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Digitalization of Society and the Evolution of Law: A Legal Analysis of the Use of Bitcoin and Altcoins in Commercial Transactions

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Abstract
This study aims to analyze the legal complexity of Bitcoin and altcoin use in commercial transactions and identify the need for legal evolution to accommodate the digitalization of society. The research method uses a qualitative approach with a literature study focusing on normative legal analysis of cryptocurrency regulation, consumer protection, and the applicable legal framework. Data collection techniques were conducted through document studies of primary, secondary, and tertiary legal materials, with qualitative descriptive analysis using content analysis and a comparative approach to cryptocurrency regulation in various jurisdictions. The results show that the legal uncertainty of cryptocurrencies creates significant legal complexity in commercial transactions, where the ambiguous legal status, diverse characteristics of altcoin technology, and cross-border jurisdictional challenges require an adaptive and responsive regulatory approach. The existing consumer protection framework is inadequate to accommodate the risks of volatility, transaction irreversibility, and the complexity of blockchain technology. An adaptive regulatory model that integrates a regulatory sandbox, a principle-based approach, and a risk-based framework provides a solution to accommodate the dynamic characteristics of cryptocurrencies. This study proposes a responsive legal adaptation framework that can facilitate the co-evolution between law and blockchain technology while providing adequate protection for all stakeholders in the cryptocurrency ecosystem.

Keywords: Digitalization of Society, Evolution of Law, Legal Analysis, Bitcoin and Altcoins

A. Introduction

The development of information and communication technology over the past two decades has brought about a fundamental transformation in the structure of global society, now entering an era known as digital society. The Society 5.0 era, driven by the rise of digitalization and technological development, has brought about significant transformations in various aspects of human life, including the economic and financial systems (Wijaya, 2024). This digitalization has not only changed the way humans interact, socialize, and conduct economic activities, but has also created new paradigms in the concepts of ownership, transactions, and economic value that challenge traditional legal frameworks that have existed for centuries.

One of the most revolutionary manifestations of societal digitalization is the emergence of cryptocurrencies, pioneered by Bitcoin, introduced in 2009 by Satoshi Nakamoto. Bitcoin and the various altcoins (alternative coins) that followed have transformed the global financial landscape by offering a decentralized peer-to-peer payment system, eliminating the need for a central authority like a bank or

government (Sondakh, 2016). This phenomenon has not only created a new asset class but also given rise to a complex digital economic ecosystem involving various stakeholders, from individuals and corporations to large financial institutions, which are beginning to adopt cryptocurrency as part of their investment portfolios.

The legal complexity arising from the use of cryptocurrency in commercial transactions is increasing with the development of various types of altcoins with diverse functions and characteristics. Each altcoin has a different protocol, consensus mechanism, and purpose, ranging from those that function as a store of value like Bitcoin, to those designed for smart contracts like Ethereum, or those that focus on privacy like Monero and Zcash (Alexander & Muhammad, 2020). This diversity creates multidimensional legal challenges, with each type of cryptocurrency requiring a different regulatory approach according to its characteristics and the risks it poses in the context of commercial transactions.

The legal aspects of using Bitcoin and altcoins in commercial transactions become even more complex when confronted with a legal system still based on traditional concepts of money, contracts, and property. Conventional laws developed to regulate physical transactions and centralized financial systems face significant challenges in accommodating the unique characteristics of cryptocurrencies, such as immutability, pseudonymity, and borderless nature (Ramadhan, 2021). This legal uncertainty not only impacts the legitimacy of cryptocurrencies as a means of payment but also creates legal risks for businesses seeking to integrate them into their business models.

From a consumer protection perspective, the use of Bitcoin and altcoins in commercial transactions raises various legal issues that have not yet been fully resolved. Extreme price volatility, the risk of losing private keys, the possibility of fraud and scams, and the absence of chargeback mechanisms like those found in conventional payment systems create significant protection gaps for consumers (Usman, 2017). This situation is exacerbated by the general public's limited understanding of blockchain technology and cryptocurrencies, resulting in a lack of understanding of the risks they face when engaging in transactions using digital currencies.

The legal vacuum surrounding the development of digitalization, manifested in cryptocoins and blockchain, is one of the main challenges facing contemporary legal systems. Existing regulations often lag far behind technological developments, creating a gray area that can be exploited for illegal activities or harm consumers (Wijaya, 2024). The lack of synchronization between the speed of technological innovation and the lengthy legislative process creates a situation where market players operate in legal uncertainty, while regulators struggle to develop an appropriate framework without stifling innovation.

The international dimension of cryptocurrency adds complexity to the development of an effective legal framework. Bitcoin and altcoins operate in a global network without recognizing national borders, creating jurisdictional and enforcement challenges that are not easily resolved with fragmented national legal approaches. Differences in regulatory approaches between countries, ranging from

highly restrictive ones like China to relatively permissive ones like El Salvador, create regulatory arbitrage that can be exploited by perpetrators to evade compliance or even engage in illegal cross-border activities.

The legal evolution necessary to accommodate the realities of a digital society and the use of cryptocurrency in commercial transactions must balance these often conflicting interests. On the one hand, a legal framework is needed that provides certainty and protection for all stakeholders, including consumers, businesses, and the financial system as a whole. On the other hand, overly strict regulations can hinder innovation and technological development, which have significant potential to increase efficiency and financial inclusion. This balance is key to developing a legal system that is adaptive and responsive to technological developments, while maintaining economic stability and protecting the public interest.

Research conducted by Sondakh (2016), in his work "Berburu Bitcoin," provides a comprehensive analysis of the technical and economic aspects of Bitcoin, the first digital currency. This research explores the workings of blockchain technology, the mining process, and the dynamics of the Bitcoin market in a global context. Sondakh emphasizes that Bitcoin functions not only as an alternative means of payment but also as a store of value that can compete with traditional assets such as gold. The research findings indicate that Bitcoin's adoption by the public is still hampered by technical factors, regulations, and limited public understanding. Sondakh's research also identifies various risks associated with Bitcoin use, including price volatility, cybersecurity, and regulatory uncertainty. While making important contributions to understanding the technical and economic aspects of Bitcoin, this research is still limited to a specific analysis of Bitcoin and does not explore the broader legal implications of cryptocurrency use in commercial transactions.

Alexander and Muhammad (2020), in their study entitled "Blockchain & Cryptocurrency: A Legal Perspective in Indonesia and the World," conducted a comparative study of cryptocurrency regulations in various jurisdictions. This study analyzes the differences in cryptocurrency regulatory approaches between Indonesia and other countries and identifies the legal challenges faced in integrating cryptocurrency into existing legal systems. The study's main findings indicate that most countries are still in the experimental stage in developing cryptocurrency regulatory frameworks, with approaches varying from prohibitive to accommodative. The study also identifies that regulatory inconsistencies between countries create regulatory arbitrage that market players can exploit to avoid compliance. Alexander and Muhammad emphasize the need for international regulatory harmonization to ensure effective cryptocurrency oversight. However, this study focuses on general regulatory analysis and does not provide an in-depth analysis of the specific legal implications of using Bitcoin and altcoins in commercial transactions, particularly from the perspective of consumer protection and law enforcement.

Ramadhan's (2021) study, "Legitimacy of Cryptocurrency (Digital Currency) as a Corporate Asset," examines the corporate legal aspects of using cryptocurrency as a corporate asset. This study analyzes the

legal implications when companies decide to hold cryptocurrency on their balance sheets, either for investment purposes or as cash reserves. The study's findings indicate that using cryptocurrency as a corporate asset raises various legal issues, including asset valuation, financial reporting, and tax liabilities. Ramadhan identified that the lack of clear accounting standards for cryptocurrencies creates uncertainty in the preparation of corporate financial statements. This study also explores the responsibilities of directors and commissioners in cryptocurrency investment decisions, as well as potential conflicts of interest that may arise. While this study provides important insights into the corporate aspects of cryptocurrency, its focus is still limited to the use of cryptocurrency as an investment asset and has not yet explored in depth the use of cryptocurrency in corporate commercial transactions, particularly in the context of relationships with consumers and suppliers.

Based on a review of previous research, several significant research gaps can be identified in the legal analysis of the use of Bitcoin and altcoins in commercial transactions. First, existing research tends to focus on macro-regulatory aspects or the technical operations of cryptocurrencies. However, no comprehensive analysis has yet been conducted on the micro-legal implications of using Bitcoin and altcoins in specific types of commercial transactions. This gap includes an analysis of how traditional contract law can be applied to smart contracts using altcoins, dispute resolution mechanisms in cryptocurrency transactions, and the legal aspects of evidence in cases of fraud or breach of contract involving digital currencies. The absence of an in-depth analysis of the interaction between traditional private law and the characteristics of blockchain technology creates significant legal uncertainty for businesses wishing to adopt cryptocurrencies in their commercial operations.

Second, there is a significant gap in research on consumer protection in the cryptocurrency ecosystem, particularly in the context of retail and e-commerce transactions. Existing research has not yet explored in depth how consumer protection principles can be implemented in a decentralized and pseudonymous environment like cryptocurrency. This gap covers aspects such as consumer rights to refunds, dispute resolution mechanisms, personal data protection in cryptocurrency transactions, and merchant responsibilities when accepting payments using highly volatile altcoins. The lack of a clear consumer protection framework in cryptocurrency transactions can create information asymmetry and a power imbalance that harm consumers, while also hampering mainstream cryptocurrency adoption due to a lack of public trust in the security and fairness of the system.

This research presents a major novelty in the form of the development of a comprehensive and multidimensional legal analysis framework to evaluate the use of Bitcoin and altcoins in various commercial transaction contexts. Unlike previous research that tends to separate technical, economic, and legal analysis, this study integrates these three perspectives into a holistic analytical framework that captures the complex interactions between blockchain technology, cryptocurrency market dynamics, and the evolution of the legal system. This framework includes the development of typological categories of cryptocurrency commercial transactions

based on their technological characteristics (proof of work vs. proof of stake, fungible vs. non-fungible tokens, centralized vs. decentralized exchanges), risk level (high volatility vs. stablecoins, privacy coins vs. transparent blockchains), and legal complexity (simple payments vs. smart contracts, domestic vs. cross-border transactions). These typological categories allow for a more granular and specific analysis of the legal implications of each type of transaction, thus providing more applicable practical guidance for regulators, business actors, and legal practitioners. The second novel contribution of this research is the development of a responsive legal adaptation model specifically designed to accommodate the dynamic and evolutionary characteristics of cryptocurrency and altcoin technology. This model differs from traditional regulatory approaches, which tend to be rigid and reactive, by proposing a regulatory framework that is principle-based, technology-neutral, and adaptive to technological developments. This model includes a regulatory sandbox mechanism for cryptocurrency innovation, an early warning system to identify emerging risks from new altcoins, and a multi-stakeholder engagement framework that involves technology developers, industry players, academics, and civil society in the regulatory development process. The uniqueness of this model lies in its proactive approach in anticipating future developments in cryptocurrency technology, while maintaining the flexibility to adapt to unforeseen innovations. This model also integrates the principles of good governance, proportionality, and a risk-based approach in the development of cryptocurrency regulations.

Contemporary reality shows that the adoption of Bitcoin and altcoins in commercial transactions has reached a level that the global legal system can no longer ignore. Data from various cryptocurrency exchange platforms indicates that daily cryptocurrency transaction volumes have reached billions of US dollars, with a growing number of multinational corporations starting to accept cryptocurrency payments for their products and services. Companies like Tesla, Microsoft, PayPal, and Visa have integrated cryptocurrency into their payment systems, while countries like El Salvador have made Bitcoin legal tender. This phenomenon creates a situation where cryptocurrency commercial transactions operate on a massive global scale, yet remain amidst high legal uncertainty. This misalignment between the realities of business practices and the existing legal framework creates systemic risks that could impact global economic stability if not promptly addressed through the development of comprehensive and harmonized regulations across jurisdictions.

On the other hand, the reality of blockchain technology and cryptocurrency continues to evolve at an exponential pace, introducing new innovations such as Decentralized Finance (DeFi), Non-Fungible Tokens (NFTs), Central Bank Digital Currencies (CBDCs), and the Web3 ecosystem, which are increasingly integrating cryptocurrency into various aspects of people's digital lives. This development is not limited to the financial sector but also extends to various sectors such as gaming, entertainment, supply chain management, and digital identity. This rapid pace of innovation presents challenges for the legal system, which requires a relatively long time to adapt, resulting in a significant time lag between technological developments and their legal regulations.

This reality demands the development of a more agile and responsive legal approach, one that can accommodate technological developments without stifling innovation, while still providing adequate protection for all stakeholders involved in the cryptocurrency ecosystem.

B. Method

This research employs a qualitative approach with a library research method focused on a legal analysis of the use of Bitcoin and altcoins in commercial transactions. A qualitative approach was chosen because it provides a deep and comprehensive understanding of complex and multidimensional legal phenomena, particularly in the context of the digitalization of society and the evolution of legal systems following the development of cryptocurrency technology. Qualitative research methods allow researchers to explore the various legal, social, and technological aspects that interact in the use of digital currencies, and provide room for interpretation and contextual analysis that cannot be achieved through a purely quantitative approach (Sugiyono, 2019).

The type of research used is normative legal research with a normative-juridical approach, where the analysis focuses on legislation, legal doctrine, and legal theories relevant to the use of cryptocurrency in commercial transactions (Muhaimin, 2020). Normative legal research was chosen because the research problem relates to legal gaps, regulatory uncertainty, and the need to develop a legal framework that adapts to the development of blockchain technology and cryptocurrency. This approach allows researchers to analyze gaps and inconsistencies in the existing legal system and propose legal solutions that can accommodate the unique characteristics of digital currencies in the context of commercial transactions.

The data collection technique used in this research is a documentary study, focusing on primary, secondary, and tertiary legal materials relevant to the research topic. Primary legal materials include laws and regulations, court decisions, and regulations from relevant authorities such as Bank Indonesia, the Financial Services Authority, and the Commodity Futures Trading Regulatory Agency. Secondary legal materials consist of scientific journal articles, legal textbooks, previous research results, and research reports from academic institutions and international bodies such as the Bank for International Settlements and the Financial Stability Board. Tertiary legal materials include legal dictionaries, encyclopedias, and online legal databases that provide definitions and conceptual explanations of the terminology used in the research (Soekanto & Mamudji, 2018).

The data analysis process was conducted using a qualitative descriptive approach using content analysis techniques to identify key themes, legal patterns, and causal relationships between various legal variables that influence the use of cryptocurrency in commercial transactions. The analysis was conducted in several stages, beginning with data categorization based on different legal aspects (contract law, consumer protection law, corporate law, international law), continuing with identifying inconsistencies and gaps in existing regulations, and concluding with synthesis to develop a comprehensive conceptual framework. Data validity was ensured through source triangulation, where information from one source was confirmed by other independent and credible sources.

This study also used a comparative approach to analyze differences in cryptocurrency regulations across jurisdictions, with the aim of identifying best practices that can be adapted to the Indonesian legal context. Comparisons were made with cryptocurrency regulations in countries with relatively mature legal frameworks, such as the United States, the European Union, Japan, Singapore, and Australia. This comparative analysis provides a global perspective on various regulatory approaches that may be applicable, while also identifying universal challenges faced by legal systems in accommodating blockchain technology and cryptocurrency. The limitation of this research lies in its focus on normative analysis without involving empirical data from industry players or cryptocurrency users, so the research results need to be further confirmed through field research to validate the practical relevance of the theoretical findings produced.

C. Result and Discussion

1. Result

a. The Legal Complexity of Bitcoin and Altcoins in Commercial Transactions

An analysis of the legal complexity of using Bitcoin and altcoins in commercial transactions indicates that legal uncertainty is a major challenge faced by businesses and consumers. Based on applicable regulations in Indonesia, cryptocurrencies, including Bitcoin, still lack clear legal status as legal tender, although their use as a trading commodity has been recognized through regulations from the Commodity Futures Trading Regulatory Agency (BAPPEBTI). This unclear legal status creates a gray area that allows for diverse interpretations from various parties, from businesses and consumers to regulatory authorities. Bank Indonesia has expressly stated that Bitcoin is not a currency or legal tender under the Currency Law and prohibits payment service providers from accepting, processing, and linking virtual currencies to payment systems (Kurniawan, 2021).

The legal complexity increases when considering the diverse technical characteristics of the various types of altcoins circulating in the market. Each altcoin has a different protocol, consensus mechanism, and function, ranging from utility tokens and security tokens to stablecoins designed to minimize price volatility. These differences in technical characteristics require a specific and granular regulatory approach. Regulations applicable to Bitcoin may not be appropriate for other altcoins, such as Ethereum, which features smart contracts, or privacy coins like Monero, which emphasize transaction anonymity. The legal system's inability to distinguish and categorize various types of cryptocurrencies based on their technical characteristics and risks creates legal uncertainty that hinders innovation and adoption of blockchain technology in the commercial sector.

The transboundary aspect of cryptocurrency adds a significant dimension of legal complexity to cross-border commercial transactions. Bitcoin and altcoins operate on a global network without recognizing jurisdictional boundaries, creating challenges in determining which law applies when disputes or violations arise in cryptocurrency transactions. This is exacerbated by differences in regulatory approaches between countries, with some adopting a permissive approach while others implement a total ban. The lack of international regulatory harmonization creates regulatory arbitrage that can be exploited by perpetrators to evade compliance or even engage in illegal

activities. Meanwhile, traditional law enforcement mechanisms based on territorial jurisdictions face limitations in monitoring and prosecuting violations that occur in cryptocurrency transactions, which are pseudonymous and can be conducted instantly across borders.

From a contract law perspective, the use of cryptocurrency in commercial transactions raises fundamental questions about the validity and enforceability of contracts using digital currencies as a medium of payment. The lack of legal tender recognition for cryptocurrency creates uncertainty about whether contracts using Bitcoin or altcoins as a means of payment are legally enforceable. Furthermore, the irreversible nature of blockchain transactions contradicts traditional contract law principles, which allow for the cancellation or modification of contracts under certain circumstances such as mistake, misrepresentation, or frustration. Smart contracts using altcoins like Ethereum add complexity by automating contract execution based on program code, which can raise questions about interpretation, modification, and dispute resolution when bugs or unforeseen circumstances arise in the program code.

b. Consumer Protection Framework in the Cryptocurrency Ecosystem

The implementation of consumer protection in commercial transactions using cryptocurrency faces fundamental structural challenges due to the decentralized and pseudonymous nature of blockchain technology. Law Number 8 of 1999 concerning Consumer Protection, the legal umbrella for consumer protection in Indonesia, does not specifically regulate transactions using cryptocurrency, resulting in a gap in providing adequate protection for consumers who use digital currencies in their commercial activities (Azis, 2021). The absence of a chargeback or refund mechanism in the cryptocurrency system, unlike conventional payment systems such as credit cards, creates high risks for consumers in the event of problematic transactions, fraud, or merchants failing to fulfill their obligations. This is exacerbated by the irreversible nature of blockchain transactions, which leaves consumers with no recourse mechanism when purchased goods or services do not match the promised or are not received at all.

The extreme price volatility of most cryptocurrencies, including Bitcoin and most altcoins, creates significant value risk for consumers in commercial transactions. Consumers making payments using cryptocurrency can experience substantial economic losses due to price fluctuations that occur between the time of order and transaction completion, particularly in transactions requiring long processing times. The absence of a protection mechanism against volatility risks within the existing consumer protection legal framework creates a risk asymmetry that is detrimental to consumers. Meanwhile, consumers also face technical risks such as lost private keys, errors in wallet addresses, or cyberattacks on the exchange platform they use, all of which can result in the permanent loss of cryptocurrency without an effective recovery mechanism.

Consumer information and education are crucial challenges in providing effective protection in cryptocurrency transactions. The majority of consumers lack an adequate understanding of blockchain technology, how cryptocurrencies work, and the risks associated with their use in commercial transactions. This lack of understanding

creates vulnerabilities that can be exploited by unscrupulous merchants or fraudsters. The caveat emptor (buyer beware) principle applicable in traditional contract law becomes problematic in the cryptocurrency context, where consumers lack the ability to conduct adequate due diligence regarding the complex technology and risks. Merchants accepting cryptocurrency payments should be obligated to provide clear and comprehensive information about the risks associated with using digital currencies, including price volatility, transaction irreversibility, and potential technical issues.

Dispute resolution mechanisms in cryptocurrency commercial transactions require an innovative and adaptive approach, given the technological characteristics that challenge traditional legal systems. Online arbitration platforms and blockchain-based alternative dispute resolution (ADR) are being developed to address the limitations of conventional judicial systems in handling cryptocurrency disputes. However, the effectiveness of these mechanisms remains limited due to the lack of adequate enforcement power and the lack of legal recognition of arbitration decisions made by digital platforms. The need to develop hybrid dispute resolution mechanisms that combine the sophistication of blockchain technology with the legitimacy and enforcement power of the formal legal system is urgently needed to provide effective consumer protection. This includes the development of smart contracts for escrow services, integration with the formal judicial system for enforcement, and standardization of dispute resolution procedures that are accessible and understandable to ordinary consumers.

c. An Adaptive Regulatory Model for Cryptocurrency Commercial Transactions

Developing an adaptive regulatory model for cryptocurrency commercial transactions requires a new paradigm in legislative and law enforcement approaches that can accommodate the dynamic and evolutionary characteristics of blockchain technology. Traditional regulatory models, which tend to be prescriptive and rigid, are not suitable for the rapidly evolving and highly innovative cryptocurrency ecosystem. A principle-based regulatory approach, which emphasizes establishing basic principles and regulatory objectives while providing flexibility in technical implementation, shows greater potential for accommodating the development of cryptocurrency technology (Alexander & Muhammad, 2020). This model allows regulators to focus on desired outcomes, such as consumer protection, market integrity, and financial stability, without becoming overly fixated on technical specifications that can quickly become obsolete as technology advances.

The regulatory sandbox concept is a crucial component of the adaptive regulatory model, allowing cryptocurrency industry players to experiment and innovate in a controlled environment with relaxed regulatory requirements. The sandbox provides space for fintech companies and cryptocurrency startups to develop and test new products or services without immediately having to comply with full regulatory requirements that may be inappropriate or even stifle innovation. In the context of commercial cryptocurrency transactions, the sandbox can be used to test various business models, consumer protection mechanisms, and technological infrastructure that support the mainstream adoption of digital currencies. The results of

sandbox experiments can provide valuable input for regulators to develop more informed and practical regulations, while also providing certainty to industry players about the future direction of regulation.

A risk-based framework in cryptocurrency regulation allows for differentiated treatment based on the level of risk posed by various types of cryptocurrencies and the business models that utilize them. Stablecoins pegged to fiat currencies have a different risk profile than volatile cryptocurrencies like Bitcoin, requiring a different regulatory approach. Similarly, utility tokens, used to access specific services, versus security tokens, which provide ownership rights or profit sharing. An adaptive regulatory model must be able to identify and categorize various types of cryptocurrencies based on their characteristics and risks, then apply proportionate regulatory measures appropriate to the risk level of each category. This includes differentiation in licensing requirements, capital adequacy, consumer protection, and reporting obligations.

Implementing an adaptive regulatory model requires an institutional framework that supports coordination between various supervisory authorities and stakeholders involved in the cryptocurrency ecosystem. In Indonesia, coordination between Bank Indonesia, the Financial Services Authority (OJK), BAPPEBTI (Indonesian Commodity Futures Trading Regulatory Agency), and the Ministry of Communication and Informatics (Kominfo) is crucial to ensuring the consistency and effectiveness of cryptocurrency regulations. A multi-agency approach with a clear division of responsibilities and a strong coordination mechanism can avoid regulatory overlap, gaps, or conflicts that can create uncertainty for industry players. Furthermore, engagement with the private sector, academic institutions, and civil society organizations is crucial to ensure that the regulations developed are not only technically sound but also practically implementable and socially acceptable. Regular review and update mechanisms must be built into the regulatory system to ensure the framework remains relevant and effective as technology and the cryptocurrency market continue to evolve.

2. Discussion

a. Legal Paradigm Transformation in the Digital Society Era

The transformation of digital society has forced the legal system to undergo a fundamental evolution that goes beyond superficial adaptation to new technologies. The Responsive Law theory, developed by Philippe Nonet and Philip Selznick, provides a relevant conceptual framework for understanding how law must evolve from a rigid and formalistic model to a system that is more adaptive and responsive to social and technological change. In the context of cryptocurrency and blockchain, the application of responsive law theory demonstrates that the legal system can no longer rely on a traditional command-and-control approach but must instead develop mechanisms that enable co-evolution between law and technology. This aligns with Wijaya's (2024) findings, which emphasize that the Society 5.0 era demands regulatory transformation that not only accommodates digital technology but also anticipates future, unpredictable technological developments.

The Legal Pluralism theory, proposed by Sally Engle Merry, provides an additional perspective for understanding the complexity of cryptocurrency regulation, which operates within multiple legal systems simultaneously.

In the Bitcoin and altcoin ecosystem, there is an interaction between code-as-law (blockchain protocols), national legal systems (domestic regulations), and international soft law (international standards), creating a complex and often contradictory normative plurality. This phenomenon results in a situation where cryptocurrency players must navigate multiple layers of legal obligations that are not always coherent or compatible with each other. Research by Alexander & Muhammad (2020) confirms that regulatory inconsistencies between jurisdictions create regulatory arbitrage that can be exploited to circumvent legal obligations, while simultaneously creating an unfair competitive advantage for players operating in more permissive jurisdictions.

Clayton Christensen's concept of disruptive innovation provides a theoretical lens for understanding why traditional legal systems have difficulty accommodating cryptocurrencies. Bitcoin and altcoins are manifestations of disruptive technology that not only changes the way transactions are conducted but also challenges fundamental assumptions about the nature of money, intermediation, and trust in the economic system. This disruption creates tension between incumbent institutions (banks, payment processors, regulators) and emerging technologies that enable disintermediation and decentralization. The research findings show that resistance to cryptocurrency is not only technological or economic, but also ideological, where cryptocurrency represents a fundamental challenge to the state monopoly in monetary policy and financial oversight that has become the cornerstone of modern economic governance.

b. Reconstructing the Digital Consumer Protection Framework

Implementing consumer protection in cryptocurrency transactions requires a fundamental reconstruction of the traditional consumer protection paradigm, which is based on clear identification of parties, reversible transactions, and centralized intermediation. The Relational Contract Theory developed by Ian Macneil provides a more appropriate conceptual framework for understanding the ongoing, complex, and embedded nature of cryptocurrency transactions within a broader technological ecosystem. In the context of cryptocurrency, the relationship between consumers and merchants cannot be understood as a discrete transaction, but rather as part of a broader network relationship involving multiple parties, including exchange platforms, wallet providers, and protocol developers. Azis (2021) identified that the traditional consumer protection framework, which focuses on bilateral relationships between buyers and sellers, is inadequate to address the multilateral complexity of the cryptocurrency ecosystem, where consumer protection requires coordination from multiple stakeholders with different roles and responsibilities.

Ulrich Beck's Risk Society Theory provides a valuable perspective for understanding the nature of risks in cryptocurrency transactions and how the regulatory system must be redesigned to accommodate the manufactured risks inherent in a digital society. Cryptocurrency transactions create new categories of risks that cannot be anticipated or managed through traditional risk management approaches based on statistical predictability and centralized control. Risks in cryptocurrency are systemic, interconnected, and can manifest in unexpected ways, such as smart contract bugs, protocol vulnerabilities, or market manipulation through algorithmic trading. Research shows that current consumer protection frameworks are still based on traditional risk categories such as product defects or seller misconduct, and do not yet

accommodate the technological and systemic risks characteristic of the cryptocurrency ecosystem.

The concept of procedural justice by John Rawls and Tom Tyler provides a theoretical foundation for developing fair and legitimate dispute resolution mechanisms for cryptocurrency transactions. Given the pseudonymous nature of cryptocurrency and the lack of a central authority, procedural justice is especially important to ensure that consumers have access to a fair resolution process when disputes arise. Current legal systems based on territorial jurisdiction and identity verification face fundamental challenges in providing procedural justice for cryptocurrency disputes that can involve anonymous parties and cross-border transactions. Research findings indicate that the development of blockchain-based dispute resolution mechanisms, while promising, still requires integration with traditional legal systems to ensure the enforceability and legitimacy of decisions made through decentralized arbitration processes.

c. The Evolution of Regulatory Models for Emergent Technologies

Developing an effective regulatory framework for cryptocurrencies requires adopting the adaptive governance theory developed by Charles Sabel and William Simon, which emphasizes experimental, collaborative, and iterative approaches to policy development. Traditional regulatory models based on static rules and top-down enforcement are incompatible with the rapid pace of innovation and high degree of uncertainty that characterize the cryptocurrency ecosystem. An adaptive governance approach allows regulators to engage in a continuous learning process through regulatory sandboxes, pilot programs, and stakeholder collaboration, which can generate real-time feedback on the effectiveness and unintended consequences of regulatory interventions. Ramadhan (2021) demonstrates that regulatory uncertainty can be reduced by adopting principle-based regulation that provides clear guidance on regulatory objectives while maintaining flexibility in implementation methods.

Elinor Ostrom's Polycentric Governance theory provides valuable insights into how governance in the cryptocurrency ecosystem can be organized effectively through multiple, overlapping governance mechanisms that operate at different scales and involve different stakeholders. The cryptocurrency ecosystem is inherently polycentric, with governance functions distributed across protocol developers, miners, exchanges, wallet providers, and regulatory authorities, each with distinct governance mechanisms and accountability structures. Effective regulation of cryptocurrency requires recognition of this polycentric nature and the development of coordination mechanisms that ensure coherence and complementarity across different governance layers. Research shows that attempts to impose centralized regulatory control on an inherently decentralized system are often counterproductive and can drive innovation underground or offshore to more permissive jurisdictions.

The application of Network Governance Theory in the context of cryptocurrency regulation demonstrates that effective oversight requires a shift from a hierarchical command-and-control approach to a collaborative network-based approach that recognizes interdependence and shared responsibility among different stakeholders. The cryptocurrency ecosystem operates as a complex network where the actions of one stakeholder can have cascading effects on others. Therefore, effective regulation requires an understanding of network dynamics and the development of governance mechanisms that

can influence behavior through network effects rather than direct command. Research findings indicate that the most effective regulatory interventions in the cryptocurrency space are those that work with and through network structures rather than against them, such as the development of industry standards, certification programs, and self-regulatory organizations that can provide governance functions that complement formal regulatory oversight.

D. Conclusion

Based on a comprehensive analysis of the legal aspects of Bitcoin and altcoin use in commercial transactions, it can be concluded that the digitalization of society has created fundamental challenges for the legal system, requiring a paradigmatic transformation from traditional regulatory approaches to a more adaptive and responsive framework. The complexity of blockchain technology and the diverse characteristics of cryptocurrencies demand a granular and risk-based regulatory approach, where each category of cryptocurrency is treated according to its specific risk profile and technical characteristics. The legal vacuum created by the time lag between technological development and the legislative process has created uncertainty that hinders mainstream cryptocurrency adoption and opens up opportunities for exploitation and activities that harm consumers. The current consumer protection framework is inadequate to accommodate the unique characteristics of cryptocurrency transactions, particularly their irreversibility, volatility, and technological complexity, which require specialized knowledge for risk assessment.

The necessary legal evolution must integrate the principles of adaptive governance, responsive law, and polycentric regulation, which can accommodate the dynamic and evolutionary nature of cryptocurrency technology. Future regulatory models must balance the need to provide certainty and protection for stakeholders with the imperative not to hinder innovation and technological development, which have significant potential to increase efficiency and inclusion in the financial system. The implementation of regulatory sandboxes, principle-based regulation, and multi-stakeholder governance mechanisms is crucial to facilitating sustainable and beneficial co-evolution between law and technology for all parties. This research contributes a conceptual framework and practical recommendations that can serve as a foundation for developing a legal system that is more responsive to the challenges and opportunities posed by the digital society era and the widespread adoption of cryptocurrency in commercial transactions.

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