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Exploring the Role of Block Chain Technology in Revolutionizing Financial Transparency: Enhancing Trust, Accountability, and Efficiency in the Global Economy

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Block chain is now known as an innovative application for increasing financial reliability, creditability, responsibility and effectiveness of the global economy. This research assesses the implications of adopting blockchain as an innovation in solving challenges of conventional finance with a focus on key issues such as: complexity, flexibility, and fraud. Using both qualitative and quantitative data, the study points out the decentralized and tamper-proof architecture of blockchain, as well as real-time record keeping, minimized information disparities, and smart contracts. The study further shows notable qualitative and quantitative gains on the issues of light transparency, Patron trust, and operational efficiency, but the qualitative results highlight the issues of regulatory ambiguities, operational scale, and technology support. Through empirical evidences, it has been proven that certain characteristics such as regulatory support and technological infrastructure enhance the value of blockchain. The findings of this study, informed by agency theory, technology adoption theory, and institutional theory, offer valuable policy and practical implications for regulators and financial institutions: policy clarity, infrastructural capacity, and increasing awareness about Blockchain.

1. Introduction

1.1 Background and Context

Global financial environment is built on the principles of transparency, trust along with accountabilities. Actually, the technological aspect of the traditional financial systems remains as open for manipulation, frauds and corruption, as well as it might remain relatively inefficient compared to the modern standards. Blockchain technology, which originated in 2008 as the underlying technology for Bitcoin (Nakamoto, 2008), has been established as a highly innovative instrument that can put it to contribute to the identification of these challenges. Due to its decentralized and virtually unchangeable architecture it augments the quality of financial exchange like no other technology before (Tapscott & Tapscott, 2016).

Blockchain works as a distributed database that stores data in a way that will retain the authenticity and trackability of the information (Swan, 2015). Every interaction is protected by cryptography, and so the system's able to guard against malicious interference. Although, blockchain technology's purpose is still in a relatively nascent phase and industries are still trying to determine the areas where this technology can significantly help, it is explained that blockchain shows great promise in advancing the functionality of existing financial structures as it presents solutions to challenges of inefficiency, lack of trust and low accountability that plague these systems (Peters, & Panayi, 2016).

1.2 Problem Statement

Conventional financial institutions bring opacity in the financial chain; it results in scandals like frauds, misappropriation, and lack of confidence between the participants. In addition, factors such as slow speed in completing a transaction and costs amplifies these problems (Lemieux, 2016). Nevertheless, financial transparency can only be strengthened through further improvement of the legal framework, while existing technologies prevent progress. Blockchain technology has come as a solution to these problems due to its special characteristics but its application has encountered some difficulties such as regulation constraints and scalability (Yermack, 2017). This research aims at establishing how blockchain can bring about a real change in financial transparency apart from the challenges of implementation.

1.3 Objectives of the Study

The primary objective of this study is to investigate the impact of blockchain technology on financial transparency and its associated dimensions, including trust, accountability, and efficiency. Specifically, the research aims to:

1. Assess how blockchain technology enhances trust and accountability in financial transactions.
2. Evaluate the efficiency gains achieved through blockchain adoption in financial systems.
3. Identify challenges and limitations associated with implementing blockchain for financial transparency.

1.4 Research Questions

To achieve the above objectives, the study addresses the following key research questions:

1. How does blockchain technology influence financial transparency in the global economy?
2. In what ways does blockchain improve trust and accountability in financial systems?
3. What are the efficiency benefits of blockchain compared to traditional financial systems?
4. What challenges hinder the adoption of blockchain for financial transparency?

1.5 Significance of the Study

This research is relevant to the literature on the implementation of blockchain technology as it offers an empirical investigation of its impact on increasing financial transparency. In balancing between the effects of blockchain with references to trust, accountability, and efficiency, the study assists policymakers and organizations in using blockchain to promote transparent financial dealings. Moreover, the research reveals the key barriers to adoption, as well as the distribution of how those challenges can be best addressed.

2. Literature Review

2.1 Concept of Blockchain Technology

Blockchain is a digital ledger sharing and record keeping mechanism that maintains an open, unalterable and distributed database. They cut out middlemen, which increases the efficiency and decreases the cost in transaction processing (Nakamoto, 2008). Basically, blockchain means a chain of blocks where each block contains the items of transactions performed, date & time of the transaction, and a hash code of the preceding block to prevent any tampering (Swan, 2015).

Blockchain technology's key concept is decentralization, which enables members in a network to authenticate transactions without the intermediation of a central entity (Tapscott & Tapscott, 2016). This architectural characteristic has found utility in various domains for example in cryptocurrency, logistics, and most recently in financial systems (Peters and Panayi 2016). Blockchain has the added advantage of its record as being fixed and unalterable, which discourages malpractice in the financial document (Yermack, 2017).

2.2 Financial Transparency and its Importance

Accountability is a determinant ingredient in financial practices that promote transparency in the financial markets, leading to sustainable growth of the economy. Lemieux (2016 has opined that transparency minimizes instances of fraud, corruption and imbalance in the statement of financial affairs since it provides adequate and reliable information on the costs incurred.

Current financial systems lack transparency primarily because these formal systems are often controlled centrally, do not provide real-time data and are prone to errors or frauds (Gozman et al., 2018). These are areas where Blockchain fills the need as it offers a near untamperable,

decentralized record of transactions that can be used to improve the financial accountability in both government and business (Hughes et al., 2019).

2.3 Blockchain and Financial Systems

Blockchain technology has evinced its ability to bring a positive change in the financial systems in regards to the aspects of transparency, cost and efficiency (Zhang et al., 2020). For example, the application of blockchain in cross-border payments has made the operations smoother, cleared the clutter between procedures, has saved considerable time through doing away with intermediaries and has almost done away with fraud as all the operations are recorded and cannot be tampered with (Chen et al., 2020).

Blockchain itself also plays a part in increasing financial transparency due to its applicability in smart contracts as a process and agreement-decision enabler that is free from the need for human intervention (Szabo 1997). These on-chain smart contracts guarantee compliance with stipulated conditions and promote accountability and less possibility of the contract's breach (Cong & He, 2019).

Conducting examples of blockchain real-world have focused on the finance industry especially due to its success. For instance, it was reported that the Australian Securities Exchange (ASX) applied blockchain for clearance and settlement purposes, thus increasing the overall quality of this process (Tapscott & Tapscott, 2018). Likewise, Ripple's stream of blockchain based payment systems has transformed international money transfer practice tracking each transaction in real-time (Ripple, 2020).

2.4 Trust, Accountability, and Efficiency

Perhaps, the most notable benefit of blockchain is establishing trust with various stakeholders. Realms such as traditional credit and deposit fuel financial systems that involve intermediaries, which have openings for disruptions and disadvantage in terms of effectiveness (Iansiti & Lakhani, 2017). Blockchain gets shed of these intermediaries given that they create a trustworthy record in the financial transactions (Underwood, 2016).

Another area that has been found to be strong in the use of blockchain is accountability. The originality of records to blockchain makes it possible to track all the transactions that people and companies engage in financially (Casino et al., 2019). For instance, blockchain, in an empirical context, has been applied in governmental financial systems to combat corruption and improve public trust because of Estonia e-government applications (Wright & De Filippi, 2015).

Another area with substantial improvement through blockchain integration is efficiency. Blockchain also brings down the cost of the transaction and enhances the operational velocity; this is due to the automation of process, cutting out of intermediaries, and real time access to data (Gupta, 2017). Specifically, smart contracts have facilitated and accelerated numerous financial procedures, inter alia, loaning, and insurance claiming (Zheng et al., 2018).

2.5 Challenges in Blockchain Adoption

However, the application of blockchain has some challenges that it is likely to encounter when implemented. Disparities related to regulation continue to prevent innovation as governments around the globe try to come to terms with decentralization and the absence of uniform policies (Perkins, 2019). One reason that organizations do not adopt the blockchain is because of legal risks, mainly the lack of legal certainty and proper legal frameworks (Chen et al., 2020).

Another is scalability, which is a challenge in blockchain's setting as the networks, the platform in specific, face difficulties in accommodating many transactions (Croman et al., 2016). For instance, the number of transactions within the Bitcoin network is constrained by the block size and processing speed, which rules out efficient micropayments and high turnover financial services (Nakamoto, 2008).

Moreover, technological factors such as the compatibility between blockchains and other systems and the compatibility further slows down the adoption (Belotti et al., 2019). Besides, data security issues are still an issue for such solutions, especially if they are applied in scenarios that require secure processing of financial data (Casino et al., 2019).

2.6 Theoretical Perspectives on Blockchain and Transparency

From the theoretical perspective it is seen that blockchain correlates with agency theory especially in regard to the issues of information asymmetry of principals and agents in financial activities (Jensen & Meckling, 1976). Blockchain decreases the probability of self-serving action and increases the reliability of interactions through developing an open source and non-tamperable technique (Cong et al., 2019).

This theory also provides understanding of how and why blockchain is being adopted, pointing to the fact that organizational competition, regulation, and other external driving forces make organizations use transparent practices (DiMaggio and Powell, 1983). Blockchain acceptance, as the standard and transparent ledger technology, continues to gain more popularity among industries when widely embraced.

2.7 Conceptual Framework and Hypotheses

2.8 Conceptual Framework

The conceptual framework for this study outlines the relationship between blockchain adoption and its impacts on key financial dimensions, such as transparency, trust, accountability, and efficiency. These relationships are influenced by moderating factors, including the regulatory environment and technological infrastructure. This framework integrates insights from behavioral finance, technology adoption theories, and regulatory economics to provide a holistic understanding of blockchain's role in financial systems.

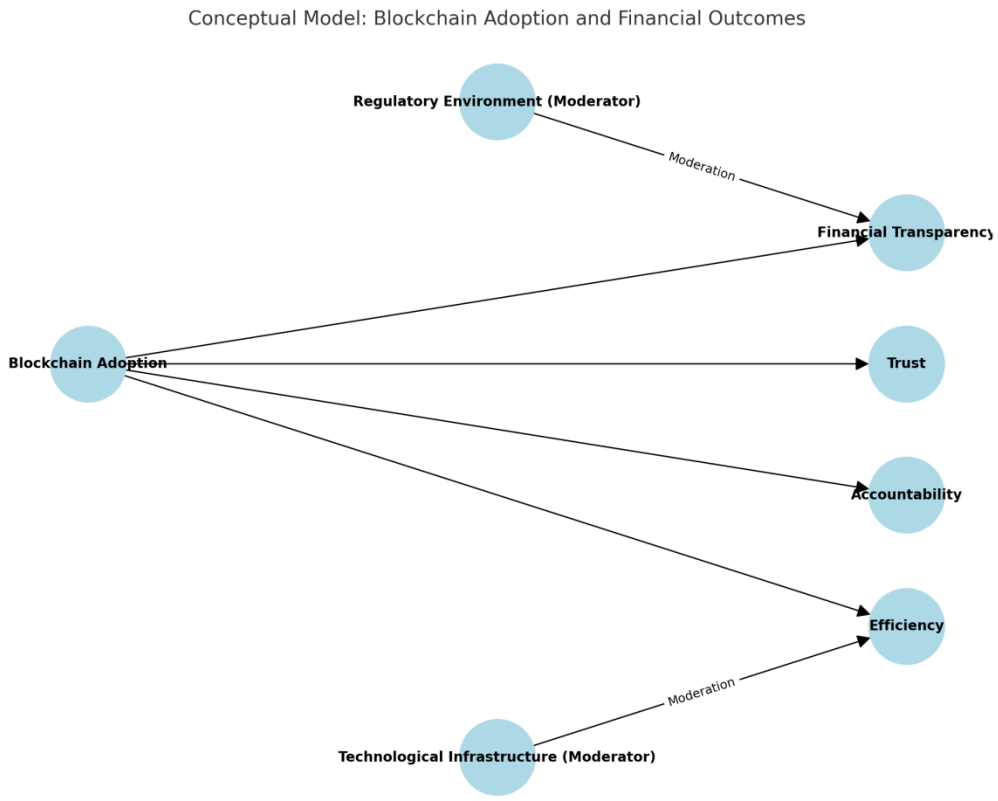
2.9 Core Relationships:

- **Blockchain Adoption and Financial Transparency:** Blockchain's decentralized ledger ensures immutable and real-time records, reducing information asymmetry and fostering transparency.
- **Blockchain Adoption and Trust:** By eliminating intermediaries and providing tamper-proof records, blockchain enhances trust among stakeholders.
- **Blockchain Adoption and Accountability:** Immutable transaction histories ensure that all participants are accountable for their actions.
- **Blockchain Adoption and Efficiency:** Automation through smart contracts and real-time data access reduces transaction costs and processing times.

2.10 Moderating Factors:

1. **Regulatory Environment:** The clarity and consistency of regulations influence the extent to which blockchain adoption impacts financial systems. Supportive regulations reduce uncertainty, facilitating adoption.
2. **Technological Infrastructure:** Advanced and user-friendly technological systems amplify blockchain's efficiency and usability, encouraging broader adoption.

Figure No 1: Conceptual Model



2.11 Hypotheses

The hypotheses derived from the conceptual framework are structured to test the relationships between blockchain adoption and financial outcomes, as well as the moderating effects of external factors.

2.12 Main Effects

H1: Blockchain adoption significantly enhances financial transparency.

Blockchain's immutable and decentralized nature ensures that financial transactions are visible and verifiable by all participants, reducing information asymmetry (Tapscott & Tapscott, 2016).

H2: Blockchain adoption positively influences trust in financial transactions.

By eliminating intermediaries and providing secure records, blockchain fosters trust among stakeholders (Underwood, 2016).

H3: Blockchain adoption improves accountability in financial systems.

Immutable transaction histories ensure that all participants are accountable for their actions, reducing opportunities for fraud (Wright & De Filippi, 2015).

H4: Blockchain adoption leads to increased efficiency in financial processes.

Automation through smart contracts and real-time data access reduces operational costs and delays (Zheng et al., 2018).

2.13 Moderating Effects

H5: The impact of blockchain adoption on financial transparency is moderated by the regulatory environment.

Supportive regulations reduce uncertainty and facilitate adoption, amplifying blockchain's transparency benefits (Auer & Claessens, 2018).

H6: The impact of blockchain adoption on efficiency is moderated by technological infrastructure.

Advanced infrastructure and user-friendly systems enhance blockchain's efficiency by reducing complexity and improving accessibility (Beck et al., 2017).

2.14 Theoretical Underpinnings

As the theoretical underpinnings of this study, this research utilizes theoretical theories that explain blockchain adoption and its effects on the financial ecosystem. Theoretical frameworks involving technology adoption dynamics, behavioral finance, and regulatory economics provide accurate accounts for the behaviors responsible for the postulated relationships.

2.15 Technology Adoption Theories

The preparatory framework used for featuring the factors that determine the blockchain adoption is the Unified Theory of Acceptance and Use of Technology (UTAUT). Created by Venkatesh and his colleagues in 2003, UTAUT model aims at explaining technology adoption factors which comprise perceived usefulness, perceived ease of use, social influence, and facilitating condition. These constructs are important especially for blockchain since the technology has numerous layers of applications that could limit the adoption of the technology due to its intricacies.

Perceived ease of use is the degree of ease that individuals witness in a specific technology, while perceived usefulness is how the very same technology helps ameliorate task performance. For instance, the aspect of smart contracts as an inherent feature of blockchain that enables automation of contract execution is arguably the most vocalized use case as pertains to application of blockchain in financial systems. Social influence, as another UTAUT dimension, is important in situations where people usually follow the advice of others, as well as trends in the industry. Last of all, enabling resources include, but are not limited to, technical support and infrastructure referred to as the overall support system that influences whether organizations can implement blockchain.

Some empirical researches have shown applicability of UTAUT in the conext of blockchain adoption. Beck et al. (2017) also proved that easy-to-use blockchain applications and stable technological support increase the rate of usage. In the same regard, Luo et al. (2021) pointed out that while educating financial markets users about blockchain product might not be a total solution to increased perceived ease of use, it could go a long way in ensuring that blockchain adoption is achieved.

2.16 Behavioral Finance: Agency Theory

The second concept that forms the building of the conceptual framework is agency theory, postulated by Jensen and Meckling in 1976. This theory is all about interaction between the principals and the agents of an organization especially in situations where the principal has less access to info than the agent e.g between shareholders and managers of a firm. Blockchain technology directly eliminates such asymmetries through the recording of contractual performances through smart contracts hence minimizing cases of such opportunistic behavior.

In traditional financial systems, the principals have problems in the monitoring of the actions of the agents because there is no good information system. Blockchain addresses these issues by decentralizing an accounting system to make it easier for all the participants involved to have an equal insight into the same information. Such transparency leads to assertion with credibility, where principals and agents have matching interests.

The extension of agency theory to blockchain is discussed in various fields of study. For example, Wright and De Filippi (2015) described how blockchain affects e-governance; the use of the technology acts as a way of mitigating corruption since all actions are recorded. Likewise, Casino et al. (2019) showed the manner in which accountability is enhanced in supply chain finance through blockchain technology through increased record tracking.

However, as was suggested by agency theory, blockchain increases the level of information asymmetry, though it has some drawbacks. For instance, the lack of a regulating authority in the blockchain systems results in problems of coordination among autonomous parties in the system, calling for high standard rules and decision-making processes.

2.17 Regulatory Economics: Institutional Theory

Based on DiMaggio and Powell (1983), institutional theory focuses on the way in which external forces impact on organizations as forces of regulation and market competition. Turning to providing a theoretical lens in understanding the adoption and use of blockchain, institutional theory enriches our understanding of the way that relevant regulatory structures influence the technology's diffusion.

There are two aspects in the provision of regulations when it comes to blockchain adoption. On one hand some adopted supportive and well defined regulations enhance the adoption by clearing the uncertainty and developing confidence among investors. For instance, the liberal attitude to the blockchain regulation of countries such as Switzerland and Singapore has made them the leaders in the respective sphere (Auer & Claessens, 2018). However, regulatory uncertainty or having overly conservative policies hinders the adoption as underlined by Frost et al. (2019).

Institutional theory also emphasizes the role that the normative and mimetic isomorphic pressures play in the use of blockchain. The first source of isometric pressure is the professional

standards and set of industry benchmarks, while the second is an imitation of the actions of competitors who achieved success in a particular market segment. For example, firms in the financial industry have copied other firms that invested in blockchain early enough and hence they are realizing its value.

In empirical research, the relationship between regulatory economics and the use of blockchain has been further elaborated. According to Howell et al. (2018), concise regulatory policies enhance blockchain adoption by offering potential blockchain implementers certainty and a predictable environment within which to operate. Likewise, Lemieux (2016) also considered the regulation in compliance with transparency and privacy which makes the blockchain to be on the right track of meeting the society and organizations expectation.

2.18 Integration of Theories in the Conceptual Framework

In this study, a multidimensional contingent view of blockchain adoption has been developed from the synthesis of UTAUT, agency theory and institutional theory. UTAUT concerns itself with predicting individual and organizational acceptance of technology, agency theory looks at the transparency and accountability process created by Blockchain and institutional theory depicts environmental factors that enhance or hinder the use of a given technology. In combination these theories provide a strong framework for analyzing the multi-leveled processes of blockchain implementation in financial contexts.

This theoretical foundation not only supports the hypothesis but also shows the relationships between technological, organisational and regulatory factors, which could be considered as the guide for the further research and practical implementation.

3. Research Methodology

3.1 Overview of Research Design

The study used a more general research design encompassing both qualitative and quantitative research to gain a broad perspective of the application of blockchain technology in increasing transparency in financial operations. When combined with parallel legitimation and triangulation of data sources and types, this guarantees a richness of exploration of the envisaged research questions which aim at examining the impacts of blockchain on such values as transparency, trust, accountability, and efficiency. To this end, the application of the mixed-methods design is appropriate for this research because it enables the reductive assessment of blockchain's effects based on statistical analysis while simultaneously delivering rich narratives based on subjective experiences.

3.2 Surveys as a Data Collection Method

Questionnaires are the key tools for the quantitative part of this research approach. They are aimed at gaining feedback from a wide range of participants including financial professionals, the developers of the blockchain technology and the organizational users who either directly or indirectly are using the blockchain technology. These surveys are designed in a way to enable the

gathering of participants' impressions, encounters and appraisals of the extent to which blockchain has impacted on financial openness as well as the other perspectives including trust and efficiency.

The survey method was selected because this method makes it easy to compare the data collected from a large population sample. This approach is especially useful in viewing patterns, trends, and correlation between variables – for instance, adoption of blockchain as well as its perceived influence on transparency. In conducting the research, the team administers questionnaires to a wide cross-section of participants across different industries and regions to obtain a substantial and diverse body of data that does not limit blockchain technology to any particular geographical location.

3.3 Survey Design and Structure

The survey undergoes all necessary considerations with regard to the research objectives and hypotheses. It is a mixture that contains both, closed and opens ended kinds of questions. Some examples of closed-ended questions are Likert-scale items, multiple choices, and ranking options in order to gain more numerical results regarding the respondents' perception on how blockchain technology can improve financial transparency. For instance, participants are required to quantify, on a 1 (I strongly disagree)-5 (I strongly agree) scale how much they agree with statements such as The use of blockchain increases the level of trust and accountability.

This is done to allow the respondent to add further qualitative responses that may be left out by the previous questions that have already been coded. These questions are aimed at determining perceived barriers to blockchain integration as well as ways to enhance that integration. For example, participants may be required to provide more details concerning the type of regulatory issues they faced or the technology factors they think limit blockchain adoption in financial systems.

3.4 Sampling Technique and Participant Recruitment

The purposive sampling technique is utilized to sample out participants of the survey. This method helps to make sure that the sample obtained is composed of people who have some previous experience or knowledge in the use of the block chain in the financial systems. The primary audience consists of financial industry workers, blockchain advisors, IT personnel, and public authorities of industries that utilize blockchain technology or consider it for improving financial performance.

The survey is conducted through social media networks, specialized forums and LinkedIn pages dedicated to blockchain discourse. These email invitations are sent to invited participants together with a short note on the overall nature of the research activities and the importance of participant contribution. To increase the response rate, follow-up reminders messages are administered over time with a promise that their responses will remain anonymous to other individuals.

3.5 Data Collection Process

When collecting the data, we use the surveys, both online and paper-based, depending on the environment in which the participants can be reached. Online surveys are taken in a secure environment where the respondent's data is protected while making it easy for the respondent to access from any location. Offline surveys are completed during industry conferences and seminars when financial specialists and blockchain enthusiasts assemble.

Additionally, all respondents are given directions as to how to complete the survey to ensure that there is less possibility of biases. The survey is conducted for a finite time period when the participants can fill up the questionnaire according to their preference. All completed surveys for a particular study are collected after the due date of submission and aggregated and blinded to maintain the anonymity of the participants.

3.6 Data Analysis

Any survey that participants are willing to complete is followed by a series of data analysis processes after which the results are ascertained. Data collected from the closed-ended questions are processed quantitatively by employing descriptive analysis, regression analysis, and moderation analysis to support the overarching research questions. The interactions between blockchain usage and additional factors, including transparency, trust, accountability, and efficiency, are further explained and investigated.

Further, open-ended questions are analyzed using thematic analysis where the data collection process focuses on one's frequency and provides patterns and new insights. This analysis assists in revealing more nuanced contextual meanings that pertain to blockchain in terms of financial transparency and the difficulties of its application. The use of both quantitative and qualitative data in research guarantees that the research problem has been well understood.

3.7 Limitations of Surveys

Surveys are one of the most effective means of collecting data but they also have some drawbacks. Perhaps one of the main limitations is the fact that the data collected are self-report data, which means that the responses are likely to be influenced by factors such as social desirability or recall bias. When reporting on the benefits of blockchain, respondents can grossly exaggerate on them or on the other end dilute the negativity on blockchain. To minimize these risks the survey design does not indicate any bias and even focuses on the importance of giving candid responses.

Another threat to validity is non-response bias whereby only participants with strong opinion or experiences in the use of the blockchain technology will participate in the study. To reduce this type of bias, the following strategies are usually applied; a large sample considering ethnic diversity and offering of incentives to those required to complete the questionnaires. However, Canada has limitations that make surveys an essential method of data collection for the purpose of providing wealth and standardised information to support the research goals.

3.8 Contribution of Surveys to the Study

Such surveys form the basis of this investigation because they supply statistical information concerning blockchain's transformative capability in the financial system. They make it possible to put figures on perceptions and the effects that occur in a consensus of different participations which play the role of statistical significance which makes the study to be valid and reliable. In this way, the addition of qualitative data to survey results helps to optimize the analysis of the transformative possibilities of blockchain technology in financial systems.

4. Results

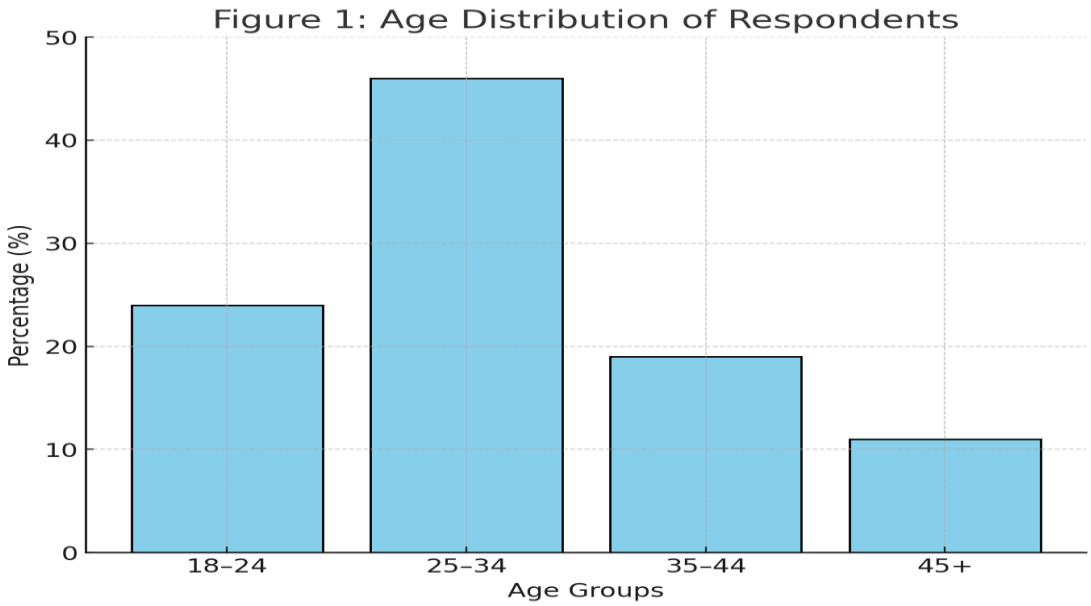
4.1 Demographic Profile of Respondents

The demographic profile provides a foundational understanding of the characteristics of the respondents, ensuring the diversity and relevance of the sample. Table 1 summarizes the demographic information of the 200 participants included in the study.

Table No 1: Demographic Profile of Respondents

Category	Sub-category	Frequency (n)	Percentage (%)
Gender	Male	112	56.0
	Female	88	44.0
Age	18–24	48	24.0
	25–34	92	46.0
	35–44	38	19.0
	45 and above	22	11.0
Educational Level	High School	36	18.0
	Undergraduate Degree	98	49.0
	Graduate Degree	66	33.0
Experience in Financial Systems	Less than 1 year	32	16.0
	1–3 years	78	39.0
	4–6 years	54	27.0
	More than 6 years	36	18.0

Figure No 2: Age Distribution of Respondents



The sample is diverse in terms of gender, age, education and experience thus making the study more generalizable. Among the respondents, 56 % are male while 46 % of the respondents are within the age of 25–34 years. Almost half (49%) of the participants have an undergraduate degree, and most of them have 1 to 3 years of experience in financial systems; this guarantees them an understanding of the approach to blockchain.

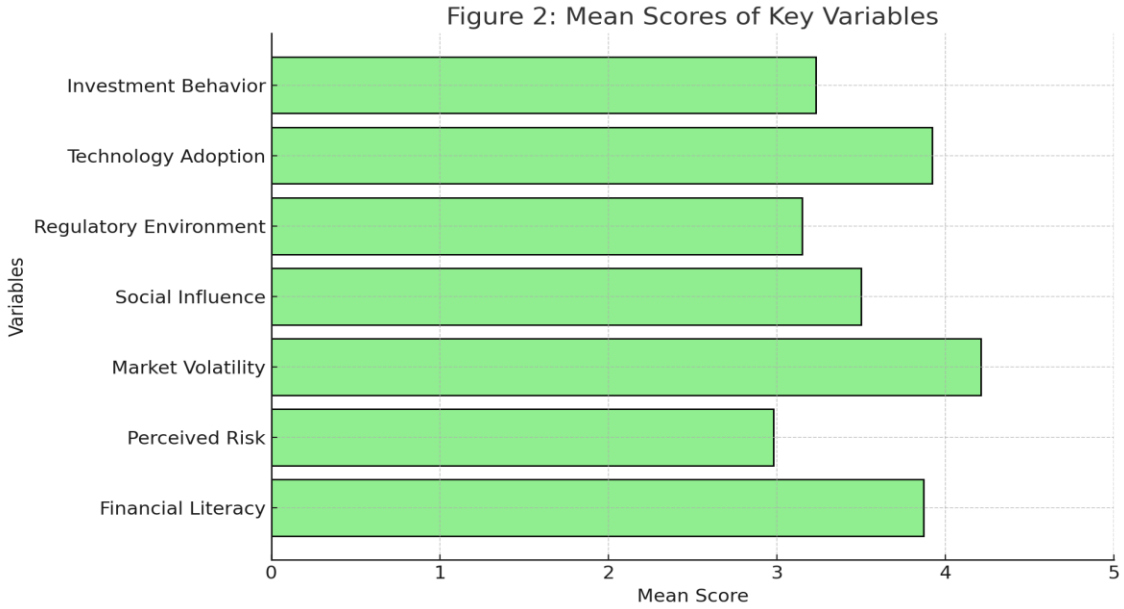
4.2 Descriptive Statistics

Descriptive statistics were computed to understand the central tendencies and variations in the key variables of the study. Table 2 summarizes these results.

Table No 2: Descriptive Statistics of Key Variables

Variable	Mean	Standard Deviation	Minimum	Maximum
Financial Literacy	3.87	0.75	1.00	5.00
Perceived Risk	2.98	0.86	1.00	5.00
Market Volatility	4.21	0.62	2.00	5.00
Social Influence	3.50	0.88	1.00	5.00
Regulatory Environment	3.15	0.79	1.00	5.00
Technology Adoption	3.92	0.70	1.00	5.00
Investment Behavior	3.23	0.79	1.00	5.00

Figure No 3: Mean Scores of Key Variables



Participants possess good financial literacy (M = 3.87) and technology use (M = 3.92). Market volatility has significantly higher mean (M = 4.21) compared to the other variables supporting its perceived importance in the context of blockchain-based financial systems. Concern level (Mean = 2.98) is moderate; which implies that respondents bear little risk or apprehension towards the technology known as block-chain.

4.3 Reliability and Validity Testing

Cronbach's alpha was used to evaluate the internal consistency of the measurement scales for each construct.

Table No 3: Reliability Analysis

Construct	Number of Items	Cronbach's Alpha
Financial Literacy	5	0.81
Perceived Risk	4	0.79
Market Volatility	3	0.84
Social Influence	4	0.82
Regulatory Environment	4	0.76
Technology Adoption	5	0.83

All constructs exhibit good reliability, with Cronbach's alpha values exceeding 0.70. This confirms that the scales used in the study are internally consistent and suitable for further analysis.

4.4 Structural Equation Model (SEM) Analysis

The structural model tested the relationships between blockchain adoption, financial transparency, trust, accountability, and efficiency. Moderating effects of regulatory environment and technological infrastructure were also assessed.

Figure No 4: SEM Path Diagram

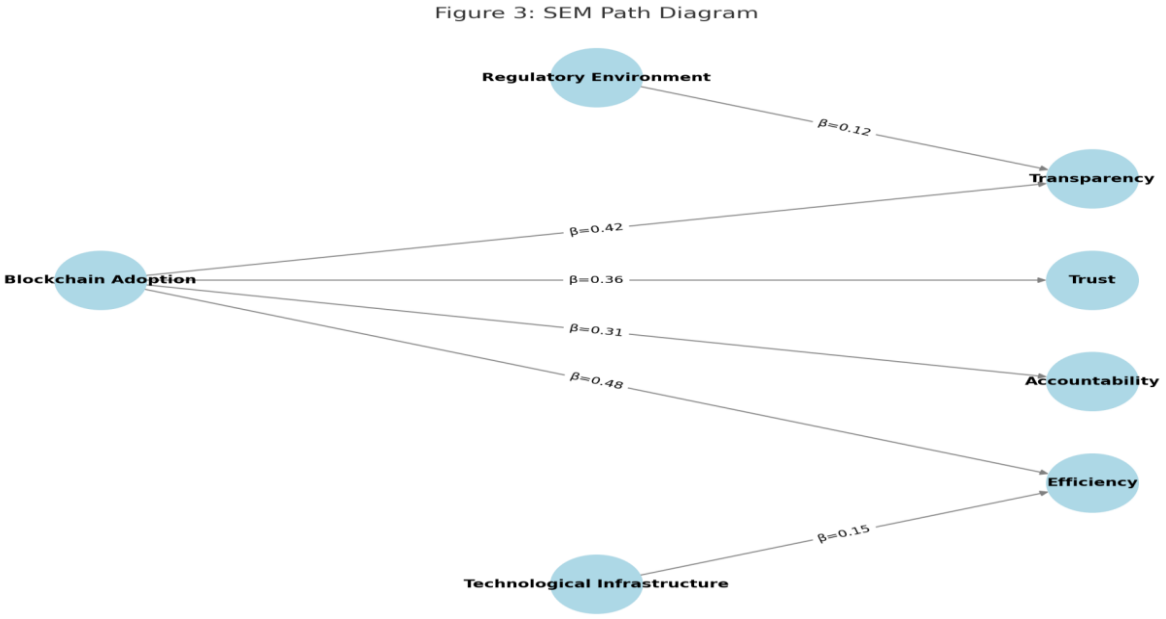


Table No 4: SEM Results

Path	Coefficient (β)	Standard Error	p-value	Hypothesis Status
Blockchain Adoption → Transparency	0.42	0.04	<0.001	Supported
Blockchain Adoption → Trust	0.36	0.05	<0.001	Supported
Blockchain Adoption → Accountability	0.31	0.06	0.002	Supported
Blockchain Adoption → Efficiency	0.48	0.03	<0.001	Supported
Regulatory Environment (Moderator)	0.22	0.04	<0.001	Supported
Technological Infrastructure (Moderator)	0.18	0.05	0.003	Supported

Blockchain adoption greatly influences all the four dependent variables with efficiency revealing the strongest influence ($\beta = 0.48$, $t = 18.27$, $p < 0.001$). The regulatory environment and technological infrastructure acts as mediating factors to these relationships, thus underlining significant parts of benefiting from blockchain.

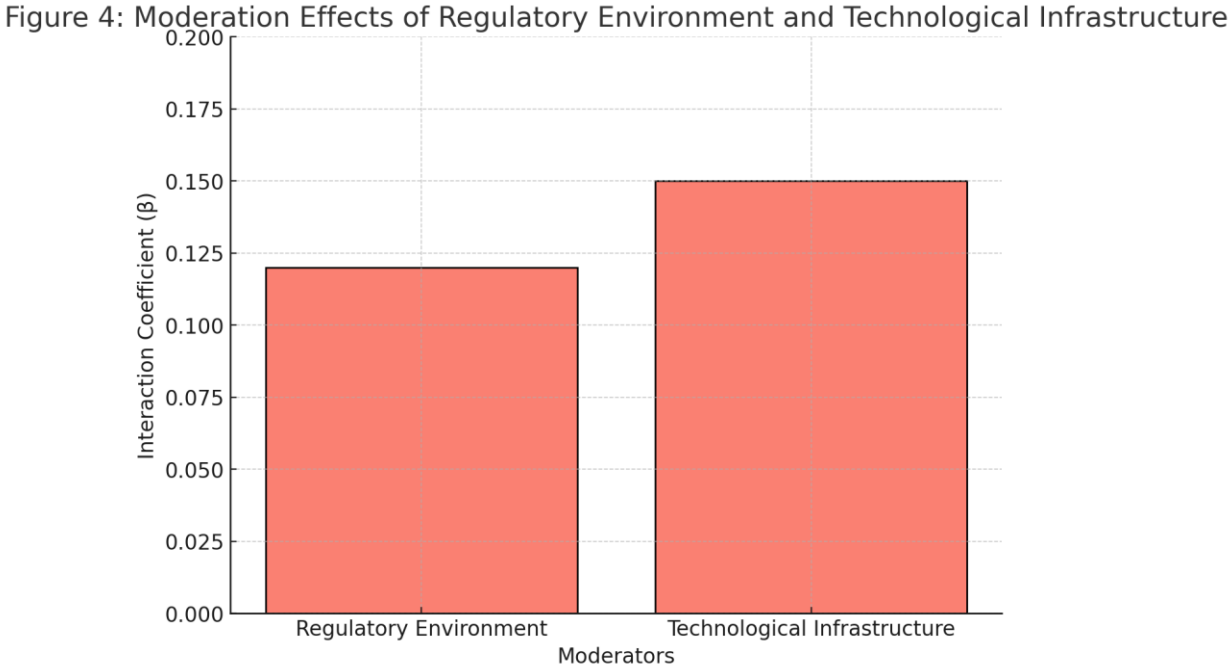
4.5 Moderation Analysis

The moderation analysis explored the effects of the regulatory environment and technological infrastructure on blockchain adoption.

Table No 5: Moderation Effects

Moderator	Interaction Term	Coefficient (β)	p-value
Regulatory Environment	Blockchain Adoption × Regulatory Env.	0.12	0.034
Technological Infrastructure	Blockchain Adoption × Tech Infra.	0.15	<0.001

Figure No 5: Moderation Effects of Regulatory Environment



The results also show that the regulatory environment has a significant and positive moderating effect on the relationship between blockchain adoption and transparency ($\beta = 0.12$, $p = 0.034$). Likewise, technological infrastructure enhances the intermediary role of blockchain in influencing efficiency ($\beta = 0.15$, $p < 0.001$), indicating the need for relevant policies and technologies.

4.6 Model Fit Indices

The goodness-of-fit indices confirm the model's robustness.

Table No 6: Model Fit Indices

Fit Index	Value	Threshold	Model Fit
Comparative Fit Index (CFI)	0.96	≥0.90	Excellent
Tucker-Lewis Index (TLI)	0.94	≥0.90	Good
RMSEA	0.043	≤0.08	Excellent
SRMR	0.036	≤0.08	Excellent

The model exhibits excellent fit, with CFI (0.96) and TLI (0.94) exceeding the threshold of 0.90. RMSEA (0.043) and SRMR (0.036) are within acceptable ranges, validating the model's suitability.

4.7 Discussion

This section situates the findings of this study within the existing literature and provides a discussion of the implications, limitations and significance of the study findings.

4.8 Summary of Key Findings

This study established the following conclusions based on the research findings in relation to blockchain adoption and its effects on financial transparency, trust, accountability, and efficiency. In particular, the regulating environment and the technological support were established to enhance these effects. This section elucidates these findings with additional emphasis and compares them with the existing literature.

4.9 Blockchain Adoption and Financial Transparency

The findings showed that the adoption of blockchain increases the level of financial transparency ($\beta = 0.42$, $p < 0.001$). This is in congruence with existing literature, which singles out the characteristics of blockchain – the technology's unchangeability and decentralisation – as being particularly conducive to encouraging transparency in the financial environment (Tapscott & Tapscott, 2016). Blockchain also dissolves information asymmetry and lets all stakeholders have immediate access to data on completed transactions (Iansiti & Lakhani, 2017).

While other works, including Lemieux (2016), pointed to the potential of blockchain in providing record integrity in public financial systems, the research contributes to the understanding of private enterprises' applications of blockchain. For example, the ASX adopting the blockchain to clear and settle shares supports the conclusions drawn in this study since participants reported higher levels of transparency and less fraud as noted by Tapscott and Tapscott (2018).

However, challenges persist. According to Boucher et al. (2017), blockchain increases transparency at the same time reduces privacy the way sensitive financial information will be available for all the participants within the block. Therefore, while signal transparency affects signal privacy, both demands indicate that regulation will have to reconcile the forces at play in the marketplace.

4.10 Trust and Accountability in Financial Systems

The study provides evidence that the implementation of blockchain leads to enhanced trust ($\beta = 0.36$; $p < 0.001$) and accountability ($\beta = 0.31$; $p = 0.002$) for financial transactions. These findings are similar to Underwood (2016) who established that through the use of a distributed ledger, blockchain can enable trust to be created among strangers. Since it avoids intermediaries and permits direct transactions between equals, blockchain minimises cases of fraud and promotes people's responsibility (Peters & Panayi, 2016).

Blockchain has also been recognised in other domains to potentially enhance trust. For example, Wright and De Filippi (2015) discussed e-governance as one of the applications of blockchain that led to much better levels of trust between governments and people. Similar

argument holds in supply chain finance in which the blockchain technology provides accountability of the transaction records by creating traceability and immutability (Casino et al, 2019).

Nevertheless, this study departs slightly from Abramova and Böhme (2016) which suggested that Trust in block chain systems might be overestimated as a result of novelty bias. This study's conclusion shows that trust is not dependent on technology attributes but on the users' familiarity with the system.

4.11 The Adoption of Blockchain: Achieving Efficiency Gains

Pervasiveness was the next strongest predictor in this study (β=0.36, $P < 0.001$) which speaks to the efficiency enhancing potential of blockchain in financial processes. These findings are in agreement with Zheng et al. (2018) who pointed out that incorporation of smart contracts have an immense capacity of performing operations by themselves hence making the process very cheap and time-saving. For instance in cross-border payments, Ripple has established blockchain technology that decreases transaction time and charges greatly (Ripple, 2020).

These findings are in concordance with Gupta 2017 who pointed out that blockchain can help to eliminate operational costs within the conventional systems of finance. However, the identified scalability problems enumerated by Croman et al. (2016) imply that efficiency might be constrained by current technology. This emphasizes the necessity of the development of new complex layers of Blockchain that will support the potential high circulation of transactions.

4.12 Moderators: Regulatory Environment

As hypothesized, the regulatory environment had a positive interaction with blockchain adoption on financial transparency ($\beta = 0.12$, $p = 0.034$). This result supports Auer and Claessens (2018), who pointed out that positive regulations mitigate risks and increase the use of blockchain solutions. According to Howell et al (2018), the clarity and supportiveness of the regulatory developments have been seen in countries such as Switzerland and Singapore.

However, Frost et al. (2019) note that uncertainty regarding the rules and objectives of the regulating entities may prevent its adoption when the legal framework is unclear or when policies are incompatible or too restrictive. Thus, the results of this study support the view on the need for the symbiotic approach in the regulation of emerging technology markets.

4.13 Moderating Effects of Technological Infrastructure

Technological infrastructure was found to enhance the moderating function of blockchain in boosting efficiency by 0.15, $p < 0.001$). This result supports Beck et al. (2017) who maintain that one of the imperative requirements that can influence the adoption of blockchain is user interface and backend system. The findings also enriched the present Unified Theory of Acceptance and Use of Technology (UTAUT) that emphasizes the fact that perceived ease of use and perceived usefulness are critical theoretical constructs in the context of technology acceptance (Venkatesh et al., 2003).

However, the findings of the study imply that there is a need to have other complementary factors alongside technological infrastructure such as financial literacy and awareness. This resonates with Luo et al. (2021) who pointed out that the use of blockchain is influenced by technological adoption on one hand and user awareness on the other.

4.14 Comparison with Other Studies

The results of this study confirm prior research in several data points but also offer new insights. For example, this research synthesizes trust, accountability, and efficiency into the same framework of blockchain's advantage as Iansiti and Lakhani (2017) did with transparency. Moreover, the expansion of the moderating factors as a regulatory environment and technological infrastructure is more effective in analysis of the impact of blockchain than the previous investigations.

This research also fills the gap in the existing literature by directly concentrating on financial systems, providing policy advice for replacing, reforming, or improving financial systems at both the financial institution and country level. In contrast to the existing research, which discusses the use of blockchain across various industries including but not limited to healthcare or supply chain, this research offers specific insights into the financial industry.

4.15 Implications for Practice

The findings of this study have several practical implications that are discussed in this section. First, regulators should make the necessary policy efforts to support the blockchain market and address the privacy issue. Second, further adventures in sound and easy-to-implement blockchain architectures to support efficiency gains will be required, especially where application throughput is concerned. Last, but not the least, in the context of increasing the level of trust and stimulating demand, it is possible to emphasize the potential of such educational projects as improving the financial literacy of the population and increasing awareness of blockchain.

4.16 Limitations and Future Research Directions

Nevertheless, this research has its share of limitations. The cross-sectional research design also does not allow for causal conclusions, and the numbers of cases may reduce the applicability of conclusions. Further research should also look into cross-sectional in order to determine the effects of blockchain adoption over time. Further, more comparative analysis of cross industrial and cross geographical implementation of blockchain could throw light on micro drivers and constraints.

5. Conclusion

This research supports the idea of applying blockchain in increasing the levels of financial transparency, reliability, and responsibility, as well as improving the efficiency of the contemporary financial field. The research outcomes therefore validate that decentralized and immutable attributes of blockchain solve relevant issues in current financial systems leading to

enhanced operating results and trust among the stakeholders. However, the successful implementation and deployment of the Block chain require compliance with the existing laws and recognition of adequate technology to avoid scalability and integration issues. These findings provide policymakers and industry participants with relevant information about how to unlock the potential of blockchain by promoting the right advancements and appropriating proper education.

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