


Chapter 1

The Slow but Unstoppable Journey of Blockchain:

A Forward-Looking Lens Into the Intelligent, Decentralized Systems Shaping Our Future

Yashodhan Karulkar

 <https://orcid.org/0000-0002-0991-3565>

*Mukesh Patel School of Technology Management and Engineering, NMIMS,
India*

Samyukta Gurudanti

 <https://orcid.org/0009-0000-5797-6555>

*Mukesh Patel School of Technology Management and Engineering, NMIMS,
India*

ABSTRACT

Blockchain emerged in 2009 as a disruptive innovation but struggled with scalability, regulatory ambiguity, and limited public understanding. Though early hype faded, steady innovation persisted. Today, advances in artificial intelligence (AI) are revitalizing blockchain by resolving these longstanding challenges. AI brings intelligent automation and adaptive decision-making, while blockchain ensures decentralized trust, secure data governance, and auditability. This chapter explores the powerful convergence of AI and blockchain, showcasing how their synergy is enabling intelligent, autonomous digital ecosystems. Through theoretical insights and real-world cases—such as JPMorgan’s Onyx, IBM Food Trust, and Ocean Protocol—it illustrates practical impact and industry transformation. It also revisits initial adoption barriers

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and shows how AI integration is unlocking scalable, secure solutions. The chapter concludes with a forward-looking vision of AI-enabled blockchain infrastructure shaping the next generation of decentralized digital environments.

INTRODUCTION

Blockchain technology first entered public consciousness through the publication of Satoshi Nakamoto's white paper in 2008, proposing a peer-to-peer electronic cash system that would become known as Bitcoin. Initially lauded as a technological breakthrough in establishing decentralized trust without central intermediaries, blockchain represented a novel fusion of cryptography, distributed systems, and economic incentives. Its ability to create tamper-proof, append-only ledgers through consensus protocols like Proof of Work introduced the idea of trust less systems, wherein multiple parties could transact securely without reliance on centralized authorities (Crosby et al., 2016).

The early 2010s witnessed an explosion of enthusiasm, with proponents envisioning blockchain as a panacea for inefficiencies plaguing traditional sectors—from reducing reconciliation times in finance to ensuring traceability in global supply chains, improving identity management, and even enabling fairer democratic voting systems. The promise of immutable, transparent, and decentralized infrastructure garnered attention from academia, industry, and government sectors alike.

However, as theoretical excitement gave way to real-world implementation attempts, a series of practical bottlenecks began to surface. The limitations of early blockchain systems such as Bitcoin and Ethereum included low transaction throughput, high latency, and significant energy consumption, particularly in proof-based consensus mechanisms (Casino, Dasaklis, & Patsakis, 2019). For instance, while Visa can process over 24,000 transactions per second, early blockchain networks struggled with single-digit throughput, hindering scalability. Moreover, the lack of interoperability among blockchain platforms and the difficulty in integrating with legacy enterprise infrastructures created friction for large-scale adoption.

Regulatory ambiguity compounded these challenges. As cryptocurrencies surged in popularity, many governments reacted with caution or outright bans, largely due to concerns around money laundering, fraud, and consumer protection. The absence of universally accepted standards and legal definitions for blockchain-based assets created uncertainty, making institutional adoption slower than expected (Atzori, 2017). Additionally, blockchain suffered a perception problem: despite its vast applicability, much of the public and media attention remained confined to its use in volatile cryptocurrency markets, which were often marred by speculative behavior, scams, and security breaches.

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