# BLOCKCHAIN TECHNOLOGY IN BANKING: A STUDY ON THE IMPLEMENTATION IN BANKING SERVICES OF BANGLADESH

**Submitted By**
**ABRAR HASAN REZA**
**ID:191-35-2674**

**Supervised By**
**MR.MD.KHALED SOHEL**
**Assistant Professor**
**Department of Software Engineering**
**Daffodil International University**

This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Software Engineering

**DEPARTMENT OF SOFTWARE ENGINEERING**
**DAFFODIL INTERNATIONAL UNIVERSITY**
**FALL 2022**

## Approval

This thesis titled on "**BLOCKCHAIN TECHNOLOGY IN BANKING: A STUDY ON THE IMPLEMENTATION IN BANKING SERVICES OF BANGLADESH**", submitted by **Abrar Hasan Reza (ID: 191-35-2674)** to the Department of Software Engineering, Daffodil International University has beenaccepted as satisfactory for the partial fulfillment of the requirements for the degree of Bachelor of Science in Software Engineering and approval as to its style and contents.

**BOARD OF EXAMINERS**

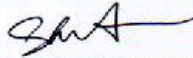-------------------------------------------------------                    **Chairman**

**Dr. Imran Mahmud**
**Head and Associate Professor**
Department of Software Engineering
Faculty of Science and Information Technology
Daffodil International University

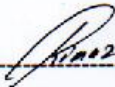-------------------------------------------------------                    **Internal Examiner 1**

**Md. Khaled sohel**
**Assistant Professor**
Department of Software Engineering
Faculty of Science and Information Technology
Daffodil International University

-------------------------------------------------------                    **Internal Examiner 2**

**Md. Shohel Arman**
**Assistant Professor**
Department of Software Engineering
Faculty of Science and Information Technology
Daffodil International University

-------------------------------------------------------                    **External Examiner**

**Rimaz Khan**
**Managing Director**
Tecognize Solution Limited

i

# DECLARATION

I hereby declare that I have done this thesis under the supervision of **Mr.Md.Khaled Sohel**, Assistant Professor, Department of Software Engineering, Daffodil International University. I also declare that this thesis is my original work for the degree of B.Sc. in Software Engineering and that neither the whole work nor any part has been submitted for another degree in this or any other university.

----------------------------

**Abrar Hasan Reza**

**ID: 191-35-2674**

Department of Software Engineering

Daffodil International University

Certified By:

----------------------------

**Mr.Md.Khaled Sohel**

**Assistant Professor**

Department of Software Engineering

Daffodil International University

# ACKNOWLEDGEMENT

First of all, I express my heartfelt thanks and gratitude to Almighty God for His divine blessing in allowing me to successfully accomplish the final year thesis.

Then I am grateful to my research supervisor, **Mr. Md. Khaled Sohel** sir who guided me throughout the whole research activities. His seemingly endless patience, scholarly guidance, constant encouragement, constant energetic supervision, valuable advice, and reading all my drafts at all stages enabled me to complete this thesis. I am also thankful to all the lecturers, Department of Software Engineering who sincerely guided me at my difficulty. I am grateful to my parents for their unconditional support and encouragement. I am thankful to my friend who supported me throughout this venture.

# Table of content

# List of Tables

# List of Figures

## Abbreviations/Acronyms

| | |
|---|---|
| BCT | Blockchain Technology |
| CBDC | Central Bank Digital Currency |
| DLT | Distributed Ledger Technology |
| FinTech | Financial Technology |
| HSBC | Hong Kong Shanghai Banking Corporation |
| ICOs | Initial Coin Offerings |
| KYC | Know-Your-Customer |
| P2P | Peer-to-peer |
| PwC | PricewaterhouseCoopers |
| SWIFT | Society for Worldwide Interbank Financial Telecommunication |

# ABSTRACT

The banking industry is the cornerstone of any nation's economy. Vulnerability in the banking sector can end up creating an economic meltdown. Transparency issues and security issues are the main vulnerable aspects of the existing banking model of Bangladesh. To eradicate the vulnerabilities and create more resilient banking model of Bangladesh, Blockchain Technology is the best potential alternative solution. Blockchain is a crucial digital method for guaranteeing the immutability, speed, and transparency of various banking activities. It offers a very secure method for transactions. The study investigates in which banking services of Bangladesh can blockchain technique be implemented and what are the current state of implementation of blockchain and the effects of them in the banking industry of Bangladesh. In this study, both qualitative and quantitative methodologies were used, and data were obtained through a survey and secondary sources including newspaper and journal articles, press releases, etc. In this study it is found that use of smart contract & blockchain makes it secure, transparent, fast and cost efficient. Additionally, the report demonstrates that the blockchain is only being used in Bangladesh's banking industry to settle Letter of Credit (LC) transactions and to send money abroad. Blockchain technology must, however, overcome obstacles like a growing network, a lack of coordination, a lack of comprehensiveness, a lack of a clear regulatory framework, and a shortage of qualified human resources. If the banking industry can overcome these obstacles, blockchain technology will replace traditional banking methods in Bangladesh.

Keywords: Blockchain, smart contract, Peer-to-Peer (P2P), Distributed Ledger Technology (DLT), transparency, Immutability, Letter of Credit (LC), Remittance.

# Chapter 1

# Introduction

## 1.1 Background of the Study

The banking industry is regarded as the engine of a strong economy. This sector is like the "lifeline" of all economic activity. Banks and payment services have been around for centuries and predate modern capitalism (Ferguson 2008; Hodgson 2015). The banking business is prone to fraud and inaccuracy due to the extensive manual operations and use of human intermediaries. Due to the presence of numerous actors and stages, exchanges in the corporate world are increasingly complicated and international, resulting in complex interconnected relationships in financial services that are perhaps challenging to handle. Blockchain is a significant digital technology in the digitization of this complex banking service system for effective management, ensuring the transparency, speed, and immutability of various banking activities. 'Blockchain' is one of the most hyped Information Technology (IT) buzzwords and one of the most important technological revolutions developed in recent years (Zhao, Fan, and Yan 2017). Blockchain has gained popularity as a distributed ledger technology since the Bitcoin whitepaper publication (Nakamoto,2008). The challenge of innovation requires a clear understanding of the role of technology (Nicola&Valentina,2021). A blockchain is a distributed shared digital ledger that is used concurrently by transactional actors. It is used for intra-bank activities, inter-bank or cross-border payments, digital currency deposit, trade finance, cryptocurrency payments, and the synchronized and decentralized completion of all transactions in all banking services. Bangladesh's banking sector has begun implementing blockchain technology in some banking service management to ensure compatibility in the world of virtual transactions, which will assure sustainability in the new business period of the fourth industrial revolution. There is a

huge gap on how to implement a technological innovation in the processes that occur within the interbank channel (Wu and Liang 2017).

In this study, we explore into the world of blockchain-enabled banking systems, which are at the forefront of a wave of technological advancement that will grow and strengthen sophisticated banking service solutions in Bangladesh. This thesis provides a good explanation of blockchain technology, the mechanism of blockchain and the use of blockchain technology in the banking industry. Additionally, the research investigates the problems banks are facing nowadays and the roles blockchain might play in solving them. Finally, the thesis shows how banks of Bangladesh are researching and implementing blockchain in banking services.

## 1.2 Motivation of the Study

Our main driving force was to investigate and apply Blockchain Technology (BCT) to improve the effectiveness of Bangladesh's financial sector. We reviewed a number of research papers, journals, and publications before deciding to work on the banking system's Blockchain optimization to elevate corporate growth and security concerns. The banking sector is a very complex and vital part of any economy. In the industry, there is a shortage of effective governance and management. Additionally, fraudsters from all over the world are harming the industry by utilizing this inferior infrastructure.

At the same time, blockchain as a technology has developed very rapidly and has proven to be very influential in the world of technology. Blockchain has already changed the popular concept of centralized systems and brought a decentralized system to the human mind. Without the use of a mediator, blockchain technology enables untrusted parties to agree on the status of a database. A blockchain could offer unique financial services like payments or securitization by offering a ledger that no one manages. The financial sector has the potential to become more transparent thanks to blockchain technology. Additionally, blockchain is transforming transaction speed and effectiveness.

We discovered that incorporating blockchain technology in banking systems requires appropriately developed software after examining several study methodologies. The development of a blockchain-based banks administration system needs to receive a lot of attention. When putting the system into place, consideration must be given to factors like network type, mining, security, confidentiality, accessibility, etc. In this article, we've looked into how banking services could be able to use blockchain technology while taking into account all of those important limitations.

## 1.3 Statement of the Problem

Every day, banks must conduct a large number of transactions. By introducing security and transparency to transactions, blockchain technology in banking might be extremely important. A blockchain eliminates centralized databases. It guarantees that no one person or entity within the system has the authority to change or tamper with the data. Additionally, it promotes transparency by doing away with the requirement for a third party or central authority to authenticate or handle peer-to-peer transactions. Not only that, the cost and time efficiency of blockchain in banking services can create disruption in the economy of Bangladesh. In this study, we tried to correlate the existing banking system and blockchain implementation in the banking services which can revolutionize the banking industry of Bangladesh. Finally, the study presents what is the current adoption level of blockchain technique in banking services of Bangladesh.

## 1.4 Research Question

The purpose of this study is to gain a better understanding on the following research questions:

1. What banking services in Bangladesh's banking sector can be created utilizing blockchain technology?

2. What effective services have banks currently produced in Bangladesh using blockchain technology and how satisfied are customers with the financial services obtained via the blockchain network?

## 1.5 Research Objectives

The objectives of this study are--

1. To study the Blockchain Technology Framework.

2. To evaluate the feasibility of implementing blockchain technology in Bangladesh's banking industry.

3. To determine how the deployment of blockchain technology has improved the banks' ability to provide financial services.

4. To evaluate the degree of consumer satisfaction with the financial services provided through the blockchain platform.

## 1.6 Research Scope

Little research has been done on blockchain usability in the banking industry of Bangladesh, its benefits, implications issues and solutions to these issues. A small number of scholars, including the Bangladesh Bank, the Bangladesh Government, and others, have conducted some study. Recently, a few publications on blockchain national strategy and blockchain technology's benefits were published. In all these articles, the researchers simply concentrated on blockchain strategy and on various blockchain application fields briefly to show the benefits of blockchain. They appropriately addressed blockchain functions, but they didn't mention how to implement them in financial services. But people can't rely on blockchain as a new disruptive innovation for payments and transactions as there is no information on how safe it is compared to existing digital financial systems in terms of payment, settlement, and trade. And what is the current state of adoption of blockchain in the banking industry of Bangladesh wasn't mentioned in the research. This study is a relatively little effort that aims to address the enormous study gap.

## 1.7 Thesis Organization

The study is composed of six chapters in total. In the first chapter, study background, motivation, objectives, problem statement, research gap are discussed. In the second chapter the literature review was done. In chapter three, the research methodology was discussed deeply. In the fourth chapter, concepts of blockchain, its types, basic technology, applications, etc. are illustrated. In the fifth chapter we discussed the findings and in chapter six, recommendations and concluding remarks are provided to build up a solid foundation to implement blockchain technology in the banking sector of Bangladesh.

# Chapter 2

# Literature Review

## 2.1 Introduction

One of the newest technologies on the market, blockchain is mostly recognized as the engine that powers Bitcoin. Businesses, start-ups, and the media are all paying close attention to this technology. Multiple sectors could be transformed by blockchain, and procedures could become more democratic, secure, transparent, and effective. Block chain has gained popularity and is the most practical technology to be used in safety-related industries, such as banking. To integrate blockchain technology into banking, a significant amount of study has been conducted. Researchers have outlined prerequisites for using blockchain technology in particular scenarios. Blockchain technology has enriched the banking sector by developing systems for processing and securing transactions as well as tracking the movement of money.

## 2.2 Literature Review

Leon Zhao, Shaokun Fan, and Jiaqi Yan (2016) provided a rundown on the research and development of blockchain technology. The study showed that the widespread use of Bitcoin in the financial and business sector opens new avenues for business innovation and research.

Peters G.W. & Panayi E. at el. (2016) also confirmed the excellent relationship between blockchain and the banking sector in one of their articles. They provided a thorough breakdown of the different applications for this technology in the banking industry, as well as later, potential obstacles to deployment.

Melanie Swan (2015) explains that the blockchain is a decentralized public ledger that can be used for the registration, inventory, and the transfer of all assets in finances, property as well as in intangible assets such as votes, software, health data, and idea. He dealt with the theoretical, philosophical, and social implications of cryptocurrencies and blockchain technology.

Yli-Huumo J, Ko D, Choi S, Park S, Smolander K (2016) retrieved 41 primary publications from academic sources, evaluated the potential of blockchain technology, assessed technical issues, and found gaps in present research. Statistics show that 80% of research focuses exclusively on Bitcoin as compared to other blockchain technologies. The majority of scalability-related research lacked a blockchain technology focus.

Satoshi Nakamoto (2008), in the white paper, proposed a peer-to-peer version of electronic cash that allows online payments to be sent directly from one party to another without going through financial institutions or third parties. It has emerged as the basis for the most popular blockchain application called bitcoin.

Svein Ølnes (2015) investigated the potential of using blockchain technology to enable governments to use secure, open, decentralized and low-cost database technology. It is emphasized that Bitcoin could be a promising technology for verifying many types of archived documents in the public sector.

Ye Guo and Chen Liang (2016) present their thoughts by examining China's banking sector in this article Ye Guo and Chen Liang, they said the blockchain has the potential to revolutionize the technology underlying bank payments, and credit information systems, thereby upgrading and transforming them. Blockchain applications will also facilitate the formation of a multi-centric and weak middle scenario that will increase the efficiency of the banking industry. It is worth noting that issues of regulation, efficiency and safety in the process of new financial innovation have always provoked extensive debate. However, history is not deterred by current roadblocks, as the technical, regulatory, and other issues of blockchain technology will eventually be resolved. Therefore, the expectation of integrating blockchain technology into the banking industry will most likely come true in the near future.

Again, Hossein Hassani, Xu Huang & Emmanuel Silva at el. (2018), They said that blockchain might significantly affect banking in the field of "big data," and that our lack of knowledge was a significant barrier. Additionally, they suggested thorough study and advancement of blockchain technology in the banking industry.

A study by Stefan K. Johansen (2017) found that blockchain technology has certain characteristics that are well-applied in the financial industry, but the appropriate use of blockchain on a large scale in the modern economy remains elusive. When we examine the key ideas, we discover that innovation, decentralization, and digital innovation are those that appear in the literature the most frequently. Research has also shown that technology advancement and disruption are driven by technical qualities. Scalability is one of the primary issues with blockchain technology. Researchers who contend that a high number of flawless nodes are necessary to guarantee the theoretically possible security of a blockchain also support this. Davidson also makes the case that institutional innovation will take on new shapes thanks to blockchain technology.

Additionally, in 2017, researchers Luisanna Cocco, Andrea Pinna, and Michele Marchesi illustrated the difficulties and opportunities presented by blockchain technology for the banking industry. In their article, they stressed that there are some significant limitations to the Bitcoin technology alone that can be remedied by the widespread adoption of blockchain technology. They contend that maintaining three characteristics will actually increase the efficiency of the banking industry. Economy, operational effectiveness, and efficient service are these.

Another researcher, I. Eyal at el. (2017), said in one of his articles that he was quite optimistic about blockchain protocols for cryptocurrencies and distributed ledger technology (DLT). He also demonstrated how the distance between blockchain research outside of Bitcoin and its use in his industry, banking, has been closing.

Also in 2017, Q.K. Nguyen(2017) emphasized the fact that there are regulatory differences between individuals and banking agencies. He said that the regulators tightened the regulations for banking transactions following the financial crisis. The general public preferred more latitude in all financial laws, nevertheless. They desired to actively participate in the formulation of policies. Following that, Q.K. Nguyen discussed the potential of blockchain in the banking industry and how it may upend the industry and satisfy all expectations. Through its use in the banking industry, blockchain has the potential to improve the efficiency of supply chains as well.

## 2.3 Research Summary

Blockchain is a relatively new technology that has the potential to significantly impact all business sectors. Blockchain has the potential to benefit the financial industry. It is evident from reading the aforementioned research papers that blockchain technology has the potential to significantly improve the banking industry. These articles highlight a number of advantages of blockchain technology in banking.

These articles showed many positive aspects of using blockchain in banking. Those are-

-> By providing an additional degree of protection, blockchain can benefit the banking industry.

-> Blockchain technology makes banking quite easy, saving time and money.

-> Blockchain makes banking sector maintenance effective and easy.

-> Blockchain can make the entire sector very efficient.

-> Blockchain can stop all widespread abuses in the banking sector.

## 2.4 Research Gap

The aforementioned literature review discusses peer-to-peer electronic money, the influence of cryptocurrencies and blockchain technology, prospective government applications for blockchain technology, and research and development related to blockchain technology. None of the aforementioned studies specifically addressed how blockchain technology is being employed in Bangladesh's banking industry, its advantages, and its difficulties. Not only that, but the services that can be fit under the implementation of blockchain technique and the current adoption level are not discussed in the studies. Which ended up creating a research gap to be studied. This study is a small initiative targeting the vast study gap.

# Chapter 3

# Research Methodology

## 3.1 Methodology

Research methodology is the process of conducting research according to scientific methods and styles with the aim of finding solutions to research questions (Kothari 2004). In methodology, research methods and approaches, sampling and data collection methods, data analysis and presentation were explained as follows.

## 3.2 Research Method and Approach

We review the authoritative literature on blockchain technology that is currently available for the theoretical portion of the research. The literature review comprised articles presenting theoretical and practical principles of blockchain technology that were either acquired from internet resources or articles that had been obtained from journals, seminar papers, newspapers, etc. To study blockchain and other research-related concepts, numerous books that are frequently utilized for academic and research purposes are also consulted. In addition to literature review, it was decided that a quantitative study survey would be more effective in achieving the study's goals and pinpointing the key justifications for the research topic.

## 3.3 Data collection Method

The data for this study was gathered as primary data from published books, articles, journals, and newspapers and was then qualitatively assessed. And for secondary data, a quantitative survey approach was taken to achieve statistical data that was used to measure variables. Quantitative research survey is a methodology that helps us draw general conclusions from research and predict outcomes. There were about eight questions about the satisfactory level of the banking system of Bangladesh and should the banking sector implement the blockchain technique and about the improvement in the banking sector after using blockchain technology. A quantitative survey of open-ended questionnaires was appropriate for this study because I want to analyze the experience and perception over blockchain technology in the banking industry of Bangladesh. The question was asked in such a way that it could be easier for the participants to understand.

## 3.4 Data Analysis and Presentation

Both primary and secondary data were used in this study to validate the research questions, with the primary data sources being published books, papers, journals, and the press releases of these banks about the deployment of blockchain technology. The secondary data were extracted from a survey to gather research information.

We collected a total of 129 responses. To value the responses Likert scale approach has been chosen for this data analysis. For example, there was a question like "Do you think blockchain technology should be introduced in the current banking sector of Bangladesh?" and they were told to select one of the following options: a) Strongly Disagree b) Disagree c) Neutral d) Agree e) Strongly Agree. Then use the Likert scale in which respondents specify their level of agreement to a statement typically in five points:

Strongly disagree valued as 1,

Disagree=2;

Neutral=3;

Agree=4;

Strongly agree=5.

Survey with open-ended questions was used to evoke responses from participants, exploring the satisfactory level of existing banking services and about future implementation of blockchain in the banking sector of Bangladesh. The success factors the participants believe are most highly valued at ensuring blockchain technique implementation in baking services success are documented.

Table 1: Frequency table for satisfactory level with the current banking system

| Valid | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-----------|---------|---------------|--------------------|
| 1 | 23 | 17.8 | 17.8 | 17.8 |
| 2 | 64 | 49.6 | 49.6 | 67.4 |
| 3 | 7 | 5.4 | 5.4 | 72.8 |
| 4 | 19 | 14.7 | 14.7 | 87.5 |
| 5 | 16 | 12.4 | 12.4 | 100 |
| Total | 129 | 100 | 100 | |

Table 2: Frequency table for blockchain technique should be introduced in current banking sector

| Valid | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-----------|---------|---------------|--------------------|
| 1 | 7 | 5.4 | 5.4 | 5.4 |
| 2 | 11 | 8.5 | 8.5 | 13.9 |
| 3 | 4 | 3.2 | 3.2 | 17.1 |
| 4 | 39 | 30.2 | 30.2 | 47.3 |
| 5 | 68 | 52.7 | 52.7 | 100 |
| Total | 129 | 100 | 100 | |

Table 3: Frequency table for blockchain technique bring more reliability

| Valid | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-----------|---------|---------------|--------------------|
| 1 | 2 | 1.6 | 1.6 | 1.6 |
| 2 | 9 | 7 | 7 | 8.6 |
| 3 | 12 | 9.3 | 9.3 | 17.9 |
| 4 | 35 | 27.1 | 27.1 | 45 |
| 5 | 71 | 55 | 55 | 100 |
| Total | 129 | 100 | 100 | |

Table 4: Frequency table for satisfied with current banking services that are using blockchain technique

| Valid | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| 1 | 2 | 1.6 | 1.6 | 1.6 |
| 2 | 10 | 7.8 | 7.8 | 9.4 |
| 3 | 5 | 3.8 | 3.8 | 13.2 |
| 4 | 32 | 24.8 | 24.8 | 38 |
| 5 | 80 | 62 | 62 | 100 |
| Total | 129 | 100 | 100 | |

## 3.5 Summary:

In the above tables, we show the frequency that we found from the data analysis by using SPSS. From the " satisfactory level with the current banking system" table we found the highest frequency for disagreement was 49.6% and 17.8% strongly disagreed. Then from the next table about 83% participants agreed that blockchain should be introduced with the current banking system. Not only that, 77.1% responded that blockchain will bring more reliability in the banking sector of Bangladesh. Finally, we asked if they were satisfied with the services that have been given through the blockchain networks or techniques, about 87% of the respondents were positive and agreed upon their positive satisfactory level.

### 3.6 Limitation of the study

Despite the study's importance, there are several limitations, which are listed below:
First of all, the report does not take into account a comparison of the actions performed in other emerging nations to integrate blockchain technology into their financial trading systems.

Second, because Blockchain is a relatively new technology, its theoretical underpinnings are still developing and taking shape. Often, this technology is still being used experimentally in relation to financial transactions.

Thirdly, among private sector tech adopters working in Bangladesh's financial system, knowledge and comprehension of blockchain technology have not advanced significantly. Misperceptions can impede research participants' ability to think clearly and accurately about the value of the state of adoption of blockchain technology.

# Chapter 4

# Concepts of Blockchain Technology Framework

### 4.1 Blockchain Definition

Blockchain was originally developed as a peer-to-peer technology for recording business transactions. The term "blockchain" itself defines its method of operation. A block including all relevant transaction information is generated whenever a transaction or event takes place on the digital platform utilizing this technology. This block is validated in all nodes of the computer system connected to the transaction system. Using an immutable cryptographic signature hash produced from data saved in the preceding block, each subsequent transaction also generates blocks that are consecutively appended to the previous block. Each block in the blockchain consists of several transactions. Blockchain uses the mechanism of Distributed Ledger Technology (DLT) where the database is decentralized and managed by multiple participants. This means that we can immediately see that a block has been manipulated or tempered with. To break a blockchain system, a hacker would have to change every block in every distributed version of the chain. Blockchains are growing continuously as more blocks are added to the chain and the security of the ledger is also improving.

A blockchain is just another type of database for recording transactions-one that is copied to all the computers in a participating network. A blockchain is thus referred to as 'a distributed ledger' (Deloitte 2015).

Blockchain is a technology that allows data to be stored and exchanged on a peer-to-peer (P2P) basis. Structurally, blockchain data can be consulted, shared, and secured thanks to consensus-based algorithms. It is used in a decentralized manner and removes the need for intermediaries, or "trusted third parties" (PwC 2017).

In fact, each block of a blockchain that develops gradually with time due to transaction among participating parties of the network, consists of two basic elements: header. it contains the unique reference number, timestamp of block generation and connection to previous block, and contents.

It contains information about sender, receiver and transacted amount or exchanged information for future records (Deloitte 2015).

The whole technology works on two premium digital ideas: asymmetrical cryptography. In this encryption technology data are encrypted and decrypted with two separate keys known as public key and private key, and distributed computer network. It is a decentralized IT network, where

the actors are interconnected with computers and permissioned to access, transfer and monitor data independently without any interruption of third parties (PwC 2015).
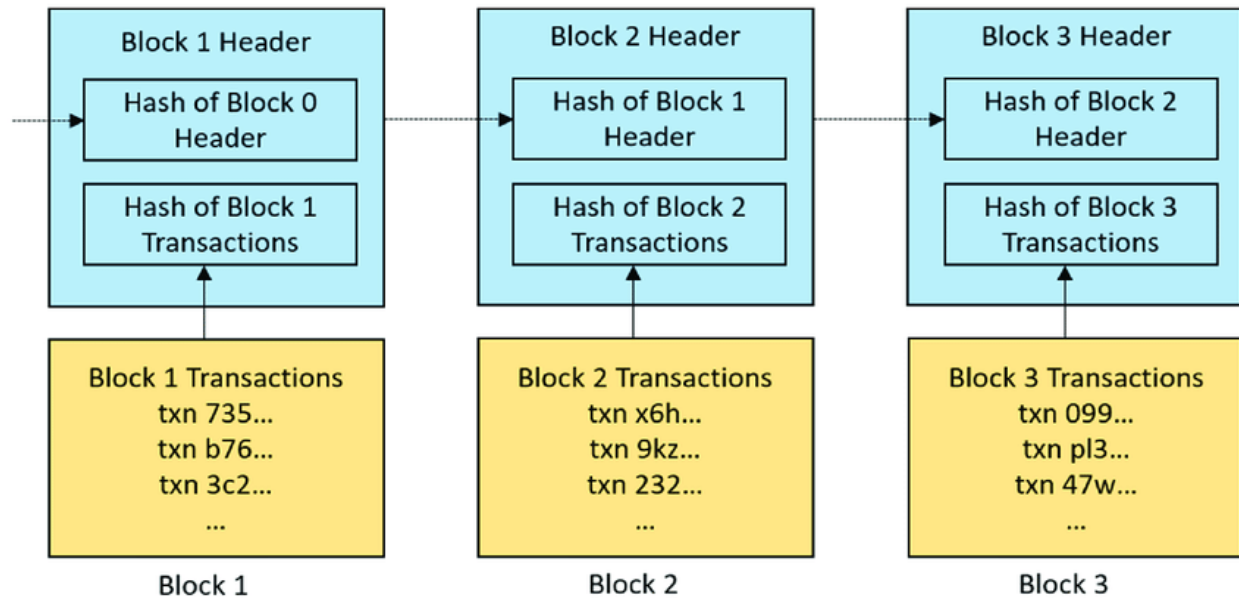


Figure 1. How blocks are chained to form a blockchain
(Cornelius C. Agbo, Qusay H. Mahmoud and J. Mikael Eklun,2019)

## 4.2 Types of Blockchain

Blockchain is primarily used to transact or exchange digital assets over a decentralized and secure network. However, each blockchain operates differently and has a different purpose. The intended audience, the network type utilized for development, the kind of transactional access to the network, and the level of security all affect how a blockchain is configured. Blockchain can be divided into four categories based on these characteristics of its design and development:

**1. Public blockchain:**

A public blockchain is a Genesis blockchain that anyone with network access can access whenever they want. The public blockchain network is decentralized and not under the authority of a recognized organization. This kind of blockchain is typically accessible and usable without previous authorization. Users of blockchain technology who have nodes on public blockchains can access records of recent and previous transactions, authenticate new transactions, offer proof of work, and add transaction history as miners to the overall public ledger. A block is created on each transaction or exchange and added to the previous block after verification. Examples of public blockchains are Bitcoin, Ethereum, Litecoin, etc.

**2. Private blockchain:**

A private blockchain is a permissioned blockchain. With a permissioned blockchain, each participant has a unique identity, which enables the use of policies to constrain network participation and access to transaction details (Manav Gupta,2017). The task of controlling participant access to the network and upholding the network's high level of security is delegated to one or more central authorities. The use of blockchains to eliminate the role of middlemen in transactions or data exchanges is limited by the fact that they are operated and managed by third parties, even though private blockchain transactions are exceedingly safe. The fact that only those individuals who are directly involved in a transaction can see the transaction data distinguishes private blockchains from public ones. Thus, with blockchains with permissions, no data modification is possible. Banks and other financial service companies frequently deploy private blockchains within their own networks and branches to deliver financial services. Examples of private blockchains include Hyperledger Fabric, Multichain etc.

**3. Consortium blockchain:**

The shared platform and shared resources concept underlie the development and operation of the consortium blockchain. Consortia blockchains are run by multiple parties, unlike public or private blockchains. Companies with related business operations agree on blockchain platforms and pool their knowledge, funds, and other resources to create a consortium blockchain. The

primary benefit of consortium blockchain is that businesses profit from economies of scale. (Manav Gupta 2017). Examples are R3, Corda etc.

**4. Hybrid blockchain:**

Public and private blockchain functionalities are combined in hybrid blockchains. All users have access to a public blockchain, but it takes a lot of time to update the ledger since a lot of data needs to be calculated for each node. The accessibility of its borderless network also raises security concerns. The private blockchain, however, is only accessible by approved individuals. Private blockchains are fast and secure since there are few users, but a central authority controls these blockchains and can add or change data. The hybrid blockchain is now available here to slove the problem. Hybrid blockchains combine the beneficial aspects of both public and private blockchains, are open for use by anyone, but can only be updated or added to with the help of a centralized management mechanism.

| Blockchain types | | | Read | Write | Commit | Example |
|---|---|---|---|---|---|---|
| Open | | Public permissionless | Open to anyone | Anyone | Anyone* | Bitcoin, Ethereum |
| | | Public permissioned | Open to anyone | Authorised participants | All or subset of authorised participants | Sovrin |
| Closed | | Consortium | Restricted to an authorised set of participants | Authorised participants | All or subset of authorised participants | Multiple banks operating a shared ledger |
| | | Private permissioned ('enterprise') | Fully private or restricted to a limited set of authorised nodes | Network operator only | Network operator only | Internal bank ledger shared between parent company and subsidiaries |

*Requires significant investment either in mining hardware (proof-of-work model) or cryptocurrency itself (proof-of-stake model).*

Figure 2: Main types of blockchains segmented by permission mode

(Dr Garrick Hileman, Michel Rauchs,2017)

## 4.3 Key Features of Blockchain Technology

Since the beginning of its practical use, blockchain technology has mostly been employed as a substitute medium of exchange in P2P protocols and has been used for security, transparency, verification, non-duplication, and other purposes. For a variety of purposes, this technology is currently being quickly adopted by various institutions. The following is a list of the key characteristics of blockchain technology:

1. Distributed and Decentralized: The foundation of blockchain technology is the idea of peer-to-peer (P2P) networks, in which certain nodes are linked together without the need for a central authority. Data is shared among blockchain users and transactions make use of the computing capacity of all participating nodes. As a result, there are less chances of single points of failure and transaction delays, and the system's ability to process more data is more robust and scalable.

2. Transparent: End-to-end cryptographic techniques are used in blockchain technology to prepare blocks. Since everyone is aware of the open and transparent data processing procedures, mutual trust is useless. Participants must authenticate transactions and verify newly updated data on the ledger. This eliminates the chance of fraudulent transactions.

3. Trustless and Consensus-based: The blockchain network's reliance on consensus processes is essential. This is the procedure for confirming and authenticating network transactions with everyone's permission. The parties to the transaction agree on the consensus mechanism's rules

in advance, and they can be changed as necessary to suit the demands of the transaction. This lessens the need to rely on other parties to confirm the legitimacy of transactions.

4. Immutability and Cryptographically sealed: Blockchain technology's immutability, which shows the technology's capacity to preserve transactional data, is one of its distinguishing characteristics. The hash technique used to create the blocks allows for this to be accomplished simply. A new block, which is coupled with the preceding one after being confirmed and agreed by the parties by consensus, contains both the current hash information and the hash of the previous block. This feature makes it nearly impossible for a hacker to alter a block's contents because doing so would necessitate knowing the hash values of all preceding blocks.

5. Chronological and time-stamped: A blockchain is made up of a number of blocks that are produced each time a transaction takes place. A new block is chronologically added to earlier blocks to build a chain and contains transactional data, including the time the transaction took place. This guarantees that each transaction's integrity is verified and lowers the long-term expenses of keeping records.

6. Irreversible and auditable: Every transaction that takes place on a blockchain is supported by proof. Each transaction is carried out with the parties' mutual consent and is consequently final and irreversible. Additionally, all network participants or a select group of users who can confirm the legitimacy of the transaction will have access to transaction details. This feature lowers the possibility of transactional double spending.

7. Digital and Real-time: No human documentation is needed to keep track of transactions because they are carried out digitally and recorded on a permanent digital ledger within the blockchain. Additionally, transactions are handled in almost real-time, which eliminates the possibility of non-payment.

8. Better security: Blockchain technology uses a public key infrastructure that makes it nearly hard for hackers to compromise the data since it requires the data stored on each node of the network to be modified simultaneously. Blockchain-based financial transactions are more secure

than other existing financial transaction techniques because of the mutually agreed consensus mechanism.

9. No or fewer intermediaries: The Distributed Ledger Technology (DLT) platform, on which the blockchain runs, establishes user trust through a mutual consensus method. As a result, there is no longer a need for an intermediary or trusted third party to confirm or authenticate blockchain transactions. Not only that, the role of intermediaries in the blockchain expands to a new dimension as a 'Blockchain as a Service' provider, who develops the distributed ledger technology structure for the blockchain adopting organizations (Chiu & Shang 2019).

10. Censorship proof: Independent user groups known as miners verify the legitimacy of rewarded transactions on public blockchains. Blockchains can evolve autonomously and without ownership because of this. The fact that there are independent miners effectively discredits the one entity in charge of censorship and trade restrictions.

11. Versatility: Blockchain technology has a wide range of applications and can be modified to meet specific needs. Blockchain technology is more valuable and reliable than current technology, as demonstrated by the banking, healthcare management, food industry, logistics, supply chain management, government documents, contract management, transportation, insurance, education, and capital markets, among other industries.

## 4.4 Applications of Blockchain Technology

Blockchain Technology has become a regular buzzword in different industries. Initially, it was solely applicable to intra-party bitcoin exchanges without the involvement of a third party. But as a result of user requests, this technology was gradually developed and is today utilized throughout numerous industries. The following is a description of the key uses for blockchain technology.

Health sector: Blockchain applications in healthcare includes healthcare database management, pharmaceutical traceability, genetic code storage, information sharing and query processing, fee and service fee payment, and precision medicine dissemination etc.

Agriculture sector: The uses of blockchain technology in the agriculture sector are diversifying. The applications are extended to agriculture subsidy management, agriculture insurance management, modernizing farm management, fertilizer distribution, green bonds, agriculture goods supply, land record management, fair pricing, weather and disaster issues, protecting illegal fishing and deforestation, transparency and traceability in production, etc. (Sylvester 2019).

Finance sector: The application of blockchain technology in the financial services is growing day by day. Transaction processing, credit management, cross-border trading, insurance, swamps, bonds, interbank processing, wealth management, central bank custody, and capital markets trading are the main applications in the financial sector.

Energy sector: Blockchain technology is being used in the energy sector for resource management, storage management, distribution management, energy trading, exploration, and transportation. It is also being used to upgrade energy grids and manage renewable energy sources as well as address environmental concerns such as carbon emissions and the green environment.

Supply chain management: Blockchain technology improves workflows, controls suppliers and consumers, and speeds up and lowers the cost of supply chain management. It also delivers more transparency, speed, visibility, reliability, traceability, sustainability, and responsibility. During the supply chain management stage, it can be used for planning, configuration, procurement, production, processing, distribution, warehousing, transportation, and end-to-end customer service. Global supply chains for industry, medicines, food processing, and agriculture all employ this technology.

Environment sector: Blockchain applications for environmental management can be used to address sustainable environmental issues. Examples of circular economy incentives include

plastic banks, sustainable resource management, sustainable financing, the management of carbon credits and carbon audits, the reduction of carbon emissions, and the management of water and land resources, among others.

Commerce and trade: More trust, security, speed, and fraud prevention are all provided by blockchain technology in transactions and business. It can resolve problems with KYC (know your customer), tracking and traceability, double payments, fraud prevention, customs, commercial legislation, and other things.

Other sectors: Blockchain technology is being used by industries like the social sector, legal and regulatory sector, music industry, and sports industry to solve numerous issues. Blockchain is being used by the media to unlock music and safeguard copyrights. Some sports-related blockchain applications include smart tickets, drug testing, athlete tokenization, and live game streaming. The modern urbanization concept of smart cities allows for effective resource planning and management as well as security assurance.

# Chapter 5

# Findings And Discussions

## 5.1 Introduction

Blockchain technology has been adopted by major commercial banks operating in the local or global financial services sector. The scale and scope of blockchain-based services is driven by the creation of a large pool of consortiums with organizations and to create a digital platform within banks to adopt blockchain technology. At this time, the main blockchain-based services provided by commercial banks in collaboration with counterpart banks around the world include smart contracts, trade finance, interbank payment settlements, cross-border fund transfers, loan syndication, security enhancement, and counterfeit transaction detection. Some of the forerunners in the global banking industry to adopt blockchain technology for providing various

financial services to their clients include JPMorgan, Citigroup, Mitsubishi UFG Financial Group, Standard Chartered Bank, BNP Paribas, and Deutsche Bank. They also involve multiple stakeholders in technological collaboration with blockchain technical support providers Ripple, R3 Corda, etc. to develop the online blockchain cloud computing network (Khakon 2021). In this chapter we will be discussing the banking services that can be developed using blockchain technology in Bangladesh, secondly which banks in Bangladesh with what blockchain banking services are being provided to the customers and the effects after the adoption and challenges for broader adoption in Bangladesh.

## 5.2 Blockchain Applications in Banking Industry

After the advent of blockchain technology, the global banking sector has witnessed a transformation in the conduct of various banking operations. Though the public blockchain challenged the bank's role as a fiduciary organization but replaced it with a process-trust based transaction system. However, cryptocurrency exchanges without a full regulatory framework raise legitimacy issues. Later the inception of private or consortium blockchain brings back the role of 'facilitator' of the banks due to the reliance on the banks for monitoring the validity of the digital asset transfer using blockchain. As a reliable technology regarding security, immutability, transparency, authenticity, speed, record management, a rising trend is observed in applying blockchain technology to execute different banking functions (Khokan 2021). Some notable functions of this technology in the banking sector which can be implemented in Bangladesh are mentioned below:

**Crypto banking:** Crypto banking is a new banking system that owns and stores cryptocurrencies and uses them to process fiat and other payments. A person can use the crypto banking platform to lend, borrow, store, mine, and pay with cryptocurrencies to meet their regular financial needs.

Cryptocurrencies work on the principle of supply and demand differently from the traditional money that transacts on market and central bank regulations. Coinbase, Trust Wallet, CEX.IO, Coin loan are some popular crypto banking platforms, where people can also exchange cryptocurrencies like Ethereum, bitcoin, Litecoin, etc. from their crypto wallet with US dollar and other fiat currencies (Chatterjee 2020). Crypto banking has taken a huge market share in the banking industry all over the world.

**Smart contracts:** Simply put, smart contracts are blockchain-based algorithms that execute when certain criteria are met. When the terms and conditions of a contract are met, they are often used to automate the execution of an agreement so that all parties can be immediately certain of the conclusion without any intermediary's involvement or time lost, such as the lessor and lessee in a house rent contract. Smart contracts improve contract processing by bringing dependability, security, correctness, speed, and simplicity while lowering legal costs, avoiding conflicts, and controlling contract fraud. Smart contract innovators include JPMorgan Chase, IBM Blockchain, Polybius, and Hyperledger.

**Interbank/cross-border transactions:** Cross-border or interbank currency transactions are now secure, dependable, quick, and precise by utilizing blockchain technology. Banks won't need to transmit any transactions because of blockchain's automation of the interbank payment system. Due to the fact that the transaction process is given trust, this occurs. With far cheaper rates than conventional banking channels, cross-border blockchain payment systems handle transactions in hours rather than days. Interbank payments are made via the blockchain money transfer system by Ripple, R3 Corda, Santander, and others.

**Trade finance:** Blockchain can eliminate the need for substantial amounts of paper documents by automating systems, simplify the current complexities of managing many trade finance actors, and enable trade finance by delivering services in near real-time. Blockchain can address the problems of double billing, intermediaries, anti-money laundering, impersonation, and untrusted

information in existing trade finance processes. Blockchain-based trade finance decentralizing processes, authenticating ownership, reducing transaction costs, and creating a reliable audit trail. R3 Corda is a well-known blockchain platform in trade finance.

**Loan syndication:** With improved security and real-time data access, consortium blockchain technology will allow lenders to manage syndicated loans effectively. A decentralized method is used to connect lenders to the blockchain network utilizing nodes. The credit approval procedure, as well as the subsequent credit management and monitoring operations, are all communicated to and tracked by lenders at the same time.

**Letter of Credit:** A letter of credit, also known as a credit letter, is an assurance from a bank that a buyer will make the right payment to a seller on time and in full. The bank will be obligated to pay the full or remaining balance of the transaction if the buyer is unable to make a payment on it. It might be provided as a service. Utilizing blockchain technology can improve security by lowering errors in the manual processing of import/export papers, make working capital for businesses more predictable, and increase convenience for all parties through mobile contact.

**Remittance:** Remittance plays a huge role in any economy of a county. Blockchain has a promising future in the remittance sector as it uses a cryptographic distributed ledger to enable reliable real-time transaction verification without the use of intermediaries such as correspondent banks. This means that both senders and receivers have full transparency with minimal fees. In this case, it can take just minutes or even seconds for a remittance transaction to reach its destination.

**Customer database:** Blockchain could create a secure, real database in the form of a digital ledger of customer spending trends, funding sources, assets, business interests, reputation, and more. Meet his requirements of Know-Your-Customer (KYC) perspective to design a customer-centric business model and recognize the risky loans.

**Time Banking:** Time banking is a system of bartering diverse services for one another using labor-time as a unit of account which was developed by various socialist thinkers based on the labor theory of value. Labor-time units can be credited to a person's account in the time bank and redeemed for services from other members of the time bank. Time banking can be considered a form of community currency. Blockchain is utilized to measure the time-value of the citizens in the societal functions through Blockchain-enabled Decentralized Time-banking System.

**Central bank digital currency:** Cryptocurrencies can be used as Central Bank Digital Currencies (CBDC) in retail and wholesale money markets as an alternative to traditional paper money for trading and deposits. A CBDC can exchange in a peer-to-peer fashion without the presence of an intermediary. Many countries like Sweden, Cambodia, Bahamas, etc. central banks have started to use CBDCs in parallel to traditional cash (Lannquist, A. 2019).

**Venture capital:** Entrepreneurs are being encouraged to raise money for venture capital using an Initial Coin Offering (ICO) built on the blockchain. In the ICO, tokens or cryptocurrency coins will be traded to finance capital investments. Investors are liberated from the laborious process of conventional venture capital creation processes by the ability to trade Tokens or Coins directly with the general public in order to raise funds.

The discussion above provides compelling evidence that blockchain technology may radically improve and diversify the banking industry of Bangladesh, enhancing efficiency in terms of speed, security, cost, etc. Blockchain offers more secure networks and can lessen the need for middlemen like brokerage firms when using cryptocurrencies to trade on the stock market. Additionally, blockchain technology can enhance the governance of the banking sector in terms

of accountability, transparency, visibility, and compliance. On the blockchain network, bank headquarters can keep tabs on branch operations. Improved interoperability allows for more accurate intra-bank transactions to be completed in shorter amounts of time.

## 5.3 Blockchain-enabled Banking Services in Bangladesh

In gathering data for this study, we discovered that four commercial banks in the private sector in Bangladesh welcomed the introduction of blockchain financial services. These institutions include Bangladesh Bank Asia Limited, Prime Bank Limited, Standard Chartered Bank, and Hongkong and Shanghai Banking Corporation (HSBC). Only two banking services are offered by the banks mentioned above using blockchain technology, according to the data we gathered for the study. Remittance and Letter of Credit are the available services (LC). A brief description of the block-chain services of these banks is given in the following paragraphs:

### 5.3.1 Blockchain enabled Letter of Credit (LC) in Bangladesh:

From the four banks, three of the banks use blockchain technology in LC trade finance. The Standard Chartered Bangladesh, the HSBC Bangladesh and the Prime Bank Limited have designed their blockchain-oriented digital LC trade finance network with the technical support from Contour, a front running blockchain technology innovator and service provider of the world. Contour was established in 2017 as Voltron and renamed in 2020 as Contour with an objective of digitizing the global trade finance using the blockchain technology (Khakon 2021). The Contour has created a decentralized blockchain ecosystem for trade finance that explores the

potential of the consortium blockchain. It will build a globally diverse network of networks connecting prominent banks, entrepreneurs and IT giants, transforming the dominant trade finance service from the podium of blockchain and providing  real-time, transparent, Ensure reliability. Standard Chartered Bank and HSBC are prominent members of the Contour blockchain network. These banks launched LC digital transactions from this platform and tested in Bangladesh as part of its global operation to digitize LC transactions.

Local commercial banks like Prime Bank Limited have joined with the HSCB blockchain platform with its technological support to execute interbank blockchain LC (Prime Bank 2020). To build the digital blockchain LC network, Contour depends on the R3's Corda Enterprise, which addresses the transaction security, speed and other traditional hassles of LC issuance. The whole network has been developed by CryptoBL, a Hong Kong based blockchain or distributed ledger technology (DLT) software development, deployment and operational service providing company. It should be noted here that HSBC backed blockchain trade finance platform of Contour has gone live since October 2020 after successful beta testing in different regions of the world (Frost 2020,Khakon 2021).

## 5.3.2 Blockchain enabled Remittance Service in Bangladesh:

Through the study we found that two banks in Bangladesh is using Blockchiain in remittance transactions. Those are Standard Chartered Bank Bangladesh and Bank Asia Limited." Bank Asia Ltd., a local commercial bank of Bangladesh has introduced blockchain remittance transfer process in partnership with RAKBank of the UAE" (International Finance 2020). RAKBank transferred blockchain technology from its proprietary remittance platform designed by Ripple. RAKBank has implemented the same blockchain technology in other countries such as the Philippines, making it easier for wage workers to transfer money back to their home countries. Ripple, which is a longstanding technology partner of Bank Asia, developed the RippleNet for the instant transfer of money to the partner bank as a strategic choice for expanding the RAK Money Transfer system with the latest blockchain technology. Ripple is  a top branded

organization for its cutting-edge distributed ledger technology (DLT) and is committed to offer the best customer experience in the global payment system. On the other hand, the blockchain remittance transfer network is developed by Standard Chartered Bangladesh with technological support from China-based Ant Group (Daily Star 2020).

## 5.4 Effectiveness of Blockchain-enabled Banking Services in Bangladesh

### 5.4.1 Effectiveness of Blockchain-enabled LC

In the traditional LC, Buyer agrees to purchase goods from Seller. This contract may be a purchase order, an accepted pro forma invoice, a formal agreement, or an informal exchange of messages. We agree on what to buy, when and how to ship and insure it, and when and how to pay for it. In this case, the agreement is to use a letter of credit as a means of payment. Then the buyer applies for a letter of credit to the issuing bank. The issuing bank sends the letter of credit to the advising bank. The advising bank verifies the authenticity of the letter of credit and forwards the letter of credit to the seller. After ensuring that the terms of the letter of credit can be met, the seller produces the goods and prepares shipment. The seller prepares the documents that prove that the goods are ready for shipment and presents these documents to the advising bank. The advising bank sends the documents to the issuing bank. The issuing bank checks the documents and if approved, the issuing bank transfers the payment to the seller through the advising bank. The issuing bank hands over the documents to the buyer. The documents allow the buyer to clear the goods from the customs and take possession of the goods. The buyer pays the issuing bank.

Whereas Blockchain LC process, at first buyer opens LC application in the blockchain network. Then the issuing bank is notified and approves or rejects the application. Authorized bank

accesses the LC requirements & approves/rejects the LC. The seller views the LC requirements and completes shipment, adds invoices and other required documents. The validated documents are stored in the blockchain, which are viewed by advising banks. It can approve/reject LC. The issuing bank reviews the documents, requests buyers to check discrepancies. The corrected LC is issued, which is then settled.
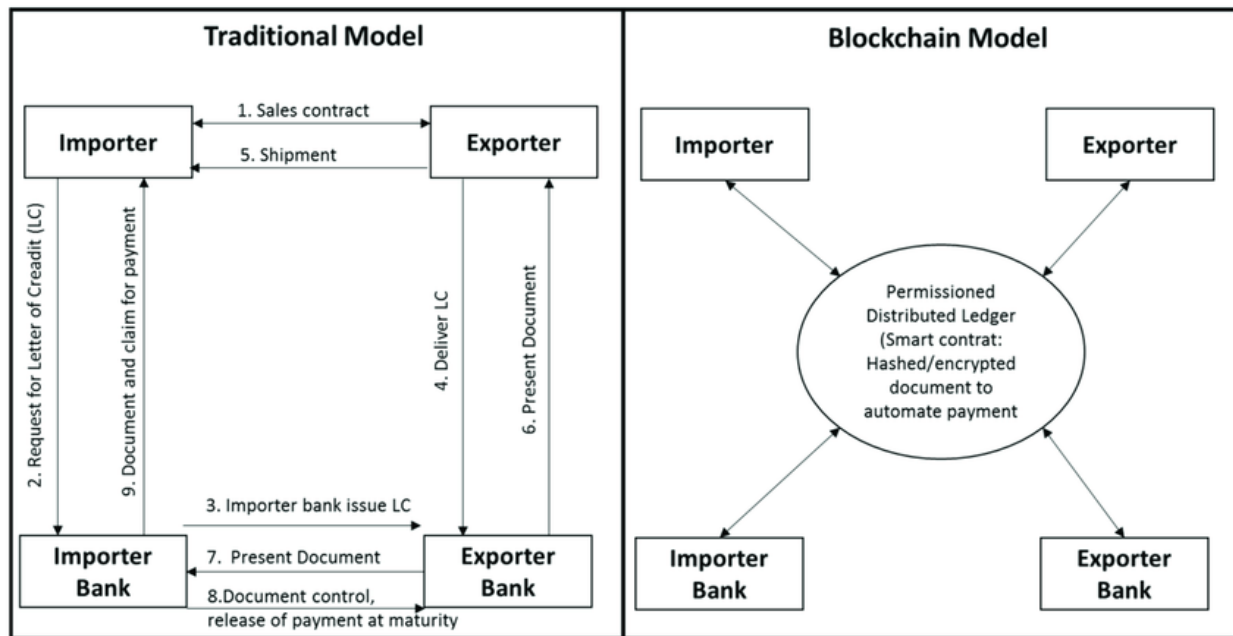


Figure 3. How Traditional and Blockchain letter of credit (LC) works (Rijanto,2021)

Traditional LC processes require a large number of physical documents and messages to be exchanged between parties by mail, fax, or, at best, email. This method of communication slows down business processes, introduces unnecessary manual work, and reduces visibility. If all goes well, it will take 7 to 10 days to exchange the documents. But Blockchain technology facilitates LC procedures by making them faster and simpler. Enabling the LC process with blockchain technology will reduce the document exchange process from 7 to 10 days to just a few hours. The network has established itself as an effective solution to the barriers in international trade and reduces the processing time of LC presentation by up to 90% - from 10 days to 24 hours. Importer, exporter, issuing bank and beneficiary's bank receive real-time tracking of the

transaction, enabling a transparent management of the trade (Prime Bank 2020). Blockchain makes this possible by providing a common distributed ledger system for all parties as the underlying framework for document recordkeeping, review, and verification. The impact of this reduction in time on international trade is enormous, lowering operating costs and lowering prices for consumers. Overall study shows that blockchain has brought a great revolution and effectiveness in the banking sector regarding Letter of Credit (LC).

**5.4.2 Effectiveness of Blockchain-enabled Remittance Transfer**

In traditional Remittance Transfer, the global remittance market is growing steadily, especially with a rapid increase in the number of migrants from developing countries to developed countries. Expatriates use a variety of currency transfer channels including Money Transfer Operators (MTO) like Western Union etc. and link through a bank. Another way of sending remittance is through an agency which is used by many migrants. The migrant sender pays the remittance to the sending agent using cash, check, money order, credit card, debit card, or a debit instruction sent by email, phone, or through the Internet. The remittance institution directs the remittance to an agent in the recipient's country. The paying agent makes the payment to the beneficiary.
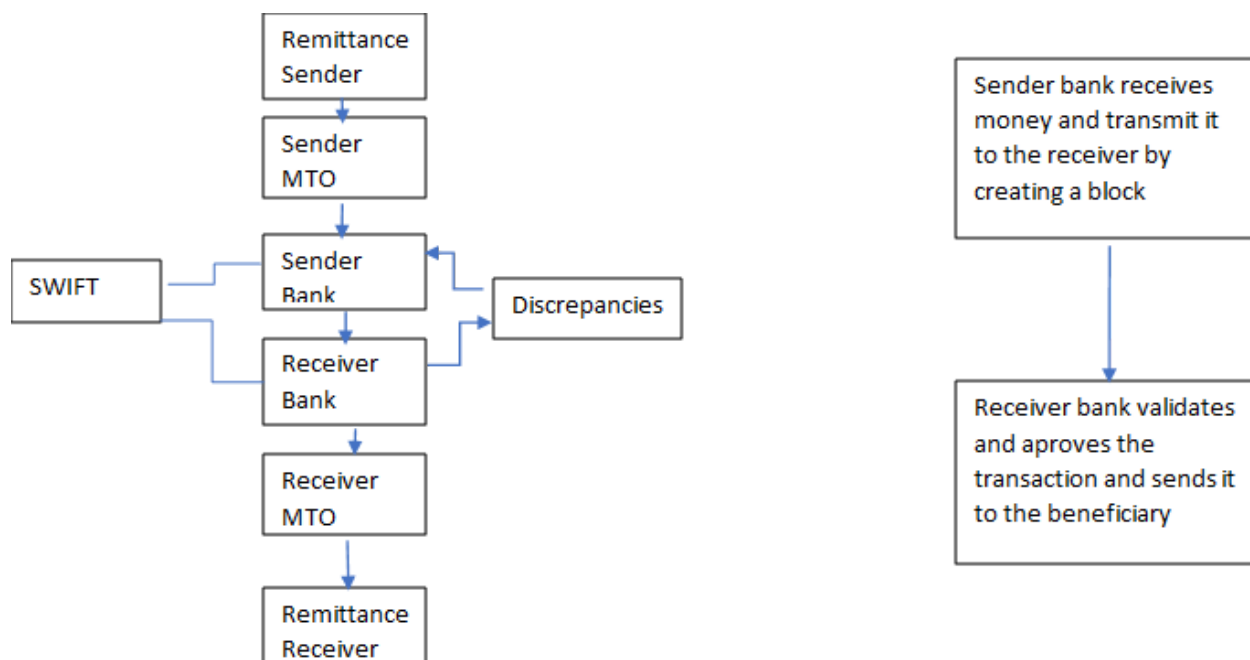


Figure 4. Traditional and Blockchain Remittance Transfer

Whereas, in blockchain remittance transactions First, the money is received or sent from the sender at the sender's bank. The sending bank opens the block for the transfer and the receiving bank is immediately notified on the approved private blockchain. Second, the receiver bank checks the authenticity of the documents simultaneously from its node, and requests the sender bank if correction is necessary. Otherwise, it validates and accepts the transaction. The money is deposited in the sender bank. Third, the remittance amount is then transferred to the beneficiary account instantly or delivered in cash or transferred to the bank account opened at other than the receiver bank through proper channels. Fourth, blocks containing remittance information are permanently added to the blockchain ledger and are almost impossible to change. The blockchain transfer process transfers money in real time without delay. The transaction process is verified and authenticated by each participant involved and attached to a central immutable ledger, making the system highly secure.

The above discussion gives solid evidence that blockchain in remittance transfer has revolutionized and brought a huge effectiveness regarding security, cost, time and transparency. Blockchain removed multiple intermediaries, prevented fake documentation, error-free, real-time, reduced charges, process Simplification.

## 5.5 Challenges of implementing Blockchain in Banking sector of Bangladesh

There are several benefits to a financial sector powered by blockchain. The banking industry as a whole can be transformed by blockchain, making it resilient to any problems the current banking industry encounters. The proper deployment of blockchain in the current banking industry, however, faces some challenges.

**Problems with scalability:** Since blockchain is a distributed system, its integration capabilities directly depend on the integration capabilities of the devices involved. Blockchain can only process 4 to 6 transactions per second on average, compared to 1,700 Visa transactions per

second. This gap poses a major challenge to the global adoption of blockchain technology. In the context of blockchain development, 'sharding' is basically a method of distributing workload and partial memory (shards) in a P2P network, where each node can only process transactions associated with that shard. The goal of this process is to relieve each node from having to fully process the blockchain, significantly improving the transaction rate. The main physical challenges in sharding are related to security and communication. When a blockchain is split into many smaller pieces, each behaves like a network with a single blockchain. Designers are even more confused because this requires a special communication process. It can end up creating security vulnerabilities in the network. So, over all scalability issues of blockchain has become a major issue while implementing.

**Regulatory Framework:** The regulatory framework for public sector blockchain technology has yet to be clarified. Bangladesh Central Bank does not allow cryptocurrency trading due to regulatory issues. However, public-private partnerships are essential to the adoption of blockchain technology in the banking sector.

**Cost and efficiency:** The use of blockchain technology significantly lowers costs. When it comes to legacy planning, there are still some difficulties. Major blockchain infrastructure setup is pricey. Small financial institutions and banks avoid making investments in things with a bleak future. Numerous other reasons, such as scalability, have also been mentioned as contributing to increased repair costs. To enable all businesses to adhere to the process, this must be corrected. If the issues mentioned above are not resolved, blockchain's future has enormous promise but very limited potential.

**Less Collaboration:** Cooperation between banks is essential to the smooth operation of interbank or cross-border payment processing. However, cooperation among Bangladeshi banks to build a concrete and extensive network remains uncertain as many banks are still planning or strategically considering adopting the blockchain technology widely. Without this cooperation, the reach of implementation cannot be expanded.

**Service Diversification:** In Bangladesh's banking industry, the adoption of blockchain technology is still in its infancy, and there are currently not many services available to customers of the banking channel. However, to be sustainable, this technology must be applied in a variety of ways to all financial services offered by banks, as it will otherwise be unable to replace the current technological infrastructure that banks have inherited.

**Mass Acceptance:** People who live in both urban and rural areas make up the majority of bank customers in Bangladesh. For financial services, you must feel comfortable using this technology. However, because it is a relatively new technology, very little of it is understood by the general population. The availability and adoption of this technology must be facilitated by banks.

However, obstacles like a growing network, dwindling collaboration, a lack of a strong legislative framework, and a shortage of competent employees must be solved for blockchain technology to be widely adopted. Despite the difficulties encountered in implementing blockchain technology in Bangladesh's banking industry, the technology has enormous potential to enhance the time, cost, and quality of the banking service systems. All of this motivates Bangladesh's banking industry to adopt and use this cutting-edge technology in step with the rest of the globe.

# Chapter 6

# Recommendation and Conclusion

## 6.1 Introduction

Since its creation, blockchain technology has developed significantly and can now be used in the financial industry. However, there is certainly room for development on a number of issues. But aside from that, blockchain has a great potential to completely alter the way that business is done today. Achieving that will require the proper support of and commitment to blockchain technology. Adoption of blockchain technology in Bangladesh's banking sector is becoming a reality following the conceptualization and planning stages. The study explored the banks of Bangladesh that have implemented blockchain technology to power their banking services with this cutting-edge technology and is preparing to keep the switch on as the world's leading banks have set for upgrading our service technology to blockchain. The empire of the Fourth Industrial Revolution. The study found that the first beta implementation of blockchain technology in trade finance or cross-border interbank payment processing was satisfactory, and that adoption would reduce time and costs, increase security, and minimize ambiguity and most importantly streamline and simplify trade finance processes. Additionally, we discovered that banks are utilizing blockchain for remittance services, which has improved procedure security and dependability. As long as all internal and external stakeholders are included in the blockchain network and the diversification of the blockchain services is accomplished within a sound regulatory framework, the use of this technology will be more successful and fruitful. With concluding remarks, this chapter explains the suggestions for further adoption of this technology in Bangladesh's banking sector.

## 6.2 Recommendation

Blockchain has a big future in the banking sector. If it's developed and used properly, it can bring a huge revolutionizing shift in the existing economic paradigms of the world. Regarding the banking sector of Bangladesh, By doing a thorough market study and persuasively outlining the course of action as the strategic goal to embrace this technology in all banking processes, banks may identify their needs and demand for blockchain technology. Banks may consider increasing budget allocations for the adoption of blockchain technology. By that, new ideas can be implemented by the innovation momentum to upgrade and sustain the deployment system of Blockchain. Banks should choose the type of blockchain technology carefully as it is suitable for the Bank's core business for the long term. For instance, permissioned consortium blockchain can be used for trade financing, allowing for error-free service delivery while also assisting banks in keeping track of participant activity to ensure the transactions' legality. One of the essential components of blockchain for its long-term scalability is diversification. Banks will profit from a comprehensive replacement of their current system, which will lower the cost of maintaining various technologies while increasing the scalability of blockchain technology in the banking industry. The ability of people involved in managing and maintaining this technology to sustain blockchain technology in the banking industry is extremely important. Banks should focus on creating enough qualified staff for smooth and widespread adoption of this technology so that it is more widely accepted by internal and external service customers. Last but not least, a widespread legal and regulatory framework must be applied so that blockchain can have the full potential to be adopted and implemented in the banking sector of Bangladesh.

## 6.3 Conclusion

Blockchain Technology has become a huge sensation in the last few years because of its openness to the public, maintaining high security, eradicating huge costs and amount of time etc. Limited implementation of blockchain technology in Bangladesh's banking sector has shown a huge potential of blockchain technology through its effectiveness in those services. Large scale adoption of blockchain in the banking industry of Bangladesh with proper collaborative regulatory framework and participation of large stakeholders can bring revolutionizing change in the economy of the country.

# Reference

Rijanto, A. (2021). Blockchain technology adoption in supply chain finance. Journal of Theoretical and Applied Electronic Commerce Research, 16(7), 3078-3098.

Ferguson, Niall. 2008. The Ascent of Money: The Financial History of the World. London: Allen Lane, Penguin

Hodgson, Geoffrey. 2015. Conceptualizing Capitalism: Institutions, Evolution, Future. Chicago: University of Chicago Press, 456p, ISBN 9780226168005.

Zhao, J. L., S. Fan, and J. Yan. 2017. "Overview of Business Innovations and Research Opportunities in Blockchain and Introduction to the Special Issue." Finance Innovation 3 (9): 1–28.

Wu, T., and X. Liang. 2017. Exploration and Practice of Inter-bank Application based on Blockchain. 2017 12th International Conference on Computer Science and Education, pp. 219–224.

Nicola Cucari, Valentina Lagasio, Giuseppe Lia & Chiara Torriero (2021): The impact of blockchain in banking processes: the Interbank Spunta case study, Technology Analysis & Strategic Management, DOI: 10.1080/09537325.2021.1891217

Zhao, J. L., Fan, S., & Yan, J. (2016). Overview of business innovations and research opportunities in blockchain and introduction to the special issue. Financial innovation, 2(1), 1-7.

Peters, G. W., & Panayi, E. (2016). Understanding modern banking ledgers through blockchain technologies: Future of transaction processing and smart contracts on the internet of money. In Banking beyond banks and money (pp. 239-278). Springer, Cham.

Swan, M. (2015). Blockchain: Blueprint for a new economy. " O'Reilly Media, Inc.".

Yli-Huumo, J., Ko, D., Choi, S., Park, S., & Smolander, K. (2016). Where is current research on blockchain technology? —a systematic review. PloS one, 11(10), e0163477.

Ølnes, S., & Jansen, A. (2015, August). What is this thing called e-Service? Interoperability challenges in e-Service modelling. In International Conference on Electronic Government (pp. 197-208). Springer, Cham.

Guo, Y., & Liang, C. (2016). Blockchain application and outlook in the banking industry. Financial innovation, 2(1), 1-12.

Hassani, H., Huang, X., & Silva, E. (2018). Banking with blockchain-ed big data. Journal of Management Analytics, 5(4), 256-275.

Johansen, S. K. (2018). A comprehensive literature review on the Blockchain as a technological enabler for innovation. Dept. of Information Systems, Mannheim University, Germany, 1-29.

Cocco, L., Pinna, A., & Marchesi, M. (2017). Banking on blockchain: Costs savings thanks to the blockchain technology. Future internet, 9(3), 25.

Eyal, I. (2017). Blockchain technology: Transforming libertarian cryptocurrency dreams to finance and banking realities. Computer, 50(9), 38-49.

Q. K. Nguyen, "Blockchain - A Financial Technology for Future Sustainable Development," 2016

3rd International Conference on Green Technology and Sustainable Development (GTSD), Kaohsiung, pp. 51-54, DOI: 10.1109/GTSD.2016.22 (2016).

Khokan Kanti Saha (2021). An Analysis of Adoption of Blockchain Technology in the Private Banking Sector of Bangladesh

International Finance 2020, RAKBank, Bank Asia drive cross-border payments using Ripple's blockchain. Retrieved from: RakBank, BankAsia drive cross-border payments using Ripple's blockchain (internationalfinance.com)

HSBC, Bangladesh 2020, HSBC drives Bangladesh's first crossborder blockchain LC transaction. Retrieved from: News and media - About HSBC | HSBC Bangladesh