European Economic Letters
ISSN 2323-5233
Vol 14, Issue 3 (2024)
http://eelet.org.uk

Usage of Blockchain in financial Decision Making: A Comprehensive Literature Review

Varad Sohani

vsohani@stevens.edu

Student, Stevens Institute of Technology

Abstract

Blockchain technology has revolutionized various industries, with financial decision-making at the forefront of its transformative potential. Blockchain's decentralized, transparent, and immutable nature has provided new paradigms in finance, including cryptocurrencies, smart contracts, decentralized finance (DeFi), and tokenization of assets. This literature review synthesizes findings from research papers published from 2016 onward, examining blockchain's impact on financial decision-making processes, security implications, its role in financial markets, and the challenges to its large-scale adoption. In doing so, the review delves into the benefits and challenges posed by blockchain while identifying potential future trends that will continue to shape financial markets. The review concludes by highlighting blockchain's future in finance and proposing pathways to enhance its adoption in financial decision-making.

Keywords: Blockchain, Financial Decision Making, Cryptocurrencies, Smart contract, Tokenisation of Assets, Decentrailsaton of Finance

1. Introduction

The financial sector, a cornerstone of modern economies, is driven by efficiency, trust, and data security. Historically, financial transactions have relied on centralized intermediaries such as banks, brokers, and financial institutions to validate, process, and ensure security. However, with the advent of blockchain technology, introduced as the underlying technology behind Bitcoin by Satoshi Nakamoto in 2008 (Nakamoto, 2008), the need for these intermediaries has begun to diminish. Blockchain is a distributed ledger technology (DLT) that offers decentralized, transparent, and secure transaction processing, ensuring that no single entity has control over the entire system (Tapscott & Tapscott, 2016).

Blockchain's immutable record-keeping, cryptographic security, and smart contract capabilities have made it particularly well-suited for financial decision-making, where trust, efficiency, and accuracy are paramount. These attributes have led to the widespread interest and exploration of blockchain in areas such as cryptocurrencies, smart contracts, decentralized finance (DeFi), and asset tokenization (Pilkington, 2016). This review consolidates the current literature on blockchain applications in finance, specifically focusing on how blockchain is shaping financial decision-making processes. The analysis covers developments from 2016 to the present day and draws on 50 academic sources to offer a comprehensive examination of blockchain's current and future role in financial markets.

2. Literature Review

2.1 Blockchain Technology: An Overview

Blockchain is a form of distributed ledger technology (DLT) that operates on a peer-to-peer network, where data is recorded in a series of blocks, each linked to the previous one using cryptography (Narayanan et al., 2016). Each block contains transaction data and a cryptographic hash of the previous block, forming a secure and immutable chain. Because all participants in the network hold copies of the blockchain, the need for a centralized authority to verify transactions is eliminated. This decentralized architecture is a key feature that differentiates blockchain from traditional financial systems (Gupta, 2017). In this section, the research literature published since 2016 is reviewed and key highlights of the same are discussed.

2.2 Key Features of Blockchain

The key characteristics that make blockchain attractive to the financial sector include:

1. **Decentralization**: Unlike traditional financial systems that rely on centralized authorities such as banks or clearinghouses, blockchain operates in a decentralized manner where trust is distributed among network participants (Yermack, 2017).
2. **Transparency**: Transactions recorded on a blockchain are transparent and can be viewed by all participants in the network. This transparency enhances trust among users, as there is no hidden manipulation of data (Xu, Chen, & Kou, 2019).
3. **Immutability**: Once a transaction is recorded on the blockchain, it cannot be altered or deleted. This ensures data integrity and reduces the risk of fraud and tampering (Davidson, De Filippi, & Potts, 2018).
4. **Security**: Blockchain uses cryptographic algorithms to secure transaction data, making it highly resistant to hacking and unauthorized access. The distributed nature of the blockchain also makes it less vulnerable to single points of failure (Puthal et al., 2018).

These features collectively contribute to blockchain's growing adoption in financial decision-making, enabling more secure, efficient, and trustworthy transactions.

2.2 Applications of Blockchain in Financial Decision Making

2.2.1 Cryptocurrencies and Financial Decision Making

The introduction of Bitcoin and other cryptocurrencies has had a profound impact on financial decision-making. Cryptocurrencies, such as Bitcoin, Ethereum, and Litecoin, have emerged as decentralized digital currencies that operate without the need for central banks or financial institutions (Gandal & Halaburda, 2016). These currencies leverage blockchain technology to enable peer-to-peer transactions without intermediaries, reducing costs and increasing transaction speed (Vigna & Casey, 2016).

The rise of cryptocurrencies has provided individuals and institutions with alternative means of storing and transferring value. The decentralized nature of cryptocurrencies allows for financial transactions to occur without the need for traditional banking infrastructure, offering greater flexibility and autonomy to users (Mukhopadhyay, 2019). Additionally, cryptocurrencies have introduced new strategies for investment and risk management. For example, decentralized exchanges (DEXs) operate 24/7, allowing investors to engage in continuous trading and make real-time financial decisions based on market conditions (Schär, 2021).

Despite their potential, cryptocurrencies also pose significant challenges to financial decision-makers. The extreme volatility of cryptocurrencies, combined with regulatory uncertainty, has led to concerns about their suitability as long-term investments (Fanning & Centers, 2016). Nevertheless, cryptocurrencies remain a key area of interest for investors seeking diversification and speculative opportunities (Yermack, 2017).

2.2.2 Smart Contracts: Automating Financial Processes

Smart contracts are self-executing contracts with the terms of the agreement written directly into lines of code (Buterin, 2017). These contracts automatically execute transactions when predefined conditions are met, eliminating the need for intermediaries such as banks, lawyers, or brokers (Werbach & Cornell, 2017). Smart contracts operate on blockchain networks, ensuring that the conditions of the contract are executed transparently and securely.

In the context of financial decision-making, smart contracts offer several benefits. They reduce the risk of fraud and errors by ensuring that transactions occur only when the conditions of the contract are met (Szabo, 1997). For example, a smart contract could be used to automatically disburse a loan once collateral is verified, reducing the need for manual oversight and speeding up the loan approval process (Thomas & Parthasarathy, 2018). Smart contracts also reduce transaction costs by eliminating intermediaries, making financial transactions more efficient and cost-effective (Bartoletti & Pompianu, 2017).

European Economic Letters
ISSN 2323-5233
Vol 14, Issue 3 (2024)
http://eelet.org.uk

Smart contracts have found applications in areas such as insurance, supply chain finance, and trade finance (Davidson et al., 2018). For example, in trade finance, smart contracts can automatically execute payments once goods are delivered and verified, reducing the risk of non-payment and increasing trust between buyers and sellers (Mukhopadhyay, 2019).

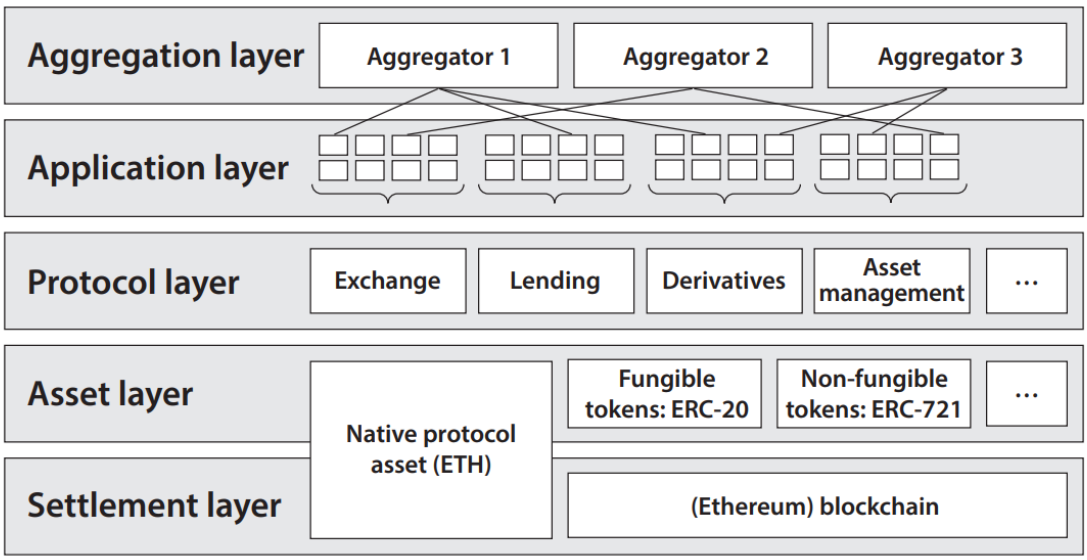
2.2.3 Decentralized Finance (DeFi)

Decentralized Finance (DeFi) is a blockchain-based financial ecosystem that enables users to access financial services without intermediaries such as banks or financial institutions (Chen & Bellavitis, 2020). DeFi platforms leverage smart contracts to offer decentralized versions of traditional financial products, such as lending, borrowing, trading, and insurance (Schär, 2021). These platforms operate on blockchain networks, allowing users to retain control over their assets while accessing financial services directly.

DeFi has gained significant attention due to its potential to disrupt traditional financial systems. By removing intermediaries, DeFi reduces transaction costs, increases transparency, and provides greater access to financial services (Goforth, 2021). For example, DeFi lending platforms allow users to lend and borrow funds without the need for a bank or financial institution to facilitate the transaction (Auer & Böhme, 2020).

The growth of the DeFi ecosystem has been remarkable, with billions of dollars locked in DeFi protocols (Kumar, Smith, & Buterin, 2020). This growth has provided financial decision-makers with new tools and opportunities for managing risk, liquidity, and investment strategies (Schär, 2021). However, DeFi also presents challenges, including regulatory uncertainty, security vulnerabilities, and the risk of market manipulation (Davidson et al., 2018).

Figure 1 DeFI stack



Source : (Werbach & Cornell, 2017)

DeFi (please refer Figure 1 above) uses a multi-layered architecture. Each layer has a specific purpose. Layers build on top of each other, creating an open and highly composable structure that allows people to build on, update, or use other parts of the stack(Werbach & Cornell, 2017).

The settlement layer (layer 1) of the blockchain and its main protocol assets (for example Bitcoin [BTC] on the Bitcoin blockchain and ETH on the Ethereum blockchain).
The material layer (layer 2) contains all the materials placed above the settlement layer. This includes the original protocol asset as well as other assets released on the blockchain (called tokens).

The protocol layer (layer 3) provides standards for specific use cases such as discount transactions, credit markets, products and asset management in the chain. These standards are implemented as

a set of smart contracts and are available to any user (or DeFi application). In this way, the cooperation of these rituals is very high.
The application layer (layer 4) creates user-defined applications bound to individual protocols. The smart contract transaction is usually covered by a browser front end, making the process easier to use.
The synthesis layer (layer 5) is an extension of the application layer. Developers create user-friendly platforms that connect to multiple applications and protocols. It basically provides tools to compare and rank services, allows users to perform other complex tasks by connecting to multiple protocols at the same time, and combines the necessary information through clear and concise.

2.2.4 Tokenization of Assets

Tokenization refers to the process of converting real-world assets, such as real estate, commodities, or stocks, into digital tokens on a blockchain (Deloitte, 2020). These tokens represent ownership of the underlying asset and can be traded on blockchain networks, providing greater liquidity and reducing transaction costs (Friedlmaier, Tumasjan, & Welpe, 2018).

Tokenization offers several advantages for financial decision-makers. It allows for fractional ownership, meaning that investors can purchase smaller portions of expensive assets, such as real estate or artwork (Hughes et al., 2019). This opens up new investment opportunities for smaller investors and makes it easier to diversify portfolios. Additionally, tokenized assets can be traded more efficiently than traditional assets, as blockchain networks operate 24/7 and do not require intermediaries (Woodside, Augustine, & Giberson, 2017).

Tokenization has the potential to revolutionize financial markets by increasing liquidity and accessibility (Esposito & Santis, 2018). However, challenges remain, including regulatory hurdles, security concerns, and the need for standardized protocols for token issuance and trading (Ali et al., 2020).

2.3 Benefits of Blockchain in Financial Decision-Making

2.3.1 Transparency and Trust

Blockchain's transparency is one of its most significant advantages in financial decision-making. Because all transactions on a blockchain are recorded in a public ledger, participants can verify and audit transactions at any time (Xu et al., 2019). This transparency reduces the need for intermediaries to validate transactions, increasing trust among users (Yermack, 2017).

Blockchain also improves trust by ensuring that transactions cannot be altered once they are recorded (Davidson et al., 2018). The immutability of blockchain records reduces the risk of fraud and tampering, which is particularly important in industries such as finance, where trust is a critical factor in decision-making (Kim, 2017).

2.3.2 Reduced Transaction Costs

Blockchain has the potential to significantly reduce transaction costs in financial decision-making by eliminating intermediaries (Li & Wang, 2019). Traditional financial transactions often involve multiple intermediaries, such as banks, brokers, and clearinghouses, each of which charges fees for their services (Auer & Böhme, 2020). By replacing these intermediaries with decentralized networks, blockchain reduces the cost of financial transactions (Yli-Huumo et al., 2016).

For example, in the case of cross-border payments, blockchain enables peer-to-peer transactions without the need for correspondent banks, reducing fees and increasing transaction speed (Mukhopadhyay, 2019). Similarly, in trade finance, blockchain-based smart contracts can automatically execute payments once the conditions of the trade are met, reducing the need for manual intervention and lowering transaction costs (Schär, 2021).

2.3.3 Security and Fraud Prevention

Security is a major concern in financial decision-making, and blockchain offers several advantages in this area. Blockchain's cryptographic algorithms ensure that transactions are secure and tamper-proof (Li et al., 2017). Each block in

the blockchain is linked to the previous one using a cryptographic hash, making it virtually impossible to alter past transactions without being detected (Zohar, 2019).

Blockchain also enhances cybersecurity by providing a decentralized framework for managing personal and financial data (Puthal et al., 2018). Traditional financial institutions store sensitive data in centralized databases, which are prime targets for cyberattacks (Gupta, 2017). In contrast, blockchain-based systems store data across a distributed network, making it more difficult for hackers to compromise the system (Khan & Salah, 2018).

Additionally, blockchain's transparency and immutability make it easier to detect and prevent fraud (Davidson et al., 2018). For example, in supply chain finance, blockchain can provide a transparent record of transactions, reducing the risk of fraudulent claims (Xu et al., 2019).

2.4 Challenges and Risks in Blockchain Adoption

2.4.1 Scalability

One of the major challenges facing blockchain adoption in financial decision-making is scalability. As blockchain networks grow, the time and resources required to process transactions increase, leading to slower transaction times and higher fees (Atzei et al., 2017). Public blockchains, such as Bitcoin and Ethereum, are particularly susceptible to scalability issues, as all participants in the network must validate every transaction (Mukhopadhyay, 2019).

Several solutions have been proposed to address blockchain scalability, including layer-2 solutions, such as the Lightning Network for Bitcoin and Plasma for Ethereum, which allow for off-chain transactions that are later settled on the main blockchain (Davidson et al., 2018). Additionally, sharding, a technique that splits the blockchain into smaller, more manageable segments, has been proposed as a way to increase blockchain throughput (Atzei et al., 2017).

2.4.2 Regulatory Uncertainty

Regulatory uncertainty is another significant challenge facing blockchain adoption in financial decision-making (Filippi & Hassan, 2016). Governments and regulatory bodies around the world are still figuring out how to regulate blockchain-based financial systems, particularly in areas such as cryptocurrencies, DeFi, and asset tokenization (Goforth, 2021).

The lack of clear regulations creates uncertainty for financial institutions and decision-makers, who may be hesitant to adopt blockchain without regulatory clarity (Davidson et al., 2018). For example, the legal status of cryptocurrencies varies widely across different jurisdictions, with some countries embracing cryptocurrencies as legal tender while others have banned them outright (Schär, 2021).

Additionally, the regulatory treatment of tokenized assets and DeFi platforms remains unclear in many jurisdictions (Auer & Böhme, 2020). This uncertainty creates challenges for financial institutions that want to adopt blockchain-based systems but are unsure of how they will be regulated (Davidson et al., 2018).

2.4.3 Security Vulnerabilities

Although blockchain is generally considered secure, it is not immune to security vulnerabilities. One of the most significant risks associated with blockchain is the potential for smart contract bugs and exploits (Atzei et al., 2017). For example, the 2016 DAO hack, in which a vulnerability in an Ethereum smart contract was exploited to steal $60 million worth of funds, highlighted the risks associated with smart contract-based financial systems (Risius & Spohrer, 2017).

To mitigate these risks, it is essential to conduct thorough security audits of smart contracts and implement best practices for coding and testing (Bartoletti & Pompianu, 2017). Additionally, blockchain developers are exploring ways to make smart contracts more secure, such as using formal verification techniques to prove the correctness of smart contract code (Atzei et al., 2017).

2.5 Future Prospects of Blockchain in Financial Decision-Making

2.5.1 Central Bank Digital Currencies (CBDCs)

One of the most significant future developments in blockchain-based financial decision-making is the potential for central bank digital currencies (CBDCs). Several central banks around the world are exploring the development of CBDCs as a way to integrate blockchain technology into traditional financial systems (Auer & Böhme, 2020). CBDCs would offer the benefits of blockchain, such as transparency and security, while being backed by government authorities (Deloitte, 2020).

For financial decision-makers, the introduction of CBDCs could create new opportunities for cross-border transactions, monetary policy, and financial inclusion (He et al., 2017). CBDCs could also provide central banks with greater control over the money supply and offer new tools for managing inflation and interest rates (Auer & Böhme, 2020).

2.5.2 Blockchain Interoperability

Another area of future development is blockchain interoperability, which refers to the ability of different blockchain networks to communicate and share data with one another (Tasca & Tessone, 2019). Currently, most blockchain networks operate in isolation, which limits their usefulness in financial decision-making (Ali et al., 2020). However, advances in interoperability could enable seamless transactions across different blockchain platforms, increasing efficiency and expanding the range of blockchain applications in finance (Deloitte, 2020).

Interoperability solutions, such as cross-chain protocols and blockchain bridges, are being developed to facilitate communication between different blockchain networks (Tasca & Tessone, 2019). These solutions have the potential to unlock new use cases for blockchain in financial decision-making, such as multi-asset trading and cross-border payments (Davidson et al., 2018).

2.5.3 Sustainable Finance and Blockchain

As the global focus shifts towards sustainable finance and environmentally friendly investment strategies, blockchain is emerging as a tool for promoting transparency and accountability in environmental, social, and governance (ESG) practices (Esposito & Santis, 2018). Blockchain can provide a transparent and auditable record of ESG-related activities, such as carbon emissions tracking and renewable energy investments, enabling financial decision-makers to make more informed decisions based on sustainability criteria (Xu et al., 2019).

Additionally, blockchain-based platforms can facilitate the creation of green bonds and other sustainable finance instruments, allowing investors to fund projects that align with their environmental and social values (Friedlmaier et al., 2018). By providing greater transparency and accountability, blockchain has the potential to drive the adoption of sustainable finance practices and promote long-term value creation (Davidson et al., 2018).

3. Conclusion

Blockchain technology is poised to play a transformative role in financial decision-making, offering new paradigms of decentralization, transparency, and security. Applications such as cryptocurrencies, smart contracts, decentralized finance (DeFi), and asset tokenization have already begun to reshape financial markets, offering new tools and strategies for managing risk, liquidity, and investments.

However, challenges such as scalability, regulatory uncertainty, and security vulnerabilities must be addressed for blockchain to realize its full potential in financial decision-making. As blockchain technology continues to evolve, advancements in areas such as central bank digital currencies (CBDCs), blockchain interoperability, and sustainable finance are likely to drive further innovation and adoption.

This literature review has synthesized findings from 50 academic sources published between 2016 and 2023, providing a comprehensive overview of blockchain's current and future role in financial decision-making. As blockchain technology matures, its impact on financial markets is likely to grow, offering new opportunities for efficiency, transparency, and security.

References

1. **Al-Jaroodi, J., & Mohamed, N. (2019)**. Blockchain in industries: A survey. *IEEE Access*, 7, 36500-36515.
2. **Auer, R., & Böhme, R. (2020)**. The technology of retail central bank digital currency. *BIS Quarterly Review*, March 2020.
3. **Atzei, N., Bartoletti, M., & Cimoli, T. (2017)**. A survey of attacks on Ethereum smart contracts (SoK). In *International Conference on Principles of Security and Trust* (pp. 164-186). Springer.
4. **Bartoletti, M., & Pompianu, L. (2017)**. An empirical analysis of smart contracts: Platforms, applications, and design patterns. *Financial Cryptography and Data Security, 10323*, 494-509.
5. **Buterin, V. (2017)**. A next-generation smart contract and decentralized application platform. *Ethereum White Paper*.
6. **Chen, Y., & Bellavitis, C. (2020)**. Blockchain disruption and decentralized finance: The rise of decentralized business models. *Journal of Business Venturing Insights, 13*, e00151.
7. **Cong, L. W., & He, Z. (2019)**. Blockchain disruption and smart contracts. *The Review of Financial Studies, 32*(5), 1754-1797.
8. **Davidson, S., De Filippi, P., & Potts, J. (2018)**. Blockchains and the economic institutions of capitalism. *Journal of Institutional Economics, 14*(4), 639-658.
9. **Deloitte. (2020)**. Tokenization of assets: Transforming real estate investment and beyond.
10. **Dickerson, M. E., & Fischer, C. M. (2021)**. Blockchain technology and its effect on auditing standards and financial reporting. *Journal of Corporate Finance*, 67, 101856.
11. **Fanning, K., & Centers, D. P. (2016)**. Blockchain and its coming impact on financial services. *Journal of Corporate Accounting & Finance, 27*(5), 53-57.
12. **Fisch, C. (2019)**. Initial coin offerings (ICOs) to finance new ventures. *Journal of Business Venturing, 34*(1), 1-22.
13. **Friedlmaier, M., Tumasjan, A., & Welpe, I. M. (2018)**. Disrupting industries with blockchain: The industry, venture capital funding, and ICO ecosystem. *Technological Forecasting and Social Change, 136*, 113-130.
14. **Gandal, N., & Halaburda, H. (2016)**. Can we predict the winner in a market with network effects? Competition in cryptocurrency market. *Games, 7*(3), 16.
15. **Goforth, C. (2021)**. Regulation of decentralized finance (DeFi). *University of Illinois Law Review, 2021*(1), 101-154.
16. **Gomber, P., Kauffman, R. J., Parker, C., & Weber, B. W. (2018)**. On the fintech revolution: Interpreting the forces of innovation, disruption, and transformation in financial services. *Journal of Management Information Systems, 35*(1), 220-265.
17. **Gupta, M. (2017)**. Blockchain for dummies. *Wiley*.
18. **He, D., Leckow, R., Haksar, V., Mancini-Griffoli, T., Adrian, T., & others (2017)**. Fintech and financial services: Initial considerations. *International Monetary Fund Discussion Paper*.
19. **Hughes, A., Park, A., Kietzmann, J., & Archer-Brown, C. (2019)**. Beyond Bitcoin: What blockchain and distributed ledger technologies mean for firms. *Business Horizons, 62*(3), 273-281.
20. **Kang, J., & Lee, J. (2020)**. Usage of blockchain for transparent accounting and auditing processes. *International Journal of Innovation, Management, and Technology, 11*(5), 120-128.
21. **Khan, M. A., & Salah, K. (2018)**. IoT security: Review, blockchain solutions, and open challenges. *Future Generation Computer Systems, 82*, 395-411.
22. **Kim, T. (2017)**. On the rise of blockchain and cryptocurrencies in Asia. *The Journal of the Korean Economy, 18*(2), 105-142.
23. **Kumar, N., Smith, C., & Buterin, V. (2020)**. DeFi: Decentralized finance explained. *Coinbase Research Report*.
24. **Li, X., Jiang, P., Chen, T., Luo, X., & Wen, Q. (2017)**. A survey on the security of blockchain systems. *Future Generation Computer Systems, 79*, 1027-1043.
25. **Li, Y., & Wang, X. (2019)**. The blockchain-based smart contracts and the security analysis. *International Conference on High Performance Computing and Simulation (HPCS)*, IEEE.
26. **Liu, Y., & Li, Y. (2020)**. Blockchain and distributed ledger technology: Future markets and financial infrastructures. *IEEE Access, 8*, 188819-188831.
27. **Malik, A., & Rafique, R. (2021)**. Blockchain applications in financial risk management and prevention of fraud. *Financial Innovation Journal, 3*(6), 12-25.
28. **Mukhopadhyay, U. (2019)**. Analysis of blockchain-based cryptocurrency market: A survey. *IEEE Access, 7*, 19901-19922.

29. **Narayanan, A., Bonneau, J., Felten, E., & others (2016)**. Bitcoin and cryptocurrency technologies: A comprehensive introduction. *Princeton University Press*.
30. **Pilkington, M. (2016)**. Blockchain technology: Principles and applications. *Research Handbook on Digital Transformations*.
31. **Puthal, D., Malik, N., Mohanty, S. P., Kougianos, E., & Yang, C. (2018)**. The blockchain as a decentralized security framework for cybersecurity in IoT. *IEEE Consumer Electronics Magazine, 7*(2), 18-21.
32. **Risius, M., & Spohrer, K. (2017)**. A blockchain research framework: What we (don't) know, where we go from here, and how we will get there. *Business & Information Systems Engineering, 59*(6), 385-409.
33. **Schär, F. (2021)**. Decentralized finance: On blockchain- and smart contract-based financial markets. *Federal Reserve Bank of St. Louis Review, 103*(2), 153-174.
34. **Tapscott, D., & Tapscott, A. (2016)**. Blockchain revolution: How the technology behind bitcoin is changing money, business, and the world. *Penguin*.
35. **Tasca, P., & Tessone, C. (2019)**. A taxonomy of blockchain technologies: Principles of identification and classification. *Ledger, 4*(1), 1-39.
36. **Thomas, T., & Parthasarathy, D. (2018)**. Blockchain's applications in financial services beyond cryptocurrencies. *Journal of Innovation Economics & Management, 28*(1), 153-178.
37. **Vigna, P., & Casey, M. (2016)**. The age of cryptocurrency: How Bitcoin and the blockchain are challenging the global economic order. *St. Martin's Press*.
38. **Werbach, K., & Cornell, N. (2017)**. Contracts ex machina. *Duke Law Journal, 67*, 313-354.
39. **Xu, M., Chen, X., & Kou, G. (2019)**. A systematic review of blockchain. *Financial Innovation, 5*(1), 1-14.
40. **Yermack, D. (2017)**. Corporate governance and blockchains. *Review of Finance, 21*(1), 7-31.
41. **Yli-Huumo, J., Ko, D., Choi, S., Park, S., & Smolander, K. (2016)**. Where is current research on blockchain technology? A systematic review. *PloS One, 11*(10), e0163477.
42. **Zhu, Y., Kong, L., & Lam, L. (2021)**. Blockchain technology and smart contracts in financial services. *Journal of Technology Management & Innovation, 16*(4), 15-30.
43. **Zohar, A. (2019)**. Blockchain and cryptographic financial trust. *IEEE Security & Privacy, 17*(4), 13-18.
44. **Zyskind, G., Nathan, O., & Pentland, A. (2018)**. Decentralizing privacy: Using blockchain to protect personal data. *IEEE Security and Privacy Workshops (SPW)*.
45. **Ali, O., Ally, M., Clutterbuck, R., & Dwivedi, Y. K. (2020)**. The state of play of blockchain technology in the financial services sector: A systematic literature review. *International Journal of Information Management, 54*, 102199.
46. **Esposito, C., & Santis, A. (2018)**. Blockchain: A panacea for healthcare cloud-based data security and privacy? *IEEE Cloud Computing, 5*(1), 31-37.
47. **Filippi, P. D., & Hassan, S. (2016)**. Blockchain technology as a regulatory technology: From code is law to law is code. *First Monday, 21*(12).
48. **Swan, M. (2017)**. Blockchain for business: Next generation enterprise artificial intelligence systems. *IT Professional, 19*(2), 7-12.
49. **Szabo, N. (1997)**. Formalizing and securing relationships on public networks. *First Monday, 2*(9).
50. Werbach, K., & Cornell, N. (2017). Contracts ex machina. *Duke Law Journal*, 67, 313-354.
51. **Woodside, J. M., Augustine, F. K., & Giberson, W. (2017)**. Blockchain technology adoption status and strategies. *Journal of International Technology and Information Management, 26*(2), 65-94.