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GENG LUO

MASTER THESIS

BLOCKCHAIN REVOLUTION: KAIP INOVACINĖ TECHNOLOGIJA GALI PAKEISTI FINANSŲ SEKTORIŲ	**BLOCKCHAIN REVOLUTION: HOW INNOVATIVE TECHNOLOGY CAN CHANGE THE FINANCIAL SECTOR**

Master degree student **Geng Luo**

Supervisor

Assoc. prof, PhD Alfreda Šapkauskienė

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INTRODUCTION

In recent years, considerable attention has been paid to the financial technologies. FinTech has been thought of as a key factor in financial industry. The past thirty years have seen increasingly rapid advances in the field of FinTech (Carlozo, 2017). The financial industry applies Internet technology to all kinds of financial services, and actively promotes the development of digital transformation of the financial industry, "Finance + Technology" integration development model has increasingly become the consensus of the industry, financial technology applies Big Data, Artificial Intelligence, Blockchain, Cloud Computing and other Internet technology in the financial industry, and constantly innovate the operation management mode, improve the experience of financial services for users, and reduce operating costs.

Blockchain is a term used in the field of information technology. In essence, it is a shared database in which data or information is stored with characteristics such as unfalsifiable, traceable, transparent, and collective maintenance (Treleaven and Yang, 2017). Based on these features, Blockchain technology has laid a solid foundation of trust and created a reliable cooperation mechanism, which has a broad application prospect. Blockchain has potentially huge application value in financial fields such as international exchange, credit certificates, equity registration and stock exchange (Catalini, 2017). Applying Blockchain technology in the financial industry can eliminate the third-party intermediary link and realize direct peer-to-peer docking, thus completing transaction payments quickly while greatly reducing costs (Tian and Lu, 2020). Blockchain has been developing relatively rapidly in the recent years. Internet Data Center has a technology maturity curve chart, that is, any technology would experience a rise from emergence to a high point, and after the heat is over, it may drop to a low point again due to the lack of sufficient application support, because the technology has matured and gradually rose after dropping to a low point (Chang and Zhang, 2020). And Blockchain, the technology itself, has reached the apex of the technology curve in 2018, after which two trends are presented (Casey and Gensler, 2018), on the one hand, Blockchain applications are being landed, on the other hand, after the heat has passed, bitcoin began to plummet, and the public began to calmly look at the value and role of Blockchain technology for the scene (Auer, 2019). Relatively speaking, the best and easiest application scenario of Blockchain is in the financial field, and the application scenario from its

birth, like Bitcoin, is for the development and application of digital currency. The combination of finance and Blockchain is natural, and as the Blockchain technology really enters the application period after settling, the application in the financial field is more and more broad, and the prospect of development is getting better and better (Chen and Bellavitis, 2020). The combination of Blockchain and finance have different values in different scenarios (Eyal, 2017). However, it is inseparable from the characteristics of Blockchain itself, that is, it reconstructs a mechanism of trust creation and transmission, so that the credit transmission of transactions can be better realized by technology, better relying on intermediaries, or even not relying on intermediaries, which reduces the cost of transmission of intermediaries and directly carries out the transformation of value and transactions (Fosso and Kala, 2018). On the other hand, it improves efficiency and reduces costs, including the realization of peer-to-peer distributed transactions, and reduces errors in the process of information transmission (Halaburda, 2018). Further, not only in the financial industry, but also in other fields of application, Blockchain can better facilitate the sharing of information (Casey and Gensler 2018).

During the past years, traditional industries have been regenerated and transformed through technological innovation and metamorphosis, and the way people invest their money is changing significantly due to the incorporation of technological innovation factors (Anjum and Sporny, 2017). There are always dual characteristics of everything, FinTech is also no exception. The challenge of FinTech for the financial industry actually lies in how to combine finance and technology with each other and handle it well (Ozili, 2019). This combination is reflected in the fact that, at first, it may be a challenge from one side to the other, and some competition may arise, but it shall seek to penetrate, and then it is a win-win situation after integration. Blockchain is one of the most dominant FinTech in the world today (Varma, 2019), and is the prime subject of this thesis, which plays a crucial role in the development of the financial industry. This paper will provide an objective analysis of the impact of FinTech on the development of the financial industry, both positively and negatively, as well as a basic outlook on some possible issues in this field. What meaningful and profound impact would blockchain and other financial technologies bring to the entire financial industry? How would it change the financial industry? What are the shocks and challenges that its emergence would bring to the traditional financial industry?

The Aim of the Master Thesis. This paper aims to explore the positive and negative impacts

of Blockchain-based financial technologies.

The Objectives of the Master Thesis:

1. To perform the stages of blockchain based financial technology from previous research.
2. To create a qualitive research methodology based on expert interviews and questionnaire.
3. To analyse the research data and performance of blockchain based financial technology.

Research Methods. In the previous studies refer to the technology of blockchain as a 'profound new technology' (Wright and De Filippi, 2015), a 'disruptive and foundational technology' (Pilkington, 2016), a 'disruptive innovation' (Atzori 2015), a digital revolution (Crosby et al., 2016), or a 'disruptive technological revolution' (Trautman, 2016). Blockchain is ''a distributed transaction database in which different computers—called nodes—cooperate as a system to store sequences of bits that are encrypted as a single unit or block and then chained together'' (Lemieux, 2016). Therefore, a qualitative research method has been taken for this study. The interviews of blockchain experts to collect the information needed, and an evaluated questionnaire is created for the study have been adopted by the author. Exploratory factor analysis (EFA) and Confirmatory factor analysis (CFA) have been applied for data analysis. Library equipment and internet tools such as Google Scholar, SPSS 20, and AMOS 20 are used as tools for this study.

The difficulty point of this study is the collection of data and the limitations of the research results caused by the inadequacy of the personal knowledge and awareness of the author in the fields concerned.

This thesis is composed by three main sections, the first of them is the investigation of blockchain-based emerging financial technologies, which consists of the mechanism of blockchain which includes the potentials and concerns of blockchain in financial sector, the applications of blockchain-based. blockchain-related financial technologies which includes the applying of distributed ledger technology and decentralized finance. the summary of research regarding blockchain-based financial technologies which includes the rational consideration during the development of blockchain, the challenges for development of emerging financial technologies, the outlook of future financial technology development trends and the second section is the research methodology, demonstrate the constructure and process of data collection and study design. The third section is applying Exploratory factor analysis (EFA) and Confirmatory factor analysis (CFA) to analyze the evaluated data, to find out the real performance of Blockchain-based

financial technology.

1. REVIEW OF BLOCKCHAIN-BASED EMERGING FINANCIAL TECHNOLOGIES

Fintech adopts blockchain and other Internet technologies in the financial industry to continuously innovate the operation and management mode and improve the experience of financial services for users. Since the birth of Bitcoin in 2009, blockchain technology has been developed for more than ten years, and its application has already left the scope of digital currency and gradually entered the mainstream technology system from the edge of technological innovation. Among the many application scenarios of blockchain, blockchain + finance can be said to be the most dynamic field at present (Baudier and Kondrateva, 2021). Both traditional financial institutions such as banks and emerging Internet technology companies are actively embracing blockchain and exploring the financial business practices based on blockchain technology.

1.1 The mechanism of blockchain

Blockchain technology is a distributed ledger technology that chronologically connects blocks of data sequentially into a chain data structure and cryptographically guarantees immutability and unforgeability (Chang and Baudier, 2020). Generally speaking, it is a distributed infrastructure and computing paradigm that uses a block-chain data structure to verify and store data, a distributed node consensus algorithm to generate and update data, a cryptographic approach to secure data transmission and access, and a smart contract to program and manipulate data. Blockchain is built on the joint use of multiple technologies, transforming the way data is stored and edited from the underlying architecture level and reshaping the consensus mechanism (Tapscott, 2017). The innovation of this technology is that the distributed network and encryption technology assign the editing, recording and recognition authority of data to each ledger, realizing a transparent and synchronized data recording and updating method, facilitating the traceability, query, and timely knowledge of information (Nakamoto, 2009). From a broader concept of space-time, blockchain technology tries to change and optimize the way data is connected and will certainly have an impact on the operation and trust mechanism of the Internet of Things behind the data (Beinke and Nguyen, 2018). The application of blockchain technology has the following three key features that directly determine its application paradigm: first, the application scenario

has a good data base and involves the issue of mutual trust among multiple parties; second, the scope of information disclosure determines the technical model; third, the business involves data management, authorization management or value transfer (Scott, 2016). The author selects many of significant and valuable previous studies in the field and critically analyze each of them for their given perspectives, followed by an insightful research discussion on them as well as provide the different viewpoints and recommendations from this paper.

1.1.1 The Potentials and Concerns of Blockchain in Financial Sector

'The Bretton Woods System 2015 White Paper' released in January 2015 proposes three phases of blockchain development (Scribd, 2015). 'In the Blockchain 1.0 stage, encrypted digital currency is introduced, mainly in the form of cryptocurrency applications such as Bitcoin. The Blockchain 2.0 stage involves the addition of intelligent contracts, enabling Blockchain to be used in financial or economic markets, and also extend to stocks, bonds, futures, loans, mortgages, property rights, intellectual property and other contracts (Yoo, 2017). The Blockchain 3.0 stage is the widely innovative application stage' (Cai, 2018).

At a time when people are increasingly doubting their trust in financial pivots, it is appealing to have a decentralized system which mitigates the requirement for the trust, like the blockchain. The blockchain as a technology of decentralized replicated ledgers based on Bitcoin as well as those of other cryptocurrencies, offering a potentially engaging substitute for managing contemporary finance (Eyal, 2017). The reasons for the rapid adoption of blockchain in other areas of finance are seen a decade after the release of Bitcoin. This is simply due to the fact that cryptocurrencies run into minimal legal and commercial hurdles, and thus could move forward rapidly after Bitcoin addressed the issue of engineering (Halaburda, 2018). There are many other potential financial applications for blockchain, such as mainstream payments and settlements, securities issuance, clearing and settlement, derivatives and other financial instruments, transaction repositories, credit bureaus, corporate governance, etc. (Hofmann and Strewe, 2017). The use of blockchain in many of these areas is already technologically viable while the major challenges are related to legislative, supervisory, systemic as well as business sides. It is likely to require a period of years to surmount these legislative hurdles, which the majority of financial intermediaries are able to use as a window of time to quickly reconstruct the trust they have lost

to withstand the challenges from blockchain (Zhang and Xie, 2020). Nevertheless, as to whether they could successfully reconstruct the trust or as to why they would be overtaken by the new technologies is yet to be seen. Blockchain is a technology that is still developing and hence immature (Lewis and McPartland, 2017); it is difficult to forecast how successful it would be beyond the only field of cryptocurrency that has been validated for using it. It takes decades for the radical new technology to achieve its complete potency. Therefore, it is entirely feasible for blockchain to demonstrate its revolutionary nature in the future years, although its successful so far has been sporadic. Businesses ought to pay attention to the technology and be aware of it due to its powerful fundamental ideas and the possible impact it could well have (Olleros and Zhegu, 2016).

The traditional financial system is riddled with many problems, increasing costs through charges and delays, generating friction via superfluous and cumbersome paperwork, and providing opportunities to commit fraud and crime, given the vast amount of data to back it up (Hwa and C.S., 2016). Blockchain is the solution to a range of problems that make the financial system inefficient and susceptible to system breakdown and error. Here are five basic principles underlying the technology of how blockchain works, which are the fundamentals for this technology (Tapascott, 2017):

1. Distributed database
2. Peer-to-peer transmission
3. Transparency of pseudonyms
4. Irreversibility of records
5. Computational logic

Through blockchain-based applications, the consumers would be able to economize on banking and insurance costs massively. Blockchain may enable numerous large corporations to do more with less, streamline their operations, and reduce risk in the process. Blockchain is truly a Game-Changer (Abadi and Brunnermeier, 2019). With the ability to decrease transaction costs between all involved participants within the economy, blockchain facilitates the peer-to-peer model of large-scale coordination which could reduce the redundancy of many current forms of organizing. Blockchain has the potential to disrupt some of the complicated intermediate functions within the profession: status and reputation, mobile value, storage value, debits and loans, transaction value,

insurance, and the management of risk, as well as auditing and tax functions. Blockchain is not considered to be an existing threat for people who enjoin new technology models and transform it internally (Catalini and Gans, 2019).

Blockchain technology is still in its early stages, but it offers an opportunity to essentially change the way financial systems operate (Iansiti and Lakhani, 2017). Existing challenges are to lower the cost of putting trust, prevent criminal intervention, and to make sure there is proper adoption and regulation of this technology. If these issues are addressed, blockchain would offer significant economic, as well as social and political advantages to the community. While blockchain technology is still quite new and facing challenges in terms of technology, the business and regulatory challenges, it presents, there is potential to transform many aspects of the financial services industry and the broader economy (Yermack, 2017). There are new methodologies on the horizon for interventions of capital and risk, which provide a catalyst for the transformation of existing financial industry corporations. These are the technologies that are available to enhance the automation of institutions and broaden financial access (Bohme and Christin, 2015). Nevertheless, there remains an inadequate technical and social foundation to support this technology. Many technological challenges including interoperability performance, security, privacy, governance, as well as scalability have to be surmounted if it is to perform any of its functions. In addition, there is more to the challenge than just the technical aspect. The potential for new arrangements resulting from the transition of existing business models to this technology has been hampered by commercial barriers as well (Saleh, 2020). Blockchain programs need to be fully integrated into current frameworks of social policy. For decentralized blockchain-based financial products, creating an equitable and efficient market as well as safeguarding investors are as essential as a more sophisticated level of finance (Chen and Wu, 2019). As crucial and highly relevant are the objectives of policymaking to assure financial sustainability as well as to prevent from money laundering, tax fraud, and the funding of terrorism. It has social and economic benefits to promote reasonable innovations that are consistent with stated public policy objectives for blockchain technology. Where appropriately applied, such technologies could reduce the "cost of trust," which has multiple manifestations in financial markets and economies. The global economy has an ancient distrust challenge which has been traditionally fixed through the centralization of intermediaries (Deloitte, 2018). But blockchain technology delivers a new facility

that can be adapted in applications other than finance and creates a distributed platform for management of confidence, which may make it easier for markets to collaborate and engage in business and issue resolution. There is growing interest in blockchain technology, which covers many use cases outside of the financial world. Examples include Identity, Supply chain, Health records management, and the Internet of Things sector. In short, if the technological and business challenges discussed in this paper would be surmounted, blockchain technology may indeed be a revolution for financial sector reform (Kumar, 2009).

1.1.2 The Applications of Blockchain-Based

First application the author would say is the adoption in supply chain. The author would analyze each of the three flows in the supply chain: information flow, financial flow, and product flow. The highly variable demand and opaque information have been the main trouble for suppliers. In the traditional supply chain, the bullwhip effect caused by opaque information is ubiquitous (Fanning and D. P., 2016). Why is there a bullwhip effect? Because suppliers at all levels do not see the global information and do not trust the information provided by upstream, so they always add some margin to the information they receive. In blockchain, all nodes see the same information, and inventory levels and demand changes are transparent. All suppliers in the supply chain are able to receive accurate information first, which not only reduces inventory, but also shortens response time and provides the basis for lean and customized production (Altus, 2018). But in this aspect of information flow transparency, a great deal of resistance actually lies not in the technology, but in the willingness of the companies at the front end of the supply chain to share information. As the saying goes, a good lean production is all about the suppliers. The host factory pushes all the inventory pressure to the supplier, no matter how volatile the market is, the supplier is required to meet 100% of the supply, this kind of cooperation attitude, even if there is a good technology cannot be solved (Kawasmi and Enas, 2015). Certainly, this point is not discussed in this article. Besides, the financial flow. This part is similar to the application of blockchain in finance. For example, traditional cross-border payment involves different commercial banks and different national central banks, and it takes several days to clear and settle, but with blockchain, the time can be reduced to a few minutes. Also, the various credentials that need to be provided in the clearing and settlement can be easily stored with blockchain technology and are highly credible,

eliminating many troubles. Finally, a word about the physical stream. This part is the closest to the consumer and the one that benefits the consumer the most. With blockchain technology, the whole process of goods from production to logistics to sales is recorded, and this record is not falsifiable (Atzori and Marcella, 2015). It is possible to imagine that the goods you buy, which machine it was produced on, what rework it has undergone, from which transport route to reach you, everything is in control. This is a great benefit to consumers, from now on no longer have to worry about buying fake goods. For merchants, combining the internet of Things and blockchain to record production information, such as production steps, temperature, and humidity, etc., you can quickly find the cause of defective products and make improvements (Cocco and Luisanna, 2017). Then, for example, in the transportation process of fresh food, suppliers can be required to record temperature, water quality and other information to ensure the freshness of fresh products. So, it can be said that blockchain can be most fully utilized in the supply chain management. Because of the huge system of supply chain, which involves all fields of information, finance, and logistics, it makes blockchain can play different roles in different fields.

There is an example of the application of blockchain in supply chain. Provenance is a blockchain startup that provides supply chain traceability services for all types of businesses, enabling the recording of information across the global retail supply chain on the blockchain, allowing consumers to retrieve it in real time and improving information transparency along the supply chain (Milne and Alistair, 2016). According to the white paper of Provenance, the company is currently testing the use of technologies such as serial numbers, bar codes, digital tags represented by RFID and NFC, as well as genetic markers to identify and connect digital assets on the blockchain to physical products, ensuring that there is one and only one physical product that corresponds to it. Each user in the supply chain needs to register on Provenance, and after registration, the user would have a unique private key to prove the authenticity of the identity. Every user with a private key can record information on the blockchain and can also view information within their rights (Nowiński and Witold, 2017). The nature of the blockchain makes the information recorded on the blockchain tamper-evident and irrevocable, which ensures that the product information viewed by the consumer is completely authentic and reliable, thus protecting the consumer's rights and interests (Richter and Chris, 2015). The tracking of Provenance extends through the entire product lifecycle. Users can monitor the target via an

Internet-connected device, transparently tracking the entire process of the origin of the goods and the transactions in between. On the blockchain, consumers can view not only the static attributes of the product, but also the transit flow of the product from the manufacturer to the distributor to the terminal consumer, allowing them to be updated at every step along the way from their smartphones. Through smart contracts built on the blockchain, Provenance is also able to innovate on traditional shopping methods (Trautman and Lawrence, 2017). Consumers could purchase products by entering into a smart contract with the manufacturer, which stipulates that if the price of the product is lower than an agreed price at a certain point in the future, the consumer would purchase a certain amount of the product at that agreed price. Since smart contracts are legally binding and automatically enforceable, manufacturers can predict future revenues based on the quantity and price of goods agreed upon in the smart contract. Consumers will also benefit not only will they have the opportunity to purchase goods at a lower price, but they will also experience a new and innovative way of shopping (Zohar and Aviv, 2015).

The concept of Provenance is that the value of a product is better delivered when consumers know how it was made and how it was delivered. Therefore, Provenance focuses on giving everyone in the supply chain, from design vendors to raw material suppliers, manufacturers, logistics providers, and consumers, the freedom to share the story behind the product on a platform provided by Provenance. By sharing text, images and videos of the manufacturing process, Provenance provides a more holistic view of the trusted manufacturing process behind a product to gain the trust of consumers. This also provides manufacturers with the opportunity to expand their market by tapping more deeply into consumer needs, creating a positive upstream and downstream supply chain ecosystem and virtuous cycle that promotes the common development of the entire supply chain system. Through the application of blockchain in the supply chain, the following future scenario may become a reality: In supermarkets, consumers can scan the QR code on each canned tuna to know exactly where the tuna was caught, certified by which organization, where it was canned, and how it was transported from the place of production to the distributor, each step of which is proved by an immutable timestamp, and the authenticity and accuracy of information in each step of the product flow is fully guaranteed (Altus, 2018). Moreover, the blockchain platform is built so that supply chain finance has characteristics such as immutability, which ensures the authenticity of credit data. Combined with technologies such as smart contracts,

work processes that rely on human resources can be programmed and executed automatically at predetermined times and conditions, reducing the rate of manual errors while also improving efficiency (Swan and Melanie, 2017). Blockchain technology could realize timely information sharing among various participants in the industry chain, such as suppliers, core enterprises, distributors, logistics enterprises and storage supervision companies, and ensure the accuracy of information and data, which will be fed back to financial institutions and realize the control of financial risks, thus solving the problem of difficult financing for small and medium-sized enterprises.

Another application is about the blockchain in banking industry. The sectors where blockchain is deployed most positively in finance are broadening towards settling, transferring money, equities, and commercial agreements. Moreover, the actions to establish a restricted system based on the central bank are accelerating. Also, the blockchain is being used for transactions between banks. The requirements of the consumer and the technical evolution are shifting (Boyce and Mundy, 2017). Meanwhile, the demand for blockchain technology is evolving intensely as the chance to violate the data held by the individuals extends, which is due to the strong demand for blockchain technology. The application forms of blockchain technology include public chain, private chain and alliance chain, etc. An important prerequisite for the application is a broad industry consensus and overall layout. Commercial banks' compliance, legal and security departments still have high doubts about the large-scale application of blockchain technology (Piotrowska and Anna, 2016). At present, the application of this technology in commercial banks is mainly for public asset business and intermediate business. First, the application of blockchain technology in commercial banks is mainly for public business. Compared with the corporate business, the application of retail business faces more difficulties (Mansfield and Steve, 2017). Firstly, the "information sharing" mechanism of blockchain technology enables all subjects on the chain to receive instant information from other users in the chain. For the retail business, the privacy protection of customers is more critical. Although the "pass-through" based recording method could protect the privacy of important information, the technology is still in the exploration stage. Secondly, the conversion between digital currency and actual currency is still not frictionless, and there are time and capital costs. For retail businesses with huge business volume and high instantaneous requirements, large-scale application in a short period of time still

needs to be explored. Second, blockchain technology has a large application space in the field of asset business. The application of asset business includes cross-border trade financing, supply chain financing, etc. In the financing business, by "uploading" the debt and claims, trade records, contract records and inventory information of enterprises involved in the financing chain, banks can restore the real and credible trade scenarios and evaluate the transactions in the chain on the timeline (Bohme and Christin, 2015). The issuance and repayment of each payment will be recorded instantly, making it easy to make judgments. The application of blockchain technology to cross-border trade finance is expected to shorten the existing business processing cycle and improve the security and transparency of the business. Third, blockchain technology helps commercial banks reduce costs and increase efficiency in intermediary business. Blockchain technology will help improve the efficiency of cross-border payment business. First, peer-to-peer transactions between remittance banks and recipient banks eliminate time and capital costs caused by correspondent banks and improve payment efficiency; second, it realizes real-time cancellation of accounts between remittance banks and recipient banks; third, it supports real-time inquiry of transaction transfer status; fourth, data storage is relatively safe (Jordan and Jerry, 2015). In addition to cross-border payment business, blockchain technology can be applied in interbank settlement and clearing network, real-time transaction system, depository receipts, digital notes and other businesses to enhance the efficiency and security of business by using its characteristics of timeliness and traceability.

Nowadays, there is the common issue of high charges and long processes in the cross-border payment sector. For example, a simple bank transfer - from one account to another - must flow through a complex set of intermediary systems before the funds finally reach the target account, from the correspondent bank to the custodian bank, each of which maintains a different ledger from the fund transferring bank to the fund receiving bank, which means that on that final day these different ledgers must be reconciled. Blockchain technology offers the possibility of establishing a global settlement system to solve cross-border payment settlement, which can realize the polycentricity of payment settlement (Ober and Micha, 2013). In cross-border payment settlement, the two depository banks no longer need to go through the cumbersome transaction process of clearing banks and settlement banks, and the payment settlement can be made directly between the depository banks on a peer-to-peer basis, and its trust consensus mechanism solves

the trust problem for both sides of the transaction. Secondly, the multi-center feature of blockchain technology ensures real-time arrival in the process of payment and settlement, and transactions can be made at any time, which greatly accelerates the efficiency of cross-border payment and settlement, and also improves the efficiency of cross-border fund application.

1.2 Blockchain-related financial technologies

From the future development trend, blockchain-based distributed ledger technology and smart contract and other emerging technologies would become closer and closer in the process of practical adoption, and the technical boundaries of each other are weakening, and future technological innovation would increasingly focus on technical crossover and integration areas (Folkinshteyn and Daniel, 2016). Blockchain has a wide variety of usages in the financial industry (Catalini and Gans, 2019). At present, the most widespread and successful adoption of blockchain technology is the digital currency represented by Bitcoin, but theoretically speaking, the technical system around blockchain could create richer and more valuable financial products and services. Currently, blockchain-based applications in the financial industry mainly include first, blockchain transaction networks. Such as P2P-based cross-border payments and remittances, trade settlements, and the purchase and sale of securities, futures and financial derivatives contracts. Secondly, it uses its decentralized credit feature to store relevant data. Blockchain has the characteristics of trustworthiness and traceability, so it can be used as a reliable database to record various information, such as storing the owner's right information of some non-financial assets and personal credit information, etc. (Delphi, 2019). Third, smart contracts. That is, the use of "smart contracts" automatically detects whether there are various conditions for the contract to take effect, and once the predetermined procedures are met, the contract will be automatically executed and processed, such as automatic transactions, automatic interest payments, dividends, etc.

1.2.1 The Applying of Distributed Ledger Technology and Decentralized Finance

Distributed ledger technology refers to the technical infrastructure and protocols that allow networks across multiple entities or locations to simultaneously access, authenticate and record updates in an immutable manner (Chen, 2020). A distributed ledger is a database that replicates, shares, and synchronizes digital data among network members that are distributed across multiple

sites in the network (Dixon 2018). Unlike traditional databases that utilize a central administrator user to control data storage, a distributed ledger has a synchronized database system that provides an auditable history of information records that are visible to any network member. And the distributed ledger relies on a consensus principle similar to that of blockchain. Every blockchain is a distributed ledger, but not every distributed ledger is a blockchain (Financial Stability Board, 2019). The nodes in both have to be decentralized as well as consistent. However, blockchains organize data in blocks and update entries using only additional ledger blocks. In the case of Bitcoin, for example, the Bitcoin blockchain records Bitcoin transactions, but this is just the tip of the iceberg. The blockchain can theoretically record a wide range of data in several different ways, not just limited to cryptocurrency transactions (Chokshi and Dixon, 2018). This includes anything that needs to be permanently recorded, such as healthcare-related records or contracts, etc. Although distributed ledger technology and blockchain share the same definition and the same purpose of decentralized databases or logging databases, they are not exactly the same. Blockchain, which originated in 2008 with the Bitcoin cryptocurrency, is a specific type of distributed ledger with a unique set of features and operational processes (Bank for International Settlements, 2018). Unlike other distributed ledgers, blockchains pack transactions or data sets into cryptographic hash-chain blocks in a sequential chain, and then use a consensus system to determine how to add new blocks to the blockchain, whereas distributed ledgers do not require such one. Distributed ledger technology might not lead to changes in potential risks, but it may lead to the opening of innovative approaches to regulate risks (Euroclear, 2016). Regulators may utilize distributed ledger technology to efficiently regulate financial marketplaces. The underlying premise is for regulation of blockchain-based finance is not supposed to be required to depart on long-established principles regarding the supervision of particular economic activities. On the contrary, there are ways that regulators and supervisors may consider examining on how the use of the technology they have developed in conjunction with the use of the financial sector (Deloitte, 2014). Due to the fact that blockchain incorporates information that is validated by consensus through a devolved economy, it has the potential to take the place of present processes of data transfer and validation. The credibility of the data is ensured by the legislative framework, related departments, and the menace of lawful punishments in the compliance procedures of today (Morgan, 2019). Comparatively, in a distributed ledger technology -based marketplace, the trustworthiness of data

is ensured by monetary incentives. It is imperative of this world that the regulators investigate under what circumstances the financial agreement of the market is sufficient to ensure the data quality available in the decentralized ledger. Efficient supervision could become a key use-case for Distributed ledger technology (Nguyen and Q.K., 2019).

Decentralized finance refers to the shift from traditional centralized financial systems to peer-to-peer finance enabled by decentralized technologies built on the Ethernet blockchain (Huang and Kong, 2019). From lending platforms to stable coins and tokenized bitcoin, the Decentralized finance ecosystem has launched a vast network of integrated protocols and financial instruments. Now with over $7 billion worth of Ethereum smart contracts locked in, decentralized finance has become the most active area of the blockchain space, offering a wide range of use cases for individuals, developers, and institutions (Zetzsche and D.A., 2017). While our traditional financial system runs on a centralized infrastructure managed by centralized institutions, agencies and intermediaries, decentralized finance is powered by code running on the decentralized infrastructure of the Ethernet blockchain. By deploying set-in-stone smart contracts on Ether, Decentralized Finance developers can launch financial protocols and platforms that can run exactly as programmed and can be used by anyone with an Internet connection (Underwood and S., 2016).

The breakthrough of Decentralized Finance is that crypto assets can now be used in a way that legal or "real world" asset cannot. Decentralized exchanges, synthetic assets and fast loans are completely novel applications that can only exist on the blockchain (Biais and Bisière, 2017). This paradigm shift in financial infrastructure has many advantages in terms of risk, trust, and opportunity. Decentralized finance leverages the key principles of the Ethernet blockchain to improve financial security and transparency, unlock liquidity and growth opportunities, and support an integrated and standardized economic system (Lee and L, 2016). It has the following advantages. First, the programmability, highly programmable smart contracts can be executed automatically, and new financial instruments and digital assets can be created. Second, invariance, where tamper-proof data coordination across decentralized blockchain architectures improves security and auditability. Third, interoperability. Ethernet's composable software stack ensures that Decentralized Finance protocols and applications can be built to integrate and complement each other. With Decentralized Finance, developers and product teams have the flexibility to build on

top of existing protocols, customize interfaces and integrate with third-party applications (Budish, 2018). As a result, the Decentralized Finance protocol is often referred to as "Money Lego". Fourth, transparency, where every transaction is broadcast to and verified by other users on the network on the public Ethereum blockchain. This transparency around transaction data not only allows for rich data analysis, but also ensures that any user can use the network activity. Ethernet and the Decentralized Finance protocol running on it are also built using open-source code that can be viewed, audited, and built by anyone. Fifth, self-guardianship (Frost and Gambacorta, 2019). By using a Web3 wallet such as MetaMask to interact with unauthorized financial applications and protocols, Decentralized Finance market participants always have custody of their assets and control over their personal data.

Decentralized finance, which is a novel field of financial technology, has the potential to reframe the landscape of nowadays finance as well as produce a new paradigm with respect to entrepreneurs and creativity, demonstrating the commitment and limitations of decentralized business models (Bergstra and Weijland, 2014). Blockchain technology could decrease the cost of transfer, broaden the transaction horizon, as well as the empowerment to perform point-to-point transactions, thereby generating the new parameter for decentralized business models. This new paradigm generates the rise of decentralized finance, using blockchain technology to build a system of alternative finance which could be even more diffused, creative, interoperable, boundary-free as well as visible. And while many challenges still stand to be addressed, both entrepreneurs and innovators are constantly attempting decentralized business models that would not conventionally have been feasible in the absence of blockchain technology. In case of success, the decentralized business models are likely to restructure the current sector with the potential to generate a new horizon for both entrepreneurship and innovation. Additionally, it is possible that by doing so, they might challenge investigators with new hypotheses for illustrating the underlying advantages as well as expenses of decentralization.

1.2.2 The perceived benefits of applying blockchain in banking

The author categorizes the presumed benefits of blockchain technology according to institutional, market and technical indicators shown in Table 1. The institutional indicators characterize the benefits that are grounded on the underlying principles of regulations and rules

across various stakeholders, whereby the benefits come from the areas of governance, culture, and regulation. Blockchain could assist in the evolution of a culture that minimizes deceptive transactions as well as enhancing trust. Records have become audit-worthy through the inclusion of appropriate sources for diverse types of accounts and documentation. Blockchain contributes to the development of a robust governance framework. Blockchain provides many market-based benefits, which are portrayed under both performance as well as business procedures. The reduction and minimization of costs are among the pivotal factors that improve the performance of financial services (Karamchandani et al., 2020). It is essential to look at different expenses from transaction, processing, and administrative costs in order to improve the efficiency of financial markets and reduce risks in business. Business processes also improve with real-time information, eliminating intermediaries and aligning processes. With regard to technical indicators, blockchain offers solutions to help drive perceived benefits. First, it facilitates data quality by providing adequate protection, accuracy, and control. Second, it offers enhanced security and an automated recordkeeping system along with faster disbursement and settlement. In any system, the architecture needs to be robust and resistant to disruptions. Therefore, the infrastructure of a financial system can define the sustainability of operations.

Table 1. Consolidated list of benefits of implementing blockchain in financial services.

Indicators	Perceived benefits	References
Institutional Indicators		
Cultural	Increased trust	New Age Banking Summit Europe (2018), Tecsynt Solutions (2018), Harigunani (2017), Kloppmann (2017), Universal payments (2017), Krause et al. (2016)
	Reduced fraud & fraudulent transactions	Goyal (2018), Nelito (2018), Oza (2018), Tecsynt Solutions (2018), Unocoin (2018), Iyer (2016)
Regulatory	Improvement in regulatory compliance	Banks Editorial Team (2018), Goyal (2018)
	Increased auditability	Rijmenam (2018), Swanitiinitiative (2018), Trade finance (2018), Business Insider Intelligence (2017), Iyer (2016), Umalkar et al. (2016)
Governance	Ensure immutable business rules	Rijmenam (2018), Kloppmann (2017), Song et al. (2016)
	Improved tractability	Trade finance (2018), Umalkar et al. (2016)
	Immutable data record	Research report (2018)
Market Indicators		
Performance	Lower financial cost	Matteson (2017), Consultancy.uk (2016)
	Decreased transaction cost	Business Insider Intelligence (2017)
	Lower operational cost	Accenture (2018), Banks Editorial Team (2018), Centaure (2018), Dale (2018), Gupta (2018), Martin (2018), Nelito (2018), New Age Banking Summit Europe (2018), Oza (2018), Harigunani (2017), Iskandar (2017), IBM (2016), Krause et al. (2016), Song et al. (2016)
	Reduced processing cost	Nelito (2018), Consultancy.uk (2016)
	Reduction in administrative cost	Business Insider intelligence (2017), Matteson (2017), Consultancy.uk (2016)
	Risk reduction	Krause et al. (2016), IBM (2016)
	Increase in efficiency	New Age Banking Summit Europe (2018), Gupta (2018), Rijmenam (2018), Trade finance (2018), Tecsynt Solutions (2018), Harigunani (2017), Krause et al. (2016)
	Improved financial-market efficiency	Unocoin (2018)
Business process	Streamlining the business process	Business Insider Intelligence (2017), Kloppmann (2017)
	Real time information	Business Insider Intelligence (2019), Accenture (2018), Nelito (2018), Rijmenam (2018), Harigunani (2017), Iyer (2016)
	Eliminate intermediaries	Goyal (2018), Gupta (2018)
Technical Indicators		
Data quality	Data protection	Research report (2018)
	Data accuracy	Martin (2018), New Age Banking Summit Europe (2018), Tecsynt Solutions (2018), Harigunani (2017), Consultancy.uk (2016), Iyer (2016), Song et al. (2016), Umalkar et al. (2016)
	Control over data	Centaure (2018), Business Insider Intelligence (2017), Iyer (2016)
Distributed ledger characteristics	Increased security	Centaure (2018), Martin (2018), New Age Banking Summit Europe (2018), Nelito (2018), Research report (2018), Trade finance (2018), Iskandar (2017), Universal payments (2017)

		Umalkar et al. (2016), Iyer (2016), Krause et al. (2016)
	Better record keeping system	Koeppl & Kronick (2017)
	Reduce human intervention	Harigunani (2017)
	Faster settlement	Centaure (2018), Dale (2018), Martin (2018), New Age Banking Summit Europe (2018), Rijmenam (2018), Tecsynt Solutions (2018), Matteson (2017) Consultancy.uk (2016)
Infrastructure	System resilience	Nelito (2018), Swanitiinitiative (2018)
	Robustness	Nelito (2018)
	Automation	Goyal (2018), Tecsynt Solutions (2018), Business Insider Intelligence (2017), Universal payments (2017), Krause et al. (2016)
	Green technology	Cocco et al. (2017)
Information exchange & transactions	Increased speed of transaction	Krause et al. (2018), New Age Banking Summit Europe (2018), Harigunani (2017), Song et al.
	Eliminate the time delay	Oza (2018), IBM (2016)
	Ensure integrity of the system	Swanitiinitiative (2018), Harigunani (2017), Iyer (2016), Song et al. (2016), Umalkar et al. (2016)
	Reduced error in handling and reconciliation	Nelito (2018), Rijmenam (2018), Tecsynt Solutions (2018), Universal payments (2017), Business Insider Intelligence (2017), Matteson (2017), Consultancy.uk (2016)
	Increased speed of transaction	Krause et al. (2018), New Age Banking Summit Europe (2018), Harigunani (2017), Song et al. (2016)

Source: Prepared by the author

The expanding demand for industry applications would reverse drive the continuous innovation and evolution of FinTech. While technology is meeting the needs, it would also be driven by the demand for continuous development and innovation. Financial technology applications in the financial industry to facilitate the transformation and development of the financial industry at the same time, financial business development changes are also constantly derived from the demand for new technology applications, would achieve the reverse drive on the development of financial technology innovation (Hughes and Dwivedi, 2019). Such drive can be reflected significantly from two main lines of development and regulation. First, at the development side, new technology applications drive the financial industry to transform and develop in the direction of inclusive finance, microfinance, and smart finance, while new financial

models derive a series of new demands in various fields such as marketing, risk control and customer service, requiring new technological innovation to meet. Second, the supervision side, the combination of the Internet and finance has brought a series of innovative financial business models, but at the same time the rapid development of Internet finance business has also brought a series of regulatory issues, the same financial supervision has put forward new requirements, the need for regulatory technology innovation to achieve and support (Accenture, 2017). From the future development trend, with the closer integration of finance and technology, the mutual driving effect of technology and demand would be more apparent, and the technological innovation and application development of financial technology would be expected to enter a more benign cycle of interaction stage.

1.3 The summary of research regarding blockchain-based financial technologies

From the previous literatures studied by the author, most of them have an enthusiastic and bullish attitude towards the development of blockchain and fintech. The authors argue that financial technologies represented by blockchain have a strong potential to reshape the entire financial industry and eliminate the existing problematic and inefficient traditional financial system. But the author argues from the technical aspect, blockchain technology still has problems such as high energy consumption, large demand for database storage space and the ability to handle large-scale transactions to be improved, etc. Moreover, the current business environment has certain constraints on the application of blockchain technology on the ground.

1.3.1 The Rational Consideration During the Development of Blockchain

People are supposed to keep a cautious and steady mind on emerging technologies as we could learn from the historical lessons of the technology industry. The vast majority focus the development of today's financial technologies, such as blockchain, on solving the cost of trust and a host of legal and regulatory agency issues, while ignoring some basic considerations for emerging technologies. This is highly likely to trigger a repetition of some historical errors. There is an example given by the author.

At the end of the 1990s, the biggest stock market bubble in history involved ordinary people in the USA and even in many other countries on an unprecedented scale, driven by dotcom and

so-called high-tech stocks. Among the most famous dotcom stocks in the dotcom bubble were Yahoo, eBay, Amazon, etc. These companies had little or no assets, and their shares were bought up by irrational investors in a rush. These companies had almost no assets, and their earnings were even negative, but in 1998-1999 their share prices soared, and their market capitalization once reached tens of billions of dollars. For example, Amazon had a market capitalization of $30 billion at the beginning of 1999, up from $30 billion in 1998. At the beginning of the year, it rose about 20 times. At its peak, Amazon's market capitalization was seven times that of Barnes Noble and Borders, the two largest book sellers in the US, combined, and 200 times its earnings. Compared to its rising share price, Amazon's performance has been poor. At the time, Amazon's quarterly sales on the Internet were only $250 million, compared to a loss of $90 million in 1998.

This is a typical example of bubbles. It was called ‘bubble’ because the dramatic price increases and even inflation of these dotcom and high-tech stocks were not backed up by much information but were the result of massive buying by irrational investors. In conventional financial theory, this should not have happened, and investors have always been able to use a variety of information to distinguish between the real and the fake. At the time, however, there was a widespread belief among shareholders that e-commerce would develop rapidly over the next ten years and that the profits of these dotcoms would soar, and that there was therefore much room for their share prices to rise. This mentality, which exists even before the dotcoms reach the point of rapid profit growth, drives up share prices. And investors believe that even this high share price is reasonable. Investors are reluctant to admit that they have bought shares that have deviated significantly from their true price until there is a problem. Clearly, the dotcom bubble was irrational. The wildly rising share prices of cyber-technology companies without the support of their performance.

The things are different, but the reason is the same, that is, whenever and wherever, facing any exciting emerging technology, people should remain sanity and rationally analyze its shadow side and sunny side, instead of being paralyzed by the opinion of oneself based on subjectivity. There are still many bubbles about emerging technology technologies such as blockchain, and there is still not a day goes by without news being published about an enterprise blockchain platform, and upon digging deeper, it turns out that the platform is run entirely by one company, so that is the reason why the author suggests thinking critically about the field. While most

technologies are now following legislative and financial requirements, some cryptocurrency companies are using the technical advantages of "blockchain" to lobby for legal exceptions for their financial activities (Noizat and P., 2015). In the real world, some systems will trumpet their blockchain, but it turns out that blockchain is only being used as a centrally managed database. Examples include the Walmart/IBM supply chain proposal (all nodes managed by Walmart and located on the IBM cloud), the Maersk/IBM TradeLens system (all nodes managed by Maersk), and the World Food Program refugee funds disbursement program (using a private, single-user Ether instance as the back end). All of these are touting the benefits of blockchain.

1.3.2 The Challenges for Development of Emerging Financial Technologies

There are always two sides of the coin, both development and benefits, but also will face some challenges. First of all, from the regulatory level, regulation of technology will become a trend of application, because technology and financial overlap has generated some new risks need to be regulated for transformation and response. The development of fintech will face new needs and challenges (Beck and Muller 2015), for example, the main body of financial services more diversified, in addition to the traditional licensed financial institutions, some non-licensed, and financial institutions, such as P2P. this regulatory aspect must strengthen a lot of resources and capacity to invest. The second aspect is the industry side, in the standard specification and infrastructure construction of these aspects, are required to enhance. For example, the application of big data artificial intelligence in the financial field, for network security and network information protection, especially in the financial field of financial data security, etc., need to have some new standards and norms to ensure the standardization and sustainability of the use. Of course, there are also security and control for the implementation of the entire financial industry information infrastructure, security, and service requirements. The third side is from the enterprise, that is, from the financial institutions, the enterprise body itself, the application of financial technology is still facing some challenges in terms of manpower, cost, mechanism, talent (Guo and Liang, 2016). For example, the cross-sector of finance and technology, enterprises need to understand both technologies, but also the need to understand the financial application needs and application scenarios, to strengthen the development of new technologies and new areas, in the basic capabilities to continuously improve. Then is the cost of new technology applications, the

entire financial industry is still relatively early development of information technology, and also has a certain foundation, but this foundation will also become an obstacle to the use of new technologies, such as a technology already has a traditional technology system, or the bank to a branch organization for architectural transformation, the previous architecture and information technology infrastructure are centralized, and now to change to distributed, therefore certainly would have to face a huge transformation costs (Upadhyay and N., 2020). There is also a mechanism, the financial industry itself is more sensitive to risk, the traditional management requirements will be higher, and technology is about flexible innovation, the need for trial and error, there is no guarantee that every application can be successful, which is some conflict and contradiction in the mechanism. There is also a lack of talents who understand both finance and technology in general. The last one is the challenge at the individual side, i.e., using fintech as an individual user. While enjoying the convenience brought by technology, they also face the risk of information security, network security and information leakage after the integration of finance and technology.

1.3.3 The Outlook of Future Financial Technology Development Trends

The new generation of information technology forms a convergence ecosystem and drives the development of fintech into a new phase (Monferrer and D., 2019). Emerging technologies such as cloud computing, big data, artificial intelligence and blockchain are n1111ot isolated from each other, but are interconnected, complementary and promote each other. Big data is the fundamental resource, cloud computing is the infrastructure, and artificial intelligence is based on cloud computing and big data, pushing the development of fintech to an intelligent era. Blockchain establishes the environment for the change of financial business infrastructure and transaction mechanism, which cannot be realized without the support of data resources and computing and analysis capabilities. From the perspective of future development trend, new technologies such as cloud computing, big data, artificial intelligence and blockchain are becoming closer and closer in the process of practical application, and the technical boundaries of each other are getting weakened continuously, and the future technological innovation would increasingly focus on the technical crossover and integration area. Especially in terms of specific application implementation in the financial sector, financial clouds and financial big data platforms are

generally centralized and integrated construction, and AI-related applications would also be deployed and realized by depending on centralized platforms (Hassani and Huang, 2018). The development of the new generation of information technology is forming a convergence ecology and driving the development of financial technology into a new phase.

2. METHODOLOGY FOR PERFORMANCE OF BLOCKCHAIN-BASED FINANCIAL TECHNOLOGIES ANALYSIS

The second chapter of the research describes the structure and the process of the methodology for exploring significance of blockchain-based financial technology. It introduces the overall methodological approach for analyzing blockchain based financial technologies. And then it shows the methodology of blockchain based technologies performance data collection. Moreover, it demonstrates methods for blockchain based technologies performance analysis, and in the end last, it discusses the limitation of research and justification.

2.1 The qualitive methodology for analyzing blockchain-based financial technologies from epistemological perspectives

The methodology of this research is adopted by qualitative analysis model to investigate the impact of blockchain-based financial technology on the financial industry. Qualitative research provides a wealth of information, often in a natural environment, void of manipulation, to produce organic results (Merriam, 2009). The information gathered may be used to enhance quantitative results or it may be used to increase background knowledge that would otherwise be difficult to collect through quantitative designs (Muntaner and Gómez, 2003). The benefits of using qualitative data may best be understood by examining the underlying philosophical views, particularly from an epistemological perspective, as the nature of knowledge is characterized and classified by purpose and design. In doing so, “it allows us our insight and our blindness, and on a primary level cut our research into what is acceptable and unacceptable” (Tennis, 2008, p. 104). Merriam (2009) identifies four primary epistemological perspectives including positivist/postpositivist, interpretive/constructivist, critical, and post-modern/post-structural. The positivist/postpositivist approach is designed to observe and measure reality, while an interpretive/constructivist approach is designed to study the multiple realities, descriptions, and experiences of populations (Merriam, 2009). A critical approach is designed to empower and identify emancipatory information, while a post-modern/post-structural approach deconstructs previous truths and rationales (Merriam, 2009). Considering that this study is an inquiry into the impact of blockchain-based financial technologies on the financial industry, as a result, the

research philosophy of interpretivism has been employed by the author in order to better present satisfactory and realistic results. Interpretivism is in association with the philosophical standpoint of idealism as well as has been used to combine multiple approaches which includes social constructivism, phenomenology, and hermeneutics. In accordance with the interpretivist methodology, it is essential for the researcher to appreciate the differences among people as a social character. In addition, interpretivist research typically concentrates on meaning as well as the possibility of deploying various approaches in order to highlight various perspectives of the problem. In research, knowledge sources could be classified into the following four types: 1. The intuitive knowledge that is grounded in intuition, beliefs, convictions, etc. Human senses have a greater effect on intuitive knowledge than reliance by facts. 2. Authoritative knowledge is based on obtained information from books, scientific articles, specialists, supreme powers, etc. 3. Logical knowledge is novel knowledge generated through the application of logical reasons. 4. Empirical knowledge depends on established and certifiable objectively based facts. The research process enables the integration of all of these sources of information into a singular research. Intuitive knowledge could be used to pick particular questions that are to be investigated regarding the chosen research domain, while authoritative knowledge is acquired during the literature review process. In addition, logical knowledge is developed by analyzing the raw data findings and the research discoveries are considered to be empirical knowledge. The interpretative method is grounded in naturalistic approaches for collecting data, in the form of interviews and case studies. Significance in this genre of research usually emerges at the end of the research procedure. The most notable variants of interpretivism consist of the following. Hermeneutics refers to the philosophy of understanding and interpretation. Hermeneutics is primarily concerned with biblical texts and wisdom literature and, as such, has little relevance to business studies. Phenomenology is "a tradition of philosophy which seeks to comprehend the world through the straightforward empirical experience of phenomena" (Littlejohn, 2009). Symbolic interactionism considers symbols as multicultural social objects that originate from culture and have a common sense of significance. In accordance with symbolic interactionism, symbols illuminate the way in which reality is constructed, and interpretivist approaches have been generally underpinned by the following tenets. 1. Relativistic ontology. This approach considers reality to be intersubjective, with senses and understandings rooted in levels of society and experience. 2. Transactional or

subjectivist epistemology. Under this approach, it is important that individuals are not dissociated with their knowledge. Therefore, an explicit connection is established between the researcher and the research subject.

This research is centered on blockchain-based financial technologies. It is the foundational technology for Bitcoin as well as other digital currencies. Developers, entrepreneurs, and technology enthusiasts are among the stakeholders who declare the potential of blockchain to reshape the landscape of modern-day economics, law, politics, and culture. Blockchain-based Fintech has made an impression on the traditional financial industry. After the 2008 credit crisis, the structure of the financial industry has been changed as a result of overall financial supervision and fintech technology innovation (Anagnostopoulos, 2018; Brem et al., 2017). Fintech has three major groundbreaking orientations. The first one involves mobile payments, such as WeChat Pay, Alipay, and Apple Pay. The second one is related to "smart contract", which consists of Chinese brands such as "Ant Financial Services", "Jingdong White Stripe" and "Huabei". P2P lending has also been identified as belonging to the Smart Contact category. The third one is extremely popular which is known as called blockchain. The primary features of these three FinTech sectors are the key subjects of the FinTech industry are instant contact, real-time data, credit rating and updates. The reason why the financial sector has been captivated by blockchain technology is because the characteristics of blockchain make it possible to establish trust more quickly as well as potentially transform the financial infrastructure (Pilkington, 2016). Nevertheless, blockchain is not yet mature. Several challenges have arisen, such as scalability, security, privacy, latency etc. Skeptics claim that the conceptualization and its implementation are still evanescent and inconclusive. It is imperative for the financial markets to have a greater awareness of the blockchain industry and find robust solutions. Under this background, the author seeks to reveal the significance and impact of blockchain-based financial technology on the financial industry through by adopting the qualitative methodology.

The author adopted this methodology with the objectives of 1. Exploring the business beneficiaries by applying Blockchain-based financial technologies. 2. the collecting primary data of massive significance to this study through interviews with experts or experienced practitioners in the financial field related to blockchain technology. 3. Coding and arranging these informative data to create a model for the study. 4. Validating the model and data through Confirmatory factor

analysis and Exploratory factor analysis. 5. To investigate the practicality and real performance of blockchain technology in the financial industry through a series of scientific analysis of the created model. 6. To answer the original research objectives of this paper through the results obtained from the analysis.

2.2 Blockchain-based technologies performance data collection

For the most efficient way to present the significance and performance of blockchain technology on the financial industry, the author used the method namely interviews. This section provides a detailed overview of the method used in this study. In the interview component, a series of information related to the selection of the interviewees and the format and process of the interview questions are described.

The aim of this study has been to develop and validate a comprehensive tool to assess the perceived commercial benefits of implementing blockchain technology in the banking sector. The research and development of the new tool required a comprehensive review of the existing literature followed by qualitative interviews to facilitate the identification of all relevant areas (Zomorodi and Lynn, 2010). According to Domegan and Fleming (2007), "qualitative research attempts to explore as well as uncover issues about the problem under study about which little is known". The literature review and analysis of the list of the published research papers on blockchain technology provided a knowledge base and key insights from previous studies that focused on that the perceived benefits of implementing blockchain technology. From the existing literature, an initial set of 35 projects was identified (Table 3). These are then divided into institutional, market and technical indicators. It was hypothesized that these elements would be most relevant for measuring the benefits of blockchain technology implementation in the banking and related services sector. In the absence of any measures or conceptual models to describe the benefits of blockchain Technology deployment in the banking sector, there are constraints in forming a set of metrics items from the literature review alone. Therefore, the authors supplemented the literature review with a qualitative study as a first step in developing a project to identify the business benefits of implementing blockchain technology in the banking sector in the service industry. Figure 1 shows the four-step methods applied in the study.

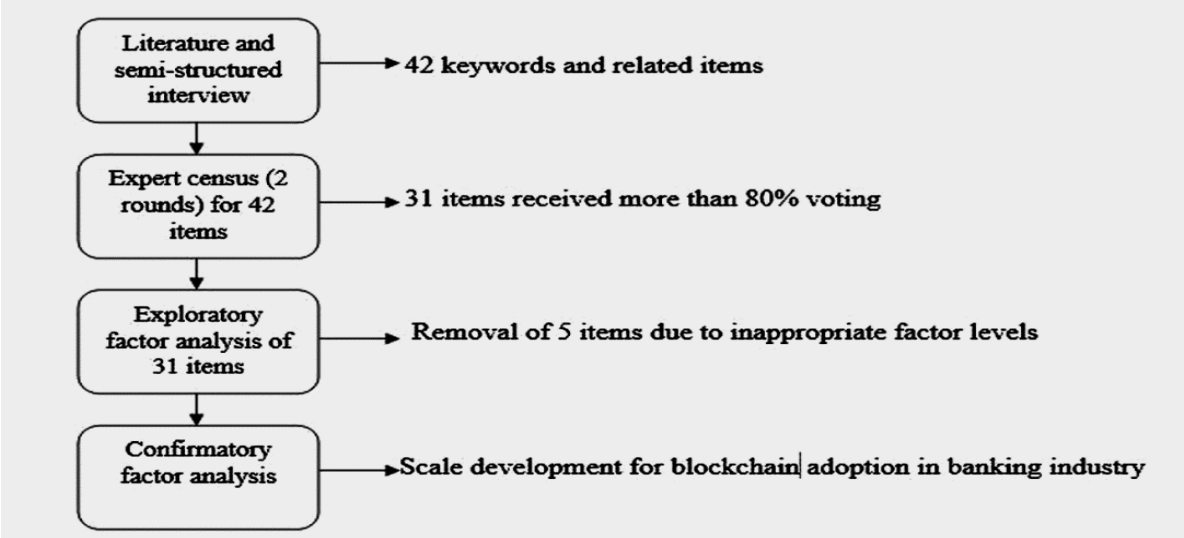

Fig. 1. Methodology adopted in the study.

Source: Prepared by the author

2.2.1 The Construction of Blockchain-Related Experts Interview and Questionnaire Method

The interview method was conducted in this research. It is the most suitable approach for the study considering a substantial amount of information could be acquired regarding the current situation. A substantial amount of information for insight into the current state of development, marketing, and commercial application of blockchain technology could be secured. In addition to the normative information from the respondents, it is also possible to create optional open-ended questions that would be tailored to each respondent's situation. This approach was adopted in this study considering open-ended questions could potentially facilitate more development possibilities and space for the respondents. Furthermore, key blockchain-related insights could be captured from open-ended questions and would be more straightforward and informative than other information. To obtain primary information from blockchain-related specialists and professionals, the semi-structured interviews were conducted. The author requested 30 target respondents, 12 of whom agreed to the invitation and willingly shared their insights and knowledge. The information of experts is shown in table 2. These respondents are appropriate for this research for a number of reasons. Firstly, they are blockchain domain specialists, and the insight they offered for this research is expertise and truly reflect the present state of the industry. Secondly, the respondents' backgrounds are varied. A number of interviewees are from research

institutions, and some are from the sector of blockchain. As a result of their knowledge and understanding of blockchain challenges in different industries, their backgrounds enabled this study to gather raw data from different contexts. Lastly, the respondents reside or work in diverse regions and their knowledge enable this research to have a better perspective on the realm of blockchain.

Table 2. Information of experts

Names(Initials)	Company	Sector	Position
LH	*NetEase*	IT	Senior engineer
ZJH	LINKSOFT	IT	Data science
WYB	35.com	Media	Project manager
YJL	Guizhou Minzu Univeristy	Higher education	professor
LX	Guizhou Minzu Univeristy	Higher education	Asscioate professor
LQ	Guizhou Minzu Univeristy	Higher education	Asscioate professor
LJ	*Thunder*	IT	Systems administrator
GJW	NetEase	IT	Technician
YCY	ICBC	finance	AML analyst
WQ	NetEase	Customer service	Team leader
ZY	Feitian	research	Web developer
SJC	ICBC	finance	Payment specialist

Source: Prepared by the author

Various specialists were identified with different backgrounds, for instance the marketing and corporate communication managers, heads of commercial banking and payment operations, technologists, blockchain consultants and professors coming from universities. There was an abundance of information and knowledge from these specialists about the advantages of adopting blockchain technology in the finance industry. Due to the Covid-19 epidemic period, most of the

interviews were conducted on platforms such as the Microsoft team as well as Tencent meetings, and five meetings were done over the phone, as the table 3 shows.

Table 3. statistics of where interviews happened

Microsoft teams	Tencent meetings	Phone calls
1	6	5

Source: Prepared by the author

During the interviews, the author has applied the notetaking for recording the key words and information provided by the interviewees through a question-and-answer format. Key words are as it follows:

Improve, transparency, trust, data accuracy, risk, reduce, increase, automate, transaction, cost, eliminate, intermediaries, administrative cost, operation cost, real time, tracking, speed, enhance, efficiency, security, integrity, immutable, trail, ensure, fast, secure, system resilience, robustness, traceability, control, value, data, streamline, business processes, business rules, financial fraud, tempering, data protection, regulatory, compliance, error, reconciliation.

At the start of the interviews, the author provided each expert with a thorough description of the goals and objectives of the research and six open-ended questions were presented. Provided goals and objectives of the research as it follows:

1. This interview is to collect the empirical information of blockchain based financial technologies.

2. This interview is designed to explore the real influences of adopting blockchain based financial technologies.

3. This interview is motivated to confirm the theories raised from literature reviews.

It was helpful for the open-ended questions to lessen the likelihood of missing out on items or questions that might have been skipped by the researcher (Nworie, 2011). The non-structured inventory made it possible for the specialists to provide open-ended feedback and enough space to develop the subject matter being investigated (Pereira and Alvim, 2015). Three of the five selected questions were openly associated with the advantages of adopting blockchain, by asking questions such as." Describe few business beneficiaries of applying blockchain in banking

industry" "Describe the practicalities of blockchain in the banking sector", or "Describe how blockchain-based financial technology will reshape the industry". With regard to the other two questions, the respondents were required to supply relevant details about implementing blockchain, including "what challenges do you face by adopting blockchain-based financial technology", as well as "What problems can blockchain solve". Concluding the large amount of qualitative data in a usable and informative project was a pivotal and complicated phase of the research. The summarization of the extensive qualitative data into useful and informative items was a key and complicating stage of the study. In the qualitative content analysis of the first three questions, 42 different keywords were identified to describe the business benefits of adopting blockchain technology in the banking sector. In particular, the responses to the first question (i.e. describing several business benefits of blockchain adoption in the banking sector) allowed experts to answer freely based on their empirical experience and therefore provided valuable information for the delineation of themes and projects. Figure 2 illustrates the framework used for the initial study, where the results of this qualitative structure were used to develop a scale of perceived benefits of implementing the blockchain technology in the banking sector. Based on the qualitative results, the authors developed 42 items indicating the perceived benefits of blockchain adoption by the banking sector.

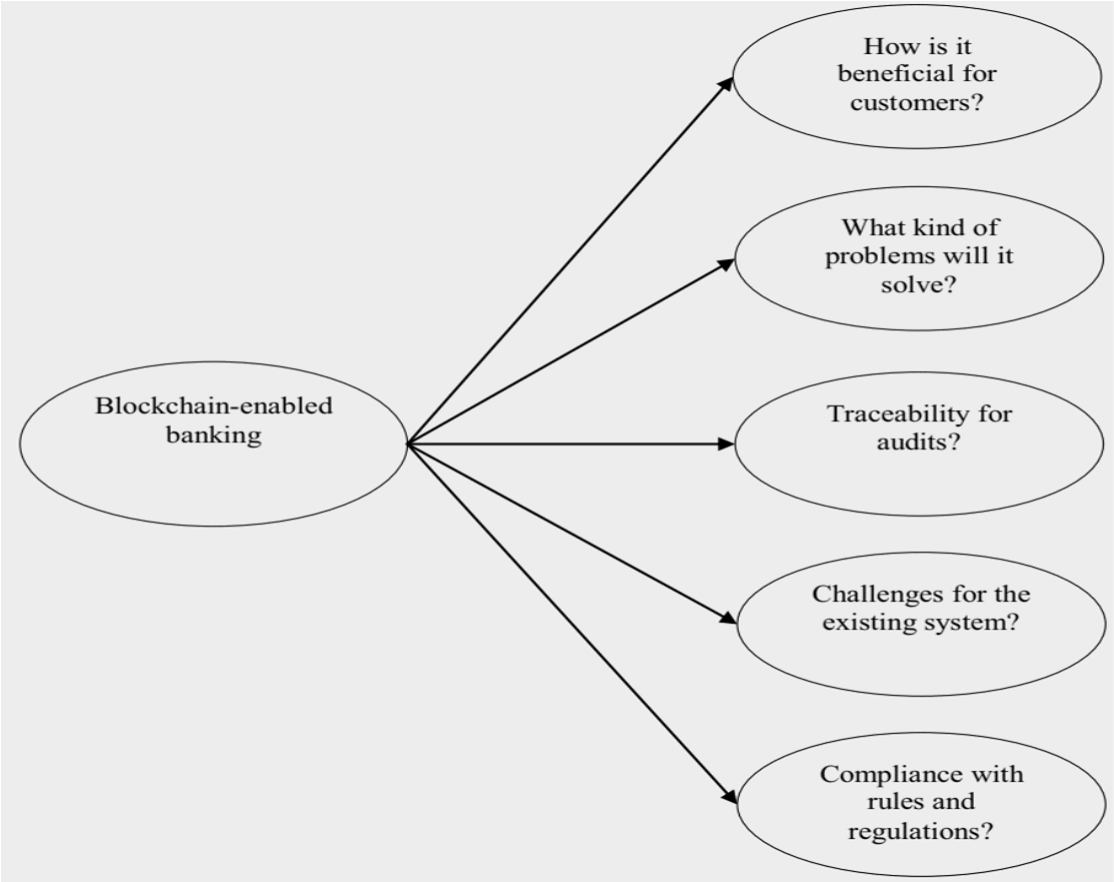

Fig.2. Preliminary framework conceptualized for the qualitative study.

Source: Prepared by the author

Following a critical review of existing literature and expert opinion, it was decided to include 42 items to determine the business benefits of implementing blockchain in the banking sector. The authors created a structured, closed-ended first draft of a questionnaire containing 42 items (a set of questions) identified from the literature review and qualitative research. Experts were asked to rate the importance and necessity of each of the 42 items in measuring the business benefits of implementing blockchain in the banking industry on a 7-point Likert scale (1-not at all important, 2-low importance, 3-slightly important, 4-neutral, 5-medium important, 6-very important, 7-extremely important). In addition, experts were asked to provide feedback/comments on the clarity, ambiguity, wording and content of the items.

The items for the tool were selected based on a consensus of over 80% (i.e. very important, extremely important). Of the 42 items, 28 items scored over 80 points. According to the consensus of the experts' scores, 28 items were important and appropriate for the research survey. However,

14 items scored less than 80%, including revisions. After the suggested changes were made, 42 items were sent to the experts again to rate their suitability. Consensus scores were again calculated for each item. Any project that did not have a consensus score of more than 80% was discarded. In the second round of scoring, the experts agreed that 31 items were appropriate and necessary and did not require further changes to the questionnaire. Expert input was taken at each stage of the questionnaire development. This contributed to the progressive development and refinement of the survey instrument. The authors ensured the validity of the questionnaire's surface and content through several rounds of expert discussions. The items for the survey instrument were selected based on a consensus of more than 80% (i.e. very important, extremely important). Of the 42 items, 28 scored above 80. According to the consensus of the experts, 28 items were important and appropriate for the study. However, 14 items scored less than 80%, including revisions. After making the suggested changes, 42 items were sent to the experts again to rate their suitability. Consensus scores were again calculated for each item. Any project that did not have a consensus score of more than 80% was discarded. In the second round of scoring, the experts agreed that 31 items were appropriate and necessary and did not require further changes to the questionnaire. Expert input was taken at each stage of the questionnaire development. This contributed to the progressive development and refinement of the survey instrument. The authors ensured the validity of the questionnaire's surface and content through several rounds of expert review.

Dornyei ¨ & Taguchi (2009) argued that “questions that have been used frequently before must have been through extensive piloting”. In order to further validate the instrument, before actual data collection took place, the author conducted a final pilot study with a relatively low sample size to measure the business benefits of adopting blockchain in the banking sector. The questionnaire was piloted with the responses from 50 blockchain consultants and blockchain marketing experts. The data was collected through a questionnaire, and it was processed through a statistical package for the social sciences (SPSS 20) for factor analysis. The primary objective of using factor analysis was to refine the item pool. Factor analysis can be conducted in a number of ways and through various methods (Field, 2013). Kaiser (1974) and Costello & Osborne (2005) state that accepting loading values greater than 0.5 “is reliable regardless of sample size.” After conducting the first factor analysis, five items were dropped from the measurement, because their

factor levels were not considered vital as per Kaiser (1974), and the author finally zeroed in on 26 items. The final draft of the questionnaire contained two sections. Section A contained 7 questions designed to define the respondent's profile. Section B contained 26 items designed to measure business paybacks of adopting and implementing blockchain technology in banking operations. The items were presented randomly as statements in the questionnaire. The items were measured using a 7-point Likert scale. The author ensured the content and face validity of the instrument via experts.

The ultimate version of the questionnaire consists of two parts. part A includes 7 items intended to determine the profile of the respondents. part B consists of 26 items intended to measure the business returns of adopting and implementing blockchain technology in banking. These items are presented randomly in the questionnaire in the form of statements. These items were tested with a 7-point Likert scale. The author made sure of the substance and face validity of the instrument through the specialists.

Table 4. Required part A and B

Required part A	Name of the Respondent Organization Department Designation Gender Age range Email ID
Required part B	Blockchain technology will improve the transparency Blockchain technology will increase the trust Blockchain technology will increase the data accuracy Blockchain technology will reduce the risk Blockchain technology will automate actions and transactions between parties Blockchain technology will reduce the transaction cost Blockchain technology will eliminate the intermediaries Blockchain technology will lower down the administrative cost

	Blockchain technology will lower down the operational cost
	Blockchain technology will help in tracking real time business transactions
	Blockchain technology will upturn the speed of transactions
	Blockchain technology will enhance the efficiency of operations
	Blockchain technology will enhance the security
	Blockchain technology will enhance the integrity of the system
	Blockchain technology will create an immutable audit trail
	Blockchain technology will ensure a fast and secure payment process
	Blockchain technology will enhance the system resilience
	Blockchain technology will enhance the robustness
	Blockchain technology will enhance the traceability of transactions
	Blockchain technology will rise the control of value chain on data
	Blockchain technology will streamline the business processes
	Blockchain technology will ensure immutable business rules
	Blockchain technology will prevent from financial fraud and tempering
	Blockchain technology will ensure the data protection
	Blockchain technology will improve regulatory compliance
	Blockchain technology will reduce the error handling and reconciliation

Source: Prepared by the author

To data collection, a convenience sampling method was used. In this study, there was a four-step method used to construct a list of 50 experts. (i) The author determined two units (public and private banking units), (ii) The author has visited the website of each bank, (iii) The author has identified the bank branches in a certain region through the options of search on the website, and (iv) The author has phoned the branches to understand their desire for blockchain technology. And in this way, there were 50 qualified candidates for the survey based on their profile and the blockchain orientation in their organization. As a result, 50 surveys were sent out individually, 36 of which were confirmed, for a response rate of 72%.

2.2.2 Variable Control and Ethical Considerations During Data Collection

In order to ensure the accuracy of the results of the study, the author took into account a series of factors that may influence the study due to subjective as well as objective differences of the respondent group and counted them one by one. such as gender, age, education level, job position, etc. The control variable is anything that is held constant or limited in a research study. It is a variable that is not of interest to the study's aims but is controlled because it could influence the outcomes. Control variables enhance the internal validity of a study by limiting the influence of confounding and other extraneous variables.

In addition to how to effectively collect research data, adequate ethical considerations were simultaneously emphasized by the author. Ethical Considerations could be specified as one of the most important parts of the research. The research may even be doomed to failure if this part is missing. According to Bryman and Bell (2007) the following ten points represent the most important principles related to ethical considerations in dissertations:

1. Research participants should not be subjected to harm in any ways whatsoever.
2. Respect for the dignity of research participants should be prioritized.
3. Full consent should be obtained from the participants prior to the study.
4. The protection of the privacy of research participants must be ensured.
5. Adequate level of confidentiality of the research data should be ensured.
6. Anonymity of individuals and organizations participating in the research must be ensured.
7. Any deception or exaggeration about the aims and objectives of the research must be avoided.
8. Affiliations in any forms, sources of funding, as well as any possible conflicts of interests must be declared.
9. Any type of communication in relation to the research should be done with honesty and transparency.
10. Any type of misleading information, as well as representation of primary data findings in a biased way must be avoided.

2.3 Methods for evaluated items analysis

This section provides a separate description of the data analysis method employed in this

study. the author has adopted thematic analysis for the primary data obtained from the interviews, and Confirmatory factor analysis (CFA) and Exploratory factor analysis (EFA) have been applied following. From the data it has been collected. The demographic information of the respondents is detailed in Table 5.

Table 5: Demographic characteristics respondents.

Demographic Variable	Categories	Percentage
Gender	Female	25%
	Male	75%
Age Range	25–35 years	44.67%
	35–45 year	58.33%
Education	MBA	42%
	B.Tech./B. E	50%
	PhD in finance	8%
Designation	Business head of banks	17%
	Blockchain marketing experts	33%
	Blockchain consultants	42%
	Others	8%

Source: Prepared by the author

There were 36 respondents, of which 25% were female respondents and 75% were male. Majority of the selected respondents (58.33%) were in the age group of 35-45 years and the remaining 44.67% were in the age group of 25-35 years. About 42% of the respondents are management graduates with MBA degrees and 50% have a bachelor's degree in technology/engineering. The remaining 8% of respondents are PhDs in Finance. While Approximately 17% of the respondents are business executives in banks, the following are blockchain marketing specialists (33%), blockchain consultants (42%), and others (8%). The maximum age of the respondents, which shall be indicated, is 45 years, as blockchain has surfaced only in the last decade. As a result, there are limited resources for consultants, experts, and marketers, especially regarding those active in the banking industry. Additionally, experienced executives over the age of 45 are mainly found at the level of strategy rather than the implementation of technology. It was scrutinized whether each respondent was aware of the disruptive blockchain technology and its benefits in the banking industry. It is clear from the respondents' profiles that most of them are involved in blockchain implementation in their own

fields and departments.

2.3.1 Thematic Analysis Employed to the Research

The interviews were transcribed, and thematic analysis was conducted. This involved coding all the data before identifying and reviewing 5 key themes. Each theme was examined to gain an understanding of participants' perceptions and motivations about the significance of blockchain based financial technology. Thematic analysis is a method for analyzing qualitative data that entails searching across a data set to identify, analyze, and report repeated patterns (Braun and Clarke, 2006). It is a method for describing data, but it also involves interpretation in the processes of selecting codes and constructing themes. A distinguishing feature of thematic analysis is its flexibility to be used within a wide range of theoretical and epistemological frameworks, and to be applied to a wide range of study questions, designs, and sample sizes. While some scholars have described thematic analysis as falling within the realm of ethnography (Aronson 1995) or as particularly suited to phenomenology (Joffe, 2011), Braun and Clarke (2006) argue that thematic analysis can stand alone as an analytic method and be seen as foundational for other qualitative research methods. Indeed, the principles of thematic analysis of how to code data, to search for and refine themes, and to report findings are applicable to several other qualitative methods such as grounded theory (Watling and Lingard, 2012) and discourse analysis (Taylor et al. 2012). Because of this flexibility, Braun and Clarke (2006) refer to thematic analysis as a method, as opposed to a more tightly prescribed methodology. Thematic analysis is not bound to a particular paradigmatic orientation; instead, it can be used within post-positivist, constructivist, or critical realist research approaches (Braun and Clarke, 2006). Using thematic analysis in different research paradigms entails harnessing this method to distinct purposes and outputs. Post-positivists can use thematic analysis to focus on individuals' meanings and experiences to gain insights into the external reality, thereby supporting the development of conjectural knowledge about reality. In many interpretivist orientations (e.g., constructivism), thematic analysis can emphasize the social, cultural, and structural contexts that influence individual experiences, enabling the development of knowledge that is constructed through interactions between the researcher and the research participants, revealing the meanings that are socially constructed (Braun and Clarke 2006). Joffe (2011) suggests that thematic analysis is particularly suited to constructivism because, through the

process of analyzing a wide range of data, it can illustrate how a certain social construct develops. In these ways, constructivist thematic analyses will search for more latent, deeper themes within the data. Among those who have described thematic analysis as a post-positivist method (Aronson 1995; Boyatzis 1998). Boyatzis (1998) forwards thematic analysis as a method that can bridge the chasm between the post-positivist pursuit of understanding a reliable, objective, fact-based reality, and the more interpretive aims of many social science.

As compared to many other qualitative methods, thematic analysis is relatively simple to learn and apply. Because it does not require the use of theory to inform analysis (i.e. it can be purely inductive) and because there are published descriptions and examples of the use of this analysis method, thematic analysis is quite accessible to less experienced researchers (King 2004; Braun and Clarke 2006; Nowell et al. 2017). At the same time, it is a powerful method for analyzing data that allows researchers to summarize, highlight key features of, and interpret a wide range of data sets. Furthermore, its methods are foundational to numerous other forms of qualitative analysis; in fact, Braun and Clarke (2006) argued that it should be the first method of qualitative analysis that researchers learn. Finally, and perhaps most importantly, thematic analysis offers researchers great flexibility with respect to: (a) the type of research questions it can address, from personal accounts of people's experiences and understandings to broader constructs in various social contexts; (b) the type of data and documents examined; (c) the volume of data analyzed; (d) the choice of theoretical and/or epistemological framework applied; and (e) the ability to analyze data with an inductive, data-driven approach or a deductive, theory-driven approach (Clarke and Braun, 2013).

2.3.2 The EFA and CFA Data Analysis

The collected primary data was analyzed with the help of different validated statistical tools and procedures. Essential stages and steps required for the development of a measurement scale. This was followed by the factor analysis applied to the collected data. Furthermore, CFA (Confirmatory factor analysis) was used to ensure the validity of the measurement scale. SPSS 20 for EFA (Exploratory factor analysis) and AMOS 26.0 for CFA have been applied. The quality of an instrument can be measured through its reliability (Broadbent et al., 2006). The reliability of an instrument is also a necessary requirement to ensure scale validity. The statistical reliability of

an instrument is referred to as the degree to which scores from a test are stable and consistent. Therefore, in order to develop a reliable instrument, it is important to maintain the reliability of the instrument. There are a number of ways to test the reliability of an instrument, however, the internal consistency and reliability are easy to estimate and are generally found to be effective in the case of field studies (Rust and Cooil, 1994). Internal consistency is a set of items or statements, and the scale shows the degree to which these items are standardized or homogenous.

Exploratory factor analysis (EFA) is a statistical technique for summarizing the information among observed variables into a smaller set of factors. The guidelines given by Straub et al. (2004) and Lewis et al. (2005) on validation suggested that factor analysis should be conducted with the help of EFA. This will help find and define the dimensions for the items measured. EFA is normally the first step in building scales. EFA is conducted to find the dimensionality of a theoretical construct (Iacobucci, 2010). To understand the pattern and structure of data, all 26 items from Section B of the instrument were exposed to an EFA using principal components analysis (PCA) followed by a varimax rotation. The PCA begins by extracting the maximum variances and puts them into the first factor, whereas varimax rotation reduces the total number of variables with high loading against each factor and makes small loadings even smaller. The factor analysis conducted here can therefore be considered as a correct modus operandi to further analyze the data.

The proposed measurement model was examined with the help of CFA(Confirmatory factor analysis) using AMOS 20. The purpose of examining the measurement model is to confirm the existence of the required level of construct reliability and validity before analyzing the inter-relationship of the constructs in the structural model (Ifinedo, 2006; Fornell and Larcker, 1981).

2.4 Limitation of research and justification

The first limitation of the study is the result of this research is limited by the sample size. Due to the limited resources, the author was just able to invite 30 target interviewees and only 12 of them accepted the invitation. For questionnaire only 36 out of 50 respondents. The small sample size may result in a biased result or that the comprehensive understanding of the status of Blockchain adoption cannot be obtained. However, it was difficult to obtain additional respondents because many of their employers did not allow them to attach further information. Furthermore, in the financial industry it is common not to attach information that could have a direct and indirect

impact on their business. The second limitation of the study is the geographic area. Data used for validation of the instrument came from 12 respondents from few areas, it somewhat limits the generalization of the findings. This again restricts the ability to generalize the findings. Testing the instrument in multiple countries would further develop and enhance its applicability. Such further work is necessary to prove the validity and confirm the generalization of the findings from this study.

However, interviewees still provided valuable insights into the current status of Blockchain adoption. Knowledge-hiding was a rising issue. One of the contributions of this research is that, based on reinforcing the previous research on knowledge hiding, discovered some unique reasons for hiding information in the financial industry using Blockchain. Jha and Varkkey (2018) believed that knowledge-hiding might bring one sense of superiority and help him or her to earn respect from others or achieve a better career development.

3. RESULTS OF BLOCKCHAIN-BASED FINANCIAL TECHNOLOGIES PERFORMANCE ANALYSIS

The third chapter of the research describes the exact result of empirical data has been collected by the author. It shows the Exploratory factor analysis of 26 Evaluated Items, Confirmatory factor analysis of Evaluated Items, and the last is reflection and outlook of blockchain-based financial technology.

3.1 Exploratory factor analysis of evaluated items

The quality of an instrument can be measured by its reliability. The reliability of an instrument is also a necessary condition to ensure the validity of a scale. The statistical reliability of an instrument is the degree to which the scores of a test are stable and consistent. Therefore, in order to develop a reliable instrument, it is important to maintain the reliability of the instrument. There are many ways to test the reliability of an instrument, however, internal consistency and reliability are easy to estimate and are generally found to be valid in the context of field studies. Internal consistency is a set of items or statements, and the scale shows the extent to which these items are standardized or homogenized.

The internal consistency and reliability of an instrument can be checked with the help of Cronbach's alpha. A value of Cronbach's alpha greater than 0.7 is acceptable, greater than 0.8 is considered good, and greater than 0.9 is considered to exhibit exceptional internal consistency. In this study, the overall Cronbach's alpha value for the 26 items was approximately 0.909, indicating that the items identified were reliable.

Exploratory Factor Analysis (EFA) is a statistical technique used to summarise information between observed variables into a smaller set of factors. EFA is usually the first step in constructing a scale. EFA is conducted to find the dimensions of a theoretical construct. In order to understand the pattern and structure of the data, all 26 items in Part B of the scale were subjected to EFA using Principal Component Analysis (PCA) and varimax rotation. Principal component analysis first extracted the largest variance and placed it on the first factor, while varimax rotation reduced the total number of variables with large loadings on each factor and made the variables with small loadings smaller. Therefore, the factor analysis performed here can be considered the

correct operational approach for further analysis of the data.

A factor analysis was conducted using PCA with varimax (orthogonal) rotation on 26 items related to measuring the benefits of implementing blockchain in the banking sector. The results of the EFA and the definitions of these factors are shown in Table 6 and Table 4. The analysis yielded five factors that together explained 67.535% of the variance. Factor 1 was described as 'high quality customer service' due to the high loadings of the items such as: increased transparency, increased trust, data accuracy, risk reduction and automation. The first factor is robust and has a high eigenvalue of 2.403 explaining 12.869% of the variance. Factor 2 is referred to as 'cost reduction' as it has high loadings with the following items: reduced administrative costs, reduced transaction costs, elimination of intermediaries, and reduced operating costs. Factor 2 has an eigenvalue of 1.898, explaining 11.048% of the variance. Factor 3 is referred to as 'efficiency and security' because it has high loadings with the following items: real-time, increasing transaction speed, improving efficiency and ensuring the integrity of the system. The variance explained by this factor 3 is 13.657% with an eigenvalue of 2.666. factor 4 is referred to as 'secure remittances' as it has high loadings with the following items: faster settlement, improved traceability, immutable data records, increased control over data, enhanced robustness, and enhanced system resilience. This factor explains 15.077% of the variance and has an eigenvalue of 7.131. factor 5 is referred to as 'regulatory compliance' as it has high loadings with the following items: streamlining business processes, reducing fraudulent transactions, improving regulatory compliance, ensuring immutable business rules and data protection. This factor explains approximately 14.883% of the variance and has an Eigenvalue of 3.462. To better understand these five factors and to show what their items indicate, we have elaborated on these five factors.F1: Quality Customer Service (QCS) The items in this factor relate to the benefits of quality customer service provided by the banking sector.F2: Cost reduction (RC). The items in this factor relate to the benefits of cost reduction in the banking sector.F3: Efficiency and safety (ES). The items in this factor relate to the efficiency and safety benefits of the banking sector.F4: Secure Remittances (SR). The items in this factor relate to the benefits of safe remittances in the banking sector. f5: Regulatory compliance (RC). The items in this factor relate to the benefits of regulatory compliance in the banking sector.

Table 6: Reliability and items loading.

Construct	Items	Description	Standard Factor loading	Cronbach (α)	Composite reliability	Average variance extracted (AVE)	Maximum shared variance (MSV)
Quality customer services	QCS1	Blockchain technology will improve transparency	0.762	0.872	0.873	0.579	0.166
	QCS 2	Blockchain technology will increase trust	0.734				
	QCS 3	Blockchain technology will increase data accuracy	0.803				
	QCS 4	Blockchain technology will reduce the risk	0.802				
	QCS 5	Blockchain technology will automate actions and transactions between parties	0.698				
Reduced cost	RC1	Blockchain technology will reduce transaction cost	0.805	0.867	0.869	0.624	0.166
	RC2	Blockchain technology will eliminate intermediaries	0.752				
	RC3	Blockchain technology will lower down administrative cost	0.726				
	RC4	Blockchain technology will lower down operational cost	0.870				
Efficiency and security	ES1	Blockchain technology will help in tracking real time business transactions	0.827	0.893	0.893	0.626	0.175
	ES2	Blockchain technology will increase speed of transaction	0.829				
	ES3	Blockchain technology will increase efficiency	0.784				
	ES4	Blockchain technology will enhance security	0.748				
	ES5	Blockchain technology will enhance the integrity of the system	0.764				
Secure remittances	SR1	Blockchain technology will create an immutable audit trail	0.778	0.892	0.893	0.582	0.175
	SR2	Blockchain technology will ensure a fast and secure payment process	0.746				
	SR3	Blockchain technology will enhance system resilience	0.762				
	SR4	Blockchain technology will enhance robustness	0.753				
	SR5	Blockchain technology will increase the traceability of transactions	0.782				
	SR6	Blockchain technology will increase the control on data	0.758				
Regulatory compliance	RCo1	Blockchain technology will streamline the business process	0.837	0.883	0.885	0.562	0.146
	RCo2	Blockchain technology will ensure immutable business rules	0.713				
	RCo3	Blockchain technology will prevent from financial fraud and tempering	0.742				
	RCo4	Blockchain technology will ensure data protection	0.704				
	RCo5	Blockchain technology will improve regulatory compliance	0.749				
	RCo6	Blockchain technology will reduce the error handling and reconciliation	0.744				

Source: Prepared by the author

3.2 Confirmatory factor analysis of evaluated items

A CFA test of the proposed measurement model was carried out using AMOS 20. The purpose of testing the measurement model was to confirm the existence of the required level of component reliability and validity prior to analysing the interrelationship of the components in the structural model. The final measurement model indicates the different factors that influence the expected benefits of disruptive blockchain technology in banking, as shown in Figure 3. The building blocks such as 'quality customer service', 'cost reduction, efficiency and security', 'secure remittances' and 'regulatory compliance' are demonstrated by five, four, five, six and six indicator items respectively. Thus, the five building blocks indicating the clear business advantages of implementing blockchain technology in the finance and banking sector are measured through 26 metrics. The convergence and discriminant reliability of the measurement models were assessed to examine their psychometric properties (see Table 4). Internal consistency measures the reliability of the different items included in the survey and is calculated with the help of the Cronbach alpha measure. cronbach alpha is an indicator calculated using pairwise correlations between the selected items and the Cronbach alpha ranges from 0 to 1. it is estimated for individual items of each construct to measure internal consistency (Table 4). a Cronbach alpha score between 0.6 and 0.7 is considered to be the minimum required level of reliability, while for a good level of reliability it should exceed 0.7. the different constructs included in the measurement model are considered to have a fair level of internal consistency, as the alpha values for the constructs 'quality customer service' are 0.872, 'cost reduction' 0.867 , 0.893 for "efficiency and safety", 0.892 for "safety remittances" and 0.883 for "regulatory compliance". Therefore, the measures included were found to be reliable and can be used for further research in structural equation modelling (SEM). In this study, a covariance-based SEM was used as it provides more verifiable features and thus reduces bias in the estimated model. In order to measure the reliability of a construct in the measurement model as well as convergent validity, the composite reliability (CR) can be tested. A CR value greater than 0.7 indicates the presence of adequate scale reliability. Table 4 shows that the composite reliability for "quality customer service" is 0.873, "cost reduction" is 0.869, "efficiency and security" is 0.893, "secure remittances" is 0.893 and "regulatory compliance" is 0.885. It can therefore be determined that the composite reliability for each of the constructs in the proposed model exceeds 0.70, indicating that the model considered represents the adoption of

blockchain in banking All of the constructs considered in the model representing the perceived benefits of adopting blockchain technology have a comparable confidence level. The convergent validity of the constructs indicates the extent to which the items converge, or whether there is a high degree of overall disagreement. Convergent validity is also measured using standardised construct loadings. High values of standardised construct loadings indicate that the items of the construct are substantive and justify its construction. Standardised constructs should have loadings on their observed variables in excess of 0.50. The observed variable loadings in Table 4 were found to be in the range of 0.7 to 0.87. The results indicate that the observed items are satisfactory and clearly represent their constructs. Thus, the presence of convergence ensures that the constructions are sound.

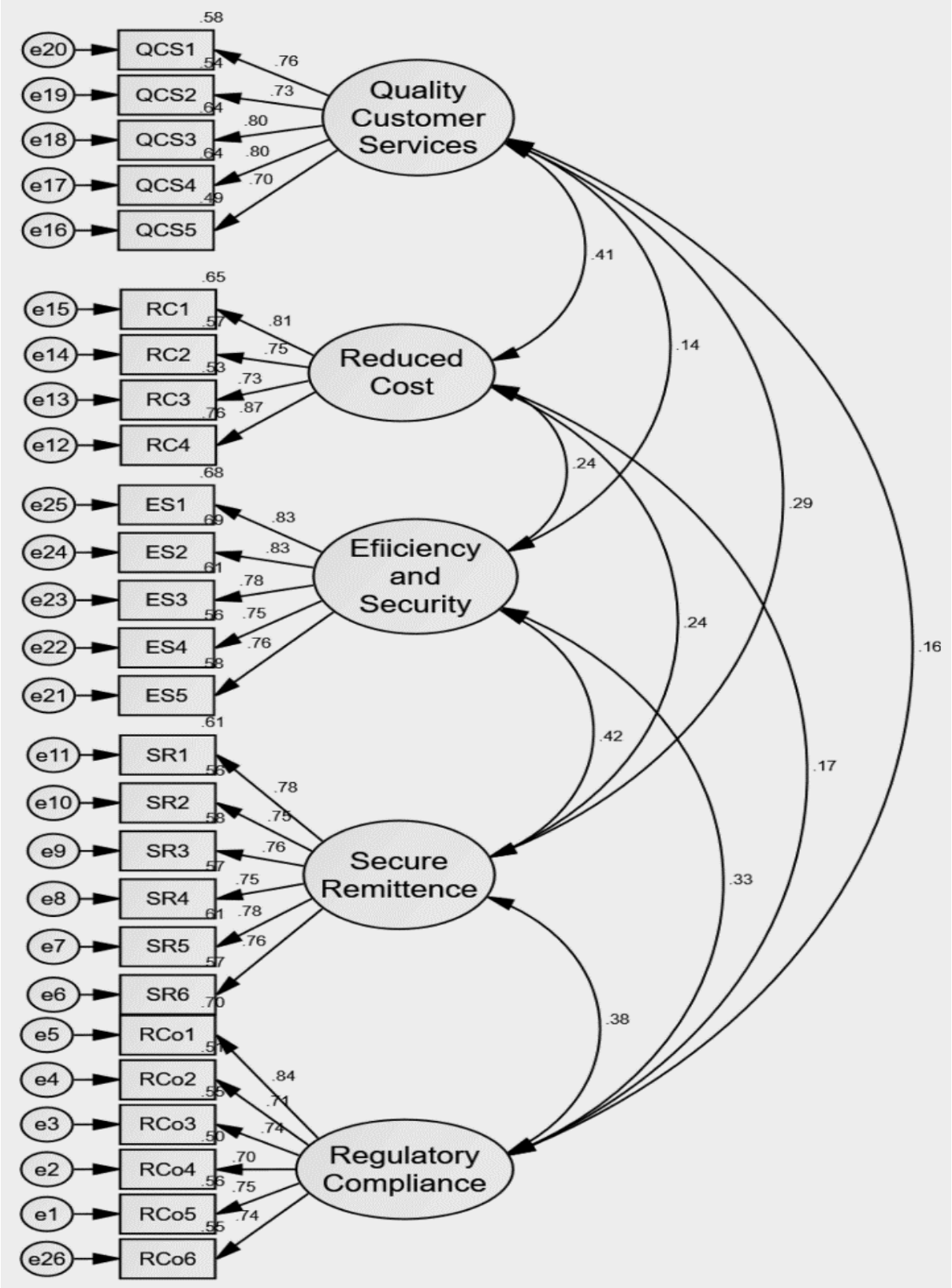

Fig. 3. Measurement model.

Source: Prepared by the author

The extent to which a construct differs from other constructs indicates its discriminant validity. Researchers use two methods to analyse discriminant validity. The first was to measure the correlation coefficient between different pairs of constructs in the model that were also theoretically different and should not be high. This is due to the fact that different sets of items are used to measure different constructs. These items are expected to be different from each other and therefore should not be too strongly correlated. Secondly, the average extracted variance (AVE) specifies whether the individual constructs in the measurement model are higher than the maximum shared variance of each construct and the square root of the AVE, and should be higher than the correlation between the constructs. Table 4 shows that 'quality customer service' has a small optimistic correlation with 'cost reduction', 'efficiency and safety', 'safe remittances' and 'regulatory compliance' (0.407, 0.143, 0.289 and 0.164). However, there was a lower correlation between 'cost reduction' and 'efficiency and security', 'secure remittances' and 'regulatory compliance' (0.242, 0.236, and 0.167). Similarly, 'efficiency and security' had little positive correlation with 'safe remittances' and 'regulatory compliance' (0.418 and 0.329). Finally, there was a small positive correlation between 'safe remittances' and 'regulatory compliance' (0.382). The low correlation between constructs suggests that all constructs included in the model are independent. Furthermore, the AVE estimates suggest that individual constructs are larger than their shared variance between constructs (see Table 6). Furthermore, the square root of the AVE (Table 7) was greater for diagonal constructs compared to non-diagonal constructs. These results suggest that each construct is highly interrelated with its items compared to the other constructs in the measurement model. Consequently, discriminant validity was also found in the proposed measurement model.

Table 7. Correlation matrix and roots of AVE's.

	Quality customer services	Reduced cost	Efficiency and security	Secure remittances	Regulatory compliance
Quality customer services	**0.761***				
Reduced cost	0.407	**0.790***			
Efficiency and security	0.143	0.242	**0.791***		
Secure remittances	0.289	0.236	0.418	**0.763***	
Regulatory compliance	0.164	0.167	0.329	0.382	**0.749***

* The diagonal represents the square root of average variance extracted from observed variables (items); The off diagonal represents correlations between constructs.

Source: Prepared by the author

Table 8. Required part A and B

Model Fit Index	Chi-square/Degree of freedom	CFI	GFI	NFI	TLI	RMSEA
Model	1.604	0.956	0.895	0.893	0.951	0.046

Source: Prepared by the author

The overall validity of the model was assessed with the help of model fit indices such as the Normative Fit Index (NFI), Goodness of Fit Index (GFI), Root Mean Square Error Approximation (RMSEA), Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI). The fit indices for the measurement models are presented in Table 6. the respective values for χ2/df (1.604), CFI (0.956), GFI (0.895), NFI (0.893), TLI (0.951) and RSMEA (0.046) are presented in Table 6. all values are within the acceptable range, except for GFI and NFI. Acceptable values are χ2/df 〈3, NFI, GFI, CFI and TLI〉 0.9, CMIN/DF 〈5 and RMSEA 〈0.8 (Gefen et al., 2000; Gefen and Keil, 1998). values for GFI and NFI are below the threshold of 0.90, but they are so close to the threshold that these values also represent a satisfactory model fit . Table 8 clearly shows that the measurement model has a good fit.

3.3 Analysis of blockchain expert interviews consideration

There are some clear advantages as well as concerns in the current use of blockchain, and they are understood and felt relatively differently by different companies in different positions. The authors have therefore identified experts who can provide us with expert insight into the issues and their advice and have obtained this data set through private one-to-one interviews with them. The purpose of this data set is to look at some of the obvious influences and roles, as well as concerns, that blockchain currently has in the financial industry from the perspective of a blockchain expert. The authors wanted to scrutinize what is a common cross-industry and cross-company issue. These 12 interviews may represent important feedback based on knowledge from their sector or company or both. Information of participants as table 9 shows below:

Table 9. Information of Participants

Participants	Company	Sector	Position
P1	*NetEase*	IT	Senior engineer
P2	LINKSOFT	IT	Data science
P3	35.com	Media	Project manager
P4	Guizhou Minzu Univeristy	Higher education	professor
P5	Guizhou Minzu Univeristy	Higher education	Asscioate professor
P6	Guizhou Minzu Univeristy	Higher education	Asscioate professor
P7	*Thunder*	IT	Systems administrator
P8	NetEase	IT	Technician
P9	ICBC	finance	AML analyst
P10	NetEase	Customer service	Team leader
P11	Feitian	research	Web developer
P12	ICBC	finance	Payment specialist

Source: Prepared by the author

According to P1, blockchain has built a sense of superiority in her team and organization because she feels she has certain new technologies that others are unaware of. An IT-driven environment gives her an advantage over others because her supervisors can assign her higher responsibilities. Her sense of superiority also earns her the respect of her peers in the industry. The use of blockchain is therefore a huge advantage for her. It also reinforces that the respect of colleagues and supervisors can be earned immediately and positive recognition from supervisors may have better career opportunities. the difference between interviewee P1 and P2 is that P2 feels that his advanced blockchain knowledge can put him in a better position than others. He does not intend to show off, but feels more secure because IT is a very competitive industry. This case therefore leans more towards "benefiting at a personal level". Either way, it is easily transferable, depending on the individual's motivation and actual intention to understand and hide the new knowledge of the blockchain. On the other hand, P10 argues that blockchain is not as stable as one would expect in day-to-day use, requires constant reporting to higher levels and has high security risks, his negative aspect of blockchain. p9, on the other hand, believes that this blockchain will increase transparency in operations and transactions and will make customers trust the company more. p3, p8 and p12 give blockchain technology a very high rating on the level of cost reduction. They are fully aware that blockchain will increase the transparency of operations and transactions. They are fully aware that blockchain applications are a very competitive market and that they must be highly skilled and competent in both technical and business areas. As such, they need to have deep knowledge, perform in implementation and experimentation, and adapt their work quickly due to market changes. On the other hand, blockchain technology high performance and security is fresh in P10's mind, and he believes that blockchain can improve the efficiency of bank transfer operations while also ensuring security for his colleagues. P5 believes that blockchain is an area that can evolve rapidly, and employees may have to be equipped with new skills and knowledge, while frequent lecture-based training may not realize long-term benefits. Experiential or problem-based learning can lead to better long-term benefits. p4, p6 and p11 are very appreciative of blockchain in streamlining business and that blockchain technology will prevent from financial fraud and throttling. In this case, ethical concerns about this hidden knowledge should be overcome or improved explicitly before blockchain is widely adopted in the banking and financial services sector. Take these interviewees' recommendations to ensure that blockchain can be used

more widely and more easily.

3.3 Interpretation of results and outlook of blockchain-based technology analysis

This study aims to examine and validate a new technology to measure the perceived benefits and implications of implementing disruptive blockchain technologies in the financial sector. It underwent a comprehensive and systematic literature review, including knowledge gained from interviews with blockchain experts, to gain better insight to develop projects. During the data analysis, 26 fairly large projects were developed. After applying appropriate concepts and scale development techniques, the items were grouped into 5 structures." QCS", "RC", "ES", "SR" and "RCo". Based on the analysis of the statistical results, we defined the business benefits of each perception. Customer service is the key to the success of any business. The use of blockchain technology enables the financial sector, such as banks, to create a new type of service for their customers, which can be built on the "Quality Customer Service" architecture. This construct has five items that offer great potential for improving customer service in terms of increased transparency, improved trust, data accuracy, risk reduction and automation. The implementation of blockchain in the banking industry will improve quality customer service indefinitely by providing consumers with risk-free, tamper-proof, transparent, trustworthy and accurate records. One of the visible business benefits of implementing blockchain in the banking system is the reduction of administrative costs. Using blockchain technology, banks can reduce their overhead expenses by significantly reducing costs, which can be based on a cost reduction construct. This construct has the following: reduced overhead costs, reduced transaction costs, elimination of intermediaries and reduced operational costs. The use of blockchain technology in the banking sector will lead to the elimination of middlemen, which will lead to a reduction in administrative and operational transaction costs. In the banking system, operational security and efficiency are of paramount importance. Blockchain technology can be used to create a secure and efficient exchange of financial transactions - this can be based on an "efficiency and security" architecture. This architecture has five items: real-time, increased transaction speed, increased efficiency, ensuring system integrity, and increased security. Implementing a secure single blockchain network in banks will ensure real-time access, speed of processing paperwork and high transaction speeds, which all lead to ensuring integrity. Secure remittances are another challenge facing the

banking industry, and disruptive blockchain technology can go a long way in speeding up settlement, improving traceability, immutable data records, increasing data control, enhancing robustness and improving system resilience. Yet another benefit of implementing blockchain in the financial sector is the effective and efficient way to ensure regulatory compliance requirements. Blockchain technology can improve private regulatory compliance and it can be based on the construction of 'regulatory compliance'. As such, it can help streamline business processes, ensure fewer fraudulent transactions, and improve regulatory compliance while protecting data. This group of perceived business benefits answers the research objective of exploring business beneficiaries through the application of blockchain-based financial technologies.

The study used a variety of validation procedures, including an extensive literature review (content validity) and review by a committee of blockchain academics and experts (face validity). Pilot testing demonstrated a high degree of structural and content validity. The tool developed consisted of 26 items divided into five structures. Each item was validated with a 7-point Likert scale. The authors consulted 36 blockchain technology consultants and blockchain marketing experts for validation. The instrument had an acceptable level of reliability. The analysis and results of this study indicate that the tool for measuring business benefits is highly reliable and demonstrates construct validity by completing convergent and discriminant validity. The study contributes to both the theoretical and practical perspectives of blockchain technology in the banking industry. On the theoretical side, the study provides an effective tool to help managers assess the benefits of implementing blockchain in the banking industry. The tool is explicitly designed for the banking industry, although some of the benefits may be applicable to other industries, as the study discusses benefits identified by working managers, experts and researchers in the blockchain space. The key points of the study are as follows. (i) it is particularly relevant for acting managers/decision makers/experts to provide a foundational view to gauge the business benefits of implementing blockchain technology before they choose to integrate it in their banking systems, and (ii) the combination of professional and theoretical use leads to the public and technical relevance of this study. Furthermore, blockchain can be designed to fit the needs of the banking ecosystem, which would further help optimise the cost of starting it. These needs could include rising transaction costs, meeting regulatory requirements, improving efficiency and security, and satisfying customers with fast and transparent services.

Blockchain is resilient, robust and a green technology. In addition to this, information exchange and transactions can be seen as a source of perceived benefits in terms of fast transactions, integrated systems, minimal errors and faster reconciliation. With the help of these characteristics, the authors identify areas of banking where blockchain can help transform the industry. Figure 4 illustrates various application areas, ranging from the cost of conducting different activities to consumer services and trade finance, and shows how they can be securely connected to different parts of the value chain.

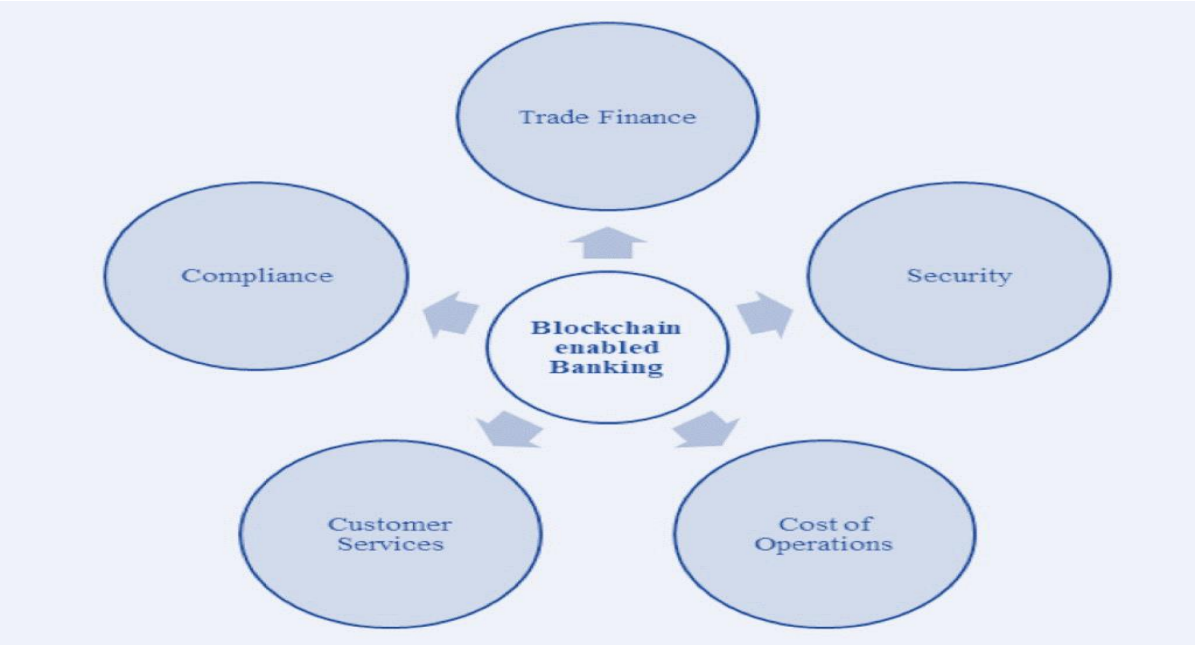

Fig. 4. Application areas of blockchain for the banking industry.

Source: Prepared by the author

Various industries and platforms have encountered difficulties in adopting blockchain. For example, issues related to security, scalability and flexibility often arise in e-government. In addition, the lack of legislative and oversight support is another barrier to blockchain adoption in the public sector. As a result of the analysis of the data collected, the authors classified the challenges of blockchain technology adoption into four categories.

Scalability. Scalability in the processing power has been another aspect of the challenge in terms of the computational capacity of the equipment, which is addressed by restrictions like "sharding". Sharding is a method of dividing computation as well as workload storage into portions. Regarding technology, the currently usable algorithms across different blockchains are very slow

and consumption of higher than estimated energy. Within the scope of energy, the question remains as to how blockchain can contribute to peer-to-peer energy transactions, electric vehicle charging as well as e-mobility. A number of industries have significant investments in their legacy systems that work otherwise smoothly, raising integration with these systems to be an additional challenge for blockchain.

Security. While blockchain technology holds the promise of leading the market for its apparent revenue potential within the near future, the security of blockchain retains worries with the nature of distributed ledger technology (DLT). The key vulnerabilities of DLT lie outside the blockchain, the so-called endpoints, at which individuals and businesses access blockchain-based platforms. Access to data requires both public and private keys, and ownership of the key and content is parallel. Therefore, hackers are likely to steal the key and attack at the weakest point of the system. Because of the weakness of their endpoint's security system (flawed code), vendors are likely to allow other partners to reveal blockchain credentials (Hughes et al., 2019). With many blockchains, inclusive of Bitcoin, attacks coming from decentralized autonomous organizations (DAOs) can come from non-tested code.

Regulation and governance. Despite the fact that numerous organizations look to blockchain to solve many of their issues, they confront also certain challenges. One roadblock has been the lack of understanding and visibility of the technology in organizations. Corporations may also strive to find enough platforms, vendors and partnerships to build prototype blockchains. Encryption of customer data has been another main challenge as a result of heightened hacker knowledge. No directives and guidelines exist on how financial services could use different models of blockchain to administrate their intranet and extranet information exchange for both payments and transactions. While the decentralized method of blockchain technology represents a central feature, it constitutes a limitation for financial services. In a decentralized environment, misalignment of goals and incentives between many stakeholders presents a challenge.

Cost and efficiency. A key concern for many organizations is the cost and efficiency of blockchain. Despite, the considerable ability of blockchain technology to lower costs, limitations are still being faced in traditional systems. Blockchain is expensive for initial investment and infrastructure development. Smaller financial services institutions or banks are likely to rather not invest on this technology. Expensive maintenance costs also present a barrier to the deployment

of blockchain technology. Thus, in fact, several barriers have to be conquered before adopting this technology. Blockchain implementation also has complicated people-related problems, such as hiding knowledge, which has been reported to hinder the success of organizations or management in the early stages of adoption. Therefore, it is important for organizations to closely monitor the development of blockchain and prepare for its implementation.

Over recent years, it is growing common for blockchain-based applications to be used in financial services. Financial services and insurance companies have been investing on blockchain technology to increase the security of particular data types, strengthen the competence of the system and enhance cooperation to other settings. This blockchain is already being used in financial asset management as well as in economic transactions. Transactions have been decentralized and immutable as a result of systematic ledger distribution. Blockchain is considered to be instrumental in global sustainability, providing consumers with the benefits that are available in the present banking system. Blockchain can potentially solve trust, security, and control of data concerns in financial services, so this is another reason the financial services are expecting blockchain during the period of smart contract adoption. It presents a revolution on capital markets, making business more secure, specifically via digital payments.

The banking industry heavily employs third parties to monitor and manage large transactions. The banking industry is burdened with the process of authenticating information and checking compliance at regular intervals. Blockchain can change this by eliminating the overlap in know-your-consumer and anti-money laundering (AML) actions. For AML, blockchain can leverage artificial intelligence (AI) and machine learning (ML) functionalities to prevent and detect unlawful transactions. Blockchain-based AI and ML can effectively sift through data strings to identify signals of any illegal activity. These tools can help blockchain monitor transactions more efficiently and if any suspicious transactions are observed, they can be halted pending further investigation. Traditional banking systems have been seen to follow decades-old processes for approving transactions and lack transaction processing speed. Bank exchange charges are also high for certain transactions. Funds exchanges and speed constitute increasingly important criteria for quality consumer services in the banking industry. Furthermore, economic activities can be accelerated by integrating trade finance and blockchain technology, where security and quick settlements are key.

Companies in need to improve their capabilities by encouraging employees to participate and attend internal knowledge sessions and meetings on blockchain. Companies need to encourage cross-functional teams to establish a detailed plan for the successful implementation of blockchain in their business. An alternate strategy needs to be created to mask the data so that no one can access it. In this virtual environment, there are opportunities for regulators to analyse, contextualize and control digital platforms. Blockchain provides a shift to peer-to-peer payments and the ongoing practice of storing and processing customer requests. Blockchain can help insurers by creating smart contracts to process claims. This technology provides visibility and complete traceability mechanisms for each claim. The transaction lifecycle includes multiple stakeholders, from settlement agents, custodians, intermediaries to brokers. With this system, traditional recording methods are used, allowing for efficiency and room for error. Consequently, blockchain technology may help automate the trade lifecycle by supplying accurate data to all parties. Similarly, there are exciting opportunities for blockchain technology in relation to trade finance and digital supply chains. This technology would help reduce costs by removing unnecessary documentation, such as 'letters of credit', by eliminating middlemen, and by enabling the exploitation of a trustworthy network for stakeholders. Financial entities worldwide will need to be in compliance with the expectations of local regulators. In particular, one of the key requirements is to 'know your customer', in the absence of automatic customer identification, which can be time-consuming. Blockchain can be used as a single interface for customer identification, therefore allowing for the exchange of documents between financial entities without restriction. This approach would contribute to maintaining privacy, that is a legislative requirement.

Over and above the aforementioned aperceived benefits, the financial sector could provide better products based on customer and market demand through the cryptocurrency circle to which financial services cater. With the help of blockchain technology, improved parameters of contract execution can be observed to address complex financial asset exchanges that are governed by an inviolable set of business rules. Each transaction is encoded and added to a distributed ledger to be secure and dependable with the visibility of each stakeholder. Blockschain technology's global network could help the banking system transform the payment supply chain with the lowest risk of collapse due to the definition of entitlements, controls, obligations and standards. Blockchain technology has the potential to be used in a plug-and-play manner for existing and future networks

of the system. In this study, projects have been measured and verified through the EFA and CFA, and these items or instruments have been used to quantify the return on blockchain implementation. This replies to another object of research that explores the implications of blockchain-based financial technologies for the financial industry. In terms of significance, blockchain technology provides a very impressive way to lower operational costs and enhance customer service in the financial sector.

As Internet finance rises, disintermediation of finance is being accelerated in the form of Yu'eBay, P2P as well as third-party payment platforms. This asset-light and service-heavy model has significantly impacted the traditional Financial Services business of commercial banks, and there is an imminent need for reform in the traditional banking sector. Driven by user demand and market competence, conventional banks have begun to formulate Internet finance, but the results have not been desirable. This has motivated traditional banks to seek new technologies and methods to speed up the development of the Internet. Blockchain has the capacity to fundamentally change the present finance and fintech sector for its innovation in storing and transmitting data. Blockchain has the ability to potentially optimize the global financial ecosystem or transfer assets more competently than the existing financial system. Research into the impact of blockchain has demonstrated that it can minimize costs and revolutionize the financial industry over a long period of time. As the blockchain prevails, commercial banks are actively pursuing the development and application of blockchain technology to enhance the current centralized banking ecosystem. Financial organizations are chopping out the intermediaries by taking benefit of blockchain's security, invariance and transparency. On the other hand, blockchain will create both opportunities and threats for the banking industry. Banks are contradictory towards blockchain, mainly because they have long played the role of middlemen, rewarded by the role of trust, while blockchain is the technology that cuts the role of the center.

Banks used to be the backbone of the Financial Industry. But nowadays banks are outdated institutions, which no longer care about customer allegiance. Considering the recent scandals affecting giants such as Goldman Sachs and Deutsche Bank, there are few who would agree that the current banking system is now modern or could be considered an "honest institution". Over the past few years, major participants have been exploring blockchain technology. Bank of America has authored 35 blockchain-related patents. Barclays, Citibank, Goldman Sachs and UBS

have formed the R3 CEV consortium to explore the potential of blockchain to reduce costs. The Nasdaq Stock Exchange and a Visa-backed startup named chain have launched Linq, based on blockchain technology. blockchain technology has transformed the business model and technical features of traditional banks. For international financial powerhouses and local commercial banks, the real motivations for applying to blockchain are as follows. Firstly, it reduces costs and value transfer. A commercial bank often requires a large investment in a centralised database due to the high maintenance and purchase costs of the terminals. On the other hand, many bookkeeping and settlements add labour costs and human operational risks. Blockchain technology addresses these issues as the use of a decentralised ledger and blockchain automation can create a low-cost and transparent model without the expense. And secondly, it allows for more accurate risk control. Commercial banks have placed emphasis on monitoring and tracking the use of loans, but in practice this is not as dependable or effective. In addition, global supervision of capital flows could make it more difficult. The polycentric capabilities of blockchain technology consider each user as a node in the blockchain, which enables direct peer-to-peer transactions between borrowers and lenders, thereby eliminating the need for banks to act as intermediaries for credit guarantees. The credit risk resulting from information asymmetry is significantly reduced, and the management of funds is made more efficient. Finally, it seeks innovative ways of making a profit. In the financial domain, a rising number of industry giants are either investing in, or partnering with, blockchain technology startups, as well as banks as well as investment houses. In this highly competition environment, banks need to pursue innovative and profitable models to explore the market by developing financial product.

Blockchain technology remains in the early stages of piloting and testing large economies of scale systems. The main contribution of this study is to provide a foundation for future research in the area of blockchain. It is also worth noting that this study is attempting to enrich the documentation and contribute to blockchain-related research. A number of general studies not carried out in the banking sector itself but relating to blockchain implementation are comparable. Blockchain enables cost efficiencies and helps the industry satisfy regulatory requirements. Furthermore, it could enhance the efficiency of banking operations through its traceability potential. Blockchain technology offers a multitude of benefits in the financial services and insurance industry beyond core banking, such as smart contracts, renewals and process excellence.

The Ethernet blockchain costs twice as much as the conventional cloud services offered by Amazon SWF. However, on another study in the energy sector, the author declared that implementation of blockchain technology helps to promote confidence, reduce costs for companies but also for customers, and increase its security. In another research, it is stated that the digital rights management can be designed with the help of the model of trust in blockchain. With regard to the evolution and implementation of blockchain, it is important to be aware of how professionals and end users regard the technology and its benefits. The author found that the architectures and projects matched the reasons for blockchain implementation mentioned in the literature on closely related industries. Providers and users can quickly develop trust in digital banking, and this could be done through a blockchain-enabled platform. Blockchain technology Could be further integrated within the tax department that maintains land records to enable proper loan payments for the creation of houses or any other type of construction. The development of a tool to measure the benefits of Blockchain installation is therefore a distinct contribution to our research. The variables were identified from secondary resources and professionals and put into an adequate structure through a structured process. Our verification of the tool provides important insights for academics and practioners in the banking industry to better integrate an understanding and to advance research into the effectiveness of blockchain adoption. Scholars can extend this research by including new industries or banking-related industries (e.g. insurance).

The undernoted key success criteria identified for the adoption of blockchain solutions in the financial services and research sectors are adequate capital and good financial governance - All interviewees recommended that firms deciding to implement blockchain must be well capitalised, as its implementation costs are high and not all organisations would be able to afford it in the long term. Aligning the organisation's activities with the blockchain initiative - The main activities of the finance department ought to be in line with the decision to use the blockchain solution (research or actual services or both). Indeed, if the company does not specialise in banking ventures, it would not be advisable to take the risk of tackling this new market. Adequate energy and power supply - blockchain will require substantial power consumption, and an abundant energy supply will place a requirement on blockchain use or adoption. Reliable high computing power - again, blockchains will require almost supercomputer level high-end computers to operate thousands or millions of calculations per second. Reliably high computing power with proper cooling, plentiful energy

supply, and low risk of natural disasters and accidents (e.g. fire) can make all transactions safe and secure. Intelligent algorithms with mathematical complexity - Blockchain requires the support of sophisticated mathematics running behind high-end computing power. It also needs intelligent algorithms running reliably behind the scenes every second. Well-trained teams - This factor has been discussed in depth in this article, particularly in relation to the problem and struggle of knowledge hiding. In order to make blockchain implementations and services every better, specialised teams with different expertise are needed. Security and privacy - Ensuring a high level of security and privacy has become very significant. High-end encryption algorithms, the removal of PINs, a combination of passwords and biometric authentication, together with dedicated access controls, can all make blockchain a more secure environment to work in. Analytics and user interfaces - Analytics capabilities allows its customers to perform simple blockchain requests behind the scenes. These operations are easy to do. Results can be returned within minutes. In this way, their customers sense its accessibility and convenient. Dedicated to product development, quality assurance, reputation and community building - Many financial services institutions are focused on market share or what the market perceives as value. Interviewees said that the first step in implementing blockchain is to come up with a quality product, then build their reputation and eventually establish their community.

CONCLUSION

The results of the research offer essential insights for blockchain and banking professionals. One of the advantages of using blockchain for business is to facilitate business operations by reducing unnecessary friction between different stakeholders. Blockchain allows an organisation to develop trust and ensure transparency throughout business transactions. Due to the large volumes of data that banking and related industries have to deal with, errors in traditional systems are not infrequent. Senior management in the banking industry can minimise the risks associated with data processing by assuring the integrity of the data. Professionals in the banking industry can use blockchain to authorise and update recurring transactions for various stakeholders in the businesses. In this way, the banking sector and other corporations could adopt blockchain technology to devise customer-centric business activities and provide value-based services. Banking executives, specialists and consultants responsible on cost reduction can consider implementing blockchain-based solutions to reduce their administrative and operational costs. In an era of information and service excellence, it is necessary to track real-time business transactions and improve the efficiency of business operations. Managers of practices can enforce blockchain technology to enhance the security and efficiency of their service ecosystem. In the banking sector, it is vital to have control over data, which must be further supported by the robustness of the system. In certain situations, such as the humanitarian financial crisis, blockchain could act as an enabler of robustness and constancy in audit trails, which would benefit both firms and auditors. As the banking industry deals with individuals' as well as companies' finances directly, it is vulnerable to fraud and misrepresentation of records. Executives could benefit from this research as it recommends the application of blockchain to clearly determine business regulations and improve regulatory compliance. Additionally, acting managers from the banking industry could implement blockchain deployments for record maintenance, digital currency exchange, smart contracts and security. Overall, professionals from different sectors could contemplate adopting blockchain for the productivity side of their business operations.

Fintech is not only the transformation and development of the industry itself, but more significantly for the social and economic development has great value and significance, so that the development of Fintech would be more dynamic and sustainable. On the one hand, it is for the role of the financial industry itself, on the other hand, it is to better play the role of the financial

industry on the whole social economy. For the financial industry itself, there are several dimensions, the first point is that fintech promotes financial business innovation. For example, network loans, Internet insurance, crowdfunding, etc., these new application models are dependent on the combination of technology and financial means. The second point is from the perspective of the user, financial technology can expand the user, better to provide users with basic service capabilities. For example, now the bank's offline network and go to the bank's offline network to do business with fewer and fewer people, we can do a lot of business through mobile banking, lowering the threshold of financial services, corresponding to the expansion of the financial services user groups, previously restricted by other factors such as geography, remote mountainous areas, a small number of residents, but also more convenient access to financial services. The third point is that financial technology has better reduced the cost of financial services. In the expansion of users at the same time, through the online service channels, to reduce the cost of financial services. The last point is that financial technology can better improve the efficiency of financial services, financial technology can significantly simplify the acquisition of customers, credit, and other internal management processes, using technology means can continue to improve the overall operational management efficiency. The above is how fintech can promote the development of the financial industry from the perspective of finance itself. Back to the perspective of the overall socio-economic development, the ability of financial services for social and economic entities has been enhanced. First of all, FinTech better strengthens the ability to serve the real economy, providing convenient and fast financing services for small and medium-sized enterprises and citizens, such as network lending and big data credit collection, mining good projects and enterprises with broader and deeper means, understanding their capital needs, doing a good job of intelligent risk control, and using information technology means such as supply chain finance to provide multi-channel financing services for more small and medium-sized enterprises. Moreover, fintech provides convenient financial service channels and can also help some special groups.

The financial sector is on the verge of a novel financial century by using new blockchain-based systems. The products and services formerly proposed by the financial industry were identified as being expensive and inefficient. As a result, the need for a significant transformation has been arisen. Blockchain could stand for the reshaping of credibility, a mechanism of agreement throughout time which allows people to trust each other in the absence of community connections

and credibility accumulation. Blockchain technology has the ability to enhance the efficiency and safety of financial systems, but there is still plenty of effort required to overcome the fundamental issues. Blockchain has many advantages, but it also comes at a cost. As with other technologies, blockchain can add to or reduce the weaknesses of existing institutions. The new technology is important in the new institutional economics and transaction cost economics research. A large number of non-market activities can be measured, exchanged, and monitored via blockchain. New institutional economists may find a new world of resource economics to study.

Blockchain is not just a technology, so this round of technological revolution has far more impact on blockchain than other technologies, and disruptive businesses, technologies or companies may emerge. However, there is no way to know exactly what the consequences of blockchain would be, and the biggest impact may come from applications that we cannot foresee. To a certain extent, blockchain is a revolution, and it may include an element of hype. There are always two sides of the coin, and it remains to be seen which side of blockchain represented by financial technology would be used to influence the financial industry in depth in future applications.

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BLOCKCHAIN REVOLUTION: HOW INNOVATIVE TECHNOLOGY CAN CHANGE THE FINANCIAL SECTOR

Geng Luo

Master Thesis

Finance and Banking Master Program

Faculty of Economics and Business Administration, Vilnius University

Supervisor Assoc. prof, PhD Alfreda Šapkauskienė, Vilnius, 2022

SUMMARY IN ENGLISH

66 pages, 9 charts, 4 figures, 113 references.

The main purpose of this master thesis is to determine the benefits and influences of adopting blockchain-based financial technology.

The master thesis consists of three main parts; the literature reviews of previous studies; the qualitative methodology is applied. Interviews of blockchain experts and questionnaire are conducted by author; and the Exploratory factor analysis and Confirmatory factor analysis have been applied to analyze the empirical data.

In literature review part, the author has carried out research on the mechanism of blockchain and explored the blockchain based applications in financial sector, and the author has categorized the perceived benefits in the main sector in financial industry, which is banking sector. In the end, outlook of blockchain related has been raised.

In methodology part, the methodology of this research is adopted by qualitative analysis model to investigate the impact of blockchain-based financial technology on the financial industry. This section provides a detailed overview of the method used in this study. In the interview component, a series of information related to the selection of the interviewees and the format and process of the interview questions are described.

In empirical data analysis part, the author has examined and analyzed the data by Exploratory factor analysis and Confirmatory factor analysis through SPSS 20 and AMOS 20. And the author

has analyzed and interpreted the results,

In the end, the conclusions and recommendations summarize the main concepts of literature analysis as well as the results of the performed research.

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SUMMARY IN LITHUANIAN

66 puslapiai, 9 diagramos, 4 paveikslai, 113 nuorodų.

Pagrindinis šio magistro darbo tikslas - nustatyti blokų grandine pagrįstos finansinės technologijos diegimo naudą ir įtaką.

Magistro darbą sudaro trys pagrindinės dalys: literatūros apžvalga, ankstesnių tyrimų apžvalga; taikoma kokybinė metodologija. Autorius atlieka interviu su blokų grandinės ekspertais ir klausimyną; empiriniams duomenims analizuoti taikyta tiriamoji faktorinė analizė ir patvirtinamoji faktorinė analizė.

Literatūros apžvalgos dalyje autorius atliko blokų grandinės mechanizmo tyrimą ir išnagrinėjo blokų grandine pagrįstus taikymus finansų sektoriuje, taip pat autorius suskirstė suvoktą naudą pagrindiniame finansų pramonės sektoriuje, t. y. bankininkystės sektoriuje. Galiausiai buvo iškeltos su blokų grandine susijusios perspektyvos.

Metodologinėje dalyje, siekiant ištirti blokų grandine pagrįstos finansų technologijos poveikį finansų pramonei, šio tyrimo metodologijoje pritaikytas kokybinės analizės modelis. Šiame skyriuje išsamiai apžvelgiamas šiame tyrime taikytas metodas. Interviu dalyje aprašoma nemažai informacijos, susijusios su interviu dalyvių atranka, interviu klausimų forma ir eiga.

Empirinių duomenų analizės dalyje autorius išnagrinėjo ir išanalizavo duomenis taikydamas tiriamąją faktorinę analizę ir patvirtinamąją faktorinę analizę per SPSS 20 ir AMOS 20. Autorius išanalizavo ir interpretavo rezultatus,

pabaigoje išvadose ir rekomendacijose apibendrinamos pagrindinės literatūros analizės koncepcijos ir atlikto tyrimo rezultatai.