Summaries

Article Title:

An Overview of Blockchain Technology: Architecture, Consensus, and Future Trends

Summary:

This article gives a detailed explanation about **blockchain technology**, covering its architecture with reference to the methods used to reach agreements (consensus mechanisms), the difficulties faced, and potential future development. The article explains blockchain technology as the following [1, pp. 558, 561].

Blockchain is a secure **tamper-proof ledger**. It is a series of blocks, each containing transaction data. Every block contains a unique hash and also includes the hash of the block before it, forming a secure chain. Each user possesses a **public and a private key pair** which allows them to sign transactions confirming that they are legitimate.

According to the use of blockchain, it can be classified into 3 types: **public blockchains** (like **Bitcoin**) that are open to anyone, **private blockchains** that are managed by a single organization, and **consortium blockchains** that are controlled by a pre-selected group of nodes.

The article explores **consensus algorithms** that are vital for blockchain operations, which includes: **proof of work** where miners solve complex puzzles and add a new block to the chain, **proof of stake** where stakeholders with an amount of cryptocurrency validate the transaction, and others like using a **fault-tolerant algorithm** like in **Hyperledger** [2, p. 560].

The main focus is given to the challenges that blockchain faces, including **scalability** (increasing the size of blockchain and limited transaction speed) and **privacy leakage** (public visibility of the ledger concerns privacy). The article provides answers by looking into new architectures and better storage techniques.

Future directions are also explored, such as expansion to **healthcare fields** and other industries beyond finance, using blockchain with **big data**, and addressing concerns about the **centralization of mining pools** [3, pp. 559, 562, 564].

Key Terms/Concepts:

- **Blockchain**
- **Bitcoin**
- **Cryptocurrency**
- **Decentralization**

Immutability

Consensus Algorithms (PoW, PoS, PBFT)

Scalability

Privacy

References:

[1] Z. Zheng, S. Xie, H. Dai, X. Chen, and H. Wang, "An Overview of Blockchain Technology: Architecture, Consensus, and Future Trends," 2017 IEEE 6th International Congress on Big Data, Honolulu, HI, 2017, pp. 558 , 561, doi: 10.1109/BigDataCongress.2017.85.
[2] Z. Zheng, S. Xie, H. Dai, X. Chen, and H. Wang, "An Overview of Blockchain Technology: Architecture, Consensus, and Future Trends," 2017 IEEE 6th International Congress on Big Data, Honolulu, HI, 2017, pp. 560, doi: 10.1109/BigDataCongress.2017.85.
[3] Z. Zheng, S. Xie, H. Dai, X. Chen, and H. Wang, "An Overview of Blockchain Technology: Architecture, Consensus, and Future Trends," 2017 IEEE 6th International Congress on Big Data, Honolulu, HI, 2017, pp. 559,562,564, doi: 10.1109/BigDataCongress.2017.85.

Article Title:

Blockchain: A Tale of Two Applications

Summary:

The article discusses the design and development of **YABW**[1, p 2] (**Yet Another Bitcoin Wallet**) and **CriptoSenhas**[2, p 13], a proof of concept application aimed at non-financial goals, specifically for exchanging meal vouchers among students at an institution. The main theme conveyed from the article is to explore the potential of **blockchain technology** beyond its association with cryptocurrency and specifically debunk the myth that blockchain has no use other than **cryptocurrency**.

The author discusses the design and development of **YABW**, highlighting key concepts of security considerations and outlines the architecture of the application, which is designed to be scalable and reusable in other scenarios as well. Then, the article shifts its focus to the **proof of work** concept, which is explored through the use of the **Ethereum** platform and the **ERC-20 standard** for its implementation.

The article concludes by discussing further research and exploration of blockchain in diverse fields and believes in the potential to revolutionize various industries while promoting **transparency** and **shared responsibility**, which were the main goals that **bitcoin** promised. [3, p 21]

Key Terms/Concepts:

Blockchain

Cryptocurrency

Bitcoin

Ethereum

ERC-20 Standard

References:

[1] M. Ferreira, S. Rodrigues, C. I. Reis, and M. Maximiano, “Blockchain: A Tale of Two Applications,” Appl. Sci., vol. 8, no. 9, p. 1506, Sep. 2018, doi: 10.3390/app8091506.P 2
[2] M. Ferreira, S. Rodrigues, C. I. Reis, and M. Maximiano, “Blockchain: A Tale of Two Applications,” Appl. Sci., vol. 8, no. 9, p. 1506, Sep. 2018, doi: 10.3390/app8091506.P 13
[3] M. Ferreira, S. Rodrigues, C. I. Reis, and M. Maximiano, “Blockchain: A Tale of Two Applications,” Appl. Sci., vol. 8, no. 9, p. 1506, Sep. 2018, doi: 10.3390/app8091506.P 21

Article Title:

Cryptocurrency and Blockchains: Retail to Institutional

Summary:

This paper investigates the possibilities of transferring **bitcoin** and **blockchain technologies** from **retail** to **institutional settings**. This study looks at the advantages and worth of integrating new technology with the current, conventional finance systems [1, p. 2].

The article provides an in-depth analysis of foreign exchange transactions as an example to compare the traditional and blockchain methods, demonstrating the potential cost savings. It also explores the possibility of paying taxes with **bitcoin** [2, p. 3] and highlights the benefits of holding **bitcoin** in **wallets**.

This article shifts the full focus to a well-known **trilemma** [3, p. 6], which posits that blockchain can only achieve two out of these three main goals: **decentralization**, **security**, and **scalability**. They discuss the limitations of the **proof of work** consensus mechanism and explore alternative solutions such as the growing concepts of **proof of stake** and **asynchronous consensus**.

The article also explores the evolution of **cryptocurrencies** from **retail-focused** platforms to more robust **institutional-grade** entities and the rise of **decentralized finance (DeFi)**.

Key Terms/Concepts:

Blockchain

Cryptocurrency

Proof of work

Proof of stake

DeFi

References:

[1] R. Low and T. Marsh, "Cryptocurrency and Blockchains: Retail to Institutional," Journal of Investing, (Forthcoming), p. 2.
[2] R. Low and T. Marsh, "Cryptocurrency and Blockchains: Retail to Institutional," Journal of Investing, (Forthcoming), p. 3.
[3] R. Low and T. Marsh, "Cryptocurrency and Blockchains: Retail to Institutional," Journal of Investing, (Forthcoming), p. 6.

Article Title:

Bitcoin: A Peer-to-Peer Electronic Cash System

Summary:

This article proposes a system of "Electronic transaction without relying on trust" called **Bitcoin** [1, p. 1]. The author **Satoshi Nakamoto** shows that traditional online payments are inherently flawed because they primarily rely on financial institutions as trusted third parties to process transactions. This creates several problems, including the possibility of reversal, increased transaction costs, and the risk of fraud.

The **Bitcoin** project aims to solve these key issues using a **peer-to-peer network** and **cryptographic proof** instead of mutual trust-based systems. Transactions are publicly announced and timestamped accordingly by hashing into a continuous chain of hashed-based **proof-of-work**, creating a permanent record that cannot be altered whatsoever [2, p. 1]. Redoing the work would require redoing the computational work, ensuring that the majority of nodes must agree on a single history of the transactions.

The system is designed based on the concept of **decentralization**, where nodes join and leave the network at will. **Miners** are intended to support the network while receiving rewards for creating blocks and collecting transaction fees. The difficulty of **proof of work** is adjusted accordingly to the rate of block creation, regardless of computational power changes [3, p. 3].

Nakamoto discusses the privacy implications of a public ledger and proposes the use of anonymous public keys to protect user identity. The article solves the main problem of **double-spending** by ensuring that honest nodes control a majority of the network, allowing for less malicious behavior [4, p. 5].

Key Terms/Concepts:

Peer-to-peer Network

Cryptographic proof

Double-spending

- **Hash-Based Proof-of-work**
- **Timestamp Server**
- **Merkle Tree**
- **Digital Signature**

References:

[1] S. Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System," 2008. [Online], p. 1.
[2] S. Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System," 2008. [Online], p. 1.
[3] S. Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System," 2008. [Online], p. 3.
[4] S. Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System," 2008. [Online], p. 5.

Article Title:

Blockchain in the Energy Sector: A Critical Assessment

Summary:

This article deep dives into fields where blockchain technologies have shifted, specifically the energy industry. However, it shows that the adoption of the technology is still relatively low compared to the significant strides made in other sectors such as **decentralized finance**, logistics, and **NFTs** [1, p. 2].

The article highlights the main reasons for this low adoption, which include the **technical limitations** of slow transactions compared to pre-existing platforms, as well as the lack of compelling **use cases** [2, p. 13]. Traditional systems often focus on transactional areas rather than procedural applications. The author also highlights the complexity of regulatory frameworks, where governing the infrastructure and financial systems creates uncertainty and discourages investment, as blockchain is still in its early days.

The article shifts focus to recent trends that could facilitate the broader adoption of blockchain in the energy sector. These include the shift to **proof of stake algorithms** to validate the system, as well as the move towards **permissioned blockchain** platforms [3, p. 8], which offer more efficient solutions for specific applications in certain industries. The study concludes that while blockchain may not revolutionize the energy sector as initially predicted, global adoption is steadily increasing as technology advances and new regulatory frameworks adapt [4, p. 13].

Key Terms/Concepts:

- **Blockchain**
- **Distributed Ledger Technologies (DLTs)**

Energy Web Foundations (EWF)

DeFi

NFTs

Permissioned Blockchain

Tokenization

Platform Economics

References:

[1] Burger, C.; Weinmann, J. Blockchain Platforms in Energy Markets—A Critical Assessment. J. Risk Financial Manag. 2022, 15, 516. [CrossRef] P. 2
[2] Burger, C.; Weinmann, J. Blockchain Platforms in Energy Markets—A Critical Assessment. J. Risk Financial Manag. 2022, 15, 516. [CrossRef] P. 13
[3] Burger, C.; Weinmann, J. Blockchain Platforms in Energy Markets—A Critical Assessment. J. Risk Financial Manag. 2022, 15, 516. [CrossRef] P. 8
[4] Burger, C.; Weinmann, J. Blockchain Platforms in Energy Markets—A Critical Assessment. J. Risk Financial Manag. 2022, 15, 516. [CrossRef] P. 13

Article Title:

Blockchain Distributed Ledger Technology: An Introduction and Focus on Smart Contracts

Summary:

Blockchain is a new type of database that aims at **security** and **transparency** for transaction recording [1, p. 4]. The article suggests that the technology has the potential to revolutionize the way businesses operate and interact with each other. One of the key benefits of blockchain comes from **smart contracts**, which are self-executing contracts that automate the processes of transferring money, assets, etc. The use of **smart contracts** is applicable in many scenarios. The article outlines examples such as **supply chain management**, **insurance claims processing** [2, p. 19].

The rapid evolution of **blockchain technology** requires many changes in the traditional system of how businesses operate and transact money and how these transactions are recorded. The technology has the potential to be **transformational** for society over the next several decades, much like the impact of the **internet** over the past 30 years.

Numerous exciting blockchain developments are ongoing, particularly in the finance area. As blockchain evolves, many business enterprises would be wise to consider how blockchain might transform their business processes [3, p. 25].

Key Terms/Concepts:

Blockchain

Smart Contracts

- **Distributed Ledger Technology**
- **Cryptocurrency**
- **Evolution**

References:

[1] Hamilton, M. Blockchain distributed ledger technology: An introduction and focus on smart contracts. J Corp Acct Fin. 2019; P. 4. https://doi.org/10.1002/jcaf.22421.
[2] Hamilton, M. Blockchain distributed ledger technology: An introduction and focus on smart contracts. J Corp Acct Fin. 2019; P. 19. https://doi.org/10.1002/jcaf.22421.
[3] Hamilton, M. Blockchain distributed ledger technology: An introduction and focus on smart contracts. J Corp Acct Fin. 2019; P. 25. https://doi.org/10.1002/jcaf.22421.

Article Title:

Blockchain in Finance: A Systematic Literature Review

Summary:

This article is a systematic literature review that examines the current state of **blockchain technology** in the financial sector [1, p. 1]. The review analyzes 54 articles focusing on the potential applications, benefits, and challenges faced by blockchain in the financial industry. The review finds that blockchain has the potential to significantly improve the areas of **efficiency**, **transparency**, and **security** of the financial industry.

The article highlights key benefits such as **reduced costs**, **increased trust**, and **improved risk management**. The potential application areas identified include: **payments**, **lending**, **digital currencies and assets**, **compliance and risk management**, **financial reporting and auditing**, **identity verification and security**, and **clearing and settlement** [2, p. 2].

However, the article shifts to several challenges that hinder the widespread adoption of blockchain in finance. These challenges include **regulatory constraints**, **scalability limitations**, and **security & privacy concerns**. Despite these challenges, the article concludes that there is potential for blockchain to transform the financial industry significantly. Further research is proposed to fully understand the technology's potential and address the existing challenges [3, p. 18].

Key Terms/Concepts:

- **Blockchain**
- **Finance**
- **Fintech**

Distributed Ledger Technology

Smart Contracts

Cryptocurrency

Benefits

Challenges

Applications

References:

[1] Karadag, B.; Zaim, A.H.; Akbulut, A. Blockchain in Finance: A Systematic Literature Review. Preprints 2024, 2024020690. P. 1 https://doi.org/10.20944/preprints202402.0690.v2.
[2] Karadag, B.; Zaim, A.H.; Akbulut, A. Blockchain in Finance: A Systematic Literature Review. Preprints 2024, 2024020690. P. 2 https://doi.org/10.20944/preprints202402.0690.v2.
[3] Karadag, B.; Zaim, A.H.; Akbulut, A. Blockchain in Finance: A Systematic Literature Review. Preprints 2024, 2024020690. P. 18 https://doi.org/10.20944/preprints202402.0690.v2.

Article Title:

Decentralized Finance (DeFi): Opportunities, Risks, and the Future of Finance

Summary:

Decentralized finance (DeFi) is a blockchain-based financial infrastructure built primarily on the **Ethereum** blockchain. It replicates the financial industry but in a more open, transparent manner. The **DeFi ecosystem** uses **smart contracts** to create protocols that facilitate a range of financial activities, including **decentralized exchanges**, **asset management**, etc. [1, p. 1, 2].

DeFi offers several potential benefits such as **efficiency** and **transparency**. **Smart contracts** can automate processes, reduce costs, and increase speed. The public nature of **blockchain**, such as in **bitcoin**, ensures transparency, allowing all transactions to be publicly audited [2, p. 59]. DeFi platforms are also permissionless, offering access to anyone with an internet connection.

However, **DeFi** also presents several risks. **Smart contracts** have vulnerabilities, leading to exploitations that result in financial losses. Operational security risks arise from the use of admin keys and the potential for malicious actors. Despite these risks, the article concludes that **DeFi** has the potential to transform the financial industry by contributing to an open, transparent financial infrastructure [3, p. 75].

Key Terms/Concepts:

Decentralized Finance (DeFi)

Ethereum

Blockchain

Smart Contracts

Decentralized Exchanges

Decentralized Lending

On-Chain Asset Management

Stable Coins

Tokenization

References:

[1] Schär, F. Decentralized Finance: On Blockchain- and Smart Contract-based Financial Markets. Journal of Finance, forthcoming. P. 1, 2
[2] Schär, F. Decentralized Finance: On Blockchain- and Smart Contract-based Financial Markets. Journal of Finance, forthcoming. P. 59
[3] Schär, F. Decentralized Finance: On Blockchain- and Smart Contract-based Financial Markets. Journal of Finance, forthcoming. P. 75

Article Title:

Distributed Ledger Technology: Potential and Challenges in Payments, Clearing, and Settlement

Summary:

Distributed Ledger Technology (DLT), which uses **Blockchain** technology, is poised to revolutionize financial markets, particularly focusing on **payments**, **clearing**, and **settlement** processes. DLT operates through a network of nodes that share a common ledger, enabling peer-to-peer connectivity and eliminating the need for a central authority. **Cryptography** ensures more secure transaction validation and data encryption, while **smart contracts** automate predefined events based on contractual terms [1, p. 10].

The article explores the advantages of DLT over traditional financial systems, which include reduced complexity, faster processing speeds, enhanced transparency, and mitigated financial operations and risks [2, p. 16]. However, the article also identifies challenges, such as the high cost of implementation, the need for widespread participation, and the requirement of reliable consensus systems to handle large transactional volumes. Legal considerations are also explored, such as establishing a clear legal basis for DLT components like shares, ledgers, digital assets, and smart contracts, while complying with existing regulations like the **Anti-Money Laundering (AML)** act.

The article concludes with the potential for the widespread adoption of DLT in the financial industry, while also outlining the security risks it poses, including cyberattacks and liquidity risks. The article stresses the need to address **credit** and **liquidity** risks, ensuring a secure and reliable system for stakeholders, regulators, and policymakers [3, p. 22].

Key Terms/Concepts:

- **Distributed Ledger Technology (DLT)**
- **Blockchain**
- **Payments**, **Clearing**, and **Settlement (PCS)**
- **Peer-to-Peer Networking**
- **Cryptography**
- **Smart Contracts**
- **Financial Market Infrastructure (FMI)**
- **Settlement Finality**
- **Operational Risk**
- **Governance**

References:

[1] Ellithorpe, M.; Kargenian, V., et al. “Distributed Ledger Technology in Payments, Clearing, and Settlement.” Finance and Economics Discussion Series 2016-095. Washington: Board of Governors of the Federal Reserve System, 2016.
[2] Ellithorpe, M.; Kargenian, V., et al. “Distributed Ledger Technology in Payments, Clearing, and Settlement.” Finance and Economics Discussion Series 2016-095. Washington: Board of Governors of the Federal Reserve System, 2016. P. 16
[3] Ellithorpe, M.; Kargenian, V., et al. “Distributed Ledger Technology in Payments, Clearing, and Settlement.” Finance and Economics Discussion Series 2016-095. Washington: Board of Governors of the Federal Reserve System, 2016. P. 22

Article Title:

Finance Infrastructure Through Blockchain-Based Tokenization

Summary:

The article explores the potential of blockchain technology to transform infrastructure in finance, particularly through **tokenization** [1, p. 9-10]. Tokenization involves representing ownership of assets on the blockchain. This process offers several advantages over traditional methods, including enhanced liquidity, increased transparency, and improved **transaction efficiency**.

Assets are traditionally illiquid, with limited trading options in traditional finance systems, but **tokenization** can facilitate fractional ownership, enabling a broader range of investors and therefore increasing liquidity. Moreover, the article shifts focus to **smart contracts** that can automate transactions without the need for a central authority to govern. Blockchain's inherent **transparency** [2, pp. 24-25] ensures that all transactions are immutable and can be easily audited, improving accountability and trust.

The article concludes with a reference to ZiyenCoin as a case study, highlighting the process of tokenizing oil and gas and discovering barriers to widespread adoption, including technical challenges, limited public awareness, and volatility in the token market [3, p. 55].

Key Terms/Concepts:

- **Infrastructure Finance**
- **Blockchain**
- **Tokenization**
- **Security Token Offering (STO)**
- **Smart Contracts**
- **Liquidity**
- **Transparency**
- **Transaction Efficiency**
- **ZiyenCoin**
- **Regulatory Uncertainties**
- **Technical Challenges**

References:

[1] Tian, Y., Lu, Z., Adriaens, P., Minchin, R. E., Caithness, A., & Woo, J. (2020). Finance infrastructure through blockchain-based tokenization. P. 9-10 Frontiers of Engineering Management, p 485–499.
[2] Tian, Y., Lu, Z., Adriaens, P., Minchin, R. E., Caithness, A., & Woo, J. (2020). Finance infrastructure through blockchain-based tokenization. P. 24-25 Frontiers of Engineering Management, p 485–499.
[3] Tian, Y., Lu, Z., Adriaens, P., Minchin, R. E., Caithness, A., & Woo, J. (2020). Finance infrastructure through blockchain-based tokenization. P. 55 Frontiers of Engineering Management, p 485–499.

Article Title:

A Blockchain-Based Peer-to-Peer Transaction Method for E-Commerce

Summary:

This article proposes a new method for peer-to-peer transactions using **blockchain technology**. The authors argue that the existing financial system suffers from security risks such as information leaks and data tampering [1, p. 2]. It also highlights the fact that reliance on third-party platforms introduces issues with trust and increased transaction costs.

To address these issues, the proposed method utilizes blockchain technology, **smart contracts**, and electronic transactions. The system includes a mechanism linking physical assets with digital assets, where digital asset credits serve as a deposit to deter fraudulent behavior. The article also explores how the system uses an **encoding algorithm** [2, p. 3] to protect sensitive data during transactions and mentions how cracking the code is impractical, addressing privacy concerns.

The authors implemented a simulation of the proposed method using the Go language and surveyed 50 students who tested the system and provided positive feedback, expressing a preference for the decentralized approach and the enhanced security features. The article concludes with the potential for the proposed method to be integrated into the real economy, improving transactions and reducing the existing monopoly of third-party intermediaries.

Key Terms/Concepts:

- **Blockchain Technology**
- **Peer-to-Peer Transactions**
- **E-commerce**
- **Smart Contracts**
- **Data Security**
- **Encoding Algorithm**
- **Digital Assets**
- **Credit Deposits**
- **Decentralization**

References:

[1] Su, X., Liu, Y., & Choi, C. (2020). A Blockchain-Based P2P Transaction Method and Sensitive Data Encoding for E-Commerce Transactions. IEEE Consumer Electronics Magazine, 9(3), 75–83. P. 2
[2] Su, X., Liu, Y., & Choi, C. (2020). A Blockchain-Based P2P Transaction Method and Sensitive Data Encoding for E-Commerce Transactions. IEEE Consumer Electronics Magazine, 9(3), 75–83. P. 3

Article Title:

An Overview of Regulatory Strategies on Crypto-Asset Regulation

Summary:

The rise of **crypto-assets** presents numerous benefits and risks for financial regulators. **Crypto-assets**, a form of **fintech** innovation, could have a significant impact on areas like **payment**, **investment**, and capital raising [1, p. 130], potentially leading to regulatory arbitrage. The challenge for regulators is finding a balance between innovation and mitigating risks associated with this new technology, such as **money laundering**, **fraud**, and **investor protection** throughout.

The **jurisdictions** have come up with several rules, ranging from complete bans to principle-based regulations. The paper identifies key principles for crypto-assets regulation and proposes the "same services, same risks, same rules, same supervision" approach to ensure a level playing field [2, p. 142]. This encourages neutrality in regulations, focusing on function rather than underlying technology.

The author advocates for a unified approach, starting with information campaigns and warnings to educate the public about **crypto-asset** risk. The paper also discusses regulatory sandboxes to enable innovation while mitigating risks.

The paper concludes by highlighting the challenges for **Western Balkan** financial regulators in developing an appropriate regulatory approach, given the region's bank-centered financial systems and the need to harmonize with EU regulations [1, p. 165].

Key Terms/Concepts:

- **Crypto-assets**
- **Virtual Currencies**
- **Blockchain Technology**
- **Fintech**
- **Financial Regulation**
- **Regulatory Strategies**
- **Risk Management**
- **Investor Protection**
- **Regulatory Sandboxes**
- **Western Balkans**

References:

[1] Jovanic, T. An Overview of Regulatory Strategies on Crypto-Asset Regulation: Challenges for Financial Regulators in the Western Balkans. In EU Financial Regulation and Markets - Beyond Fragmentation and Differentiation; Bajakić, I., Božina Beroš, M., Eds.; Conference Proceedings; Zagreb, 2020. P. 130
[2] Jovanic, T. An Overview of Regulatory Strategies on Crypto-Asset Regulation: Challenges for Financial Regulators in the Western Balkans. In EU Financial Regulation and Markets - Beyond Fragmentation and Differentiation; Bajakić, I., Božina Beroš, M., Eds.; Conference Proceedings; Zagreb, 2020. P. 142
[3] Jovanic, T. An Overview of Regulatory Strategies on Crypto-Asset Regulation: Challenges for Financial Regulators in the Western Balkans. In EU Financial Regulation

and Markets - Beyond Fragmentation and Differentiation; Bajakić, I., Božina Beroš, M., Eds.; Conference Proceedings; Zagreb, 2020. P. 165

Article Title:

A Compliant-by-Design Blockchain-Based KYC/ICO System

Summary:

This article addresses the challenges of implementing Know Your Customer (KYC) regulations in Initial Coin Offerings (ICO), which are important for introducing new crypto coins [1, pp. 1-2]. Due to the decentralized nature of blockchain technology, ensuring KYC and Anti-Money Laundering (AML) regulations presents unique challenges. The author proposes a novel blockchain-based system KYC/ICO system that is designed to be compliant-by-design, meaning the system is built to automatically enforce regulatory requirements.

The author analyzes relevant EU and German regulations including AMLD5 and GwG [2, pp. 1-4] to identify key design objectives for the system. These objectives include secure identity verification using electronic identification schemes, such as the German eID system, etc.

The proposed system integrates the KYC process directly into the ICO investment flow. Investors first transfer funds to a smart contract, which acts as an escrow holder. The investor then completes the KYC process using an eIDAS-compliant eID system. The KYC provider verifies the identity and records the completion status on the blockchain. The ICO emitter then reviews the KYC information and decides whether to accept the investment, triggering the release of tokens to the investor.

The article proposes a prototype for implementing and discusses the system in terms of legal compliance, technical feasibility, and user acceptance. It acknowledges the limitations and the need for further research at the end.

Key Terms/Concepts:

- Know Your Customer (KYC)
- Initial Coin Offering (ICO)
- Blockchain Technology
- AMLD5
- GwG
- GDPR
- eIDAS

Electronic Identification

Smart Contracts

Compliance-by-Design

Decentralized Finance

References:

[1] Ostern, N. K.; Riedel, J. Know-Your-Customer (KYC) Requirements for Initial Coin Offerings: Toward Designing a Compliant-by-Design KYC-System Based on Blockchain Technology. Bus. Inf. Syst. Eng. 2021, 63 (5), 551–567. P. 1-2
[2] Ostern, N. K.; Riedel, J. Know-Your-Customer (KYC) Requirements for Initial Coin Offerings: Toward Designing a Compliant-by-Design KYC-System Based on Blockchain Technology. Bus. Inf. Syst. Eng. 2021, 63 (5), 551–567. P. 1-4

Article Title:

Unchaining Collective Intelligence for Science, Research and Technology Development by Blockchain-Boosted Community Participation

Summary:

The article explores how blockchain can revolutionize organizations in the process of research and development (R&D). The author argues that blockchain can address various challenges within the current scientific landscape, particularly issues related to reproducibility and transparency. [1, p. 4]

The author highlights the key features of blockchain that are relevant to science and RTD [1, p. 4], including its decentralized nature, the immutability of recorded data, the use of smart contracts for automation and enhancing trust, and the implementation of tokenization in economies.

The paper proposes a decentralized concept that utilizes the blockchain mechanics like reputation systems and prediction markets to improve the efficiency and effectiveness of scientific collaboration and knowledge creation. The authors argue that a blockchain-based token economy can foster a more inclusive, community-driven approach to science and R&D, leveraging collective intelligence and expertise from a broader range of contributors.

The paper concludes by discussing the similarities between the blockchain protocols and traditional workings of scientific communities, arguing that it can amplify the existing scientific community workings and practices. Blockchain can transform science and R&D into a truly global and open "internet of knowledge," leading to more transparent, credible, and impactful research outcomes [2, pp. 5, 8-9].

Key Terms/Concepts:

Token Economy

Crypto economy

Consensus

Reputation Systems

Liquid Democracy

Participatory Research

Collective Intelligence

Reproducibility Crisis

Intellectual Property (IP)

Non-Fungible Tokens (NFTs)

Decentralized Autonomous Organizations (DAOs)

Prediction Markets

References:

[1] Lawton, J. (2021). Unchaining Collective Intelligence for Science, Research and Technology Development by Blockchain-Boosted Community Participation. Frontiers in Blockchain, p. 4.
[2] Lawton, J. (2021). Unchaining Collective Intelligence for Science, Research and Technology Development by Blockchain-Boosted Community Participation. Frontiers in Blockchain, p. 5, 8-9.

Article Title:

A Comprehensive Review of Cryptocurrencies in Finance

Summary:

The article provides a comprehensive review of the application of bitcoin and cryptocurrency in finance. The review focuses on three key areas: price formation, market efficiency, and investment with diversification.

The article first examines the factors that influence cryptocurrency prices and highlights the role of market liquidity, trading volume, transaction costs, and news information flow in driving price fluctuations [1, p. 3-4].

The review then explores the efficiency of cryptocurrency markets. While some studies suggest that bitcoin markets have moved towards more efficiency in recent years, empirical studies indicate that they are still inefficient, exhibiting significant price volatility and long-range memory along the way.

Finally, the source discusses the use of cryptocurrency in investment and diversification strategies. Cryptocurrencies offer potential benefits due to their low correlation with traditional asset classes. However, concerns remain regarding

their long-term sustainability and the high volatility risk they pose to portfolio performance [2, p. 9].

Key Terms/Concepts:

- Bitcoin
- Cryptocurrencies
- Price Formation
- Market Efficiency
- Portfolio Strategy
- Investment
- Diversification
- Blockchain
- Distributed Ledger Technology (DLT)

References:

[1] Flori, A. Cryptocurrencies in Finance: Review and Applications. International Journal of Theoretical and Applied Finance 2019, 22 (4), 1950020. P 3-4.
[2] Flori, A. Cryptocurrencies in Finance: Review and Applications. International Journal of Theoretical and Applied Finance 2019, 22 (4), 1950020. P 9.

Article Title:

Blockchain Applications for Industry 4.0 and Industrial IoT

Summary:

This article provides a comprehensive review of the application of blockchain within the context of Industry 4.0. The author argues that blockchain has the potential to address the main challenges faced by various industrial sectors, particularly those related to data security, transparency, and automation [1, pp. 1, 10].

The article identifies several key areas where blockchain is being actively researched and implemented, such as for patient data management, in supply chain/logistics for product management, and in the power industry for energy trading, etc.

The author also discusses open challenges and newer application areas for blockchain inIndustry 4.0. These include scalability,security and privacy concerns, energy and cost efficiency, resource constraints of IoT devices, and the need for regulatory frameworks. Newer application areas include the drone industry, education, and the music and taxi industries.

Key Terms/Concepts:

Blockchain

Industry 4.0

Industrial Internet of Things (IIoT)

Smart Contracts

Data Security

Transparency

Automation

Traceability

Peer-to-Peer (P2P)

Smart Grids

Supply Chain Management

References:

[1] Alladi, T.; Chamola, V.; Parizi, R.M.; Choo, K.-K.R. Blockchain Applications for Industry 4.0 and Industrial IoT: A Review. IEEE Access 2019, 7, 154518–154544. https://doi.org/10.1109/ACCESS.2019.2956748.P. 1, 10

Article Title:

An Architecture for Blockchain-Based Cloud Banking

Summary:

This article proposes a two-tier blockchain framework specifically designed for cloud banking applications. The framework addresses the lack of practical blockchain solutions for domestic banking that would enhance security, transparency, and efficiency [1, pp. 1, 4].

The proposed architecture distinguishes between master nodes (block generators) and normal nodes (transaction validators). The framework incorporates several innovative features, including an identification protocol that verifies customer identities, a dual token model that employs a native token for staking and rewards, and a group clearing protocol [2, pp. 9-10] that enables efficient settlement among multiple banks.

The article argues that this architecture offers several advantages over existing public, private, and consortium blockchains, including enhanced security, scalability, decentralization, fairness for developers, and regulatory compliance. The author envisions the framework as a foundation for an open API platform that will foster innovation in payment and financial applications while promoting financial inclusion.

Key Terms/Concepts:

Blockchain

Cloud Banking

Distributed Ledger Technology

Master Nodes

Normal Nodes

Identification Protocol

Stable Coins

Group Clearing

Nomination Mechanism

Reputation System

Decentralization

Scalability

Security

Regulatory Compliance

References:

[1] Do, T. An Architecture for Blockchain-Based Cloud Banking. In Emerging Trends in Intelligent Computing, Communication and Devices; Balas, V.E., Jain, L.C., Eds.; Lecture Notes in Networks and Systems; Springer: Cham, Switzerland, 2021; Vol. 163, p 1, 4
[2] Intelligent Computing, Communication and Devices; Balas, V.E., Jain, L.C., Eds.; Lecture Notes in Networks and Systems; Springer: Cham, Switzerland, 2021; Vol. 163, p 9-10

Article Title:

AI-Powered Blockchain Technology in Industry 4.0

Summary:

This research proposal explores the convergence of Artificial Intelligence (AI) and blockchain technology and their combined potential to transform Industry 4.0. The article highlights the synergistic relationship between AI and Blockchain, with AI bringing intelligent decision-making capabilities, while blockchain provides a secure and transparent framework for data storage and transaction execution.

The article outlines a range of applications for this technology across diverse industry sectors [1, pp. 21, 27, 32, 37, 40]:

- Smart Contracts and automation: automated supply chain management, intelligent manufacturing, predictive maintenance, and decentralized energy trading.
- Supply Chain Management: enhanced traceability, efficient inventory management, and demand forecasting.

Predictive Maintenance: condition monitoring, anomaly detection, and PMaaS (Predictive Maintenance as a Service).

Quality Control: immutable data management, AI-driven inspection, and collaborative quality management.

Decentralized Decision-Making: data sharing, consensus, and development of DAOs (Decentralized Autonomous Organizations).

However, the article also identifies several challenges such as scalability, privacy and security concerns, skill gaps, and adoption barriers.

The article concludes by examining the societal implications and opportunities of AI-powered blockchain. It emphasizes the role of DAOs, decentralized marketplaces, and sharing economies in empowering progress and innovation. The proposal stresses the need for collaborative efforts to mitigate challenges through technical solutions, regulatory frameworks, security measures, and ethical considerations.

Key Terms/Concepts:

Artificial Intelligence (AI)

Blockchain

Industry 4.0

Supply Chain Management

Predictive Maintenance

Quality Control

Decentralized Autonomous Organizations (DAOs)

Smart Contracts

References:

Gebert, M. AI-Powered Blockchain Technology in Industry 4.0: Exploring the Transformative Synergy of AI and Blockchain Technologies. ResearchGate 2024. https://doi.org/10.13140/RG.2.2.16929.21600, pp. 21, 27, 32, 37, 40

Article Title:

DeFi-ning DeFi: Advantages, Challenges and the Pathway Forward

Summary:

This article explores the field of decentralized finance (DeFi), examining its potential to revolutionize traditional financial services by leveraging blockchain technology with smart contracts [1, pp. 1, 3]. The authors outline the key advantages of DeFi, including permissionless access, trustlessness, transparency, interconnectedness, decentralized governance, and self-sovereignty for users. The article provides a detailed overview of the DeFi ecosystem, categorizing it into five main areas:

- Lending platforms (lending and borrowing using smart contracts)
- Assets (tokenized assets and management)
- Decentralized Exchanges (DEXes for cryptocurrency trading)
- Derivative services
- Payment networks

The article discusses the economics and governance of DeFi, noting its rapid growth and the adoption of decentralized governance models. The authors then shift focus to key challenges faced by DeFi, such as security, limited scalability, reliance on external data sources, transparency issues, regulation, legal status, and privacy concerns.

In conclusion, the article emphasizes DeFi's potential to transform the financial landscape and stresses the importance of addressing these challenges for DeFi to achieve long-term sustainability and mass adoption.

Key Terms/Concepts:

- Decentralized Finance (DeFi)
- Blockchain
- Smart Contracts
- Lending Platforms
- Decentralized Exchanges (DEXes)
- Derivative Services
- Payment Networks
- Security
- Scalability
- Oracles
- Regulation
- Privacy

References:

Amler, H.; Eckey, L.; Faust, S.; Kaiser, M.; Sandner, P.; Schlosser, B. DeFi-ning DeFi: Challenges & Pathway. 2020. P. 1, 3

Amler, H.; Eckey, L.; Faust, S.; Kaiser, M.; Sandner, P.; Schlosser, B. DeFi-ning DeFi: Challenges & Pathway. 2020. P. 14

Article Title:

Scaling Up Sustainable Investment Through Blockchain-Based Project Bonds

Summary:

The article explores the potential of financial technologies, particularly using blockchain-based solutions, to mobilize domestic savings for sustainable investments in low- and middle-income countries (LMICs) [1, p. 2]. The authors argue that LMICs face a significant need for investment in sustainable infrastructure, including renewable energy, to align with global climate goals and achieve sustainable development. They emphasize that the current approach, which blends finance and private capital from high-income countries, has limitations and inherent risks such as debt traps [2, pp. 1, 5].

The article proposes a blueprint based on blockchain that raises funding from digital crowdfunding platforms. These platforms would enable transparency, recording, and certification of project proceeds and revenue streams. The proposed system would have several advantages, such as mobilizing domestic savings, encouraging local currency investments, enhancing transparency, and providing proof of impact reporting, which boosts investor confidence.

The article acknowledges the implications and challenges such as the digital infrastructure gap in LMICs and the need for support [3, p. 14].

Key Terms/Concepts:

- Sustainable Investment
- Blockchain
- Fintech
- Project Bonds
- Crowdfunding
- LMICs
- Domestic Resource Mobilization
- Transparency
- Accountability
- Digital Infrastructure

References:

Chen, Y.; Volz, U. Scaling Up Sustainable Investment Through Blockchain-Based Project Bonds. Dev. Policy Rev. 2022, 40, 39–57, P. 2

Chen, Y.; Volz, U. Scaling Up Sustainable Investment Through Blockchain-Based Project Bonds. Dev. Policy Rev. 2022, 40, 39–57, P. 1, 5

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