VILNIUS UNIVERSITY
FACULTY OF ECONOMICS AND BUSINESS ADMINISTRATION

FINANCE AND BANKING MSc

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MASTER THESIS

Blockchain revoliucija: kaip inovatyvios technologijos gali pakeisti finansų sektorių	**Blockchain Revolution: How Innovative Technology Can Change the Financial Sector**

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Vilnius, 2024

ABSTRACT

This research paper explores the transformative potential of blockchain technology within the financial sector. Focused on addressing the lack of blockchain technology knowledge among finance professionals, the study delves into the foundational aspects of blockchain, its characteristics, its impact on the financial sector, and adoption challenges. Employing a comprehensive survey analysis of finance and technology professionals' opinions, the research combines both quantitative and qualitative insights. Highlighting the urgency for enhanced communication and education to bridge the knowledge gap, the research results note substantial blockchain technology knowledge gaps between technology and finance professionals. Recommendations advocate strategic investments in employee knowledge through targeted training, coupled with integrating blockchain into academic curricula for future finance professionals. The research contends that closing this cognitive gap holds the key to unlocking blockchain's transformative potential, fostering cost efficiency, heightened transparency, and the emergence of innovative business models within the financial industry.

Keywords: Blockchain, technology, financial sector, fintech, innovation, decentralization.

TABLE OF CONTENTS

INTRODUCTION

Blockchain, a distributed ledger technology, is a financial technology (FinTech) that offers a secure computing environment and a tamper-proof record of all transactions (Zheng et al , 2018). FinTechs are businesses that employ cutting-edge technology to deliver financial services in opposition to traditional finance practices (European Investment Bank., 2019). The first notable use of Blockchain technology was the 2009 launch of the digital currency known as Bitcoin, which was created by the pseudonym, Satoshi Nakamoto. Modern cryptocurrencies were developed in 2008 using the blockchain concept in combination with a number of other technologies and computing concepts. These digital currencies are secured by cryptographic mechanisms rather than a central repository or authority. The first currency not governed by a single entity was bitcoin (Nakamoto 2008). In the Bitcoin network, blockchain enables the transfer of digital currency among members without the involvement of a central bank or intermediary (Shrivas & Yeboah, 2017; Nofer, Gomber, Hinz, & Schiereck, 2017; Tama, Kweka, Park, & Rhee, 2017).

Blockchain operates in a decentralized system facilitated by the integration of numerous key technologies, including distributed consensus algorithms, cryptographic hashes, and digital signatures. There is no need for any intermediaries to validate or verify any of the transactions because they all take place decentralized (Litke et al., 2019). Decentralization, trust, smart contracts, and anonymity are some of the crucial aspects and features of blockchain (Kouhizadeh & Sarkis, 2018).

Besides its application within the Bitcoin network, many academics and industry professionals anticipate that it will fundamentally alter the financial sector. Blockchain technology's development has been heralded as the upcoming revolution that will alter the scope and structure of the banking and finance sector as well as how business transactions are carried out (Ceremeno, 2016). Although awareness of blockchain's disruptive impact in other industries and professions is still growing, it is widely acknowledged in the finance industry (Brender & Gauthier, 2018). In the process of digitizing asset ownership, blockchain technologies have been regarded as the key technical breakthrough. Aside from providing a secure audit trail that can not be tampered with, the blockchain has been defined as a versatile programmable platform for managing ownership and contracts (Mattila, 2016; Lindman et al., 2017). Blockchain is becoming more and more popular, and its applications are emerging across a wide range of industries. Blockchain technology has the ability to significantly change current business models, according to a paper that the European Commission issued in April 2016 (Probst et al., 2016). According to the same paper, by 2022 it is

predicted that smart contracts, which are based on blockchain technology, could enable banks to save between 13.8 and 18.4 billion euros per year on infrastructure expenditures.

There are differing opinions on the future of blockchain technology, with some seeing it as a temporary trend and others viewing it as a revolutionary development on par with the Internet. Daily articles in the media and on social media discuss the potentially disruptive effects of blockchain on business models and the economy as a whole. The transparency, security, immutability, and traceability offered by blockchain make it particularly useful in the financial industry, where it is used in cryptocurrencies such as Bitcoin and Ether. However, it is also being explored for use in other sectors such as insurance, international trade, healthcare, and government services. While the audit and control professions may not currently be a focus in discussions on the impact of blockchain, some experts predict that it will lead to significant changes in these fields.

Blockchain technology has the potential to replace many current digital platforms, but it also has technical limitations. One major issue is scalability (Zheng et al., 2018). An increase in block size requires a large amount of storage space and can slow down the propagation of information within the blockchain network, this can lead to centralization and trust issues, as users may not want to operate and maintain such a large blockchain (Blundell-Wignall, 2014). To fully understand the benefits, risks, and challenges of blockchain technology and minimize the potential for technical, social, and political consequences, it is important to carefully consider all of these factors.

Blockchain technology adoption and implementation have been slow and hindered by numerous challenges and a lack of understanding. Therefore, the problem to be addressed by this study is the lack of understanding of blockchain technology's full potential and implications among financial institutions and their employees, as well as the potential risks and challenges that come with the adoption of blockchain technology in the financial sector such as security, scalability, and privacy.

This can be a problem as it can hinder the adoption of blockchain technology in the financial sector, despite its potential benefits. Thereby, two research questions are addressed: How can blockchain technology revolutionize the financial sector? and what challenges must be addressed to ensure its successful implementation?

The research aims to investigate the current state and implications of blockchain technology in the financial sector and identify the barriers to its adoption and implementation, as well as potential solutions to overcome these challenges and fully realize the potential of blockchain technology in the financial industry. The research methodology will involve conducting a survey among a sample of finance professionals, and technology experts. The survey is designed to gather

both quantitative and qualitative data, which will allow for a more comprehensive understanding of the attitudes and perceptions of the participants.

In this paper, the following topics will be covered: background and definitions of blockchain technology (Section 1.1), the key characteristics and features of blockchain technology (Section 1.2), the impact of blockchain technology on the financial industry and its various applications (Section 1.3 and 1.4), the challenges and limitations of adopting blockchain technology (Section 1.5), the research methodology (Section 2), the results and analysis (Section 3), and the conclusion and recommendations (Section 3.5).

1. BLOCKCHAIN TECHNOLOGY AND THE FINANCIAL SECTOR

1.1. Background and Definitions

Blockchain technology was originally the name given to the system used to support the operation of Bitcoin. The creator of Bitcoin, Satoshi Nakamoto, did not use the term "blockchain" in their 2008 whitepaper, and the document suggests that the author was not introducing a new technology in the conventional sense, but rather a software design that utilized various existing technologies to create a "purely peer-to-peer version of electronic cash." (Ammous, Saifedean, 2016). It is argued that Bitcoin was the first decentralized public ledger in the world and has gained widespread recognition globally (Pilkington, 2015).

While there is no widely accepted definition of the concept, Seebacher & Schüritz (2017) defined it as a type of database that is shared and agreed upon by a network of computers connected to each other in a peer-to-peer fashion. It consists of a series of blocks that contain timestamped transactions that are protected by encryption and verified by the community of users on the network. Once a transaction is added to the blockchain, it cannot be changed, making the blockchain a permanent record of past events. Oxford dictionary defines Blockchain as “a system in which a record of payments made in cryptocurrency is maintained across several computers that are linked.”. The Economist (2017) describes it as a type of distributed ledger technology that records and stores information about the creation of bitcoins through a process called "mining." This data is stored in a sequence of transactions on a network of connected computers, and the blockchain data structure ensures that this history is verifiable and cannot be altered or deleted.

The blockchain is essentially a decentralized ledger that is maintained and updated by a network of computers simultaneously. It is commonly used by cryptocurrencies to record payment transactions, and the Bitcoin network was developed with the blockchain as its underlying infrastructure (Abramova & Bohme, 2016). F. Tschorsch and B. Scheuermann (2016) describe the blockchain as a kind of spreadsheet or ledger that utilizes the resources of a large peer-to-peer network to verify and approve each transaction, allowing for the secure settlement and transfer of assets at a low cost. The core concept of the blockchain is that it is accessible to everyone, but controlled or owned by no single user. It is maintained and updated by the members of the network through strict rules and general agreements, meaning that they all agree on how the chain should be updated (The Economist, 2016).

Bitcoin is the most well-known and controversial example of a cryptocurrency that is closely tied to blockchain technology. It allows for anonymous, global transactions worth billions of dollars

without governmental control, which has resulted in regulatory issues with national governments and financial institutions (Crosby, M., Pattanayak, P., Verma, S. & Kalyanaraman, V, 2016). Other electronic cash schemes, such as ecash and NetCash, existed before Bitcoin, but did not achieve widespread use. The use of a blockchain-enabled Bitcoin was to be distributed in such a way that no single user controlled the electronic cash and there was no single point of failure, leading to its popularity (Gupta et al., 2019). Its main advantage was the ability to facilitate direct transactions between users without the need for a trusted third party. According to Yaga, D., Mell, P., Roby, N., & Scarfone, K. (2018) it also enabled the issuance of new cryptocurrency to users who manage to publish new blocks and maintain copies of the ledger (called "miners" in Bitcoin) in a defined manner. The automated payment of miners enabled the distributed administration of the system without the need for organization. Through the use of a blockchain and consensus-based maintenance, a self-policing mechanism was created to ensure that only valid transactions and blocks were added to the blockchain (Yaga, D., Mell, P., Roby, N., & Scarfone, K, 2018).

Blockchain technology is broadly classified into two types: permissionless (public) blockchain and permissioned (private) blockchain. A permissionless blockchain, such as Bitcoin, is open to anyone and there are no restrictions on who can participate, run a node, or access a wallet. These types of blockchains are open and transparent, anyone can review it at any given point of time. They are also known as public blockchains and power most of the digital currency in the market. On the other hand, permissioned blockchain, also known as private blockchain, acts as a closed ecosystem where access is restricted and participants need some form of permission to join the network, view the history, or issue transactions. These are controlled by a central authority and can be owned by private individuals or organizations. The consensus mechanism used in these blockchains may be the same as public blockchain or some other mechanism may be used, such as Ripple. (Sheth & Dattani, 2019)

1.2. Key Characteristics and Features of Blockchain Technology

In summary, the key features and characteristics of blockchain technology that make it a powerful and attractive technology are addressed as follows.

1.2.1. Smart Contracts

A smart contract was first proposed in the 1990s as a computerized transaction protocol that executes the terms of an agreement (Nick Szabo,1997). According to the Gabler Wirtschaftslexikon, a smart contract is "A software-based contract in which a wide variety of contract conditions can be stored. During the course of the contract, certain linked actions (e.g., disbursements) can be executed automatically if there is a corresponding trigger (e.g., fulfillment of contract conditions)" (Mitschele, 2018). Smart contracts are created by embedding contractual clauses in a coded script, which can then be embedded into the blockchain and become an autonomous agent that is permanently tamper-proof (Buterin, 2016). When a transaction is performed, the smart contract's code is read and executed, enforcing the contract's conditions and processing the results (Sultan, Ruhi, & Lakhani, 2018). Smart contracts act as self-executing software agents and can be used to govern transactions in a decentralized manner (Stark, 2016).

1.2.2. Decentralization

In traditional centralized database systems, transactions are trusted through central intermediaries that guarantee their validity. In contrast, public blockchains operate in a fully decentralized setting, allowing trust in transactions to be established among previously unknown or untrusted nodes (Viriyasitavat & Hoonsopon, 2019). The network is protected by the proof-of-work protocol, eliminating the need to trust a third party to verify and record transactions (Böhme et al., 2015; Crosby et al., 2016). Blockchain platforms, such as Bitcoin and Ethereum, maintain permanent and unchangeable records of transactions between multiple parties, while also enabling the use of smart contracts – self-executing agreements that do not require a centralized third party to verify (Underwood, 2019). Within this framework, blockchains can provide a single version of the truth to all parties involved, making all types of agreements easier to manage and creating a secure audit trail (Hoffman et al., 2020). Andreas Antonopoulos, a blockchain advocate, states that blockchain technology allows people to go from trusting other people to trusting math (Antonopoulos, 2014). Werbach also describes blockchain technology as enabling "trustless trust," where transactional security is achieved through reliance on deterministic computation (Werbach, 2016).

In theory, decentralized platforms are more difficult to censor and regulate than centralized ones. However, the impact of decentralization on the privacy and confidentiality of information is harder to determine. On one hand, decentralization reduces the chance of monitoring by a centralized authority, but on the other hand, the openness and transparency of a decentralized network also make information more vulnerable to third parties (Filippi, 2016). Because there is no central authority managing the network, coordination can only be achieved through the disclosure of information to all nodes, requiring a greater degree of transparency (Galloway, 2004).

1.2.3. Anonymity

Users can interact with the blockchain network through a generated address, and they can generate multiple addresses to protect their identity. There is no central party maintaining users' private information, providing a level of privacy for the transactions recorded on the blockchain, however, it is important to note that blockchain technology cannot fully guarantee privacy due to inherent limitations (Wang et al., 2018).

1.2.4 Persistency

Transactions recorded on a Blockchain ledger are considered to be permanent as they are distributed across the network, with each node maintaining and controlling its records. For instance, in a Blockchain with 10 blocks, block 10 will contain the hash of the previous block and to create a new block, the information of the current block is utilized. This means that all blocks in the chain are connected and linked to each other, and even the transactions are linked to prior transactions. Because of this, any changes made to a transaction will result in a significant alteration of the block's hash (Monrat et al., 2019). This characteristic of Blockchain leads to properties such as transparency and immutability (temper resistance), which makes it auditable (Hammerschmidt, 2017).

1.3. The Impact of Blockchain Technology on The Financial Sector

Blockchain technology has the potential to significantly impact the financial sector by providing a decentralized, secure, and transparent platform for financial transactions (Walker et al., 2016). Since its introduction in 2009 with the creation of the Bitcoin blockchain, the use of blockchain technology has expanded beyond cryptocurrency and is being explored by various financial institutions and organizations as a way to streamline and improve financial processes (Schneider et al., 2016).

One major potential impact of blockchain technology on the financial sector is the ability to increase the efficiency and speed of financial transactions. Traditional financial systems rely on intermediaries such as banks and financial institutions to verify and facilitate transactions, which can be time-consuming and costly. In contrast, blockchain technology allows for secure peer-to-peer transactions to be verified and recorded on a decentralized network, eliminating the need for intermediaries and reducing transaction times. Although distributed payment platforms are still considered new and developing technology, they are quickly gaining recognition. For example, Japan began examining the legal implications of Bitcoin and other cryptocurrencies being treated as currencies in 2016 (Lindman et al., 2017). New digital payment systems are being created to meet the demand for banking services, however, these systems do not yet meet all the unique needs that have arisen. Previous research has shown that it can be challenging to compete with established trends in the heavily regulated banking sector (Dahlberg et al., 2008; Reuver et al., 2015).

Another potential impact of blockchain technology is increased security and transparency. Transactions on a blockchain are secured through cryptography and recorded on a publicly accessible ledger, making it difficult for fraud or errors to go undetected. This increased transparency can also help to build trust and confidence in financial systems, particularly in areas where trust in traditional financial institutions is low. Blockchain technology also has the potential to enable financial inclusion by providing access to financial services for individuals and businesses in underserved or unbanked areas (Larios-Hernández, 2017). Through the use of blockchain-based platforms and digital assets, individuals and businesses can participate in financial transactions without the need for traditional banking infrastructure. This can be especially beneficial in developing countries where access to financial services is limited. Blockchain technology also possesses the capability to enable the creation of new financial products and services. For example, the use of stablecoins, which are digital assets pegged to the value of a fiat currency or other asset, can facilitate the transfer of value across borders and allow for the creation of new types of financial instruments (Arner et al., 2020).

Reducing the need for intermediaries, like banks, to assist transactions is one of the main benefits of employing blockchain technology in the financial sector because intermediaries usually have a monopoly, intermediaries can slow down the system, benefiting themselves while hindering efforts to improve products, boost productivity, and enhance the customer experience (Knezevic, 2018). Through the utilization of blockchain technology, both individuals and organizations may choose how to generate and manage value. It has the potential to transform not only payments but also investment banking, accounting, audit, venture capital, insurance, the securities industry, enterprise risk management, retail banking, and other industries thanks to its benefits, such as attestation, cost reduction, speed, decreased risk, increased innovation, and ability to adapt (Knezevic, 2018).

The banking sector is notorious for being conservative and highly regulated, and significant changes to its revenue model have not been witnessed for a very long time. However, PWC predicts that within the next ten years, technological advancements will have a substantial influence on the banking sector (PWC, 2014). Financial institutions must adopt new technologies that are transforming the way they do business if they are to keep up with these developments (Jutila, 2017). Major multinational financial institutions are particularly interested in decentralized and permissionless blockchains, due to their ability to overhaul the payment clearing process and revolutionize the financial industry. Numerous of these institutions, like Goldman Sachs, J.P. Morgan, and UBS, have started their own blockchain research laboratories and done research on the subject. Blockchain-related patent applications have even been made by some, and Nasdaq and NYSE stock exchanges have conducted in-depth research on the subject. Even more so, Nasdaq claimed in 2015 that it had successfully performed the first blockchain-based securities transaction. The feasibility of blockchain technology has also been investigated by other institutions, including Visa, the US Depository Trust & Clearing Corporation, and the Society for Worldwide Interbank Financial Telecommunication. A number of financial institution-based consortiums, with the R3 consortium being the most significant, have been formed to further support the development and deployment of blockchain. With the recent addition of Ping An Bank and China Merchants Bank, it now consists of more than 40 significant banks, including Bank of America, Deutsche Bank, and Morgan Stanley,. The China Financial Blockchain Consortium was established in China and consists of WeBank, Ping An Bank, and CMB Network Technology. It is widely believed that blockchain will have a substantial influence on the banking industry in the coming years and that it has the potential to increase back-end processing efficiency and lower operating expenses. About half of global banking executives, according to a McKinsey survey, anticipate that blockchain will

have a big influence within three years, with others saying it will happen in as little as 18 months. 15% of banks would have widely used blockchain technology by the following year, according to another survey of 200 international banks. IBM has also forecasted that by four years, 66% of banks will be using commercial blockchain on a large scale. (Guo & Liang, 2016)

McKinsey estimates that blockchain technology will enable banks to cut operational expenses by USD 1 billion annually and regulatory fines by USD 2–3 billion annually. Additionally, they estimate blockchain solutions to reduce annual losses from fraud by USD 7-9 billion annually (Higginson et al., 2022). The blockchain in the banking and financial services industry worldwide is projected to experience a significant increase, rising from $1.17 billion in 2021 to $1.89 billion in 2022, with a CAGR of 61.9%. This expansion is primarily attributed to businesses resuming operations and adjusting to the post-pandemic environment while recovering from the effects of COVID-19, which had previously led to restrictions such as social distancing, remote working, and shutdown of commercial activities, causing operational difficulties. The market is forecasted to reach $12.39 billion in 2026, with a CAGR of 60% (ReportLinker, 2022).

However, there are also challenges to the widespread adoption of blockchain technology in the financial sector. One major issue is regulatory uncertainty, as many governments and financial institutions are still unsure of how to approach and regulate blockchain-based financial products and services. There are also concerns about scalability and energy consumption, as some blockchain networks can require significant computing power and energy to operate. Moreover, it is important to note that the adoption of blockchain technology in the financial sector is still in its early stages, and it remains to be seen how it will ultimately impact the industry. It is likely that the adoption of blockchain technology in the financial sector will vary across different regions and countries, and will depend on a variety of factors including regulatory frameworks, technological infrastructure, and market demand.

1.4. Implications of Blockchain Technology in The Financial Sector

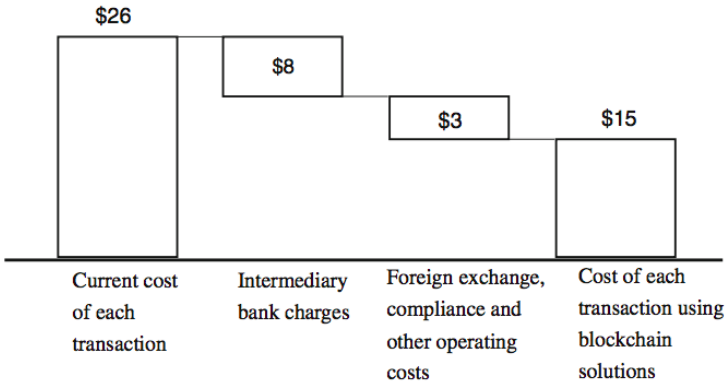
Blockchain technology has been hailed as a game-changer for the financial sector, offering the potential to revolutionize the way financial transactions are conducted. The technology's ability to provide secure, transparent, and tamper-proof transactions has led to a growing interest in its application in various areas of the financial industry. From digital currencies, to smart contracts, to supply chain finance, the implications of blockchain technology in the financial sector are far-reaching. This discussion will delve into the various ways in which blockchain technology is being applied in the financial industry and the potential impact it may have on the sector as a whole.

1. **Payments Processing**: Blockchain technology can be employed to make it easier for people or businesses to transfer money, either directly or by using digital currencies like bitcoin. This could deliver a quicker and safer replacement for traditional payment processing methods. It is clear that blockchain technology has the ability to produce an unchangeable digital ledger for transactions that can be integrated into business operations today. By ensuring that transaction information is disclosed only among individuals involved in such transactions, blockchain technology gives a high level of privacy and eliminates the need for a central authority to oversee them. (Konstantinidis et al., 2018)
2. **Cross-border Payments**: It takes approximately 3 days for a payment to arrive. This exemplifies the ineffectiveness and massive amount of occupied funds involved (Mei & Jun-Hua, 2016). Due to the lack of intermediaries like banks and money transfer providers, blockchain technology can make sending money worldwide simpler and faster. Consequently, enhancing service effectiveness and lowering banks' transaction costs. Banks will be able to meet the demands for quick and simple payment clearing services for international business transactions. (Guo & Liang, 2016)

   According to an estimate by McKinsey, the use of blockchain can significantly lower the cost of each transaction in cross-border commerce. (Ngai et al, 2016)

   The details are displayed in Figure below.

Figure 1. *Applications of Blockchain in Cross-Border Payments.*



Source: Mckinsey (Report by Mckinsey: Blockchain—Disrupting the Rules of the Banking Industry, 2016-05.)

3. **Trade Finance**: Trade finance, which entails the funding and documenting of international trade transactions, can be simplified with blockchain technology. A letter of credit (LC) is a payment settlement tool used by banks to streamline the trade finance process and reduce risk (Harfield, 1982). However, it still does not account for less than one-fifth of global trade despite the lengthy processes, high costs, and delays caused by contracts. As LC issuance takes longer and costs more money, it loses appeal to trading partners. However, blockchain-based smart contracts can be modeled in accordance with all terms mentioned in LCs between suppliers and clients, guaranteeing payment as soon as the traded goods are delivered to the buyer. This approach might reduce the contractual ambiguities and informational inconsistencies that increase the time and expense of LC amendments. (Fridgen et al, 2018)
4. **Identity verification**: Blockchain technology can be utilized to verify the identification of people or companies, making it simpler to verify that someone is who they say they are. This may be beneficial when opening bank accounts or confirming the ownership of financial assets, among other financial contexts. Blockchain can be used to protect sensitive data (for instance, issued and managed by government entities). However, a blockchain-based digital ID may be a more secure solution. Without the use of intermediary banks, people can exchange money, link to family, and verify their identities using the global blockchain ID. (Knezevic, 2018)

5. **Asset Management**: Financial assets like stocks and bonds can be tracked and their ownership verified using blockchain technology. A permissioned and permissionless asset management system is made possible using blockchain technology. Blockchains with trusted permissions are maintained by governmental agencies. Through smart contracts, permissioned blockchains validate the registration of end-user assets on permissionless blockchains. Additionally, permissioned blockchains eliminate the double spending of assets by limiting the number of authenticated smart contracts each asset can be registered in on a permissionless blockchain. (Zakhary et al., 2019)
6. **Insurance**: The underwriting and claims processes for insurance can all be streamlined using blockchain technology. Insurers can automate the process of confirming the terms of an insurance policy and processing claims by using smart contracts, which could result in quicker and more effective processing of claims. Blockchain can be used to register assets that can be uniquely identifiable by one or more IDs that are challenging to copy or destroy. This can be used to trace the history of transactions as well as confirm the ownership of an asset. Any property (physical or digital, including real estate, cars, tangible goods, computers, and other valuables) may be recorded in the blockchain, and the ownership and transaction history may be verified by anybody, particularly insurance. (Crosby et al., 2016)
7. **Credit Scoring**: The inefficiency of bank credit information systems is primarily caused by the following factors: first, the limited data and its poor quality make it challenging to assess the state of personal credit; second, there are issues with inter-institutional data sharing; and third, the ownership of user data is ambiguous, which makes it difficult to circulate due to privacy and security concerns (Guo & Liang, 2016). A decentralized credit scoring system that incorporates a greater variety of data sources, such as a person's social media usage or mobile phone usage, can be developed using blockchain technology. This might give a clearer, more complete image of a person's creditworthiness, which could make it simpler for them to get loans.
8. **Regulatory Compliance**: Blockchain technology enables the secure and transparent recording of transactions, which can be used to enhance the compliance process for financial organizations. Banks and other financial institutions are required to regularly fulfill reporting obligations like tax returns, audits, and other financial reports. Blockchain technology has the potential to greatly reduce time and cost by automating reporting. All paperwork may be avoided using blockchain. The transactions could be automatically updated and registered. As a result, there may be less risk of non-compliance and financial institutions may find it

simpler to meet regulatory requirements. The ability to track transactions can be useful for anti-money laundering operations. (Petrov, 2019)

9. **Supply-Chain Finance**: Blockchain technology can be used to improve the financing of supply chains, particularly for small and medium-sized enterprises (SMEs) that may have difficulty accessing traditional sources of financing. Supply-chain finance comprises a sizable number of paper-based transactions and human inspections. The process also involves a large number of intermediaries, which raises the risk of unlawful transactions and adds to its high costs and ineffectiveness. Blockchain technology can automate processes that rely largely on paper by using smart contracts to reduce the number of manual interventions. This would decrease manual operational risks and considerably increase the efficiency of supply-chain finance. (Guo & Liang, 2016)
10. **Crowdfunding**: Blockchain technology could help traditional banking and crowdfunding overcome their issues. For example, fundraisers could issue their own shares or even smart contracts that would ensure pledge contributions would be refunded if funding goals were not reached. This makes it possible for crowdfunding investors and project initiators to safely and affordably register their rights. (Zhu and Zhou, 2016)
11. **Personal Finance**: Blockchain technology can be used to improve personal finance management, such as budgeting and saving. For example, a blockchain-based personal finance management platform could allow individuals to track their expenses in real-time, create and track financial goals, and receive personalized financial advice.
12. **Customized Investment Management**: Originally, mutual funds have created the opportunity for small investors to participate in a variety of assets, provided that they are prepared to select from a set of pre-determined available options. While mutual funds are a decent choice for people who want to adhere to a popular benchmark index, they might not be ideal for those who desire a tailored investing strategy or a non-standard return. In Europe, structured products have grown in popularity as a desirable alternative for investors looking for more complex investments than what mutual funds have to offer. The minimal issuance amount for these customized investment products might be as low as $1 million, which might not be viable for mutual fund or bond issuances. (Varma, 2019)
13. **Derivatives Trading**: Most derivatives transactions have substantially more complicated post-trade procedures than securities transactions, with post-trade life cycles lasting weeks or even several years. Numerous derivatives transaction terms, such as collateral management and payment on expiration, can be directly programmed into smart contracts,

allowing for the automatic execution and enforcement of clauses (Casey et al., 2018). In order to automate record-keeping, lifecycle events, and payment management for more than $11 trillion in cleared and bilateral credit derivatives, IBM is collaborating with the DTCC to offer a blockchain framework for their Trade Information Warehouse (Castillo, 2021).

14. **Real Estate**: Blockchain technology can be used to improve the process of buying and selling real estate, such as by automating the transfer of ownership and streamlining the process of registering property ownership. A public and unchangeable database for land registries can be implemented using blockchain technology. This may be especially advantageous for corrupt nations with weak land registries. Information on property rights, including registered properties and interests in land, can be found in land registries. They enhance security in a variety of ways. One way a blockchain-based land registry improves security is by making it impossible to alter ownership of property rights illegally, which happens frequently in nations with corrupt governments. (The Economist, 2015)
15. **Pension Management**: By automating the process of making contributions, estimating benefits, and transferring payments to pensioners, blockchain technology can be employed to optimize the management of pension funds. As a result, a larger spectrum of people may have easier access to pension management by lowering the costs and risks involved. A blockchain-based pension management system lowers the cost of pension management while enabling flexible and transparent transactions for citizens. (Grima, 2020)
16. **Know Your Customer (KYC)**: The first step in anti-money laundering (AML) due diligence is known as KYC. Most of the major issues can be tackled with blockchain, which will completely change how banks handle KYC (Martens et al., 2017). Banks should save client data during the "know your customer" (KYC) procedure in their own database and then use encryption technologies to upload summary data for storage in the blockchain. The blockchain can be used to alert the original data provider of query requests so that a query can be run. All parties can therefore access external big data without disclosing their key business information. By ensuring that the summary and the original data are consistent, encryption technology can avoid the dissemination of incorrect information that might confuse their counterparts. The blockchain enables the automated encryption and exchange of client data and transaction records within the parameters of customer information protection rules. This reduces the need for redundant KYC efforts between banks. (Guo & Liang, 2016)

17. **Private Securities:** Blockchain technology has the potential to have a significant impact on the management and trading of private securities. Publicly listing a company is quite expensive. To underwrite the deal and draw investors, a bank's syndicate is required. Corporate shares are listed in a secondary market by the stock exchanges in order to operate safely and trades can be settled and cleared efficiently. Theoretically, businesses may now offer shares directly through the blockchain. The secondary market that is built on top of the blockchain is where these shares can subsequently be bought and traded. (Crosby et al., 2016)
18. **Risk Management:** A key component of financial technology (FinTech) is the risk management framework, which can now be improved by combining it with blockchain. Investors who currently hold securities through a network of custodians run the risk of one or more of these failing. Blockchain enables investments and collateral decisions to be made quickly rather than after careful deliberation (Zheng et al., 2018). In Micheler and von der Heyde (2016), Micheler and Heyde claimed that by combining a new system with blockchain, it is possible to decrease custody risk and maintain the same level of transactional security. Additionally, decentralized autonomous organizations (DAO) can participate in business collaborations using blockchain-based smart contracts.
19. **Accounting:** With the emergence of software capable of creating various information and maintaining transaction records, the accounting field has undergone significant changes. In its early phases, software gradually transitioned from a centralized or limited accounting system to a decentralized one using the internet (Gautham, 2017). Blockchain accounting has been introduced as blockchain technology has advanced to assist professionals and maintain order tracking in "blocks" in a secured environment. With the help of blockchain, we are able to record transactions as well as verify them without the need for human intervention or an intermediary because the technology is entirely automated (Kwilinski, 2019; Walch, 2016). Additionally, this removes the need to pay out commissions and other secondary transactions to other parties, takes out intermediaries, and eliminates errors caused by intermediaries (Demirkan et al., 2020). Another illustration of how technology affected accounting is the transition from simple accounting, in which transactions were recorded, to double accounting, which began with the entry of events as well as the justifications for their implementation into documents, since the start of the fixation of business processes. Such records were first created (and are still created today) on paper registers, and later on, with the help of computers and a variety of software, they were transferred to the digital

environment (Melnychenko & Hartinger, 2017). Thus, the process of gathering data has changed.

The popularity of blockchain is growing in the public accounting sector. For instance, PwC and EY have successfully created auditing tools designed for auditing blockchain transactions, while Deloitte was one of the first companies to effectively audit the blockchain protocol (Deloitte, 2021). Notably, EY built the EY blockchain analyzer, which is designed to extract transactions from different blockchain ledgers (Curtis, 2018), while PwC also started to provide continuous auditing software to audit transactions on private business blockchains.

Smith (2018) examined how blockchain technology might affect the accounting industry. He also conducted a comparative analysis of the potential changes in processes as a result of the spread of this technology. Accounting businesses make significant financial, technological, and human investments in blockchain. However, blockchain exploration and adoption are still in their infancy. Accounting and certification professionals face opportunities and difficulties as a result of the automation of accounting and audit tasks, and they are compelled to change in order to adapt. As a result of this change, technology may be able to automate some accounting or auditing tasks, and the auditing and accounting experts will take on a more strategic role.

20. **Auditing:** Due to its characteristics, the adoption of blockchain will enable or at the very least facilitate the automation of audit tests, shortening the time needed for audits. For the time being, auditors compare the data from several sources to ensure that their clients' data is accurate. These reconciliations won't be necessary after blockchain implementation because all transactions will be stored in one distributed transactional database. Additionally, the structure of audit teams will shift. In the future, teams will be managed by auditors with strong computer and accounting expertise who will collaborate closely with IT auditors and other types of specialists such as data visualization, blockchain, and big data. (Brender & Gauthier, 2018)

Although IT environments become more revolutionary and complicated, scientific research demonstrates that the importance of the IT auditor position in an audit is frequently poorly conveyed and indirect, and in practice, there is little interaction between auditors and IT auditors (Bagranoff and Vendrzyk, 2000). Smith (2020) investigated the relationship between blockchain and smart contracts by examining how these applications can alter the auditing procedure. According to him, the blockchain needs to interact with other platforms

and be connected with the current technology systems in order to be effective and efficient. Blockchain platforms can be customized at the corporate level and connected to other technical systems thanks to smart contracts.

The implications, benefits, and difficulties of the two forms of blockchain (permissionless and permissioned) for auditors were addressed by Liu et al. (2019). These authors claim that blockchain-related audit operations are becoming more prevalent. As a result, the auditor can verify the validity of data stored on a blockchain and confirm the existence of digital assets. Additionally, the auditor may find these operations challenging due to the blockchain's lack of centralized authorities, which may force them to create new techniques for verifying the property.

The financial statement audit paradigm could be impacted by blockchain technology and smart contracts, according to Rozario and Thomas (2019) study. The authors made an effort to outline a conceptual framework for an external audit blockchain in which intelligent audit processes (a type of smart contract) can conduct audit programs on their own and reveal audit results to various users almost instantly. They demonstrated how the audit blockchain might potentially enhance audit quality and minimize the expectation gap between auditors, financial users, and regulators by utilizing both financial and non-financial data.

Junior auditors will no longer be performing some tests and duties that do not require specialized technical knowledge in favor of analyses that do. As a result, audit companies will require senior professionals rather than juniors. It will have a significant impact on such firms' highly pyramidal organizational structure, as fewer and fewer employees advance through the levels of management (junior, senior, manager, senior manager, partner). Junior accountants and other recent graduates often begin their careers as external auditors in order to obtain exposure to a variety of clients in terms of business sectors or company size. After a few years, they usually leave the audit sector to take on different jobs in the industry. They continue their training in the sector while being coached by more senior auditors. However, it appears that if accounting businesses hire more experienced professionals rather than juniors, this model is likely to be diminished or even reversed. Future graduates will first gain experience in the field by working in it before joining an audit firm. This shift in trends will prompt businesses with significant employee turnover to evaluate their human resources practices. (Brender & Gauthier, 2018)

However, the audit paradigm does not yet incorporate the utilization of new technologies as part of a transition to methodology, in contrast to the digital business world,

despite significant technological disruption over the past decade. Additionally, no empirical study has yet been carried out on the blockchain and the audit due to the complexity of the technology.

1.5. Challenges and Limitations of Adopting Blockchain Technology

Blockchain technology has the potential to revolutionize various industries by providing secure, transparent, and tamper-proof transactions. However, like any new technology, there are also challenges that need to be addressed when it comes to adopting blockchain. These challenges are addressed as follows.

1.5.1. Scalability

Solutions based on blockchain and cryptocurrencies for various business models are becoming increasingly popular. However, its performance and scalability, in particular, raise questions about whether it will be able to keep up with the growing demand from various business and government-based sectors (Monrat et al., 2019). Marr (2018) noted that the complexity, encryption, and distributed nature of blockchain transactions make them difficult to adopt quickly. The Bitcoin blockchain can only process about 7 transactions per second due to the original block size restriction and the time interval needed to build a new block, which does not meet the requirement of processing millions of transactions in real-time. As a result of the extremely limited block capacity, many tiny transactions may experience delays since miners favor those with a large transaction fee. Large block sizes, however, would slow the speed of propagation and result in blockchain branches. Any widely used platform must be able to handle thousands to hundreds of thousands of transactions per second. (Zheng et al., 2018)

Without scalability and performance, the economy would have to stop in its tracks, causing significant delays for both consumers and businesses. This shows how crucial these issues are for this developing technology. Numerous small transactions could be delayed in the meanwhile since miners favor those with high transaction fees due to the relatively limited capacity of blocks. Block sizes are restricted; for instance, a Bitcoin block size is 1 MB. Although this technique was intended to increase platform security, it significantly slows down transaction times when compared to other existing systems. Many transactions cannot be processed at once due to the small block size. (Monrat et al., 2019)

A novel cryptocurrency strategy was proposed by (Bruce, 2014) to address the bulky blockchain issue. In the new strategy, the network deletes outdated transaction records, and all

non-empty addresses' balances are stored in an account called tree database. This eliminates the need for nodes to store every transaction in order to determine if a transaction is valid or not. Additionally, a lightweight client could assist in resolving this issue. A novel strategy called VerSum (van den Hooff et al., 2014) was proposed to offer another approach to allow the existence of lightweight clients. Lightweight clients can outsource costly computations over large inputs using VerSum. By comparing results from different servers, it makes sure that the computation result is accurate.

In 2016, Eyal et al. proposed a new version of Bitcoin called Bitcoin-NG (Next Generation). The concept behind Bitcoin-NG is to separate the traditional block into two parts: a key block that is used for leader election, and microblocks that store transactions. Miners compete to become the leader, and the leader is responsible for creating microblocks until a new leader is chosen. Bitcoin-NG also modified the "heaviest chain" strategy, where only key blocks are considered in determining the longest chain and microblocks do not contribute to the weight. This redesign of the blockchain addresses the balance between block size and network security.

1.5.2. Privacy and Security

Since users can make transactions using created addresses rather than their actual identities, blockchain is regarded as offering security and anonymity to sensitive personal data. Yet, some researchers argued that Blockchain would be exposed in terms of transactional privacy given that the network members can see the public key used to initiate a transaction (Henry et al., 2018). While it is said that a peer can remain anonymous in the Blockchain network, current research on the Bitcoin platform has proven that a member's real identity can be revealed by linking their transaction history (Smith et al., 2016).

The transient nature of user pseudonyms in Bitcoin was a major factor in the currency's early success. Despite years of close examination by privacy experts, there are now a variety of effective techniques that attackers can use to connect different Bitcoin transactions to a single user, and in many cases, to the user's actual identity. Ultimately, rather than offering the high level of financial privacy that its early users hoped for, Bitcoin and other cryptocurrencies are often less private than traditional banking, which is required to follow government regulations that provide basic privacy protections. To address this issue, researchers in the cryptography and privacy fields have developed several protocols that aim to improve blockchain privacy by separating users' pseudonymous identities from their specific transactions. This makes it more difficult for people to link transacting parties based on information contained in the blockchain. However, these protocols do not attempt

to hide users' identities from network-level adversaries when they publish or retrieve data from the blockchain. Instead, they rely on an external anonymous communication network, such as Tor, to provide this protection. However, using complex protocols over general-purpose, low-latency anonymity networks like Tor can be risky and can expose users to subtle but potentially devastating deanonymization attacks, which undermine the privacy guarantees of the entire blockchain system. (Henry et al., 2018)

In addition, a method for connecting user pseudonyms to IP addresses, even when users are behind NAT or firewalls, was presented in a paper by Biryukov et al. (2014). The list of nodes that each client connects to in this study can be used to distinguish each client and can be learned and used to track a transaction's origin.

The "Transaction Malleability" attack is a type of attack that occurs when someone alters the unique transaction ID before the transaction is confirmed, resulting in the modification of the transaction and the transfer of cryptocurrencies to the attacker's account (Konstantinidis et al., 2018). According to Abd Halim et al (2017), there are concerns with the blockchain's individual nodes, where stolen keys could result in harmful transactions. Wu and Liang (2017) highlights the most significant issue faced by the proof of work mechanism as when miners attempt to control more than 50% of the network's computing power to stop transactions from being confirmed, known as the 51% attack. In Wijaya et al (2017) , a solution for the 51% attack is proposed in the form of a VAT system developed on a centralized blockchain. Tsai et al (2016) notes that all nodes participating in a blockchain are linked by a P2P network, although P2P networks have been shown to contain security flaws.

Mixcoin (Bonneau et al., 2014) offers a straightforward approach to preventing dishonest behavior by using encryption. The intermediary encrypts the user's details, such as the number of funds and the transfer date, using its private key. If the intermediary does not transfer the money, anyone can verify that the intermediary cheated. However, this method only detects theft and does not prevent it. Coinjoin (Maxwell, 2013) uses a central mixing server to shuffle the output addresses to prevent theft. CoinShuffle (Ruffing et al., 2014) is similar to Coinjoin and uses a decryption mixnet for address shuffling.

In Zerocoin (Miers et al., 2013), a zero-knowledge proof is applied. Miners do not need to validate transactions through digital signatures but rather validate that the coins being used belong to a list of valid coins. This technique prevents the linking of payment origins to transactions, thus avoiding transaction graph analysis. However, it still reveals the destination and amount of payments. To address this issue, Zerocash (Sasson et al., 2014) was proposed. To hide transaction

quantities and user-held coin values, Zerocash uses zero-knowledge Succinct Non-interactive Arguments of Knowledge (zk-SNARKs).

1.5.3. Regulation Problems

Blockchain platforms like cryptocurrencies are facing regulatory issues because their decentralized nature weakens the ability of central banks to control economic policy, which makes governments cautious about adopting blockchain technology (Kakavand et al., 2017). Using Biction as an example, the decentralized nature of the system weakens the central bank's ability to control economic policy and the amount of money in circulation, causing governments to be cautious of adopting blockchain technology (S & Jacob, 2020). Authorities need to research this new issue and quickly develop new policies to avoid risks in the market. Despite the potential positive uses of blockchain technology, its wider applications have been met with some hesitation by policymakers and regulators due to its association with bitcoins, which have been linked to money laundering activities. For example, the Financial Action Task Force revealed in 2015 how Liberty Reserve's founders were able to launder hundreds of millions of dollars to criminal organizations over the course of six years (Monrat et al., 2019). Regulators are often unclear about their stance on the new technology, and it can be difficult to obtain their approval. In the past, cryptocurrencies were able to operate outside of regulatory frameworks entirely. This has changed recently, though, as a number of cryptocurrency exchanges have obtained licenses as money changers and traditional exchanges, securities brokers, and asset managers have started to provide products related to cryptocurrencies. For instance, the Cboe Futures Exchange in the United States introduced Bitcoin futures in December 2017 after receiving the required regulatory permissions (Varma, 2019).

1.5.4. Energy Consumption

While there are various consensus mechanisms, the Proof of Work (PoW) mechanism is still the most widely used. PoW involves solving complex puzzles, which require a large amount of energy (Van Rijmenam & Ryan, 2018). It was predicted that in 2020 the bitcoin blockchain's PoW consensus mechanism would consume as much energy as Denmark (Deetman, 2016). The incentive mechanism for mining Bitcoin motivates people worldwide to participate in the process. The revenue generated from mining draws individuals into using power-hungry devices to earn a share of it. As a result, both the price of bitcoin and the network's overall energy consumption rate increased to a new high (Monrat et al., 2019). The total energy usage of the Bitcoin network is greater than that of several countries, according to a report by the International Energy Agency

(Vranken, 2017). In addition to consuming a significant amount of energy, bitcoin also leaves a significant carbon footprint. The network of bitcoin is powered by China's coal-fired power plants (Monrat et al., 2019). According to Nature Climate Change (2018), Bitcoin mining alone could raise global warming above 2 °C in less than 30 years. Luckily, new blockchains might employ alternative consensus algorithms that utilize a lot less power.

1.5.5. Selfish Mining (51% Attacks)

Another unethical practice used by mining pools to raise block rewards and threaten the integrity of a blockchain network is known as selfish mining (Gobel et al., 2016). Eyal et al. presented a blockchain network that could still be vulnerable if someone wanted to cheat with a small amount of hashing power, even though it is generally accepted that malicious nodes that have over 51% of computing power can control the blockchain network (Eyal & Sirer, 2018). A solitary miner or a group of miners can start a selfish mining operation by refusing to broadcast validated blocks to the rest of the network. To keep the lead, they then continue mining for the following block. Only if certain conditions are met may the public see the solved blocks. As a result, the chain of the selfish miner lengthens and gets more challenging, which forces the network to adopt their solutions while other miners waste resources on a worthless branch. Finally, the greedy miners generate more revenue. That tempts the rational miners to join the longer chain, raising the possibility that the selfish pool may gain more than 51% power (Monrat et al., 2019). Eyal and Sirer (2018) demonstrated in particular that the network is weak even if only a small amount of the hashing power is used for cheating.

1.5.6. Interoperability

Interoperability not only combines the ability to adapt and move between different systems, but also has the potential to address some of the most significant issues currently being studied in the field of blockchain technology (Belchior et al., 2021). Interoperability can improve the scalability of blockchain technology by allowing for the transfer of transactions to other blockchains through methods such as sharding. Additionally, it can enhance privacy by enabling users to choose different blockchains for data with varying privacy needs and opens up new opportunities for businesses (Fynn et al., 2020; Wang et al., 2019).

Despite the potential benefits of interoperability, there currently exists no universal protocol for different blockchain systems to collaborate and integrate with one another. This lack of interoperability hinders the advancement of the blockchain industry. As a result, cryptocurrency

remains the primary use case for blockchain technology. The lack of interoperability allows for freedom in development, but it also creates isolated networks that cannot interact with one another. For instance, there are over 6,500 active blockchain projects on GitHub using a variety of platforms, languages, consensus mechanisms, protocols, and privacy features. To address this problem, standardization is needed for enterprises to collaborate on application development and share blockchain-based solutions, as well as integrate with existing systems. (Monrat et al., 2019)

In an explorative approach, Mainelli and Smith (2015) concluded that integrating distributed ledgers into trusted third-party systems can support services such as know-your-customer, money-laundering prevention, insurance, or credit services. (Walsh et al. 2016) shows that while anonymity, decentralization, and scalability have initially been investigated, other aspects such as effects of (un-) permissioned blockchains, restricted data access, consensus mechanisms, modularity, and interoperability are mostly disregarded.

2. METHODOLOGY FOR RESEARCHING THE IMPACT OF BLOCKCHAIN TECHNOLOGY ON THE FINANCIAL SECTOR

2.1 Research Aim, Objectives and Model

As blockchain technology continues to evolve, it is crucial to understand the perceptions and opinions of professionals working in finance and technology sectors. They can provide valuable insights into the current awareness, attitudes, and beliefs surrounding blockchain technology in the financial industry.

This research aims to gain a deeper understanding of how blockchain technology is currently being perceived in the financial and technology sectors. The research will specifically focus on the perceptions, attitudes, and experiences of financial and technology professionals regarding blockchain technology in the financial sector. It will assess the level of awareness and knowledge by inquiring about the respondents' familiarity with blockchain, their understanding of its benefits and challenges, and their knowledge of its potential applications in the financial industry. This analysis will provide insights into the current knowledge landscape and serve as a foundation for further research.

The topic of blockchain technology's impact on the financial sector is a complex and multi-faceted one, requiring a research approach that can capture a wide range of perspectives and insights. Using both quantitative and qualitative research models can provide a more comprehensive understanding of the current state of blockchain technology adoption in the financial sector and its potential future impact as quantitative data provides a general overview of the attitudes and perceptions of the industry, while qualitative data provides a more detailed understanding of specific experiences and perspectives (Britt, 2014). Furthermore, using both quantitative and qualitative research methods can provide a more robust dataset, as it allows for the triangulation of data and enhances the validity of the research findings.

The research methodology used will be designed to gather both quantitative and qualitative data, which will allow for a more comprehensive understanding of the attitudes and perceptions of the participants.

The objectives of this research are as follows:

1. To assess the level of awareness and knowledge among finance and technology professionals regarding the benefits and challenges of blockchain technology in the financial sector.
2. To understand the attitudes and beliefs of professionals toward the potential impact of blockchain technology on the financial industry.
3. To identify any disparities in knowledge, attitudes, and beliefs between finance and technology professionals.
4. To provide valuable insights and recommendations for fostering greater understanding, awareness, and acceptance of blockchain technology in the financial sector.

By accomplishing these objectives, we aim to provide valuable insights and contribute to the advancement of knowledge in the field. By identifying the perceived opinions and attitudes, we can make informed decisions on how to approach them and fill the knowledge gaps. Additionally, the study will contribute to the existing body of knowledge by generating new data and insights specific to the surveyed population, thereby supporting future research and discussions in academia, industry, and policy circles.

2.2. Research Hypotheses

Based on the literature review and prior research, the following hypotheses have been developed:

Hypothesis #1: "Finance professionals are not well aware of the blockchain technology implications in the financial sector."

Hypothesis #2: "Finance professionals are not confident in the security and reliability of Blockchain technology."

Hypothesis #3: "Finance professionals believe that blockchain technology has the potential to revolutionize the financial industry."

The hypothesis tests were conducted with the appropriate assumptions and significance levels to determine whether the observed differences between the two professional groups were statistically significant. By employing these methodologies and analysis techniques, this survey aimed to provide a comprehensive understanding of the awareness, attitudes, and beliefs of finance and technology professionals regarding blockchain technology's potential impact on the financial sector. The findings from this analysis will be presented in the subsequent sections of the report, along with their implications for the industry.

2.3. Organisation and Instruments

A survey was conducted using an online self-administered design. The survey was distributed to a sample of 400 professionals working in various roles and sectors within the finance and technology industry. The survey instrument consists of 17 questions, including both closed-ended and open-ended questions, which were designed to elicit insights on the perceived current state of blockchain technology in the financial sector and the challenges of adopting blockchain technology in finance, as well as the expected impact on various aspects of the financial industry. The data collection process involved distributing the survey via email and social media platforms such as Linkedin to a targeted group of finance and technology professionals and achieving a response rate of 62.75% with 251 responses. The respondents' identities were kept confidential, ensuring anonymity, and encouraging honest responses.

A frequency analysis was conducted for each survey question to determine the distribution of responses. This analysis allowed for a clear understanding of the participants' opinions and preferences on various aspects related to blockchain technology in the financial sector. The results were presented in a tabular format to facilitate interpretation.

To compare the awareness and attitudes of professionals from the finance and technology sectors, a heatmap analysis was performed. The heatmap displayed the percentage of professionals from each sector who fully agreed, were aware, confident, or held other specific opinions for each survey question. This visual representation helped identify any divergences or similarities between the two sectors.

A correlation matrix was generated to examine the relationships between different survey questions. This analysis provided insights into the interdependencies and associations among the variables. By understanding the correlations, we could identify the most influential factors and their impact on the participants' overall perspectives regarding blockchain technology in the financial sector.

2.4. Sample Selection

The target population for this study is individuals working at financial institutions, such as banks and investment firms, and individuals working in the technology sector. This population was chosen because they are most likely to have a vested interest in the development and implementation of blockchain technology in the financial sector.

The sample population is chosen using a random sampling method to ensure that the sample is representative of the target population. This is done through simple random sampling, where

participants are chosen at random from the sampling frame, and stratified random sampling, where the population is divided into subgroups, and a random sample is chosen from each subgroup. By using a combination of these methods, the sample population can be selected in a way that is representative of the target population, and the research findings can be considered reliable.

To create the sampling frame, a list of financial institutions and blockchain experts was gathered. Professionals from these institutions were invited to participate in the survey. The sampling frame included professionals from 100 financial institutions and technology companies.

To select the sample population, a combination of simple random sampling and stratified random sampling is used. 25 financial institutions were randomly selected from the sampling frame, ensuring that the sample included a mix of small and large institutions. Similarly, 25 technology companies were randomly selected from the sampling frame, ensuring that the sample included a mix of experts from different backgrounds and experiences. 400 randomly selected professionals from the selected 50 financial institutions and technology companies are sent invites to participate in the survey. This makes the sample size 400 participants.

2.5. Research Challenges and Limitations

This study has certain limitations, one being the limited amount of historical data available on blockchain technology. As it is relatively new, there is a shortage of data to analyze and that makes it hard to forecast the long-term effects of blockchain on the financial sector. Additionally, blockchain technology is a complex and rapidly evolving field, which makes it challenging for researchers without a strong technical background to fully comprehend and examine the technology and its potential impact. The lack of large-scale, live deployments of blockchain technology in the financial sector can make it challenging to conduct research on its actual effects on the industry.

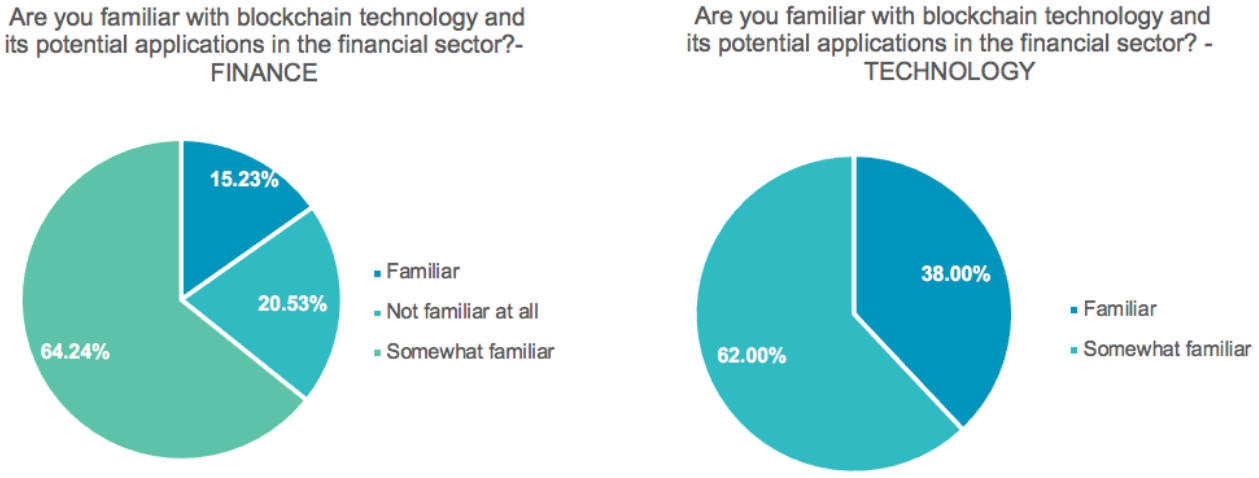
Surveys may have a low response rate, which can affect the representativeness of the sample and the generalizability of the results. It can be challenging to select a representative sample which can affect the validity of the results. There is still a limited understanding among financial professionals about the full potential of blockchain technology, as it is a complex and technical subject that may be difficult for non-tech professionals to fully understand and analyze. This can affect the accuracy of the responses. Moreover, surveys can be affected by various types of errors, such as coverage error when the population being surveyed is not fully represented or outdated, nonresponse error when certain individuals do not participate, and item nonresponse when certain questions are not answered either by accident or intentionally (Salant & Dillman, 1994).

3. RESEARCH RESULTS ANALYSIS

3.1. Frequency Analysis

3.1.1. Familiarity With Blockchain Technology

Figure 2, familiarity with blockchain charts



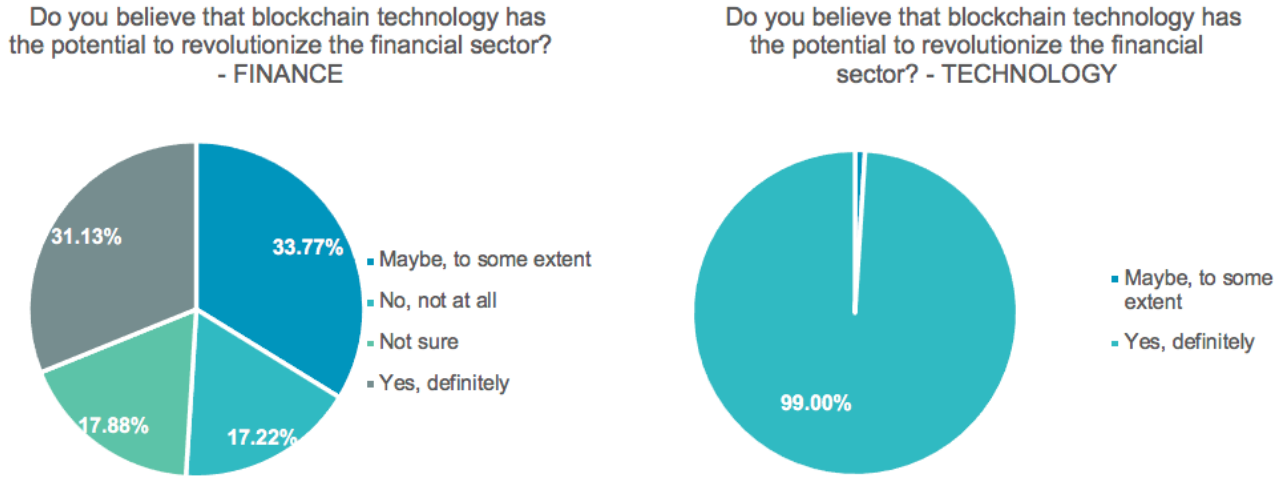
Source: Author

In the finance sector, 15.23% of respondents reported being familiar with blockchain technology, while in the technology sector, the familiarity rate was significantly higher at 38.00%. This indicates that professionals in the technology sector have a greater level of awareness and understanding of blockchain technology compared to their counterparts in finance.

Furthermore, 20.53% of respondents from the financial sector stated that they were not familiar with blockchain technology at all, suggesting a lack of awareness or knowledge among a significant portion of finance professionals. On the other hand, 64.24% of respondents indicated being somewhat familiar with blockchain technology, indicating that they possess a basic level of understanding but may not be fully aware.

3.1.2. Blockchain Technology's Potential To Revolutionize The Financial Sector

Figure 3, Blockchain Technology's Potential To Revolutionize The Financial Sector Charts



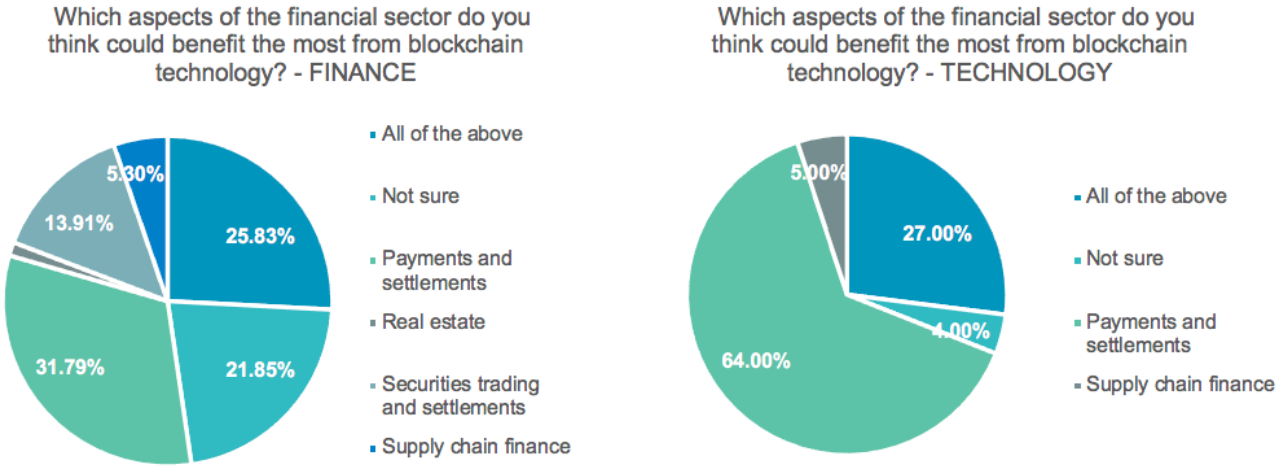
Source: Author

In the finance sector, 33.77% of respondents see some potential for blockchain to bring about revolutionary changes, while 17.22% express skepticism and 17.88% are unsure. However, 31.13% firmly believe in the transformative power of blockchain technology. In contrast, among technology professionals, an overwhelming 99.00% believe that blockchain has the potential to revolutionize finance, with only 1.00% expressing partial belief.

These results highlight the divergent views between the two sectors. Finance professionals exhibit a wider range of opinions, while technology professionals overwhelmingly embrace the transformative potential of blockchain in finance. This comparison emphasizes the need for further exploration and discussion within the finance sector and suggests that technology professionals may play a crucial role in driving blockchain adoption in finance.

3.1.3. Aspects Of The Financial Sector That Could Benefit The Most From Blockchain Technology

Figure 4, Aspects Of The Financial Sector That Could Benefit The Most From Blockchain Technology Charts

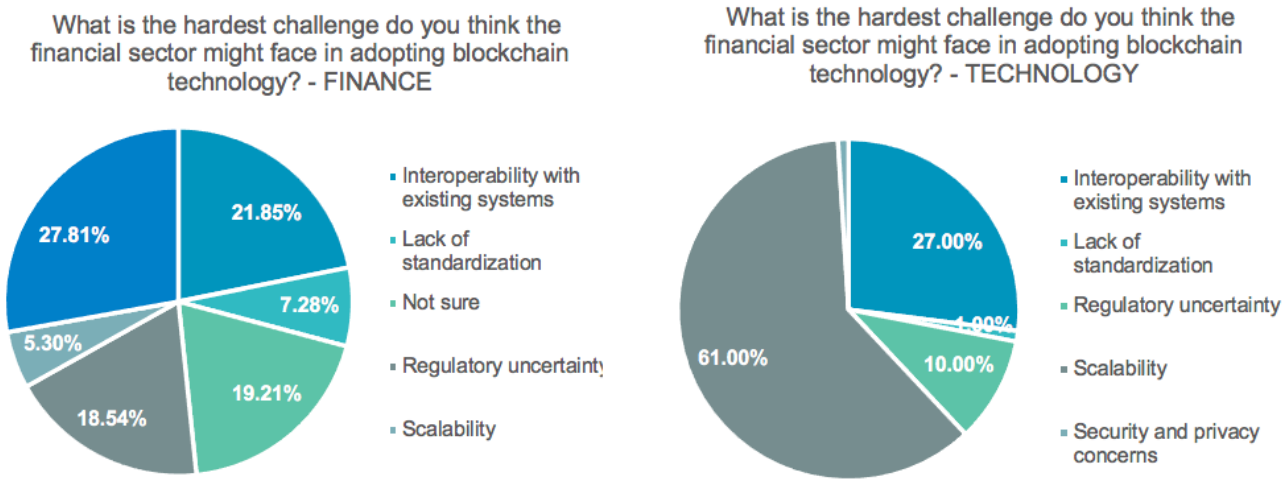


Source: Author

In terms of the aspects of the financial sector that could benefit the most from blockchain technology, both sectors recognize the potential across various areas. However, in the finance sector, 31.79% of respondents specifically mention payments and settlements as the key area of benefit, while securities trading and settlements (13.91%) and supply chain finance (5.30%) are also mentioned. In the technology sector, most respondents (64.00%) believe that payments and settlements would benefit the most, with a smaller percentage (5.00%) considering supply chain finance. Notably, a significant proportion (27.00%) in the technology sector selects "all of the above," suggesting a broader perception of blockchain's potential across multiple areas.

3.1.4. The Hardest Challenge The Financial Sector Might Face In Adopting Blockchain Technology

Figure 5, The Hardest Challenge The Financial Sector Might Face In Adopting Blockchain Technology Charts

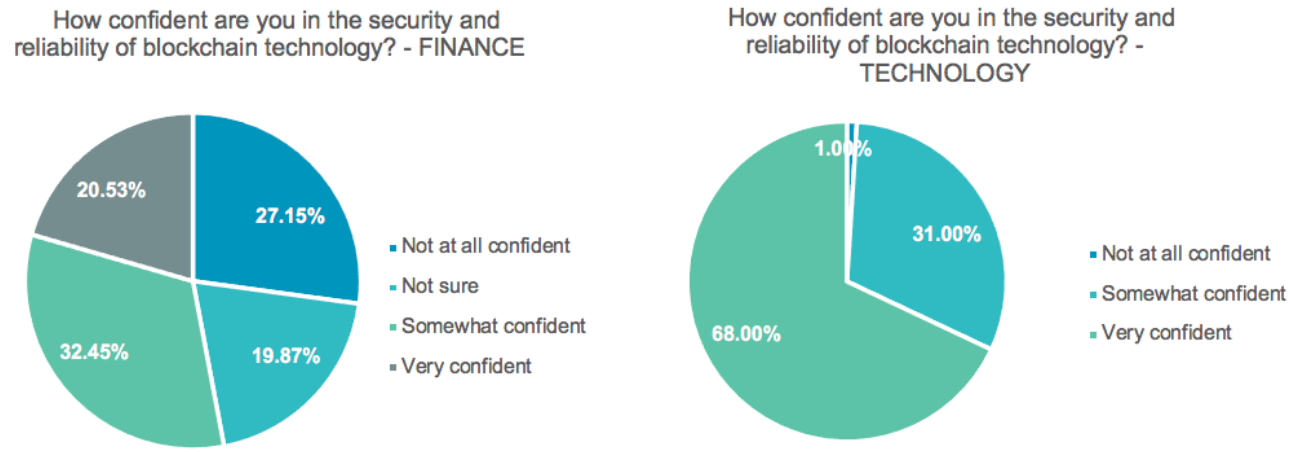


Source: Author

When considering the challenges in adopting blockchain technology, both sectors identify interoperability with existing systems as a major hurdle. In the finance sector, 21.85% of respondents highlight this challenge, while 27.00% of technology professionals share the same concern. Regulatory uncertainty is also a prominent challenge for the finance sector (18.54%), whereas scalability is a significant concern for the technology sector (61.00%). Interestingly, lack of standardization is mentioned by only 1.00% of technology professionals.

3.1.5. Confidence In The Security And Reliability Of Blockchain Technology

Figure 6, Confidence In The Security And Reliability Of Blockchain Technology Charts

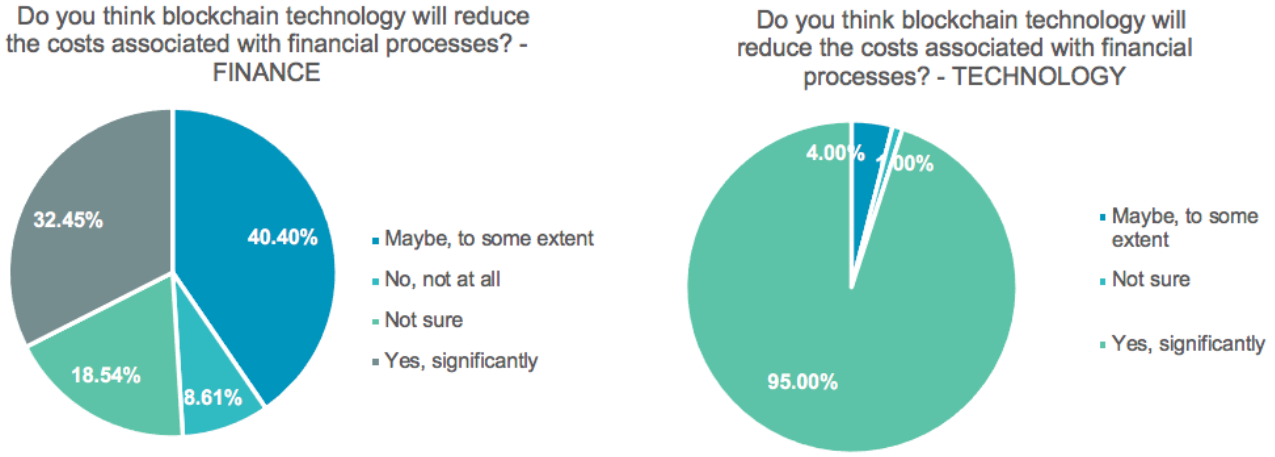


Source: Author

Examining the confidence levels in the security and reliability of blockchain technology, the finance sector exhibits more uncertainty. In this sector, 27.15% express no confidence, while 19.87% are unsure. However, a considerable proportion (32.45%) expresses some level of confidence, and 20.53% are very confident. In contrast, the technology sector shows higher levels of confidence, with only 1.00% lacking confidence, 31.00% having some confidence, and a majority (68.00%) being very confident.

3.1.6. Blockchain Technology's Effect On The Costs Associated With Financial Processes

Figure 7, Blockchain Technology's Effect On The Costs Associated With Financial Processes Charts

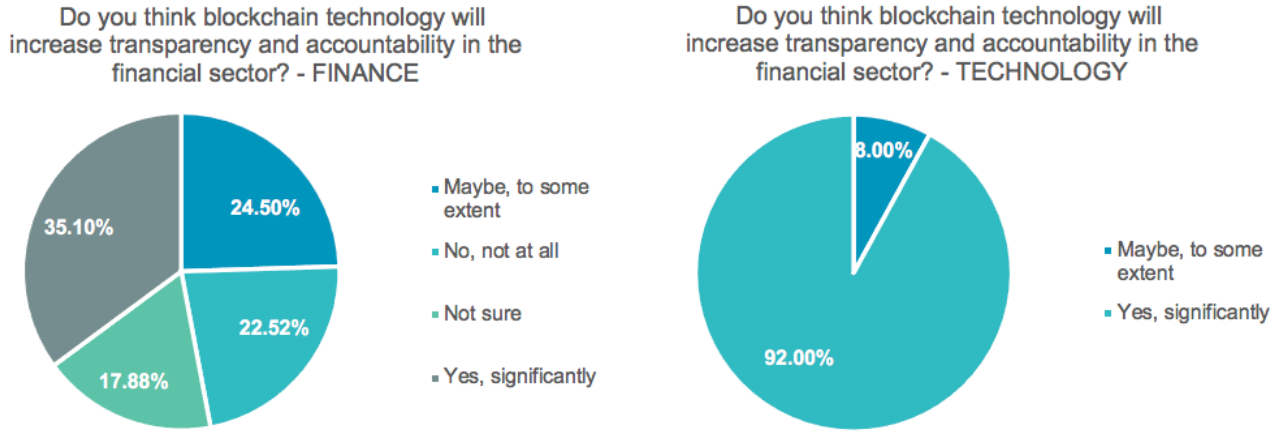


Source: Author

When comparing the responses from the finance and technology sectors regarding the potential impact of blockchain technology on cost reduction, transparency, and personal usage, notable differences emerge. In the finance sector, 32.45% of respondents believe that blockchain technology will significantly reduce the costs associated with financial processes. Additionally, 40.40% think that it will reduce costs to some extent. Comparatively, in the technology sector, an overwhelming majority of respondents (95.00%) believe that blockchain technology will significantly reduce costs, while only 4.00% consider it to some extent. This indicates a stronger belief in the cost-reducing potential of blockchain technology among technology professionals.

3.1.7. Blockchain Technology's Effect On Transparency And Accountability In The Financial Sector

Figure 8, Blockchain Technology's Effect On Transparency And Accountability In The Financial Sector Charts

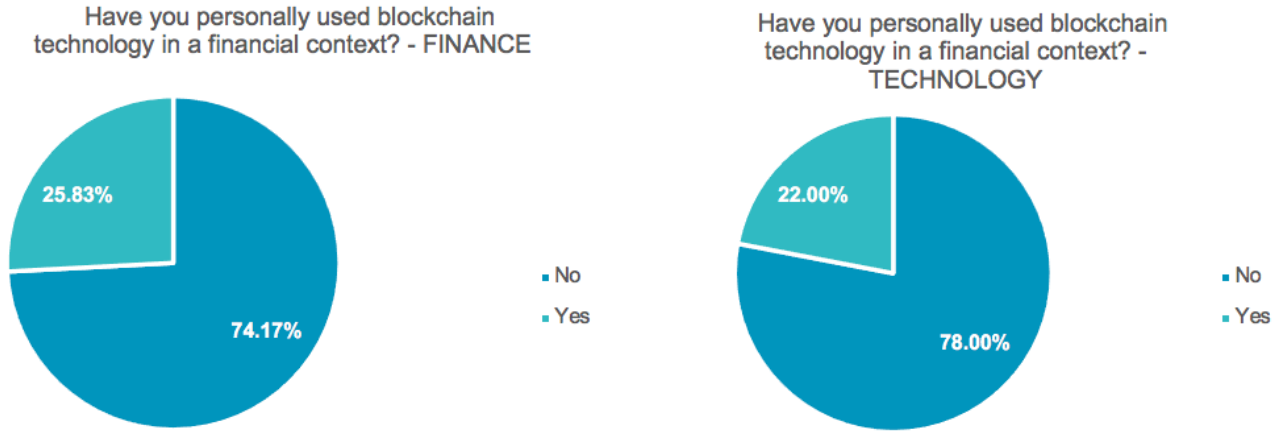


Source: Author

Regarding transparency and accountability, 35.10% of respondents from the finance sector believe that blockchain technology will significantly increase transparency and accountability in the financial sector. Another 24.50% perceive a moderate impact, while 22.52% do not believe it will have any effect. In the technology sector, an even higher percentage (92.00%) believe that blockchain technology will significantly increase transparency and accountability, with only 8.00% considering a moderate impact. This indicates a stronger consensus among technology professionals about the transformative potential of blockchain in enhancing transparency and accountability.

3.1.8. Experience With Blockchain Technology In A Financial Context

Figure 9, Experience With Blockchain Technology In A Financial Context Charts

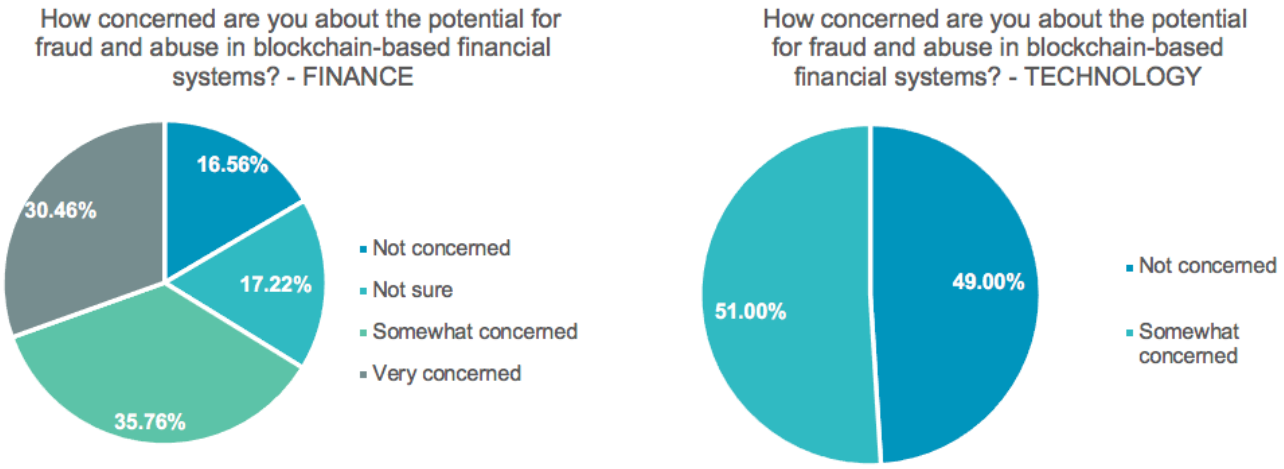


Source: Author

Examining personal usage of blockchain technology in a financial context, the finance sector shows lower adoption rates, with 25.83% of respondents stating they have personally used blockchain technology. In contrast, the technology sector reports a slightly higher adoption rate, with 22.00% of professionals having used blockchain in a financial context. These figures suggest that while blockchain adoption is still relatively low in both sectors, technology professionals have a slightly higher level of personal experience with the technology.

3.1.9. Concerns About Potential For Fraud And Abuse In Blockchain-Based Financial Systems

Figure 10, Concerns About Potential For Fraud And Abuse In Blockchain-Based Financial Systems Charts

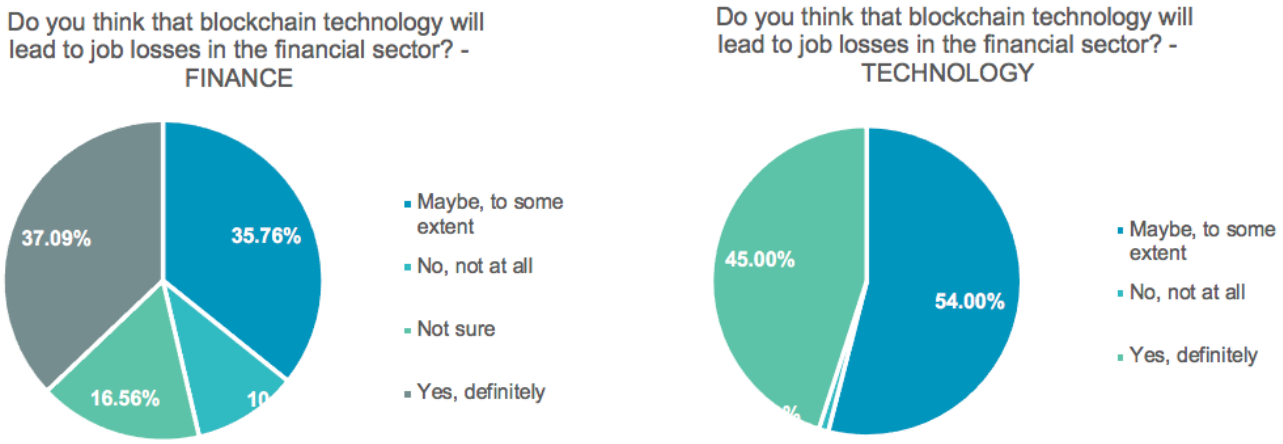


Source: Author

When examining the responses from the finance and technology sectors regarding concerns about fraud and abuse, potential job losses, and the impact on traditional financial intermediaries, distinct patterns emerge. In the finance sector, 30.46% of respondents express a high level of concern about the potential for fraud and abuse in blockchain-based financial systems. Additionally, 35.76% are somewhat concerned. Comparatively, in the technology sector, a smaller percentage of respondents (51.00%) indicate some level of concern about fraud and abuse, with a significant majority (49.00%) stating they are not concerned. This suggests that technology professionals are generally less worried about the risks associated with blockchain-based financial systems.

3.1.10. Blockchain Technology's Impact On Jobs In The Financial Sector

Figure 11, Blockchain Technology's Impact On Jobs In The Financial Sector Charts

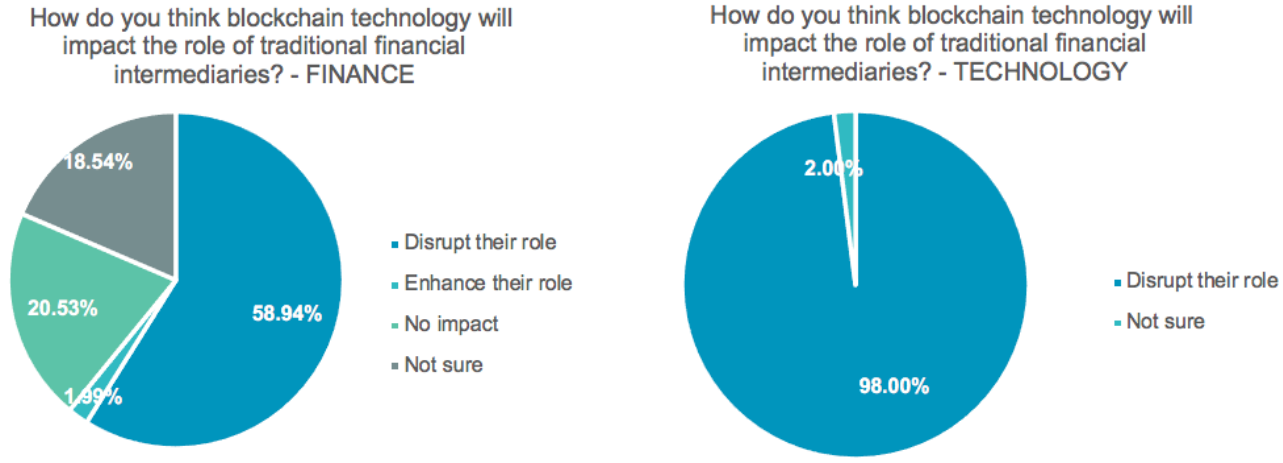


Source: Author

Regarding the potential for job losses in the financial sector due to blockchain technology, 37.09% of finance sector respondents firmly believe that job losses will occur, while 35.76% consider it a possibility to some extent. In contrast, the technology sector exhibits a higher level of concern, with 45.00% stating that job losses will happen, and 54.00% acknowledging it to some extent. This indicates a greater apprehension among technology professionals about the impact of blockchain on employment in the financial sector.

3.1.11. Blockchain Technology's Impact The Role Of Traditional Financial Intermediaries

Figure 12, Blockchain Technology's Impact The Role Of Traditional Financial Intermediaries Charts

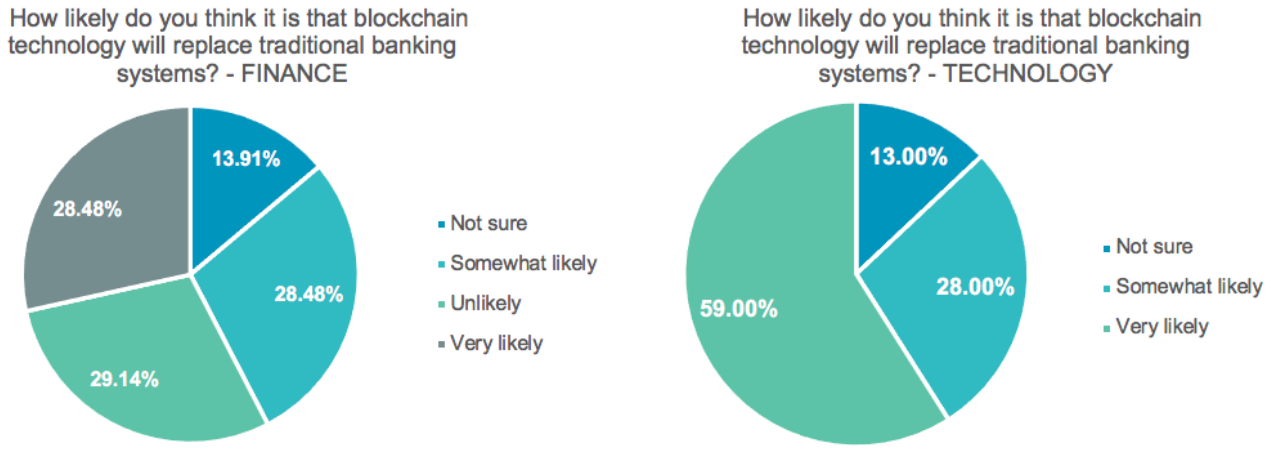


Source: Author

Regarding the impact on traditional financial intermediaries, most respondents from both sectors anticipate disruption. In the finance sector, 58.94% believe that blockchain technology will disrupt the role of traditional financial intermediaries, while only 1.99% think it will enhance their role. In the technology sector, an overwhelming 98.00% predict disruption, with only 2.00% unsure of the impact. This suggests a strong consensus among technology professionals that blockchain technology will significantly disrupt the role of traditional financial intermediaries.

3.1.12. Blockchain Technology's Likelihood To Replace Traditional Banking Systems

Figure 13, Blockchain Technology's Likelihood To Replace Traditional Banking Systems Charts

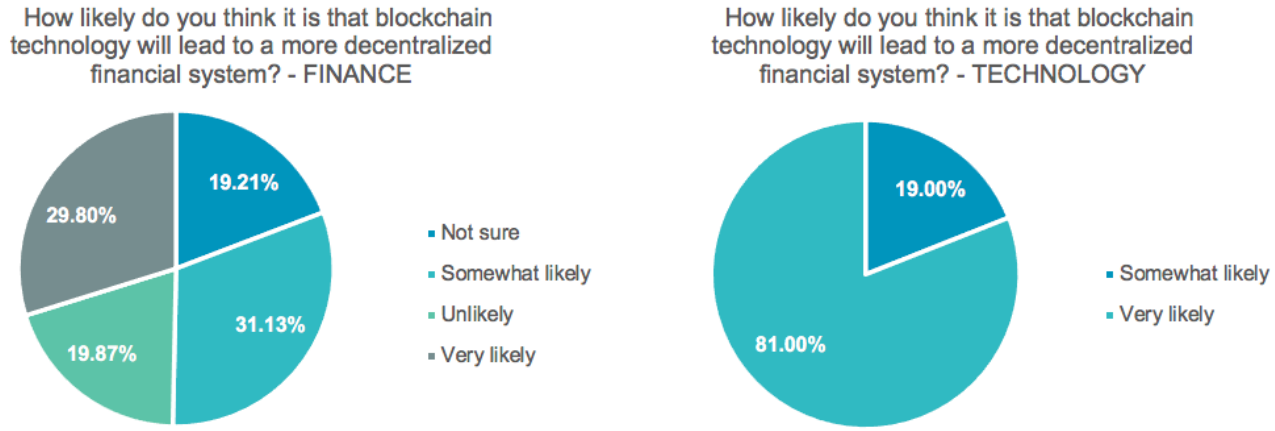


Source: Author

In the finance sector, there is a relatively balanced distribution of responses regarding the likelihood of blockchain technology replacing traditional banking systems. Approximately 29.14% consider it unlikely, while 28.48% believe it is somewhat likely or very likely. Additionally, 13.91% are unsure. On the other hand, in the technology sector, there is a higher level of confidence in this possibility, with 59.00% stating that it is very likely, 28.00% considering it somewhat likely, and only 13.00% unsure. This suggests that technology professionals have a stronger belief in the potential for blockchain technology to replace traditional banking systems.

3.1.13. Blockchain Technology's Liklihood To Lead To A More Decentralized Financial System

Figure 14, Blockchain Technology's Liklihood To Lead To A More Decentralized Financial System Charts

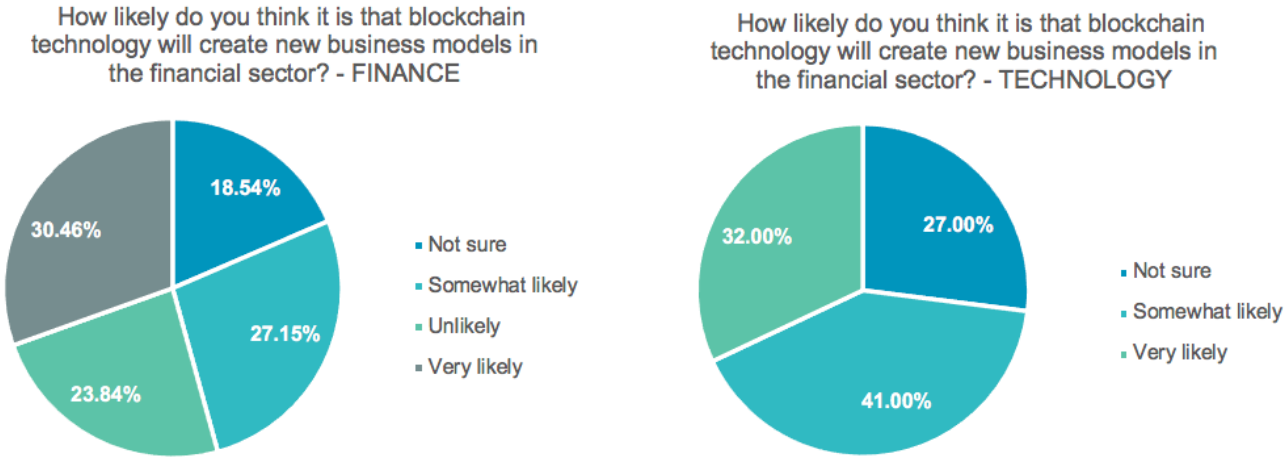


Source: Author

Regarding the likelihood of blockchain technology leading to a more decentralized financial system, a similar pattern emerges. In the finance sector, 19.21% are unsure, 31.13% believe it is somewhat likely, and 29.80% consider it very likely. Conversely, in the technology sector, a significant majority (81.00%) express a high level of confidence in the potential for blockchain technology to achieve a more decentralized financial system, with 19.00% stating it is somewhat likely. The relatively lower level of uncertainty in the technology sector implies a greater conviction among technology professionals about the transformative power of blockchain in decentralizing the financial landscape.

3.1.14. Blockchain Technology's Liklihood To Create New Business Models

Figure 15, Blockchain Technology's Liklihood To Create New Business Models Charts

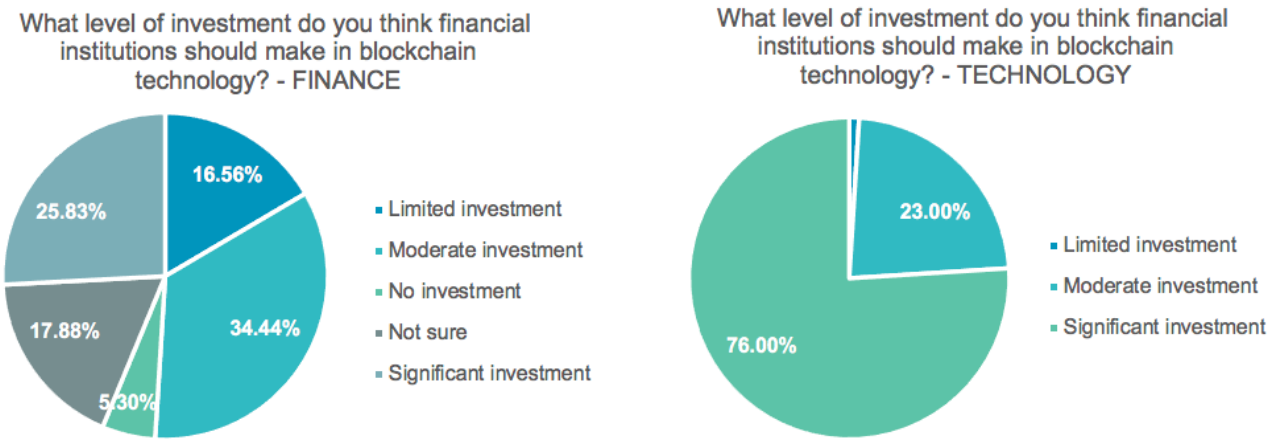


Source: Author

Regarding the creation of new business models in the financial sector, both sectors demonstrate a certain level of uncertainty. In the finance sector, 18.54% are unsure, while 27.15% consider it somewhat likely and 30.46% believe it is very likely. In the technology sector, 27.00% are unsure, 41.00% find it somewhat likely, and 32.00% think it is very likely. This indicates that while there is some degree of consensus on the potential for new business models, there remains a need for further exploration and understanding of the specific ways in which blockchain technology can drive innovation in the financial sector.

3.1.15. Level Of Investment Financial Institutions Should Make In Blockchain Technology

Figure 16, Level Of Investment Financial Institutions Should Make In Blockchain Technology Charts

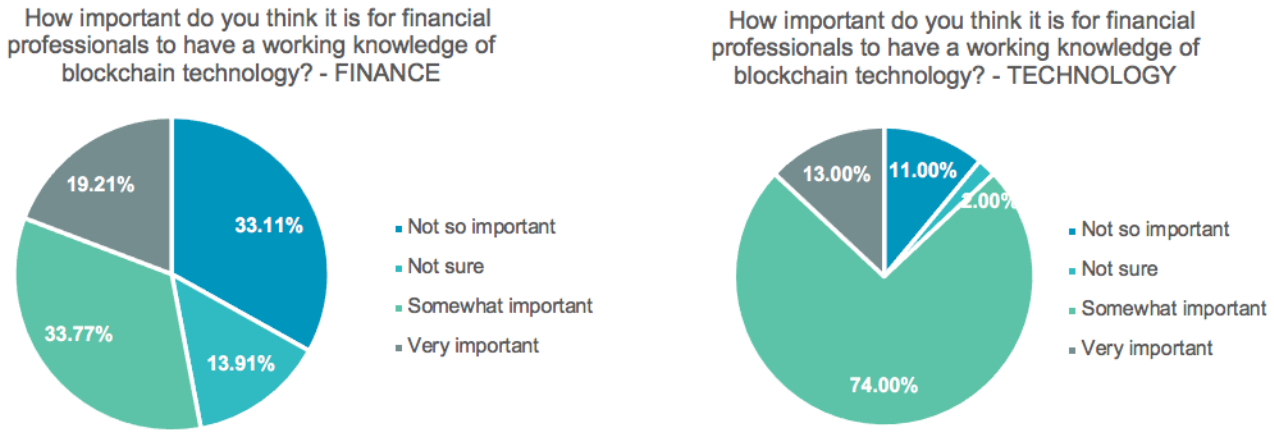


Source: Author

In the finance sector, opinions regarding the level of investment in blockchain technology are more diverse. While 34.44% advocate for moderate investment and 25.83% support significant investment, a considerable portion (16.56%) suggests limited investment, and 5.30% believe no investment should be made. Additionally, 17.88% express uncertainty in determining the appropriate level of investment. On the other hand, the technology sector exhibits a more unified viewpoint, with 76.00% advocating for significant investment in blockchain technology, 23.00% endorsing moderate investment, and only 1.00% suggesting limited investment. This discrepancy suggests that technology professionals perceive a greater potential for blockchain technology and its value in financial institutions, thereby emphasizing the need for substantial investment

3.1.16. Importance Of Working Knowledge Of Blockchain Technology For Finance Professionals

Figure 17, Importance Of Working Knowledge Of Blockchain Technology For Finance Professionals Charts



Source: Author

The survey results indicate a notable disparity in the perceived importance of blockchain technology knowledge between finance and technology professionals. Among finance professionals, 33.11% consider having a working knowledge of blockchain technology as not so important, while 13.91% are unsure about its importance. On the other hand, 33.77% believe it to be somewhat important, and a significant proportion of 19.21% deem it as very important. In contrast, technology professionals hold a different perspective. Only 11.00% of technology professionals consider blockchain knowledge as not so important, with a mere 2.00% expressing uncertainty. A substantial majority of 74.00% believe it to be somewhat important, and 13.00% view it as very important.

These results suggest that finance professionals may have a relatively higher proportion of individuals who do not perceive blockchain knowledge as important or are unsure about its significance. In contrast, technology professionals have a significantly higher proportion who consider it important or very important for financial professionals to possess a working knowledge of blockchain technology. This divergence in opinion could potentially be attributed to the different roles and responsibilities of the two professional groups. Technology professionals, being directly involved in the development and implementation of blockchain solutions, may have a deeper understanding of its potential and relevance to the finance industry. Finance professionals, while acknowledging the importance to a lesser extent, may require further education and awareness regarding the benefits and implications of blockchain technology in their field.

3.2 Correlation Analysis

Questions considered for the correlation analysis:

Q	Questions
Q2	Are you familiar with blockchain technology and its potential applications in the financial sector?
Q3	Do you believe that blockchain technology has the potential to revolutionize the financial sector?
Q6	How confident are you in the security and reliability of blockchain technology?
Q7	Do you think blockchain technology will reduce the costs associated with financial processes?
Q8	Do you think blockchain technology will increase transparency and accountability in the financial sector?
Q9	Have you personally used blockchain technology in a financial context?
Q10	How concerned are you about the potential for fraud and abuse in blockchain-based financial systems?
Q13	How likely do you think it is that blockchain technology will replace traditional banking systems?
Q14	How likely do you think it is that blockchain technology will lead to a more decentralized financial system?
Q15	How likely do you think it is that blockchain technology will create new business models in the financial sector?
Q17	How important do you think it is for financial professionals to have a working knowledge of blockchain technology?

The correlation matrix provides valuable insights into the relationships between various questions related to blockchain technology and its potential applications in the financial sector.

Familiarity with Blockchain Technology: The correlation between familiarity with blockchain technology and other questions in the matrix ranges from weak to moderate positive correlations. It suggests that individuals who are familiar with blockchain technology tend to have a more positive outlook on its potential applications, believe in its ability to revolutionize the financial sector, are more confident in its security and reliability, have used blockchain and believe blockchain will decentralized the financial system and replace traditional banking.

Potential to Revolutionize the Financial Sector: There is a moderate positive correlation between the belief in the potential of blockchain technology to revolutionize the financial sector and other questions in the matrix. It indicates that those who believe in the transformative power of blockchain technology are more likely to see its benefits in reducing costs, increasing transparency and accountability, likely to replace traditional banking, lead to a decentralized financial system and creating new business models.

Confidence in Security and Reliability: Confidence in the security and reliability of blockchain technology shows a moderate positive correlation with various aspects of blockchain adoption and its potential impact on the financial sector. Individuals who are more confident in blockchain technology's security and reliability are also more likely to believe in its potential to revolutionize the financial sector and are more open to its adoption in reducing costs, increasing transparency, leading to a decentralized financial system and creating new business models.

Reducing Costs and Increasing Transparency: The questions related to reducing costs and increasing transparency in the financial sector through blockchain technology exhibit moderate positive correlations. This suggests that individuals who see the potential of blockchain technology to reduce costs are also likely to believe in its ability to increase transparency and accountability.

Personal Use and Concerns about Fraud and Abuse: The correlation between personal use of blockchain technology in a financial context and concerns about fraud and abuse in blockchain-based financial systems is weak. It implies that personal experience with blockchain technology may not necessarily correlate strongly with concerns about its potential risks.

Replacement of Traditional Banking Systems and Decentralization: There is a moderate positive correlation between the likelihood of blockchain technology replacing traditional banking

systems and its potential to lead to a more decentralized financial system. It indicates that those who see the possibility of blockchain replacing traditional banking systems are also more likely to believe in its potential to drive decentralization in the financial sector.

Additionally, most questions have a positive correlation with decentralization. Revolutionize, Security and Reliability, Cost reduction, increased transparency and accountability and the likelihood to replace traditional banking systems, all have a correlation above 0.7 with decentralization.

Creation of New Business Models: The likelihood of blockchain technology creating new business models in the financial sector shows a moderate positive correlation with other aspects of blockchain adoption. Individuals who perceive blockchain's potential to create new business models are also more likely to believe in its transformative power and see its benefits in reducing costs, increasing transparency, and driving decentralization.

Importance of Knowledge for Financial Professionals: The importance of financial professionals having a working knowledge of blockchain technology exhibits weak to moderate positive correlations with various aspects of blockchain adoption. This suggests that individuals who value the importance of blockchain knowledge are more likely to see its potential benefits and believe in its ability to revolutionize the financial sector.

In summary, the correlation matrix highlights several interesting relationships between different aspects of blockchain technology and its potential applications in the financial sector. It suggests that the main perception that drives attitudes and beliefs in blockchain is how strong the individual believes blockchain will lead to a decentralized financial system creating multiple effects: revolutionize the financial sector, increase security and reliability, reduce costs, increase transparency, and will replace traditional banking systems. The correlations also indicate that those who see the potential for blockchain technology to replace traditional banking systems are more likely to believe in its ability to drive decentralization.

Decentralization shows as strongly related to transparency and accountability, as its correlation is the highest (0.88) and highly significant. We can conclude there is a strong relationship between decentralization and transparency as its main effect. Furthermore, personal experience is found with low correlations, suggesting that having experience working with Blockchain is not a key factor in having a positive perception of its applications in the financial sector. Potential for fraud has only negative correlations, suggesting that as the positive opinions on

blockchain technology in the rest of the questions increase, the concerns on this topic decrease, and therefore we can also conclude we need better education on blockchain. Additionally, the importance placed on blockchain knowledge by financial professionals aligns with a positive outlook on its potential benefits and transformative power.

Figure 18, Correlation Analysis

	Q2	Q3	Q6	Q7	Q8	Q9	Q10	Q13	Q14	Q15	Q17
Q2	1.00										
Q3	0.44	1.00									
Q6	0.35	0.77	1.00								
Q7	0.49	0.75	0.61	1.00							
Q8	0.38	0.87	0.72	0.79	1.00						
Q9	0.40	0.27	0.29	0.19	0.21	1.00					
Q10	-0.16	-0.44	-0.61	-0.32	-0.38	-0.20	1.00				
Q13	0.39	0.72	0.62	0.65	0.73	0.26	-0.42	1.00			
Q14	0.40	0.85	0.76	0.74	0.88	0.23	-0.43	0.77	1.00		
Q15	0.38	0.68	0.55	0.61	0.69	0.35	-0.36	0.74	0.68	1.00	
Q17	0.29	0.60	0.68	0.50	0.62	0.28	-0.39	0.65	0.60	0.60	1.00

Source: Author

3.3. Heatmap Analysis

The heatmap provides an overview of the comparison between the finance and technology sectors in terms of professionals' familiarity, beliefs, confidence, and opinions related to blockchain technology.

Familiarity with Blockchain Technology: In the finance sector, 15.23% of professionals are familiar with blockchain technology and its potential applications in the financial sector. In contrast, a higher proportion of professionals in the technology sector (38.00%) are familiar with blockchain technology. The difference of 22.77% suggests that professionals in the technology sector are more likely to be familiar with blockchain technology.

Potential to Revolutionize the Financial Sector: Among finance professionals, 31.13% believe that blockchain technology has the potential to revolutionize the financial sector. In the technology sector, a significantly higher percentage (99.00%) holds this belief. The substantial difference of 67.87% indicates that professionals in the technology sector have a stronger belief in blockchain's revolutionary potential.

Confidence in Security and Reliability: In terms of confidence in the security and reliability of blockchain technology, 20.53% of finance professionals express confidence, while a higher proportion (68.00%) of technology professionals share this sentiment. The difference of 47.47% suggests that professionals in the technology sector are more confident in the security and reliability of blockchain technology.

Cost Reduction in Financial Processes: In the finance sector, 32.45% of professionals think that blockchain technology will reduce costs associated with financial processes. In the technology sector, a significantly higher percentage (95.00%) holds this view. The substantial difference of 62.55% indicates that professionals in the technology sector are more optimistic about the cost reduction potential of blockchain technology.

Increased Transparency and Accountability: Regarding the belief that blockchain technology will increase transparency and accountability in the financial sector, 35.10% of finance professionals agree, while a higher proportion (92.00%) of technology professionals agree. The difference of 56.90% suggests that professionals in the technology sector see greater potential for transparency and accountability through blockchain technology.

Personal Use of Blockchain Technology: In the finance sector, 25.83% of professionals have personally used blockchain technology in a financial context. The technology sector has a slightly lower proportion (22.00%) in this regard, resulting in a small difference of -3.83%.

Concerns about Fraud and Abuse: Finance professionals exhibit a higher level of concern (30.46%) about the potential for fraud and abuse in blockchain-based financial systems compared to the technology sector, where 0.00% express such concerns. The notable difference of -30.46% indicates that professionals in the technology sector are less worried about fraud and abuse in this context.

Replacement of Traditional Banking Systems and Decentralization: In terms of the likelihood of blockchain technology replacing traditional banking systems, 28.48% of finance professionals perceive this possibility, while a higher percentage (59.00%) of technology professionals hold this view. The difference of 30.52% suggests that professionals in the technology sector are more likely to believe in the replacement potential of blockchain technology.

Creation of New Business Models: Both sectors exhibit similar opinions on the likelihood of blockchain technology creating new business models in the financial sector. Finance professionals show a belief of 30.46%, while the technology sector has a slightly higher proportion (32.00%), resulting in a small difference of 1.54%.

Importance of Blockchain Knowledge for Financial Professionals: In the finance sector, 19.21% of professionals consider it important for financial professionals to have a working knowledge of blockchain technology. The technology sector has a slightly lower proportion (13.00%) expressing this importance, resulting in a difference of -6.21%.

In summary, the heatmap provides insights into the differences between the finance and technology sectors regarding familiarity, beliefs, confidence, and opinions related to blockchain technology. Professionals in the technology sector tend to be more familiar with blockchain, have a stronger belief in its potential to revolutionize the financial sector, and exhibit higher levels of confidence in its security, cost reduction potential, transparency, and accountability benefits. They also express lower levels of concern about fraud and abuse and are more likely to see blockchain technology replacing traditional banking systems and driving decentralization. However, both sectors exhibit similar opinions on the creation of new business models and the importance of blockchain knowledge for financial professionals.

Figure 19, Heatmap Analysis

Values	Finance	Technology	Difference
Count of Please select the industry you work in	151	100	-51
Sum of Score: Are you familiar with blockchain technology and its potential applications in the financial sector?	15.23%	38.00%	22.77%
Do you believe that blockchain technology has the potential to revolutionize the financial sector?	31.13%	99.00%	67.87%
How confident are you in the security and reliability of blockchain technology?	20.53%	68.00%	47.47%
Do you think blockchain technology will reduce the costs associated with financial processes?	32.45%	95.00%	62.55%
Do you think blockchain technology will increase transparency and accountability in the financial sector?	35.10%	92.00%	56.90%
Have you personally used blockchain technology in a financial context?	25.83%	22.00%	-3.83%
How concerned are you about the potential for fraud and abuse in blockchain-based financial systems?	30.46%	0.00%	-30.46%
How likely do you think it is that blockchain technology will replace traditional banking systems?	28.48%	59.00%	30.52%
How likely do you think it is that blockchain technology will lead to a more decentralized financial system?	29.80%	81.00%	51.20%
How likely do you think it is that blockchain technology will create new business models in the financial sector?	30.46%	32.00%	1.54%
How important do you think it is for financial professionals to have a working knowledge of blockchain technology?	19.21%	13.00%	-6.21%

Source: Author

3.4. Hypothesis Testing

3.4.1. Hypothesis #1: Financial professionals are not well aware of the blockchain technology implications in the financial sector.

In this hypothesis, the null hypothesis (Ho) states that finance and technology professionals have the same level of awareness of the blockchain implications in the financial sector. The alternative hypothesis (Ha) suggests that there is a difference in awareness between the two groups.

The t-test results indicate a t-statistic of -7.7603, which is greater than the t-critical value of 1.655 (one-tail) and the p-value is less than the significance level of 0.05. Therefore, there is sufficient evidence to reject the null hypothesis. The findings suggest that finance professionals are not as aware as technology professionals of the implications of blockchain in the financial sector, indicating an opportunity for improvement in their knowledge and understanding.

Table 1, Hypothesis #1 testing

	Values
Mean	0.152317881
Variance	0.129977925
Observations	151
Hypothesized Mean Difference	0.38
Df	150
t Stat	-7.760373055
P(T<=t) one-tail	6.0606E-13
t Critical one-tail	1.6550755
P(T<=t) two-tail	1.21212E-12
t Critical two-tail	1.975905331

Source: Author

3.4.2. Hypothesis #2: Finance professionals are not confident in the security and reliability of blockchain technology.

The null hypothesis (Ho) states that finance and technology professionals have the same level of confidence in the security and reliability of blockchain technology. The alternative hypothesis (Ha) suggests that there is a difference in confidence between the two groups.

The t-test results show a t-statistic of -14.3937, which is greater than the t-critical value of 1.655 (one-tail), and the p-value is less than 0.05. Therefore, there is enough evidence to reject the null hypothesis. The findings indicate that finance professionals are not as confident as technology professionals about the security and reliability of blockchain technology. This implies that there might be a lack of trust or understanding among finance professionals regarding the potential of blockchain technology in providing secure and reliable solutions.

Table 2, Hypothesis #2 testing

	Values
Mean	0.205298
Variance	0.164238
Observations	151
Hypothesized Mean Difference	0.68
Df	150
t Stat	-14.3937
P(T<=t) one-tail	2.34E-30
t Critical one-tail	1.655076
P(T<=t) two-tail	4.68E-30
t Critical two-tail	1.975905

Source: Author

3.4.3. Hypothesis #3: Finance professionals believe that blockchain technology has the potential to revolutionize the financial industry.

In this hypothesis, the null hypothesis (Ho) states that finance and technology professionals believe alike that blockchain technology has the potential to revolutionize the financial industry. The alternative hypothesis (Ha) suggests that there is a difference in belief between the two groups.

The t-test results reveal a t-statistic of -17.954, which exceeds the t-critical value of 1.655 (one-tail), and the p-value is below 0.05. Hence, there is sufficient evidence to reject the null hypothesis. The findings suggest that financial professionals do not share the same belief as technology professionals regarding the potential of blockchain technology to revolutionize the financial sector. This difference in perception might be attributed to varying levels of exposure, understanding, or acceptance of blockchain's transformative capabilities among professionals in the two sectors.

Table 3, Hypothesis #3 testing

	values
Mean	0.311258
Variance	0.215806
Observations	151
Hypothesized Mean Difference	0.99
Df	150
t Stat	-17.954
P(T<=t) one-tail	1.7E-39
t Critical one-tail	1.655076
P(T<=t) two-tail	3.4E-39
t Critical two-tail	1.975905

Source: Author

In conclusion, based on the results of the hypothesis tests, it can be inferred that finance professionals exhibit lower awareness, confidence, and belief in the potential of blockchain technology compared to their counterparts in the technology sector. These findings highlight the need for increased awareness and education among finance professionals regarding the implications and benefits of blockchain technology in the financial industry.

3.5. Conclusion and Recommendations

This research paper aims to understand blockchain technology's potential applications in the financial sector, address the risks and challenges that come with the adoption of the technology including lack of understanding among finance professionals, and explore potential solutions to these challenges.

The key findings provide valuable insights into the perceptions and attitudes of finance and technology professionals towards blockchain technology in the financial sector. The correlation matrix highlights several interesting relationships among different aspects of blockchain technology. It suggests that the belief in blockchain's potential to revolutionize the financial sector is a key driver of attitude and perception. Professionals who see blockchain as a catalyst for decentralization are more likely to believe in its ability to revolutionize the industry, increase security and reliability, reduce costs, enhance transparency, and replace traditional banking systems. The correlation between decentralization and transparency is particularly strong, indicating that decentralization plays a vital role in promoting transparency and accountability.

Interestingly, personal experience with blockchain technology shows a low correlation with perceptions, implying that effective communication and education about blockchain are crucial factors rather than individual exposure to working with the technology. Concerns about fraud and abuse exhibit negative correlations with other aspects, suggesting that increased agreement, belief, or confidence in blockchain technology is associated with decreased concerns about fraud. These findings emphasize the need for improved communication and education to enhance understanding and address concerns related to blockchain technology in the financial sector. Additionally, the study highlights the importance placed on blockchain knowledge by financial professionals, which aligns with a positive outlook on its potential benefits and transformative power.

The heatmap reveals distinct differences between finance and technology professionals. Technology professionals exhibit greater familiarity with blockchain, stronger belief in its potential to revolutionize the financial sector, and higher levels of confidence in its security, cost reduction potential, transparency, and accountability benefits. They also express lower levels of concern about

fraud and abuse and are more inclined to envision blockchain technology replacing traditional banking systems and driving decentralization. However, both sectors show similar opinions regarding the creation of new business models and the importance of blockchain knowledge for financial professionals.

The hypothesis tests further support these findings. Hypothesis #1 indicates that finance professionals are not as aware as technology professionals of the implications of blockchain in the financial sector. Hypothesis #2 highlights that finance professionals are less confident than technology professionals in the security and reliability of blockchain technology. Lastly, Hypothesis #3 reveals that financial professionals do not share the same belief as technology professionals regarding the potential of blockchain technology to revolutionize the financial industry.

In summary, the findings suggest a need for improving the awareness, confidence, and belief of finance professionals in blockchain technology. Enhancing their knowledge and understanding can bridge the gap between the finance and technology sectors, enabling finance professionals to fully leverage the benefits of blockchain technology, such as cost reduction, transparency, and the creation of new business models. Effective communication, education initiatives, and fostering a deeper understanding of blockchain's transformative capabilities within the finance industry are essential for unlocking its full potential.

To address this problem, we recommend that financial institutions invest in their employee’s knowledge and skill set by offering training programs, workshops, educational resources and hands-on experience. Additionally, we believe that blockchain technology's financial implications should be integrated into educational institutions' curricula. Offering dedicated courses or modules would ensure that students are well aware and prepared for the revolutionary evolving technologies in the financial sector.

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