REPORT ON CRYPTOCURRENCY AND ITS IMPACT

Abstract

Cryptocurrency has now become a disruptive technology, disrupting the financial services domain ever since the launch of Bitcoin in 2009. The following report aims at discussing the presence of cryptocurrency and its consequences for various spheres of life. The paper also analyses and explains what cryptocurrency is, with an emphasis on the use of blockchains and decentralized finance (DeFi). It also looks at the different risks associated with cryptocurrencies including threat to institutions, volatility and regulatory concerns. Furthermore, the report examines advantages cryptocurrency provides such as: monetary integration, new possibilities within the payment industry, and tokenized economic enfranchisement. Specifically, the following themes are discussed: privacy and security of ICT workforce; diversity and equality; and ICT and environmental sustainability. The authors then make recommendations on how disruption that is brought about by cryptocurrencies could be managed and these include regulation, and responsible use of the assets.

Contents

1. Introduction

Electronic or virtual currencies that also work as an electronic marketplace for the buy and sell of goods and services have transformed the financial services industry since the emergence of Bitcoin in 2009. Being based on cryptographic mechanisms to perform transactions, cryptocurrencies present an option to centralized systems, which are being managed and controlled by certain banks or governments. This paper seeks to understand the technological deployment standard in the creation of cryptocurrencies, the possibility of disruption, and the social implications of the same with deeper analysis being done (Nakamoto, 2008).

2. Definition and Discussion on Cryptocurrency

What is Cryptocurrency?

Cryptocurrency is a digital currency based on cryptographic algorithms that manage operations, issue amounts of new coins, and validate transfers of assets. It uses a technology called Blockchain; it is decentralized: the history of transactions is recorded in a distributed register, excluding the possibility of fraudulent actions and eliminating the need for conventional financial mediators (Nakamoto, 2008).

Blockchain Technology

Cryptocurrencies utilize Blockchain because it is an efficient and secure way to incorporate an organizational framework that records and chronologically organizes blocks of transactions. To support this notion, Crosby et al., (2016) forwarded some arguments that this technology enables security and trust in a way that any change on any piece of information in the Blockchain requires consensus from the network, making it almost impossible to make an unauthorized change on the information.

3. Threats in the form of disruption potential of the Cryptocurrency.

Effects on Financial Houses

Relying on cryptographic algorithms, cryptocurrencies try to eliminate intermediaries in financial transactions. This can significantly minimize charges within the transactions and enhance organizational performance, which has been perceived to directly compete with typical banks and financial enterprises that rely on middle agencies within the transaction processing (Vigna & Casey, 2015).

Decentralized Finance (DeFi)

DeFi is the new frontier of finance, decentralizing traditional financial systems with the help of Blockchain. This change not only widens access to financial services because of the decrease in entry barriers but also improves transaction clarity and minimizes costs, which benefits a fair chance financial atmosphere (Schär, 2021).

4. Societal Impact

Sector Impact

Cryptocurrencies have become mainstream and interact with the global economy at fabulous speed with tremendous benefits that can rethink several business units such as real estate, healthcare, and law industries. In this way, cryptos disenfranchise numerous transaction-intermediary agents, and the resulting reduction of inessential frictions can improve processes' efficiency, slash the costs of transfers, and quicken the tempo of transactions. Removing transactional 'extra' elements helps optimize the process and extends the range of services the client can obtain. For example, in real estate, decentralized digital resources help to purchase and sell properties without the involvement of intermediaries such as banks and lawyers and shorten the time and cost it may take to transfer property (Catalini & Gans, 2016). Likewise, with blockchain-based asset value in health care, cryptocurrencies can enable efficient patient records and insurance claims to transition free from bureaucratic constraints. This extension of services also makes them available to more people, resulting in the sectoral opening of service provision (Catalini & Gans, 2016). In addition, the continued expansion of Cryptocurrency impacts the legal sector. As legal systems in contracts

and the sale of intellectual property include cryptocurrencies, processing becomes faster and less costly, making legal services accessible to a broader populace.

Employment

To some extent, cryptocurrencies have brought new opportunities, but they have also threatened some traditional workplaces, such as banks. Adrian (2018) notes that with the emergence of blockchain systems and decentralized financial systems, or DeFi for short, it becomes possible to reduce or even eliminate intermediaries in the financial markets; this, therefore, has significant implications for jobs that are related to account management, loan processing and even some of the advisory services. While some traditional jobs have been affected by cryptocurrencies, the new type of money has paved the way for entirely new occupations. The latter prescribes the need and the shortage of blockchain developers and financiers in the cybersecurity and business management realms, as well as the significance of financial technology (fintech) central to cryptocurrencies' security and operation (Tapscott & Tapscott, 2016). For instance, blockchain developers are responsible for the development and continued management of the peer-to-peer network behind cryptocurrencies, and cybersecurity professionals are accountable for ensuring the security of the user's assets. Furthermore, with the increasing importance of fintech, there is a rising demand for talent to design/deploy cryptocurrency and other related frameworks into the financial market.

As positive as these changes are for creating jobs, they need employees in the banking industry and the technological sector to be trained afresh. These shifts mean that talent must be retrained with new knowledge connected to rejuvenation, Blockchain, cybersecurity, and decentralized finance. This retraining is vital not only for ordinary workers desiring to maintain employment in the future but also for organizations aspiring to be more competitive in an evolving financial environment (Tapscott & Tapscott 2016). Hence, though cryptocurrencies are replacing some roles, they also foster the creation of new, high-demand professions within innovative industries.

5. Risks and Opportunities Provided by Cryptocurrencies

Despite these opportunities, cryptocurrencies also present several challenges that must be addressed to promote their practical usage in the international financial system. At the same time, they offer a myriad of activities that hold the potential to create both the impetus for change and access to financial markets for social members. In this section, an elaboration of potential threats and possibilities of cryptocurrencies will also be presented, along with an evaluation of those claimed threats or opportunities.

Risks

1. **Volatility**

   One of the most crucial risks of cryptocurrencies is the significant, unpredictable price fluctuations. Traditional cryptocurrencies such as Bitcoin and Ethereum have witnessed extreme short-term volatility. Whenever they occur, investors and firms using them as a means of exchange face severe consequences regarding their money. For instance, Bitcoin rose from below one thousand dollars at the beginning of 2017 to almost twenty thousand dollars by the end of 2017, dropping to nearly three thousand dollars in 2018 (Baur, Hong, & Lee, 2018). This volatility undermines the ability of cryptocurrencies to act as a stable currency, resulting in instability in their use.

2. **Regulatory Challenges**

   Cryptocurrencies exist in an uncontrolled and partially regulated area, which becomes troublesome for regulators. The anonymized and decentralized systems hinder government agencies' ability to track transactions, contributing to illicit activities as money laundering, terrorism financing, and tax evasion (Böhme, Christin, Edelman, & Moore, 2015). The absence of well-coordinated legal systems in many countries also leads to one-sided competition for economic players and investors, hindering the expansion of cryptocurrencies. The lack of legal standards addressing virtual currencies may lead to fear among potential users and stifle creativity.

3. **Security Risks**

Although cryptocurrencies are digital assets based on secure cryptographic principles, they remain vulnerable to security threats. Cryptocurrencies have been attacked multiple times, resulting in massive losses worth billions of dollars. For example, in 2014, Mt. Gox, an online trading platform for virtual currencies, was hacked, and about 850,000 Bitcoins were stolen (Möser, Böhme, & Breuker, 2013). Cryptocurrencies are inherently decentralized, implying that once digital assets are hacked, they can hardly be retrieved. Hacking and fraud pose significant risks to cryptocurrency investments.

4. **Technological Disparities**

Cryptocurrencies depend on technological advancement and internet connectivity, which are not equally available to all populations. In underdeveloped regions, limited access to the internet or low-quality connections, coupled with low levels of digital literacy, can exclude people from the market, deepening existing gaps. This digital divide also challenges the widespread adoption of cryptocurrencies, especially in areas with weak underlying technological infrastructure.

Opportunities

1. **Financial Inclusion**

One of the most promising cryptocurrency trends is the potential for financial inclusion. Many global populations need access to a bank account or minimal banking experience. Cryptocurrencies allow people to engage in worldwide commerce without relying on a bank account or previous credit history (Narayanan et al., 2016). This can contribute to poverty eradication and foster business opportunities by enabling people to participate in business and finance.

2. **Innovation in Payment Systems**

Cryptocurrencies promise faster, cheaper, less risky, and more efficient methods for cross-border payments. Traditional methods like wire transfers and SWIFT are time-consuming, costly, and involve third parties. Cryptocurrencies, in contrast, remove intermediaries, reducing transaction costs and the time required to complete transfers. For instance, Bitcoin

offers nearly immediate cross-border transactions at much lower costs than existing systems (Catalini & Gans, 2016). This globalization of cash offers cross-border value transfer at cheaper costs for businesses and consumers alike.

3. Decentralized Finance (DeFi)

DeFi is a relatively new sub-genre of the cryptocurrency market that aims to duplicate centralized financial services like lending, borrowing, and trading in a decentralized marketplace. According to Schär, DeFi platforms rely on blockchain technology and do not involve intermediaries, minimizing costs, enhancing transparency, and improving access to financial services. DeFi offers users decentralized control over assets and opens new financial service access, which may not have been possible. It is likely to revolutionize traditional financial organizations and increase economic freedom.

4. Economic Empowerment Through Tokenization

Using tokens, a product of blockchain technology is a modern fundraising and economic enfranchisement technique. Issuing tokens allows organizations and companies to launch tokens representing investors' stakes in real estate, commodities, and patents. These tokens can be sold to investors on cryptocurrency exchanges, offering a new form of business funding and providing investors with relatively illiquid investments. This democratization of capital markets could create new opportunities for financing small and medium businesses (SMBs) and stimulate innovation across various industries (Catalini & Gans, 2016).

6. Ethical Responsibilities of the ICT Workforce

Growing technologies such as cryptocurrencies are incorporated into businesses and societies, presenting the ICT workforce with many ethical questions and decisions. ICT professionals must ensure the proper use of these technologies through correct implementation, enhanced security, fairness, transparency, and inclusion without detriment to people. The ICT human resource department's primary ethical duties concerning cryptocurrency are as follows:

1. Privacy Protection

The main ethical issue in cryptocurrencies is anonymity since services such as Bitcoin make it possible to escape mainstream surveillance and data monetization. This is good for users' privacy; however, it poses a problem for regulators, especially when implementing Anti-Money Laundry Laws (AML) and Know Your Customer Laws (KYC). These measures increase the chance of criminal activities, including money laundering and tax evasion (Reid & Harrigan, 2013).

IT people are in a precarious position to protect their clients' privacy while simultaneously fulfilling the requirements of the law. To achieve this, Zero-Knowledge Proofs (ZKP) and Secure Multiparty Computation (SMC) could be used. ZKP is the technique used to verify the correctness of the transaction. At the same time, the information used to check this correctness will remain undisclosed, thus satisfying legal requirements and keeping users anonymous (Ben-Sasson et al., 2014). In the same way, SMC allows parties to authenticate transactions while at the same time preserving the confidentiality of the information they exchange (Goldreich, 2004).

Similarly, PETs, including DIDs and SSI, allow users to manage their personal information, though only relevant data are disclosed to third parties (Allen et al., 2020). To use such tools effectively, it is necessary to explain them to the users to generate trust in the technology.

Therefore, although currencies afford high levels of privacy, ICT workers must understand confidentiality being used as a cover for unlawful operations. Thus, while utilizing privacy-preserving techniques, its laundry can protect user anonymity and meet the traceability required for supervision.

2. Security and Risk Management

Cryptocurrencies have become a prime target of attackers because of their high-value virtual coin components. ICT professionals are responsible for ensuring that user's information and data are safeguarded from fraudulent and theft activities and hackers. One critical approach is storing the hardware with keys offline, thus mitigating online dangers such as phishing and malware (Möser et al., 2013). Also, multi-signature solutions demand more keys for signing a transaction and will help protect the platform from spoofing and other types of cyber threats.

Performing security checks and risk analyses more often than usual is essential. ICT professionals must stay alert to such threats, indicating that systems must change. Ethical behavior also ranges from vulnerability reporting to revealing weaknesses that do not affect society.

Communication with users is mandatory if the breach occurs, and cooperation with law enforcement officers is necessary in case of potential violations. There are also user-related risks, and ICT professionals should devote their efforts to correcting user behavior, for instance, by teaching them not to use weak passwords or send sensitive data to coworkers' personal email accounts.

Further, decentralized risk management is the management of risks wherein decentralized governance and consensus protocols shall be needed to control and mitigate risks without compromising the decentralized concept.

By adopting these measures, ICT professionals can protect cryptocurrency platforms and ensure that the users' assets are safe and that trust in the system is maintained.

3. Inclusivity and Accessibility

Singh & Bob Navbar Wala have identified diverse ethical responsibilities of ICT personnel: inclusivity and accessibility are two fundamental ethical obligations, especially when utilizing digital currency. In the context of the emergence of cryptocurrency as a new form of financial service, there is a real chance of expanding the coverage of banking services to those previously ignored by traditional monetary systems. Cryptocurrencies are most beneficial and could act as decentralized and easily accessible financial instruments for individuals in a particular country

who do not have access to conventional banking services or formally regulated bank accounts (Narayanan et al., 2016).

However, all these possibilities for the integration of digital currencies into society require actions for increased accessibility for socially vulnerable populations if ICT professionals do not independently take actions to eliminate barriers to vulnerable people. This consists of people with disabilities, people in rural and remote areas, and other groups who may not be able to afford modern devices. Some usability challenges include making interfaces and user experiences universally accessible so that no users find them confusing, too complex, or intimidating.

ICT professionals need to pay attention to developing platforms to comply with the web accessibility standards, including the WCAG, so that the digital currencies can be accessed by the physically or visually, audibly or cognitively handicapped. However, the informative function is no less significant. Creating easily understandable educational materials is crucial for cryptocurrencies' growth since the underlying technology can be intricate and somewhat frightening.

Furthermore, there is a need to analyze the compatibility of these platforms with different devices and network conditions. Several users in the developing world are likely to have limited access to high-end gadgets or steady internet connection. This is particularly important because the internet penetration in the world, especially in third-world countries, is not highly advanced, and many do not even own computers, graphics cards, or any other high-end devices, but creating such a platform could make cryptocurrencies a worthy investment for almost anyone.

All in all, special attention should be paid to the fact that ICT professionals are committed to building the depth of inclusiveness and accessibility into the platforms of digital currency services, devices and networks compatibility, effective educational materials, etc. Hence, it guarantees that the impact of cryptocurrencies as an enabler is open to all people, including the less privileged groups.

4. Environmental Sustainability

Environmental sustainability is a core issue when mining cryptocurrencies, especially concerning PoW. Currencies like Bitcoin that use PoW to validate the transactions and protect the network need substantial quantitative power, which, in turn, demands a significant quantity of energy. The

extent of energy demand in virtualized forms is so massive that it is being measured in terms of the power consumed by the countries themselves, thus eliciting worries about the environmental impact (Narayanan et al., 2016).

The ICT specialists can help enhance the stewardship of this problem by supporting the creation and application of smoother technologies within the cryptocurrency industry. The most realistic of these alternatives is the already mentioned proof-of-stake (PoS) consensus algorithm, which consumes much less energy. While PoW counts on local miners to solve complex cryptographic riddles, PoS demands that participants hold and deposit a predetermined amount of Cryptocurrency to approve transactions. This significantly lessens the computational load and energy consumption, making for a more efficient way of securing cryptocurrencies.

Besides supporting using PoS and other eco-friendly consensus algorithms, ICT specialists must consider using renewable energy sources in cryptographic mining. Cryptocurrencies based on member data can use renewable energy like solar, wind, and hydroelectric power to minimize carbon footprint. Thus, the professionals in the respective fields should enshrine and develop the technologies to support and sustain such renewable energy sources to reduce the negative consequences over time due to the increased effects of Bitcoin mining.

Therefore, there is no doubt that ICT specialists have a moral duty to influence sustainability and sustainable measures in Cryptocurrency. This extends from pushing for the migration to better consensus algorithms such as PoS and using cleaner renewable energy sources in mining. These endeavors shall be crucial in mitigating the diseases of digital currencies and making cryptographic assets a sustainable financial innovation.

5. Transparency and Accountability

Transparency and accountability must constitute the core before ethical practices are enforced within digital platforms, including Cryptocurrency and Blockchain. Transparency means the extent to which organizations and people share information with others to facilitate evaluation of their actions, choices, and procedures. In the field of Cryptocurrency, transparency is possible within the complexity of blockchain solutions since all transactions are recorded in the distributed register. This visibility makes the activities on the network reliable and transparent, something that is not directly associated with the high risk of financial systems.

Nonetheless, as exemplified by transparency, Blockchain offers inherent properties with ethical issues that ICT professionals need to consider. One such challenge is the challenge of openness: it is easy to become overbearing and breach privacy. Transparency makes transactions conspicuous to ensure everyone is answerable, but it could prove fatal since users can easily expose their identifiable details or financial information. Therefore, ICT professionals have an ethical obligation to maintain users' privacy while avoiding compromising information through obscurity that high levels of transparency might occasion. They note that this requires adopting privacy-enhancing techniques such as zero-knowledge proofs or confidential transaction techniques that enable confirmation without disclosure of specifics.

Thus, attaining the right degree of transparency also implies that where individuals and organizations engage with Cryptocurrency and blockchain technology, there are consequences for their conduct. ICT professionals need to call for policy standards that require personal/company accountability for agents within these systems. This could include monitoring and reporting features that are necessary for activities, in addition to avoiding wrongdoing or fraudulent acts. Comfort that such proxies exist as audit trails kept in a system of records of all activities conducted within a given system and anti-fraud tools meant at detecting or discouraging illegitimate activities go a long way into establishing responsibility.

Also, ICT professionals should support the use of tools, standards, and frameworks that promote ethical posture. It may comprise fundraising for specific cryptocurrency application interfaces with ethical intent and principles or even affirmative regulations to uphold the ethical policies. The self-conception of rules is often viewed as a problem given decentralized approaches such as those found in cryptocurrencies; however, they can and must constitute an essential lever for holding a decentralized system accountable without sacrificing its innovative character. Thus, thanks to the introduction of ETHICAL practices and reporting on and advancing accountably infused ICT solutions, ICT practitioners can actively contribute toward maintaining and enhancing the integrity, security, and respect for the privacy of users of cryptocurrencies.

In conclusion, transparency should remain one of the many benefits of Blockchain, but this should be exercised carefully. ICT professionals need to know how to balance users' rights and promote transparency while preventing misuse of these rights. Using tools such as audit trials and anti-fraud

standards, as well as supporting ethical standards and regulations, can assist in creating a more secure and responsible cryptocurrency market (Reid & Harrigan, 2013).

6. Ethical Use of Power

In cryptocurrencies, substantial control is decentralized and vested among developers, miners, and those overseeing the cryptocurrency market. This decentralization is seen as a significant advantage since it raises the question of the need for more conventional intermediaries such as banks or the government. However, it is also a significant weakness because such a distribution of control creates the potential for unethical behavior. Network participants who hold explicit control over the network, e.g., the developers or miners, might wish to change the consensus rules to their advantage or pursue a behavior that they know goes against the trust built in the system. Situations like this can erode the very idea of the decentralized system, which by default means equity, transparency, and the ability to share information more frequently and elaborately (T apscott & T apscott, 2016).

ICT professionals should assertively take a stand concerning power in cryptocurrency networks to reduce these risks. For this reason, they have an ethical responsibility to maintain the distributed autonomy framework that underlines cryptocurrencies, which are permeated with institutions that check power and fight for fairness. This can involve the development of protocols that are immune to 'gaming' to ensure that critical decisions based upon the future evolution of the infrastructure are properly made to benefit all parties. If power is balanced throughout the network, it is challenging and less likely for influential people to engage in unethical conduct.

There are solutions to decentralized decision-making methods to keep governance fair, including decentralized autonomous organizations (DAOs). They eliminate the possibility of having single people or a limited number of persons controlling the given DAO's decision-making while enabling substantiated, decentralized ethical determinations. Since decisions are made by allocating voting rights according to the level and kind of participation rather than capital or computational resources, everyone in the DAO network has a voice. This makes bringing in more 'participation' from the internal public easier, thus achieving a decentralized form of governance.

First, ICT professionals should give their support and input for the creation of organizations with decentralized governance, such as DAOs. Other than preventing monopolization of the network,

14

these systems enhance fairness, equity, and participation in the network. Through the distribution of governance power so that a few stakeholders have little control, DAOs ensure the ethics of cryptocurrencies.

Besides promoting decentralized governance mechanisms, ICT professionals must guarantee that the systems they develop involve fairness and equity. This entails the development of systems that are equally usable by all forms of users, any level of computer literacy, monetary status, geographical location, etc. It also entails designing mechanisms that allocate incentives to mine, transact, and validate based on certain conditions and decision-making processes. Such systems contribute to the decentralization of the cryptocurrency space and keep it as close to its initial message as possible – accessible to everyone.

Indeed, cryptocurrencies provide excellent control to developers, miners, and other stakeholders. However, this control shall be rightfully applied. ICT professionals are responsible for supporting decentralized authority systems to eliminate the concentration of power. Cryptocurrency decision-making procedures, including decentralized autonomous organizations, provide a realistic way to protect the ethical use of the networks. Thus, the work of ICT specialists, who will develop systems based on similar values and principles, means that cryptocurrencies remain an effective and democratic response to the centralization of financial systems (T apscott & T apscott, 2016).

7. Recommendations to Minimize Disruption

Looking at the elements of disruptive technology in the global financial system, cryptocurrencies have started having an impact, yet their influence will negatively affect businesses, governments, and investors. Despite the numerous benefits of cryptocurrencies, measures must be formulated to reduce all the adverse consequences resulting from their adoption. The following suggestions promise to minimize the impact of cryptocurrencies' adverse effects while enhancing their opportunities as much as possible.

1. Implementing Standard and Clear Regulatory Systems

Providing and enforcing coherent regulatory measures is vital to eliminate the disruptive ramifications of cryptocurrencies. Governments and international regulatory authorities must unite and establish laws that clarify the legal context for businesses and investors as they expand on

these technologies. At the same time, these laws should support virtual currencies without fostering illicit activities like money laundering or scams (Böhme, Christin, Edelman, & Moore, 2015).

Such frameworks should be accompanied by policies on taxation, consumer protection, AML (Anti-Money Laundering), and KYC (Know Your Customer) measures. Identical laws across different jurisdictions would solve the problem of legal risks and allow broader cryptocurrency adoption, reducing associated risks and creating a safer space for their consumption.

2. Moral Obligation: Advocating Public Education and Awareness

A key challenge to cryptocurrency usage is more education, as many people remain ignorant. Cryptocurrencies are relatively new, and insufficient information about their function may lead to inefficient usage and increased fraud attempts. Public awareness should be promoted by governments, financial institutions, and ICT professionals to ensure people understand the risks, benefits, and correct usage of cryptocurrencies (Narayanan, Bonneau, Felten, Miller, & Goldfeder, 2016).

These educational efforts should focus on topics such as secure storage of digital assets, identifying possible scams, and the consequences of decentralized financial systems. Awareness initiatives should also target specific groups, such as small enterprises, by providing guidance on best practices for integrating cryptocurrencies into their business models.

3. Promoting the Use of Sustainable Practices

Cryptocurrency mining is closely associated with high energy consumption, particularly with proof-of-work protocols like those used by Bitcoin. The environment cannot bear the massive effects of cryptocurrencies; thus, it is crucial to encourage sustainable practices in the sector.

A proposed solution is to shift from energy-intensive consensus algorithms like PoW (Proof of Work) to more efficient ones like PoS (Proof of Stake). Autonomous organizations using PoS require fewer computations, reducing the environmental impact of cryptocurrency networks (Narayanan et al., 2016). Additionally, governments and corporations should ensure that mining operations utilize renewable energy sources to reduce their environmental footprint further.

4. Building Relationships with Traditional Financial Institutions

Cryptocurrencies should not be seen as a replacement for existing financial models but as an addition to them. By fostering collaboration between the ICO market and traditional monetary intermediaries, fluctuations can be minimized, and crypto assets can stabilize their presence in daily life (Catalini & Gans, 2016).

For example, integrating cryptocurrencies with widely used systems like PayPal or Visa can provide users with regulated but flexible transaction options. Strengthening the relationship between banks and cryptocurrency exchanges can create a secure and transparent layer between users and the underlying infrastructure.

5. Adopting Better Security Measures

With the rise of hacks, frauds, and cyberattacks in cryptocurrency, it is essential to develop better security protocols to address unexpected events. ICT professionals must continue enhancing encryption methods, multi-signature wallets, and decentralized storage to safeguard user assets (Möser, Böhme, & Breuker, 2013).

Additionally, digital currency applications should integrate advanced security features to prevent unauthorized access to user accounts and sensitive data. Preventive measures like security audits, vulnerability assessments, and bug bounty programs can help identify and fix potential security flaws.

6. Realization of Scalability on Demand

As more entities and individuals adopt cryptocurrencies, scalability has become a pressing issue. Existing blockchain structures often need help to handle high traffic, leading to slow transactions and high fees, which deter users and businesses from utilizing cryptocurrencies for everyday purchases.

To address this, developers should implement scalability solutions such as layer-2 protocols (e.g., the Lightning Network for Bitcoin), sharding, or sidechains to increase transaction throughput without compromising security (Catalini & Gans, 2016). Improving scalability will ensure that cryptocurrencies become more practical and efficient for real-world applications.

7. Incubating Technology Development and Research

Cryptocurrencies and blockchain technology are still relatively new, and ongoing innovation is needed to mitigate their negative impact while maximizing their benefits. Governments, universities, and private companies should support research and development projects to enhance the capabilities of blockchain technology.

These efforts should focus on broadening the potential applications of Blockchain, improving its security and performance, and exploring new use cases beyond payment systems. Financial support, such as grants and funding, alongside collaborative partnerships, could lead to technological breakthroughs that reduce the negative impact of cryptocurrencies on businesses and society (Schär, 2021).

References

- Baur, D. G., Hong, K., & Lee, A. D. (2018). Bitcoin: Medium of exchange or speculative assets? *Journal of International Financial Markets, Institutions and Money*.

- Böhme, R., Christin, N., Edelman, B., & Moore, T. (2015). Bitcoin: Economics, technology, and governance. *Journal of Economic Perspectives*.

- Catalini, C., & Gans, J. S. (2016). Some simple economics of the Blockchain. *MIT Sloan Research Paper No. 5191-16*.

- Crosby, M., Pattanayak, P., Verma, S., & Kalyanaraman, V. (2016). Blockchain technology: Beyond Bitcoin. *Applied Innovation Review*, 2.

- Möser, M., Böhme, R., & Breuker, D. (2013). An inquiry into money laundering tools in the bitcoin ecosystem. *eCrime Researchers Summit*.

- Nakamoto, S. (2008). Bitcoin: A peer-to-peer electronic cash system. Retrieved from https://bitcoin.org/bitcoin.pdf

- Narayanan, A., Bonneau, J., Felten, E., Miller, A., & Goldfeder, S. (2016). *Bitcoin and cryptocurrency technologies: A comprehensive introduction*. Princeton University Press.

- Reid, F., & Harrigan, M. (2013). An analysis of anonymity in the Bitcoin system. *Security and Privacy in Social Networks*.

- Schär, F. (2021). Decentralized finance: On Blockchain- and smart contract-based financial markets. *Federal Reserve Bank of St. Louis Review*, 103(2), 153-174.

- Tapscott, D., & Tapscott, A. (2016). *Blockchain revolution: How the technology behind Bitcoin is changing money, business, and the world*. Penguin Books.

- Vigna, P., & Casey, M. J. (2015). *The age of Cryptocurrency: How Bitcoin and digital money are challenging the global economic order*. St. Martin's Press.

Appendix A: Ethical Matrix

Levels of Social Analysis \ Topics of Ethical Analysis	Responsibility		Ethical Issues						
	Individual	Professional	Quality of Life	Use of Power	Risks & Reliability	Property Rights	Privacy	Equity & Access	Honesty & Deception
Individuals	X	X	X		X		X	X	X
Communities & Groups	X		X		X	X	X		
Organisations	X	X			X	X	X		
Cultures									
Institutional Sectors	X	X	X	X	X	X	X	X	
Nations			X	X	X		X	X	
Global			X					X	

Appendix B : Identified Opportunities and Risks

Social opportunity and risk categorisation					
HIGH Likelihood of Occurring ... **LOW**	**Incidental**	**Minor**	**Significant**	**Major**	**Severe**
Very likely to occur				Privacy Concerns and Legal/Ethical Challenges	Enhanced Detection and Monitoring
Likely to occur			Security Vulnerabilities	Improved Accuracy and Predictive Analytics	
Possible to occur	Lack of Accountability and Technical Errors	Dependence on Technology and Misuse	Resource Optimization and Data Integration		
Unlikely to occur			Facial Recognition and Identification		
Very unlikely to occur					
LOW Opportunity / Impact / Consequence **HIGH**	Local, small-scale, easily reversible change on social characteristics or values of the communities of interest or communities can <u>easily adapt</u> or cope with change. Local small-scale opportunities emanating from the technology that the community can readily pursue and capitalise on	Short-term recoverable changes to social characteristics and values of the communities of interest or community has <u>substantial capacity</u> to adapt and cope with change. Short-term opportunities emanating from the technology.	Medium-term recoverable changes to social characteristics and values of the communities of interest or community has <u>some capacity</u> to adapt and cope with change. Medium-term opportunities emanating from the technology.	Long-term recoverable changes to social characteristics and values of the communities of interest or community has limited <u>capacity</u> to adapt and cope with change. Long-term opportunities emanating from the technology	Irreversible changes to social characteristics and values of the communities of interest or community has <u>no capacity</u> to adapt and cope with change.