ORIGINAL RESEARCH ARTICLE

JBFS Volume 16 Number 2 (December) 2024
DOI: https://doi.org/

Aditi Shams*
Associate Professor, Department of International Business, University of Dhaka

Keywords
Blockchain adoption, TOE framework, DOI framework, Private banks, Emerging country, Bangladesh.

JEL Classifications: M1, 03

Received: 24 November, 2024

Accepted: 15 May, 2025

Published online:

Published in Print:

ISSN (Online) 3006-5720

ISSN (Print) 1990-5157

Exploring Blockchain Adoption in the Banking Sector of Bangladesh

Abstract

Blockchain technology adoption is increasingly prevalent among business practitioners, academicians, and policymakers. However, blockchain usage is still in its infancy in many emerging economies, such as Bangladesh. This research aims to explore the enablers and barriers influencing the adoption of blockchain technology in the banking sector of Bangladesh. Drawing on the Technology-Organizational-Environment (TOE) model and diffusion of organizational innovation (DOI) theory-based view, this research aims to investigate the motivators and internal & external barriers to blockchain technology adoption in Bangladesh's banking sector. This study took a qualitative case-based approach, combining multiple exploratory case studies and interviews with the senior managers of commercial private banks operating in Bangladesh. The results reveal that senior managers have shown a positive attitude towards adopting advanced technology to improve customers' end experiences. Managers are eager to adopt blockchain technology in international trade finance-related activity. However, they have emphasized the operational and regulatory context as major setbacks for blockchain technology adoption in the banking sector of Bangladesh.

Cite as:

1. Introduction

Blockchain is a decentralized and distributed digital ledger where each transaction is linked to the last transaction in a secure chronological chain. Blockchain technology (hereafter, BCT) has the potential to make significant inroads in supply chain & logistics, healthcare, land and property registers, voting systems, carbon credit trading, and banking services. Blockchain technology offers a wide variety of advantages to consumers, corporations, and society. BCT allows users to conduct transactions with each other directly without a third party to verify the transaction. Transactions can be tracked and traced instantly, while real-time settlement of transactions is possible. In addition, BCT enables organizations to reduce costs, gain greater efficiency, transparency, and enhanced security and trust (Lacity, 2018).

According to experts, currently, international transactions are costly, cumbersome, and long-delayed (Casey, Crane, Gensler, Johnson, & Narulaet, 2018). BCT can displace the conventional paper-based business methods and enact more secure & trustworthy trade channels in the banking and finance sector (Gupta & Gupta,2018; Nofer, Gomber, & Hinz,

2017). Blockchain expedites transactions by utilizing a solid framework for cross-border transactions while removing expensive intermediaries. Blockchain for letter of credit (LC) payments can handle paperwork swiftly and save costs associated with this payment method (Belu, 2019).

The World Trade Organization (WTO) predicted that the use of BCT in international trade capacity to erase numerous trade restrictions has a revolutionary effect on doing business outside national borders (Derindag, Yarygina, & Yu-Tsarev, 2020). In the United States and the United Kingdom, Blockchain may reduce the time it takes to settle trade processes from 20 to 6–10 days, boosting revenue and cutting operating expenses while reducing regulatory capital needs and hazards (Kawasmi, Gyasi, & Dadd, 2020). Developing nations like India, Kenya, and other countries in East Africa are finding a growing number of uses for Blockchain. The Indian economy has grown substantially due to the advanced initiatives introduced in the financial and banking sector. The blockchain adoption rate is 55% in India (Kulkarni & Patil, 2020).

Additionally, Kulkarni & Patil (2020) anticipated that investment banks in India might save up to $10 billion by using Blockchain for payment settlements and recovery. Fastening the letter of credit settlement process has led to a decline in import confirmation costs. Indian banks pay between 0.50% and 0.75% annually; Pakistani banks pay between 1.25% and 1.75% annually; and Bangladeshi banks pay between 2.00% and 3.00% annually, which is significantly higher compared to its neighboring countries (Mavis, 2022, 19 June).

Bangladesh is slated to graduate from the least developed country to a middle-income country in 2026 based on its significant improvements in the economic growth indicators (2008-2019). However, according to the 'Doing Business Report' (2020) and Global Competitiveness Report, Bangladesh ranks 168th and 105th respectively, which is much weaker compared to its neighboring countries (India and Pakistan). Bangladesh Bank cyber heist 2016, in which thirty-five fraudulent instructions were issued by security hackers via SWIFT network to illegally transfer US$ 1 billion belonging to the central bank of Bangladesh, has created major concern over the prevailing transaction security system in place in Bangladesh. In addition, the Tk. 16,000 crore LC fraud from Social Islami Bank, and Tk. 30,000 crore loan scam from Islami Bank by S. Alam Group has shaken clients' trust in banking transactions.

In addition, slower letter of credit processing time, transaction complexities, increased cost, and inefficiencies in international trade transactions adds to stakeholders' agony and frustration over the current forms of banking services. According to banking professionals in Bangladesh, the LC settlement process takes about 3 days to complete, which is lengthy compared to other countries. The counterparty clients consider any payment delay to be a default. The cost of LC certification, discounting commercial transactions, and borrowings eventually rises. Exported goods reach their destination while the documentation is in the lengthy procedure of being verified by bank employees. Because the exporter delivers the goods and relies on the transaction partner to fulfill the payment obligation, international payments carry

a significant level of risk for Bangladeshi exporters. Transferring money in the form of export-import payments, remittances, or other foreign income brings in several complexities. Hence, adopting a real-time clearance system ensuring greater transparency, accountability, speed, and trust is the market demand.

In March 2020, Bangladesh government has released the first-ever National Blockchain Strategy (NBS, 2020). The main goal of the strategy is to make Bangladesh a blockchain-enabled society where blockchain technology (hereafter, BCT) will play a major role in meeting the Sustainable Development Goals (SDG), facilitating international trade-transactions, and addressing local outcry for a secure digitalized platform. Following the NBS, a few multinational and national banks adopted BCT in banking services in Bangladesh. Standard Chartered Bangladesh executed the first blockchain technology-based LC in 2020. HSBC Bangladesh executed the first cross-border LC between Bangladesh and Singapore in the same year. City Bank, Prime Bank, and Bank Asia have also adopted BCT for cross-border LC, interbank LC, and remittance transfer, respectively. Although the use of BCT in banks and financial services is in the early stages of development, not much is known about the application of BCT, its relative advantages, and barriers to BCT implementation in the banking sector of Bangladesh.

Extant literature suggests that banking sector in both developed and developing country context recognizes the utility of BCT. Existing studies have documented perceived security, ease of use, and perceived operational efficiency as pivotal role of BCT (Hussain et al. 2024; Kajla et al. 2023). Existing evidence highlights blockchain as a strategic tool to help overcome challenges of fraud risks, transaction costs, and inefficiencies prevalent in the banking services. However, systematic literature review on blockchain adoption points a scarcity of literature on empirical evidence (Hussain et al. 2022). Given the global insights of BCT application, an in-depth empirical investigation of the BCT adoption in the local context of Bangladesh is timely. The interplay of emerging technology trends and the readiness of banking sector in Bangladesh to adopt BCT, will provide interesting insights to policymakers and banking executives about harnessing better services. Hence, this study is conducted to analyze the adoption of blockchain technology in the banking services and find relevant factors that are affecting the use of this technology. This study will critically identify the blockchain technology adoption motivators of banks and the potential barriers to BCT use. The research questions are the following:

RQ1: What are the factors that motivate banks to adopt BCT?

RQ2: What are the barriers to the implementation of BCT in banking service?

This study chose to adopt a technology adoption framework to elevate the drivers critical to Blockchain adoption in the international trade process of banks. The study chose to analyze BCT application in trade settlements by banks in an organizational environment utilizing both 'Technology, Organization, and Environment' (TOE) and 'Diffusion of Innovation' (DOI) framework. This study aspires to provide useful insights for policy makers, regulators, and other

private and public banks in the country. It would allow them to identify the potential benefits and barriers to BCT adoption and assess its potential for the banking sector in Bangladesh. This study would also enable banks to be better prepared to implement BCT in their operations.

Switching to a new technology might elevate the drivers and lessen the barriers expected to be uncovered after a comprehensive understanding of the aspects that affect blockchain technology adoption. When making decisions during the development phase, the acceptance rate is helpful because it allows decision-makers to evaluate the challenges that users and consumers may encounter as a result of using technology (Taherdoost, 2022). Moreover, a study of adoption will indicate the usefulness of blockchain technology by analyzing direct economic data and real-world circumstances (Kulkarni and Patil, 2020).

2. Literature Review and Theoretical Framework

2.1. Literature Review

BCT has emerged as a disruptive innovation in the banking sector. Extant literature shows that security, accountability, transparency, reducing fraud, cost reduction, operational efficiency, and improved trust of the stakeholders serve as primary notions to adopt BCT in the banking sectors (Casey et al., 2018; Chiu, 2017; Ducas &Wilner, 2017; Hussain et al., 2024; Jain, 2024; Kajla et al. 2023; Suyanti et al. 2024; Yoo, 2017). The centralized nature of the traditional structure of financial transactions , where banks and other financial organizations control the procedures, makes foreign payments difficult, time-consuming, and error-prone (Rawat, Chaudhary, & Doku., 201Studies have frequently cited that the immutability, transparency, auditability, and speed of transaction settlement inherent in the BCT adoption directly addresses the longstanding challenges faced by the banking sectors, and thus offers a significant upgrade to the traditional banking structure (Casey et al., 2018; Sharma, 2023; Kajla et al. 2023). Jain (2024) conducted an survey on two hundred and fifty respondents within Indian banks and highlighted that transaction security, efficiency, and lower cost per transaction are major perceived benefits of BCT adoption. Kajla et al. (2023) surveyed Indian banks and found that the organizational dimension is the most significant criterion for blockchain adoption. They discovered that transforming from traditional centralized database-based banking systems to decentralized networks inherited by BCT requires ample IT resources and financial resources. Blockchain could make international payments and settlements between banks between multiple parties and across borders easier by allowing point-to-point transfer and straight-through processing of global financial transactions (Yoo, 2017; Chiu, 2017). By keeping an eye on the Blockchain, a bank can keep accurate financial records, perform settlements, and transfer remittances while ensuring delivery-versus-payment by combining asset transfers with payments (Yoo, 2017). Participants in the interbank market will be able to receive cash and securities more rapidly as a result of the accelerated transfer, freeing up liquidity that may have been bound up in collateral. In addition, quicker blockchain-based PCS processing decreases labor reconciliation, and real-time transaction processing will eliminate the advantages that clearing

offers, hence boosting the need for "spot liquidity" in the settlement.

Using Blockchain with conventional financial systems will increase the power between counterparties. Blockchain can reduce the requirement for intermediaries to verify financial transactions and the frictions caused in financial networks by various intermediaries (Cocco, Pinna, & Marchesi, 2017). Banks have realized that Blockchain might allow them to reduce infrastructure expenses by up to $20 billion by 2025 (Nelaturu, Du, & Le, 2022). By embracing Blockchain technology, banks may also reduce the costs associated with bank-to-bank transactions (Chowdhury, Suchona, Alam, & Khan, 2021).

2.2. Theoretical lens

This study draws on the Technology-Organization-Environment (TOE) and Diffusion of Innovation (DOI) to understand the adoption of BCT in the banking sector of Bangladesh. This study inherited TOE and DOI to uncover the inherent internal and external complexities involved with BCT adoption in the banking sector. The framework enables the exploration of technological, organizational, and environment aspects when assessing the adoption of blockchain technology. Detailed discussion on the framework is as follows-

Technology-Organization-Environment (TOE)

The Technology-Organization-Environment (TOE) framework is an application-based framework for research from the viewpoint of an organization (Piaralal, Yahya, & Karim, et al., 2015). It was developed by Tornatzky & Fleischer[1] (1990). The TOE methodology presents three primary aspects to investigate the variables influencing the organization's adoption of innovative technologies. The technological context includes the features and benefits of innovative technology; the organizational context includes issues within the company, such as management, employees, products, and services; and the environmental context includes issues existing in the business-related field, including competitors and business partners. Previous studies have used the TOE research technique, particularly those focusing on information systems (Wang, Wang, & Yang, 2010; Kesker, et al. 2021).

a) Technological Aspect

The technical element includes all relevant technologies for the business, including those already in use and others that are now being sold but still need to be implemented. Banks should use blockchain infrastructure to build and run the global technology network. Scalability is crucial since Blockchain in banking must manage vast data collection. Since transactions recorded in blocks cannot be changed once added, blockchain expertise is vital to changing how people trade value. According to Keskar (2023), the cross-border and permissionless possibilities offered by blockchains might significantly lower institutional costs. In essence, Hassani et al. (2018) found that the use of blockchain technology may result in banking cost reductions of close to USD 8 billion. The technology's shared databases and encryption enable numerous users

[1] L.G. Tornatzky, M. Fleischer, The processes of technological innovation, Lexington Books, 1990, as cited in Wang, Y. M., Wang, Y. S., & Yang, Y. F. (2010). Understanding the determinants of RFID adoption in the manufacturing industry. *Technological forecasting and social change*, *77*(5), 803-815.

from various cities, states, and nations to simultaneously access the digital ledger that is often updated (Maliket al, 2021).

b) Organizational Setting

Adoption aptitude is influenced by the organization's resources and creativity and explicit and unplanned intra-hierarchical components for communication and control. According to Salwani et al. (2009), the organizational context includes scope, organizational scale, and legislative belief. According to studies conducted on the TOE framework- innovativeness, firm structure, capacity, operational capability, financial resources, organizational slack, quality of human capital, trust, organizational knowledge accumulation, physical infrastructure, top management, support for innovation, expertise, and infrastructure, and organizational context are among the most crucial organizational context variables. Due to their limited resources, small businesses are slower to embrace emerging technology. Small businesses, however, are more adaptable and agile than big businesses.

Kajla et al. (2023) surveyed Indian banks and found that the organizational dimension is the most significant criterion for blockchain adoption. They discovered that transforming from traditional centralized database-based banking systems to decentralized networks inherited by BCT requires ample IT and financial resources. In addition, studies have found that Larger firms have more resources to accelerate BCT adoption, make greater expenditures, have a more significant number of processes and activities, and may seek banking partners to implement technology (Kajla et al. 2024; Saheb & Mamaghani, 2021).

c) Environmental Context

An organization's effects from the outside world are referred to as the environmental context. Although a company's decision to adopt a new technology mostly depends on the intention to broaden its operation, external factors can sometimes act as a deciding factor. According to earlier research, there are three primary types of external pressure: pressure from competitors, influence from trade partners, and pressure from laws and regulations (Chang, et al. 2013; Chong et al., 2009; Chong & Olesen, 2017; Lin & Lin, 2008). Blockchain, as a novel technology, will replace centralized international trade finance procedures with a digital, decentralized ledger that provides all parties, including banks, with access to a single information source. Thus, monitoring all records and digitally confirming or certifying the custody of assets in a real-time environment is possible. Blockchain technology permits Bitcoin and other cryptocurrencies, which might challenge the dominance of central banks over monetary policy by conventional banks. Individuals and businesses may engage in direct transactions without traditional payment networks.

Without bank systems or bank accounts, there are no banks. Blockchain will provide clients with several payment options while reducing consumer banking expenses; consequently, the preparedness of customers is required for banks to use this technology (Zhu & Kraemer, 2005). The blockchain technology used by banks would need to be compliant with privacy rules and maintain the security of data. The government must establish regulatory regulations for this innovative technology.

Diffusion of Innovation (DOI)

The DOI is a hypothesis that examines how, why, and how quickly new concepts and technologies diffuse across cultures, operating at both the individual and the corporate levels. DOI theory holds that innovations spread across social systems through particular channels (Rogers 1995). The degree to which individuals accept technology can vary. Therefore, the proportion of those individuals embracing new inventions is often distributed over time (Rogers 1995). Individuals are often separated into the following five groups of innovativeness (from earliest to latest adopters) based on the segmentation of this normal distribution (Rogers 1995). This innovation process is more complex when introduced in organizations and includes the involvement of key personnel and opponents of the new technology, where every party plays a part in the innovation-decision process.

DOI theory seeks to explain the innovation-decision process, deciding variables of the rate of adoption, and distinct kinds of adopters. DOI covers five important innovative characteristics: Trialability, complexity, observability, compatibility, and relative advantage. The term "relative advantage" refers to the extent to which a new phenomenon is favored over its predecessor. There is evidence that this framework is a strong indicator of whether or not people will accept new technology. Compatibility refers to the degree to which innovation is regarded as compatible with the possible end-users existing values, past experiences, and requirements. The complexity of an invention is the complexity faced by its end users. When discussing inventions, "trialability" refers to how well they lend themselves to small-scale evaluation. The degree to which others may see the effects of innovations is known as observability. These factors break down end-users' decision-making and technology adoption.

Woodside et al. (2017) researched the adoption status of Blockchain. The Diffusion of Innovation (DOI) model is used in the global banking industry to gauge management acceptability and the adoption of the Blockchain in general. Without naming an industry, their study determined that the technology was now in the innovation stage of adoption. In contrast, the widely used DOI examines the underlying processes of diffusion and evaluates the viability of implementing a new invention in a social system. Potential adopters are influenced by their perception of innovation, communication techniques, the structure of the social system, and change-promotion activities that encourage DOI (Wonglimpiyarat & Yuberk, 2005).

a) Technological Aspect

This component looks at the technical aspects of the technology and how it can be used to benefit the organization. It includes understanding the technology itself, its capabilities, and how it can be integrated into the organization's processes. Compatibility according to Rogers (1995), refers to how well a technological advancement conforms to prevailing beliefs, previous knowledge, and organizational requirements. Multiple studies have been identified as a key factor in the adoption and use of technology (Xu, Zhu, & Gibbs., 2004; Zhu & Kramer, 2005; Zhu et al., 2003, Atkinson, 2007). The degree to which an invention is seen as superior to the concept it replaces is known as a relative advantage. Verma and Bhattacharyya (2017), Chwelos et.al

(2001), and Alshamaila et al. (2013) have identified relative advantage as significant factors. According to Rogers' theory, innovations that provide a clear, visible advantage over the previous approach will be more quickly accepted and implemented. Recent studies have also shown that an invention won't be adopted if a potential user sees no equivalent benefits from using it. The degree to which an invention is deemed to be challenging to comprehend and utilize is referred to as its complexity (Moore & Benbasat, 1991). Additionally, Rogers proposed that if businesses find technology challenging to comprehend and integrate with their organizational procedures, they are less inclined to utilize it (Verma & Bhattacharyya, 2017). Transparency in information refers to information being readily available and verifiable for everyone. As a result, it reduces ambiguity and improves information visibility (Al-Jabri, & Roztocki, 2015). Businesses that prioritize information openness are more likely to use blockchain technology. Disintermediation is the process of eliminating a middleman from the business process. A key component of BCT is disintermediation, which enables firms to conduct peer-to-peer transactions without the need for middlemen, reducing costs and risks related to the intermediaries and enhancing operational efficiency (Malik et.al.; 2021). Technological assets comprise IT assets such as hardware, software, platforms, and databases necessary for the adoption of technology.

b) Organizational Setting

This component looks at the organizational structure and processes needed to implement the technology. It includes understanding the organizational culture and the role of management in the adoption process. It also involves assessing the skills and resources needed to implement the technology. Top management support is a critical factor in technology adoption (Mirchandani & Motwani,2001). The awareness and endorsement of technological advantages by upper management is a strong indicator of future technology adoption (Jeyaraj et al., 2006). As the organization's top decision-makers, they play a crucial role in business and organizational development (Verma & Bhattacharyya, 2017). Moreover, Organization size refers to the firm size categorization of a small, medium, or large based on the respective country of research. Kuan and Chau (2001) found the organizational size to be a determining factor in blockchain adoption. They found that larger firms with operations spread in different countries are likely to adopt new technology faster as opposed to small organizations.

c) Environment Context

Environmental context refers to the external impacts that a company experiences. Although a company's choice to embrace a new technology should largely be driven by the desire to better its core business, external pressure may occasionally be the deciding factor. It includes understanding the regulatory and legal framework, as well as perceived government support associated with the technology (Tornatzky & Fleisher 1990). Government policies are characterized as resource and regulatory assistance from the government. Shrier and Pentland. (2016) and Crosby, Pattanayak, and Kalyanaram (2016) stated government resource support to be a significant factor. It includes consulting and technical assistance, which may aid banks in Bangladesh in gaining a better understanding of blockchain advantages,

hurdles, and regulations. Providing recommendations on how to operate blockchain technology and conducting instructional seminars, respectively, requires government assistance. Government regulatory assistance consists of legislative support for blockchain and the openness of blockchain regulatory laws (Kawasmi et al., 2020).

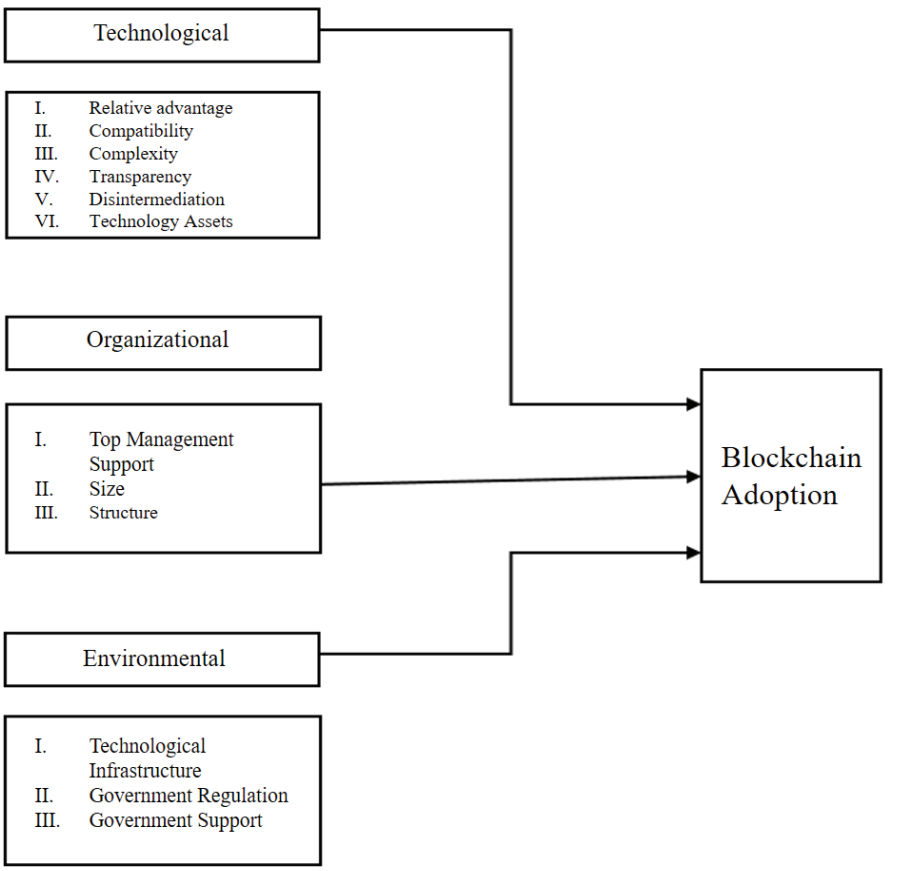

Figure 1: Author Constructed

3. Methodology

Research Approach and Data Collection Method

A qualitative exploratory research approach is utilized to investigate the research questions. This study adopted a multiple exploratory case study design to explore motivators and barriers. A case study method is particularly important since there are only handful of banks that adopted BCT (Farrukh, Mathrani, & Sajjad, 2023). Here survey method or empirical analysis based on this limited usage is not plausible (Eisenhardt, 1989; Yin, 2009). In this study, first, five Bangladesh based Banks were chosen for data collection. The sample banks have used blockchain

technology in banking service thus is the only source of primary information on BCT usage. Secondly, based on the conceptual framework developed in the earlier section, semi-structured interviews were conducted on IT officers and managers of the sample banks. Senior managers and the Information technology department head of each bank were approached for an interview. Only seven personnel were available and agreed to take part in the interview of which two interviewees were heads of the IT department in their respective banks and five personnel were managers of trade services division. Four interviews were conducted face-to-face and three interviews were conducted online through the Zoom platform. With permission, only one of the interviewees agreed to be recorded. Semi-structured interview questionnaire based on the factors identified from extant literature was emailed to the banking officials before the interview. Each interview lasted 20-30 minutes. The interviewers are coded randomly according to a number and listed below in the following Table-2. Seven principles of Klein and Myers (Klein & Myers, 1999) were followed to analyze the answers.

Table 2: Interviewee Information

Interviewee Code	Bank Code	Position
Interviewee 1	Bank 1	Business Manager, Global Trade and Finance Division.
Interviewee 2	Bank 2	Manager, Trade Operations Division.
Interviewee 3	Bank 2	Assistant Manager, Trade Services Division.
Interviewee 4	Bank 3	Manager, Trade Services Division.
Interviewee 5	Bank 4	Manager, Trade Operations Division.
Interviewee 6	Bank 5	Head of Information Technology Department.
Interviewee 7	Bank 6	Head of Information Technology Department.

Findings and Discussion

The study analyzes factors critical to blockchain implementation in selected banks of Bangladesh adopting the Innovations theory (DOI) and Technology–Organization–Environment (TOE) framework. The obtained results for all the selected banks are discussed below according to the developed framework:

a) Technological Aspect

Blockchain technology adoption is heavily influenced by technical aspects such as its perceived advantages, interoperability, information transparency, and disintermediation. Banks in Bangladesh, both foreign and domestic, have been utilizing the Contour platform[2] for their trade financing activities.

The relative advantage of Blockchain is that it facilitates paperless commerce and trade financing by connecting banks and corporations through a distributed network. By eliminating the need for physical papers and replacing them with digital ones, the platform cut the time it

2 The Contour platform for blockchain tracks and traces information as it moves between parties. It keeps all players in sync, reducing the need for reconciliation and speeding up transactions, whilst providing with end-to-end visibility (ESCAP, "Cross-Border paperless Trade Database", https://www.digitalizetrade.org/services/hsbc-contour-blockchain-platform)

took to exchange documents from the usual 5-10 days to only 24 hours. Only authorized users may access transaction data inside the banks' Contour platform. Due to this distributed data storage system, businesses now have a more secure trading environment. Saheb and Mamaghani (2021) also addressed security and privacy as a crucial advantage of blockchain in Europe and Middle Eastern banks. The Contour platform can monitor and trace data as it flows between users. Previous studies identify traceability as one of the key factors encouraging adoption of blockchain (Saheb & Mamaghani, 2021). Besides giving users complete insight into the status transactions, it also maintains all the moving parts in sync, cutting down on time spent reconciling.

According to Interviewee 2, "*Blockchain is a revolutionary technology that can fasten international payments. However, higher costs of using a third-party platform is an obstacle until we are able to achieve economies of scale".* Cost reduction was one of the benefits in the Australian context of blockchain adoption as stated by Malik, et.al (2021). Also, Holotiuk and Moormann (2018) stated in their paper on blockchain adoption in Germany that transaction costs will decrease if blockchain is implemented. However, it would be difficult for organizations that find it too difficult to keep up with the pace of technological development. Another notable contribution of Blockchain is the security it provides. Though the existing SWIFT platform is secured, it is time-consuming. Given that it is a trust-based system, the customer data recorded in a blockchain might be seen by authentic sources, alongside the information security precautions implemented via a blockchain's encryption capabilities (Sazu & Jahan, 2022). As per Interviewee 3, *"Due to the implementation of Blockchain, the cash conversion cycle has been reduced to 10-15 days. As the technology provides real-time visibility, the time to cross-check shipping documents is saved".* Wang et al. (2019) also highlighted cost reductions as the critical long-term advantage of blockchain implementation. Because the transactions in Bangladesh have yet to reach economies of scale and no locally developed platform to conduct the operations, the cost has been higher to perform the payments.

Interviewees addressed two areas where compatibility with blockchain technology is required. Interviewee 2 stated, *"Blockchain technology supports group and daily organizational goals. Another notable key area where compatibility is required is local regulatory compliance". Interviewee 7 stated, "Blockchain technology is not fully developed to use for banking services yet. To use blockchain, banks, clients and the parties involved in the international transaction have to use the same platform (For example, Contour Platform). Here in Bangladesh, we have different providers. Therefore, this creates problems of collaboration. Again, we cannot force all clients to use same platforms".* Here, the group refers to multinational guidelines in which clear indications are stated about which transactions should be done and the ones that have to be avoided. All the bank managers interviewed mentioned there were no technical complexities in bank payment obligations through blockchain technology. However, Interviewee 3 stated, *"Exporters are not comfortable with the technology as they lack technical education. It is important to educate them about the benefits of using the*

technology, and then we can realize the technology's full potential". Basoglu, Daim, & Kerimoglu (2007) also found new skills to be crucial, and exchange requirements to be integrated into the organization are to be realized with activities designed to increase people's familiarity with new technology. We also found that the Blockchain offers greater transparency in international payments. Interviewee 1 mentioned, *"Blockchain offers real-time visibility, and that is why there is no necessity to issue NT707 separately. Information on the letter of credit can be amended, added, or extended by the exporter himself in blockchain platforms".* Since all the relevant parties have access to the blockchain platform, information can be updated in real-time, which ensures transparency. Interviewee 4 and 6 stated, "*According to import policy, third party certification is required for goods to be released. For instance, issuing sanitary and phytosanitary or health certificates would take 2-3 days. Access to Blockchain will enable the certificates to be uploaded in real-time while notifying relevant parties instantly*". The effect of perceived disintermediation was first reported by Malik et al. (2021), who found that organizations that wanted to remove intermediaries were more inclined to use the technology. Insights from Interviewee 3 revealed that Blockchain had eliminated courier parties through which shipping documents were sent.

Additionally, he stated, *"Extensive use of Blockchain will lower the dependency on the SWIFT payment system. As worldwide monopoly will be reduced, it is expected that the communication channels in banking systems will be smoother".* As mentioned earlier, technological assets include software, platforms, databases, etc., and local and multinational banks in Bangladesh have used the Singapore-based Contour platform. Since in-house development is not cost-effective and would require a massive amount of investment, it would not be profitable for banks to use a blockchain platform of their own. However, in the upcoming days, when transactions are increased using blockchain technology, it is expected that organizations can develop their own platform to fasten trade financing operations.

b) Organizational Characteristics

Support from top management affects how an organization makes decisions. Managers of selected banks believe blockchain adoption will be easier if the top management is dynamic. Adopting new technology can be troublesome in organizations where conflict of interest and bureaucratic force exists. Interviewee 1 said, *"It is crucial for top management to be tech-friendly when implementing blockchain technology."* From a managerial perspective, the organization's size also plays an important role. Interviewee 2 reported, *"It is easier for multinational banks to adopt blockchain technology early. Due to the worldwide contract of using a chosen blockchain platform, increased bargaining power reduces the massive cost".* Kulkarni & Patil (2020) and Wang et.al. (2019) also mentioned that when an organization's present infrastructure, organizational principles, and business procedures are compatible with blockchain technology, employees tend to implement it. Zhu and Kraemer (2005) stated that it is difficult for smaller organizations to adopt a new technology unless it has passed the early stages of development. This is similar to the findings of the study

where interviewees stressed that it is easier for larger organizations to take the financial risk of implementing blockchain technology compared to other ones.

Again, the organizational structure was a significant determinant when assessing the adoption of blockchain technology in the banks of Bangladesh. Local and state-owned companies are exposed to low adaptability as they are primarily trained for routine work. For organizations where cultural diversity is nurtured, technology adoption is faster, and employees are naturally trained to embrace the technology quickly. Flexibility, such as speed and efficiency of organizational processes, is essential for organizations to manage a changing business environment and remain competitive. The workforce adaptability in enterprises may be enhanced through technical skill development, learning organization, and multi-skill and strategic workforce (Kumar, A., and Krishnamoorthy; B., 2020). Hence, organizations need to increase their adaptability and become tech-friendly to benefit from the technology successfully.

c) Environmental Context

Kajla et al (2023) indicated that organizations' confidence and trust in blockchain technology increase when the government assists in developing laws and regulations. Because ***g***overnment regulation can positively or negatively impact blockchain technology, it is essential to identify the legal and regulatory framework (Baker, 2012). The absence of a stable legal landscape must be taken into account by businesses thinking about implementing blockchain technology. Blockchain, for instance, gives related parties the option to conduct financial transactions outside the established, heavily controlled financial system. As Interviewee 1 stated, *"Blockchain is the future, hence we have to invest here today or tomorrow. The success of blockchain adoption depends on collective efforts, policy regulations by the government, and a robust ecosystem"*. Chong et al., (2009), Kajla et al. (2023), Shrier and Pentland (2016) and Crosby et al. (2016) also found government regulation to be a significant factor in banking organizations.

Organizations may be hesitant to utilize blockchain technology as a result of regulatory uncertainty for fear of breaking financial laws. Although the National Blockchain Strategy (2020) stated the urgency of Blockchain integrated national information infrastructure, legislative rules on blockchain implementation and usage have yet to be authorized. Batubara, F.R. et.al. (2018) also encourages the creation and adoption of blockchain technology through technological support infrastructures. Banks operating in Bangladesh believe technological infrastructure can prevent money laundering, documentary fraud, and unwanted delays regarding payments to exporters. As it has been reported that Bangladesh now spends 25–35 days longer in trade financing than its nearest rivals, China and Vietnam, government support regarding regulatory guidelines can reduce the time expected to yield more significant profits and higher exports. Though organizations have not received any financial incentives, the government has motivated banks to enhance blockchain operations further. Interviewee 3 stated, *"The Bangladesh government has supported us from the beginning of our first transaction. We look forward to utilizing the technology for greater efficiency in the upcoming*

days". Interviewee 6 & 7 has highlighted the necessity of regulatory guidelines by Bangladesh Bank for BCT adoption. All seven interviewee's have mentioned that banking sector is heavily regulated by the central bank (here, Bangladesh Bank). If Bangladesh Bank does not approve any legal regulatory guideline to adopt BCT for banking transactions, banks cannot adopt the technological breakthrough due to legal implications. Hence, it's the government's initiative to a fully digitalized banking service that can enable the banks to adopt cutting-edge technological breakthrough and enhance customer support. As Blockchain is an emerging technology, government support regarding access rights, transaction regulations, and authorization is crucial to driving the utmost benefits for mitigating international trade challenges in banking activities.

4. Conclusion

The objective of the study was to assess the drivers of blockchain adoption in the banking services of private banks in Bangladesh. A framework was constructed combining the TOE and DOI models for assessing bank manager views on Blockchain adoption. Senior managers and IT professionals serving in the trade and financing division of reputed banks located in Bangladesh were interviewed to gain insights for completing the study. This qualitative study on blockchain adoption suggested that the technology can be beneficial in banks as it would fasten the letter of credit process from approximately 4-7 days to 24 hours. Hence, it would be beneficial for Bangladesh to mitigate the challenges of international trade related to bank payment obligations.

Research on the viability and use of blockchain technology in the banking sector is limited. The potential of Blockchain will undoubtedly outweigh the dangers, and regulators would do well to consider the benefits that this transformation will bring to the financial sector. As considerable data growth continues, blockchain development is equally important along with the developed countries. It is important to develop infrastructure readiness, onboard every participant in the international trade process, and lastly create an ecosystem through collective efforts. In this study, the insights of managers who have been directly involved in blockchain activities shared a similar view on cost and lead time reduction, fraud detection, and the speed with which blockchain can facilitate international trade processes. The government of Bangladesh has been supporting the use of blockchain in banks, however it is high time to initiate laws and regulations concerned with the technology and create an ecosystem where every party related to the international trade process is onboarded.

This study has several theoretical, practical, and policy-related implications. From a theoretical perspective, this study contributes to the blockchain adoption subject domain. First, this study adds empirical evidence to the blockchain adoption study in an emerging developing country context. Findings from unique legal, regulatory settings, and organizational context of Bangladesh adds significant new knowledge to the existing BCT adoption literature. Second, this study draws on TOE and DOI framework-to empirically examine the motivators and barriers, which is largely missing in the emerging country context. Additionally, the integration of TOE and DOI framework

with the empirical findings contributes to explicitly creating linkage between the salient features and the organizational theories.

The future is blockchain; hence, banks must decide whether to innovate with blockchain-based big data technology or accept the risk of falling behind and giving up the competitive edge in a fast-evolving environment in an era when technology defines survival in a volatile and competitive industry. While Blockchain development is still in its early stages, we need to advance our technology and method for monitoring the Blockchain. The government and relevant departments should formulate policies to enable the public to benefit from Blockchain.

This study gives an introduction to factors affecting banks from adopting blockchain applications. The study has focused on the decision to use Blockchain in banking activities rather than on their subsequent deployment or maintenance. Adoption drivers for BCTs were restricted to technological, organizational, and environmental aspects. Further research can examine the readiness of BCT adoption in different sectors of Bangladesh. In addition, future research can conduct comparative analysis to evaluate the effectiveness of various private and public initiatives for technology adoption. Moreover, future research can examine the causal relationship of BCT deployment and profitability in a firm-level analysis.

Funding Information: This research is supported by the University Grant Commission, Dhaka, Bangladesh.

Acknowledgement: I am thankful to Mr. Islam, Department of International Business, University of Dhaka, for his expert comments and support for data collection. I also thank research assistant Ms. Kabir and Ms. Rahman for their contribution in data collection.

References

Al-Jabri, I. M., & Roztocki, N. (2015). Adoption of ERP systems: Does information transparency matter?. *Telematics and Informatics*, *32*(2), 300-310.

Alshamaila, Y., Papagiannidis, S., & Li, F. (2013). Cloud computing adoption by SMEs in the north east of England: A multi-perspective framework. *Journal of Enterprise Information Management*, *26*(3), 250-275.

Atkinson, N. L. (2007). Developing a questionnaire to measure perceived attributes of eHealth innovations. *American Journal of Health Behavior*, *31*(6), 612-621.

Baker, J. (2011). The technology–organization–environment framework. *Information Systems Theory: Explaining and Predicting Our Digital Society, Vol. 1*, 231-245.

Batubara, F. R., Ubacht, J., & Janssen, M. (2018, May). Challenges of blockchain technology adoption for e-government: a systematic literature review. In *Proceedings of the 19th annual international conference on digital government research: governance in the data age* (pp. 1-9).

Basoglu, N., Daim, T., & Kerimoglu, O. (2007). Organizational adoption of enterprise resource planning systems: A conceptual framework. *The Journal of High Technology Management Research*, *18*(1), 73-97.

Belu, M. G. (2019). Application of blockchain in international trade: An overview. *The Romanian Economic Journal*, *71*(22), 2-16.

Casey, M., Crane, J., Gensler, G., Johnson, S., & Narula, N. (2018). *The impact of blockchain technology on finance: A catalyst for change*. International Center for Monetary and Banking Studies. https://www.media.mit.edu/articles/the-impact-of-blockchain-technology-on-finance-a-catalyst-for-change/

Chiu, I. H. (2017). A new era in fintech payment innovations? A perspective from the institutions and regulation of payment systems. *Law, Innovation and Technology*, *9*(2), 190-234.

Chowdhury, M. U., Suchana, K., Alam, S. M. E., & Khan, M. M. (2021). Blockchain application in banking system. *Journal of Software Engineering and Applications*, *14*(7), 298-311.

Chwelos, P., Benbasat, I., & Dexter, A. S. (2001). Empirical test of an EDI adoption model. *Information systems research*, *12*(3), 304-321.

Crosby, M., Pattanayak, P., Verma, S., & Kalyanaraman, V. (2016). Blockchain technology: Beyond bitcoin. *Applied innovation*, 2(6-10), 71.

Cocco, L., Pinna, A. and Marchesi, M., 2017. Banking on Blockchain: Costs savings thanks to blockchain technology. *Future Internet*, 9(3), p.25.

Derindag, O. F., Yarygina, I. Z., & Tsarev, R. Y. (2020). International trade and blockchain technologies: implications for practice and policy. In *IOP Conference Series: Earth and Environmental Science* (Vol. 421, No. 2, p. 022051). IOP Publishing. doi: 10.1088/1755-1315/421/2/022051.

Ducas, E., & Wilner, A. (2017). The security and financial implications of blockchain technologies: Regulating emerging technologies in Canada. *International Journal*, *72*(4), 538-562.

Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of management review*, *14*(4), 532-550.

Gupta, A., & Gupta, S. (2018). Blockchain technology application in Indian banking sector. *Delhi Business Review*, *19*(2), 75-84.

Holotiuk, F., & Moormann, J. (2018, June). Organizational Adoption of Digital Innovation: the Case of Blockchain Technology. In *ECIS* (p. 202).

Hussain, N., Babalola, F., Kokogho, E., & ODIO, P. (2024). Blockchain technology adoption models for emerging financial markets: enhancing transparency, reducing fraud, and improving efficiency. *International Journal of Multidisciplinary Research and Growth Evaluation,* 5(1), 1281-1292. https://doi.org/10.54660/.ijmrge.2024.5.1.1281-1292

Jain, P. (2024). Examining blockchain adoption and usage behavior in private banks in India: an empirical study based on Rogers' diffusion theory. *MNTRC*, 1(1), 20-26. https://doi.org/10.21786/mntrc/1.1.4

Jeyaraj, A., Rottman, J. W., & Lacity, M. C. (2006). A Review of the Predictors, Linkages, and Biases in IT Innovation Adoption Research. *Journal of Information Technology*, 21(1), 1-23. https://doi.org/10.1057/palgrave.jit.2000056

Kajla, T., Sood, K., Gupta, S., Raj, S., & Singh, H. (2023). Identification and prioritization of the factors influencing blockchain adoption in the banking sector: integrating fuzzy AHP with TOE framework. *International Journal of Quality & Reliability Management*, 41(8), 2004-2026. https://doi.org/10.1108/ijqrm-03-2023-0079

Kawasmi, Z., Gyasi, E.A. and Dadd, D., (2020). Blockchain adoption model for the global banking industry. *Journal of International Technology and Information Management*, 28(4), 112-154.

Keskar, S. S., (2023). Electronic Bills of Lading (Ebol) in International Trade: Current Status and Future Outlook. *The Management Quest.* 5(2), 80-102.

Klein, H.K., and Myers, M.D., (1999). A set of principles for conducting and evaluating interpretive field studies in information systems. *MIS quarterly*, 67-93.

Kuan, K. K., & Chau, P. Y. (2001). A perception-based model for EDI adoption in small businesses using a technology–organization–environment framework. *Information & Management*, 38(8), 507-521.

Kulkarni, M., & Patil, K. (2020, March). Block Chain Technology Adoption for Banking Services-Model based on

Technology-Organization-Environment theory. In *Proceedings of the International Conference on Innovative Computing & Communications (ICICC)*.

Kumar, A., & Krishnamoorthy, B. (2020). Business analytics adoption in firms: A qualitative study elaborating TOE framework in India. *International Journal of Global Business and Competitiveness*, *15*(2), 80-93.

Lacity, M.C. (2018). Addressing key challenges to making enterprise blockchain applications a reality. *MIS Quarterly Executive*, 17(3), 201-222.

Malik, S., Chadhar, M., Vatanasakdakul, S., & Chetty, M. (2021). Factors affecting the organizational adoption of blockchain technology: Extending the technology–organization–environment (TOE) framework in the Australian context. *Sustainability*, *13*(16), 9404.

Mavis, M. (2022, 19 June), This is how LC confirmation cost is affecting import volume, dollar rates and forex reserves. *Dhaka Tribune*. Accessed on March, 2023. https://www.dhakatribune.com/business/272797/this-is-how-lc-confirmation-cost-is-affecting

Mirchandani, D. A., & Motwani, J. (2001). Understanding small business electronic commerce adoption: an empirical analysis. *Journal of Computer Information Systems*, *41*(3), 70-73.

Moore, G. C., & Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information systems research*, *2*(3), 192-222.

Nelaturu, K., Du, H., & Le, D. P. (2022). A review of blockchain in fintech: taxonomy, challenges, and future directions. *Cryptography*, *6*(2), 18.

Nofer, M., Gomber, P., Hinz, O., & Schiereck, D. (2017). Blockchain. *Business & information systems engineering*, *59*, 183-187.

Piaralal, S. K., Nair, S. R., Yahya, N., & Karim, J. A. (2015). An integrated model of the likelihood and extent of adoption of green practices in small and medium sized logistics firms. *American Journal of Economics*, *5*(2), 251-258.

Rawat, D. B., Chaudhary, V., & Doku, R. (2019). Blockchain: Emerging applications and use cases. *arXiv preprint arXiv:1904.12247*.

Rogers, E. M. (1995). Diffusion of Innovations: modifications of a model for telecommunications. *Die diffusion von Innovationen in der Telekommunikation*, 25-38.

Saheb, T., & Mamaghani, F. H. (2021). Exploring the barriers and organizational values of blockchain adoption in the banking industry. *The Journal of High Technology Management Research*, *32*(2), 100417.

Intan Salwani, M., Marthandan, G., Daud Norzaidi, M., & Choy Chong, S. (2009). E-commerce usage and business performance in the Malaysian tourism sector: empirical analysis. *Information management & computer security*, *17*(2), 166-185.

Farrukh, A., Mathrani, S., & Sajjad, A. (2023). An exploratory study of green-lean-six sigma motivators for environmental sustainability: Managerial insights from a developed and developing economy. *Business Strategy and the Environment*, *32*(8), 5187-5210.

Sazu, M. H., & Jahan, S. A. (2022). Impact of blockchain-enabled analytics as a tool to revolutionize the banking industry. *Data Science in Finance and Economics*, *2*(3), 275-293.

Sharma, J. (2023). Blockchain technology adoption in financial services: Opportunities and challenges. *Revolutionizing Financial Services and Markets Through FinTech and Blockchain*, 99-117.

Shrier, D., Wu, W., & Pentland, A. (2016). Blockchain & infrastructure (identity, data security). *Massachusetts Institute of Technology-Connection Science*, *1*(3), 1-19.

Taherdoost, H. (2022). A critical review of blockchain acceptance models—blockchain technology adoption frameworks and applications. *Computers*, *11*(2), 24.

Verma, S., & Bhattacharyya, S. S. (2017). Perceived strategic value-based adoption of Big Data Analytics in emerging economy: A qualitative approach for Indian firms. *Journal of Enterprise Information Management*, *30*(3), 354-382.

Wang, Y. M., Wang, Y. S., & Yang, Y. F. (2010). Understanding the determinants of RFID adoption in the manufacturing industry. *Technological forecasting and social change*, *77*(5), 803-815.

Wang, Y., Han, J. H., & Beynon-Davies, P. (2019). Understanding blockchain technology for future supply chains: a systematic literature review and research agenda. *Supply Chain Management: An International Journal*, *24*(1), 62-84.

Wonglimpiyarat, J., & Yuberk, N. (2005). In support of innovation management and Roger's Innovation Diffusion theory. *Government Information Quarterly*, *22*(3), 411-422.

Woodside, J. M., Augustine Jr, F. K., & Giberson, W. (2017). Blockchain technology adoption status and strategies. *Journal of International Technology and Information Management*, *26*(2), 65-93.

Xu, S., Zhu, K., & Gibbs, J. (2004). Global technology, local adoption: A Cross-Country investigation of internet adoption by companies in the united states and china. *Electronic markets*, *14*(1), 13-24.

Yin, R. K. (2009). *Case study research: Design and methods* (Vol. 5). sage
.

Yoo, S. (2017). Blockchain based financial case analysis and its implications. *Asia Pacific Journal of Innovation and Entrepreneurship*, *11*(3), 312-321.

Zhu, K., & Kraemer, K. L. (2005). Post-adoption variations in usage and value of e-business by organizations: cross-country evidence from the retail industry. *Information systems research*, *16*(1), 61-84.

Zhu, K., Kraemer, K., & Xu, S. (2003). Electronic business adoption by European firms: a cross-country assessment of the facilitators and inhibitors. *European journal of information systems*, *12*(4), 251-268.