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INNOVATIVE DEVELOPMENT OF BLOCKCHAIN TECHNOLOGY AND ASSET TRADING MODELS IN THE 21ST CENTURY

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Since entering the 21st century, technological innovation has continued to reshape the financial transaction model. Blockchain, with its technological features such as decentralization and tamperability, is reconfiguring the infrastructure for traditional asset transactions. This paper systematically analyzes the transformative impact of blockchain technology on the core links of asset authentication, circulation and settlement, and promotes the construction of a credible digital asset trading ecosystem through the construction of cross-domain synergistic mechanisms and the improvement of the digital governance system, so as to facilitate the high-quality development of the digital economy.

Keywords: digital economy; blockchain; asset digitization; asset tokenization.

ИННОВАЦИОННОЕ РАЗВИТИЕ ТЕХНОЛОГИИ БЛОКЧЕЙН И МОДЕЛЕЙ ТОРГОВЛИ АКТИВАМИ В 21 ВЕКЕ

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С начала 21 века технологические инновации продолжают изменять модель финансовых транзакций. В качестве технологической парадигмы блокчейн переоснащает инфраструктуру традиционных операций с активами благодаря своим техническим характеристикам, таким как децентрализация и неизменяемость. В данной статье системно анализируется трансформационное воздействие технологии блокчейн на ключевые этапы аутентификации активов, их обращения и расчетов, а также подчеркивается важность создания доверенной экосистемы торговли цифровыми активами через построение межотраслевых синергетических механизмов и совершенствование системы цифрового управления для содействия высококачественному развитию цифровой экономики.

Ключевые слова: цифровая экономика; блокчейн; цифровизация активов; токенизация активов.

In recent years, the digital asset trading market has become increasingly prosperous, and the types and scale of digital assets have been expanding. Digital assets, or digital assets for short, are assets created, stored, managed and traded through digital technology. Unlike traditional physical assets, it exists in electronic form, is owned or controlled by an individual or enterprise, is transmitted and traded through the Internet, and can bring economic value or has potential economic value for the owner. Digital assets are characterized by virtuality, replicability, ease of transmission, security,

etc., and cover a wide range of forms such as cryptocurrencies and digital securities. With the deepening application of blockchain technology in the financial field, more and more physical assets are being transformed into digital forms. Blockchain technology is a secure, transparent and efficient distributed ledger system, and the core principles include decentralization, data immutability, cryptography, consensus mechanism, data structure and smart contracts. These characteristics give blockchain openness, anonymity and security, making it an important force in driving innovation and digital transformation across industries. China has introduced a series of policies to promote the development of blockchain technology in various industries.

Table 1

China's policies on blockchain technology development

Policy Name	Policy Content Keywords
Beijing Blockchain Innovation and Development Action Plan (2020-2022)	Blockchain theory innovation, technology platform innovation, infrastructure construction.
Guiding Opinions on Accelerating the Promotion of Blockchain Technology Application and Industrial Development (2021)	Industrial integration, Internet, big data, artificial intelligence, universal application.
Implementation Plan for Promoting Urban Blockchain Digital Infrastructure System Project of Shanghai (2023)	Self-innovation application, school research institution industrial organization access.
Shanghai Blockchain Key Technology Tackling Special Action Plan (2023)	Industrial development, multi-region and multi-domain.
Guidelines for the Construction of Blockchain and Distributed Ledger Technology Standard System (2024)	2023 Summary, technology application, standard development, ecological construction.
Report on the Development of Blockchain Innovation and Application in China (2023)	Domestic leading, international first-class, technological innovation and application.

Blockchain and traditional asset trading models. Both asset tokenization and asset-backed tokenization involve transferring assets onto a blockchain for digital representation and trading. Asset Tokenization (Security Tokenization) refers to the process of converting real-world assets (e.g., real estate, artwork, financial products, carbon credits) into tokenized forms for trading and management on a blockchain. Asset-Backed Tokenization involves transforming rights to real-world assets into blockchain-based digital tokens for transactional and administrative purposes. While both are critical applications of blockchain technology in finance and signal the future direction of digital asset trading, their focuses differ: Asset Tokenization emphasizes the expression and circulation of assets on the blockchain, ensuring compliance, ownership verification, and seamless transfer through smart contracts. Asset-Backed Tokenization prioritizes the digitized representation and trading of assets, enhancing liquidity and enabling decentralized exchange mechanisms. As digital assets evolve, they will inevitably progress into tokenized and asset-backed forms. This transformation converts tangible and intangible real-world assets into digital assets, facilitating value creation, value marking, value exchange, and value distribution. Ultimately, this allows digital assets to circulate in markets as freely as traditional securities like stocks and bonds.

The development of digital assets to a certain extent will enter into asset tokenization and tokenization, and the tangible and intangible assets in the real world will be transformed into digital assets for value creation, value marking, value exchange and value distribution, so that digital assets can really circulate in the market like stocks and bonds.

Table 2

Asset Tokenization and Asset-Backed Tokenization Comparison

Comparison Dimension	Asset Tokenization (Security Tokenization)	Asset-Backed Tokenization
Core Definition	The process of converting real-world assets into blockchain-based tokens (security tokens), enabling end-to-end digital representation and on-chain circulation.	The process of digitizing asset rights (e.g., ownership, revenue rights) into blockchain-based tokens, focusing on digital representation and transactional functionality.
Technical Focus	Emphasizes on-chain expression and circulation (e.g., fractional ownership, compliance verification, smart contract automation).	Prioritizes digitized representation and trading (e.g., token standardization, liquidity enhancement, decentralized exchange scenarios).
Future Development Focus	Integration with traditional finance (e.g., CBDC interoperability), cross-chain compliance, and regulatory alignment.	Innovation in decentralized finance (DeFi), and DAO governance tokenomics.

Shanghai, as the center of national financial transactions, established the Shanghai Data Exchange in 2021. In the three years since the establishment of the Sea Data Exchange, the transaction volume has been climbing. According to the data on the official website of the Sea Data Exchange, the size of the Shanghai Data Exchange's on-floor transactions reached more than 1.1 billion yuan in 2023, and its listed data products are nearly 3,000, and an increasingly active data market trading ecosystem is gradually taking shape. The integration of blockchain and digital asset trading has unique advantages in terms of transaction cost, transaction efficiency and security. Under the traditional asset transaction model, the transaction process is long and complex, involving many subjects, high transaction costs and long time. In addition, the transaction process is prone to information asymmetry, which affects the fairness of the transaction.

The integration of blockchain technology and digital asset trading will reshape the asset trading model, constituting a new model of digital asset trading and management based on blockchain technology, with a broad application prospect. For example, Castonguay and Stein Smith proposed a blockchain-based multi-party authentication digital asset platform (BDAP), which has a security protocol that can help the relevant participants confirm the authenticity of the assets and has a high transaction processing capacity, thus effectively avoiding the inefficiency of warehouse receipt pledge and the problem of duplicate collateralization in supply chain finance [1]. Cross-chain technology allows assets on different chains to trade with each other, and the scope of asset trading is constantly expanding. Compared with the traditional transaction mode, the transaction mode based on cross-chain technology not only reduces the cost, but also makes the transaction process more transparent, efficient and safe.

Asset Tokenization Financing. Real World Assets (RWA), directly translated as “Real World Assets”, refers to the digitization and tokenization of real-world assets in the blockchain or Web3 ecosystem, including tangible assets such as real estate, as well as intangible assets such as copyrights and carbon credits [2]. These assets include tangible assets such as real estate and intangible assets such as copyrights and carbon credits, etc. The core concept of RWA is to bring traditional financial assets into the decentralized financial ecosystem through blockchain technology, so as to achieve more efficient, transparent and safer asset management and transactions. quality, even if the company itself is not large enough, the company's financial condition is not enough to go public or cannot obtain bank financing, it’s possible to obtain financing through RWA.

RWA increases the flexibility of asset trading and lowers the investment threshold for investors through asset tokenization, where each token symbolizes partial ownership of a real asset. For example, instead of spending millions of dollars to invest in high-end real estate, an investor could purchase a token representing a portion of that property; or instead of spending a large amount of money to support a medical research study, an investor could purchase a token representing a portion

of the results of that study (intellectual property). The process of tokenizing an asset is more complex and usually consists of three parts: a pre-tokenization phase, a tokenization phase, and a post-tokenization phase. The following is the process by which the legal entity holding the assets will tokenize its assets.

Table 3

Asset tokenization process

Stage	Process
Pre-Tokenization Stage	Selection of tokenization partner (technology platform and legal advisor); Asset valuation (assessing the market value of real assets); Ownership verification (legality of asset ownership); Legal Due Diligence; Develop management and maintenance processes for real assets.
Tokenization Stage	Creation of digital tokens: Create digital tokens on the blockchain to entitle the holders to enjoy a proportionate share of the asset's potential appreciation and future revenue, and establish a link between the tokens and the asset; Implement smart contracts: Use blockchain smart contracts to manage the issuance, tracking and distribution of token proceeds.
Post-Tokenization Stage	Token distribution and sale (sell to investors through public, private or both); Asset monitoring and management.

Based on: [3].

Looking at digital asset transactions based on blockchain technology, it has the following features in addition to reducing transaction costs, improving transaction efficiency and security. First, enhancing asset liquidity: tokenized assets can be traded globally, increasing the liquidity of real assets and providing a new way of linking the supply and demand sides of assets and funds. Second, lower investment threshold: tokenization allows assets to be split into smaller shares, lowering the investment threshold and enabling more individuals and institutions to participate in investment. Thirdly, a wide range of application scenarios: tokens can represent various types of assets, including physical assets, financial assets, intellectual property, etc., providing a wide range of application scenarios. A report released by Citibank 2023 predicts that blockchain asset tokenization will be the killer app that drives the blockchain industry into the multi-trillion-dollar scale, and that virtually any asset that can be represented in terms of value can be tokenized. Tokenization of private sector (unlisted company) assets will grow more than 80 times, reaching a size of about $4 trillion by 2030.

Conclusion. The integration of blockchain and economic development is the inevitable direction of development in the 21st century, and blockchain digital asset transactions significantly optimize the traditional model by reducing costs and increasing efficiency: its decentralized architecture cuts down intermediary costs, smart contract automation reduces labor costs, and the transfer of assets on the chain eliminates the expenditure on warehousing and transportation; at the same time, the real-time data transmission and instant settlement shorten the transaction cycle, and the automated execution of smart contracts eliminates the delay in the process, achieving a efficiency leap. Ni Ning pointed out in 2023 regarding transparency and security that distributed ledger ensures full traceability of transactions and reduces information asymmetry, and that encryption technology, data tamper-proof features, and multi-node storage mechanisms greatly enhance resistance to attacks [4]. However, its development faces multiple challenges: regulatory lag, China's digital asset regulations are not yet perfect and need to be adapted to blockchain characteristics to prevent risks; technical bottlenecks, insufficient cross-chain interoperability, infrastructure fragmentation, and underlying security vulnerabilities, such as data heterogeneity as pointed out by Cai ZiYin [5]; insufficient standardization, although 209 technical standards were released in China in 2023, there is still a need to unify the norms to promote large-scale application. In this regard, a breakthrough is needed in three

areas: on the technical side, to improve transaction performance and integrate AI, 6G and other technologies, and to formulate national standards to coordinate the infrastructure; on the regulatory side, to innovate a “sandbox mechanism” to balance risk and innovation, and to improve the legal framework for the protection of data property rights and privacy protection; and to implement practitioner certification and to promote global collaboration to build a trustworthy transaction ecosystem.

In summary, in the future economic development, blockchain provides innovative solutions for asset transactions in terms of cost and security. Only through technical standardization, dynamic regulation and multi-party collaboration can we break through the bottleneck and empower the high-quality development of the global digital economy.

References

1. *Castonguay J. J., Stein S. S.* Digital Assets and Blockchain: Hackable, Fraudulent, or Just Misunderstood? // Accounting Perspectives. 2020. Vol. 4. P. 363–387.
2. A look back at the past and present and how real assets are on the rise [Electronic resource] // PANews. RWA : сайт. URL: https://new.qq.com/rain/a/20240826A02YGP00.20240826 (date of access: 05.02.2025).
3. *Peng Zhao.* From IPO to Asset Pass-Through to IMO, Web3 enters the inflection point of serving real enterprises [Electronic resource] // AIGC Observation. URL: https://aigcdaily.cn/news/b24ucooe8rjp99t/ (date of access: 15.02.2025).
4. *Ni Ning.* Application of Blockchain Technology in Secure Transactions of Digital Assets // Digital Technology and Application. 2023. Vol. 10. P. 232–236.
5. *Ziyin Cai.* Research on key technology of cross-blockchain data sharing and collaboration. Beijing : Beijing University of Posts and Telecommunications, 2024.