THE ROLE OF BLOCKCHAIN IN SECURING ONLINE TRANSACTIONS.

BY

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Abstract

In today's digital era, online commercial transactions have become an integral part of global trade, reshaping traditional marketplaces through the power of the internet. However, the growth of e-commerce has come with serious concerns surrounding the security, transparency, and trustworthiness of transactions conducted virtually. A major challenge remains the vulnerability of centralized systems to fraud, data breaches, and manipulation. This paper critically examines the role of blockchain technology in securing online transactions, offering a detailed analysis of how its features such as decentralization, immutability, transparency, and automation through smart contracts address existing shortcomings in traditional e-commerce systems. The paper adopts a doctrinal research methodology, relying on secondary data from academic journals, textbooks, online articles, and relevant case studies to provide a comprehensive understanding of the subject matter. The core objective of this paper is to establish how blockchain enhances the safety and credibility of online transactions, thereby boosting consumer confidence in digital marketplaces. It also aims to clarify the public misconception that blockchain is synonymous with cryptocurrency, while emphasizing its broader applicability. Findings suggest that blockchain significantly reduces human error, eliminates the need for third-party verification, and ensures transaction integrity through a decentralized and tamper-proof ledger. Smart contracts further automate and enforce agreements without the need for intermediaries, making transactions faster, more efficient, and more secure. The paper recommends the adoption of blockchain infrastructure by major online platforms, the education of stakeholders on its uses beyond cryptocurrency, and the creation of supportive regulatory frameworks to govern its deployment. In conclusion, blockchain stands out as a revolutionary tool in securing online transactions, promising a future of safer, faster, and more transparent digital commerce.

Keywords*: Blockchain, E-commerce, Online Transactions, Security, Smart Contracts.*

1.0 Introduction

Ideally, it is well established that human wants are unlimited, this then resulted in the need for making transactions to get what we want from whoever possesses it. Commercial transactions have not been traced to begin at a particular time, as the exchange of goods and services is traceable to, and is as old as man's existence itself.

[1]

Traditionally, exchange of goods occurs in a local marketplace where two people meet to transact and facilitate their trades.[2] However, the facilitation of transactions has experienced a paradigm shift through the advent of technology. Thanks to the internet, transactions occur between parties without their meeting physically.[3]

2.0 Overview of Online Commercial Transactions

The advent of technology has taken itself as a monumental force in shaping transactions globally, making it a possibility for people to transact without meeting or even know each other. The most of it, is people transacting at the comfort of their homes.

In its simple term, E-commerce, fully known as electronic-commerce, is the exchange of goods and services through the use of the internet. An e-commerce typically involves two people meeting virtually at a designated online platform on their devices in order to conduct their transactions without setting up a physical meeting, which may at times occur.[4] As it has been staged, e-commerce requires an internet space for people to transact. Popular ones among e-commerce platforms include *Shopify, Amazon, eBay,*

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[1] Ulrich M. Drubnig. "Commercial transactions". Available at
https://www.britannica.com/topic/commercial-transaction accessed on 20th July, 2025.
[2] Indeed Editorial Team. "What is a marketplace? Benefits, importance and goals." Available at
https://uk.indeed.com/career-advice/career-development/what-is-a-marketplace accessed on 20th July, 2025.
[3] Cameron Hashemi, Ben Lutkevich. "E-commerce". Available at
https://www.techtarget.com/searchcio/definition/e-commerce accessed on 20th July, 2025.
[4] Andrew Bloomentha. "E-commerce Defined: Types, History, and Examples". Reviewed by Margaret James. Fact checked by Katrina Munichiello. Available at
https://www.investopedia.com/terms/e/ecommerce.asp accessed on 20th July, 2025.

Etsy, Walmart, Alibaba.[5] While notable ones in Nigeria include *Jumia, Konga, Jiji, Payporte, Slot* etc. [6]

3.0 Introduction to Blockchain Technology

As the world evolves, information becomes power and security is paramount. A technological advancement which has turned into a backbone of transparency and ensuring security of information is the blockchain technology.

Blockchain is a shared, immutable digital ledger, which enables the recording of transactions and the tracking of assets within a business network and providing a single source of truth. [7] *Think of a game of whispers which includes 5 people, where the information whispered by the first person to the second person gets distorted or completely changed before it gets to the last person. A simple way to ensure the right information is passed to the last person from the first person is through the use of blockchain technology.* Blockchain technology is a collection of digital ledgers which is shared across different computers around the world where information stored on one computer is visible to all other computers, and any slight change in one is updated on the others[8].

How the technology works:

Blockchain uses a multi-step process that includes the following five steps:

- An authorized participant inputs a transaction, which must be authenticated by the technology.
- That action creates a block that represents the specific transaction or data.
- The block is sent to every computer node in the network.

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[5] V Vineet Kumar. "10 Top Ecommerce Companies List and Guide" (2025). Available at https://www.shopify.com/ng/blog/ecommerce-companies accessed on 20th July, 2025.

[6] Sam. "Top 10 e-commerce websites in Nigeria". Available at https://avada.io/blog/ecommerce-websites-in-nigeria/ accessed on 20th July, 2025.

[7] Stephanie Susnjara & Ian Smalley. "What is blockchain?". Available at: https://www.ibm.com/think/topics/blockchain accessed on 20th July, 2025.

[8] https://www.ibm.com/think/topics/blockchain accessed on 20th July, 2025

- Authorized nodes validate transactions and add the block to the existing blockchain.

- The update is distributed across the network, which finalizes the transaction.

Once a transaction is completed, blockchain is updated across all nodes, making the transaction permanent, transparent, and tamper-proof. [9]

4.0 Concept of Blockchain

The blockchain technology is a digital ledger shared across different computer networks identified as nodes in which these ledgers are interconnected and information stored on one reflects and is visible to another to foster transparency and traceability. [10] Blockchain involves the use of blocks which are connected by chains, and once one is filled up, it is linked to previous blocks, and a new one is automatically created, which also links to previous ones once filled up as well. This ensures information stored are not in a centralized form under a single central authority, but in a decentralized form across different computer networks around the globe. [11]

In considering public understanding of the technology, a usual misconception among people is that the blockchain technology is the same as cryptocurrency. However, blockchain is an invention in its entirety, while cryptocurrency is just a specific use of the invention alongside other things which the technology is used for. The first cryptocurrency to adopt the use of the blockchain technology was Bitcoin by an anonymous person or group identified as Satoshi Nakamoto in 2009, who arguably is the creator of the blockchain technology also. Bitcoin used blockchain as a decentralized

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[9] Kinza Yasar, Nick Barney& Mary K. Pratt. "What is blockchain? Definition, examples and how it works". Available at https://www.techtarget.com/searchcio/definition/blockchain accessed on 20th July, 2025.
[10] Stephanie Susnjara & Ian Smalley. "What is blockchain?". Available at https://www.ibm.com/think/topics/blockchain accessed on 20th July, 2025.
[11] Veera Budhi. "Advantages And Disadvantages Of Blockchain Technology". Available at https://www.forbes.com/councils/forbestechcouncil/2022/10/20/advantages-and-disadvantages-of-blockchain-technology/ accessed on 21st July, 2025.

public ledger to record transactions transparently and securely without a central authority.
[12]

Flowing from the above, when defining the subject term ***Blockchain***, there are certain key things which are important to note in understanding what blockchain is, and what it entails. These terms are discussed in this paper below.

4.1   Key Features of the Blockchain Technology

As it has already been established above in this paper, the blockchain technology works through sharing transactions across different networks. This makes it characterized by features like decentralization - data shared across different nodes as opposed to being subjected to one single authority; immutability – data contained in the blockchain technology are permanent, and not subjected to unnecessary changes; transparency – since information is shared across different nodes, it fosters a sense of truth when there is nothing to hide from the other party. [13] It is however important to delve into the detailed explanation of each term.

Immutable: Immutability means the technology is permanent, unalterable and not subjected to an abrupt change. Blockchain works through a collection of computer networks identified as nodes. Once a transaction is initiated and completed, it is recorded, after which it cannot be modified or deleted. That ensures the technology is immutable and a tamper -proof ledger which provides a high level of trust and security.
Every computer network, node, has a copy of the ledger. When a transaction is initiated, before it is approved, it requires validation from majority of the nodes in the network which then approves the transaction and records it. This means a transaction is not approved and recorded by a single node, but by majority of the nodes or unanimously by

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[12]Kriptomat. "A Brief History of Blockchain Technology That Everyone Should Read". Available at https://kriptomat.io/blockchain/history-of-blockchain/ accessed on 21st July, 2025.
[13] Ministry of Electronics and Information Technology, Government of India. "Features of BlockChain". Available at https://blockchain.gov.in/Home/BlockChain?blockchain=feature accessed on 21st of July, 2025.

all nodes. Once a transaction is validated and saved, it is irreversible and cannot be edited, change or deleted by any user of the network. [14]

Decentralized: In a blockchain, the framework is not under the oversight of a single entity or organization. The network takes the form of decentralization since it is maintained by a collection of nodes. This is one of the most important features of the blockchain technology given that it provides a great alternative to the centralized system. This gives users the autonomy and authority over the network as opposed to when it is under the control of a single individual or organization. This technology then provides the chance for us to access the network through the web from anywhere and save our assets since it is not subjected to certain regulations by any party or a certain regulating body.

This feature is a significant one, not only with it being opposed to a centralized system, but also on that there is a very low level of transaction failure, since transactions are regulated and not subjected to human approvals, resulting in lower chances of failure or errors.

Another thing this feature does is that even if a single node is compromised or attacked, it does not result in transaction failures since it is subjected to approval from majority of the nodes, and each node is distributed across networks globally. The decentralization of blockchain ensures individuals manage their assets independently without being under the control of centralized company. [15]

Transparent: Another important feature of blockchain is its transparent nature. This makes the system a new standard of transparency. It allows network participants to access the holdings and transactions of public addresses, with the user having his own private keys -password- to access the network. Every transaction, be it tangible or non-tangible, can be traced from the start to the finish with blockchain.[16] The blockchain technology aids traceable and unchangeable transactions which allows parties to trade with

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[14] GeeksforGeeks. "Features of Blockchain". Available at https://www.geeksforgeeks.org/ethical-hacking/features-of-blockchain/ accessed on 21st July, 2025.
[15] Shardeum Content Team. "Key Features of Blockchain Technology". Available at https://shardeum.org/blog/what-are-the-features-of-blockchain/ accessed on 21st July, 2025.
[16] "What are the characteristics of Blockchain?" Available at https://how.dev/answers/what-are-the-characteristics-of-blockchain accessed on 21st July, 2025.

confidence without an intermediary. Although available for the public to see through public addresses, record owners' have the way to access their records privately using a public - private key pair. That way, users may remain anonymous and still maintain transparency.[17] This feature in particular makes blockchain suitable for things like voting, governing, and financial transactions. Other key features of the blockchain technology includes that it is ***Distributed***, it ensures ***Faster Settlement***, ***Smart Contracts,*** it is as well ***Secure.[18]***

5.0 Smart Contract in Blockchain Technology

To any enthusiast of technology who is familiar with the blockchain technology, ***Smart contract*** is no stranger. Smart contract can be seen as an automated, self-executing agreement that does not require human intervention or execution.

Smart contracts work by the following simple "if/when…then…" statements that are written into code on a blockchain. A network of computers executes the actions when the stipulated conditions are met, fulfilled and verified.

These actions might include releasing funds to the appropriate parties, registering a vehicle, sending notifications or issuing a ticket. The blockchain is then updated when the transaction is completed. That means the transaction cannot be changed, and only parties who have been granted permission can see the results. [19]

A simple illustration is given below on what smart contract is about.

Think of a situation where you go into a hotel where you want to sleep over for two weeks. For each day you spend in the hotel, there is a particular price, and there is a machine in the hotel that gives you the code to access the room you'll be staying throughout your stay in the hotel. Since you are spending 2 weeks, it brings out your price which you are to pay. After payment, the machine automatically brings out a code

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[17] Shardeum Content Team. "Key Features of Blockchain Technology". Available at https://shardeum.org/blog/what-are-the-features-of-blockchain/ accessed on 21st July, 2025.
[18] GeeksforGeeks. "Features of Blockchain". Available at https://www.geeksforgeeks.org/ethical-hacking/features-of-blockchain/ accessed on 21st July, 2025.
[19] IBM Content Team. "What are smart contracts on blockchain?" Available at https://www.ibm.com/think/topics/smart-contracts accessed on 22nd July, 2025.

that doesn't work for a night that you didn't pay for, but for the two weeks that you paid for. The code then is what you use in accessing the rooms.

In the illustration given above, the only two parties there are the machine that brings out the code, and you visiting the hotel. What the machine that brings out the code does exactly is what a smart contract means. An agreement (the hotel pricing) has been inputted into a code for making the machine. All you are just required to do is your acceptance which is your payment, after which it gives you the code to access rooms. All these being done without human intervention is exactly what a smart contract is. A smart contract is a self-executing program that automates the actions required in a blockchain transaction. [20]

Smart contracts permit trusted transactions and agreements to be carried out among disparate, anonymous parties without the need for a central authority, legal system, or external enforcement mechanism. [21]

Smart contract works in the same way as a traditional contract while also automatically enforcing the contract. Smart contracts are programs that execute exactly as they are set up(coded, programmed) by their creators. As a traditional contract is enforced by the law, a smart contract is enforced by the code it was programmed with. [22]

5.1   What then are the Features of a Smart Contract and what are its Capabilities?

Distributed

Being a concept under blockchain technology, smart contract makes use of the distribution nature. Under a smart contract, every individual on the network is guaranteed to have a copy of all the terms, conditions and warranties of the smart contract and these

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[20] Erika Rasure; Suzanne Kvilhaug. "What Are Smart Contracts on the Blockchain and How Do They Work?" By The Investopedia Team. Available at https://www.investopedia.com/terms/s/smart-contracts.asp accessed on 22nd July, 2025.
[21] Ibid
[22] GeeksforGeeks Content Team. "Smart Contracts in Blockchain". Available at https://www.geeksforgeeks.org/solidity/smart-contracts-in-blockchain/ accessed on 22nd July, 2025.

conditions are not subjected to be changed by either of the parties. A smart contract is copied and distributed by all the nodes connected to the network. [23]

Specificity

Smart contract as a programmed agreement designed by code does not do more, does not do less. What does this mean? Smart contract as an agreement designed by certain code for a specific function is only limited to the function which it has been designed to do, these functions can only be done when certain conditions which are part of the code it was designed with, are met or fulfilled. Smart contract can only perform functions for which they are designed only when the required conditions are met. The final outcome will not be different or change, regardless of who or how the person executes the smart contract. [24]

Immutable

Right from the time a smart contract is implemented, it is not subjected to any changes whatsoever. Smart contract cannot be changed, and it can only be removed if the functionality has previously been implemented by either of the parties.

Autonomy

Another notable feature of smart contract is the high level of freedom and autonomy it gives the dealing parties. Firstly, there is no existence of a third party in the contract. The contract is made by you and shared between the parties. No intermediaries are involved which minimizes bullying and grants full authority to the dealing parties. Additionally, the smart contract is maintained and executed by all the nodes on the network, thus removing all the controlling power from any one party's hand. Once a party is not satisfied with the terms, he may simply not agree to it, although could not be changed. [25]

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[23]   GeeksforGeeks   Content   Team.   "Smart   Contracts   in   Blockchain".   Available   at https://www.geeksforgeeks.org/solidity/smart-contracts-in-blockchain/ accessed on 22nd July, 2025.
[24] Ibid
[25] Ibid

Customizable

Although Smart contracts are immutable- cannot be changed once implemented, it then is subjected to modifications, only if it could be done before the deployment. Before deployment, either party or both parties have the chances and freedoms to modify it to suit their needs and meet their wants before implementing it. [26]

Transparent

Smart contracts are always stored on a public distributed ledger called blockchain due to which the code is visible to everyone, whether or not they are participants in the smart contract. [27]

Trustless

In a smart contract, integrity or trust is not required, as there is transparency for you to see what are the terms on the contract. By that, a smart contract only enforced when both parties fulfill their own side of the agreement. These are not required by third parties to verify the integrity of the process or to check whether the required conditions are met. [28]

6.0 Challenges in Online Transactions

Since serving as a substitute to the traditional method of conducting transactions, e-commerce has significantly gained the trust of people globally, with people adopting it due to its easiness, efficiency, and safety in conducting transactions. However, is there actually any guarantee that conducting transactions online is a safe way of conducting transactions? On its deeper look, the flow of online transaction is hindered by problems of online payments businesses face, including security concerns, mounting fees, regulatory compliance, and ensuring smooth customer experience. [29]

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[26] Ibid

[27] Ibid

[28] Ibid

[29] DPO Pay Content Team. "Top 5 Challenges in Online Payments and How to Overcome Them". Available at https://dpogroup.com/blog/top-5-challenges-in-online-payments-and-how-to-overcome-them/ accessed on 21st July, 2025.

6.1 Security Threats

As the digital world evolves, consumers' information gets shared out more and more. This growth makes transactions easier. But it brings significant risks for customers and merchants.

Cyber criminals often target online payment systems, such as credit transactions, digital wallets, and online banking,. These include identity theft, phishing, and data breaches. According to Juniper's Research, companies risk losing over $362 billion globally due to these frauds between 2023 and 2028. [30]

6.2 Replication of Banking Sites

Sometimes, banking sites may be replicated by scammers. These sites are fake websites that imitate legitimate ones, causing significant issues for online payments. These sites trick users into entering their login credentials and allow scammers to access their real accounts.

When a customer enters any of these sites, and ignorantly inputs both his username and password unknowingly. Scammers then use this info to link the victim's mobile banking to their phone. This scam can lead to significant financial losses and compromised personal data. [31]

6.3 Cross-border transactions

Transactions vary, and may be done nationally and internationally between countries with two distinct currencies. This then is what is referred to as cross-border transactions. Cross-border payments can be slow, inefficient, and expensive, but they play an important role in global trade. Ordinarily, the infrastructure of local banks cannot handle cross-border payments, resulting in independent and non-uniform development in technologies and software platforms that complicate or stall cross-border transactions. [32]

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[30] Eugene Makieiev, BDM. "Top 5 problems with online payments in 2024". Available at https://integrio.net/blog/top-problems-with-online-payments accessed on 21st July, 2025.

[31] Ibid

[32] DPO Pay Content Team. "Top 5 Challenges in Online Payments and How to Overcome Them". Available at https://dpogroup.com/blog/top-5-challenges-in-online-payments-and-how-to-overcome-them/ accessed on 21st July, 2025.

6.4 **Data Breaches**

The growing sophistication of cyber-attacks and malware has made data breaches a pervasive threat for both businesses and consumers. From malware-infected POS terminals to phishing attacks targeting unsuspecting users, the risk of data compromise looms large in today's digital ecosystem. [33]

6.5 Transaction Errors and Disputes

Another challenge that faces digital payment systems is the potential for transaction errors or disputes. Resolving these disputes and managing chargebacks may be time-consuming and costly for all parties involved. Despite the advanced technologies, errors can occur during the payment process, leading to incorrect charges, double payments, or failed transactions.

Additionally, disputes may arise between merchants and customers over issues such as delivery discrepancies or unauthorized charges. Charge flow automated charge back management system efficiently handles these disputes, reducing the time and cost involved in managing charge backs.[34]

7.0 Blockchain as a Solution

Since the breakthrough of the ground-breaking, revolutionary blockchain technology, several companies, governmental agencies, financial institutions and non-profit organizations have started exploring ways in which they could employ the use of the technology in becoming a better version of themselves. The exploration stems from the ability of the technology to share data among entities, foster transparency and some other key benefits that could be gotten from its use.[35]

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[33] Chargeflow "Challenges of Digital Payment and Prevention Strategies". Available at https://www.chargeflow.io/blog/challenges-of-digital-payment-and-prevention-strategies accessed on 21st July, 2025.

[34] Ibid

[35] Mary K. Pratt. "Top 10 benefits of blockchain for business". Available at https://www.techtarget.com/searchcio/feature/Top-10-benefits-of-blockchain-technology-for-business accessed on 22nd July, 2025.

Having discussed on how commercial transactions conducted online are subjected to so many challenges that could hinder the effectiveness of electronic commerce, this part of this paper therefore seeks to bring to the limelight, the various solutions proposed by the use of the blockchain technology to e-commerce and the financial sector at large. [36]

The blockchain technology, through its proven characteristics proposes many solutions to the financial industry. The solutions the blockchain technology proposes are in detailed discussed below.

7.1 Trust

The first and foremost benefit of the blockchain technology is trust. In every course of transactions, trust serves as a backbone. Blockchain establishes trust between different entities such where there is neither trust, nor is it proven. Serving as a result, these entities are willing to engage in business dealings that involve transactions or data sharing they may not have otherwise done or would have required an intermediary.

Enabling of trust is one of the core benefits which the blockchain technology brings to the table. This is evident in early blockchain use cases that facilitated transactions among entities that did not have any direct or straight forward relationships yet without fear could share their data and information when making payments. The use of blockchain technology in the financial market like cryptocurrency is a typical example of how the technology enables trust between parties who do not know each other, or have no prior relationships. [37]

7.2 Security

Another important thing in e-commerce is security of data and privacy. The distributed consensus of blockchain technology nature eliminates every single point of failure and

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[36] Veera Budhi. "Advantages And Disadvantages Of Blockchain Technology". Available at https://www.forbes.com/councils/forbestechcouncil/2022/10/20/advantages-and-disadvantages-of-blockchain-technology/ accessed on 22nd July, 2025.

[37]   Mary K. Pratt. "Top 10 benefits of blockchain for business". Available at https://www.techtarget.com/searchcio/feature/Top-10-benefits-of-blockchain-technology-for-business accessed on 22nd July, 2025.

reduces the need for data intermediaries such as transfer agents, messaging system operators and inefficient monopolistic utilities. Blockchain also enables implementation of secure application code designed to be tamper-proof against fraud and malicious third parties, making it technically impossible to hack, manipulate or get tampered with. [38]

Blockchain creates an immutable record of transactions with end-to-end encryption to shield against fraud and unauthorized activities. Also, unlike the centralized system where only a copy of data is kept in a single computer network, which although may be secured, but if tampered with, risks the complete elimination of such data, blockchain technology stores the copy of its data in different computer networks which is virtually impossible to tamper with all the computer networks. Additionally, it is argued that blockchain easily addresses managing of data better than the traditional system by anonymizing data and, in some cases, requiring permission to limit access. [39]

7.3 Speed

Another solution which the blockchain technology poses is speed. After eliminating intermediaries and replacing many of the manual processes of transactions, blockchain easily functions quite faster than the traditional online methods of transactions. Some experts have concluded that blockchain is faster than other processes and technologies when all the steps including the manual ones are taken into account. For example, in one of the most prominent applications of blockchain, Walmart used the technology to trace the source of sliced mangoes in seconds a process that previously took seven days. [40]

Blockchain provides an efficient solution for reducing transaction costs and accelerating financial processes. Unlike traditional systems that involve multiple intermediaries and long processing times, blockchain technology enables direct transactions between parties without requiring third-party intervention. Additionally, RippleNet, a blockchain

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[38] Consensys. "What are the Benefits of Blockchain in Finance?" Available at https://consensys.io/blockchain-use-cases/finance accessed on 22nd July, 2025.
[39] Mary K. Pratt. "Top 10 benefits of blockchain for business". Available at https://www.techtarget.com/searchcio/feature/Top-10-benefits-of-blockchain-technology-for-business accessed on 22nd July, 2025.
[40] Ibiid

platform used by banks such as Santander and American Express, facilitates near-instant cross-border transfers, eliminating delays associated with traditional processes. These improvements are particularly important for international payments, where time and costs are critical factors. Compared to traditional systems such as SWIFT, which can take several days to complete a transaction, blockchain significantly reduces processing time, sometimes to just a few seconds for specific transactions. [41]

7.4 Smart Contract

Talking of the solutions brought by blockchain technology, smart contract is a very significant and notable one. Without adding it to the list, it is not complete. As smart contract has been extensively discussed above to a an automated, self-executing, self-verifying agreement which is programmed through a code to perform specific functions when certain conditions laid down have been fulfilled by the parties to the contract. [42]

The modern method of finance is heavily based on papers, and human interventions which may lead to slowing down of works, lack of professionalism, infringement of privacy and lack of trust. Smart contract on the other hand, making use of automations and no human intervention promotes efficiency and an ideal solution to these services. Smart contracts enable seamless, secure transactions and various features ideal for the financial services industry. Smart contracts represent hope for smoother legal processes, workflow management, regulatory compliance, and clearing and settlement in the financial markets and international trade. Smart contracts in finance can help a business or individual to tokenize assets, use cryptocurrency, or automate transactions.[43]

7.5 Transparency and traceability

Traceability provides visibility and accountability throughout the transaction, validating safety, quality, and authenticity. In many ways, it serves as a safety net if a product seems

[41] T. G. Budisteanu. "Blockchain and the Banking Sector: Benefits, Challenges and Perspectives". Open Journal of Social Sciences, 13, 288-300, 2025. Doi: 10.4236/jss.2025.133019.

[42] IBM. "What are smart contracts on blockchain?" Available at https://www.ibm.com/think/topics/smart-contracts accessed on 22nd July, 2025.

[43] Headera. "Smart Contracts in Finance". Available at https://hedera.com/learning/smart-contracts/smart-contracts-finance accessed on 22nd July, 2025.

to be defective or contaminated, traceability allows for swift identification of the problem's source, minimizing damage. This safeguards consumers and helps companies avoid expensive recalls. It also helps to ensure that products adhere to quality standards and comply with regulations, an essential requirement in industries like food and pharmaceuticals. The immutability and transparency of blockchain make it an ideal technology for tracking and verifying the origins and movement of goods or data through supply chains. [44]

8.0 Legal and Regulatory Considerations

Having taken the time to explore what blockchain technology is, what are its structures, features, benefits, and solutions it brings to conduct of transactions online, it is then however important to know that, to almost every technological advancements, of which the blockchain technology is one, it is quite pertinent to check out for certain legal issues to be considered of which this section of this paper delves into the legal perspective as regards the blockchain technology and its functions, and how it performs these functions. On a deeper look of the works they do, the blockchain technology and smart contract deal with things related to privacy, data, and security of its users, which is what makes it important to consider the potential legal challenges of these technologies.

8.1 Regulatory Compliance

The first challenge blockchain poses to consider is on the regulations available for traditional oral and written contracts. Smart contracts, unlike traditional contracts which are enforced by the law, are enforced by codes. This then leads to a significant challenge for the legal system to address agreements enforced by codes, compare to those enforced by the law. [45] In the traditional contract law, elements of a contract include offer, acceptance, consideration, legality, capacity, while the smart contract technology poses challenges to these elements. Smart contracts allow anonymous parties to enter into

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[44] Inēs Botelho. "Traceability and Blockchain: Transparency for Any Business". Available at https://cardanofoundation.org/blog/traceability-and-blockchain-transparency-for-any-business accessed on 22nd July, 2025.
[45] J. Szabo., C. Bernard, & L. Philip. "Legal Implications and Challenges of Blockchain Technology and Smart Contracts". Computer Life, 12(2), 6-10, 2024. https://doi.org/10.54097/ztn2w848

agreements, including someone who does not have the required capacity under the law, or for a subject matter of illegality. While a notable feature of the smart contract is its immutability, the traditional contract identifies and places significance on modifications of contractual terms on the mutual consents of parties to an agreement. This raises another issue of difficulty in addressing the immutability of a smart contract as opposed to the existing regulations on contracts. [46]

Currently, there is no framework guiding smart contracts, which provides the implication that smart contracts will be enforced by traditional contract laws. While the traditional contract laws recognizes certain elements like offer, acceptance among others, it may be challenging to identify all these elements in the case of a smart contract. However, traditional contract principles may still be applied to smart contract, but that will depend on certain factors.

8.2 Data Privacy and Protection

Another challenge that should be given regards to is on the issue of data management and privacy. Blockchain technology and data privacy are often contentious, in which balancing the transparency of data and the increasing demand for data privacy is becoming monumental. The transparent and immutable nature of a smart contract, although the core features and strength of blockchain, challenges the protection of data, and it's privacy. It goes against the purpose of data privacy regulations, particularly, the European General Data Protection Regulation, GDPR. The GDPR provides for key elements like consent of individuals in data privacy, right to access it, as well as the right to be forgotten (right to erasure) of data. [47]

Due to the immutability of the blockchain technology, data recorded are permanently stored and tamper-proof, however, this is as opposed to provision of article 17 of the regulation, GDPR. Article 17 of the GDPR guarantees the erasure of data on the request by the owner. The Article 17 gives the data subject the right to obtain from the controller

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[46] GeeksforGeeks. "Smart Contracts vs Traditional Contracts". Available at https://www.geeksforgeeks.org/computer-networks/smart-contracts-vs-traditional-contracts/ accessed on 22nd July, 2025.
[47] Regulation (EU) 2016/679 (General Data Protection Regulation).

the erasure of personal data concerning him or her without undue delay and the controller shall have the obligation to erase personal data without undue delay provided certain circumstances are met. [48]

When a transaction is recorded on a blockchain, it becomes visible to everybody on the network transparency. However, this transparency is a double-edged sword. As it ensures accountability and promote trust, so can it lead to exposure of personal data and sensitive information of its users. Blockchain, with its inherent transparency and immutability, presents certain key challenges to the implementation of GDPR. In a blockchain, data, once recorded, cannot be altered or erased, potentially clashing with the principles of data rectification and right of erasure espoused by GDPR. Additionally, the decentralized nature of blockchain makes it difficult to identify a centralized 'controller' of data, another key requirement of GDPR. [49]

Tailored down to the Nigerian regulation on data protection, The Nigeria Data Protection Act, 2023, *NDPA.* The Nigeria Data Protection Act 2023 ("NDPA") regulates the protection of personal information; establishment the Nigeria Data Protection Commission for the regulation of the processing of personal information; promotion of data processing practices that safeguard the security of personal data and privacy of data subjects; protection of data subjects' rights, and provision of means of recourse and remedies, in the event of the breach of the data subjects' rights; and strengthening the legal foundations of the national digital economy and guarantee the participation of Nigeria in the regional and global economies through the beneficial and trusted use of personal data.[50] Capital market operators are among the entities that must comply with the requirements of the NDPA. The NDPA mandates lawful data collection, minimal data usage, and limited retention periods. The Nigeria Data Protection Regulation Implementation Framework 2019 (deemed made pursuant to the NDPA) specifies

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[48] Art 17, Regulation (EU) 2016/679 (General Data Protection Regulation).
[49] Financial Crime Academy. "Blockchain and Privacy: Navigating the Balance between Transparency and Data Protection". Available at https://financialcrimeacademy.org/blockchain-and-privacy/ accessed on 23rd July, 2025.
[50] DLA Piper. "Data protection laws in Nigeria". Available at https://www.dlapiperdataprotection.com/?c=NG&t=law accessed on 23rd July, 2025.

statutory retention periods for storing personal data. Personal information collected during the KYC process in smart contracts can be encrypted and stored in decentralised identity systems, allowing selective disclosure, updates, and erasure as necessary, ensuring protection from unauthorised access. The consent of the customers should also be obtained digitally regarding the processing of their date as a condition to proceed with the relevant transaction. [51]

8.3 Jurisdictions

Given the decentralized and distributed nature of the blockchain technology, it spans across different localities which makes it possible to conduct a borderless transaction using a blockchain network. As limitless as this seems, it makes vague the jurisdiction which a transaction falls when it involves parties who do not stay within the same jurisdiction. When disputes arise, it becomes an issue of determining what laws of what jurisdictions will be applicable to such dispute. When the ambiguity of determining what Jurisdiction will take over such dispute, conflict of law arises and this may be costly as different jurisdictions certain regulations all-embracing blockchain, whole some have stringent policies against the use of the technology. [52]

This challenge then is further supported by the anonymous nature of blockchain transactions which makes it difficult to identify and locate parties to a transaction. While having the difficulties of determining the jurisdictions, it is important to note that certain jurisdictions like Malta have taken themselves as a home for the technology, while in the jurisdiction of China, strict policies have been implemented against the technology.

As expected, the distributed nature of blockchain paralyzes the original intent of jurisdiction rules to allocate power among sovereigns. It compels a defendant to a case to defend their case in courts worldwide, which imposes undue burdens on the defendant.

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[51] Udo Udoma & Belo-Osagie "Smart Contracts: Assessing Some Legal Implications Of Its Use In The Nigerian Capital Market". Available at https://www.mondaq.com/nigeria/fin-tech/1508146/smart-contracts-assessing-some-legal-implications-of-its-use-in-the-nigerian-capital-market accessed on 23rd July, 2025.
[52] Ibid

Furthermore, it has the potential to cause abusive lawsuits. Thus, jurisdictional rules have to adjust the standard for adopting the effect test correspondingly.

Although, the internet to a large extent is distributed and allows for cross borderless interactions, but the comprehensive distribution of blockchain complicates the distributed nature of the internet to a different wider level. The primary feature of blockchain is decentralization, meaning that an activity can be conducted by a group of people who do are not within the same vicinity and not under one centralization. Without a centralized institution having any authority over this group of people committing the activity, determining the conduct place of such activity could be challenging since they are not consolidated in one centralization. Under traditional jurisdiction rules, in cases involving multiple participating individuals, the place of any individual who participated the activity can serve as the conduct place. However, in the case of blockchain, the participating individuals are distributed worldwide. Therefore, in any jurisdiction where the conduct test is adopted over the effect test, such country can claim jurisdiction over a blockchain-based activity and paralyze the original intent of jurisdictional rules. [53]

The challenge posed by blockchain can be more intriguing. Blockchain participants often participate in the blockchain system (e.g., verify the records to be updated into the ledger) in their residences. If a plaintiff requests for the defendant to be liable for such conduct, the conduct place is very likely to be the residence place of the defendant. To that extent, blockchain compromises the conduct test and the principle of *actor sequitur forum rei,* the core principle of jurisdictional rules. [54]

9.0 Limitations of Blockchain

Given a groundbreaking and revolutionary instrument that blockchain has taken itself to be identified as, considering its features and functions, one may call it a limitless technology, in which however, it is no perfection. Blockchain due to some functions in

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[53] Yueh-Ping (Alex) Yang. " When Jurisdiction Rules Meet Blockchain: Can the Old Bottle Contain the New Wine?". Associate Professor at National Taiwan University Department of Law. Available at https://stanford-jblp.pubpub.org/pub/jurisdiction-rules-blockchain/release/1 accessed on 23rd July, 2025.
[54] Ibid

which it performs may sometimes experience some challenges which could cause series of setbacks in the works it performs.

9.1 Scalability

Scalability in blockchain technology refers to speed in transactions. It is the capacity which a blockchain has to accommodate workload, transactions and speed. The scalability of a blockchain is determined by certain factors like the heaviness of the load on it, storage requirements and more. At the moment, transactions involving blockchain technology takes more to time to process compared to traditional methods of payment. The network's capacity is determined by scalability, which also affects the number of network nodes, the number of transactions the network can handle, how quickly the network can handle transactions, and other factors.

Scalability issues in blockchain technology refers to the challenges encountered in handling an increasing number of transactions. As blockchain networks like Bitcoin and Ethereum grow in popularity, they face difficulties in processing transactions quickly and efficiently due to limitations in transaction throughout, which may lead to higher fees and longer confirmation times. [55] In understanding how challenging is blockchain scalability, one key thing to understand is *blockchain trillema.*[56] What does this mean?

As coined by Ethereum co-founder Vitalik Buterin, trillema is the conflict between 3 core aspects of the blockchain technology security, scalability and decentralization. *Security* refers to the organized defense measures that must be put in place for blockchain technology to prevent malicious attacks from different sources. The second aspect being *scalability* demands that blockchains accommodate a large number of transactions and users without increasing fees or transaction times substantially. The final aspect, *decentralization* is also a key feature of blockchain technology, where authority over the

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[55]Shardeum Content Team "What is Blockchain Scalability? A Deep Dive Guide". Available at https://shardeum.org/blog/what-is-blockchain-scalability/ accessed on 23rd July, 2025.

[56] Cryptopedia Staff. "The Blockchain Trilemma: Fast, Secure, and Scalable Networks". Available at https://www.gemini.com/cryptopedia/blockchain-trilemma-decentralization-scalability-definition accessed on 24th July, 2025.

network is distributed around different computer networks rather than being under the control of a single centralized entity.

These concepts are core, as well overlapping such that ensuring all three would be virtually impossible, which makes possible for only two to be accomplished at a time, diminishing the significance of the third aspect. [57]
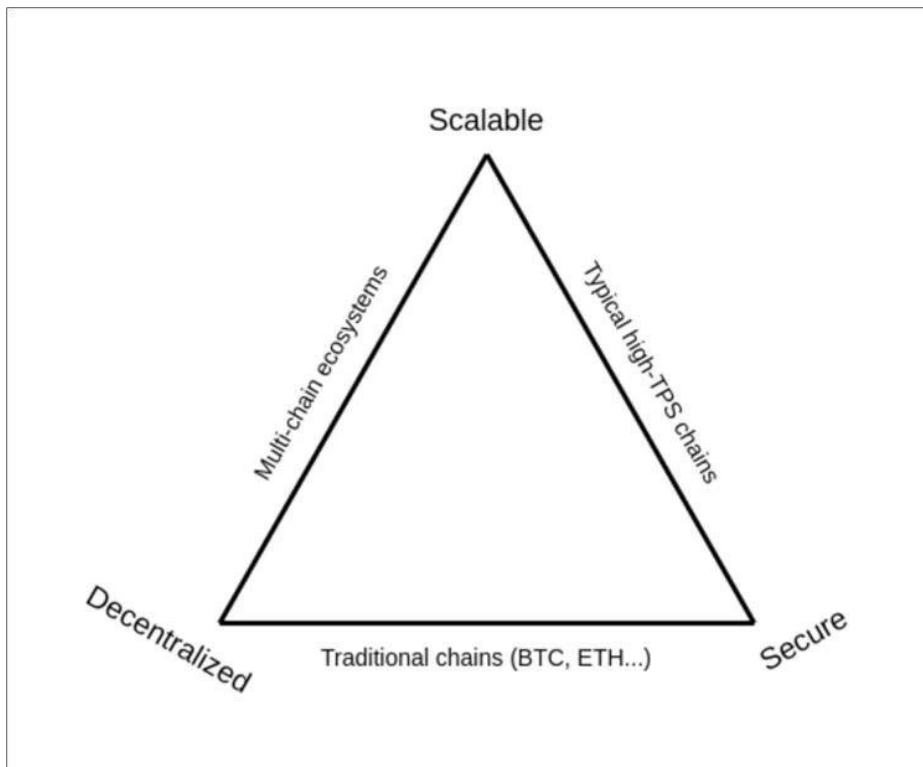
58

Scalability is the ability of blockchain to handle more work. The overarching goal for achieving scalability is to do so without reducing security and decentralization. On cryptocurrency blockchains, scalability translates directly to transactions per second. Because it is very decentralized and secure, the Bitcoin blockchain is not very scalable

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[57] Nathan Crooks. "What is the blockchain trilemma?". Available at https://www.theblock.co/learn/249536/what-is-the-blockchain-trilemma> accessed on 24th July, 2025.
[58] Nathan Reiff. "Scalability: Blockchain Tech's Greatest Problem". Available at https://www.investopedia.com/investing/governance-blockchain-techs-greatest-problem/ accessed on 24th July, 2025.

without the help of external programming. Since Bitcoin's introduction to the public in 2009, many people have been interested in scaling the blockchain. [59]

9.2 Energy Consumption

Another challenge we have with the blockchain technology is its high consumption of energy. Blockchain transactions consume as much energy such that if it were a country, it would be ranked 41st among the countries consuming the most energy in world, almost as much as Austria.[60] A single Bitcoin transaction consumes as much energy as would be used for thousands of other things. What is behind every blockchain transactions is the consensus of all the nodes that every transaction on the blockchain is true. The competition between computers to arrive at that consensus by solving cryptographic puzzles is known as mining. And mining uses powerful, purpose-built computer chips and software, plus a reliable Internet connection and air conditioning to keep CPUs cool as they word 24/7 at complex calculations. All of that consumes an enormous amount of electricity. [61]

Additionally, computers joining in mining do not change the functionality of a blockchain, but only increase its energy use. The law of diminishing returns plays a big role here. Once a blockchain network reaches a critical number of nodes, security already meets a base requirement. But mining is lucrative, and more and more people own cryptocurrency. As a result, the Bitcoin blockchain alone currently uses 204,5 TWh of electricity per year, comparable to the power consumption of Thailand. And it's the amount of energy used itself that is the problem, not the source of that energy. Many miners are switching to renewable energy sources. But this simply moves the problem elsewhere. We don't yet have enough renewable energy production to cover all of our

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[59] Ibid

[60] Christopher Koch. "Blockchain's energy crisis". Available at https://www.sap.com/blogs/blockchains-energy-crisis accessed on 24th July, 2025.

[61] Ibid

activities. So, if mining uses up renewable energy, that just increases the non-renewable energy used on other activities. [62]

9.3 Cost of Storage

Blockchain as a technology has been created to store transactions and keep them for future referencing. Although you could view them in the future, but you cannot have them as data store on the technology are non-editable and cannot be deleted. When talking of storage cost, it is important to put our attention more onto the Ethereum network, because it is mostly associated with storage challenges than other networks.

Just like nodes and miners keep the bitcoin blockchain functioning, Gas serves the pillar that keeps the Ethereum blockchain functioning. All activities, such as sending Eth from one account to another, creating smart contracts, making payments and all activities involving the Ethereum blockchain all have a specific fee charged. Gas serves as the unit in which each fee is charged. So therefore, any activity (creating contracts, making message calls, utilizing and accessing account storage and executing operations on the virtual machine) has a universally agreed cost in terms of gas. Every transaction performed have a specific amount dedicated to it, and this changes as the complexity of the transaction increases. The higher the complexity of the problem the larger volume of gas it will cost.[63]

How much then does GAS cost?

A gas is worth of 0.00000005 ETH and if you planning to store data or let's say a 256-bit word it will cost you 20,000 gas. A kilobyte is thus 640k gas or 0.032 ETH or 16.70 USD as per the current rate of Ethereum which is $528.3 Dollar.[64]

That serving as a guide, it makes interesting to blow your mind when you calculate the amount it costs to store up to a GB of data.

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[62] Ellen Meijer. "Blockchain and our planet: why such high energy use?". Available at https://pre-sustainability.com/articles/blockchain-and-our-planet-why-such-high-energy-use/ accessed on 24th July, 2025.
[63] Rohan Pinto. "Costs Of Storing Data On The Blockchain". Available at https://www.1kosmos.com/blockchain/cost-of-storing-data-on-the-blockchain/ accessed on 24th July, 2025.
[64] Ibid

9.4 High Level of Risk

The blockchain technology, most especially, smart contracts, rely heavily on codes. An error in the code will likely result in an error in the contract. Error in the contract may then lead to high level of risk, which may even lead to loss of funds, and private information.

Case study*: **Dao Hack***

A Decentralized Autonomous Organization is a blockchain-based cooperative that is collectively owned by its members, with rules set and executed through code. DAOs replace centralized management structures with a techno-democratic approach wherein decisions are voted upon by investor-stakeholders.

The Hack

It all just started through a bug in the development of DAO. Speculations had started going round that there was a potential hacking going on in the DAO system, but before the developers could go on to analyze the situation and check for what went wrong, a group of hackers have taken advantage of the situation by using the holes in the system to extort enough money from the DAO system. This was done due to a bug in the code the system was developed through. The system was programmed in such a way that, while on withdrawal, as long as the whole process is ongoing, the system does not update your Ethereum balance, rather it does that after the whole interactions between you and the system. So that gave the hacker the enough chance to withdraw up to 3.6 million coins out of the 12 million plus which has been raised.

The bug gave the hacker the enough chance to withdraw up to 3.6 million coins leaving the rest in the system. [65]

A simple illustration of the hack is given below.

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[65] Andrew Loo. "What Was the Famous DAO Heist? *A real-life cryptocurrency heist from the early days of   Ethereum   that   shook   up   the   crypto   world"*.   Available   at https://corporatefinanceinstitute.com/resources/cryptocurrency/dao-heist/ accessed on 24th July, 2025.

In a situation you are in need of cash, and decide going over to an ATM machine to make withdrawal. All you ordinarily have in your account is ₦20,000. You place a withdrawal of ₦10,000, and then stood for a while, with your debit card still in the machine, to check for an alert signifying debit in your account, you did not receive any text. You decided to open your bank app and discover your balance has not changed. You then go on to place another withdrawal of ₦10,000 to be well aware of the situation, still, balance remains the same. Seeing how it is, you decide to take advantage of the situation by withdrawing another ₦10,000. You kept on withdrawing, and withdrawing till you withdrew up to ₦250,000, whereas the amount in your account initially was never up to that. After you rejected your debit card from the ATM machine, it brings up an alert signifying you placed withdrawal, with your balance moving to ₦0.[66]

Using the DAO Hack as a case analysis of how the technology is exposed to high risk brings to our notice that, the system heavily relies code, and an error in the code may lead to loss of monetary funds.

10.0 Conclusion

In a world where human wants are unlimited, where humans have to interact in order to get what they so desire from another person, the need for transactions arises. This leads to the introduction of trade and commerce. This refers to the exchange of goods and services between different people who meet in a designated space to conduct the transaction.[67]

Traditionally, trade usually take places in a local centre identified as the market. However, as the world evolves, technology has taken over, the need to easily transact between individuals from distanced localities emerges, thus leading to the facilitation of

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[66] Ernesto Frontera. "A History of 'The DAO' Hack." Available at https://coinmarketcap.com/academy/article/a-history-of-the-dao-hack accessed on 24th July, 2025.

[67] Dimple Tiwari. "Trade and Commerce: Definitions, Differences, and Importance Reviewed". Available at https://www.vedantu.com/commerce/difference-between-trade-and-commerce accessed on 24th July, 2025.

transactions in the internet space. This led to the introduction of Electronic Commerce, *E-commerce.*[68]

E-commerce, unlike the traditional methods of transaction, is easily conducted between individuals who have never met, or interacted, right from the comfort of their homes. It has helped in facilitating trades through the use of the internet space and devices, which makes faster and efficient, reduce the cost in setting up a physical cost, makes easier to reach wide audience etc.[69]

As the world further evolves, only those with access to the right information hold power, and security becomes paramount, a groundbreaking technology, the blockchain technology comes up with its distinct features to turn the world of data storage around. Blockchain is a technology which comprises of several blocks connected together through a chain, where information stored on one is connected on the others, thereby enhancing transparency and traceability. [70] The blockchain technology has certain distinct features like **immutability** – information, once approved by computer networks identified as nodes, and is recorded on a block, becomes permanent. It is not subjected to change by any user, cannot be modified or even deleted.; **Distribution**: Information on a blockchain is distributed across nodes which makes it impossible to conceal information by a single user. Information is spread across different nodes across different areas which fosters transparency.; **Decentralization** - Blockchain technology is not limited to the control of a single centralized authority. It spreads its control across different users including those not confined within the same locality or jurisdictions.; **Consensus** - before a transaction is recorded and stored in a block in blockchain, such transaction requires approval from majority of the distributed computer networks, therefore reducing the likelihood of fraud or storing a corrupt data in a block. **Traceability –** since

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[68] Amazon Content Team. "What is ecommerce?" Available at https://sell.amazon.com/learn/what-is-ecommerce accessed on 24th July, 2025.

[69] MailChimp. "What Are the Advantages and Disadvantages of E-commerce?" Available at https://mailchimp.com/resources/advantages-and-disadvantages-of-ecommerce/ accessed on 24th July, 2024.

[70] Stephanie Susnjara and Ian Smalley.. "What is blockchain?" Available at https://www.ibm.com/think/topics/blockchain accessed on 24th July, 2025.

transactions on blockchain are distributed to every computer in the network, it makes easy to track down any source of error in the system.[71]

Having discussed on what online transactions encompasses, it is then important to know that it is without its challenges hindering its efficiency. Such challenges include fraud, data breaches, lack of trust among several others. As the various challenges hindering the efficiency of e-commerce have been discussed above in this paper, we are tempted to imagine how easy things would be if the financial industry could actually employ the use of the blockchain technology. The blockchain technology, through its proven characteristics, proposes many solutions to the financial industry. The solutions include *trust, transparency, traceability, speed, security* amongst many others.

Furthermore, among the most significant applications of blockchain technology is in streamlining payment systems. It eliminates the need for intermediaries, which makes it facilitate payment faster, make it more secure and facilitate more affordable cross-border transactions. Trade finance, one of crucial components of international trade, at times suffers from slow and cumbersome processes, extensive paperwork and susceptibility to fraud. Blockchain technology will address these challenges by digitizing trade documents, streamlining processes and providing a tamper-proof environment for secure transactions. Also, blockchain technology can facilitate compliance by providing a secure, transparent and tamper-proof record of transactions, making it easier for regulators to monitor and audit financial activities. [72]

Glossary of Terms in Blockchain Technology

Blockchain

A blockchain is a distributed database or ledger shared across a computer network's nodes. They are best known for their crucial role in cryptocurrency systems, maintaining a secure and decentralized record of transactions, but they are not limited to

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[71] Amazon Content Team. "What is Blockchain Technology?" Available at https://aws.amazon.com/what-is/blockchain/ accessed on 24th July, 2025.

[72] Imane Adel. "How Blockchain Is Transforming The Entire Financial Services Industry". Available at https://www.forbes.com/councils/forbestechcouncil/2023/06/07/how-blockchain-is-transforming-the-entire-financial-services-industry/ accessed on 24th July, 2025.

cryptocurrency uses. Blockchains can be used to make data in any industry immutable meaning it cannot be altered. [73]

Distributed Ledger

Distributed ledger technology (DLT) is a digital system for recording the transaction of assets in which the transactions and their details are recorded in multiple places at the same time. Unlike traditional databases, distributed ledgers have no central data store or administration functionality.[74]

Node

A blockchain node is a connection point within a blockchain network that receives, stores, verifies, and transmits data. A node ensures the integrity of transactions and blocks by maintaining a copy of the entire blockchain ledger, and is responsible for the network's security, decentralization, and consensus processes. [75]

Decentralization

Decentralization in blockchain refers to the distribution of authority and control across a network of participants. In this model, no single entity has unilateral control over data or decision-making, eliminating reliance on a central authority like a bank or government. Instead, decentralized networks rely on nodes independent participants that collectively verify and approve transactions.[76]

Block

A block is the fundamental unit of a blockchain that contains a set of validated transactions and cryptographic links to previous blocks, forming an immutable record in the blockchain network.

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[73] Adam Hayes. "Blockchain Facts: What it is, How it works and How it can be used." Available at https://www.investopedia.com/terms/b/blockchain.asp accessed on 24th July, 2024.
[74] Nick Barne. "Distributed ledger technology (DLT)". Available at https://www.techtarget.com/searchcio/definition/distributed-ledger accessed on 24th July, 2025.
[75] Corey Barchat. "What are blockchain nodes and how do they work?" Available at https://www.moonpay.com/learn/blockchain/what-are-blockchain-nodes accessed on 24th July, 2025.
[76] Starknet. "What is decentralization in blockchain?" Available at https://www.starknet.io/glossary/what-is-decentralization-in-blockchain/ accessed on 24th July, 2025.

Each block in the blockchain is a digital container that permanently stores transaction data for the network. When new transactions occur, they are processed and bundled into a block. Once the network validates these transactions, the block is sealed and linked cryptographically to previous blocks. This creates a chain where each block's contents can't be altered without affecting the others. [77]

Mining

Bitcoin mining is the process by which transactions are officially entered on the blockchain. It is also the way new bitcoins are launched into circulation. Mining is conducted by miners using hardware and software to generate a cryptographic number that is equal to or less than a number set by the Bitcoin network's difficulty algorithm.[78]

The above listed terms are a means to an end, neither the end, nor close to the end itself . More terms in blockchain technology are listed below, and could be explored.

Consensus Mechanism

Proof of Work (PoW)

Proof of Stake (PoS)

Cryptocurrency

Smart Contract

DApp (Decentralized Application)

Oracle

Wallet

Private Key

Public Key

Gas

Scalability

DeFi (Decentralized Finance)

NFT (Non-Fungible Token)

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[77] Peter Gratton. "What Is a Block in the Crypto Blockchain, and How Does It Work?". Available at https://www.investopedia.com/terms/b/block-bitcoin-block.asp accessed on 24th July, 2025.
[78] Euny Hong. "How Does Bitcoin Mining Work? A Beginner's Guide." Available at https://www.investopedia.com/tech/how-does-bitcoin-mining-work/ accessed on 25th July, 2025.