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Contemporary Studies of Risks in Emerging Technology, Part A

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Foreword – 1



The role of Artificial Intelligence (AI), the Machine Learning (ML), usage of Chatbots and the emergence of Blockchain Technology has had a salutary effect on the technological innovations that have supported the Financial sector. A lot of misgivings and apprehensions have been laid to rest and it has been brilliantly brought about in the edited book.

The Banking, Mutual Funds market and Insurance sectors, part of the service sector, have always had to bear the brunt of numbers – number of bank accounts, number of policies issued, number of investors, and ultimately the number of account / policy holders. Basically, because of the numbers game (and let us remember that we have touched the 8th billion number in population today), the service sector Financial Organisations had to undertake the task of Learning, Unlearning, and Relearning for their employees and staff members so that the technological advancements are easily used by them. This transition from the physical paper and pen to digitisation and then to take it to the next level has been an arduous task which has been very effectively been reflected in some of the chapters of this book.

The Innovations and technology combined have brought disruptions to the fore and these disruptions have been aided by the AI, ML and the likes to ensure that the service sector Financial organisations touch a new height because of simplification of the physical processes and the ease of doing business from anywhere! Before we generalise the disruptions, let us also understand the fact that this is not an Indian phenomenon alone – it is global in nature as discussed in this book.

What appeals most about the entire efforts by the authors and the editor is the fact that the flow of the chapters has been reflective of the gradual development in this sector. A case in point is the development of the MSMEs and the role of digitisation and upgradation of technology that this ‘backbone’ of the Indian economy could harness. The coverage of the Sustainable Development Goal 9 (Goal 9 or SDG 9) is about ‘industry, innovation and infrastructure’ and is one of the 17 Sustainable Developmental Goals adopted by the United Nations General Assembly in 2015. SDG 9 aims to build resilient infrastructure, promote sustainable industrialisation and foster innovation, which has been dealt with here.

The specific case studies whether related to the Punjab, Ukraine, Role of Multimedia Innovative Technology in Green Banking or the e-waste management have been very subjectively dealt with.

And that is the crux of the edited book where new horizons are reached by way of ensuring that the common man’s challenges, difficulties, and problems have been provided with solutions by way of these innovations.

I wish the readers a very happy reading and hope that the areas/people covered herein would benefit out of these ruminations and bring to fore the success stories to be emulated.

Prof Pratik Priyadarshi
Associate Professor
Birla Institute of Management Technology,
Greater Noida.

Foreword – 2



Emerging technologies promise new solutions, increased innovation, and new avenues for connecting with our customers and markets. The Internet of Things, cloud computing, virtual and augmented reality, blockchain, artificial intelligence, and e-commerce are just a few of the emerging technologies reshaping the world. However, as with any opportunity for growth, they come with risks that businesses should start thinking about right away. As emerging technologies have already permeated our daily lives and are here to stay, it is critical that organisations understand the risks posed by these emerging technologies so that professionals in risk management, corporate security, and information security can begin to develop strategies and initiatives to prepare their organisations to embrace and capitalise on these technologies.

The book *Contemporary Studies of Risks in Emerging Technology* is aimed at both scientists and professionals who are interested in emerging technologies and the risks associated with their application. It covers a wide range of topics, including the emerging role artificial intelligence in financial services, chatbots and their applications, how to apply machine learning algorithms to improve user experience, green computing for sustainable future technologies, and many others. The book devotes special attention to blockchain technology, an emerging technology widely regarded as one of today's most promising opportunities for banks and other financial institutions. However, despite being one of the most popular emerging technologies in the banking industry, blockchain is not yet widely

available, as fully embracing the power of blockchain technologies may take 10 to 20 years.

I hope readers enjoy this fascinating journey of knowledge and do not get lost in the mazes of emerging technology!

Yours sincerely,
Dr Prof Ramona Rupeika-Apoga
University of Latvia

Preface

With the rapid development of technologies, it becomes increasingly important for us to remain updated on new and emerging technologies. This series, therefore, aims to deliver content on current and future technologies and how the young generation benefits from them. The global financial crisis has highlighted major weaknesses in financial records, information, and data. These weaknesses have led to inadequate access to financial records and information, higher operational risks, flawed bankruptcies, and foreclosure proceedings. The Lockdown due to the ongoing COVID-19 pandemic has increased the scope for criminals to exploit vulnerabilities and commit financial crimes. The increased online presence and homeworking have significantly expanded the attack surface for cybercriminals. Criminals use vulnerabilities, increasing the risks of cyberattacks, money laundering (ML) and terrorist financing (TF). Research is therefore needed to identify trends, tools, and applications that will provide the necessary records, information, and data to support more effective financial analysis and risk management.

The unique contribution of this volume is to bring together researchers from distinct domains that seldom interact to identify theoretical, technological, and practical issues related to managing financial records, information, data, and security.

Emerging technologies have redesigned the financial services industry through innovative means to cater to evolving customer expectations of personalisation and ease. FinTech has progressed as one of the most pioneering and cost-effective disruptive technologies. Initial adaptation of FinTech solutions has permitted several start-ups, financial service providers, and other assorted sectors to accomplish an augmented pace of growth. This book also highlights how emerging technologies alter the subtleties of doing business for benefactors, the possibility of emerging technologies, advantages and disadvantages, technology-linked issues/challenges in financial services, and the drivers of this revolution.

The book revolves around Ethical, legal, and political/policy issues in the use and regulation of Technology. The interdisciplinary nature of the series editorial team offers the best possible examination of works that address the ethical, legal, and social implications of emerging technologies. This text is essential for technologists, IT specialists, programmers, computer scientists, engineers, managers, administrators, academicians, students, policymakers, and researchers, covering topics such as computer-supported collaborative learning, machine learning algorithms, and blockchain.

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Chapter 1

Emerging Role of Blockchain in Banking Operations: An Overview

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Abstract

Introduction: Blockchain technology is the method of storing the data systematically, such that it is impossible to change, defraud or hack the data. Distributed Ledger Technology is another name for this technology. It is like a digital ledger of numerous transactions stored or distributed throughout the Blockchain extensive network by a computer system. Banks offer critical services like payments, clearance and settlement systems, trade finance, securities, etc. Hence, there are fraud and mistakes in these key services due to many manual procedures and human mediators.

Purpose: The main purpose of this chapter is to study the emerging role of Blockchain in banking services. This chapter will attempt to examine the significance and applications of Blockchain in banking operations. This chapter will also investigate the challenges encountered by banks in adopting Blockchain technology.

Research Methodology: In this research chapter, secondary data are collected by studying the various journal papers and scholarly articles, with exact keywords like: blockchain, banking sector, applications and blockchain role. Data are collected from the Emerald, Springer Open, Google Scholar, and Science Direct databases.

Findings: This technology will enhance transparency in banking transactions in the coming future. The adoption of Blockchain will transform the banking system in many ways, such as faster payment and settlement systems, security management and fundraising.

Keywords: Distributed ledger technology; transforming; blockchain; banking industry; transparency; clearance and settlement system;

JEL Codes: O16; O33; O30; Q55

1. Introduction

In this era of advancement and digitalisation, many changes can be seen in the financial sector. Blockchain is one of them. Today, stock exchanges, central banks, commercial banks and various other financial institutes are exploring the potential of blockchain technology. This technology has brought significant transformation in banking operations. These technologies open new doors for open-source prospects, particularly new digital platforms and services (Lindman, Rossi, & Tuunainen, 2017). Banks are becoming more digital, and advanced technologies have emerged in this field. Blockchain can alter many businesses and procedures by making them more participatory, safe, visible and effective. Blockchain is widely regarded as one of the twenty-first century's most significant technological breakthroughs in digitising asset ownership. The most numerous blockchain applications will necessitate close collaboration among developers, officeholders, inventors and regulatory bodies, adding complexity and delaying execution (weform.org, 2016).

Almost all societies want openness in public administration in every country and the development of new technologies to increase management ability inside an organisation and better control and administration. Blockchain is one of the emerging technologies that might be employed in anti-corruption groups. Blockchain was first created to enable the well-known cryptocurrency Bitcoin. Nakamoto proposed Bitcoin in 2008 and developed it in 2009 (Nakamoto, 2008). 'Blockchain technology' is a novel technology that uses open ledger or distributed ledger methods to store data in a chain (block) in a general ledger that is visible to all block members. Using available database transactions in a blockchain utilising decentralised procedures is a novel concept. Security and trust are supposed to be protected with open or decentralised databases. Decentralised is a new instrument or technique that can depend on an economic standpoint (Grima, Kizilkaya, Sood, & ErdemDelice, 2021; Lindman et al., 2017).

It's an open-source ledger viewable to everyone on the network and offers unrivalled security. It relies on its users to update the catalogue on a regular basis. In other words, a blockchain-based economic system is 'trust-free' since it runs without the involvement of any specific people. This technology offers a realistic option for removing mediators, cutting operational expenses, and boosting the efficiency of a sharing business. It is a platform that allows users to conduct transactions without a central or trusted intermediary. The world's most important economic relationships can be re-imagined using blockchain technology. As a result, there is a large potential to create new digital interactions in trustless sharing platforms (Sun, Yan, & Zhang, 2016).

Immutability: Blockchain data are unchangeable and cannot be easily modified. Furthermore, information is only added to the chain when it has been acknowledged by everyone, ensuring that transactions are secure. Miners are the people who check for errors and add them to blocks.

Decentralised: It is a distributed and open ledger; all entries are recorded and viewed by anybody. No person, member, or organisation controls and affects the transactions. This technique offers immediate accessibility to the public as well as a private key that may be shared with other users.

Improved security: As no single point may bring the entire network down, blockchain delivers enhanced security.

Increased Capacity: One of the key features of this technology might increase the network's capacity. It may be more effective to have a large number of cooperative computers than a small number of centralised servers.

Personal Privacy: Anonymity is a valuable tool for concealing users' identities and keeping their information secret.

1.2. Categories of Blockchain (Parizo, 2021)

Public blockchain: Blockchains available to the public is known as public blockchains. Anyone may engage in this blockchain, which implies that anyone can participate in transactions facilitated by the blockchain. Everyone can see what blocks are being added, allowing anyone to engage in the consensus mechanism.

Private blockchain: It is a system under blockchain which runs in a confined environment, like a closed system, or is owned by a private organisation. This blockchain is identical to a public blockchain system in context of peer-to-peer connection and decentralisation, but it is much smaller. These chains are often housed on a closed network within an organisation rather than permitting everyone to enter and contribute processing power.

Hybrid blockchain: This type of blockchain merges private and public blockchains. It enables companies to design a private network while run by getting permission alongside a public, permissionless network, permit them to choose who has access

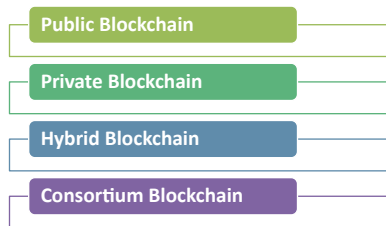


Fig. 1. Types of Blockchain (Author's Compilation).
Source: (Parizo, 2021)

to particular blockchain data and what information is shared publicly. Transactions and information are frequently not publicly disclosed in a hybrid blockchain, but they may be confirmed if necessary, like providing access by creating a smart contract. Private data is kept within the system but may still be approved.

Consortium blockchain: It contains private and public blockchain components, making it analogous to a hybrid blockchain. It differs, however, because it requires a decentralised network of varied organisational members working. A consortium blockchain eliminates the risks related to a certain industry's private blockchain by restricting access to a defined group. Consensus methods are managed by predetermined nodes in a consortium blockchain. The initiating, receiving and validating of transactions are handled by a validator node. Member nodes have the ability to send or receive transactions.

2. Literature Review

Research in the field of blockchain has revealed that this technology not only develops revolutionary transformations in the banking industry but also can bring transformation to the entire financial sector. Gebert (2017) stated that technology is a game-changing and disruptive invention that aims to reduce bureaucracy and regulation while maintaining legal requirements for company activity. Blockchain technology produces a decentralised public record that promotes transparency and allows parties to execute transactions without the risk of being hacked. Most significantly, blockchain technology removes all forms of information asymmetry, meeting the demands of all stakeholders for evidence of authenticity (Andoni et al., 2019; Sharma, & Park, 2018).disclosed that popular Indian financial institutions are considering using blockchain technology because it might be a speedier, more transparent and secure way to better serve their clients. These banks include the Reserve Bank of India (RBI), Yes Bank, Axis Bank and the State Bank of India (SBI). Banks use blockchain technology mainly for financial transactions, registrations and back-end services (Andoni et al., 2019; Taylor, Dargahia, Dehghantanha, Parizi, & Choo, 2019; Zheng, Xie, Dai, Chen, & Wang, 2018).

Gencer et al. (2019) described at an International conference that the technology is a game-changing and disruptive invention that aims to reduce bureaucracy and regulation while maintaining legal requirements for company activity. Most significantly, blockchain technology removes all forms of information asymmetry, meeting the demands of all stakeholders for evidence of authenticity. Polyviou, Velanas, and Soldatos (2019) conducted research and discussed five potential financial industry use cases in their survey, all of which are predicted to be fundamentally revolutionised by blockchain technology; Know Your Customer (KYC), customer profile management, management of insurance claims, securing the credit risk for SMEs and to collaborative securities chain. To examine the applications and implications of blockchain technology, Maull, Godsiff, Mulligan, Brown, and Kewell (2017) conducted a survey and suggested a five-point model that synthesises these possibilities, explaining how they may lead to 'disruptive innovation', using qualitative interview data as the leading resource. A new conceptual model is presented to aid future issue-solving in the domain. The research

objectives are to explore the association between technology and business model by recognising the potential application of distributed ledger technologies (DLTs). The research found that DLTs have the potential to be the first multipurpose emerging digital technology, that is, a digital technology that can empower the economy to run in whole new ways, thanks to characteristics like smart contracts. One more survey has been done by [Trautman \(2017\)](#) and looks at some of the disruptive banking systems advances expected to arise due to rapid technological breakthroughs. Virtual currencies and Bitcoin's roots are also explored, and an overview of distributed ledger technology explains what it is and why it is essential. The article briefly mentions the regulatory hurdles to this new technology's implementation. As per 2014 World Bank estimates, around 2 billion individuals do not have access to financial services. India accounts for 20.6% of the unbanked population. They investigated how blockchain may play an essential part in the financial inclusion process in the study. According to them, FIs that utilise blockchain for internal and cross-border payments may save money, speed up the settlement, and improve customer experience. They concluded that regulators must engage, interfere early and guide innovation ([Aggrawal, 2017](#)). [Liang \(2016\)](#) have examined that fundamental technology of payment clearing and credit reporting systems in banks may be upgraded and altered by blockchains. Blockchains also enable the creation of 'multi-centre, weakly intermediate scenarios', which will increase the effectiveness of banking operations. They also examined the possibility of this technology being integrated into the financial business in the future. According to [Dashkevich \(2020\)](#), the efficient use of this technology for central banks enhances the clearing and settlement of payments between all institutions. In a DLT-based payment clearing system (PCS), all banks participate and agree among themselves, eliminating the requirement for an intermediate connection to control the transaction. This can make the settlement process quick by lowering the time it takes to finish ([Dashkevich, 2020](#)).

Most research has focussed on applying the blockchain in the financial area. This chapter emphasises the role of blockchain technology in banking operations and the challenges encountered in implementing this technology.

2.1. Blockchain Has a Significant Emerging Role in Banking Operations

Blockchain technology has a wide range of applications. It's vital to remember that bitcoin isn't the same as blockchain; instead, it's one of the most popular technologies ([Crosby, Nachiappan, Pattanayak, Verma, & Kalyanaraman, 2016](#)). Blockchain technology in Action in India, blockchain technology may be used in various industries, and industry leaders are reshaping blockchain applications to fit their needs. Following are some specific use cases where blockchain technology can play a prime role in the banking sector:

Payment clearing system: Interbank payments are commonly processed by intermediate clearing organisations, which involve various sophisticated operations, including bookkeeping, transaction and balance reconciliation, payment initiation and so on. So, the trade takes a long time and is costly. Blockchain might

be the solution in this scenario. Blockchain technology eliminates the mediator (financial institutes) and leads to efficient and less-costly banking transactions. All this leads to fast and easy cross-border transactions.

Bank credit information: Various factors are responsible for the inefficiency of the bank credit information systems. Firstly, the absence of information supply and poor data consistency make it hard to evaluate the personal loan state; secondly, inter-institutional information sharing challenges (Pallathadka et al., 2022) and third, no clarity regarding ownership of user information, which also creates issues in circulation due to security and privacy concerns. While solutions to these problems would need collaborative relationships from diverse stakeholders, blockchain technology can help in specific ways (Liang, 2016).

Digital currency: Cryptocurrency functions can be used as a medium of exchange by employing cryptography to make transactions safer and manage the generation of new units of money. Examples are Bitcoin, Ethereum, Ripple, Litecoin and other prominent cryptographic currencies. Due to the ability of users to manage their transactions, cryptocurrencies help to avoid identity theft. It protects the operator from fraud and deception by ensuring that transactions cannot be reversed once completed and that no personal information is sent (Sharma, 2020). Users may transfer and receive money from anywhere without worrying about centralised authorities thanks to this as well. Given that they are instantly authenticated, all parties may view the transactions.

Financing supply chain: Due to a lack of sufficient collateral and credit history, small- and medium-sized businesses (SMEs) have difficulty obtaining loans. Blockchain may improve supply chain finance by providing higher safety, security, efficiency and decision-making. There are several manual and paper-based transactions involved in supply-chain financing. There are many intermediary steps, considerable risks associated with illegal transactions, huge costs and low efficiency. This technology may substantially eliminate manual interventions and apply intelligent contracts to digitise operations that rely primarily on documentation. It will considerably increase supply-chain financing efficiency while also lowering manual operational hazards. Banks and trade financing businesses can save money with the use of supply-chain finance technologies (Liang, 2016).

Consortium accounts: One of the essential roles of this technology is to prevent money from being diverted. The lender cannot trace the borrower's usage of funds since the borrower conducts many transactions transferring cash from one bank to another. Blockchain technology aids in the monitoring of a borrower's final use of funds provided by a group of institutions. As banks can oversee the last use of money, it will decrease non-performing assets (NPAs). All group members have access to information on fund flow, which also aids in the building of the monitoring framework (Sharma, 2020; Sood, Seth, & Grima, 2022).

Trading funding: Trade funding is credit assistance and payment guarantee offered by financial mediators to ensure the successful completion of a trade transaction. Letters of credit are among the most frequently used forms of corporate financing.

A formal guarantee that the seller will receive the purchase amount by the due date, and that the bank will be held liable if it is not, is provided by the bank on behalf of the buyer. Blockchain-based smart contracts have the potential to increase the productivity and save expenses. By using blockchain technology, the labourious process of generating a Letter of Credit may be sped up. A smart contract may be utilised to make the agreement after the parties to the deal use their respective blockchain-based platforms and data can be shared on a personally distributed ledger (Collomb & Sok, 2016; Gupta & Gupta, 2018; Liang, 2016; Petrov, 2019).

Know your customer: Another significant application of blockchain in banking is KYC. Banks need 26 days to finish the KYC procedure (Petrov, 2019). The bank's responsibility is to store and confirm the user's data before commencing any banking transactions. To prevent money laundering and terrorism funding, KYC is governed by a legal framework. The bank's responsibility is to store and confirm the user's data before commencing any banking transactions. Blockchain technology enables banks to distribute blocks that include client data and store it in a secure manner. It increases operating efficiency and gets rid of redundant duties (Gupta & Gupta, 2018; Liang, 2016; Tejal Shah, 2018). The immutability of the data kept in blocks ensures the correctness of the data. In this manner, other financial institutions may access the information once it is kept.

Product personalisation and customer profile management: Blockchain technology can enable far more accurate, safe, and privacy profiling of clients and organisations, similar to KYC use cases. Customers frequently have accounts and other transactions with many banks and financial organisations. Data might be stored in various financial institutions and on platforms other than financial institutions, like social media. Blockchain architecture might allow for the secure exchange of such data across institutions and decrease the faith hurdles preventing them from sharing consumer data. Furthermore, blockchain architecture might make managing the agreement of customers to share their data more accessible. Banks can offer client-centric analytics, adjust products and services to the demands of their clients, and can develop a more accurate client profile (Polyviou et al., 2019; Sood, Kaur, & Grima, 2022).

Financial reporting system: Regular reporting is required of banks and other financial institutions, including tax reports, audits, and other financial reports. Every bank must produce information on time, which is especially vital for preventing fraud and money laundering. Generating reports regularly to the regulations takes time and effort. Blockchain technology may help streamline reporting and result in cost savings. All paperwork may be eliminated using blockchain. The transactions may be updated automatically. The regulatory board's and the banks' tasks would both be made simpler by this. The transfers may be traced, aiding in attempts to combat money laundering (Petrov, 2019). The capacity of blockchain to store transactions and monitor their history will make the work of auditors and regulators easier. Banks may be able to automate financial information and regulation due to this. Many institutions and regulators are experimenting with blockchain implementation (Collomb & Sok, 2016).

Accounting and auditing: In digitalisation, accounting has been a slow-moving industry. Conforming to high regulatory requirements for data quality and authenticity is one of the reasons behind this. As a result, accounting might be another field where blockchain can help. Experts predict that the invention of this technology will simplify compliance and improve conventional double-entry accounting techniques. Banks can post transactions directly into one register, and no need to keep different records for the transaction receipts. The entries in the registry are all made public. Thus, the documents can be more visible and secure. This technology would operate as a digital notary and ensure that all entries and transactions are genuine. Smart contracts on the this technology can be used to make payments for services automatically (Kkozyra, 2020).

2.2. Challenges in Implementing Blockchain in Banking Industry

Regulation: This is one of the most challenging components of implementing blockchain in a business. Many firms are using blockchain technology as a transactional device. There are no written rules in place. Consequently, no one follows any fixed rules regarding the blockchain. The blockchain is a new technology that can enable individuals from numerous nations to connect without obeying any regulatory code. This is a significant problem for producers and service providers.

Storage: The lack of a centralised computer to handle the data and device IDs is one of the significant benefits of blockchain, but the ledger must be preserved on the nodes themselves (Alenezi, Zulkipli, Atlam, Walters, & Wills, 2017). As time goes by and the number of nodes in the network grows, the distributed ledger will grow storage capacity.

Processing time and high energy consumption: the time and energy needed to encrypt each and every item on a blockchain. IoT systems are made up of many types of devices with various processing capabilities, and not all of them will be able to execute the same encryption algorithms concurrently (Atlam, Alenezi, Hussein, & Wills, 2018). You'll need to utilise your computer to solve laborious calculations while mining. As a result, once you start mining, your PC will need more and more electricity to get out of this bind. Miners currently account for 0.2% of overall energy use. Miners will require more power than the world can supply if it continues to climb. As a result, it's now one of the network's most pressing concerns (Iredale, 2021).

Low scalability: Another difficulty that occurs while installing blockchain is readability. In reality, blockchains are only suitable for a small number of individuals. Transitions take longer to complete as the number of users in the system rises. Consequently, the cost of the operations are high than average, limiting the network's user base. It may take hours or even days to complete the transaction. Due to this blockchain implementation challenge, the technology is becoming less profitable (Iredale, 2021).

Lack of knowledge: The development of blockchain technology is still quite young. As a result, the number of individuals with in-depth understanding and skill in this technology is extremely low, especially in the financial sector. There is