Chapter 12
The Ethical and Legal Dimensions of Blockchain:
A Comprehensive Analysis of Global and UAE Perspectives

Saif Ahmed Almaeeni
Department of Computer Information Science, Higher Colleges of Technology, Sharjah, UAE

Mubarak Aldhanhani
Department of Computer Information Science, Higher Colleges of Technology, Sharjah, UAE

Majid Alhammadi
Department of Computer Information Science, Higher Colleges of Technology, Sharjah, UAE

Sultan Almaazmi
Department of Computer Information Science, Higher Colleges of Technology, Sharjah, UAE

Ammar Almomani
https://orcid.org/0000-0002-8808-6114
Higher Colleges of Technology, Sharjah, UAE

ABSTRACT

Blockchain technology has revolutionized financial and administrative systems through decentralization, transparency, and immutability. These attributes enable

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specialized hardware applications while paradoxically generating challenges regarding information governance and cross-border regulatory compliance. A fundamental contradiction exists between blockchain's inherent characteristics—trustless transactions, immutable data storage, and disintermediation—versus established cyberspace legal frameworks demanding data erasure rights and intellectual property protection. This analysis examines jurisdictional variations in regulatory approaches, with particular focus on UAE's implementation strategies. The research contributes to blockchain governance discourse by identifying cybersecurity vulnerabilities and advocating for regulatory innovation that balances technological advancement with ethical considerations, enabling sustainable adoption.

INTRODUCTION

Conceptual Foundation of Blockchain Technology

Blockchain technology is a type of distributed ledger that allows recording of transactions in a peer-to-peer manner without depending on an authority. In its core, the functioning of blockchain is based on cryptographic hashing: sequential transactions are organized into blocks which are in turn linked together, making the historical record impossible to tamper with as long as it was validated by participants of the network (Tang et al., 2020; Zaghloul et al., 2020). Despite the fact that the blockchain was initially designed to support the peer-to-peer digital currency system that was called Bitcoin, it has since been developed to include supply chain management, decentralized finance, sharing of health information, and government solutions (Kshetri, 2021).

Figure 1 presents a simplified visualization of the transaction processing flow in most of the blockchain systems. Blockchain Transaction Processing Process. Within this schema the proposed transactions are broadcast by participants to the network; the transactions are validated by specialized nodes using consensus-based mechanisms; once accepted, the transactions get aggregated into a novel block. It is then cryptographically connected with previous blocks creating the chain of record that cannot be changed. This is because each node has a copy of this shared ledger which makes it extremely cumbersome to alter or forge historical entries.

Consensus mechanisms such as Proof of Work (PoW) and Proof of Stake (PoS) define how nodes reach agreement on the validity of proposed blocks. PoW, used by Bitcoin, demands computational resources to solve cryptographic puzzles, limiting malicious tampering by making attacks prohibitively expensive. PoS, adopted by modern blockchain platforms like Ethereum, ties validation power to the amount of