Chapter 2
IoT and Blockchain Integration for Enhanced AI–Driven Business Intelligence

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ABSTRACT

The Internet of Things (IoT) amalgamation with Blockchain technologies holds immense potential to augment Artificial Intelligence (AI)-driven Business Intelligence (BI) capabilities. As data-driven decision-making becomes paramount, this convergence presents organizations with unprecedented opportunities to enhance their BI systems. This study explores the foundational concepts, technological frameworks, and real-world applications underpinning IoT, Blockchain, and AI fusion within BI ecosystems. Examining the synergies between these cutting-edge technologies elucidates potential benefits, such as fortified data security, heightened transparency, and streamlined operational efficiencies. Concurrently, the study delves into the associated challenges, including interoperability complexities and scalability concerns. This study examines current trends, emerging developments, and future directions in AI-powered BI integrated with IoT and Blockchain. It offers key insights for researchers, practitioners, and decision-makers working in this field.

INTRODUCTION

The amalgamation of IoT, AI, and Blockchain technologies heralded a paradigm shift, revolutionizing how businesses operate and make informed decisions. Driving this transformation is the pursuit of sophisticated BI, which harnesses data-driven insights to inform strategic decisions, optimize operations, and enhance competitive advantage (Kalinaki, Shafik, et al., 2024; Kalinaki, Yahya, et al., 2024; Nair & Tyagi, 2023; Pancić et al., 2023; Shafik et al., 2024). The rapid spread of IoT devices has triggered an unparalleled surge in data creation, posing business challenges and opportunities (Kalinaki, Yahya, et al., 2024). IoT devices, ranging from wearables, smart meters, and sensors to industrial equipment and smart home appliances, continuously generate vast amounts of data from various sources, forming a deluge called the "IoT data torrent" (Chataut et al., 2023; Shafik, 2023). The torrential influx of data presents obstacles in storing, processing, and analyzing information as conventional centralized systems grapple to handle the staggering volume, pace, and diversity of data emanating from the constantly expanding web of interconnected devices (Muniswamaiah et al., 2023). However, this data torrent also unlocks immense potential for businesses to glean invaluable insights into customer preferences, operational streamlining, market dynamics, and burgeoning prospects (De Luzi et al., 2024; Karthick & Gopalsamy, 2023). Harnessing IoT data gives enterprises a competitive advantage through data-driven decision-making, process optimization, improved customer experiences, and cross-industry innovation. Real-time IoT data analysis empowers businesses to swiftly adapt to market shifts, identify inefficiencies, and capitalize on emerging opportunities.

Traditionally, businesses have relied on centralized data storage and processing systems, which can be vulnerable to single points of failure, data tampering, and security breaches (Alli et al., 2021; Islam et al., 2023; Nair & Tyagi, 2023). Blockchain's decentralized, immutable nature offers a potent solution to these challenges. By leveraging the distributed ledger and consensus mechanisms inherent in Blockchain, businesses can establish a secure and tamper-proof record of data provenance, facilitating traceability, transparency, and accountability throughout the BI process (Pancić et al., 2023; Shah et al., 2022). Integrating IoT data streams with Blockchain technology enables businesses to create an auditable and immutable data trail, from its source to its final analysis and insights (Shafik et al., 2024). This attribute proves invaluable in industries where data integrity is paramount, including financial services, healthcare, supply chain management, and regulatory compliance. By harnessing Blockchain, enterprises can ensure that the information from IoT devices is secure, authentic, and unaltered, cultivating trust and enabling seamless collaboration among stakeholders. Blockchain's decentralized structure abolishes single points of failure, enhancing BI system resilience. Its distributed

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