Original Article

Financial Sector And Blockchain Technology: Challenges And Applications

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Abstract

The present study aims to provide a holistic understanding of the multidimensional applications of blockchain in the global finance sector. This paper is an attempt to highlight the Strengths, Weaknesses, Opportunities, and Threats to blockchain technology in financial services. SWOT analysis has been conducted by critical investigation of relevant extant literature in the context of peer-reviewed international journals and industry reports. The findings of the study reveal that limited contributions by blockchain technology have been made in the financial sector. It has untapped potential to contribute to the development of financial services. The risk of blockchain technology can be further minimized and trust can be built in the mindset of the government regulator by implementing strict regulation while adopting blockchain technology. The findings of the paper will stimulate future research in the multidimensional adoption of blockchain technology in the financial sector.

Keywords: Blockchain, SWOT Analysis, Financial Sector, Risk, FinTech

1. Introduction

A considerable section of the financial industry is undergoing profound transformation at the moment. Over the course of time, the progressive advancement of cutting-edge digital technology has made a significant contribution to the growth in the number of service options that are currently available. Since conventional business practises are rendered outdated by digitization, new competitors have been able to enter the market (Feyen et al., 2021). The Organization for Economic Cooperation and Development (OECD) published a report not too long ago that investigates the impact that several emerging innovative data-oriented technologies, such as Big Data, the Internet of Things, Artificial Intelligence, and others, will have on various operations and services in the financial sector (such as payment transactions, financial investments, lending and others (Casino, Dasaklis & Patsakis, 2019). To yet, the only new technology to significantly impact financial sector operations and services is blockchain technology, which underpins cryptocurrencies like Bitcoin. According to Ceremeno (2016), blockchain technology is the new revolution in banking and finance and should be widely adopted. Although blockchain technology was first designed to facilitate the creation of cryptocurrencies, its current potential applications go well beyond this. The distributed ledger technology known as blockchain paves the way for secure and intermediary-free digital currency, asset, and information transfers (Swan, 2019). From international payments and cryptocurrencies (Ilk et al. 2021) to supply chain finance and insurance, Blockchain has emerged as a new research frontier in the financial industry and academia (Gomber et al. 2018; Goldstein et al. 2019). Since there are no middlemen and no counterparty risk, the decentralised structure of blockchain technology has significant implications for institutional economics, according to Davidson et al. (2016). The blockchain technology has the potential to be used in the future to develop operational tools and to develop new services. The financial institutions like banks are eager to incorporate cutting-edge fintech technologies like blockchain to remain competitive in the growing fierce competition within the global financial sector. Vovchenko et al., (2017) observed that a growing number of commercial banks around the world are turning to blockchain technology to gain competitive advantages in financial contracts by dropping the costs of economic agent interaction, offering data transparency, controlling and minimizing financial transaction costs. Crosby et al., (2016) observed the use of Blockchain applications in stock markets (NASDAQ) and organisations like American Express in their

transaction systems. This discovery was made relatively recently. According to Yudina (2016), the implementation of digital technologies such as Blockchain has the potential to bring benefits that are realised over the long run. Vega and Clohessy (2021) discovered that the adoption of blockchain technology, which removes the need for a third party to act as a middleman in financial transactions, can make the trades that take place between parties with dubious reputation more secure. Guo and Liang (2016) conducted research on the implementation of blockchain technology in a variety of nations, including the United States of America, the United Kingdom, India, Japan, Gibraltar, Russia, and South Africa.

Nevertheless, there is a subset of the financial sector that believes blockchain technology will have a smaller impact on our daily lives. The bitcoin concept has been brought as an alternative of financial institutions **(Chang et al., 2020).** This is clearly contradicted by the fact that the great majority of Bitcoin transactions currently occur on stock exchanges (and thus financial institutions) where Bitcoin and other cryptocurrencies can be swapped against each other and conventional fiat money. The various risks identified by financial markets hider its wider adoption in global financial markets. For the most part, Bitcoin, Ethereum, and other cryptocurrencies are built on the blockchain technology that has been widely criticised by traditional financial institutions **(Attaran and Gunasekaran, 2019).** Due to its risks, many countries in Asia, Europe and other part of the world, showed their reluctance to warrant specific financial regulations for the development and adoption of blockchain technologies in financial sector **(Cremano, 2016; Guo & Liang, 2016).**

Th present study is an attempt to provide a theoretical lens to understand the potential benefits and challenges as the determinants of blockchain adoption through conducting SWOT Analysis. The strengths and opportunities of blockchain applications are covered under the potential benefits whereas weakness and threat are discussed under challenges of Blockchain applications in financial sector.

The remaining portions of the paper are organised as follows: The functionality of the Blockchain technology is discussed in the second section. Section Three depicts the benefits and opportunities of Blockchain in financial sector. The following section highlight the risks and challenges of Blockchain in financial services. Section Five discuss the key findings and SWOT Analysis. Future directions have been highlighted in Section six.

2. Background - Blockchain Technology

Zhang, Xue and Liu (2019) described blockchain as a distributed system. In contrast to single node transaction cash book, blockchain offers multiple nodes for maintaining the data integration. Each node on the blockchain receives a copy of the newly entered transaction. The new transactions are aggregated into one block, and the so-called consensus process (explained in more detail below) determines which node gets to send their block. Other nodes determine whether or not each transaction in this block should be considered legitimate. The block that comes after this one will make reference to accepted blocks. The conclusion of this process is that every node will keep a copy of the blockchain and will reach a consensus on the order in which the blocks should be processed **(Shrestha et al., 2020).** The following diagram describes the block chain functioning mechanism through three block structure **(Schmalenbach et al., 2020)**

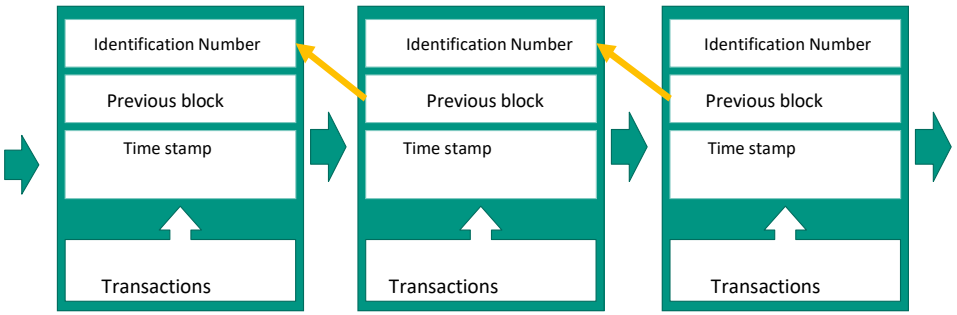

Fig. 1 Blockchain Mechanism's Three Block Structure

Through asymmetric cryptography and the so-called consensus process, blockchain technology provides such trust **(Kaur et al., 2021).** The asymmetric cryptography is employed to build them in such a way that their authenticity can be verified. In this case, a private and a public key are often used to create a one-way link between them. To achieve this, the sender uses her private key and any other key to encrypt her transaction. The public key of the sender may be used to decrypt the transaction, allowing anybody on the network to confirm that it came from the sender. Ultimately, the purpose is to secure the transaction's legitimacy and integrity, allowing the sender to be identified at any moment and preventing the transaction from being tampered with **(Rutland, 2018). Khan et al. (2021)** illustrated the substantial part of consensus knowledge in managing the next node to send its block to the blockchain. Nodes that collect the new transactions are reviewed and packed in order to be able to add the next block to the current chain (the so-called miners), and a payment is provided so that a sufficient number of nodes participate in this stage. only blocks containing genuine transactions that do not conflict with themselves or with the rest of the blockchain should be created by knots. **Yaga et al., (2018)** noticed that no transactions should be included that use the same asset more than once. The Bitcoin network depends on, most popular, proof-of-work consensus process, which is the most widely used. **Sobti & Geetha (2012)** noted that Bitcoin's blockchain (256 bits) apply a hash function to encapsulate a huge quantity of data into a small amount (the hash value) of fixed size. The number of leading zeros in a hash value on the Bitcoin blockchain now defines a maximum value. This is achieved by adding a time being to a chunk of information. A process of trial and error is now being used to adjust the hash value until the requirements are met. The hash rate measures how many tries are made to discover a valid solution per unit of time **(Rutland, 2018).** Finally, all other nodes may check that the work has been completed. It's as simple as entering the block with the nonce into the hash function, and checking whether the hash value fits the specifications **(Zheng et al., 2017).** The blockchain is made up of a series of blocks, each of which contains the hash value of the prior block. Any attempt to tamper with the blockchain would result in a new hash value for that block, which would affect subsequent blocks **(Marbouh et al., 2020).**

Blockchain Benefits and Opportunities in Global Financial Industry

Investigating the possibilities of Blockchain technology in the banking and financial industries Distribution Ledger Technologies, like as Bitcoin and other cryptocurrencies, provide a varied range of operational advantages to financial institutions, including increased security, cost savings, and immutability, among other things **(Mendling et al., 2018). Park & Park (2017)** found that storing data on a blockchain is safer than storing data in a single database because database attacks are less common than attacks on blockchains. As a result, when blockchain technology is employed in a field that requires the information disclosures it facilitates the consumers with data transparency. Consequently, blockchain technology has the potential to be applied in financial services sector. In the foreseeable future, its range of applications are expected to grow. When it comes to the implementation of blockchain technology, cost reduction will always be a key factor to consider **(Hassani et al., 2018). Ngo (2017)** identified the potential application of Blockchain technology in sinking the infrastructure costs substantially that results to saving the financial expenditure in a given financial year. **Hillsberg (2018)** hails the significant role played by Blockchain technology in reducing the agency cost by abolishing the requirement of mediators in financial operations.

Wang et al. (2019) comprehensive Blockchain, as an groundbreaking technique that promotes transparency in data storage. It is an immutable ledger that adds to the building of confidence in the data it holds. **Queiroz and Wamba (2019),** claim that one of the prime reasons behind people's intention to use blockchain is the high degree of transparency provided by the blockchain to its users. They further argued that Blockchain make it possible for all network members to stay up to date with useful information while making transactions that leads to build confidence. According to a study by **Clohessy and Acton (2019),** the key causes behind the adoption of blockchain technologies are minimizing costs, strengthening data security, operational and transactional efficiency and transparency in the transactional procedures. **Reinhardt, Oliveira, & Ring, (2020)** discovered that the functions of blockchain technology will further enhance the efficiency and operational quality of financial institutions. **Berentsen and Schar, (2018)** depicted the transparency of transactions in cryptocurrencies with the application of Blockchain.

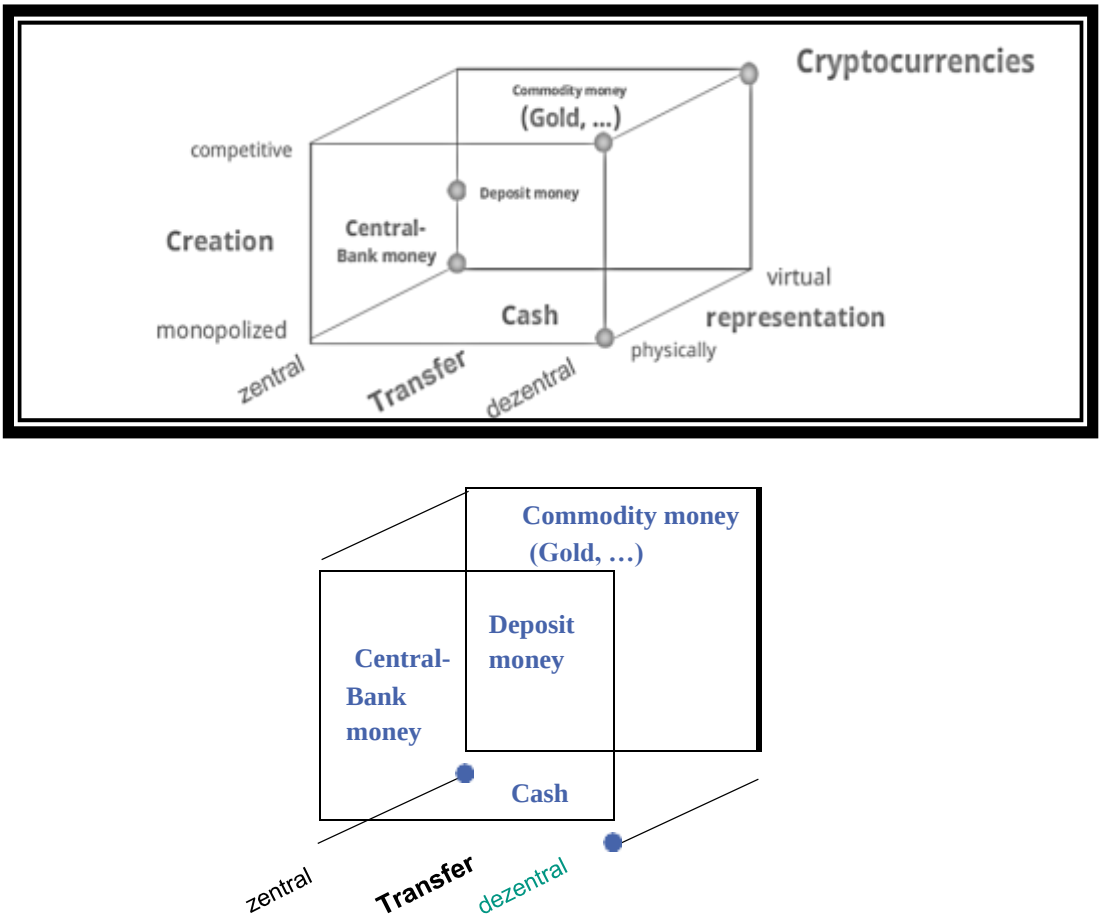

Figure 2: Dimensions of payment systems

Berentsen and Schar, (2018) applied three dimensions to characterise currencies or generic payment systems. These are the rules that govern the creation, representation, and transfer of monetary value **(Kevin and Suresha, 2018).** A central bank, for example, may have a monopoly on money generation, or it can be done in a competitive manner, such as when looking for gold. One way to symbolise money is to put it into an account or to have it physically in the form of currency. There are two ways in which people may exchange cash: through a bank directly or as in the case of a cash exchange **(Perkins, 2020)**. Cryptocurrencies such as Bitcoin or Ethereum combine virtual representation and decentralized transfer properties that have considerable efficiency advantages over the physical one and which are desirable from an economic point of view **(Reyna et al., 2018).** Before the invention of Blockchain, the combination of virtual and decentralized transfer was not feasible.

Moreover, Blockchain can be assisted to avoid excessive price volatility by distributing the money supply among a select few participants. Stable coins were created as a response to the wide fluctuations in the value of cryptocurrencies. The essential principle is that the currency is backed by a set quantity of money. Due to their design, stable coins rely on a central authority, which is the company or consortium that collateralizes them (Diaby et al., 2021). That is in direct opposition to the original purpose of cryptocurrencies, which was to eliminate the need for a central authority. Due to its large volume of data generated by using a cryptocurrency, it may lead to a systemic relevance of relevant actors and a risk of monopolies, which is worsened by this **(Diaby et al., 2021).**

Another significant application of Blockchain in finance sector is the development of Smart Contracts. Chenthara et al. (2020) observed the development of. A "smart contract" is a term used to describe a piece of code stored in the blockchain that, when certain conditions are met, is automatically executed without the involvement of the code's initial author. Smart contracts permit the blockchain to store more data and do calculations. All information in a smart contract can be verified by any party at any time. Due to the technology of the blockchain, once recorded, the code cannot be changed. The machine-readable nature of the code ensures that there is no possibility for ambiguity in its meaning. They provide a high degree of safety because terms of the contract can't

be altered afterwards and are frequently encoded using cryptography. A blockchain generally transfers an item or makes a payment instantly. One usage is extreme event insurance**. Zheng et al. (2020)** conducted an in-depth analysis and claim that Blockchain can help speed up the claims process rather than relying on traditional methods. Bitcoin blockchain has been applied in executing the payment transactions under complicated conditions or the delivery of a crypto asset. The Ethereum public blockchain may be used to execute increasingly complicated smart contracts **(Mammadzada et al., 2020)**

Initial Coin Offerings (ICO) is another emerging service where blockchain contribute significantly with its applications. ICOs allow less well-informed participants to monitor the investing behaviour of the experts and contribute to achieving critical mass. This is because ICOs are both rights of use and investments, which have a significant impact on both of these outcomes **(Zhang et al., 2019).** Because of the network effect, it is possible to see an increase in the value of tokens when there is a significant demand for them. Attention and subsequent platform adoption increase as a result of increased value **(Gong, 2009)**

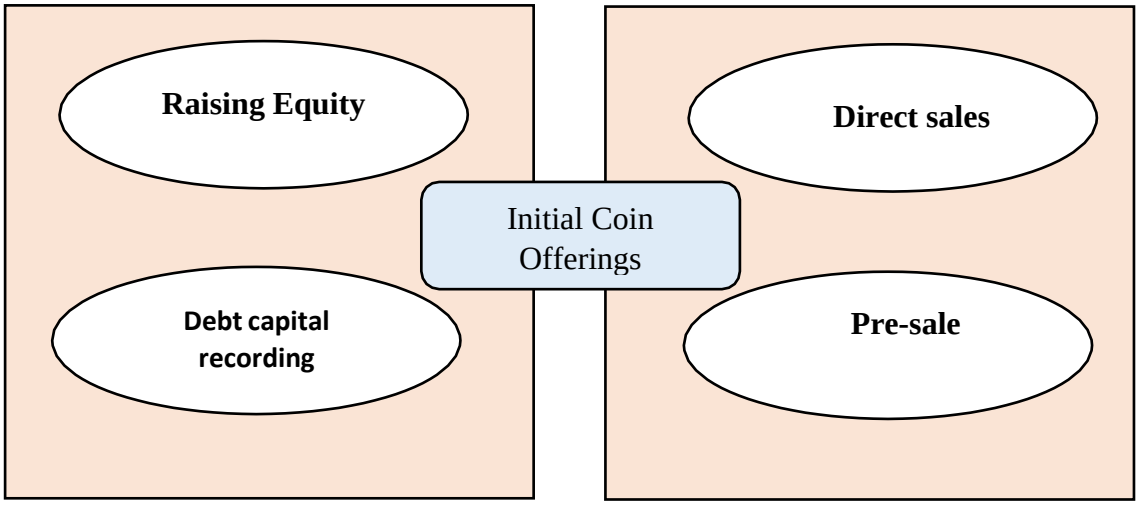

Fig.3 Classification of Initial Coin Offerings (ICOs)
Source: https://www.coinschedule.com/stats.html

The application of Blockchain can't be ignored in security settlements **(Adhami, Giudici and Martinazzi, 2018)**. Non-tangible assets may be recorded via the use of a blockchain, which establishes a consensus on the transactions that have been carried out. In this regard, a blockchain might theoretically be used to conduct transactions involving equities. Since securities transactions are subject to regulatory and tax laws, as well as privacy constraints, the blockchain requirements in this application vary from those for cryptocurrency. It would be simple to trace the ownership of a security. In addition, smart contracts may be used to automate procedures such as interest and dividend payments. With comparison to the current system, processing would be substantially more efficient in this new system. Instead of the current settlement two trading days following the trading day, a settlement that is much speedier or even real-time might be implemented. Settlement risks may be reduced or eliminated if security delivery and payment were carried out simultaneously. The need for a central counterparty would be eliminated **(Schar, 2021)**. **Chiu and Koeppl (2019)** have built a theoretical model of a public un-permissioned blockchain based on the proof-of-work approach **(Yermack, 2017).** Market participants can pay a fee, which raises the attractiveness of their transaction to the miners, resulting in a transaction being completed more rapidly. This allows for greater flexibility in transaction processing speed. As a result, the revenue generated by the fees is required to give incentives to the miners **(Huibers, 2021).** Blockchain based small contracts helps in making the financial derivative transaction fully automated and completed in real time. It further not only reduces the counterparty risk, but it also downsides in that market players must retain liquidity on hand in case of a probable margin call at any point in time **(Yaga et al., 2018).**

Yermack (2017) explores the implications of blockchain technology. His rationale is predicated on the

idea that all aspects of securities trading are supported entirely by blockchain technology. As previously indicated, this makes it simple to keep track of who owns certain securities. This makes it possible for issuers to connect with their shareholders in a timely and cost-effective manner **(Yermack, 2017)**. By lowering the cost of voting for shareholders and increasing the function of the general meeting as a shareholder forum, suggest that blockchain technology may enhance the function of the general meeting and its role as a shareholder forum **(Lafarre and Van der Elst, 2018)**. Because of the legal framework, as previously stated in the preceding section, blockchain-supported securities trading will not be anonymous under any circumstances. As a result, it may be presumed that at the very least the supervisory authorities are aware of the identities of the shareholders. Insider trading would be simpler to identify as a result of this, and it would be more difficult to acquire holdings in a stealthy manner while avoiding the obligations of regulatory reporting. This would allow market participants to get real-time updates on reportable securities transactions of corporate insiders (directors deals), which would limit insider trading gains while increasing the information efficiency of the market as a whole **(Sharma and Charbathia, 2015).** Re-dating of stock options for management would be made more difficult if the options were also based on a blockchain **(Singh et al., 2020).**

3. Challenges and Risks of Blockchain in Financial Sector

The widespread use of blockchain technology in both the financial and non-financial sectors of the global economy is hampered by a number of challenges and problems that make it difficult to deploy. Data and privacy concerns have a negative impact on the public's perception of the blockchain system, leading to a variety of regulatory and supervisory constraints on the technology's widespread use (**Lin and Liao, 2017; Chen, and Wang, 2018**). Various hazards are linked with blockchain implementation by banks, including operational, regulatory, legal, and reputational issues **(Bauer and Hein, 2006; Deshpande et al., 2017)** Financial losses could occur due to major flaws in system reliability and integrity, according to a Basel committee report. Hardware or software failures, disruptions, protections, and systems, as well as database intrusions, are among the hazards outlined by the Federal Deposit Insurance Corporation. External hacking has been emerged as the most significant operational risk. Hackers can access personal data by manipulating data or account balances. **Pennathur (2001)** find that internal controls may be lacking when a small bank contracts out their web operations to a third-party partner Customers may also overuse the website, whether on purpose or by accident, increasing the likelihood that it may become unavailable for commercial operations. If inadequate controls and processes are not adequately established and enforced in a digital environment, they may result in theft or fraud, depending on the circumstances (**Deshpande et al., 2017).** As a result of these worries, banks' reputations have the potential to be harmed, which is a serious risk given the fact that connections in the financial sector are built on trust **(Fiordelisi et al., 2014).** Upadhyay (2020) found scalability of blockchain systems is also a barrier because of the volume of data that is generated by many business functions. The high resource consumption and limited scalability of the major public blockchain implementations, such as those utilised by Bitcoin, are two of the most serious issues with these systems. The high resource usage is due to the incentives built into the system, as well as the proof-of-work consensus technique used to reach a consensus **(Salimitari, Chatterjee and Fallah, 2020).** It is created by the payment for each freshly mined block that an equilibrium is reached in which the miners have an incentive to bring more computer power into operation until their marginal costs are equal to their marginal revenues. An increase in the Bitcoin price implies that the marginal costs, in the form of power spending, have increased as well. As a result of this, the electricity consumption of the Bitcoin network has now reached the level of the electricity consumption of whole nations **(de Vries, 2018). Mohanta, Jena, Panda, & Sobhanayak (2019)** and **Deshpandey et. al. (2017)** identified that training, designing and implementation of blockchain carries a significant cost to the company. The government regulations, high expert fees, lack of integrity lead to create a big hurdle for the blockchain adoption across various business dimensions**. Harwood-jones, (2016)** and **Khan & Salah (2018)** noticed that as many nations have not yet approved Bitcoin as a legal currency, making the adoption of blockchain difficult. **Monrat, Schelen, & Andersson (2019)** studied that the reputation of blockchain has been severely damaged by the involvement of Bitcoins in financial scams, which has a negative impact on blockchain's credibility. Businesses and governments are more reluctant to implement it because of this. cryptocurrency also has characteristics that are not possible to accomplish with any other known payment system. Nonetheless, we do not believe that a widespread adoption of "actual" cryptocurrencies is likely in the foreseeable future **(DeVries, 2016).** The primary reason for this is the loss of efficiency that would arise from the introduction of a second currency with a value that differs from the value of the primary currency in circulation (the legal tender). In contrast, stable coins (which

include the crypto currency Libra, which was created by Facebook) do not suffer from this drawback **(Saiedi, Broström and Ruiz, 2021)**.

4. Discussion and Conclusion

The aim of this study was to explore the benefits and challenges of blockchain technology in financial sector. The study finds that although blockchain technology has created new paradigm shift and provided solutions to numerous challenges facing the digital economy, it has also experienced numerous difficulties in its implementation and development. It is therefore a double-edged sword for traditional economic and financial progress. The present study provides the complete insights of the important aspects of financial expenditures, advantages, risk and potential opportunities from the prospects of blockchain applications towards the financial sectors. The study underlines the various aspects that may affect the adoption and implementation of blockchain in finance sector globally. The findings from the above cited literature indicates the limited impact of blockchain on the banking and financial industries compared to other industrial sectors. The blockchain technology leads to reduce the uncertainty as it is data driven technology. Its applications have gradually built the trust and confidence of the investors and analysts and stretch its applications across variousaspects of financial sector such as banking, derivatives, security settlements and many more. The study finds that blockchain technology face various risk factors such as scalability, operating cost, agency cost, security, training cost, regulatory risks etc. Based on the review of literature conducted, the following table summarize the four key aspects of SWOT analysis of blockchain applications in finance:

Summary of SWOT Analysis

Strength	**Weakness**
a) Data Privacy b) Transaction Transparency c) Rigorous Security d) Efficiency e) Immutability f) High Speed Transaction transfer	a) Scalability b) Interoperability c) High operating cost d) Agency cost e) High training cost f) High transaction cost
Threat	**Opportunities**
a) Reputation Risk b) Association with Cryptocurrencies c) Non-recognition by governments d) Hacking Threat	a) Infant stage of development b) Recognized benefits only in few sectors c) Untapped potential benefits across financial services d) In-process adoption by many nations

Source: Author's compilation

However, due to high corporate governance restrictions on listed companies, the completely blockchain-based securities trading system does not appear to be feasible in shorter future. Still this data oriented revolutionary technology has an enormous potential to offer new cutting-edge services to financial sectors that can overshadow its negatives. The blockchain based corruption, tax evasion, and financial frauds may be prevented globally if rigorous rules and monitoring mechanisms across all nations are put in place. Based on the studied literature, it is found that the financial engineers must work on the database structure of blockchain technology to make it fraud proof. More industries will be able to benefit from blockchain technology because of this. Globally, blockchain technology is used to transform the conventional banking processes cost-effectively and offer cutting edge in data privacy, transaction transparency and security, immutability, and faster money transfer.

5. Future Directions

From the given theoretical framework, the present study provides the significant insights into the various issues related to financial sectors. The study's primary findings can help others

to embrace the empirical work and research within the given context. The study proposes that the future researchers should investigate the blockchain based financial and economic applications in business environment from the multidimensional perspectives to serve the entire society in a better manner. The present study emphasized on exploring the benefits and risks with SWOT analysis only in banking and financial sector. The future researcher may conduct the SWOT analysis of blockchain applications in other industrial sectors. The additional sectors of application not described in length in this article, such as the provision of promissory note loans, are applicable. Future studies should find answers to the problems that this study identified as obstacles to the widespread use of blockchain technology. The study also suggest the business houses to employ the blockchain technology in developing new products and services and to boost the cutting edge over their competitors. The financial sector's regulators and policy makers are also urged to take note of the feasible advantages of a blockchain solution over the current institutional framework.

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