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Blockchain adoption in sustainable supply chains: Opportunities, challenges, and sustainability impacts across sectors

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Abstract

Purpose: This research reviews blockchain technology's integration into modern financial systems, outlining its huge potential to bring about improvement in areas such as transparency, security, and operational efficiency. Based on the challenges of data integrity, fraud prevention, and reduction of intermediaries, the study assesses the transformational role of blockchain in financial institutions.

Research Methodology: A mixed-methods approach was taken, where quantitative data from the surveys of 150 financial executives across different types of organizations were combined with qualitative insights from expert interviews. Such statistical analysis, complemented by thematic interpretation, could enable an integrated assessment of blockchain applications and related challenges in the financial sector.

Results: The results reveal that blockchain significantly enhances the transparency and security of transactions, hence reducing fraud and manipulation of data. The respondents were very optimistic about the cost reductions due to the elimination of intermediaries. Yet, these are counterbalanced by barriers to wide diffusion, such as scalability issues, regulatory uncertainties, and technical integration complexities that reduce the full potential of blockchain.

Limitations: The limitations of the study are the small sample size, which limits the generalization of findings. Further research with larger and more diverse samples is needed to investigate more comprehensively the impact of blockchain on the financial sectors.

Contributions: The research, therefore, contributes to discourses on blockchain as a transformative finance technology, giving insights into useful strategic, policy, and technology issues.

Novelty: It also presented both opportunities and challenges in view of realizing blockchain's role in digitizing financial ecosystems.

Keywords: *Blockchain, the financial systems, transparency, security and efficiency of transactions, the regulatory compliance, and finance innovation*

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1. Introduction

Technology helps us in numerous ways, with researchers in many disciplines developing more efficient, effective, and secures technologies. Examples include network technologies that led to the Internet. Network technology helps individuals share information across time and location.

Blockchain technology, however young in network technologies, has several potential benefits. In finance, blockchain technology has improved financial management and commerce. Blockchain's first prominent use was trading value (Bitcoin). Akter, Fosso Wamba, and Dewan (2017).

However, ledgers and intelligent contracts indicate blockchain is more than Bitcoin. Blockchain has changed global trade. It is valued due to human verification and massive permanent record of technologies that have the ability to communicate the information amongst system participants.

Blockchain seems apt for supply chain issues. Still, many companies cannot decide whether to get this new technology early and enjoy material benefits or wait until integration of the technology is less expensive, and the prospects are brighter .In every kind of technology, there has been an early and late adopter category. Shedding light on the obstacles are the first step for blockchain adoption in supply chain networks. More the understanding and overcoming obstacles can provide a boost to the blockchain technology.

While businesses are starting to recognize the potential of blockchain in supply chain management, this combination is also drawing significant interest from both academic and industrial communities. Some major companies have already invested in blockchain, while others are contemplating it (Becker, Ringle, Sarstedt, & Völckner, 2015). These instances point to the potential of blockchain-supply chain integration. Many believe that blockchain has the power to resolve all supply chain difficulties. This new technology is a boon for businesses and researchers, but the challenges of supply chain adoption and requirements still need to be addressed.

The technology is beneficial, but adoption could be more active and may be hampered by hidden issues that limit definite judgments (Chang & Chen, 2020). Epidemic theory suggests that bringing new technologies to a sector is complex and time-consuming. Some companies may desire to be early adopters, while others may be cautious. Others may be debating their choices due to limited finances or unconvincing rewards. This prompts our research questions. (i) How do technological, organizational, and environmental (TOE) aspects affect firms' blockchain resistance? (ii) Which TOE framework determinant is most important? III. What are the factor relationships?

Many blockchain studies exist, yet gaps remain. While research demonstrates that this technology improves organizational performance, only some have examined obstacles to blockchain adoption (organizations' reluctance to embrace it) (Chang & Chen, 2020).

Our research is not just about theoretical exploration. We aim to provide practical insights that can make blockchain more feasible for organizations. We want to enable an effective and efficient supply chain management by pinpointing the major drivers for blockchain integration and major barriers to the managers' adoption of blockchain-based supply chains. System (Pu & Lam, 2021). Although survey articles have examined the hurdles, supply networks must focus more on blockchain integration. This study is familiar with blockchain technology, but our TOE framework conceptualization of the obstacle to comprehending such blockades seems innovative (Chang & Chen, 2020). Our findings suggest precautions and mitigations for these issues. Future claims may benefit from our findings. Our investigation and assessment procedure considers numerous aspects to determine suitability (Fahim, Al Mamun, Hossain, Chakma, & Hassan, 2022).

This paper continues as follows: We synthesize pertinent material in the literature review. Xiong, Qureshi, and Najjar (2013)We explain the research approach and validity. We then present and debate our findings. The report finishes by considering further research (Tanha et al., 2022).

2. Literature review

2.1 Blockchain Technology in Supply Chains

The year 1991 marked a significant milestone in the history of technology with the introduction of the first blockchain (Rossum, 2017). This pioneering development aimed to establish an unchangeable timestamp system, laying the foundation for the evolution of blockchain technology in the years to come.

The blockchain's integrity is ensured by its peer-to-peer network, where every node has a full copy of the chain. Many nodes not only add chains but also validate them: the networks are secured by nodes based on consensus. All parties agree on block validity: blockchains are secured by proof-of-work and peer-to-peer consensus. According to Rossum (2017) Blockchain and supply chain are defined, then their relationship and critical roles are examined. Complex supply networks with multiple participants upstream and downstream require simplification. Blockchain handles supply chain challenges. Blockchain improves company processes, not replaces them. Initial research supports this. Users can connect to enterprise systems and maintain data visibility utilizing blockchain as a platform replacement (Chike, Mbamalu, Oguanobi, & Egbunike, 2023).

Blockchain's distributed ledger lets individuals communicate electronic information inside a fixed border, independent of location. Data mistakes have long plagued the supply chain. These mistakes often occur during input. Blockchain reduces data entry mistakes since fewer individuals do them.. Pharmaceutical supply chains demonstrate transparency needs. Fake and low-quality pharmaceuticals threaten patients and the industry. The public ledger of blockchain can solve these problems (Min et al., 2005). Because blockchain shares all real-time information, responsible parties can respond quickly if something goes wrong (Rozanna & Ahadiat, 2023).

Another significant characteristic of blockchain is smart contracts. Examined intelligent contract-based supply chain tracking and predicted that blockchain will reshape the sector. An electronic contract advances the procedure to payment if all preset requirements are satisfied (Pu & Lam, 2021). Buyers may be guaranteed things are in a specific condition, and sellers can be sure the proper amount is paid on time. Blockchain can alleviate supply chain issues and increase functionality and regulation (Pu & Lam, 2021) Traditional paper-based documentary credits-letter of credit-involve an inordinate amount of commercial activities and participants at great cost for insurance and logistics internationally. Generally, the reissuance of letters of credit is cumbersome and time-consuming. This problem is considerably simplified by blockchain-enabled platforms (Zahedi & Piri, 2023).

Blockchain protects users against cyber-attacks. Service providers keep electronic data on central servers, which can be attacked. Due to its distributed consensus and cryptography, blockchain can secure sensitive data.

2.2. Understanding Technology Adoption Obstacles

2.2.1. Technology Acceptance Model

Most of them make use of the technological acceptance model - TAM in describing the factors of technology adoption and challenges. The aim was to model the technical adoption of information system users. The model was updated in 1996 to indicate perceived ease of use and usefulness directly affects behavioral intention. Knowing intentions is essential, but technology's success requires more (Mashizha, Gumbo, & Chimwe, 2023). We must recognize factors that support adoption ambitions and those that limit them. Both must be addressed to improve adoption. Compatible, sophisticated, and treatable innovations cause technological resistance, he believes. Without these attributes, companies reject innovations (Tijan, Aksentijević, Ivanić, & Jardas, 2019).

2.2.2 Innovation diffusion theory

It provides a five-factor model for organizational innovation in the persuasion stage prior to the decision stage, taking into consideration technology along with the spread of innovation. Relative advantage, or "the degree to which an innovation is perceived as better than the idea it supersedes," drives early adoption. Rogers believes it is not whether or not innovation is beneficial but rather that the decision makers apply it. Innovative ideas with a perceived advantage are accepted faster. Second, technical compatibility—how well it fits into the system—is essential. Potential customers' values, experience, and needs may fit the innovation. It may take time to accept unconventional technologies (Taherdoost, 2021). Third, technological complexity hinders understanding and utilization. Complex technology with many interconnected parts requires effort to understand and use. Complex technologies are often rejected. Rogers adds that management prefers technology implementation after precise testing (Min et al., 2005). Treatability means "the degree to which an innovation may be experimented with on a limited basis." Treatability means a concept can be tested before adoption. The fourth attribute is observability—how successfully an invention is observed, communicated, and demonstrated to potential consumers (Treiblmaier, 2019).

2.2.3 TOE Context

System and adapters are invisible technological adoption barriers that must be addressed. Due to the fact that all agents must be involved, blockchain integration is not as straightforward unlike when barcodes were integrated into systems for instance. The barriers may either be internal, external, or even the system itself. Their study on blockchain technology and sustainable supply chain management unveils many challenges in coalition, with numerous being interdepartmental coordination. (Taherdoost & Madanchian, 2021).

Financial issues hinder adoption. Due to its unknown cost, management may be hesitant to use blockchain. Technology, software, recruiting, and in-house training affect opportunity and accounting implementation costs. Blockchain may need a large initial investment, but it saves money (Mahmod, 2022).

Table 1. Tech issues

Number	**Issues**
1	Black box effect complexity
2	Inconsistent programming language: Java, C++, Python.
3	Risk and security
4	Childishness
5	Interoperability
6	High level of energy consumption
7	Outlook for Bitcoin grim
8	Technology is networked
9	Scalability
10	Implementation cost

A 2018 Irish enterprise survey found that blockchain deployment requires senior management backing and organizational readiness. Regardless of industry influence, organization size, blockchain expertise, and information insufficiency affect blockchain integration pace and motivation. Intra- and inter-organizational barriers occur (Table 2). Intra-organizational commitment constraints exist in some companies. Successful technology adoption requires the management team's long-term commitment (Min et al., 2005). Blockchain technology adoption may be slowed by supply chain participants' concerns about transparency or infrastructure investments (Tijan et al., 2019). Helped the management team with finances and technology, removed obstacles, solved problems, engaged all personnel, and communicated their vision to influence technology adoption. According to Wang and Qualls (2007) Corporate inexperience may cause blockchain hostility. The gap between skilled labor and knowledge has expanded due to technology. One needs to know IT and daily routines to fully utilize this technology. Thus, hiring or training blockchain experts is expensive. With enough skilled workers, organizations may implement blockchain or reap its full benefits (Pu & Lam, 2021).

Table 2. Organizational Obstacles

Number	**Obstacles**
1	Management technology expertise
2	Reluctance and weak managerial support
3	Insufficient technical expertise
4	Need for tight cooperation
5	Policy gaps for blockchain
6	Priority is given to other tech investments
7	Platform provider vendor lock-in Inter-organization
8	Two businesses' cultures differ
9	Information disclosure and privacy problems
10	Work on teamwork and communication

Intra-organizational impediments include departmental collaboration issues. Some department members oppose change because it hurts. Change is valued differently by different parties. New technology adoption may transform corporate culture, requiring new responsibilities, duties, knowledge, or aptitudes to manage and help diverse aspects (Wang & Qualls, 2007). Monopolistic power may deter new users. Developers and platform providers design blockchain systems. Monopolies occur when one company dominates a market, hurting other companies. Blockchain platform vendors may lock in users (Chow & Singh, 2022).

Second, organizations experiencing even more significant inter-organizational challenges may benefit from expertise. Other enterprises' supply chain network actions should examine their technology adoption levels and organizational aspects (Wang & Qualls, 2007). Due to network sizes, assumptions, and information, companies adapt at different speeds. Therefore, they may not reveal information and may overprotect. Outsiders cannot access vital corporate data. Companies must be knowledgeable to overcome this resistance. Cultural differences between companies can also affect supply chains.

This last group includes governments, institutions, and enterprises that affect supply chain activities but are not actively involved (Table 3). Lack of government and industrial policies delays blockchain implementation and deters stakeholders. Besides supply chains, blockchain is employed elsewhere. Enterprises of all sizes are investigating potential uses, frequently observing before acting. External stakeholders require political and economic government support to engage sooner (Zyskind & Nathan, 2015). Prioritizing blockchain efforts and offering legal assistance, financial subvention, seminars, training, etc., may lessen company opposition to blockchain adoption. Tech innovations should start with excellent infrastructure. Ineffective IT infrastructure currently exists. High-speed Internet and power are essential for usability.

Table 3. Environmental challenges.

Numbers	Environmental Obstacles
1	Possible encouragement program limit
2	Limited government support
3	Blockchain laws are seen as restrictive
4	Potential tech bottleneck
5	Governance limits
6	No success stories

Thirteen factors were investigated from the list. Most books and blockchain media sources mentioned these implementation factors. Other hurdles were not discussed because most of our panel talks did not address them, not because they were unimportant. So, we've tried to find TOE framework obstacles.

Years	Authors	Barriers (TOE)																												
		Technological Barriers													Organizational Barriers										Environmental Barriers					
															Intra-Org						Inter-Org									
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
2016	[45]			G						G	G						G													
2019	[24]	G	G		G	G	G				G							G					G							
2018	[47]				G								G	G		G	G									G	G	G		G
2011	[48]						G			G	G	G	G	G	G								G							
2018	[43]			G			G			G		G	G		G		G				G		G	G			G	G	G	
2017	[38]	G		G	G		G	G				G	G					G	G		G		G			G	G	G	G	
2020	[30]			G	G	G				G	G	G	G	G	G	G		G	G				G				G	G		
2019	[28]			G							G	G	G	G	G			G	G				G				G	G		
2018	[49]			G	G					G		G	G													G	G	G		
2017	[50]	G	G	G	G		G	G			G	G	G	G	G			G			G		G				G	G	G	G
2018	[51]			G			G			G	G	G	G			G	G		G		G		G	G		G	G	G		
2017	[29]	G	G	G	G	G	G	G			G	G	G	G	G	G		G					G		G	G				G
2020	[31]			G	G							G	G																	
2017	[52]						G			G		G	G		G			G		G			G				G	G	G	
2018	[53]			G				G		G	G	G	G		G		G						G	G			G			
2018	[54]			G	G	G	G	G		G	G	G	G	G	G	G		G	G			G	G	G		G	G	G		G
2020	[26]			G	G		G		G			G	G	G	G	G		G	G			G	G	G	G	G	G	G	G	
2018	[21]			G						G																	G	G	G	
2018	[24]	G	G				G	G			G	G	G	G	G	G	G	G	G	G	G	G	G	G			G	G	G	
2017	[55]	G		G	G		G			G	G	G	G		G			G	G		G		G			G	G	G	G	G
2020	[56]			G	G	G	G	G	G		G	G	G	G	G	G		G					G			G	G	G	G	G
2018	[4]	G	G		G	G	G	G	G	G	G	G	G	G				G	G				G	G			G	G		
2019	[34]	G	G	G	G		G	G			G	G	G	G	G	G		G	G				G		G	G		G	G	
2019	[57]						G								G			G	G								G	G		

Table 4. Barriers to technology, organization, and environment

Barrier Number	**Barrier Description**
1	Black box effect complexity
2	Lack of programming language standards (Python, C++, etc.)

3	Security and vulnerability
4	Immaturity
5	Flexibility and immutability
6	Interoperability
7	Uses of high energy
8	Process reengineering needed
9	Negative Bitcoin outlook
10	Technological network
11	Inability to scale
12	Trial and reversibility of technology
13	Cost of implementation
14	Management team tech awareness
15	Poor management support and resistance
16	Close cooperation is required
17	Inexperience and technical ignorance
18	Lack of blockchain policies
19	Other technological investments are prioritized
20	Fear of vendor lock-in
21	Cultural variations across businesses
22	Concerns about privacy and transparency
23	Communication and collaboration
24	Missing incentive programs
25	Lack of government aid
26	Blockchain legislation and legal frameworks are lacking
27	Poor governance and regulation

28	Few successes
29	Lower infrastructure

Source: (Chang & Chen, 2020)

2.3. Possible Theories

2.3.1. Tech Perspective

According to this study, complexity is the difficulty of understanding technology at the business level. Intricate technology is more challenging to implement rapidly. Challenging technology is frequently discarded or postponed. We assert that the intricacy of blockchain diminishes organizations' opposition to its adoption. Technological maturity refers to the extent of blockchain technology's utilization since its inception. A mature, widely adopted technology is readily implementable by a corporation owing to its ample resources and comprehensive understanding.

Consequently, immaturity obscured evaluation. From an innovation perspective, compatibility refers to a technology's alignment with an organization's legacy systems, processes, IT infrastructure, and other networks. Enhanced compatibility facilitates organizations' adoption of technology. Blockchain technology is distinct from different technologies. The velocity of transactions offsets security measures. Scalability pertains to transaction velocity and block dimensions. Since its inception, blockchain has faced criticism regarding its scalability issues, with numerous researchers suggesting it may occupy a distinct status. Systems that facilitate expedited transactions and accommodate larger blocks are superior.

It is considered one of the most secure platforms, but no organization will invest in a technology that has the potential to become outdated. Blockchain is designed from a distributed ledger system that has no central database. In such a situation, the data therein becomes immutable. In case advanced technologies, like quantum computers, are developed, platform users can easily be exploited.

As expected, money represents a big barrier to integration and development of technologies. Facilities, software, operational downtime, and maintenance make implementation costly. Hence, based on this, we would recommend the following hypotheses on technologies:
Hypothesis 1: Advanced technology renders firms resistant to blockchain implementation. Hypothesis 2: Reduced technical maturity renders organisations reluctant to blockchain adoption. Hypotheses 3: Ower technology compatibility makes enterprises resistant to blockchain—4 h hypothesis. L's technological scalability makes corporations resistant to the blockchain.
Hypothesis 5. H her technological security and privacy issues make enterprises oppose blockchain.
Hypothesis 6. High implementation costs make corporations resistant to the blockchain.

2.3.2. Organizational Setting

Managers decide whether to accept new technologies in their industry. However, managers' technical knowledge affects their response. Decision-makers are cautious in uncertain situations. blockchain is an innovative and complex network technology. F w businesses have had the skills or technical understanding to exploit the technology since its launch. To understand the possibilities, costs, and advantages of this unique technology, one needs expert information technology understanding. Blockchain platform providers and developers construct systems with a lot of power, which disadvantages client enterprises. Here, blockchain platform providers may aim to retain users. An option demands a large infrastructure investment, making switching platform suppliers difficult. All sides must participate actively. Communication is crucial yet difficult since firms must be careful about releasing internal information. To us, each party strives to supply only application-relevant data while maintaining excellent relations. We suggest these hypotheses:
Hypothesis 7. Blockchain opposition arises because of the management team's technological ignorance.
The 8th hypothesis. L's experience and technical knowledge make firms resistant to the blockchain.
The 9th hypothesis. Organizations oppose blockchain due to fears of vendor lock-in.

H10:
Hypothesis 10. Blockchain opposition rises with enterprises' perception of more collaborative effort.

2.3.3. Environmental Setting

Government support is crucial for technology uptake. The impression of a lack of government funding or assistance deters enterprises from adopting the technology. Cryptographic signatures and smart contracts have also been established without regulations. The firms and organizations are still in the process of deciding on legislation regarding blockchain, such as who would arbitrate the conflicts. Enterprises need an effective technical infrastructure so that benefits arise properly through such technologies. An uninterrupted, fast Internet connection and energy are essential. T us, we hypothesize:
Hypothesis 11. The perception of government backing constraints raises enterprises' blockchain reluctance.
Hypothesis 12. blockchain opposition develops as corporations see regulatory and legal constraints.
Hypothesis 13. Blockchain opposition rises with perceived technological infrastructure constraints.

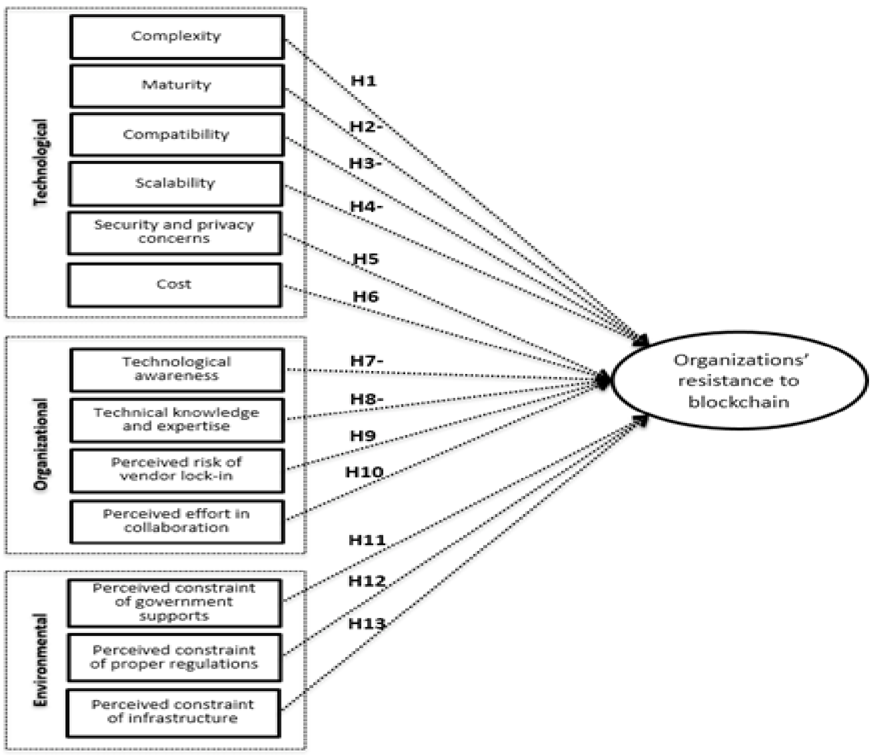

Figure 1 shows the research organization and hypotheses.

See Figure 1—structured research.

3. Methodology

3.1. Approach to research

The objective is to find out the barriers to digital innovations in supply chain management at the organizational level. The blockchain world is new, fast-growing, and promising. We reviewed literature in business and organizational management, information science, manufacturing, and operations for an understanding of its issues and challenges. These fields are not blockchain-related but have several intriguing impedances that may be studied. Different but similar views can be used in this investigation. Most research requires 30–500 samples, so we employed an internet questionnaire survey. A questionnaire survey was used for this study. The questionnaire contains critical data.

3.2. Data Collection

There are mainly primary and secondary data sources. Researchers gather the former, whereas pre-existing sources provide the latter. Research goals are often impossible with one source. This present research study had plankton data collection in the United States, involving 150 financial professionals from various institutions. Quantitative data through a survey on the impact of blockchain on financial systems of blockchain experts on practical challenges and applications within the U.S. financial industry (Appendix A).

Diffusion barrier factors for each dimension were retrieved from six integrated datasets from different disciplines. Data was critical from Business Insider, Coindesk, Cointelegraph, Forbes, and Reuters. Combinations of elements identified keywords. In addition, synonyms for the term "blockchain" included the terms "blockchain," "distributed ledger," and "shared ledgers," while for the word "barriers," synonyms included "challenges," "hurdles," and "obstacles."

Relevant articles from the aforementioned sources were critically screened for relevance issues. Titles, keywords and abstracts of relevance and suitability were assessed. Primary texts of the articles were crosschecked to avoid misconceptions. All 29 obstacles cannot be surveyed simultaneously due to time and resources. Thus, we commenced with the inhibitor's frequency. The literature seldom discusses vendor lock-in and legal void of blockchain; blockchain is new and not off-the-shelf. Thus, both these components have to be included in our research. After shortlisting the constructions and creating survey topics, we pre-tested graduate students, professors, and close friends who know supply chain networks, blockchain, and information systems.

Pre-test questionnaires have five components. The first portion is consent and introduction. The second portion collects gender, business size, industry, and other demographics. The third, fourth, and fifth portions reflect respondents' technological, organizational, and environmental blockchain adoption challenges.

Items in the questionnaire are measured on a five-point Likert scale from "strongly disagree" to "neutral" and "strongly agree". That measurement items are in index A. The questionnaire was linked by email. Items on each of the shortlisted hurdles were used to develop a 13-item quiz. Digital innovation-experienced techniques were selected. This research is based on data collected from supply chain networks or organizations that have either not embraced the technology called blockchain or tried to embrace it properly. Data were from May–June 2020—initial plans called for an online survey.

Distributed. The logistic, supply chain, and blockchain posts were released on LinkedIn, Xing, Hi5, Facebook, and WhatsApp and enjoyed the highest number of participants. On social networking sites, "Blockchain in Supply Chains" was at an advantage. The novelty of blockchain in supply chains reduced our sample population. Anonymous comments via online survey are to be looked at skeptically. Nine of the 92 data sets had to be excluded from our study due to patterns or unintelligible responses. Most of the respondents are male and female, with blockchain experience of 6–20 years, and they hold a bachelor's degree at 8% or graduate degree at 92%. Most data emanates from transportation and warehousing at 48%, manufacturing and wholesale at 25%, other at 11%, and finance and insurance at 16% respectively.

3.3. Statistics

SEM defines discreet relationships for each dependent variable set and effectively calculates multiple regression equations to be tested together. Evaluation of many components was to be undertaken using a set of variables, so multivariate SEM analysis was appropriate. Multivariate studies combine measurements. SE has structural and measurement models. The measuring model allows the researcher to use various indicators to measure the independent or dependent variables. Our proposed structural model uses a path model in order to link the dependent and independent variables. In it, blockchain resistance is dependent on 13 independent variables.

3.3.1 Structural equation modeling

It was a two-component method. After testing the measurement model in terms of its reliability and validity, fitting the structural model was performed. After data collection, a statistical analysis was performed. Besides, a full-version questionnaire was designed for data collection and the identification of items with inappropriate loadings. We reviewed 92 responses.

The measurement model tested the relationships among construct and item. We evaluated the measuring model in terms of the guideline. First, we checked the degree to which the indicators reflectively represent the construct by investigating construct reflective indicator loadings, internal consistency reliability of the constructs, and convergent and discriminant validity.

Discriminant validity is determined by its statistical difference from other structural model constructs. For each construct, measure the AVE value for the squared inter-construct correlation-that is, a measure of shared variance-of that construct and all other reflectively rated constructs. The variance should not be higher than the AVEs.

Another way of assessment is cross-loading. Cross-loading value is an item-level discriminant validity, a measure commonly used. After testing for collineality, we test the internal construction R2. R2 shows the explanatory power and accuracy of the model. Values range from 0 to 1, where 0.75, 0.50, and 0.25 are significant, bearable, and weak, respectively; the next step is the Q2 value of PLS route model, by blindfolding. Quality should be 2: always good. The PLS path model shows large, medium, and small predictive relevance of 0.5, 0.25, and 0.4 respectively.3.2. Hypothesis Testing with SEM, SmartPLS predicts results to test hypotheses. Looking at coefficient values and signs, we analyze the t-values and p-values. Significant values are > two and $p < 0.05$, and the limit for accepting or rejecting the hypothesis is researchers and reviewers are more reliant on covariance-based research.

Contrary to PLS-SEM, PL users must justify their choice on the basis of evidence. Both are complementary, not alternative. In the case of empirical situations where CB-SEM fails, PLS is employed. This study uses the PLS because it can evaluate a small sample size and because the structural model is complex, with many components. PLS gives us rapid and very reliable results for appropriate data for our question. However, we are aware of risks but take great care in considering benefits.

A PLS predicts a linear conditional expectation relationship between dependent and independent variables. This is similar to multiple regression as it portrays model relationships. Part-model implementations are mostly SmartPLS. SmartPLS yields good results without sample size sensitivity like AMOS or LISREL. Factor correlation is checked in order to find out the strength and Direction of constructs. Smart PLS latent variable correlations show Type, Direction, and intensity.

3.4 Validity/reliability

Cannot overstate research trust. Academic proof that the study followed proper processes with good backing can persuade readers. Data reliability and validity, empirical data source, and outcomes application were examined in this study. Replicating this quantitative analysis is straightforward. For easy retesting, empirical data were recorded in Excel (.csv).

Senior researchers' data reliability and validity checks were followed. Many renowned academics have constructed and deployed instruments to evaluate our expected components and adoption intention. We changed the questions to assess impediments and our dependent variable to increase validity and reliability. We needed to determine the variables and variable constructions utilized to measure anticipated traits and adoption intention, even if numerous academic instruments have excellent validity and reliability. Using consistency methods, reliability testing ensures empirical data's veracity and impartiality. The theory says dependability is how successfully a variable or combination of variables/constructs measures what they are supposed to. Testing measurement methods for validity. Validity measures how successfully a test measures its goal.

In this study, for reliability and validity testing, we used reflecting indicator loadings for the item reliability test, composite reliability Cronbach's alpha for internal consistency reliability testing, AVE for convergent validity, and criterion [64] for discriminant validity. Face and content validity We proposed as pre-tests. We asked and confirmed senior graduate students as a pretest to verify that the language and vocabulary measured the construct adequately. We then collated the construct literature questions in order to verify the content validity and rated their applicability and representativeness based on definitions and language.

The questionnaire assessed organizations' resistance to potentially conflicting factors. Complexity, compatibility, and scalability clash with maturity. Reorganizing the questions logically helped us measure all constructions, letting us measure similar structures. We examined sensitive topics like animation's resistance to blockchain's technological knowledge constraints and senior managers' awareness indirectly to let respondents speak. Resistance studies measure companies' blockchain resistance indirectly. We track new technology implementation challenges and success factors for technological comprehension and senior management awareness.

Data comes from population and sampling. Convenience sampling is ideal. Sample errors constitute a significant downside of its extensive use. This study collected non-adopter responses from various demographics to reduce sampling errors. Web-based surveys addressed observer bias. We need to find out how potential respondents completed the questionnaire (alone or with coworkers who may have biassed their responses) because they were emailed the site link. All respondents had connected jobs. They could answer a questionnaire impartially.

This study required multivariate analysis, hence a SEM was used. SEM empirical data was analysed using AM S and PLS. It was optimal for this inquiry to use PLS over AMOS.

4. Results and discussions

4.1 Confirmatory Factor Analysis

The CFA confirms the factor structure of a given observed variable. In CFA, the latent construct observable variable relationship hypothesis may be tested by the researcher. The researcher hypothesizes a pattern based on theory, research, or both for the relationship and can test it statistically. The final questionnaire excluded non-essential elements. A measurement list was developed to control for errors and classify things before using SmartPLS on Google Sheets results.

Measurement model access was made in four steps: we analyzed after reflecting indicator loadings reflecting internal consistency reliability. Next, we computed convergent and discriminant validity, and items with loading values more than 0.7 were listed in Table 5 - the final edition

Table 5. Analysis of Outer Loading

Variables	**Items**	**Measurement Items**	**Outer Loading**
Maturity	IMM1	Many real-world examples.	0.892
	IMM2	Proven potential and utility.	0.829
Compatibility	INC1	Compatible with operations.	0.818

	INC2	Not compatible with business process.	0.853
Scalability	SCA1	Decent block speed.	0.715
	SCA2	Practical block size.	0.783
	SCA3	Speed and size are excellent.	0.779
Complexity	COM1	Blockchain difficult from a business view.	0.784
	COM2	Difficult from a technical view.	0.737
	COM3	Using blockchain is hard.	0.795

Variables	**Items**	**Measurement Items**	**Outer Loading**
Security & Privacy Concerns	SEC1	Concern over sharing sensitive info.	0.784
	SEC2	Not confident in platform security.	0.743
	SEC3	Unsafe for sensitive business info.	0.837
Cost	COS1	Increases hardware/software costs.	0.795
	COS2	Raises training/recruiting costs.	0.706
	COS3	High up-front investment.	0.787

Technological Knowledge	KNW1	High technological effort required.	0.827
	KNW2	Requires strategic knowledge.	0.857
Vendor Lock-in Risk	VEN1	Trying to lock in preferred vendors.	0.799
	VEN2	Collaboration with suppliers is inadequate.	0.752

Variables	**Items**	**Measurement Items**	**Outer Loading**
Government Support	GOV1	Government supports blockchain.	0.752
	GOV2	Introduces policies for blockchain adoption.	0.808
	GOV3	Provides blockchain training and support.	0.776
Infrastructure	INF1	Inadequate infrastructure for blockchain.	0.801
	INF2	Inefficient Internet service for blockchain.	0.795
	INF3	Limited access to blockchain.	0.802
Resistance	RES1	Will not adopt unless beneficial.	0.795
	RES2	Waiting for the right time to adopt.	0.753
	RES3	Needs clarification before adopting.	0.738

	RES4	Blockchain not needed.	0.701
	RES5	Unlikely to adopt soon.	0.733
	RES6	Blockchain not suitable for our organization.	0.775

Reliability of empirical data was examined through a SmartPLS consistency study. Cronbach's alpha and composite reliability were tested for internal consistency. A Cronbach's alpha number close to one demonstrates that the internal consistency of variables increases. Alpha values should be ≥ 0.9 for excellent, ≥ 0.8 for good, ≥ 0.7 for acceptable, ≥ 0.6 for dubious, ≥ 0.5 for poor, and < 0.5 for undesirable by George and Mallery [100].

Alpha varies by scale question count. More questions mean less consistency. Table 6 displays factor p-values and consistency. Components are mostly consistent. Only compatibility, scalability, and vendor lock-in risks were worried. Composite reliability was our second verification.

Table 6. Cronbach's Alpha Analysis

Factors	**Cronbach's Alpha (α)**	**p-Value**
Complexity	0.724	0
Maturity	0.715	0
Compatibility	0.63	0
Scalability	0.694	0
Security and privacy concerns	0.758	0
Cost	0.703	0
Technological knowledge and awareness of top managers	0.8	0
Expertise and technical knowledge	0.754	0
Perceived risk of vendor lock-in	0.625	0
Perceived effort in collaboration and communication between firms	0.714	0
Perceived constraint on government support	0.738	0

Perceived constraint on existing regulations and legal framework within blockchain	0.715	0
Perceived constraint on technological infrastructure	0.778	0

The composite dependability of Jöreskog [69] is 0–1. Higher values indicate better reliability. A reliability of 0.6–0.77 is "acceptable in explanatory research"; 0.77 to 0.92 is "satisfactory to good"; 0.95 or higher is "problematic" . From the results h, no construct has reliability below 0.7. Range of values.

Table 7. shows satisfactory results from 0.755 to 0.885. We believe this research is consistent and reliable.

Table 7. Composite reliability analysis

actors	**Composite Reliability**	**p-Value**
Complexity	0.816	0
Maturity	0.851	0
Compatibility	0.823	0
Scalability	0.803	0
Security and privacy concerns	0.832	0
Cost	0.807	0
Technological knowledge and awareness of top managers	0.853	0
Expertise and technical knowledge	0.83	0
Perceived risk of vendor lock-in	0.755	0
Perceived effort in collaboration and communication between firms	0.852	0
Perceived constraint on government support	0.822	0

Perceived constraint on existing regulations and legal framework within blockchain	0.813	0
Perceived constraint on technological infrastructure	0.842	0
Resistance to blockchain	0.885	0

Convergent validity is how well a notion explains measurement item variance. Researchers utilize AVE (Average Variance Extracted) to determine convergent validity. Acceptable AVE is 0.5 or above. Our study's AVE values for each component are over 0.55, indicating high convergent validity (Table 8). Resistance to blockchain has an AVE value which is 0.562, that implies it accounts for at least 56% of the variance in the items. Over 0.5 is the criterion that is reached.

Table 8. Average variance extracted

Factors	**AVE (>0.5)**	**p-Value**
Complexity	0.597	0
Maturity	0.741	0
Compatibility	0.699	0
Scalability	0.577	0
Security and privacy concerns	0.623	0
Cost	0.583	0
Technological knowledge and awareness of top managers	0.659	0
Expertise and technical knowledge	0.62	0
Perceived risk of vendor lock-in	0.609	0
Perceived effort in collaboration and communication between firms	0.743	0
Perceived constraint on government support	0.607	0

Perceived constraint on existing regulations and legal framework within blockchain	0.592	0
Perceived constraint on technological infrastructure	0.639	0
Resistance to blockchain	0.562	0

Finally, the discriminant validity of the measurement model is validated. Discriminant validity reflects the degree of a structural model construct being differentiable. Discriminant validity can be verified by suggesting that the AVE of each construct is greater than any other square inter-construct correlation of the same constructs, as per the values presented in Table 9.

Table 9. Discriminant Validity

COMPX	**MATR**	**COMPA**	**SCAL**	**SECU**	**COST**	**AWNS**	**EXPT**	**RISK**	**COLL**	**SUPP**	**REGU**	**INFR**	**RESS**
COMPX	0.77												
MATR	0.62	0.86											
COMPA	0.76	0.63	0.84										
SCAL	−0.59	−0.51	−0.68	0.76									
SECU	0.74	0.59	0.61	−0.57	0.79								
COST	0.65	0.55	0.74	−0.51	0.73	0.76							
AWNS	−0.67	−0.53	−0.72	0.61	−0.71	−0.68	0.81						
EXPT	−0.67	−0.47	−0.73	0.53	−0.72	−0.70	0.78	0.79					
RISK	0.55	0.45	0.56	−0.61	0.56	0.52	−0.67	−0.64	0.78				

COLL	0.61	0.53	0.65	−0.54	0.66	0.67	−0.74	−0.66	0.59	0.86			
SUPP	0.68	0.67	0.72	−0.59	0.69	0.71	−0.73	−0.66	0.58	0.7	0.78		
REGU	0.68	0.64	0.76	−0.58	0.77	0.75	−0.70	−0.69	0.54	0.59	0.69	0.77	
INFR	0.74	0.57	0.71	−0.47	0.72	0.67	−0.66	−0.69	0.62	0.75	0.67	0.75	0.8
RESS	0.68	0.55	0.72	−0.66	0.69	0.69	−0.72	−0.71	0.63	0.71	0.72	0.72	0.71

Several structural model stages are needed to verify model fit. Calculate VIF values before examining the structural relationship. In Table, numbers above 10 indicate collinearity, whereas values below five are acceptable. All of our study values are below five, which is sufficient. Since collinearity is not a problem, R2 and Q2 values from PLS techniques and blindfolding are studied. Our calculations show an excellent model fit with R2 = 0.792 and Q2 = 0.458.

Table 10. Variance of Inflation factor (VIF) values

Factors	**VIF**
COMPX	2.887
MATR	1.268
COMPA	4.486
SCAL	1.58
SECU	3.484
COST	3.692
AWNS	3.278
EXPT	3.768
RISK	1.555
COLL	2.543
SUPP	2.393
REGU	3.628

INFR	4.167

4.2. Result description

The majority of survey participants believe that blockchain is a young, undeveloped technology that need further work. (Table 11). Investors don't trust the technology. Compatibility complexity and faults support this. This approach has several complicated algorithms, making learning and use challenging. Implementation cost uncertainty fuels this opposition. This complements a previous study that showed cost constraints as a major issue.

Table 11. Data Analysis

Factors	**N**	**Mean**	**Standard Deviation**
COMPX	82	3.305	0.913
MATR	82	3.367	0.911
COMPA	82	3.283	0.834
SCAL	82	3.193	0.924
SECU	82	2.598	0.792
COST	82	3.249	0.889
AWNS	82	3.578	0.962
EXPT	82	2.271	0.875
RISK	82	3.124	0.867
COLL	82	3.249	0.889
SUPP	82	2.586	0.911
REGU	82	3.237	0.917
INFR	82	3.161	0.948
RESS	82	2.9	0.792

Statistics descriptions

4.3. Analysis

We deleted sloppy questionnaire responses after collecting empirical data. The statistical application SmartPLS version 3 ran PLS.

4.3.1 Partial LMS

Partial LMS

Figure 2 SmartPLS configuration output. Here, the resistance is R2. Regression coefficients are those that connect independent and dependent variables and measure the increase or decline in the dependent variable with the independent one. So it is the line slope of the regression equation. The outside loadings numbers are between each round build and its rectangle elements. This identifies the objects which have a low loading below 0.7:. Only outer loading values that surpassed the cutoff survived. All items and regression coefficients for each concept can be seen in Appendix B.

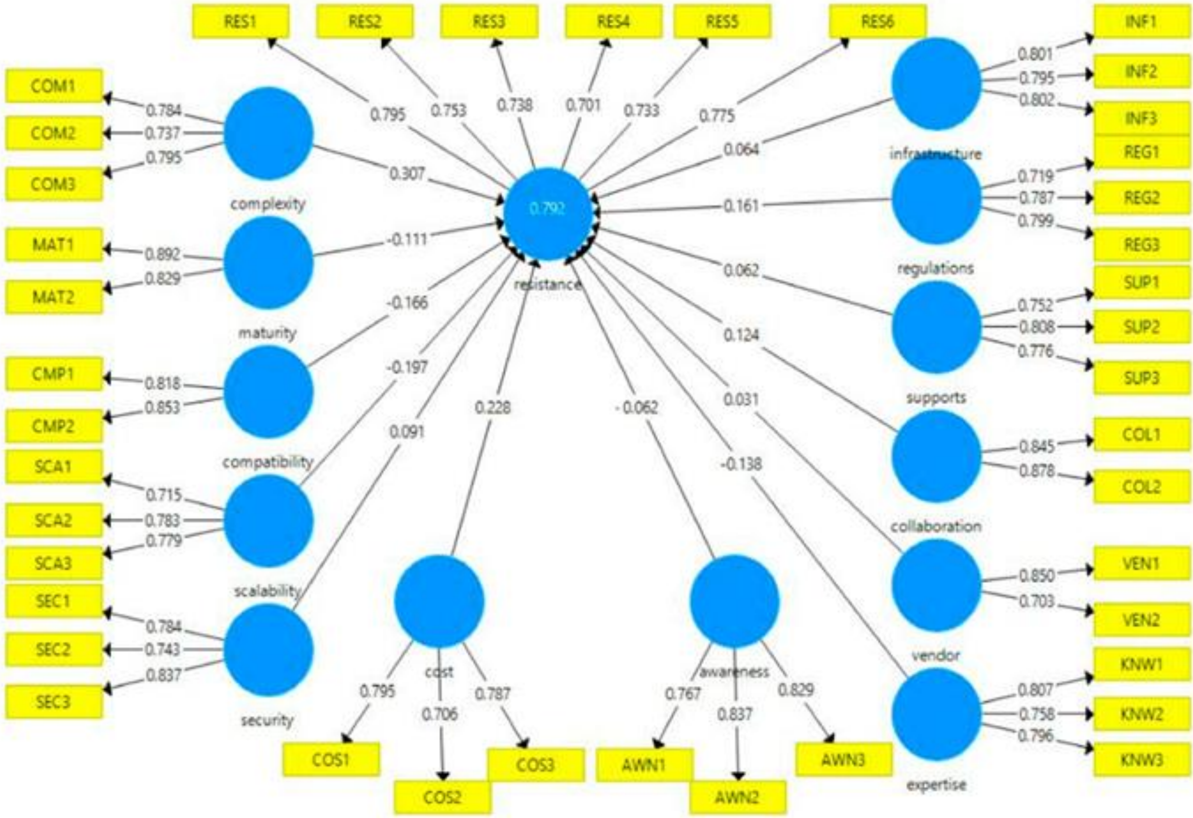

Figure 2. Path coefficient and coefficient of determination or predictive power (R^2).

The importance of beta (β) values in SmartPLS is analyzed by means of regression coefficients, p-values, and associated t-statistics. The criteria for significance: P = 0.05 and t > 1.96. Results from the PLS algorithm in Table 12.

Table 12. Path Coefficient results from partial least square (PLS) software SmartPLS

Factors	**N**	**Mean**	**Standard Deviation**
COMPX	82	3.305	0.913
MATR	82	3.367	0.911
COMPA	82	3.283	0.834
SCAL	82	3.193	0.924
SECU	82	2.598	0.792
COST	82	3.249	0.889

AWNS	82	3.578	0.962
EXPT	82	2.271	0.875
RISK	82	3.124	0.867
COLL	82	3.249	0.889
SUPP	82	2.586	0.911
REGU	82	3.237	0.917
INFR	82	3.161	0.948
RESS	82	2.9	0.792

H7 (management team technological expertise and awareness), H9 (vendor lock-in risk), H11 (government support constraint), and H13 (technology infrastructure constraint) were unsupported.
As H1 shows, complexity increases firms' blockchain resistance. This matches prior research. People who thought blockchain was complicated resisted more. Behaviorist logic explains that blockchain is complicated, so managers must be extra cautious.

Expected are H2, H3, and H4, involving lower technological maturity, compatibility, and increased scalability that raises blockchain resistance. History can attest that immaturity, incompatibility, transaction size, and speed impede blockchain technology from being widely used.

The relationship between compatibility and resistance proved to be negative. Compatibility of a legacy system and use cases are two factors that help prospective users to adopt new technologies. They do not intend to replace the old system which needs time and money but integrate new and old technologies. This study found that high interoperability makes organizations resist blockchain.

H5 links security and risk prevention (increasing technological security and privacy issues enhance firms' blockchain resistance). People who are uncomfortable exchanging data or information fight such networks as hazardous.

As expected, our data confirms that H6 (higher cost increases enterprises' blockchain resistance), as do many previous research studies that found switching costs paramount. Hardware, software, HR, and skill acquisition are implementation costs. Blockchain is young, and there are few skilled professionals. As implementation cost uncertainty - sunk, transition, and loss costs - directly and indirectly raises resistance, organizations have to offer high enough inducements to recruit and retain high-quality personnel. One other investigation found a negative relationship.
H8-Organizational setting: Lower competence and technical knowledge raise blockchain resistance. H10: Higher perceived effort in inter-firm collaboration upsurges blockchain resistance.
Regarding H8, information system management researchers believe blockchain technology has been around for a long time, but its complexity and immaturity keep technical workers from being competent. Organizations can evaluate and influence this new technology's acceptance when knowledgeable and skilled.

Hypothesis 10 states blockchain resistance is linked to "perceived effort in collaboration and communication between firms." Collaboration weakens decision-makers and discourages investment. Many reasons explain this positive relationship. Every collaboration risks a firm's brand and market share. Firms may avoid collaboration because it seems difficult, time-consuming, and complicated.

Only the environmental hypothesis H12 was supported: A higher perceived constraint on existing regulations and legal frameworks increases organisations' resistance to blockchain. More regulatory action needs to be taken to broaden the adoption of blockchains. Current laws do not deal with such newly introduced concepts such as cryptographic signatures and intelligent contracts. Lack of governments' control and involvement in the technology may also disincentivise adopters.

This study rejected Hypotheses 7, 9, 11, and 13. H7 (upper management's technological awareness and blockchain hostility) must be proven. Based on our small sample size, additional assumptions are premature. Similarly, the "perceived risk of vendor lock-in" significantly correlated with resistance, echoing prior findings. According to our data, this is the least significant association. Expanding this result is impossible. We can assume vendor lock-in risk remains a considerable worry.

As expected, Hypothesis 11's least significant link between perceived government support restrictions and organization resistance is positive. Despite government support, businesses may employ the technology.

The second least significant relationship was perceived restrictions on efficient technology infrastructure and organizational resistance. Their good relationship is shown by. This indicates that perceived technology infrastructure limits do not increase organization resistance. Different demographic mixes may yield different results due to sample size. We can answer the first research question:

1. Table 13 positively correlates: technological complexity, security, and privacy with implementation cost, and resistance of organisations to blockchain. On the contrary, technical maturity, compatibility, and scalability are negative in correlation to organizational blockchain resistance. Hence, technological maturity, compatibility, and scalability would lower enterprise blockchain reluctance.
2. While organizational experience and technical understanding relate negatively to blockchain resistance, perceived cooperation effort does so positively. Thus, organizational perceived commercial collaboration increases the resistance to blockchains.
3. Environmental factors and blockchain resistance: The greater the perceived rule constraints, the more the blockchain resistance of a firm may increase. Blockchain opposition decreases with fewer governmental and legal constraints.

Table 13. Casual relationship between factors and Resistance

Category	**Factor**	**Relationship with Resistance**	**Score (β)**
Technology	Technological complexity	Positive	0.307
	Technological maturity	Negative	-0.111
	Technological compatibility	Negative	-0.166
	Technological scalability	Negative	-0.197

	Security and privacy concerns	Positive	0.091
	Cost of implementation	Positive	0.228
Organization	Expertise and technical knowledge	Negative	-0.138
	Perceived effort in collaboration	Positive	0.124
Environment	Perceived constraint on existing regulations	Positive	0.161

The goodness-of-fit of a model refers to its fit with empirical data. Due to the model's parameters, blockchain resistance varied by 79% (R2 = 0.792; Figure 2). ToE characteristics explain 79% of an organization's blockchain resistance, showing a good model match.

The second study question examines complexity, implementation cost, scalability, compatibility, and perception as key TOE framework factors.

From most to least influential, regulations, legal frameworks, expertise, and technical understanding affected acceptance.

4.3.2 Relationships between factors

This section finds latent variable correlations by examining factor relationships. Complexity significantly affects maturity, compatibility, and management team tech awareness. Excellence is linked to security, privacy, implementation costs, infrastructure shortages, efficient laws, teamwork, and vendor lock-in. Incompatible and complicated blockchain is also still in its infancy, with less scalability. Their concerns also include security, implementation costs, risk of vendor lock-in, perceived collaborative efforts, government support for efficient technical infrastructure, and laws.

Compatibility, scalability, manager technological awareness, expertise, and technical knowledge were positively related to technological maturity. On the other hand, security concerns, costs, perceived vendor lock-in risk, collaboration efforts, perceived government regulation support, and inefficient technological infrastructure were negatively related to it.

Similar to compatibility, scalability, senior managers' tech awareness, technical expertise and maturity correlated similarly. These characteristics and maturity move together. As blockchain technology improves and becomes more interoperable, installation costs, regulation concerns, perceived constraint support, etc. will drop.

With increasing technology, comes security and cost. The two are negatively related to maturity, compatibility, and the management team's awareness and skills in technology while positively related to the rest. Complex blockchains make responders extra cautious and conscious of costs. Thus, they believe that present regulations and infrastructures need improvement to be adopted. (Table 14).

Table 14. Correlation factors.

Factors	**COMPX**	**MATR**	**COMPA**	**SCAL**	**SECU**	**COST**	**AWNS**	**EXPT**	**RISK**	**COLL**	**SUPP**	**REGU**	**INFR**
COMPX	1												
MATR	-0.755	1											
COMPA	-0.757	0.734	1										
SCAL	-0.588	0.51	0.781	1									
SECU	0.737	-0.688	-0.613	-0.767	1								
COST	0.745	-0.554	-0.74	-0.51	0.729	1							
AWNS	-0.672	0.733	0.716	0.609	-0.705	-0.677	1						
EXPT	-0.668	0.768	0.73	0.533	-0.717	-0.803	0.78	1					
RISK	0.553	-0.454	-0.563	-0.612	0.563	0.522	-0.666	-0.643	1				
COLL	0.609	-0.532	-0.645	-0.538	0.659	0.666	-0.744	-0.661	0.59	1			
SUPP	0.678	-0.667	-0.718	-0.588	0.686	0.71	-0.726	-0.656	0.577	0.7	1		

REGU	0.679	-0.644	-0.766	-0.576	0.766	0.747	-0.701	-0.69	0.539	0.588	0.686	1	
INFR	0.738	-0.57	-0.711	-0.473	0.72	0.766	-0.662	-0.688	0.621	0.646	0.771	0.754	____

4.4. Management Implications

It suggests ways to improve current and future blockchain systems. Integration is essential to overcome blockchain's technological challenges. Data security innovations. Developers best handle such concerns. A lightning network or second layer to big blockchain networks could tackle scalabilityYou could even split those networks into smaller sets or regions they cover. Those subsets can be then connected to a legacy system by linking with the database. Calculating and storing on the blockchain record metadata - for example, Modex Blockchain Database - secures the integrity of the database. Once the scaling occurs, security and HR could be developed for maturity. Useful technology sells. We need to understand and be prepared to offer its functions.

Technological constraints cannot be changed by organizations. However, managers can disrupt organizations. Workshops and training may provide teaching blockchain to every worker. Managers should study blockchain and Oracle too. Managers may promote knowledge by working with educational institutions and suggesting needs. Managers should change their organization's data structure in such a way that competitiveness must not be harmed by shared information. In the case of selective interaction type, disclosure is suitable. This lets implementations be done on current systems without buying new ones. If so, adoption will be good. We think companies must teach employees in technology to accept blockchain.

The supply chain philosophy of long-term relationships and collaboration informs our inter-organizational elements. Blockchain may disrupt the system, but it's helpful in the long term. Prepared, change-friendly people benefit most. Incentive alignment suggests organizations collaborate and make decisions to improve supply chain performance. Successful collaboration includes sharing benefits, costs, and risks. To execute the benefits, all parties must provide something valuable. Everyone must agree—firms must be interdependent and complementary.

To this end, the specific characteristics of a platform should be considered by companies before opting for one. These are a smart contract that aligns with the corporate objectives of an entity, the security, privacy, and scalability mechanism, and perceived switching difficulty of platforms. Open-source systems may require expensive proprietary services or technology. Companies should implement blockchain now. Businesses will gain blockchain and related technology ecosystem first-mover advantages.

5. Conclusion

Based on research questions and goals, this section gives study conclusions. In our organization resistance model, components explain 79% (0.792 in Figure 2) of variation.

Data supported our hypotheses for technological factors of resistance variables pertaining to blockchain. The data supports hypotheses H1–H6, along with past research. H1, H5, and H6 show that organizations are resistant due to complexity, security, and privacy concerns about Blockchain having higher implementation costs. Thus, the cost of complexity, security, and privacy, and implementation increases the resistance of an organization.

Enterprises resist blockchain due to lower technological maturity, compatibility, and scalability. Thus, maturity, compatibility, and scalability decrease enterprise resistance to blockchain, which is the dependent factor.

Specifically, two hypotheses-"H7 and H9"-supported the causal links of organizational features and blockchain resistance, while two rejected them. Thus, it is not possible to confirm if "lesser technological knowledge and awareness of management team increase organizations resistance towards blockchain" or "higher perceived risk of vendor lock-in increases organizations resistance towards the blockchain." H8 and H10 received support. Poor competence and technical understanding raise firms' blockchain resistance, a negative causal connection. Growing an organization's technological expertise lessens blockchain opposition and vice versa. H10 says, "A higher perceived effort for collaboration between firms increases organizations' resistance to the blockchain." If a firm's apparent attempt to interact with other enterprises falls, its blockchain resistance decreases.

Two of three environmental variables and blockchain resistance theories were unsubstantiated. We cannot verify that "a higher perceived constraint of government support increases organizations' resistance to blockchain" or "an efficient technological infrastructure increases organizations' resistance to the blockchain." Only H12 was supported-restrictive regulations and the legal framework reinforce organizations' blockchain avoidance. Because blockchain avoidance represents the dependent variable, "perceived constraint on existing regulations and the legal framework" and "organization's resistance to blockchain" are related. Organizations reject blockchain when "perceived constraint on existing regulations and the legal framework" changes.

The factors that had the most significant influence on organisations' blockchain resistance in our second research question were the ones related to: complexity, cost, scalability, compatibility, and perceived limits on existing legislation and legal frameworks. Concretely, complexity has the coefficient of 0.307, implementation cost of 0.228, scalability of -0.197, compatibility of -0.166, and perceived regulatory and legal framework limitation of -0.161. Therefore, in a case where all factors but "scalability" remain constant, "organization's resistance to blockchain" decreases by 0.197 in the case of "scalability" increased by one.

Complexity, security, privacy, implementation cost, perceived collaboration, and perceived limit on efficient legislation were positively related. Second, maturity, compatibility, scalability, experience, and technical knowledge are related. A negative relationship is developed between the groupings. Even though various successful blockchain supply chain deployments took place, the adoption could be higher. The following are the preand adopting challenges and remedies for acceptance of blockchain technology. Apart from interand intra-organizational limits, the system-related and governmental restrictions hamper blockchain diffusion.

Significant barriers to the adoption of blockchain, according to findings from the survey, are technology maturity, cost, compatibility, and scalability. They believe that a lack of limits actually hurts company adoption. Companies might delay using blockchain because it's too complex and immature.

Many literature contributions result from this study. This setting lacks official studies, therefore it starts there. Second, this probe found

This report addresses the main barriers to blockchain adoption rather than adding explanations. The former is often as valuable as the latter. This report can help professionals invest in this new platform. It can help managers advance their organizations.

Like all surveys, this one's objectivity restricts it. Position, sector, and blockchain experience affect reactions. A global pandemic impeded data collecting in our investigation. Blockchain technology is relatively young; hence, this study had few participants and had poor data collection. Given that the major targets are companies that have been reluctant to adopt the technology, these limits do not affect the findings' reliability. Literature reviews add another limitation. Our data show this field is growing and gaining respect. Previous studies limited the barriers we assessed, and selected portals limited the literature search. Reviewing online sources from major consulting firms pioneering blockchain technology research and deployment removes this constraint.

As this technology becomes mainstream, a more thorough evaluation is needed. Such hurdles and, more importantly, strategies should be studied in the future

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