

Cryptocurrency and Its Difficulties

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Abstract:

Cryptocurrency is a digital currency that operates on decentralized blockchain systems. Such a system facilitates direct transactions between users without the interference of banks or government authorities. Recently, it has gathered a lot of global attention for its being transparent and safe. It has the potential to revolutionize the financial systems. But, at the same time, these pros are coupled with significant cons that decelerate its adoption and create instability. The major factors include drastic changes in the market price, uncertain regulatory environment, possible security breaches, high power consumption, and association with illegal activities like money laundering or scams. Besides that, the majority of the population is not well-educated about it; the technology seems too complicated, and the laws differ widely from one country to another. All this leads to the creation of distrust and a slow process of acceptance. This article reviews five new research papers that scrutinize these problems from different angles such as law, economics, and technological details. The conclusions drawn indicate that cryptocurrency can stimulate new innovations and attract more individuals to the world of finance. However, it is vital to the safe and long-term acceptance of the digital financial ecosystem to handle the main risks and bottlenecks in regulation.

Keywords — Artificial Intelligence, Network Vulnerability, Social Engineering, Penetration Testing, Cybersecurity, Ethical Hacking, Automation, Governance, Data Security.

I. OVERVIEW

The introduction of cryptocurrencies greatly impacted the digital economy. It has a non-centralized approach to the control of money that is still visible to all the people concerned. This arrangement is the opposite of the traditional banking systems that are controlled by central banks. Blockchain technology is the center of all this. It is the digital ledger that is shared and copied among many computers on a peer-to-peer (P2P) network. Each transaction is recorded and confirmed by the system before the next one is entered. After the information gets recorded, it cannot be edited or erased anymore. Such a system provides a high degree of security and credibility for the entire process.

Governments or central authorities are the ones that issue fiat currencies. This is the opposite model from which cryptocurrencies are born. The mining processes or proof-of-stake mechanisms support the communities as the specific method depends on the network's design.

In the past few years, Bitcoin, Ethereum, and Ripple have been the cryptocurrencies that gained the most popularity in the market. Investors from different sectors, along with businesses and governments, have become very interested in keeping a close watch on the further developments of these coins. The public is using them for e-commerce, smart contracts, and digital asset investments, etc. These applications are indicators that they could transform the financial markets completely. They would even alter the way people make payments as part of their day-to-day activities.

Nevertheless, the cryptocurrencies are not without their different and serious problems that challenge them and have to be tackled straight on. When it comes to volatility, it

is a sudden swing in prices that knocks off the users' ground. The laws about cryptocurrencies are not clear yet, and they have a long way to go to guide the industry.

II. LITERATURE REVIEW

The first paper looks at the misuse of cryptocurrencies by criminal groups. Its full title is The (mis)use of cryptocurrencies by criminal organizations: A systematic literature review (2025). The method used was a systematic literature review focused on blockchain technology and analysis of cryptocurrency transactions. One big plus is that it gives a deep look into how these groups take advantage of crypto systems, helping law enforcement build better tools against money laundering. On the downside, the anonymity in blockchain deals stands out as a real problem. Tracking illegal money flows gets tough, and enforcing rules across borders turns even harder.

Another paper from 2019 covers cryptocurrency adoption and security issues in various countries, titled Cryptocurrency: Adoption Efforts and Security Challenges in Different Countries. They employed a comparative analysis method covering blockchain-based currency systems and models for international adoption. The advantages include breaking down global pushes for crypto use, spotting best practices and fresh policy ideas. Still, the study points out drawbacks like the lack of worldwide standards, low user awareness in many places, and cybersecurity risks that slow down broader adoption.

A paper published in 2025 investigates cryptocurrency investment and its impact on economic stability, entitled Cryptocurrency Investment and Economic Stability: A Risk Analysis in Emerging Markets. Quantitative

risk analysis was applied using cryptocurrency exchanges and financial data analytics. The research observes how these investments influence stability in non-industrial countries, covering risks and the fruits of digital assets in those markets. The outcomes point to extreme price fluctuations, uncertain regulations, and insufficient investor protections as major challenges.

A 2023 source discusses obstacles regarding the regulation of cryptocurrencies and Bitcoin, titled *The Obstacles in Regulating Cryptocurrencies / Bitcoin*. The methodology was a combination of descriptive analysis and a review of regulatory frameworks. The benefit is that it shows the legal changes required for dealing correctly with crypto and clearly points out the shortcomings of current rules. Among the difficulties are divergent regulations from one country to another, little real understanding by policymakers, and great difficulty in monitoring decentralized transactions.

The last paper from 2020 discusses both Bitcoin and cryptocurrency challenges as well as opportunities, titled *Bitcoin and Cryptocurrency: Challenges, Opportunities and Future Works*. They conducted an analytical study and literature review with blockchain technology at the heart of the matter. The paper gives a complete account of crypto advantages such as decentralization while also identifying key risks.

III. EXISTING VS. PROPOSED SYSTEM

The table below summarizes the key differences between the existing cryptocurrency ecosystem and the proposed improved system that addresses identified challenges.

TABLE I
 COMPARISON OF EXISTING AND PROPOSED SYSTEMS

Aspect	Existing System	Proposed System
Transactions	Slow, via intermediaries	Fast, peer-to-peer
Security	Vulnerable to hacks	Some research projects are looking at how to introduce renewable energy to the mining process.
Regulation	Weak or unclear	Integrated compliance tools has proven to be an effective way to reduce the carbon footprint of mining.
Volatility	High	Reduced risk strategies
User Awareness	Low	User-friendly, educational
Illegal Use	Money laundering, fraud	AI monitoring to prevent misuse
Energy	High consumption	Green agreement (PoS)

IV. CONNECTIVITY WITH ARTIFICIAL INTELLIGENCE (AI)

The connectivity of AI and crypto systems is an advancement that could revolutionize security, efficiency, and user experience. AI technologies like machine learning and predictive analytics can already be applied in real-time monitoring of the blockchain network, suspicious activities detection, and fraudulent transaction prevention. With the help of pattern analysis done on transactions, an AI system is

able to find out irregularities such as money laundering, hacking, and phishing.

AI technology predicts price market patterns by combining historical data analysis with market sentiment evaluation to help stabilize cryptocurrency price fluctuations. The AI-based automated trading systems perform buy-sell operations at optimal market periods to reduce financial exposure for traders. AI systems within DeFi platforms execute lending, borrowing, and investment operations, resulting in enhanced system reliability and profitability.

AI integration with blockchain technology enables cryptocurrency systems to achieve enhanced security, operational efficiency, and user accessibility, which establishes trust between personal users and financial organizations. The integration enables new possibilities for smart contracts that use AI for decision making, autonomous digital wallets, and customized financial advisory systems.

V. ENVIRONMENTALLY SAFE BLOCKCHAIN ALTERNATIVES

The case of cryptocurrencies, especially those relying on a Proof-of-Work (PoW) consensus layer such as Bitcoin, has raised concerns due to their energy consumption. The process of mining alone consumes vast amounts of computing power, bringing up issues of pollution and global warming. Efforts are being made to lessen these impacts by employing environmental-friendly blockchain alternatives.

A widely adopted avenue of inquiry is the execution of Proof-of-Stake (PoS) or hybrid consensus protocols, which have substantially more energy efficiency than conventional PoW mining protocols. In a PoS model, validators are selected to add new blocks based on how many coins they own and stake; there is not a large amount of computational energy expended during this process. Other improvements which require less energy include layer-2 scaling and energy-efficient protocols on blockchain. Some research projects are looking at how to introduce renewable energy to the mining process. Integrating solar, wind, or hydro-power into the crypto mining process has proven to be an effective way to reduce the carbon footprint of mining. Through the implementation of environmentally safe measures, blockchains can become socially responsible and sustainable.

VI. CENTRAL BANK DIGITAL CURRENCIES (CBDCS) AND MIXED METHODS

CBDCs are like digital cash from a country's main bank, just like regular money. Unlike cryptocurrencies such as Bitcoin, CBDCs are closely regulated and official money that does not jump around in value too much. A CBDC is centralized, but it can still use some good parts of electronic money since it is a digital version of what we already use. CBDCs can be linked to existing crypto networks to get the best of both worlds: central control and decentralized functionality.

Mixed approaches let a CBDC keep things steady and reliable while also being open, fast, and taking advantage of crypto's perks. For example, stablecoins linked to CBDCs could soften the blow of crypto's price volatility, making them suitable for regular purchases and global payments. They can also use smart contracts and automated compliance tools to keep transactions safe, easy to trace, and legal.

If governments use CBDCs and mixed methods, more people might start using digital payments, increasing financial inclusion and creating interesting options using blockchain technology within established rules. CBDCs connect old-school banking and crypto by giving a safer space for users, businesses, and large institutions.

VII. ENHANCED SECURITY AND PRIVACY PROTOCOLS

Security and privacy are very much present throughout the entire cryptocurrency ecosystem. The blockchain technology, due to its decentralization and use of cryptographic methods, gives partial security, but still users and platforms face risks of hacking, phishing, wallet theft, and unauthorized access. For that reason, security and privacy protocols must be improved to maintain trust in crypto systems and protect digital assets.

Future improvements will focus on high-tech cryptographic protocols along with quantum-resistant algorithms, which will defend blockchain networks against threats posed by quantum computing. Multi-layered authentication techniques comprising two-factor authentication (2FA), biometric authentication, and hardware wallets provide users' funds and personal information with extra layers of security.

Privacy-oriented protocols, like zero-knowledge proofs and confidential transactions, give people the power to conduct transactions securely and anonymously while blockchain remains transparent and auditable. Furthermore, AI-driven monitoring systems integrated into these protocols will be capable of identifying suspicious activities in real time, averting fraud or unauthorized access.

VIII. FRAMEWORK FOR COMPLIANCE AND REGULATORY PRINCIPLES ACROSS THE GLOBE

Among the many challenges existing within the crypto ecosystem is the absence of a single global regulatory framework, which creates much uncertainty for investors, users, and financial institutions. Cryptocurrencies are a global asset class, but regulations on their use vary significantly from jurisdiction to jurisdiction, which presents both compliance challenges and greater risk of fraud, money laundering, and other illicit activities.

Future developments will focus on creating global regulatory frameworks that provide clear guidance on the use of cryptocurrencies, taxation of cryptocurrency, and principles relating to anti-money laundering (AML). Embedding compliance tools into the blockchain network can automatically monitor transactions while allowing the decentralized nature and privacy aspects of the digital

currency to remain intact. Compliance tools could include AI transaction monitoring, blockchain analytics, and automated reporting of suspicious activity in real time.

Standardizing regulatory frameworks and incorporating more sophisticated compliance tools will enhance the safety and acceptance of cryptocurrencies. Greater reliance on standardization will foster trust among users, investors, governments, exchanges, and financial institutions.

IX. THE GROWTH OF DECENTRALIZED FINANCE (DEFI)

Decentralized Finance (DeFi) refers to a set of financial apps built on blockchain networks, eliminating the need for intermediaries like banks and brokers. In DeFi platforms, users can directly lend, borrow, trade, and invest without intermediaries, with the assistance of smart contracts that enhance transparency and decrease costs while speeding up the transaction process.

DeFi development will focus on accessibility and usability, with future innovations including fully automated decentralized exchanges (DEXs) and smart contract-governed insurance protocols. The potential of additional technologies such as AI will assist in investment strategies, risk assessments, and liquidity management within DeFi ecosystems.

Advancements in DeFi can lead to financial services being more accessible for underbanked users and those without access to traditional banking infrastructure, thereby increasing financial inclusion. DeFi may also enhance transaction processing over cross-platform exchanges through various blockchain networks.

X. BLOCKCHAIN NETWORK INTEROPERABILITY

In today's blockchain world, a considerable limitation for many networks is that they operate in isolation with little to no cross-chain transactions or data exchange. The overall goal of blockchain network interoperability is to allow seamless business transactions and asset transfer between various separate blockchains.

Once blockchains adopt Cross-Chain protocols and Bridges, users can transfer tokens, run smart contracts, and share data from multiple blockchains without relying upon centralized infrastructure, resulting in greater improvements in efficiency, liquidity, and usability of distributed decentralized applications (DApps). Additionally, interoperability combines both private and public blockchains, allowing business and financial institutions to utilize blockchain applications while maintaining regulatory compliance.

Improved interoperability increases collaboration across crypto ecosystems, encourages innovation, and enables a unified platform that supports many digital assets to work concurrently. This is a powerful attribute in building a truly interconnected and decentralized digital economy.

XI. USER-FRIENDLY INTERFACES AND EDUCATIONAL TOOLS

One of the most significant barriers to broad adoption in the cryptocurrency space is how difficult it is to manage digital wallets, private keys, and blockchains. Many people — especially beginners — experience difficulty navigating crypto platforms, which increases the risk of error, fraud, and/or loss of funds. Future enhancements will focus on developing user-friendly interfaces and educational tools.

Intuitive wallet designs, mobile applications, and simplified processes for transacting will help users send, receive, and manage their digital assets without technical knowledge. Educational platforms, tutorials, and interactive guides can increase awareness regarding security practices, review how transaction blockchains work at a high level, and review various investment options.

User-friendly interfaces and strong educational tools can help both technical and non-technical users participate more safely in the digital economy as more and more participants become crypto-educated.

XII. PARTNERSHIP WITH INTERNET OF THINGS

Combining cryptocurrency and blockchain technology with Internet of Things (IoT) devices is a new technology that will enable autonomous, secure, decentralized machine-to-machine transactions. IoT devices, such as smart sensors, cars, and appliances, generate tremendous amounts of information and typically need to make automated small transactions to pay for and receive energy, tolls, or share resources.

With blockchain and cryptocurrency, IoT devices are empowered to use secure autonomous payments and smart contracts without any human interference. The blockchain transaction is totally transparent, immutable, and traceable. Additionally, AI can monitor usage to optimize energy consumption, detect anomalies, and identify unauthorized access on a connected device.

Combining IoT and cryptocurrency will yield autonomous digital economies where devices will easily buy and sell resources and collaborate to perform optimally. This will enhance the reliability of IoT networks while providing a new layer of functionality to blockchain networks, further enabling smart cities, autonomous supply chains, and decentralized service platforms.

XIII. CONCLUSIONS

Cryptocurrencies are quickly changing the future of digital finance. They provide decentralization, transparency, and transactional speed. The possibility to upend traditional financial services, to enhance financial inclusion, and to create innovative forms of investment are but a few of the opportunities offered by cryptocurrencies.

Unfortunately, the widespread use and overall stability of cryptocurrencies are hindered by a number of

challenges. Some of the primary challenges include volatility in price, insecurities in transaction processing, distinctions in regulatory approaches between countries, high energy supply requirements, and use for illegal activities.

Positive future developments exist in the realms of artificial intelligence interfacing with blockchain, green protocols, digital currencies within central banks, security enhancements, decentralized finance (DeFi), cross-jurisdictional regulatory frameworks, and the tokenization of all physical assets. In summary, cryptocurrencies give us both opportunities and risks. With the proper level of development, regulation, and innovation, we can maximize the merits of cryptocurrencies and minimize potential detriments, taking a step towards a safe and effective digital economy.

ACKNOWLEDGMENT

The authors wish to acknowledge the support of the Department of Master of Computer Application, Sri Manakula Vinayagar Engineering College, Pondicherry, India, and all those who contributed to the development of this research.

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