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The Potential Role of Blockchain Technology in the Digital Transformation of the Banking Sector: Opportunities, Applications, and Strategic Implications

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Abstract The banking sector, which constitutes one of the fundamental pillars of the global financial system, has undergone a profound transformation driven by rapid technological advancements and digital innovation. The transition from traditional branch-based banking to digitally enabled financial services has significantly improved accessibility, operational efficiency, and customer experience. Within this context, blockchain technology has emerged as a disruptive innovation with the potential to reshape the structure and functioning of modern banking systems. This study examines the potential integration of blockchain technology into the digital banking ecosystem and evaluates its capacity to address critical challenges associated with conventional banking operations. Blockchain's decentralized architecture, immutability, transparency, and cryptographic security offer a reliable framework for enhancing trust, reducing operational risks, and eliminating the need for intermediaries in financial transactions. The research explores how blockchain can contribute to improving operational efficiency, lowering transaction and administrative costs, strengthening cybersecurity, and enhancing data integrity across banking processes. Particular emphasis is placed on key application areas, including cross-border payment systems, digital identity management and authentication, smart contracts, regulatory compliance (RegTech), and real-time transaction settlement. The study also discusses the strategic implications of blockchain adoption for financial institutions in terms of competitive advantage, risk management, and business model innovation. In addition, the analysis considers the role of global crises, such as the COVID-19 pandemic, in accelerating digital transformation and increasing institutional investments in distributed ledger technologies. The findings suggest that blockchain technology holds significant potential to transform banking operations by increasing transparency, improving transaction speed, enhancing security, and supporting the development of a decentralized and resilient financial infrastructure. By addressing existing inefficiencies while enabling new financial services and business opportunities, blockchain is positioned as a critical technological component in the future evolution of digital banking.

Keywords: Digital Banking; Blockchain Technology; Financial Innovation; Distributed Ledger Technology; Cross-Border Payments; Smart Contracts; Financial Security

JEL Classification: G20; G21; G29

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1. The Impact of the COVID-19 Pandemic on Digital Banking

Following the 2008 global financial crisis, banks in many jurisdictions entered a period of restructuring that emphasized resilience, cost discipline, and stricter compliance requirements. Over time, the sector's ability to leverage technological innovation became a key differentiator, particularly as digital channels matured and customer expectations shifted toward speed, convenience, and uninterrupted access to services. The COVID-19 pandemic acted as a major accelerator of this trajectory, converting what had often been a gradual migration from branches to digital platforms into an urgent, system-wide transition.

A central driver of the pandemic-era shift was the need to reduce physical contact and maintain continuity under lockdowns and social-distancing rules. As a result, retail banking activity moved rapidly toward online and mobile channels. Evidence from a global retail-banking survey indicates that, on average, 13% of respondents across 16 major markets used online banking for the first time during the pandemic, while 12% became first-time mobile banking users, underscoring how crisis conditions expanded digital adoption to new customer segments (Brackert et al., 2021). In parallel, Boston Consulting Group also reported a 23% increase in online banking usage and a 30% increase in mobile banking usage, suggesting that the pandemic advanced digital migration by several years relative to pre-crisis expectations (Boston Consulting Group [BCG], 2021).

This behavioral shift had observable operational consequences. Branch networks—already under pressure from cost considerations and changing customer preferences—experienced additional declines as demand for in-person services weakened. In the United Kingdom, research on branch network changes documented a **substantial net loss of bank and building society branches between 1989 and 2012**, indicating a long-term structural move away from branch-centric service delivery (University of Nottingham, 2013). Complementing this, official UK statistical briefings note a sustained downward trend in bank branch numbers since the mid-1990s, reinforcing the broader international pattern of distribution-channel transformation (Rhodes, 2019).

During the pandemic, banks also intensified investment in customer-facing digital tools to handle surging demand while maintaining service quality. Many institutions expanded the use of mobile applications, real-time alerts, remote onboarding, and automated support systems (e.g., chat-based assistance) to reduce pressure on call centers and branches. Beyond retail consumers, small business segments increasingly relied on digital banking services to sustain operations during restrictions. In this context, empirical findings from India suggest that convenience factors and perceived ease of use, reinforced by pandemic conditions, significantly shaped usage patterns of digital banking services among rural MSMEs (Ahmed & Sur, 2021).

The Turkish banking sector provides an instructive case illustrating how quickly digital channels can scale under crisis conditions. Using sectoral data compiled from banking statistics, one study reported notable increases in the number of active digital banking customers during the pandemic period, reflecting both consumer preference for contactless services and banks' active encouragement of digital usage through communication and channel steering (Beybur & Çetinkaya, 2020). These patterns align with the broader global narrative: pandemic constraints reduced resistance to digital channels, while repeated successful usage experiences strengthened customer confidence and routine adoption.

In summary, the COVID-19 pandemic did not merely increase digital banking usage temporarily; it accelerated a deeper structural transition in banking distribution and service models. The combined effects of crisis-driven necessity, improved digital customer experience, and banks' expanded technological capabilities intensified the shift away from branch dependence and toward platform-based financial service delivery. As digital adoption normalizes, competitive advantage increasingly depends on secure, scalable, and user-centered digital ecosystems—an environment in which emerging technologies such as blockchain can further contribute through trust, transparency, and automation across transactions and verification processes.

2. The Expansion of Digital Banking in Türkiye: Adoption Dynamics and Market Profile

Although Türkiye's diffusion of digital banking unfolded in parallel with global developments, its early-stage momentum emerged during a period when internet access was not yet widespread for mass users. In this context, **Türkiye İş Bankası's launch of internet banking in 1997**—followed in the same year by **Garanti Bankası**—is commonly identified in the Turkish literature as a milestone that helped frame subsequent sectoral digitalization strategies (Kartal & Pala, 2010).

Over time, Turkish banks treated digital channels not only as alternative delivery mechanisms but also as instruments for sustaining profitability and enhancing customer satisfaction through speed, convenience, and lower unit costs. Banks intensified customer communication and channel education efforts, aiming to broaden user bases and deepen usage by helping customers understand new services and adopt them effectively. Such strategic emphasis reflects a broader global pattern: as financial services become more platform-based, customer experience and "ease-of-use" factors increasingly shape competitive advantage.

Recent adoption evidence (TBB, 2024 March reporting)

According to the Banks Association of Turkey (TBB), the March 2024 statistical report consolidates data from 28 banks providing internet banking and 22 banks providing mobile banking services. Within the January–March 2024 period, the report indicates a total of 113.630 million digital banking users (non-deduplicated across banks), of whom 1.671 million used only internet banking, 102.612 million used only mobile banking, and 9.347 million used both channels.

When focusing on "active" users (at least one login in the relevant three-month period), the same report shows approximately 109.045 million active retail (individual) digital banking customers and 4.585 million active corporate digital banking customers. The gender split among active retail users is reported as approximately 65% male (≈71 million) and 35% female (≈38 million).

The age distribution further suggests that digital banking adoption has moved beyond a niche "youth-only" pattern. For January–March 2024, the largest share of active retail users falls within the 36–55 age band (≈43 million), followed by 26–35 (≈29 million) and 18–25 (≈20 million). This structure implies that digital channels have become mainstream across multiple demographic segments, while also reflecting strong traction among younger cohorts.

Internet vs. mobile: usage intensity and channel preference

The TBB report highlights a consistent pattern: mobile banking dominates in both adoption and transaction volume. As of March 2024, the number of registered (logged in at least once) customers is far larger than the number of active users—especially in internet banking—indicating that registration does not necessarily translate into frequent use. For January–March 2024, active internet banking customers total 11.018 million (retail + corporate), whereas registered internet banking customers (logged in at least once historically) reach 107.186 million.

On the transactional side, the report records **128 million** internet-banking financial transactions totaling **TRY 10.430 trillion** in January–March 2024; **money transfers** (EFT/havale/FX transfers) account for **~75%** of total internet-banking transaction volume. Mobile banking volumes are substantially larger: **2.588 billion** transactions totaling approximately **TRY 27.640 trillion** in the same period, again led by money transfers and investment transactions.

Taken together, these indicators position Türkiye as a market where digital banking is no longer supplementary: it is central to retail banking behavior, with mobile interfaces serving as the dominant channel for both everyday payments and increasingly sophisticated investment activity.

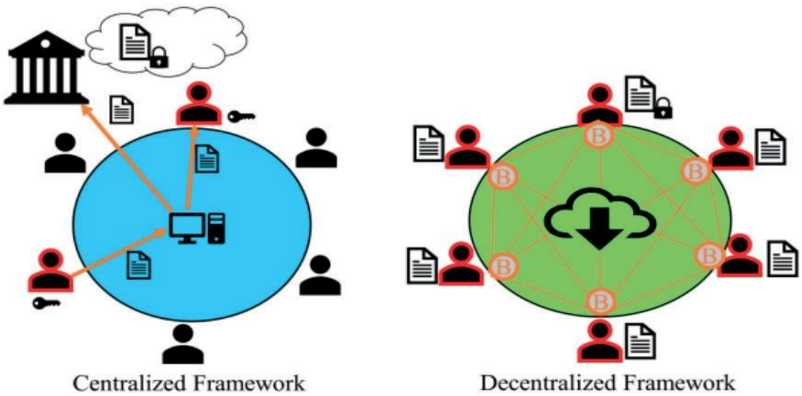


Figure 1. Blockhchain technolojical circle (Puthal vd., 2018)

3. Future Targets of Digital Banking: Resilience, Security, and Data-Driven Personalization

As digital banking scales, the sector's next-stage objectives increasingly concentrate on (i) continuity and resilience, (ii) cybersecurity maturity, and (iii) advanced analytics and personalization—all under a stronger regulatory governance umbrella.

3.1. Business continuity and "always-on" service delivery

A major future-oriented priority is the capability to maintain uninterrupted service under adverse conditions such as natural disasters, infrastructure failures, or targeted cyber incidents. Achieving this requires resilient architectures, redundancy planning, and operational protocols designed around high availability and rapid recovery. In a market where customers expect continuous access to funds, investments, and payments, service continuity becomes a reputational and systemic stability requirement, not merely a technical feature.

3.2. End-to-end security and cyber incident response capacity

As usage expands, the threat surface expands. Turkish banking regulation explicitly sets minimum procedures and principles for managing banks' information systems and electronic banking risks. In parallel, Türkiye's national cyber incident response framework emphasizes coordinated structures—such as national and sectoral incident response organizations—supporting standardized detection, reporting, and mitigation practices.

At the sector coordination level, TBB publicly frames cybersecurity work as a collaborative domain involving fraud analysis, awareness, and cooperation with relevant stakeholders. This aligns with future goals described in your text: strengthening encryption infrastructure, minimizing unauthorized access risks, institutionalizing coordination, and improving customer trust through demonstrably robust security controls.

3.3. Artificial intelligence, automation, and fraud prevention

Another strategic target is greater adoption of AI-enabled systems in areas such as fraud detection, customer support automation, and risk scoring. When implemented with appropriate governance, AI can reduce operational error, improve response time, and expand banks' capacity to deliver 24/7 support at scale. However, the same trend increases the importance of model-risk management, data quality, explainability requirements, and secure-by-design software practices—especially as banking becomes more API-driven and interconnected.

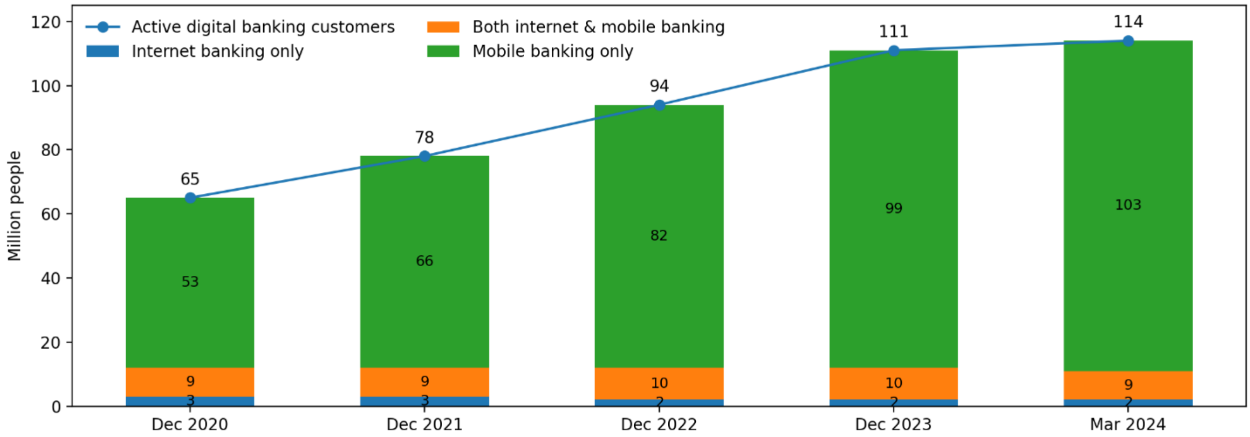
3.6.4. Regulatory agility, certification, and compliance-by-design

Given the rapid evolution of technology and digital fraud techniques, banks must also remain agile in adapting to changing regulatory requirements. The emerging direction is to embed compliance into systems and processes from the design stage (compliance-by-design), reducing the cost and operational friction of later remediation. This is particularly relevant for digital onboarding, remote identification, authentication, and transaction monitoring—areas where both customer experience and compliance constraints are strongest.

3.5. Customer-centric personalization and integrated commerce-finance ecosystems

Finally, digital banking strategy increasingly centers on personalization: using customer data (ethically and lawfully) to deliver tailored products, proactive alerts, and more intuitive financial guidance. This includes personalized savings and investment tools, dynamic credit offerings, and contextual product suggestions. As e-commerce and embedded finance continue to expand, banks may also deepen integration with commercial platforms—enabling smoother payment flows, financing-at-checkout, and more seamless experiences across banking and retail ecosystems.

Overall, Türkiye's digital banking trajectory—characterized by large-scale mobile adoption and growing digital investment activity—suggests that the next competitive frontier will be defined by resilience engineering, cybersecurity maturity, AI-enabled operations, and customer-centric product design, supported by strong governance and regulatory alignment.



4. Blockchain and Digital Banking

The evolution of banking technologies has progressed through several stages, beginning with the use of standalone computers, followed by the implementation of computer networks and core banking systems. The primary objective of technological adoption in banking has been to enable the concept of "banking anytime and anywhere." Innovations such as electronic banking, electronic funds transfer (EFT), inter-branch connectivity, and automated teller machines (ATMs) have fundamentally transformed the operational structure of financial institutions.

At the same time, rapid developments in information and communication technologies have accelerated the transformation of financial services. The widely cited statement by Bill Gates that *"banking is necessary, but banks are not"* has become increasingly relevant in the context of digital transformation and platform-based financial services (Ficht & Alich, 2018). One of the most significant technological developments supporting this transformation is blockchain technology, which has the potential to disrupt traditional economic structures and business models across multiple industries.

Blockchain has attracted the attention of a wide range of economic stakeholders due to its broad applicability and transformative potential. Organizations are particularly interested in its ability to improve resource efficiency and create competitive advantages. Key expected benefits include enhanced transparency, reduced operational costs, and improved efficiency within transaction environments (Osmani et al., 2020). Consequently, industries and governments worldwide have begun exploring blockchain-based solutions. The European Union, for example, has formally supported the technology through its European Blockchain Strategy, recognizing blockchain as a strategic digital infrastructure capable of transforming economic systems.

Furthermore, blockchain's capacity to reshape economic relationships is particularly relevant for sectors where intermediaries traditionally play a dominant role. According to Tapscott and Tapscott (2017), decentralized digital infrastructures may significantly reduce the role of intermediaries, thereby altering competitive dynamics and enabling more direct peer-to-peer economic interactions.

Technological innovations such as blockchain, artificial intelligence, and process automation are expected to significantly reshape banking structures and operational principles (Gupta & Gupta, 2018; Patki & Sople, 2020; Ahmed et al., 2022; Cucari et al., 2022; Karim et al., 2022; Kumari & Devi, 2022). As a result, financial institutions are increasingly adapting to technological change and becoming part of a broader global digital transformation. Within the context of the Fourth Industrial Revolution, blockchain is emerging as a critical enabling technology with the potential to redefine financial service delivery.

Table 1. Key Characteristics of Blockchain Technology in Banking

Feature	Description	Relevance for Banking
Decentralization	Data are stored across multiple nodes instead of a single central authority.	Reduces dependency on intermediaries and single points of failure.

Distributed Ledger	Each participant holds an identical copy of the transaction database.	Ensures transparency and data consistency among financial institutions.
Immutability	Once recorded, transactions cannot be altered or deleted.	Prevents fraud, data manipulation, and unauthorized changes.
Cryptographic Security	Transactions are protected using advanced encryption methods.	Enhances data protection and customer privacy.
Consensus Mechanism	Network participants validate transactions before they are added to the ledger.	Increases trust and ensures transaction legitimacy.
Peer-to-Peer Structure	Participants interact directly without intermediaries.	Enables faster and lower-cost financial transactions.

Source: Adapted from Yavuz (2019); Erdoğan & Bodur (2020); Puthal et al. (2018).

Table 2. Comparison of Traditional Banking Systems and Blockchain-Based Systems

Criteria	Traditional Banking	Blockchain-Based Banking
System Structure	Centralized	Decentralized / Distributed
Intermediaries	Required (banks, clearing houses, correspondent banks)	Limited or eliminated
Transaction Speed	Slow, especially for cross-border payments	Near real-time settlement
Operational Costs	High due to intermediaries and manual processes	Lower due to automation and peer-to-peer transactions
Transparency	Limited access to transaction records	High transparency and traceability
Security Risk	Vulnerable to single-point failures and cyberattacks	Higher resilience due to distributed architecture
Data Integrity	Can be modified by authorized entities	Immutable and tamper-resistant

Source: Martino (2021); Osmani et al. (2020); Kawasmi et al. (2020).

Table 3. Potential Applications of Blockchain in the Banking Sector

Application Area	Description	Expected Impact
Cross-border Payments	Direct international transfers without correspondent banks	Reduced costs and faster settlement
Trade Finance	Digital documentation and automated verification	Reduced paperwork and operational delays
Identity Management	Blockchain-based digital identity verification	Enhanced security and faster customer onboarding

Loan Processing	Smart contracts for automated approval and execution	Reduced processing time and operational errors
Securities Settlement	Real-time clearing and settlement of financial instruments	Lower settlement risk and improved efficiency
Fraud Detection	Transparent and traceable transaction history	Improved risk management and fraud prevention

Source: Drescher (2017); Ji & Tia (2022); Harris & Wonglimpiyarat (2019).

Table 4. Major Benefits of Blockchain Adoption in Banking

Benefit Category	Explanation
Cost Reduction	Eliminates intermediaries and reduces operational and infrastructure costs.
Operational Efficiency	Automates repetitive processes and improves processing speed.
Transparency	Enables real-time tracking and auditability of transactions.
Security	Uses cryptography and distributed architecture to protect data.
Risk Reduction	Minimizes fraud, errors, and operational risks.
Financial Inclusion	Expands access to financial services, especially in underserved regions.
Regulatory Compliance	Facilitates real-time monitoring and reporting for regulators.

Source: Osmani et al. (2020); Martino (2021); Jung (2019).

Table 5. Challenges and Risks of Blockchain Implementation in Banking

Challenge	Description
Regulatory Uncertainty	Lack of clear legal frameworks in many jurisdictions
High Implementation Costs	Infrastructure transformation and integration expenses
Scalability Issues	Limited transaction capacity in some blockchain networks
Interoperability Problems	Difficulty integrating with existing banking systems
Organizational Resistance	Institutional inertia and lack of technical expertise
Energy Consumption	High energy requirements in some consensus mechanisms
Data Privacy Concerns	Balancing transparency with confidentiality requirements

Source: Kawasmi et al. (2020); Ji & Tia (2022); Harris & Wonglimpiyarat (2019).

4.1. Blockchain Technology and Its Relationship with the Banking Sector

Blockchain has gained widespread attention in recent years, largely due to the growing visibility of cryptocurrencies such as Bitcoin in global media (Sladic et al., 2021). Initially developed to facilitate the transfer of digital currencies without the need for intermediaries, blockchain promotes decentralization and trustless transactions (Martino, 2021).

Conceptually, blockchain can be described as a **distributed digital ledger** in which transaction records are stored permanently and cannot be altered or deleted (Erdoğan & Bodur, 2020). Unlike centralized databases, blockchain operates through a distributed architecture where each participant maintains a copy of the ledger. This distributed structure ensures equal access, real-time data synchronization, and enhanced system transparency (Yavuz, 2019).

Through peer-to-peer networking, participants can directly interact without relying on a central authority. Transactions are grouped into blocks, verified by network participants (validators or miners), and added sequentially to the chain once consensus is achieved (Puthal et al., 2018). This structure ensures data integrity and prevents unauthorized manipulation.

The decentralized nature of blockchain represents a significant departure from traditional centralized financial systems, where intermediaries control information flows. Similar to how peer-to-peer systems disrupted industries such as music distribution, blockchain has the potential to reduce the role of intermediaries in financial services (Drescher, 2017).

One of the most relevant banking applications is cross-border payments, which currently rely on correspondent banking networks that increase costs, processing time, and operational complexity. Blockchain-based payment systems can enable direct peer-to-peer transfers, reducing transaction costs, settlement times, and exchange-rate uncertainties.

At the same time, new competitors—including fintech firms and technology companies—are entering the financial services market using advanced technologies. Major technology firms such as Microsoft, IBM, and large digital platform companies have actively invested in blockchain research and development, recognizing its potential to generate long-term competitive advantages (Harris & Wonglimpiyarat, 2019).

4.2. Potential Benefits of Blockchain Technology in the Banking Sector

The traditional banking sector is currently operating in a highly competitive and technologically dynamic environment. Emerging technologies, evolving customer expectations, and the entry of fintech firms are forcing financial institutions to reconsider their business models. In this context, blockchain offers several strategic advantages.

Transparency and Traceability

One of the most widely recognized benefits of blockchain is enhanced transparency. All transactions recorded on a blockchain network are time-stamped, traceable, and accessible to authorized participants (Jung, 2019). This feature improves auditability, reduces the risk of fraud, and enhances regulatory compliance. Real-time visibility of transactions also enables regulators and institutions to monitor financial activities more effectively, potentially reducing systemic risks (Kawasmi et al., 2020).

Cost Reduction and Operational Efficiency

Blockchain can significantly reduce operational costs by eliminating intermediaries and automating manual processes. Studies suggest that financial institutions could save billions of dollars annually through process simplification, automation, and peer-to-peer settlement mechanisms (Martino, 2021; Osmani et al., 2020). Shared distributed infrastructures may also reduce IT infrastructure and operational expenses while improving scalability (Ji & Tia, 2022).

Security and Data Integrity

Blockchain systems provide enhanced security through cryptographic encryption, decentralization, and consensus mechanisms. Since data are distributed across multiple nodes, there is no single point of failure, reducing vulnerability to cyberattacks and system failures (Miles, 2017). The immutability of records further minimizes the risk of data manipulation and financial fraud.

Automation through Smart Contracts

Blockchain enables the use of smart contracts, which automatically execute predefined actions once specified conditions are met. These programmable agreements can streamline processes such as loan approvals, collateral management, and trade settlements, reducing processing time and human error while improving operational efficiency (Ji & Tia, 2022).

Trust and Regulatory Efficiency

The traceability and auditability features of blockchain reduce the need for manual verification and facilitate compliance with regulatory requirements. Real-time monitoring capabilities can simplify reporting processes and improve accountability, reducing the administrative burden on financial institutions (Martino, 2021).

5. Conclusion and Recommendations

Blockchain technology represents a transformative innovation with the potential to redefine traditional banking processes. Its distributed ledger architecture enables secure, transparent, and immutable transaction recording without the need for centralized control. These characteristics make blockchain a promising foundation for the development of next-generation financial services.

One of the most significant application areas is cross-border payments, where blockchain can reduce settlement times, eliminate intermediary costs, and improve efficiency. This capability is particularly important for increasing financial inclusion and improving access to financial services in developing economies.

Blockchain also offers substantial improvements in data security and fraud prevention. The immutable structure of blockchain records reduces the risk of unauthorized alterations and enhances the protection of sensitive financial information. In addition, smart contracts can automate complex banking operations, improving operational efficiency and customer experience.

Beyond operational improvements, blockchain can strengthen risk management, enhance financial transparency, and support the detection of illegal activities such as money laundering through improved transaction traceability.

However, despite its significant potential, several challenges must be addressed before widespread adoption can occur. These include:

- Regulatory uncertainty and the need for standardized legal frameworks
- High implementation and integration costs
- Technical scalability and interoperability issues
- Organizational resistance to change within traditional financial institutions

To support effective adoption, policymakers and industry stakeholders should develop clear regulatory guidelines, promote industry collaboration, and invest in research and infrastructure development. Financial institutions, in turn, should pursue gradual implementation strategies, pilot projects, and partnerships with fintech firms to reduce transition risks.

In conclusion, blockchain technology is expected to play a critical role in the future of digital banking. Its integration with emerging technologies such as artificial intelligence, digital identity systems, and advanced analytics may contribute to the development of a more secure, efficient, transparent, and inclusive global financial ecosystem.

Ethical Considerations

This study does not involve human participants, personal data collection, or experimental procedures. All information used in the research is based on publicly available academic literature, institutional reports, and secondary sources. The research was conducted in accordance with academic integrity principles, ethical publishing standards, and international research ethics guidelines. The author confirms that the manuscript is original and has not been submitted to or published in any other journal.

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Conflict of Interest

The author declares that there is **no conflict of interest** regarding the publication of this paper. The author has no financial, institutional, or personal relationships that could have influenced the work reported in this study.

References

1. Ahmed, S., & Sur, S. (2021). Change in the usage patterns of digital banking services by Indian rural MSMEs during demonetization and COVID-19 pandemic-related restrictions. *Vilakshan – XIMB Journal of Management, 20*(1), 166–192. https://doi.org/10.1108/XJM-09-2020-0138
2. Ahmed, S., Alshater, M. M., El Ammari, A., & Hammami, H. (2022). Artificial intelligence and machine learning in finance: A bibliometric review. *Research in International Business and Finance, 61*, 101646. https://doi.org/10.1016/j.ribaf.2022.101646
3. Aliyeva, B. (2016). Positive and negative aspects of internet use in the banking system. *Inonu University International Journal of Social Sciences, 5*(1), 237–257.
4. Bankagazetesi. (2021). Telephone banking staff and their responsibilities. Retrieved June 4, 2024, from https://bankagazetesi.com
5. Bapat, M., & Pillai, S. (2025). Implementation of blockchain technology in the agriculture industry. *Science, Education and Innovations in the Context of Modern Problems, 8*(6), 57–65. https://doi.org/10.56334/sei/8.6.5
6. Beybur, M., & Çetinkaya, M. (2020). The impact of the COVID-19 pandemic on the use of digital banking products and services in Turkey. *International Journal of Western Black Sea Social and Human Sciences, 4*(2), 148–163. https://doi.org/10.46452/baksoder.829078
7. Boston Consulting Group. (2021). *Retail banks face the urgent need to retool offerings and strategies.* https://www.bcg.com
8. Brackert, T., Chen, C., Colado, J., Poddar, B., Dupas, M., Maguire, A., Sachse, H., Stewart, S., Uribe, J., & Wegner, M. (2021). *The front-to-back digital retail bank: Global retail banking report 2021.* Boston Consulting Group.
9. Cucari, N., Lagasio, V., Lia, G., & Torriero, C. (2022). The impact of blockchain in banking processes: The interbank Spunta case study. *Technology Analysis & Strategic Management, 34*(2), 138–150. https://doi.org/10.1080/09537325.2021.1878332
10. Demir, Y., Ozturk, E., & Albeni, M. (2007). The relationship between financial markets and economic growth in Turkey. *Journal of Social and Economic Research, 2007*(2), 438–455.
11. Demirel, A. C. (2017). *Digital banking and analysis of its current situation in Turkey* (Master's thesis). Baskent University.
12. Demirel, S. (2021). The impact of the COVID-19 pandemic on digital banking transactions. *Journal of Banking and Capital Markets Research, 5*(11), 49–64.
13. Drescher, D. (2017). *Blockchain basics: A non-technical introduction in 25 steps.* Apress.
14. Ecmir, R. T., & Sagbas, I. (2021). ATM banking systems and regulations. *Journal of Customs and Trade, 8*(24), 24–36.
15. Erdogan, S., & Bodur, D. (2020). Blockchain technology and its potential effects on today's financial system. *Mali Cozum Journal, 30*, 281–295.
16. Ficht, S., & Alich, D. (2018). Trusted AI and data security in banking. Handelsblatt Banking Summit. Retrieved June 4, 2024, from https://veranstaltungen.handelsblatt.com
17. Govez, A., & Uysal, B. (2023). The causality relationship between digital banking and the number of branches and personnel: Toda–Yamamoto approach. *Journal of Economics, Business, Politics and International Relations, 9*(1), 50–61.
18. Gupta, A., & Gupta, S. (2018). Blockchain technology application in the Indian banking sector. *Delhi Business Review, 19*(2), 75–84.
19. Harris, W. L., & Wonglimpiyarat, J. (2019). Blockchain platforms and future bank competition. *Foresight, 21*(6), 625–639. https://doi.org/10.1108/FS-04-2019-0033

20. Hinson, R., Osarenkhoe, A., & Okoe, A. F. (2013). Determinants of bank selection. *Journal of Service Science and Management, 6*(3), 197–205.
21. Isnet. (2023). What is digital banking? Retrieved June 1, 2024, from https://www.isnet.net.tr
22. Ji, F., & Tia, A. (2022). The effect of blockchain on business intelligence efficiency of banks. *Kybernetes, 51*(8), 2652–2668. https://doi.org/10.1108/K-08-2020-0569
23. Jung, T. J. (2019). How blockchain transparency supports cybersecurity. IBM Blockchain Blog. Retrieved July 1, 2024, from https://www.ibm.com/blogs/blockchain
24. Karim, S., Rabbani, M. R., & Bawazir, H. (2022). Applications of blockchain technology in finance and banking beyond digital currencies. In *Blockchain Technology and Computational Excellence for Society 5.0* (pp. 216–238). IGI Global.
25. Kartal, B., & Pala, E. (2010). Customer attitudes toward internet banking: A pilot study. *Journal of Management and Economics, 17*(2), 43–61.
26. Kawasmi, Z., Gyasi, E. A., & Dadd, D. (2020). Blockchain adoption model for the global banking industry. *Journal of International Technology and Information Management, 28*(4), 112–154.
27. Kocer, M. (2012). *The effects of e-commerce on marketing strategies* (Master's thesis). Istanbul Commerce University.
28. Kuberkar, S., & Singhal, T. K. (2025). Citizen adoption of AI and blockchain technologies within smart city service delivery in India. *Science, Education and Innovations in the Context of Modern Problems, 8*(2), 839–855. https://doi.org/10.56334/sei/8.2.65
29. Kumari, A., & Devi, N. C. (2022). The impact of fintech and blockchain technologies on banking and financial services. *Technology Innovation Management Review, 12*(1–2).
30. Kus, P. (2018). *Digital banking services* (Master's thesis). Bahcesehir University.
31. Martino, P. (2021). *Blockchain and banking: How technological innovations are shaping the banking industry.* Springer.
32. Miles, C. (2017). Blockchain security: What keeps transaction data safe? IBM Blockchain Blog. Retrieved July 1, 2024, from https://www.ibm.com/blogs/blockchain
33. Nelson, P., & Richmond, W. (2007). Internet banking: Gold mine or money pit? *Academy of Banking Studies Journal, 6*(1), 1–25.
34. Osmani, M., El-Haddadeh, R., Hindi, N., Janssen, M., & Weerakkody, V. (2020). Blockchain for next-generation banking services: Cost, benefit, risk and opportunity analysis. *Journal of Enterprise Information Management, 34*(3), 884–899. https://doi.org/10.1108/JEIM-02-2020-0040
35. Ozcan, B., & Ari, A. (2011). Financial development and economic growth: Evidence from Turkey. *Business and Economics Research Journal, 2*(1), 121–135.
36. Ozyurek, H. (2021). Current and potential application areas of blockchain technology. *Anadolu University Journal of Economics and Administrative Sciences, 22*(4), 31–50.
37. Patki, A., & Sople, V. (2020). Blockchain implementation in the Indian banking sector: Challenges and future directions. *Journal of Banking and Financial Technology, 4*(1), 65–73.
38. Puthal, D., Malik, N., Mohanty, S. P., Kougianos, E., & Yang, C. (2018). The blockchain as a decentralized security framework. *IEEE Consumer Electronics Magazine, 7*(2), 18–21.
39. Rhodes, C. (2019). *Bank branch and ATM statistics* (Briefing Paper No. CBP08570). House of Commons Library.
40. Sari, C. (2019). *Cost analysis of ATMs as a payment system* (Master's thesis). Istanbul Sabahattin Zaim University.
41. Seyrek, I. H., & Aksahin, A. (2016). Evaluation of mobile banking service quality factors using the analytic hierarchy process. *International Review of Economics and Management, 4*(3), 47–61.
42. Sladic, G., Milosavljevic, B., Nikolic, S., Sladic, D., & Radulovic, A. (2021). A blockchain solution for securing real property transactions: A case study for Serbia. *ISPRS International Journal of Geo-Information, 10*(1), 35. https://doi.org/10.3390/ijgi10010035
43. Tapscott, D., & Tapscott, A. (2017). How blockchain will change organizations. *MIT Sloan Management Review.* http://mitsmr.com/2gbIHrI
44. TCMB. (2015). *Financial stability report.* Central Bank of the Republic of Turkey. https://www.tcmb.gov.tr
45. Turkish Banks Association. (2024). *Digital, internet and mobile banking statistics – March 2024.* https://www.tbb.org.tr
46. Turkish Language Association. (2023). *Current Turkish dictionary.* https://sozluk.gov.tr
47. Ustaomer, K. (2019). Digitalization in the Turkish banking sector. *Journal of Economics, Business and Management, 3*(1), 1–24.
48. Vural, E. (2019). *Evaluation of internet and mobile banking service quality* (Master's thesis). Cumhuriyet University.
49. Yavuz, M. (2019). Digital transformation in the economy: Blockchain technology and its applications. *Journal of Finance, Economics and Social Research, 4*(1), 15–29.

50. Yildirim, O. (2020). A theoretical approach to the financial system and the case of Turkey. *International Journal of Banking, Economics and Management Studies, 3*(2), 74–86.
51. Zeybek, H. (2018). Digital banking. *Mali Cozum Journal, 28*, 79–107.