smart Chain (BNB)*.

CoinGecko, Lucius Fang, Erina Azmi, Banjamin Hor, & Khor Win Win. (2021). *How to DeFi: Advanced*. CoinGecko. https://books.google.rs/books/about/How_to_DeFi_Advanced.html?id=Ivo2EAAAQBAJ&redir_esc=y

*Cryptocurrency Prices, Charts And Market Capitalizations | CoinMarketCap*. (n.d.). Retrieved February 11, 2025, from https://coinmarketcap.com/

*ERC-20 Token Standard*. (n.d.). Retrieved February 11, 2025, from https://ethereum.org/sr/developers/docs/standards/tokens/erc-20/

George, B. (2023). *What Is a CEX? Centralized Exchanges Explained*. https://www.coindesk.com/learn/what-is-a-cex-centralized-exchanges-explained

Guegan, D. (2017). *Public Blockchain versus Private blockhain*. https://shs.hal.science/halshs-01524440

Gururaj, H. L., Manoj Athreya, A., Kumar, A. A., Holla, A. M., Nagarajath, S. M., & Ravi Kumar, V. (2020). BLOCKCHAIN. *Cryptocurrencies and Blockchain Technology Applications*, 1–24. https://doi.org/10.1002/9781119621201.CH1

Hao, Y., Li, Y., Dong, X., Fang, L., & Chen, P. (2018). Performance Analysis of Consensus Algorithm in Private Blockchain. *IEEE Intelligent Vehicles Symposium, Proceedings*, *2018-June*, 280–285. https://doi.org/10.1109/IVS.2018.8500557

Jensen, J. R., von Wachter, V., & Ross, O. (2021). An Introduction to Decentralized Finance (DeFi). *Complex Systems Informatics and Modeling Quarterly*, *0*(26), 46–54. https://doi.org/10.7250/CSIMQ.2021-26.03

Johnson, K. (2021). Decentralized Finance: Regulating Cryptocurrency Exchanges. *William & Mary Law Review*, *62*(6). https://scholarship.law.wm.edu/wmlr/vol62/iss6/4

Kaur, G. (2023, April). *What is Binance Coin (BNB) and how does it work?* https://cointelegraph.com/learn/articles/what-is-binance-coin-bnb-and-how-does-it-work

koinmilyoner. (2023, February). *Binance Smart Contract Development — A Step by Step Guide | koinmilyoner on Binance Square*. https://www.binance.com/en/square/post/249110

Lau, D., Lau, D., Sze Jin, T., Kjo, K., Azmi, E., Fang, L., Hor, B., & Win Win, K. (2021). *How to DeFi: Beginner*. CoinGecko. https://books.google.rs/books/about/How_to_DeFi_Beginner.html?id=43okEAAAQBAJ&redir_esc=y

Lehar, A., & Parlour, C. A. (2021). Decentralized Exchanges. *UWA BlockChain and Crypto Conference*.

Lewis, A. (2018). *The Basics of Bitcoins and Blockchains*. Mango Publishing Group. https://bitsonblocks.net/wp-content/uploads/2018/07/the-basics-contents-draft.pdf

Liu, X., Farahani, B., & Firouzi, F. (2020). Distributed Ledger Technology. *Intelligent Internet of Things: From Device to Fog and Cloud*, 393–431. https://doi.org/10.1007/978-3-030-30367-9_8

Mackay, B. (2019). *Evaluation of Security in Hardware and Software Cryptocurrency Wallets* (Issue January) [Edinburgh Napier University]. https://www.researchgate.net/publication/338054399

Milutinović, M. (2018). CRYPTOCURRENCY. *Економика - Часопис За Економску Теорију и Праксу и Друштвена Питања*, *1*, 105–122.

Montevirgen, K. (2022). *What Is Proof of Work in Blockchain Verification? | Britannica Money*. https://www.britannica.com/money/proof-of-work-blockchain-verification

Nakamoto, S. (n.d.). *Bitcoin Whitepaper | Wielfried Zouantcha*. Retrieved February 11, 2025, from https://www.zouantcha.com/blog/bitcoin-whitepaper

Nofer, M., Gomber, P., Hinz, O., & Schiereck, D. (2017). Blockchain. *Business and Information Systems Engineering*, *59*(3), 183–187. https://doi.org/10.1007/S12599-017-0467-3/METRICS

Nugroho, D. A., & Setiawan, R. (2023). FACTORS FOR CHANGES IN TRADING VOLUME, CHANGES IN MARKET CAPITALIZATION, AND CHANGES IN CIRCULATING SUPPLY TO BINANCE COIN (BNB) RETURNS. *Jurnal Ekonomi*, *12*(02), 1056–1065. https://www.ejournal.seaninstitute.or.id/index.php/Ekonomi/article/view/1841

Oliveira, L. ;, Zavolokina, L. ;, Bauer, I. ;, Schwabe, G., Oliveira, L., Zavolokina, L., & Bauer, I. (2018). *To Token or not to Token: Tools for Understanding Blockchain Tokens*. https://doi.org/10.5167/uzh-157908

Pernice, I. G. A., & Scott, B. (2021). Cryptocurrency. *Internet Policy Review*, *10*(2). https://doi.org/10.14763/2021.2.1561

Schwiderowski, J., Pedersen, A. B., & Beck, R. (n.d.). *Crypto Tokens and Token Systems*.

Sidorenko, E. L. (2019). Stablecoin as a New Financial Instrument. *International Scientific Conference "Digital Transformation of the Economy: Challenges, Trends, New Opportunities*, *84*, 630–638. https://link.springer.com/chapter/10.1007/978-3-030-27015-5_75

Sriman, B., Ganesh Kumar, S., & Shamili, P. (2021). Blockchain Technology: Consensus Protocol Proof of Work and Proof of Stake. *Advances in Intelligent Systems and Computing*, *1172*, 395–406. https://doi.org/10.1007/978-981-15-5566-4_34

Sunyaev, A., Kannengießer, N., Beck, R., Treiblmaier, H., Lacity, M., Kranz, J., Fridgen, G., Spankowski, U., & Luckow, A. (2021). Token Economy. *Business and Information Systems Engineering*, *63*(4), 457–478. https://doi.org/10.1007/S12599-021-00684-1/TABLES/5

Tapscott, D., & Kaplan, A. (2019). *Blockchain Revolution in Education and LifeLong Learning: Preparing for Disruption, Leading the Transformation*. https://cognizium.io/uploads/resources/Blockchain Research institute - Blockchain revolution in Education And Lifelong Learning - 2019 - Apr.pdf

Tikhomirov, S. (2018). Ethereum: State of Knowledge and Research Perspectives. *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), 10723 LNCS*, 206–221. https://doi.org/10.1007/978-3-319-75650-9_14

*Total DeFi Market Cap Chart — TradingView*. (n.d.). Retrieved February 11, 2025, from https://www.tradingview.com/symbols/TOTALDEFI/

Wegrzyn, K. E., & Wang, E. (2021, August). *Types of Blockchain: Public, Private, or Something Else*. Foley & Lardner LLP. https://www.foley.com/insights/publications/2021/08/types-of-blockchain-public-private-between/

Wembo, J. (2025). *Crypto vs. Traditional Banking — Who Holds the Key to Your Wealth?* . https://joelotepawembo.medium.com/crypto-vs-traditional-banking-who-holds-the-key-to-your-wealth-a09c231fe788

*What is a crypto faucet? | Coinbase*. (n.d.). Retrieved February 11, 2025, from https://www.coinbase.com/learn/crypto-glossary/what-is-a-crypto-faucet

Ye, C., Li, G., Cai, H., Gu, Y., & Fukuda, A. (2018). Analysis of security in blockchain: Case study in 51%-attack detecting. *Proceedings - 2018 5th International Conference on Dependable Systems and Their Applications, DSA 2018*, 15–24. https://doi.org/10.1109/DSA.2018.00015

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# Blokčejn tehnologija i decentralizovane finansije: Teorija i praksa u kreiranju kriptovalute

**Rezime:** *Blokčejn tehnologija predstavlja revolucionarni koncept u oblasti digitalne ekonomije, omogućavajući sigurnost, transparentnost i decentralizaciju podataka i transakcija. Ovaj rad istražuje osnovne principe blokčejn tehnologije, ulogu kriptovaluta i razvoj decentralizovanih finansija (DeFi). Analiziraju se ključne razlike između centralizovanih i decentralizovanih menjačnica, kao i značaj DeFi aplikacija u savremenom finansijskom ekosistemu. Takođe, kroz studijski primer prikazuje se proces kreiranja nove kriptovalute - ELAB, uključujući implementaciju pametnog ugovora na Binance Smart Chain mreži i distribuciju tokena. Glavni cilj rada je da pruži teorijski i praktični uvid u fundamentalne koncepte blokčejna i njegovu primenu u realnim sistemima. Rezultati rada pokazuju kako se kriptovalute mogu koristiti u različitim kontekstima, uključujući obrazovni sistem, gde gejmifikacija putem digitalnih tokena može doprineti povećanju angažovanosti studenata.*

**Ključne reči:** *blokčejn, kripto valute, decentralizovane finansije*

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## UVOD

Blokčejn tehnologija predstavlja jednu od ključnih inovacija u savremenom digitalnom svetu, omogućavajući sigurnost, decentralizaciju i transparentnost podataka i transakcija (Bogdanović et al., 2019). Po svojoj strukturi, blokčejn je distribuirana knjiga (ledger) koja beleži transakcije u povezanim blokovima, obezbeđujući imunitet na falsifikovanje i cenzuru (Barney et al., n.d.). Njegova primena seže daleko van granica finansijskih transakcija, uključujući oblasti zdravstva, obrazovanja, sajber bezbednosti i industrije zabave.

Posebno značajnu primenu blokčejn ima u razvoju kriptovaluta, digitalnih sredstava koja omogućavaju peer-to-peer transakcije bez posrednika (Pernice & Scott, 2021). Kriptovalute poput Bitkoina (eng. *Bitcoin*) i Eterijuma (eng. *Ethereum*) predstavljaju osnovu kriptoekonomije, dok novi koncepti, poput stabilnih kriptovaluta (eng. *StableCoin*) i decentralizovanih finansija (*DeFi*), redefinišu tradicionalne finansijske modele (Milutinović, 2018). DeFi omogućava korisnicima da koriste finansijske usluge poput pozajmljivanja, razmene i štednje bez posredstva banaka ili drugih centralizovanih institucija, koristeći decentralizovane aplikacije (*dApps*) zasnovane na blokčejnu (Jensen et al., 2021; Johnson, 2021).

Pored teorijskog pregleda ključnih koncepata blokčejn tehnologije i kriptovaluta, ovaj rad se fokusira na praktičan aspekt kroz prikaz kreiranja nove kriptovalute – ELAB. Na primeru *Binance Smart Chain* mreže, detaljno se opisuje implementacija pametnog ugovora, kreiranje tokena i način njihove distribucije. Takođe, istražuje se potencijal primene ovakvih rešenja u obrazovanju kroz uvođenje bodovnog sistema baziranog na blokčejnu.

U nastavku rada, prvo se analizira literatura i osnovni principi blokčejn tehnologije i kriptovaluta. Zatim se obrađuju decentralizovane finansije i njihova primena, nakon čega se prikazuje studijski primer kreiranja i distribucije kriptovalute ELAB. Na kraju, diskutuje se o mogućnostima buduće primene blokčejn tehnologije u obrazovanju i drugim sektorima.

## BLOKČEJN TEHNOLOGIJA

Blokčejn je tehnologija koje se može definisati kao digitalna knjiga (eng. *ledger*) svih transakcija koje se dešavaju u okviru neke mreže računara, omogućavajući transparentnost, sigurnost i nepromenljivost upisanih podataka (Bogdanović et al., 2019; Nofer et al., 2017). Naziv blokčejn (eng. *blockchain*) dolazi iz načina na koji se transakcije čuvaju na mreži, a to je blok. Svaki pojedinačni blok koji se nalazi u lancu sadrži transakcije i prilikom svake nove transakcije koja se dogodi na blok lancu, ta transakcija se zapisuje u knjigu svakog učesnika. Baza podataka kojom upravlja više učesnika naziva se decentralizovana baza podataka, (eng. d*istributed ledger technology - DLT)* (Barney et al., n.d.) (Liu et al., 2020).

Blokčejn tehnologija pruža mogućnost rešavanja problema centralizovanih sistema koji omogućavaju korisnicima sa najviše moći da kontrolišu informacije koje su vidljive javnosti i na taj način ograničavaju sam sistem, dok ostali korisnici donose odluke isključivo na osnovu dostupnih informacija (Bogdanović et al., 2019). Ukoliko bi neko želeo

da ugrozi ili kompromituje blokčejn sistem, bilo bi neophodno da promeni svaki blok koji se nalazi u lancu, u svim distribuiranim verzijama lanca. Kako bi takav napad bio moguć, haker bi morao da ima kontoru nad 51% celokupnog lanca, što je veoma teško u razvijenim sistemima blokčejna (Ye et al., 2018).

Postoje dve glavne vrste blokčejn lanaca – privatni i javni (Bogdanović et al., 2019; Wegrzyn & Wang, 2021). Javni, ili blokčejn „bez dozvole," omogućava svima učešće u finansijskim transakcijama bez potrebe za identifikacijom (Guegan, 2017). U javnim blokčejnovima obično postoji "domaća" kriptovaluta, dok se konsenzus često postiže kroz ekonomske podsticaje i primenu „dokaza o radu" ( eng. *Proof-of-Work - PoW*) (Monteviregen, 2022; Sriman et al., 2021).

S druge strane, privatni ili „dozvoljeni" blok lanci zahtevaju da se zna identitet učesnika (Guegan, 2017; Hao et al., 2018; Wegrzyn & Wang, 2021). U privatnom blokčejnu, interakcije između grupe učesnika koji dele zajednički cilj, ali nemaju puno poverenje jedni u druge (na primer, transakcije koje uključuju razmenu dobara, informacija ili sredstava) još uvek mogu da se obezbede. Postoji nekoliko primena blokčejn tehnologije kao što su: muzička industrija, zdravstvo, obrazovanje, sajber bezbednost i mnoge druge (Hao et al., 2018; Wegrzyn & Wang, 2021).

## TOKENI I KRIPTOVALUTE

Tokeni na blokčejnu predstavljaju digitalne entitete koji omogućavaju vlasništvo, prenos i upravljanje različitim vrstama sredstava, prava ili vrednosti unutar decentralizovanih mreža (Bogdanović et al., 2019). Ovi tokeni funkcionišu na principima distribuirane knjige (DLT) i mogu biti korišćeni za širok spektar aplikacija, uključujući digitalne valute, vlasničke instrumente, pristupne ključeve i sistemske nagrade (Schwiderowski et al., n.d.).

Postoji nekoliko ključnih kategorija blokčejn tokena (Oliveira et al., 2018):

- Platni tokeni (*payment tokens*) se koriste kao digitalni novac i omogućavaju direktne peer-to-peer transakcije bez posrednika, pri čemu su Bitcoin i Ethereum najpoznatiji primeri.
- *Utility* tokeni služe za omogućavanje pristupa određenim uslugama ili funkcijama na blokčejn platformama
- *Asset* tokeni predstavljaju digitalizovane oblike stvarnih sredstava, poput akcija, nekretnina ili umetničkih dela. Ova kategorizacija pomaže u razumevanju različitih uloga tokena u digitalnoj ekonomiji i omogućava regulatornim telima da primene odgovarajuće pravne okvire.

Jedan od glavnih izazova u token ekonomiji jeste interoperabilnost između različitih blokčejn mreža, što može uticati na fleksibilnost korišćenja tokena i njihovu vrednost. Dok privatne blokčejn mreže omogućavaju veću kontrolu nad pravilima interakcije

i transakcija, javni blockchain sistemi donose veću transparentnost i decentralizaciju, ali i izazove u pogledu regulative i skalabilnosti (Sunyaev et al., 2021).

Platni tokeni mogu biti nativni ili tokenizovani (Oliveira et al., 2018; Schwiderowski et al., n.d.):

- Nativni tokeni su osnovni tokeni blokčejn mreže i služe kao njeno glavno sredstvo razmene i plaćanja. Oni su direktno povezani sa blokčejn mrežom na kojoj funkcionišu. *Bitcoin* (BTC) je prvi i najpoznatiji primer nativnog tokena, dizajniran isključivo kao digitalna valuta koja omogućava *peer-to-peer* transakcije bez potrebe za centralizovanim autoritetima. Slično tome, *Ether* (ETH), iako prvenstveno služi za pokretanje pametnih ugovora na *Ethereum* mreži, takođe se koristi kao platni token za pokrivanje troškova transakcija (*gas fee*).
- Tokenizovani platni tokeni su tokeni koji su kreirani na postojećim blokčejn mrežama koristeći standardizovane protokole kao što su ERC-20 (*Ethereum*) ili BEP-20 (*Binance Smart Chain*). Ovi tokeni nemaju sopstveni blokčejn, već koriste infrastrukturu postojećih mreža za izvršavanje transakcija. Primeri uključuju USDT (*Tether*) i USDC (*USD Coin*), koji su *StableCoin*-i vezani za vrednost tradicionalnih fiat valuta kako bi smanjili volatilnost.

Razvoj tokenizovanih ekosistema otvara mogućnost za potpuno nove poslovne modele, uključujući decentralizovano finansiranje (DeFi), gde tokeni omogućavaju korisnicima da pozajmljuju, ulažu i osiguravaju sredstva bez potrebe za tradicionalnim bankarskim institucijama. Takođe, rastuća primena *non-fungible* tokena (NFT) pokazuje kako blokčejn može transformisati umetničku i kreativnu industriju, omogućavajući stvaranje digitalnih dokaza o vlasništvu koji su nepromenljivi i proverljivi u blokčejn mreži (Schwiderowski et al., n.d.).

## Kriptovalute

Kriptovalute su digitalni ili virtuelni oblici valuta koji koriste kriptografiju za osiguranje plaćanja i uklanjanje potrebe za posrednicima u transakcijama (Milutinović, 2018). Ove valute mogu se dobiti putem rudarenja (eng. *mining*) na blokčejn mreži ili kupovinom na kripto berzama i koriste različite metode šifrovanja, kao što su parovi javno-privatnih ključeva i heš (eng. *hash*) funkcije (Pernice & Scott, 2021). Iako se kriptovalute poput *Bitcoin* retko koriste za svakodnevne kupovine, stekle su popularnost kao finansijski instrumenti zbog svoje rastuće vrednosti i mogućnosti prenosa sredstava preko granica (Burniske & Tatar, 2018).

Infrastruktura blokčejna je zaslužna za *Bitcoin* revoluciju (Tapscott & Kaplan, 2019). *Bitcoin* je kriptovaluta koja obezbeđuje sigurnost i poverenje kroz programe za verifikaciju i validaciju transakcija (Lewis, 2018). Zahvaljujući nezavisnosti blokčejn mreže od bilo koje centralizovane institucije, *Bitcoin*-om ne mogu upravljati tradicionalni centralni sistemi plaćanja i bankarstva (Lewis, 2018; Pernice & Scott, 2021).

Vodeće blokčejn tehnologije velikih kriptovaluta i njihovih mreža, poput *Bitcoin*, *Ethereum* i Bajnensa (eng. *Binance)*, neprekidno rastu, a sa njihovim rastom blokovi se dodaju u lanac, što znatno povećava sigurnost evidencije (Burniske & Tatar, 2018). Kao kriptovaluta, *Bitcoin* koristi decentralizovane kriptografske alate i *peer-to-peer* sistem kako bi korisnicima omogućio transfer novca bez oslanjanja na centralizovane pouzdane ustanove poput platnih usluga ili banaka (Lewis, 2018; Nakamoto, n.d.). Sa druge strane, *Ethereum* kao platforma za pametne ugovore i njena osnovna kripto valuta Eter (eng. *Ether*), omogućava korisnicima ne samo transfer novca, već i razvoj i izvršavanje decentralizovanih aplikacija (*dApps*) bez oslanjanja na centralizovane posrednike poput tradicionalnih servera ili finansijskih institucija (Arslanian, 2022; Tikhomirov, 2018). Takođe, ekosistem blokčejn mreža - *Binance* i njegova kripto valuta *Binance Coin* (BNB) koristi decentralizovane i centralizovane infrastrukture kako bi omogućio transfer vrednosti, trgovinu i interakciju sa *Binance Smart Chain* mrežom, pružajući korisnicima opcije za transakcije, plaćanja i pokretanje decentralizovanih aplikacija, uz mogućnost korišćenja centralizovane *Binance* menjačnice za dodatnu likvidnost i usluge (Cernera et al., n.d.; Kaur, 2023; Nugroho & Setiawan, 2023).

U septembru 2024. godine tržište kriptovaluta je u fazi stabilizacije. Ukupan kapital koji se nalazi u kriptovalutama iznosi 2.2 triliona američkih dolara po sajtu https://coinmarketcap.com/.

Većina popularnih kriptovaluta ima sopstveni blokčejn i nativnu valutu, kao što su *Bitcoin*, *Ethereum, BNB, XRP* i *Solana*. Pored njih postoje i kriptovalute koje nazivamo *StableCoin*-ima, poput *Tether*-a i *USD Coin*-a. *StableCoin* je vrsta kriptovalute koja je obično vezana za određenu fiat valutu, kao što su dolar, evro ili jen (Sidorenko, 2019). Postoje i posebni primeri *StableCoin*-a povezani sa zlatom ili drugim kriptovalutama, mada su manje zastupljeni.

## DECENTRALIZOVANE MENJAČNICE I DECENTRALIZOVANE FINANSIJE

Kripto menjačnice baziraju svoje poslovanje na posredstvu u kupovini i prodaji kriptovaluta i naplaćivanju provizije po transakciji (Brasse & Hyun, 2023; Johnson, 2021). Menjačnice koje imaju veći obim poslovanja nude i štednju, poput tradicionalnog bankarskog sistema. U ovakvom sistemu korisnici štednje dobijaju od banke proviziju na svoju štednju a sama provizija je najčešće veća nego kod tradicionalnih banki (Wembo, 2025).

Tržište kriptovaluta je veoma dinamično i podložno značajnim promenama, što je posledica njegove relativno kratke istorije. Međutim, novi zakoni i regulative smanjuju rizike i promene. Velike kripto menjačnice su u Sjedinjenim Američkim Državama pod nadzorom državnih agencija (Johnson, 2021).

Centralizovane menjačnice - *CEX* (eng. *Centralized exchange*) su organizacije koje koordinišu trgovinu kriptovalutama u većim razmerama a koriste poslovni model koji je nalik tradicionalnim menjačnicama (George, 2023). Nasuprot centralizovanim

menjačnicama postoje i decentralizovane kripto menjačnice - *DEX* (eng. *Decentralized exchange*), međutim one su ređe od ranije pomenutih centralizovanih koje i dalje čine oko 90% ukupnog broja kripto menjačnica (George, 2023).

Najveća menjačnica po obimu transakcija, oko dvadeset milijardi američkih dolara dnevno, je *Binance* (Brasse & Hyun, 2023). Menjačnica funkcioniše po modelu centralizovane menjačnice ali je pokrenula i svoj decentralizovani odsek . *Binance* poseduje sopstvenu kriptovalutu za svoj ekosistem poslovanja - *Binance coin* i blokčejn tehnologiju *Binance Smart Chain* (Kaur, 2023; Nugroho & Setiawan, 2023). Kreiranjem svog blokčejna, *Binance* se aktivno uključio u sferu decentralizovanih kripto menjačnica (Lehar & Parlour, 2021).

*Binance coin* inicijalno je zasnovan na *Etherium* blokčejnu, prateći standard *ERC-20* (*ERC-20 Token Standard*, n.d.), kasnije postavši izvorni token *Binance* lanca. Pokrenut je jula 2017. u seriji od dvesta miliona *BNB* tokena (Kaur, 2023).

Trenutno je *BNB* šesta najveća kriptovaluta po tržišnoj kapitalizaciji koja iznosi oko 91,7 milijardi dolara (*Cryptocurrency Prices, Charts And Market Capitalizations | CoinMarketCap*, n.d.). Uspeh koji se ogleda u tržišnoj kapitalizaciji kriptovaluta duguje razvoju *Binance* menjačnice.

*Binance DEX* je decentralizovana razmena koja nastoji da prenese ključne aspekte *Binance* platforme u decentralizovano okruženje, pružajući bezbednost i prednosti *DEX*-a (Asef et al., 2024). *Binance Chain* je osnova ove razmene, sa primarnim fokusom na brzo i efikasno upravljanje razmenom sredstava. Binance DEX omogućava primanje i slanje Binance Coin-a (BNB) između različitih adresa (Asef et al., 2024; Brasse & Hyun, 2023; Cernera et al., n.d.). BNB je pretvoren u lokalni novčić *Binance Chain* lanca, čime se povećava njegova upotreba za troškove i razmene (Kaur, 2023).

Decentralizovane finansije – *DeFi* (eng. *Decentralized finances*), decentralizovane finansije je pokret koji zastupa finansijske usluge zajmova i trgovanja bez posredstva centralizovanih subjekata (Jensen et al., 2021). Ovakve usluge se propagiraju preko decentralizovanih aplikacija - dApps, gde je većina zasnovana na platfomi *Ethereum*. DeFi se i ogleda u nizu finansijskih usluga poput bankarstva, obveznica, tržišta novca i osiguranja oponašajući tradicionalna finansijska poslovanja i tržišta (Jensen et al., 2021).

Glavne kategorije koje DeFi obuhvata su (Jensen et al., 2021):

1. *Decentralizovane menjačnice*
   Omogućavaju korisnicima razmenu kripto valute bez posredstva bilo koje centralizovane treće strane, kao i samostalno čuvanje svoje digitalne imovine. Ne zadržavajući sredstva na centralizovanim menjačnicama, korisnici izbegavaju potrebu da veruju u solventnost tih platformi.
2. *DeFi pozajmljivanje i zaduživanje*
   Ovaj vid zaduživanja daje korisnicima pravo polaganja sopstvene digitalne imovine kao zaloga, za koju oni potom mogu dobiti adekvatan zajam. Digitalna imovina korisnicima može poslužiti i kao sredstvo štednje, odnosno učešća na tržištu pozajmljivanja na osnovu kog korisnici mogu dobiti kamatu na sopstvenu štednju.

Ovakav sistem pozajmljivanja i zaduživanja u potpunosti eliminiše potrebe korisnika za proveru kreditnog rejtinga, odnosno kreditne sposobnosti, ili potrebe bankovnih računa .

3. *Decentralizovani StableCoin*
   Koncept koji rešava pitanje poverenja. *StableCoin* kreira se metodom prekomerne kolateralizacije, beleže se u decentralizovanim knjigama i njima upravljaju decentralizovani autonomni entiteti. Provere rezervi *StableCoin*-a su potpuno dostupne na uvid javnosti.

Uz navedene krucijalne faktore, prisutni su i mnogi drugi koji doprinose razvoju decentralizovanog sektora poput: plaćanja, upravljanja finansijama, osiguranjima ili fondovima, derivati i mnogi drugi faktori (CoinGecko et al., 2021; Lau et al., 2021).

Sektor decentralizovanih aplikacija i organizacija pokazuje trend rasta. Nakon poslednje recesije usledile su mere korekcije i stabilizacije celog DeFi tržišta koji trenutno ima kapitalizaciju izmerenu sa 100,6 milijardi američkih dolara (*Total DeFi Market Cap Chart — TradingView*, n.d.).

DeFi sektor doživljava kontinuirana unapređenja i stavlja akcenat na pristupačnost i lakoću kreiranja čime privlači znatan broj novih investitora. Među brojnim funkcionalnostima koje poseduje ovaj sektor izdvajaju se i (CoinGecko et al., 2021; Lau et al., 2021):

- Novčanik – ***Argent*** pravi drastično superiorno uključivanje kripto novčanika fokusiranog na korisnika, sa najsavremenijom bezbednošću, lokalnom integracijom sa DeFi decentralizovanim aplikacijama, kao što su *Compound* i drugi, kao i one koji ne zahtevaju *seed* ključeve.
- Učešće u DeFi stavkama – **Zapper** efikasno apstrahuje složene procese i korake koji su uključeni u upravljanje DeFi stavkama, aplikacijama i proizvodima. Pored toga, pruža korisnicima mogućnost da lako pristupe različitim budžetskim stavkama u okviru jedne platforme, čime značajno štedi vreme i napor.
- Prilagođeni napredak – **Gelato Finance** je predstavio mehanizam poznat kao reaktor za događaje u kriptovalutama. Ovaj alat omogućava korisnicima da definišu specifične aktivnosti koje će biti automatski izvršene kada se ispune određeni uslovi, kao što su "Kupite Ether kada cena dostigne 200 dolara" ili "Pošaljite kriptovalutu Alisi na njen rođendan" .
- Osiguranje - **Nexus Mutual** primer je mehanizama garancije i zaštite. Platforma omogućava korisnicima da zaštite svoja digitalna sredstva, funkcionišući na principu zajednice gde članovi mogu da ulažu u osiguranje i odlučuju o isplatama koji pokrivaju troškove mogućih incidenata.

Uzimajući u obzir ekspanziju ovog sektora, neophodne su potrebne regulative i lakši pristup korisnicima kako bi se ta ekspanzija nesmetano nastavila (Bogdanović et al., 2019; Brasse & Hyun, 2023; Johnson, 2021).

## STUDIJSKI PRIMER - ELAB KRIPTOVALUTA

Studijski primer koji će se obrađivati u nastavku rada, pokazuje proces kreiranja kriptovalute. Prilikom kreiranja jedne kriptovalute potrebno je napisati, razviti i testirati pametni ugovor na blokčejn mreži. Svaka transakcija, pa i testiranje, zahteva korišćenje kriptovalute u određenom iznosu, ali za potrebe testiranja koristiti se test mreža i test tokeni koje svaka blokčejn mreža obezbeđuje (Bogdanović et al., 2019; Gururaj et al., 2020; Nofer et al., 2017). Način obezbeđivanja ovih test tokena se vrši pomoću česmi (eng. *faucet*) (*What Is a Crypto Faucet? | Coinbase*, n.d.).

Inicijalno, potrebno je kreirati digitalni novčanik - koji nam omogućava trgovinu i čuvanje kriptovaluta, ali i samo kreiranje jedne. Novčanik može biti softverskog ili hardverskog tipa i služi za čuvanje informacija o privatnim blokčejn ključevima vlasnika, za izvršavanje svih transakcija na nekoj blokčejn mreži, kao i čuvanje informacija o kriptovalutama vlasnika (Mackay, 2019). Za potrebe ovog primera korišćen je softverski kripto novčanik - *Metamask*.

Studijski primer je realizovan na *Binance Smart Chain TestNet* blokčejn mreži. Svaka velika blokčejn mreža, ima svoju test kopiju, koja dozvoljava testiranje decentralizovanih aplikacija bez potrebe trošenja realnih kripto sredstava. Migracija sa test mreže na aktivnu mrežu iziskuje svega par dodatnih koraka u standardizovanoj proceduri.

*Binance Smart Chain* mreža je bazirana na *Ethereum* blokčejnu pa se za samo kreiranje pametnog ugovora, odnosno kriptovalute koristi programski jezik *Solidity* (koinmilyoner, 2023).

Kreiranje pametnog ugovora prikazano je na ilustraciji broj 1.

```
contract ERC20 is Context, IERC20, IERC20Metadata {
    mapping(address => uint256) private _balances;
    mapping(address => mapping(address => uint256)) private _allowances;

    uint256 private _totalSupply;

    string private _name;
    string private _symbol;

    constructor(string memory name_, string memory symbol_) {
        _name = name_;
        _symbol = symbol_;
}
}
```

**Ilustracija 1** Kreiranje pametnog ugovora

Navedeni segment koda kreira pametni ugovor ERC20 koji propisuje pravila pri kreiranju tokena. Mapa *_balances* prikazuje podatak o balansu svakog korisnika, odnosno koliko svaka adresa (korisnik) poseduje tokena. Mapa *_allowances* čuva informacije o tome koliko jedna adresa (korisnik) može da potroši tokena u ime druge adrese (korisnika). Promenljiva *_totalSupply* zadaje ukupnu količinu tokena emitovanih u sistemu.

Promenljive *_name* i *_symbol* čuvaju naziv i simbol tokena, što su informacije preko kojih identifikujemo token na tržištu.

Konstruktor se poziva prilikom objavljivanja ugovora na blokčejn mreži, prima dva parametra za identifikaciju tokena i inicijalizuje ih sa konkretnim vrednostima.

```
function balanceOf(address account) public view virtual override
returns (uint256) {
return _balances[account];
}
```

**Ilustracija 2** Trenutno stanje na računu/nalogu - balans

Nakon kreiranja ugovora programiraju se funkcije kojima možemo obezbediti pojedine funkcionalnosti u sistemu. Na ilustraciji broj 2 prikazana je funkcija kojom možemo dobiti balans, odnosno stanje računa, jednog konkretnog korisnika.

```
function transfer(address to, uint256 amount) public virtual override
returns (bool) {
address owner = _msgSender();
_transfer(owner, to, amount);
return true;
```

**Ilustracija 3** Prenos sredstava

Ilustracija broj 3 predstavlja funkciju kojom omogućavamo da određena adresa (*owner*) pošalje nekoj drugoj adresi (*to*), određeni iznos (*amount*) kriptovalute. Uslov za uredno izvršenje ove funkcije je nenegativan iznos kriptovalute za slanje.

```
function _transfer(
      address from,
      address to,
      uint256 amount
  ) internal virtual {
      require(from != address(0), "ERC20: transfer from the zero address");
      require(to != address(0), "ERC20: transfer to the zero address");

      _beforeTokenTransfer(from, to, amount);

      uint256 fromBalance = _balances[from];
      require(fromBalance >= amount, "ERC20: transfer amount exceeds balance");
      unchecked {
          _balances[from] = fromBalance - amount;
      }
      _balances[to] += amount;
      emit Transfer(from, to, amount);

      _afterTokenTransfer(from, to, amount);
  }
```

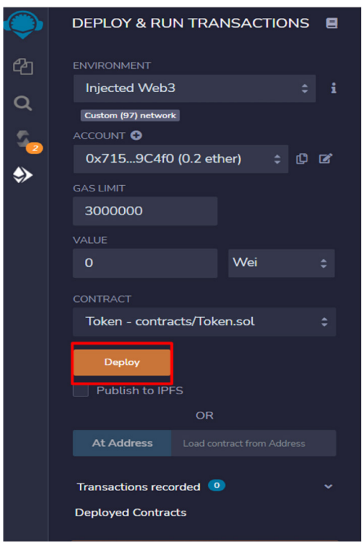
**Ilustracija 4** Implementacija funkcije prenosa sredstava

Funkcija *_transfer* prikazana na ilustraciji br 4 sadrži logiku iza prenosa sredstava sa jedne na drugu adresu. Funkcija proverava slanje sa i na nultu adresu koje nije omogućeno jer može da uzrokuje gubitkom sredstava i pokreće *_beforeTokenTransfer* funkciju koja pre samog transfera u sebi sadrži delove koda za validaciju i praćenje transakcije. Funkcija potom proverava da li pošiljalac ima dovoljno tokena, nakon čega stanje računa pošiljaoca za broj tokena koji je namenjen za transfer i za isti broj povećava stanje računa primaoca. Na kraju funkcija poziva i funkciju *_afterTokenTransfer* u kojoj se takođe može sadržati logika za praćenje transakcije ili eventualnu statistiku transakcija.

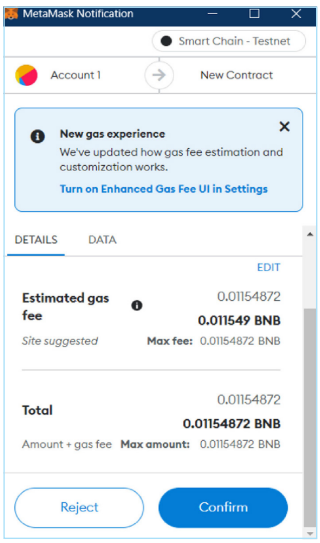
```
contract Token is ERC20 {

constructor () public ERC20("ELAB", "ELAB") {
    _mint(msg.sender, 1000000000 * (10 ** uint256(decimals())));
}

}
```

**Ilustracija 5** ERC20 ugovor

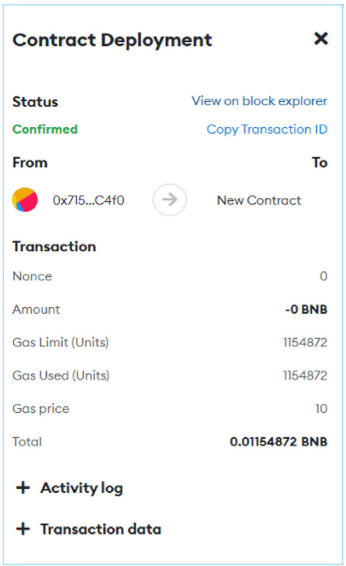
Prikaz konkretne instance ERC20 ugovora kojom se kreira Elab kriptovaluta sa emisijom od milijardu jedinica, može se videti na ilustraciji br 5. Sa završenom fazom kodiranja potrebno je odraditi *deploy*, odnosno puštanje, novokreirane kriptovalute i time je staviti u promet (ilustracija 6). Za kreiranje i puštanje kriptovalute potrebno je platiti naknade na blokčejn mreži (ilustracija 7.)




**Ilustracija 6**
Deploy kriptovalute




**Ilustracija 7** Naknade za kreiranje i puštanje kriptovalute




**Ilustracija 8** Uspešno puštanje pametnog ugovora

Nakon uspešno plaćenih naknada dobijamo poruku o uspešnom puštanju našeg pametnog ugovora (ilustracija 8).

## DISKUSIJA

Proces kreiranja kriptovalute ELAB u okviru ovog istraživanja pokazuje kako blockchain tehnologija može omogućiti razvoj prilagođenih digitalnih tokena sa specifičnim funkcionalnostima. Korišćenje pametnih ugovora na Binance Smart Chain mreži omogućava efikasno i transparentno upravljanje distribucijom tokena, dok digitalni novčanici poput Metamaska pružaju jednostavan način za njihovo čuvanje i korišćenje. Ovaj proces naglašava kako kreiranje kriptovalute nije rezervisano samo za globalne finansijske institucije, već može biti primenjeno i u specijalizovanim sektorima poput obrazovanja, finansijskih instrumenata i digitalnih identiteta.

Distribucija kriptovalute se bazira na jednostavnom principu, uzimajući u obzir da se na početnu adresu inicijalizuje određen broj kreiranih ELAB kriptovaluta. Sve što je potrebno za distribuciju kriptovalute su adrese na koje je potrebno poslati određene iznose iste.

Pitanje potencijalne upotrebe ELAB tokena ostaje otvoreno za dalju diskusiju. Jedan od predloženih scenarija primene je u obrazovnom sistemu, gde bi tokeni mogli služiti kao alat za gejmifikaciju nastavnog procesa. Studenti bi mogli koristiti ELAB kriptovalutu kao sistem nagrađivanja za akademska postignuća ili kao način validacije učešća u kursevima i projektima. Ovakav model bi mogao unaprediti angažovanost studenata i povećati transparentnost ocenjivanja i sertifikacije znanja.

Međutim, postavlja se pitanje daljeg razvoja i integracije takvih sistema. Da li bi ovakvi tokeni mogli imati vrednost izvan internog ekosistema i da li bi ih regulatorni okviri prepoznali kao legitimna sredstva razmene? Takođe, kako obezbediti dugoročnu održivost tokena, sprečiti spekulacije i potencijalne regulatorne prepreke? Dalja istraživanja su potrebna kako bi se testirala stabilnost, prihvaćenost i sigurnost ovakvih modela u realnim primenama.

## ZAKLJUČAK

Ovaj rad je istražio osnovne koncepte blokčejn tehnologije, kriptovaluta i decentralizovanih finansija, s posebnim fokusom na proces kreiranja i distribucije prilagođenih tokena. Kroz detaljnu analizu literature i studijski primer ELAB kriptovalute, rad je demonstrirao praktičnu primenu pametnih ugovora i decentralizovanih tehnologija u razvoju digitalnih sredstava.

Glavni doprinos rada leži u povezivanju teorijskih osnova sa praktičnim eksperimentom kreiranja kriptovalute, čime se pruža uvid u mogućnosti koje blokčejn nudi izvan tradicionalnih finansijskih tokova. Studijski primer ukazuje na potencijal primene tokena u obrazovanju, omogućavajući veću transparentnost i efikasnost ocenjivanja kroz decentralizovane sisteme nagrađivanja.

Postignuti rezultati otvaraju niz novih pitanja i pravaca za buduće istraživanje. Dalji rad može uključiti analizu regulatornih aspekata kreiranja tokena, testiranje modela tokenizacije u različitim sektorima i istraživanje dugoročne održivosti ovakvih sistema. Blokčejn tehnologija nastavlja da se razvija, pružajući nove mogućnosti za digitalizaciju finansijskih i nefinansijskih resursa, a ovakvi eksperimenti doprinose boljem razumevanju i adaptaciji ovog inovativnog pristupa u različitim domenima.

## Reference

Arslanian, H. (2022). Ethereum. *The Book of Crypto*, 91–98. https://doi.org/10.1007/978-3-030-97951-5_3

Asef, M. A., Mojtaba, S., & Bamakan, H. (2024). *From x*y=k to Uniswap Hooks: A Comparative Review of Decentralized Exchanges (DEX)*. https://arxiv.org/abs/2410.10162v2

Barney, N., Troy, S., & Pratt K., M. (n.d.). *What is distributed ledger technology (DLT)? | Definition from TechTarget*. Retrieved February 11, 2025, from https://www.techtarget.com/searchcio/definition/distributed-ledger

Bogdanović, Z., Radenković, B., Despotović-Zrakić, M., Barać, D., Labus, A., & Naumović, T. (2019). BLOKCHAIN TECHNOLOGIES: CURRENT STATE AND PERPECTIVES. *Zbornik Radova Međunarodne Naučne Konferencije o Digitalnoj Ekonomiji DIEC*, *2*(2), 1–12.

Brasse, A., & Hyun, S. (2023). Cryptocurrency exchanges and the future of cryptoassets. *The Emerald Handbook on Cryptoassets: Investment Opportunities and Challenges*, 341–353. https://doi.org/10.1108/978-1-80455-320-620221022/FULL/XML

Burniske, C., & Tatar, J. (2018). *Cryptoassets : the innovative investor's guide to bitcoin and beyond*. 325. https://www.oreilly.com/library/view/cryptoassets-the-innovative/9781260026689/

Cernera, F., Morgia, L., Mei, A., & Sassi, F. (n.d.). *Token Spammers, Rug Pulls, and Sniper Bots: An Analysis of the Ecosystem of Tokens in Ethereum and in the Binance Smart Chain (BNB)*.

CoinGecko, Lucius Fang, Erina Azmi, Banjamin Hor, & Khor Win Win. (2021). *How to DeFi: Advanced*. CoinGecko. https://books.google.rs/books/about/How_to_DeFi_Advanced.html?id=Ivo2EAAAQBAJ&redir_esc=y

*Cryptocurrency Prices, Charts And Market Capitalizations | CoinMarketCap*. (n.d.). Retrieved February 11, 2025, from https://coinmarketcap.com/

*ERC-20 Token Standard*. (n.d.). Retrieved February 11, 2025, from https://ethereum.org/sr/developers/docs/standards/tokens/erc-20/

George, B. (2023). *What Is a CEX? Centralized Exchanges Explained*. https://www.coindesk.com/learn/what-is-a-cex-centralized-exchanges-explained

Guegan, D. (2017). *Public Blockchain versus Private blockhain*. https://shs.hal.science/halshs-01524440

Gururaj, H. L., Manoj Athreya, A., Kumar, A. A., Holla, A. M., Nagarajath, S. M., & Ravi Kumar, V. (2020). BLOCKCHAIN. *Cryptocurrencies and Blockchain Technology Applications*, 1–24. https://doi.org/10.1002/9781119621201.CH1

Hao, Y., Li, Y., Dong, X., Fang, L., & Chen, P. (2018). Performance Analysis of Consensus Algorithm in Private Blockchain. *IEEE Intelligent Vehicles Symposium, Proceedings*, *2018-June*, 280–285. https://doi.org/10.1109/IVS.2018.8500557

Jensen, J. R., von Wachter, V., & Ross, O. (2021). An Introduction to Decentralized Finance (DeFi). *Complex Systems Informatics and Modeling Quarterly*, *0*(26), 46–54. https://doi.org/10.7250/CSIMQ.2021-26.03

Johnson, K. (2021). Decentralized Finance: Regulating Cryptocurrency Exchanges. *William & Mary Law Review*, *62*(6). https://scholarship.law.wm.edu/wmlr/vol62/iss6/4

Kaur, G. (2023, April). *What is Binance Coin (BNB) and how does it work?* https://cointelegraph.com/learn/articles/what-is-binance-coin-bnb-and-how-does-it-work

koinmilyoner. (2023, February). *Binance Smart Contract Development — A Step by Step Guide | koinmilyoner on Binance Square*. https://www.binance.com/en/square/post/249110

Lau, D., Lau, D., Sze Jin, T., Kjo, K., Azmi, E., Fang, L., Hor, B., & Win Win, K. (2021). *How to DeFi: Beginner*. CoinGecko. https://books.google.rs/books/about/How_to_DeFi_Beginner.html?id=43okEAAAQBAJ&redir_esc=y

Lehar, A., & Parlour, C. A. (2021). Decentralized Exchanges. *UWA BlockChain and Crypto Conference*.

Lewis, A. (2018). *The Basics of Bitcoins and Blockchains*. Mango Publishing Group. https://bitsonblocks.net/wp-content/uploads/2018/07/the-basics-contents-draft.pdf

Liu, X., Farahani, B., & Firouzi, F. (2020). Distributed Ledger Technology. *Intelligent Internet of Things: From Device to Fog and Cloud*, 393–431. https://doi.org/10.1007/978-3-030-30367-9_8

Mackay, B. (2019). *Evaluation of Security in Hardware and Software Cryptocurrency Wallets* (Issue January) [Edinburgh Napier University]. https://www.researchgate.net/publication/338054399

Milutinović, M. (2018). CRYPTOCURRENCY. *Економика - Часопис За Економску Теорију и Праксу и Друштвена Питања*, *1*, 105–122.

Montevirgen, K. (2022). *What Is Proof of Work in Blockchain Verification? | Britannica Money*. https://www.britannica.com/money/proof-of-work-blockchain-verification

Nakamoto, S. (n.d.). *Bitcoin Whitepaper | Wielfried Zouantcha*. Retrieved February 11, 2025, from https://www.zouantcha.com/blog/bitcoin-whitepaper

Nofer, M., Gomber, P., Hinz, O., & Schiereck, D. (2017). Blockchain. *Business and Information Systems Engineering*, *59*(3), 183–187. https://doi.org/10.1007/S12599-017-0467-3/METRICS

Nugroho, D. A., & Setiawan, R. (2023). FACTORS FOR CHANGES IN TRADING VOLUME, CHANGES IN MARKET CAPITALIZATION, AND CHANGES IN CIRCULATING SUPPLY TO BINANCE COIN (BNB) RETURNS. *Jurnal Ekonomi*, *12*(02), 1056–1065. https://www.ejournal.seaninstitute.or.id/index.php/Ekonomi/article/view/1841

Oliveira, L. ;, Zavolokina, L. ;, Bauer, I. ;, Schwabe, G., Oliveira, L., Zavolokina, L., & Bauer, I. (2018). *To Token or not to Token: Tools for Understanding Blockchain Tokens*. https://doi.org/10.5167/uzh-157908

Pernice, I. G. A., & Scott, B. (2021). Cryptocurrency. *Internet Policy Review*, *10*(2). https://doi.org/10.14763/2021.2.1561

Schwiderowski, J., Pedersen, A. B., & Beck, R. (n.d.). *Crypto Tokens and Token Systems*.

Sidorenko, E. L. (2019). Stablecoin as a New Financial Instrument. *International Scientific Conference "Digital Transformation of the Economy: Challenges, Trends, New Opportunities*, *84*, 630–638. https://link.springer.com/chapter/10.1007/978-3-030-27015-5_75

Sriman, B., Ganesh Kumar, S., & Shamili, P. (2021). Blockchain Technology: Consensus Protocol Proof of Work and Proof of Stake. *Advances in Intelligent Systems and Computing*, *1172*, 395–406. https://doi.org/10.1007/978-981-15-5566-4_34

Sunyaev, A., Kannengießer, N., Beck, R., Treiblmaier, H., Lacity, M., Kranz, J., Fridgen, G., Spankowski, U., & Luckow, A. (2021). Token Economy. *Business and Information Systems Engineering*, *63*(4), 457–478. https://doi.org/10.1007/S12599-021-00684-1/TABLES/5

Tapscott, D., & Kaplan, A. (2019). *Blockchain Revolution in Education and LifeLong Learning: Preparing for Disruption, Leading the Transformation*. https://cognizium.io/uploads/resources/Blockchain Research institute - Blockchain revolution in Education And Lifelong Learning - 2019 - Apr.pdf

Tikhomirov, S. (2018). Ethereum: State of Knowledge and Research Perspectives. *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, *10723 LNCS*, 206–221. https://doi.org/10.1007/978-3-319-75650-9_14

*Total DeFi Market Cap Chart — TradingView*. (n.d.). Retrieved February 11, 2025, from https://www.tradingview.com/symbols/TOTALDEFI/

Wegrzyn, K. E., & Wang, E. (2021, August). *Types of Blockchain: Public, Private, or Something Else*. Foley & Lardner LLP. https://www.foley.com/insights/publications/2021/08/types-of-blockchain-public-private-between/

Wembo, J. (2025). *Crypto vs. Traditional Banking — Who Holds the Key to Your Wealth?* . https://joelotepawembo.medium.com/crypto-vs-traditional-banking-who-holds-the-key-to-your-wealth-a09c231fe788

*What is a crypto faucet? | Coinbase*. (n.d.). Retrieved February 11, 2025, from https://www.coinbase.com/learn/crypto-glossary/what-is-a-crypto-faucet

Ye, C., Li, G., Cai, H., Gu, Y., & Fukuda, A. (2018). Analysis of security in blockchain: Case study in 51%-attack detecting. *Proceedings - 2018 5th International Conference on Dependable Systems and Their Applications, DSA 2018*, 15–24. https://doi.org/10.1109/DSA.2018.00015