Article Paper

Title: Blockchain Tuning in the Banking Sector: Improving security, Efficiency, and Trust

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Abstract:

This research paper comprehensively expands on the importance of the applications of blockchain technology in the banking industry and its implications for security enhancement, efficiency, and building trust. By leveraging its decentralized and immutable nature, blockchain technology can address longstanding challenges in traditional banking systems, offering enhanced security, transparent border transactions, streamlined internal processes, and improved customer experiences. In addition to the advancement and transformation of financial and banking systems, this article is particularly interested in the eco-sociological and organizational changes brought about by the adoption of blockchain-based information systems as an alternative to current legacy systems, particularly in the financial services sector. However, the literature in this field is still in its infancy, and we do not yet have a comprehensive understanding of the possible consequences of blockchain technology due to regulatory concerns for banks.

International banks have already started on project-based enhancement in their systems using the blockchain infrastructure. Regulators are in transit of creating proposals to financial institutions based on the historical performance of the technology. The paper reviews prior research on the topic, outlines the research methodology, presents the objectives, analyses the key findings, and concludes with insights on the future of blockchain in the banking sector. Additionally, it gives a general overview of the possible benefits and challenges of blockchain technology in the banking/ financial industry.
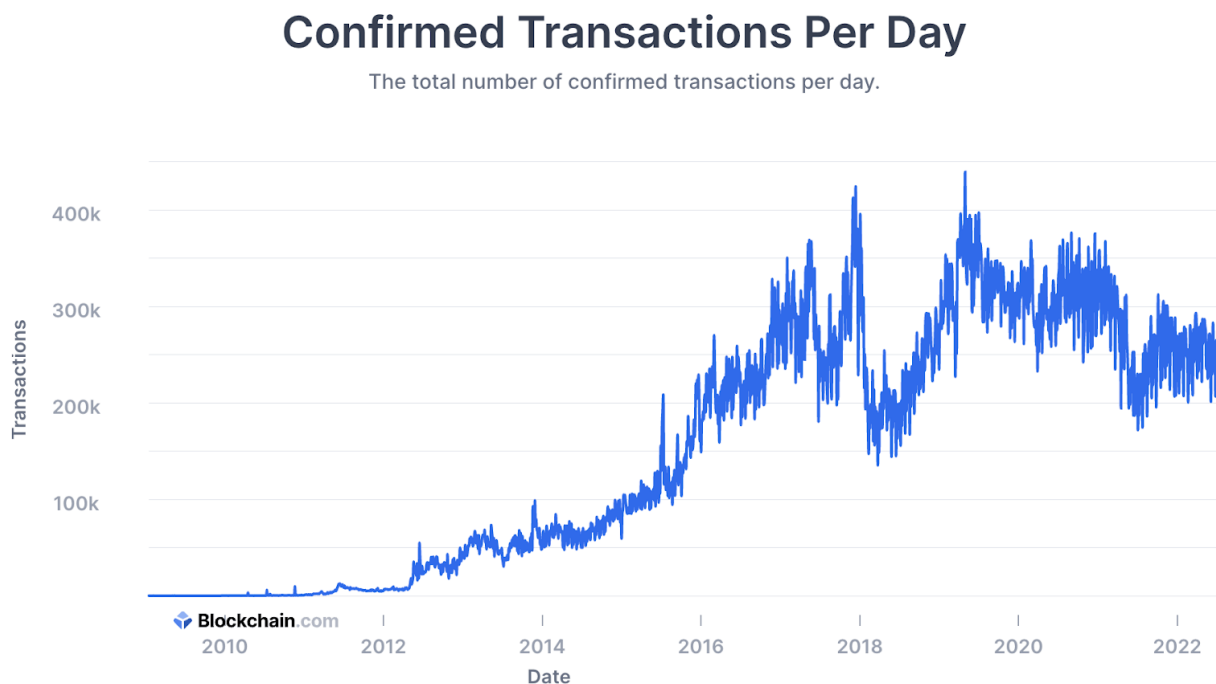
Key Words: Anti-Money Laundering, Banking, Blockchain, Decentralised Ledger, International Trade, System Upgradation

Introduction:

An introduction to blockchain technology and its potential outcomes for the banking sector is given in this section. The banking vis a vis financial industry is essential in facilitating financial transactions, but it encounters issues such as security flaws, a lack of red flag detection, ineffective internal policies, and a lack of transparency. By providing a decentralised and transparent ledger that boosts security, efficiency, and confidence in financial operations, blockchain technology presents a possible alternative. Technology is further assisting banks in aligning internal systems with regulator-required anti-money laundering procedures. As per the recent study, over 60% of

banking institutions are planning to adopt blockchain infrastructure in their international transactional activities, 23% for securities settlements, and over 20% for KYC and other banking regulations. The number of confirmed Bitcoin transactions per day has grown from just over 50,000 in January 2014 to over 249,000 as of August 2022 (CBINSIGHTS, Oct 2022, How blockchain could disrupt banking, https://www.cbinsights.com/research/blockchain-disrupting-banking/) - Fig. 1 source: blockchain.com.

Fig. 1

Confirmed Transactions Per Day

The total number of confirmed transactions per day.

Blockchain technology offers an efficient, low-cost payment delivery system that beats the processing periods of traditional bank transfers and does away with the requirement for third-party verification. 90% of the members of the European Payments Council believe that blockchain technology would radically change the industry by 2025. (CBINSIGHTS, Oct 2022, How blockchain could disrupt banking, https://www.cbinsights.com/research/blockchain-disrupting-banking/) But the question remains open, "Will conventional banking systems ever adopt this technology?" as the use of cryptocurrencies for illegal purposes for example digital fraud, manipulation, tax evasion, money laundering, terrorist financing, and other unethical actions is the main source of regulatory concerns.

Literature Review:

This section provides an analysis of existing literature on the applications, usage and benefits of blockchain technology in the banking sector. The financial markets, banking and insurance sector has been benefited greatly from blockchain technology. In fact, the primary factors behind the blockchain wave of innovation is the change from centralised ecosystems to their decentralised capacity.

For applications in corporate finance, corporate governance, cash management and treasury, as well as more broadly for many of a firm's management operations, we think DLT appears to be a promising technology on paper (Collomb, A., & Sok, K. (2016)). According to recent studies, blockchain has opened up a lot of opportunities for the banking and financial sectors, and we may investigate it in the direction of regularisation and centralisation rather than just decentralisation. Blockchains rely on public key cryptography, like many other internet-based technologies, to shield users from having unauthorised individuals take control of their accounts. People can use the private and public key pairs to encrypt information before sending it to one another, which allows the recipient to check if the communication actually came from the intended recipient and whether it was tampered with. This is crucial when a network needs to be informed that a transaction between two parties has been reached an agreement. To continue, The idea of hash functions is important in this case. A hash function's main purpose is to make it easier to find information in a collection of records in an effective way. A hash function is any function that can be used to convert data of any size into data of a specific size, and whose result is a bit-string known as the hash value, hash code, or hash sum. The hash table, which is employed as an effective indexing technique when conducting searches, is where these hash values are stored in tabular form. The overview by Carter & Wegman includes thorough descriptions of the various hash function types and those were evaluated during the study. Carter & Wegman (1977).
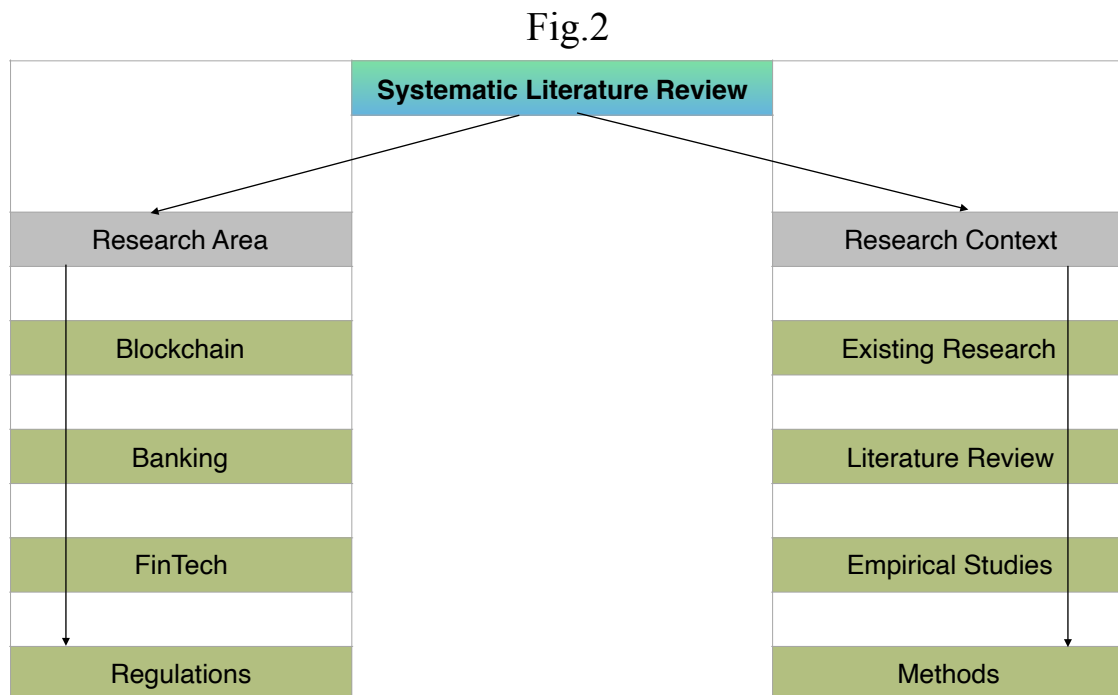
During the systematic literature review, the scaling issues for blockchain in general were examined. However, the technological adaptability over the traditional banking is a major concerns for the policy makers as blockchain is still not regulated in all over the world (Richard Kastelein, Sept 2016). As per the world bank, financial institutions are based on the centralised databases controlled by and from one place at a time, nevertheless, blockchain which is referred as encryption/ decryption transformation of the messages spread out across many computers based on the decentralised databases which is again a big challenge for a bank and any institutions in the financial sector (Gareth W. Peters, & Efstathios Panayi. 2015). The current studies were concentrated on the technological advancement within the banking industry using blockchain, but they did not take into account the challenges brought on by the pandemic Covid-19. Even banks are still having trouble spotting red flags when processing international transactions, fighting money laundering and terrorist financing, and mitigating regulatory fines and penalties, all of which could be examined by fine-tuning the systems using the blockchain technology.

Another significant application of the blockchain legacy is smart contracts, which were initially put forth in 1994 by computer scientist and cryptographer Nick Szabo (Szabo 1994, 1997). Szabo defined smart contracts as "computerised transaction protocols that execute the terms of a contract." He suggested contractual clauses should be converted into node codes and embedding them in hardware or software that can automatically self-enforce them (i.e., satisfy common contractual conditions) in order to lessen the need for reliable intermediaries between transacting parties in international banking transactions as well as the incidents of malicious or unintentional exceptions (Szabo 1994, 1997). Still the question remains the same as Is the smart contracts explained above are really reliable? As using these blockchain based contracts also creates a number of regulatory and legal obstacles in addition to the technical ones. Moreover, If a smart contract has a bug, there would be no easy way to rectify it because, once it was placed on the blockchain, it could no longer be changed because the blockchain is immutable.

Research Design:

This study aims to provide a thorough evaluation of the literature using secondary data on blockchain technology utilisation in relation to the Banking and finance industry. In this section research plan, data collection methodology, data analysis and study limitations are all described in detail. The systematic literature review (SLR) of the existing study and published material were utilised to accomplish our research objectives because systematic reviews are a more thorough and distinctive way to analyse the literature in a certain field (Cronin, Ryan, & Coughlan, 2008). A SLR technique necessitates describing the process for evaluating and synthesising study results, as well as the time frame for the investigations that must be covered.

Figure 2. presents the selection and preparation process used for this paper, including the broad categories of the SLR such as research area and context which will be explained later:

Fig.2

Systematic Literature Review	
Research Area	Research Context
Blockchain	Existing Research
Banking	Literature Review
FinTech	Empirical Studies
Regulations	Methods

Basically, we have performed a thorough literature evaluation of the available contents on the blockchain and its evolving technology, as shown in the figure above. Research area and research context are the two main categories into which the review has been separated. Blockchain, banking, fin-tech, regulations were the primary research area during the study, however, existing empirical studies and literature review were the research context.

The entire methodological approach consists of the following actions:
1. Establish the need for the review and develop a plan and method for it.
2. Prior to synthesising the material, determine the research gaps, select the studies, assess the quality, make notes, and gather data.
3. Outline the review's conclusions.

While targeting banking and fin-tech industry in the study's research area current research was included to cover the information on methodologies, applications, findings, strengths, and limits using various publications. In particular literature review and empirical studies were followed as a research context with the help of digital databases with linear and cross searches such as Emerald, Research-gate, ProQuest, Springer and Google Scholar.

We used previous published research on the blockchain technology in banking as basis of our explanatory study on the existing researched made a comparison between experience of the existing authors with knowledge on blockchain, and research literature. Thus the resining based approach was followed during the research.

In the banking sector, the major challenges we still face is with banking availability in the rural areas, loans to undocumented individuals, and traditional methods of transferring money domestically as well as internationally. As per the fig. 3 below are the major concerns with implementation of the blockchain framework in banking:

Fig. 3
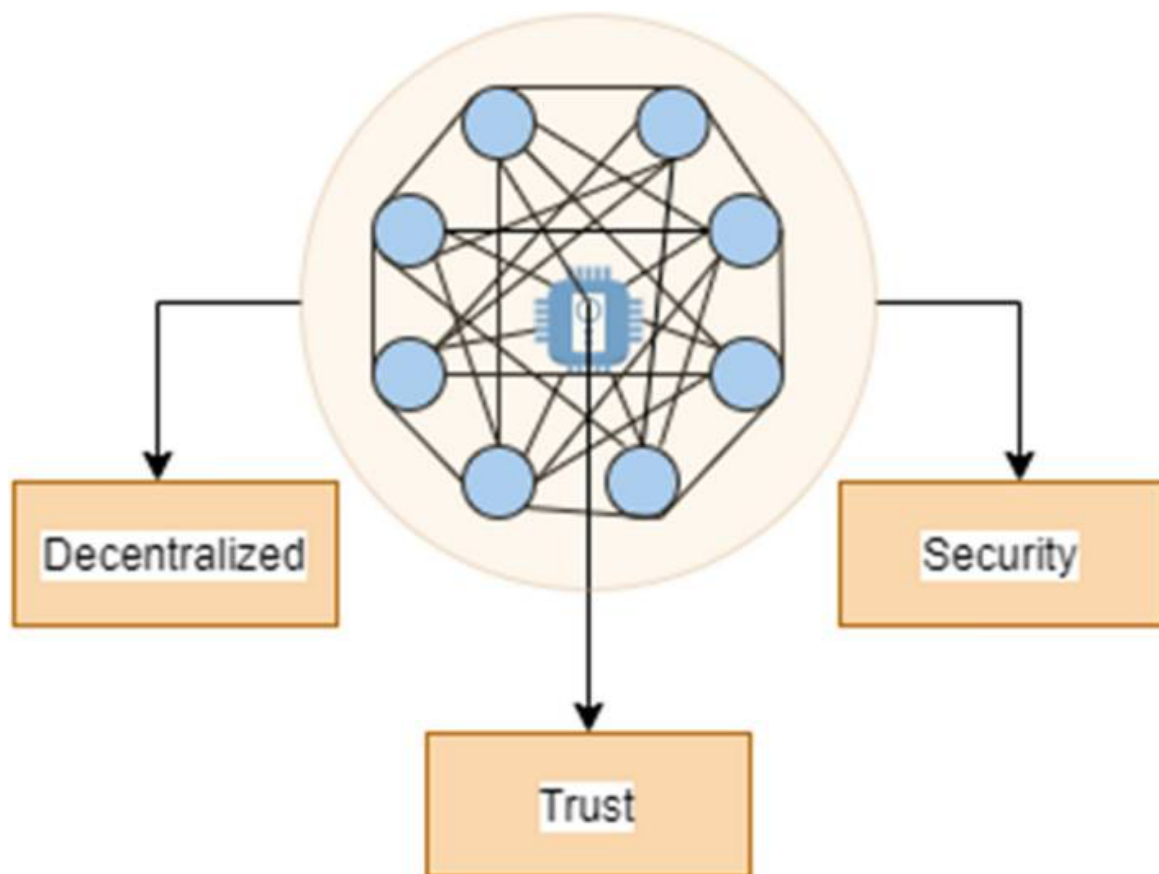
AML/CFT (Anti-Money Laundering & Counter financing of terrorism) with blockchain: Policy makers are truly recognised the multi-layers protection provided by the blockchain infrastructure, which can further help banks in combating money laundering and terrorist financing, however, the major challenge is with the regulatory aspect of the blockchain due to its decentralised operations.

A single large financial institution may have over 80 lines of business, each with a dedicated AML compliance officer, according to FinCEN's outreach report. Compared to pre-financial crisis levels, several banks now incur additional compliance expenses of more than $4 billion yearly as a result of this complexity. (FINCEN, FINANCIAL INSTITUTIONS OUTREACH INITIATIVE: REPORT ON OUTREACH TO LARGE DEPOSITORY INSTITUTIONS 5(2009). If the technology itself considered as regulated by major regulators in the world i.e. FinCen, FCA, FSA Japan, Austrac, Fintrac Canada etc., it can be adopted by the financial institutions to overcome on those AML/CFT challenges and further infrastructural development cost can be saved.

Another major issue faced by the banks now a days are the sanctions violations which will impact their trustworthiness and reputations among the clients. The "Treasury Department's Office of Foreign Asset Controls (OFAC)" is principally responsible for implementing the sanctions based on the targets which can be economic, targeted and sectorial based.

A number of startup businesses have started to exploit the Blockchain technology to provide tools that banks and regulators may use to improve internal and regulatory compliance. Some firms, such as Elliptic and Coinfirm, are using blockchain technology with an eye towards solving AML problems at financial institutions. Another startup, Gem, is focused on digital identities and believes that it has potential applicability for AML compliance use in financial institutions. These existing studies clearly showed that the blockchain is an emerging technology in the coming future which can be utilised by the banks to combat financial crime. (Chung-Chia Huang, Asher Trangle (2020)).

Transactional Banking with Blockchain: Let's take a consideration of the International transactions by the banks using correspondent banking relationships. Major banks in India and overseas banks are offering international banking transactions which includes trade transactions and other remittances. Yes there are charges to these transactions which includes, charges of the remitter/ respondent bank, correspondent bank and receiving bank. In general, our banking international transactional structure was created in such a way that an average cross border bank transfer usually takes three day to settle. A simple bank to bank transfer requires a layers of intermediaries, before it gets credited to the beneficiary account. Then every bank reconcile their transfers between the Nostro (account maintained by local bank with foreign bank in foreign currency) and Vostro (INR account maintained by foreign bank with Indian bank) account created for these transactions.

Fig. 4 below explain about the basic flow of transfer using correspondent banks:
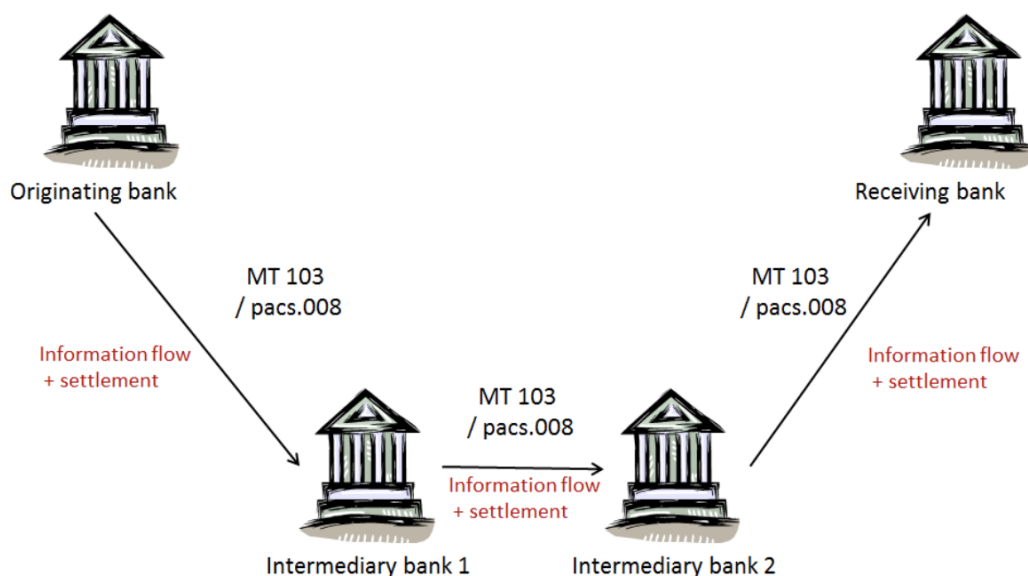
Here, the intermediary banks are the correspondent banks to the originator banks and receiver bank simultaneously. These banks actually transmitting payments messages (MT 101, 102, 103) via SWIFT (Society for Worldwide Interbank Financial Communication) interface used by these banks and its globally accepted technology. SWIFT's sends millions of messages in a day for more than 11000 financial institutions. Due to the traditional payment setup between these banks the individual transaction cost is higher with the risk involved.

The current hassle based situation could change with the blockchain technology, which is decentralised ledger technology. The transactions can be processed smoothly without the involvement of the correspondent banks. An interbank blockchain infra can track all transactions transparently with out any challenge as compared with the SWIFT to compare the ledger to each involving bank/s. Thus the transactions could be settled on the public blockchain wallet directly instead relying on the intermediaries banks including corespondent bank. However, lack of proper regulation on these emerging technologies couldn't much improve the current lagging in the financial sector and this approach can be used for future oriented fast digital banking. We need to develop the system in such a way that any in-between bug/s in block/s can be fixed without rejecting whole chain to avoid a total failure otherwise it will require a redo again.

Now the next question comes in our mid is "Is Blockchain really secure?" - due to its nature such as cryptography where encryption & decryption key is utilised, immutability and decentralisation we feel that the blockchain technology is a secure and in banking we can call it a tamper-proof account transactions. However, this doesn't imply that the blockchain is not vulnerable to digital cyber attacks and security breaches. People with bad intentions could exploit the blockchain's security vulnerabilities to take advantage of them, and numerous examples of these blockchain frauds have made the news from time to time.

In view of the current financial crime trends in the banking sector, regulators and organisations like FATF (Financial Action Tack Force), OFAC (Office of foreign asset control under US Treasury), Egmont Group which provides Financial Intelligence Units (FIU's) a support function to securely exchange expertise in to combat money laundering should come up with their recommendation on blockchain technology. In order to better regulate this technology, regulator must comprehend its benefits and capabilities.

Analysis:

This section compares the study literature reviews with a practical use of blockchain technology in the banking sector to present the research analytical findings. Every existing author has agreed that the decentralised distributed ledger that underpins the blockchain technology is effective in terms of banking transactions, operational effectiveness, and assurance. This technology can simply be fine-tuned in banks' systems to increase overall productivity on a broader scale. The blockchain is a new technology that will assist banks in more cheaply overcoming their current security difficulties in the global financial sector, as we also addressed during the literature review and research design.

There are now two components to introducing this technology in routine banking. The adoption of this technology will be challenging in domestic banking, which includes rural and agriculture banking, because there is a lack of education in rural areas, fewer security channels, agriculture banking is extensive, and the products serve only to improve the financial circumstances of the
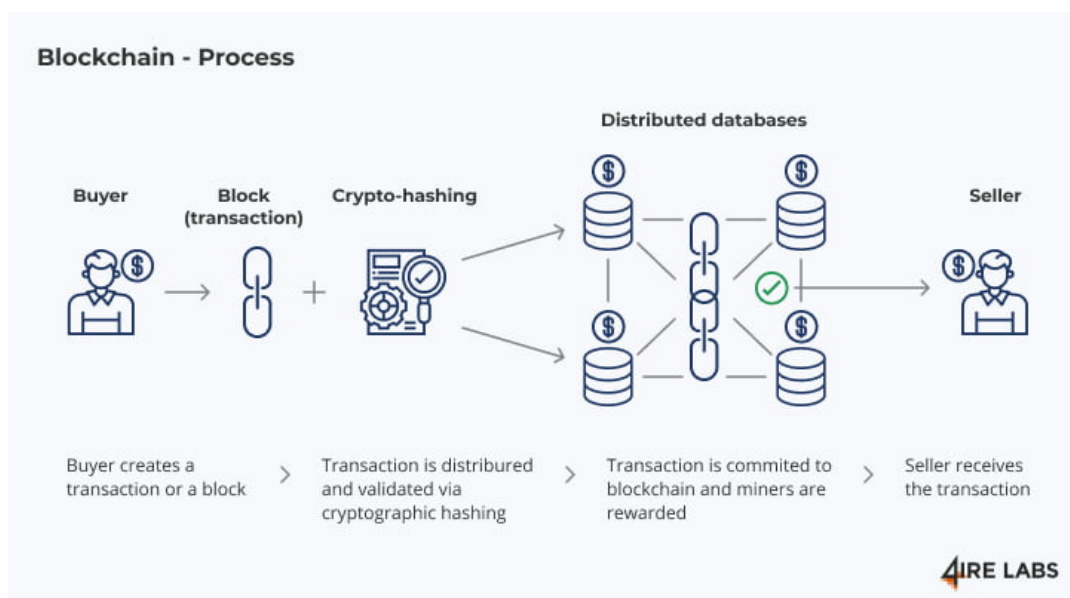
farmers at the local level. On the other hand, when it comes to international banking, where a significant number of transactions and currencies are involved, blockchain technology has the capabilities to drastically improve overall efficiency in terms of cost, productivity, speed, and dependability.

Let's discuss more in details the pros and cons of the blockchain technology in the banking vis financial sector with a comparative analysis:

1. Cost Effective: During the study it was identified that the new blockchain technology is cost effective to international banks where large number of transactions are involved on day to day basis. Even many global banks like, Bank of America, Deutsche Bank, UBS, Barclays has already find out ways to explore blockchain technology either by developing by themselves or collaborating with blockchain-based companies. In continuation of the research findings we have observed that the international banking transaction are more effective and cheaper when banks uses blockchain framework instead of traditional banking. Due to the high expenses associated with international trade and documentation procedures, cross-border commercial transactions can now be supported through the use of distributed ledger and blockchain technology. It would also speed up delivery and consume less paper. The world's overall trade approximately 85% relying on the trade finance and the commercial impact of blockchain would be seen globally across all industries those involved in the cross-border trade transactions.

2. Secure and Reliable: Blockchain technology appear to be secure and reliable which comes with multi layer protection using encryption and decryption of the keys, secondly, these are the alpha numeric keys which can not be manipulated. However, many banks are still scared adopting this technology due to availability of the public information publicly which is again a privacy concern for the financial institutions. A closed and authorised blockchain would be helpful in this situation. The basics of blockchain technology is a public ledger, but it may also be modified to become semi-private or "restricted". Since we have explained smart contracts via blockchain earlier which can be used in trade transactions where importer and exporter might establish rules through smart contacts that will allow automatic payments when the due date is and eliminate the chances of missing the payment dates. The below image fig. 5 is showing the trade execution via blockchain using smart contracts which is more efficient when compare with the SWIFT based traditional transactions:

(Source: 4irelabs.com) Fig. 5

Blockchain - Process

Buyer → Block (transaction) + Crypto-hashing → Distributed databases → Seller

Buyer creates a transaction or a block > Transaction is distributed and validated via cryptographic hashing > Transaction is commited to blockchain and miners are rewarded > Seller receives the transaction

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3. Fast and Accurate: During the research study we have also observed that how fast, accurate and authentic the blockchain based transfers in the banking sector. The banks can utilise the times involved in a basic transactions to process manually in an other advancement activity if they adopt the blockchain technology.

For instance, it takes a tremendous amount of labour and system upgrades to do KYC reviews during onboarding and ongoing maintenance at the same time. For their periodic KYC assessments, all the major banks maintain a dedicated document repository. If a regulator requests information on a specific person or company, they use this repository. To update the KYC information on the system, a tremendous amount of labour and time are required throughout the entire procedure. A decentralised ledger is connected with the permission-less configuration, therefore blockchain-based KYC is something to take into consideration. Due to client privacy concerns, regulators are still having trouble adopting fully complete blockchain-based KYC systems. As a result of our analysis of the existing literature, we have determined that smart contracts are crucial for updating any person's KYC since they immediately update with each new document that is uploaded by that specific person. In such way, KYC updated are faster and accurate without any doubled-layer hassle using smart contracts underline blockchain technology.

4. Blockchain require Regulation: Due to the decentralised ledger of a blockchain, which is a big privacy risk for a banking institution, the majority of the major FIU's and financial institutions have not adopted the concept of blockchain terminology. Although policy makers still view this technology as being in its infancy, namely in the banking and financial sector, it is only a matter of time before these authorities develop better ways to utilise it. Due to this technology's decentralised storage, payments may result in any AML/CFT difficulties, which could have further effects on the client-based relationship. We need to cope up with the cost-revenue analysis considering traditional banking which is centralised vs. modern blockchain based banking on decentralised ledger.

5. Bugs and Error: The study on the blockchain in banking is a eye catching when we compare it with the traditional banking considering costs and effectiveness, however, all technology comes with their inherent risks such as technical error and bugs which is again a challenge for a bank/s as they are already struggling with the phishing, malicious and digital fraud on a daily basis. During the study we have identified that if a bug can be placed in a particular block within the blockchain it can be be fixed and there is no replicable to it. Banks should consider non-permissible based storage of information which can be utilised for their daily operational activity.

Conclusion:

The research study's main context are outlined in this section, which is focused on how blockchain technology will be adopted in the banking industry in the coming future. It covers the possible benefits of using blockchain technology, including enhanced security, continuous customer trust, and improved digital transparency.

We have defined blockchain and its key characteristics which includes distributed ledger technology at a decentralised environment. This will help banks to make transactions faster, storage a lot of documents at a one place, and there are no need of many intermediaries between the International banking transactions. Blockchain also aims to reduce regulatory risks as many banks facing the challenges when they involved in money-laundering and financial crime activities. Due to

incomplete and sluggish KYC due diligence banks are not able to identify their customer based on the nature of business and geographical boundaries. However, blockchain can foster these issues and help banks to navigate themselves so that they can reduces those operational errors cost effectively. However, financial institutions are still reluctant to adopt this technology as it is not widely regulated yet. Even regulators are focusing on these studies on blockchain in banking which will eventually help them to understand its benefits at a larger scale. Blockchain platform will help banks and other financial institutions in assisting the risk parameters inducing residual and inherit risks to combat financial crime. The term "blockchain" is now accepted on a global scale, and banks have begun developing algorithms to fine-tune their technology in order to reduce risk, save money by avoiding costly daily operational mistakes made by humans, and boost overall productivity. This technology will be supplement to the traditional banking as it will not be replaced in all due to wide banking network but it will make life easier and efficient.

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