Advancement of Blockchain Technology for Innovation and Efficiency in Business Models

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Abstract: The augmenting business advancement and the advent of Artificial Intelligence build the business process to develop novel ways of collaboration. Digitalization of business is fostered and data privacy can be provided through blockchain technology. Blockchain enhances security, trust, transparency, and instant traceability among employees. It utilizes a shared and static ledger with the members of a business process who have permission for its access. It reduces errors, and paperwork, and minimizes overheads and transaction costs. It eliminates the requirement of middlemen to verify transactions. Thus, it contributes to cost savings by improving the efficiency, speed, and automation of business processes. The application of Blockchain has continuously evolved since its first inception in cryptocurrency. This paper is based on the innovation and efficiency provided through the introduction of blockchain technology to innovative business models. The research surveys literature to obtain a comprehension of the opportunities provided by blockchain in enhancing business. It bestows altering and upgrading business models to the needs of customers, suppliers, and competitors. The study suggests that the combined impact of Artificial Intelligence, the Internet of Things, and Sensing Technology with blockchain has the prospects to provide remarkable benefits to the business. Its ingenuity empowers organisations to work with their business partners in a protected environment. It provides numerous incentives to transform consumers into blockchain business models. Employing blockchain technology in business models facilitates the application of cryptography and tokenization. Start-up firms use initial coin offerings (ICOs) to generate investments through crowdfunding of these token-based ecosystems. This research would assist organisations in innovating their business models through the implementation of blockchain technology and enhance efficiency, security, and transparency in their business.

Keywords: Blockchain Technology, Business Models, Innovation, Efficiency

1. Introduction

Over the last few years, increasing applications of blockchain technology have emerged in business models. Blockchain is a distributed ledger that utilizes cryptography to link the blocks of data (Shueb et al. 2024). All the parties involved have control over data rather than just a single business resulting in a decentralized system. Blockchain is tamperproof and operates on a peer-to-peer network of data. The application of blockchain technology has proliferated across diverse industries including finance, logistics, automotive food, and beverage. The conception of a full-fledged blockchain business model is unexplored yet. The development of blockchain business models is majorly attributed to the start-ups facilitating the dissemination of the technology (Grünewald et al. 2024). Gaming and financial industries are employing tokenization and blockchain in their business models. Blockchain technology has been relevant in logistics and supply chain management however, it seems less employed than in financial applications. Blockchain technology assists in data automation and financial flows in supply chain management. It has remodelled the business by enhancing security, transparency, and efficiency in business models (Bafghi2024).

Blockchain contributes to the notion of participation-based value creation. The complete network of partners avails the benefit of the value network rather than a privileged group of stakeholders (Ghobakhloo et al. 2024). The transparency and traceability feature of blockchain technology allows stakeholders and supply partners to comprehend the socio-environmental performance of operations, raw materials, and products. Blockchain technology facilitates inventory management and order fulfilment by optimizing the distribution of materials and products (Mishra and Jain 2024). Despite that, the proliferation of blockchain technology is in the nascent stage. The implementation of this technology is still quite challenging for businesses.

Implementing blockchain technology has to be accomplished in a network to explore its full potential. Business nowadays operates in cross-enterprise networks (Ding et al. 2024). A dynamic and cross-company configuration of competencies and resources is defined as Enterprise networks. Thus, the effect of one business impacts all the other business partners within the enterprise ecosystem. So, the business has to consider the intrigue, requirements, and challenges related to the associated partners. The business models undergo a drastic

transformation with the implementation of blockchain technology (Salama et al. 2024). The enterprise network partners also transform their business models. The synergy of technical feasibility with developing appropriate business models is crucial for implementing blockchain technology. Blockchain can augment technologies such as Artificial Intelligence and the Internet of Things (Gupta and Singh 2024). It enhances waste reduction, material efficiency, and emission prevention, thus optimizing the manufacturing process.

The study addresses the following research question:

Research Question: How does blockchain technology assist in developing innovative and efficient business models?

By exploring the advancement of blockchain technology, the study aims to comprehend its impact on developing innovative and efficient business models. By acknowledging the role of blockchain technology, the study provides valuable insights into the role of blockchain technology in enhancing security, transparency, and efficiency in business models.

2. Literature Review

Blockchain technology is a decentralized, distributed ledger technology. It records transactions over multiple computers transparently, securely, and tamper-proof (Dong et al. 2023). This technology permits peer-to-peer transactions and obliterates the requirement of intermediaries. It offers a decentralized computer network, eliminating the risk of failure of central points. It is immutable, and the data once stored on the blockchain cannot be modified or deleted which assures transparency in data and prohibits fraud. This technology promotes transparency in transactions, enhancing accountability and trust among all network participants (Ahmed 2025). It enhances the security of transactions using cryptographic techniques, preventing hacking and unauthorized use of data.

The prominent use cases for blockchain are cryptocurrencies like Ethereum, Bitcoin, and similar digital currencies. It promotes decentralized borrowing, lending, and trading through decentralized finance (DeFi) (Makarov and Schoar 2022). It also supports supply chain management by tracking products from source to destination with transparency. It contributes to the healthcare sector by augmenting data sharing and protecting records of patients. It corroborates voting systems through tamper-proof digital elections (Shuker and Hussain 2024).

Blockchain technology is classified into four types including public blockchain, private blockchain, consortium blockchain, and hybrid blockchain (Audu and Shabih 2024). In the public blockchain, anyone can access, validate, and participate as it is open and decentralized (Witts et al.2024). It is used by cryptocurrencies like Ethereum and Bitcoin, decentralized finance (DeFi) platforms like Uniswap, and Non-fungible tokens (NFT) marketplaces like OpenSea. Private blockchains provide control to authorized participants. They get access to the network and validate transactions (Yang et al. 2024). It is used in enterprise solutions like supply chain tracking, banking, and finance, like RippleNet for cross-border payments, and healthcare, to securely store patient records.

Consortium blockchain is controlled through multiple organizations. A group of predefined participants can validate transactions here (Geng et al. 2024). It is used in banking and finance, like R3 Corda, for secure transactions by banks. A hybrid blockchain is a synergy of private and public blockchains. It keeps a few data public with controlled access (Negi et al. 2024). It is used in healthcare, securely share patient records between hospitals.

The revolution of blockchain technology fosters innovation in traditional business models. It eliminates the requirement of intermediaries like brokers, banks, and third parties by providing peer-to-peer connections, thus decreasing cost (Bakare et al. 2024). The blockchain technology provides secure and authorized transactions. It allows for the formation of smart contracts, automating processes and agreements in business. This minimizes the overheads, increasing the efficiency of the business model (Ye et al. 2024). This technology benefits sectors like real estate, finance, and supply chain management with speedy and secure transactions.

Blockchain technology is facilitating businesses with tokenization. Assets like stocks, real estate, and art can be tokenized to entitle fractionalized ownership and liquidity, thus revamping investment and augmenting crowdfunding (Guggenberger et al. 2024). This technology enhances efficiency and safety in the supply chain by boosting transparency and real-time tracking of products. Blockchain promotes decentralized autonomous organizations (DAO), which revokes central authority, leveraging community-driven decision making where governance is driven by stakeholders (Bonnet and Teuteberg 2024).

Blockchain technology has introduced non-fungible tokens (NFTs), which are assets like digital content, video, or a piece of art tokenized through blockchain (Damodaran 2024). The assets are stored in one place, and these tokens are stored on a blockchain. These NFTs generate novel business opportunities in digital art, gaming, and entertainment. These NFTs offer ownership proof to digital assets. Blockchain offers decentralized finance (DeFi), providing financial services like borrowing, lending, and insurance without the involvement of traditional banks (Singh, 2024). The risk of cyber threats is minimized through decentralization and encryption of data using blockchain technology.

3. Methodology

This study follows a hybrid approach to a systematic literature review through qualitative and quantitative analysis. A quantitative analysis is carried out on all selected papers. A qualitative analysis is performed on the top-cited papers. The methodology selected to attain the final papers is the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) technique. It is a process of systematic literature review involving four stages: (a) identification, (b) screening, (c) eligibility, and (d) inclusion. Through this technique, the most pertinent papers can be discovered.

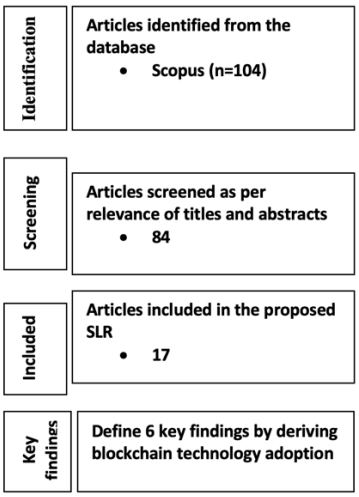

Figure 1: Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) flow diagram for the proposed systematic review.

The database used for this purpose is Scopus, which covers over 89 million records covering book series, journals, conference proceedings, and cited references. The right keyword selection is the criterion to view the maximum related articles in the area. The following list of queries was used to search the literature related to this study. The terms used in the search were “blockchain technology adoption”, “efficiency”, and “innovation”. Query Terms: “Efficiency” OR “Innovation” AND “Blockchain Technology Adoption.” The PRISMA guidelines were incorporated to establish whether an article met the inclusion criteria (Figure 1), and the irrelevant articles were excluded.

Table 1: The seven most cited articles on Blockchain technology enhancing efficiency and innovation in business models.

Author(s)	Article Title	Journal, Year (Citation)	Key Findings
Saurabh and Dey	“Blockchain Technology Adoption, Architecture, and Sustainable Agri-food Supply Chains.”	Journal of Cleaner Production, 2021 (371)	BCT can improve the agri-food supply chain efficiency and quality management
Toufaily et al.	“A Framework of Blockchain Technology Adoption: An Investigation of Challenges and Expected Value.”	Management, 2021 (251)	Innovation is the most trending technologies in the ecosystem.
Ullah et al.	“Blockchain Technology Adoption in Smart Learning Environments”.	Sustainability (Switzerland)< 2021 (135)	BCT is aiding decision makers in building smart learning environment for the educational institutes.

Author(s)	Article Title	Journal, Year (Citation)	Key Findings
Valeri and Baggio	"A Critical Reflection on the Adoption of Blockchain in Tourism."	Information Techonology and Tourism, 2021 (129)	BCT can assist in treating operational problems in transactions, contracts, sales, payments, and supply chain in tourism.
Bhardwaj et al.	"Determinants of Blockchain Technology Adoption in Supply Chains by Small and Medium Enterprises (SMEs) in India."	Mathematical Problems in Engineering, 2021 (110)	BCT adoption is aiding supply chains in cost optimisation, effective record-keeping, transparency, and route tracking.
Nayal et al.	"Antecedents for Blockchain Technology-enabled Sustainable Agriculture Supply Chain."	Annals of Operations Research, 2023 (90)	BCT positively influences sustainable agriculture supply chain performance through its innovative capabilities.
Munim et al.	"Assessing Blockchain Technology Adoption in the Norwegian Oil and Gas Industry Using Bayesian Best Worst Method."	Journal of Industrial 2022 (64)	BCT can assist oil and Information Integration, gas industry for operational excellence.

Source: Accessed on 2 April 2025 (Scopus database)/ compiled by the authors.

4. Results and Analysis

Adapting the PRISMA technique, the advancement of blockchain technology in enhancing the efficiency and innovation in business models has been studied. Table1. presents the top seven most-cited articles relating to the role of blockchain technology.

Lou and Li (2017) investigated the intention to adopt blockchain technology. The study explored the application of this technology in Bitcoin, a cryptocurrency, and the building of smart contracts as offered in Ethereum. It would assist in a financial firm's performance through reconciling multiple ledgers, thus enhancing operational efficiency. It's decentralized, and encryption prevents data breaches. It aids in designing smart contracts that execute only after meeting risk conditions (Okaily 2025).

Hidayanto and Prabowo (2019) explored the application of blockchain technology in supply chain management. The study probed the impact of technology in reducing costs and improving services. The application of blockchain technology would foster future developments, incorporating cost reduction, standardization, regulation system development, platform development, and talent cultivation in supply chain management capabilities (Duan et al.2023). The supply chain capability of the industry concerned with integrity issues like halal food benefits from blockchain technology. Competitive pressure, top-management support, external support, and triability are some factors for blockchain technology adoption (Ali et al. 2024).

Darabseh and Martins(2020) have delved into the adoption of blockchain technology in the AECO (Architecture, Engineering, Construction, and Operations) sector. This technology has improved to expand, store and share construction data more efficiently. Blockchain technology has supported the construction industry by developing smart construction projects, enhancing collaboration, efficiency, and transparency through decentralized data management. Adopting this technology nurtures the sustainability of the construction projects (Alawag et al. 2024).

Duy et al. (2018) explored the opportunities and challenges of blockchain adoption. It highlighted the disruption the technology would bring in sectors like healthcare, intellectual property, insurance, financial payments and education. Bhadoria et al.(2022) examined the scope of blockchain technology in the e-voting system. The paper demonstrates its application in maintaining transparency, immutability, and end-to-end verifiability to assure fair elections. The three organisational capabilities, namely technological capability, innovation capability, and information-sharing capability, facilitate blockchain technology adoption. This enhances the firm's performance, inducing competitiveness and sustainability of electronics companies (Polas et al. 2025).

The following list of key findings is presented after the analysis of the 17 articles on adoption of blockchain technology:

Key finding 1: Blockchain technology has applications in cryptocurrency and building smart contracts.

Key finding 2: Blockchain technology assists in the performance of financial firms.

Key finding 3: Blockchain technology enhances supply chain capabilities.

Key finding 4: Blockchain technology has supported the construction industry.

Key finding 5: Blockchain technology is facilitating an e-voting system.

Key finding6: Blockchain technology improves the performance and sustainability of electronics companies.

The papers analysed above support the research question that blockchain technology assists in developing innovative and efficient business models by enhancing supply chain capabilities, cost reduction, trustworthiness, fraud detection, decentralization, reconciliation of multiple ledgers, inducing competitiveness, and sustainability.

5. Discussion

The analysis of existing literature shows that blockchain has moved beyond cryptocurrencies and now applies to multiple sectors, including supply chain, construction, finance, healthcare, and governance. The adoption of decentralized ledger systems has become widespread due to their capability to boost data security, reduce fraud incidents, and offer tamper-proof records. These features help organizations increase operational effectiveness while creating opportunities to transform their business models. Smart contracts, together with tokenization, have revolutionized traditional business operations by enabling automated, trustless transactions that lower administrative costs and eliminate third parties.

Businesses within the financial services and supply chain sectors show the highest adoption rates of blockchain technology, as these industries require secure, real-time verification of data and audit trails. The healthcare sector is incorporating blockchain for storing electronic health records, which assures patient ownership and data integrity. It is employed in fitness tracking by providing the users control over their fitness figures. Fintech has incorporated blockchain by building smart contracts for automating financial agreements. Blockchain provides decentralized finance, offering investments, insurance, and loans without the need for intermediaries. It has been adopted in the food industry to enhance transparency in the supply chain from farm to retailer and build customer trust by showcasing the complete food journey. Ripe.io develops blockchain-based food solutions focusing on a trusted digital supply chain, enhancing the quality and safety of food. Sectors like construction and education are currently at the experimental stage. Blockchain technology is increasingly being integrated with Artificial Intelligence (AI), the Internet of Things (IoT), and sensing technologies to develop integrated digital ecosystems. However, interoperability issues, system integration challenges, and data governance concerns arise as a result of this technological convergence.

Blockchain is contributing to software development by providing decentralization, trust, and security. The incorporation of digital signatures provides only the private key holders to authorize transactions. High-value transfers are assisted by time locks and multi-signature wallets. Decentralization facilitates each node to have access to a copy of the ledger, administering no sole point of control or failure. The users don't require any information about each other instead, the smart contracts ensure trusted execution. Smart contract, once deployed, follows its code conclusively, and thereafter, there is no manual intrusion. The smart contract code and transactions are publicly thus anybody can audit flows and balances. Smart contracts powered with zero-knowledge guarantee undisclosed logic and transactions.

Barriers to adoption include undefined regulatory standards, scalability concerns, energy efficiency challenges, and the capital expenses required for infrastructure upgrades. Small and medium-sized enterprises (SMEs) face significant constraints that may prevent them from implementing blockchain despite understanding its long-term advantages. The reviewed literature shows that blockchain has gained widespread strategic importance among firms seeking competitive advantage through transparent operations, efficient processes, and innovative practices. Research indicates that blockchain understanding has progressed to a new stage, prompting organizations to embrace its enterprise-level implementation across industries.

5.1 Theoretical Implications

The research provides substantial theoretical insights into how blockchain technology transforms business models by achieving better operational efficiency, transparency, and innovation. Blockchain functions as an

enabling system for decentralized trust and secure data management, as supported by the literature, which highlights its role in building contemporary business frameworks. The research supports and expands the diffusion of innovation theory, the technology acceptance model, and the resource-based view by identifying blockchain's strategic contribution to competitive advantage.

Blockchain technology demonstrates theoretical applicability across supply chain management, healthcare, construction, and finance sectors, indicating its potential for industry-wide implementation. The development of smart contracts and token-based ecosystems enables peer-to-peer transactions and Decentralized Autonomous Organizations (DAOs) to operate through decentralized governance structures. These theoretical foundations establish a basis for studying blockchain not only as a technological tool but also as a factor capable of revolutionizing business and institutional systems.

5.2 Practical Implications

The examined studies reveal that blockchain technology enables businesses to decrease operational costs while accelerating transactions by removing intermediaries. Supply chain management benefits from increased transparency, as blockchain allows for real-time tracking across the agricultural, pharmaceutical, and logistics industries. With its data protection features, organizations can defend against cyber threats through encryption and tamper-proof mechanisms. Smart contracts automate various business operations, reducing the need for human monitoring and improving operational efficiency. Startups can leverage blockchain technology for decentralized fundraising through Initial Coin Offerings (ICOs). Overall, blockchain technology serves as a transformative system that delivers operational efficiency, cost reduction, and enhanced transparency and trust—benefiting both established firms and emerging ventures.

6. Conclusion

This research demonstrates that blockchain technology is an essential tool for modernizing both traditional and digital business models. A systematic analysis of 104 academic articles was conducted to investigate blockchain's impact on innovation, security, efficiency, and decentralization within business ecosystems. The PRISMA method enabled the identification and assessment of highly cited studies that underscore blockchain's value across various industries.

Findings show that blockchain facilitates the reconciliation of multiple ledger systems, automation of smart contracts, transparent supply chain operations, and improved cybersecurity. Its relevance is evident in sectors such as construction and e-governance, where it supports smart infrastructure development and secure digital elections. Collectively, the evidence confirms that blockchain adoption enables businesses to become more agile, secure, and customer-centric—laying a foundation for sustainable competitive advantage.

7. Limitations and Future Research Directions

While the study provides a comprehensive overview of blockchain implementation, its findings are limited by the exclusive use of the Scopus database. Future research should expand the scope by incorporating academic sources from Web of Science, ProQuest, DOAJ, EconLit, and EBSCO to improve the generalizability and inclusiveness of results. This approach would allow for more region-specific and context-sensitive research.

Additionally, this research is conceptual and literature-based. Future studies should empirically validate blockchain-based models through primary data collected from organizations that have adopted such technologies. Research should also explore the sustainability and energy efficiency of blockchain solutions in greater depth. Special attention must be given to startups and SMEs, which face unique barriers compared to larger corporations. Finally, interdisciplinary studies examining the legal, ethical, and environmental dimensions of blockchain adoption would contribute to a more holistic understanding of its long-term impact.

Ethical Declaration

This study involved no human or animal subjects and adhered to ethical research standards. All sources used are publicly available or properly cited.

AI Use Declaration

AI tools were used only for language editing. All ideas, analysis, and interpretations are the authors' own.

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