

# Analysis of the Application of Blockchain Technology in Banking

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**Abstract:** This paper discusses the application of blockchain technology in the banking industry, highlighting its role in business upgrading, restructuring, and addressing various challenges. Blockchain technology provides a decentralized KYC process, enhances transparency and security in shareholding management, and facilitates the establishment of a decentralized governance structure within banks. It also introduces operational efficiencies by automating processes and integrating data verification into transaction processing. By ensuring data truth and integrity, blockchain reduces fraud risks and bolsters customer trust. However, it poses challenges in data correction and regulatory uncertainty. While blockchain technology optimizes payment and settlement systems, reduces transaction costs, and enhances operational efficiency, it also undermines traditional banks' intermediary revenue streams and dominant position. Integrating blockchain technology into existing banking operations requires overcoming technical complexities, appropriate technical skills, and cultural changes. Despite these challenges, blockchain technology creates a sound environment for product innovation, achieves resource sharing and innovative collaboration, and will help the financial market in its digital transformation and smart upgrading. Banks must work with regulators to craft clear regulatory frameworks and policies that foster innovation while ensuring safety and compliance.

**Keywords:** Blockchain Technology, Banking Industry, Regulatory Challenges.

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## 1. Introduction

Since the onset of the global economic recovery in 2023, the banking industry has embarked on an ambitious journey of business upgrading and restructuring, seeking out lucrative growth avenues to ensure robust operational health and sustained development. This proactive stance is a testament to the industry's resilience and adaptability amidst the lingering effects of the recent economic downturn.

However, the path to progress is fraught with challenges. The global business environment remains uncertain, with the recovery outlook clouded by a myriad of factors. The tightening of the overall credit environment, coupled with the uneven pace of economic growth across Europe, the United States, and Asia-Pacific economies, poses significant hurdles for the banking sector. This divergence in economic fortunes not only complicates the industry's growth trajectory but also exposes it to potential risks stemming from shifts in monetary and fiscal policies by major economic powers. Such policy adjustments can have far-reaching implications, influencing interest rates, asset values, and the overall financial landscape.

In response to these challenges, financial regulators worldwide have stepped up their oversight, imposing stricter capital requirements, enhanced risk management frameworks, and heightened scrutiny of digital technologies. These regulatory enhancements aim to fortify the banking system against potential vulnerabilities, ensuring its stability and resilience amidst the ongoing transformations.

Despite these regulatory pressures, the banking industry has seized the opportunity presented by technological advancements. The seamless integration of artificial intelligence, blockchain, and big data with financial resources has catalyzed the digital transformation of the sector. This fusion has not only streamlined operations and improved efficiency but has also enabled banks to serve the real economy with unprecedented quality and precision. By

leveraging these technological tools, banks can better assess creditworthiness, mitigate risks, and tailor financial products to meet the diverse needs of their customers.

In conclusion, while the banking industry faces an array of challenges in the post-recovery era, its commitment to business upgrading, restructuring, and embracing technological innovation positions it well for future growth and development. By navigating the complexities of the global business environment and adapting to regulatory changes, banks can continue to play a pivotal role in supporting economic prosperity and financial stability worldwide.

## 2. Issues Faced by Stakeholders and Corresponding Blockchain Solutions

### 2.1. Customers

For individual customers, the process of banking procedures is long and cumbersome, and procedures and customer information are dynamically updated, which means that with the traditional business model, banks need to spend a lot of manpower and time to follow up this process.

Blockchain technology provides decentralised KYC process. Firstly, the application of a distributed ledger allows customer information to be registered only once before it can be queried and updated in any bank participating in the blockchain network, which demonstrates the secure and efficient service experience that blockchain technology offers to customers [1]. Secondly, compared with centralisation, decentralisation systematically manages customer information through distributed applications such as smart contracts and can only be accessed with the customer's permission, which not only excludes the interference of third-party trust issues, but also strictly avoids the leakage of the customer's privacy, and improves the security of the data and the consistency of the information [2].

For enterprise customers, they are more involved in supply chain finance. The pain points they face mainly lie in the fact that, firstly, information on the operating conditions and financial performance of each enterprise does not circulate among enterprises, and there is information asymmetry between enterprises. Secondly, credit only spreads between core enterprises and core suppliers, and business built on this basis cannot reach downstream suppliers. In addition, there is information asymmetry between firms and banks. Since banks do not have detailed information on the receivables and payables of enterprises, they may have difficulty in making decisions on lending to such enterprises.

Through blockchain technology, all parties in the supply chain can share and verify transaction data in real time, and the credit of the core enterprise can be passed to the multi-level suppliers of the entire supply chain, improving the financing capacity of the whole chain. In addition, the creditor's rights between enterprises can form a digital certificate, by splitting and transferring the certificate, suppliers at all levels can solve their own financing problems by holding maturity, debt offset or transfer.

## 2.2. Suppliers

At the vendor level, banks' vendors mainly include core system vendors, cloud computing vendors, and third-party service providers. Taking cloud computing vendors as an example, firstly, how to ensure that a large number of banks' sensitive data is stored and transported securely and in a compliant manner in the cloud is one of the pain points faced by cloud computing vendors. To this end, strong encryption, multi-factor authentication and intrusion detection systems, as well as regular security audits and compliance assessments, can be employed to ensure data security and privacy protection in the cloud, while banks must also keep up with and familiarise themselves with the latest regulations to ensure that cloud computing practices comply with the appropriate applicable regulations.

Secondly, when a bank uses a cloud service provider frequently, it can become locked in, making it difficult for the bank to change providers, reducing business flexibility and innovation. Distributed cloud and multi-cloud management. The distributed cloud delivers low latency and high performance by distributing cloud services to different physical locations, reducing the risk of network outages and improving platform performance. At the same time, adopting a multi-cloud management strategy can avoid vendor lock-in and increase business flexibility.

In addition, there are technology integration and standardization challenges. Due to the non-uniformity of cloud service technology stacks from different vendors, the integration of cloud-based solutions and banks' traditional financial systems can be both complex and time-consuming, resulting in a forced lengthening of the innovation business cycle. Introducing the agile development system of the Internet industry to complement cloud applications, deploying or migrating banking technology systems, reducing technology development and management costs, and improving system scalability.

## 2.3. Shareholders and Employees

At the shareholder level, blockchain technology offers a transformative solution to address long-standing issues of transparency and security in shareholding management. By leveraging its inherent immutability, blockchain ensures the

invariance and traceability of shareholding transactions, creating an immutable ledger that is resistant to tampering or alteration. This feature is particularly crucial in preventing unauthorized seizures and freezing of shareholdings, thereby safeguarding the interests of shareholders and enhancing their confidence in the banking system.

Moreover, blockchain technology can facilitate the establishment of a decentralized governance structure within banks. This decentralized approach not only enhances transparency but also streamlines decision-making processes, making bank governance more efficient and inclusive. By enabling shareholders to participate directly in governance decisions through smart contracts and voting mechanisms on the blockchain, the industry can foster a more democratic and accountable governance environment.

For bank employees, blockchain technology introduces several operational efficiencies. Firstly, by automating processes such as payment and loan approval, blockchain eliminates unnecessary intermediate links and manual interventions, thereby minimizing human errors and reducing processing times. This automation not only enhances productivity but also ensures consistency and accuracy in decision-making [3].

Secondly, blockchain technology integrates the data verification process into transaction processing, simplifying the overall data management framework. Bank employees can now efficiently manage customer information and transaction records, as blockchain's distributed ledger technology ensures that data is updated in real-time across all nodes in the network. This real-time synchronization minimizes the risk of data inconsistencies and facilitates seamless data retrieval and analysis.

Finally, the decentralization of blockchain technology extends its benefits to customers as well. By ensuring the truth and integrity of data, blockchain reduces the risk of fraud and theft, thereby bolstering customer satisfaction and trust. Customers can have peace of mind knowing that their personal and financial information is securely stored and protected against unauthorized access or manipulation. This heightened trust can lead to increased customer loyalty and engagement, driving the bank's long-term success and sustainability [4].

## 3. Limitations of Blockchain Technology

### 3.1. Immutability and Data Correction

The immutability of blockchain ensures the security and integrity of transactions, but it also poses challenges when it comes to updating data or correcting errors. Once a transaction is recorded on the blockchain, it cannot be altered or deleted. This can be problematic if there are errors in the initial data entry or if circumstances change and the data needs to be updated. While some blockchain systems allow for soft forks or hard forks to address significant issues, these processes are complex and can disrupt the network. Therefore, careful consideration and rigorous validation processes are essential to ensure data accuracy before it is recorded on the blockchain [5].

### 3.2. Interoperability Between Blockchain Systems

The lack of interoperability between different blockchain systems is a significant hurdle in achieving widespread

adoption. Different blockchain networks often use different protocols, data formats, and consensus mechanisms, making it difficult for them to communicate and share data seamlessly. Efforts are underway to develop standards and protocols that can facilitate interoperability, such as cross-chain communication technologies and atomic swaps. However, these solutions are still in their early stages of development and face challenges such as scalability and security.

### **3.3. Storage and Hardware Requirements**

The high storage and hardware requirements of blockchain technology, especially for industries with large transaction volumes like finance, present significant challenges. As the blockchain grows, so does the demand for storage space and computational power. This can lead to increased costs and performance bottlenecks. Solutions such as sharding, which involves dividing the blockchain into smaller, more manageable pieces, and layer-2 solutions, which offload transactions to secondary networks, are being explored to address these issues. However, these approaches come with their own set of challenges and trade-offs.

### **3.4. Allocation of Accounting Rights and Consensus Mechanisms**

In distributed ledgers and smart contracts, the allocation of accounting rights and the conditions for reaching commercial consensus are crucial. However, these aspects can be difficult to define and measure, especially in consortium blockchains where multiple organizations participate. Clear governance structures, rules, and incentives are needed to ensure fair and efficient decision-making. Additionally, monitoring and evaluating the contribution and activity of each node or participant in the consortium can be challenging, requiring sophisticated mechanisms for tracking and rewarding participation.

### **3.5. Legal and Regulatory Uncertainty**

The lack of clear legal and regulatory frameworks for blockchain technology poses significant risks for financial institutions and enterprises. While blockchain has the potential to revolutionize cross-border payment and settlement, the lack of regulatory clarity can create legal and compliance uncertainties. Governments and regulators are gradually developing policies and guidelines to address these issues, but the process is slow and complex. In the meantime, financial institutions and enterprises must navigate a regulatory landscape that is constantly evolving and subject to interpretation [6].

To overcome these challenges, a collaborative approach involving stakeholders from across the industry, government, and academia is essential. Efforts to develop standards, protocols, and best practices for blockchain implementation can help address interoperability, storage, and governance issues. Additionally, ongoing dialogue and cooperation between regulators and the blockchain community can help clarify legal and regulatory frameworks, fostering a more supportive environment for blockchain innovation and adoption.

## **4. Positive and Negative Impacts of Blockchain Technology**

### **4.1. For Bank Users**

On the one hand, one of the core advantages of blockchain

technology is its decentralized and immutable nature, which makes the tampering of any single node unable to affect the integrity of the entire system, thus greatly improving the security of transactions. In addition, every transaction on the blockchain is encrypted and time-stamped, ensuring the transparency and traceability of transactions, and both individual users and corporate customers can view the transaction history in real time through the blockchain platform, reducing the problem of information asymmetry. This not only helps banks reduce fraud, such as fake money transfers, identity theft, etc., but also enhances customers' trust in the bank. Especially in areas such as cross-border payments and supply chain finance, the transparency of blockchain can effectively prevent money laundering, smuggling and other illegal activities, and improve the compliance of financial institutions. In addition, blockchain technology is capable of optimizing payment and settlement systems, thereby reducing transaction costs, speeding up transactions, and significantly improving operational efficiency. More importantly, blockchain technology provides banks with the opportunity to innovate financial services, such as digital currency, supply chain finance, etc. At the same time, blockchain can also be used to build a decentralized financial ecosystem, such as decentralized exchange (DEX), decentralized lending platform, etc., to provide users with more diversified financial service options and enhance the competitiveness of banks.

On the other hand, the application of blockchain technology may undermine the advantages of traditional banks. With the development of blockchain technology, more and more decentralized financial platforms (DeFi) have begun to emerge, which allow users to conduct peer-to-peer transactions directly without having to go through intermediaries such as banks. This not only reduces banks' intermediary revenue streams, but also threatens to undermine their dominant position in payments and settlements. There are also barriers to integrating this emerging technology into existing banking operations and facilities. Firstly, blockchain technology itself has a high level of technical complexity and requires appropriate technical skills and expertise, and the development and deployment of blockchain systems requires a significant investment of time and resources, increasing implementation costs. Secondly, the application of blockchain technology also requires cultural change within the bank as well as external education and guidance. Traditional bank employees are accustomed to a centralized management model and may be resistant to decentralized and distributed working methods, so banks need to strengthen the training of their employees. At the same time, the acceptance of new technologies by customers will directly affect the speed of promotion of new technologies, so banks need to gradually guide their customers to accept and use blockchain-related financial services through education and publicity.

### **4.2. For the Financial System**

On one hand, blockchain technology, due to its decentralized nature, diminishes the need for banks and other financial institutions' classic intermediary functions, it can enable the entire industry and system of finance in general to become more effective, with less cost and security risks, by excluding the very possibility of third-party involvement [7]. Invariance and traceability guaranteed by blockchain ensure the transparency and trustworthiness of transactions, hence increasing the transparency of financial markets and reducing

fraudulent risks. The creation and development of blockchain technology create a sound environment for financial product innovation. For example, smart contracts are built on blockchain for application to meet diversified customer needs in the digital era. In addition, the traditional financial market is limited by geography and industry, resulting in the inability to integrate and utilise resources, whereas blockchain technology achieves cross-border resource sharing and innovative collaboration with decentralised and distributed features [8]. It will be able to bridge financial institutions, enterprises, and individuals in different countries and regions through the blockchain platform, sharing data, technologies, and resources to break the limitation of geographic and industrial sectors, co-operate on a global scale, innovate, and inject new impetus into the whole financial system. In the long run, blockchain technology will help the financial market in its digital transformation and smart upgrading, providing technical routes for sustainable development of the financial industry. The rapid development of the digital economy has increasingly raised the digitization requirements for the financial industry. More security and efficiency in transactions: blockchain technology has grown to provide more intelligent management of the financial market through big data analytics, artificial intelligence, among other technical means [9].

While the decentralization of blockchain increases the difficulty of regulation, it provides a certain degree of freedom and security. Traditional financial regulation relies on the centralized management model where regulators can supervise and regulate financial activities by controlling intermediaries. However, the decentralized nature of blockchain makes it hard for regulators to intervene in tracking down some illegal financial activities. For instance, the anonymity on the public chain may make it easy for criminals to conduct illegal activities like money laundering and terrorist financing, enhancing regulatory difficulty [10]. It also is a challenge to traditional financial institutions in their intermediary role of credit and may affect significantly the business model of traditional banks and other financial institutions. Besides, since blockchain technology is still developing, the energy-intensive consumption of it has not been tackled yet, and hence is quite expensive to put into practice and maintain.

## 5. Summary

While the development of blockchain technology indeed faces a multitude of challenges, it simultaneously opens up unprecedented avenues for the innovation of banking business models. The industry has already garnered considerable experience in the application of this transformative technology, which will undoubtedly propel further advancements in blockchain technology and encourage commercial banks to delve deeper into exploring its myriad application scenarios.

Firstly, fostering business innovation and fostering ecological synergy is paramount. In practical application contexts, blockchain should be harnessed not merely as a tool, but as a catalyst for revolutionizing business models and processes, thereby unlocking new business value. Simultaneously, leveraging blockchain's endogenous mechanisms can attract partners to collaborate, jointly establishing and expanding ecological alliances. This symbiotic relationship fosters a vibrant and interconnected ecosystem where all participants thrive.

Secondly, the emphasis on technological innovation and talent nurturing cannot be overlooked. Cultivating versatile professionals who excel in both technology and business integration is essential. By actively engaging in blockchain alliances and collaborative projects, both domestically and internationally, we can infuse fresh vitality into the application and innovation of blockchain technology. This approach ensures that the industry remains at the forefront of technological advancements, driven by a workforce that is both skilled and forward-thinking.

Thirdly, participating in blockchain technology research and standard-setting is crucial for the industry's sustainable growth. Banks must forge stronger ties with regulators, jointly crafting clear regulatory frameworks and policies that foster innovation while ensuring safety and compliance. Establishing innovation labs for experimental purposes and actively engaging in the international standardization of blockchain technology further strengthens industry dialogue and collaboration. Together, these efforts propel the safe and compliant development of blockchain technology.

Lastly, keeping abreast of the technological integration trend is vital. Leveraging the latest generation of cutting-edge information technology enables the breakthrough and reconfiguration of traditional banking boundaries. This, in turn, facilitates cross-sector and cross-institution collaboration, fostering a more interconnected and efficient financial landscape. By embracing these technological advancements, banks can unlock new potentials, enhancing their operational efficiency and customer experiences alike.

In conclusion, the development of blockchain technology presents significant opportunities for banking innovation. By focusing on business and ecological synergy, technology and talent development, research and standard-setting, and technological integration, banks can harness the full potential of blockchain to drive business growth, enhance operational efficiency, and create new value propositions for customers.

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