Blockchain-Based International Transaction and Settlement System Using Smart Contracts

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***Abstract*—Our blockchain-based International Transaction and Settlement System Using Smart Contract is designed to use smart contracts to help users make efficient and profitable global transactions without interference from third-party intervention. Blockchain technology, decentralization, immutability, transparency, and traceability. Smart contracts allow users to validate their contracts and trust by providing automatic changes without central control. Therefore, our system can be considered tamper-proof for world-wide business. We use the Stratis Smart Contract. At Stratis, we use Cirrus Core to support user wallets.**

Keywords—Stratis smart contract, decentralization, Blockchain technology.

I. INTRODUCTION

In today's global economy, international Money Transaction plays an important role in supporting economic and financial interaction between different countries. However, the traditional process used to process and resolve these changes is often inefficient, costly, time-consuming, and lacks transparency. To solve these problems, blockchain technology has emerged as a promising solution that provides security, transparency, and efficiency.

Blockchain technology is a decentralized and distributed digital ledger that records transactions across multiple computers or nodes. It was originally introduced as the underlying technology for Bitcoin, the first and most well-known cryptocurrency. However, its applications have since expanded beyond digital currencies to various industries and sectors.
Blockchain at its core, a blockchain is a chain of blocks, where each block contains a list of transactions. These transactions are securely recorded in a chronological order and form a transparent and immutable ledger. The decentralized nature of blockchain means that no single entity or central authority has control over the entire network. Instead, all participants in the network maintain a copy of the blockchain and jointly verify transactions.

Key features of blockchain technology include:

Decentralization: Unlike traditional systems that rely on a central authority, blockchain operates on a peer-to-peer network where all participants have equal rights and responsibilities.

Security: Transactions recorded on a blockchain are encrypted and linked to previous transactions, forming a chain. This makes it very difficult for malicious actors to change or manipulate the data, ensuring the integrity and security of the system.

Transparency: The blockchain ledger is transparent, meaning all participants can view and verify the transactions. This transparency fosters trust and accountability among participants.

Immutability: Once a transaction is added to the blockchain, it is nearly impossible to change or remove it. This immutability feature ensures the historical data integrity prevents fraud.

Smart Contracts: Blockchain technology supports the execution of self-executing contracts known as smart contracts. These contracts automatically perform predefined actions when specific conditions are met, without the need for intermediaries.
A smart contract is a self-executing contract with the terms of the contract written directly into lines of code.

It runs on a blockchain platform like Ethereum or Stratis and automatically performs actions when predetermined conditions are met. Smart contracts eliminate the need for intermediaries because they execute them without the need for manual intervention or trust in a central authority.

Stratis is a blockchain platform that provides enterprise solutions for businesses that want to integrate blockchain technology. It offers various features, including smart contracts. Stratis Smart Contracts enable developers to create decentralized applications (dApps) and automate business processes using C# and the Microsoft .NET framework, which are widely adopted in the software development industry.

Stratis Smart Contracts:

Stratis Smart Contracts leverage the Stratis blockchain infrastructure and ensure security, transparency and immutability. Developers can create and deploy their smart contracts on the Stratis network, allowing pre-defined actions to be performed once specific conditions are met. These smart contracts can be used for a wide range of applications, including supply chain management, financial services, identity verification, and more.

This paper aims to design blockchain-based global transactions and settlements using smart contracts to simplify and improve the efficiency of international transactions.

A. EXISTING SYSTEM

Existing global Transaction systems are based on the end payment networks of traditional financial institutions such as banks and This machine is based on intermediary machines and intermediaries. Here are some key features of 's current system:

1. Bank: When a customer wishes to make an international payment to, their bank uses, the sending phone number of the bank in the country, to facilitate the transaction. This process often involves many agents, resulting in longer transaction times and higher costs.

2. SWIFT: The Organization for Worldwide Interbank Financial Telecommunications (SWIFT) is a communications system used by financial institutions around the world. SWIFT messages facilitate communication and coordination between banks involved in international transactions, but clearing transactions remain between business money transactions that are always available.

3. Central Clearing and Settlement: For international transactions, the clearing and settlement process usually involves a central location such as a central bank or clearinghouse. These institutions ensure that funds numbered are transferred from banks and transactions numbered are determined according to legal requirements. However, this process can take a long time, especially with Cross-border business with many advantages and decisions.

4. Foreign Exchange (Currency) Marketing: The foreign exchange market is a decentralized market where currencies are bought and sold. Banks and financial institutions facilitate currency exchange for international transactions from foreign markets. Currency Exchange Transactions vary with supply and demand, affecting the total value of global markets.

B. PROPOSED SYSTEM.

Our Blockchain-based system is designed to use smart contracts. Smart contracts is a simple programs stored on the blockchain that is executed when an events are executed. As it is primarily used for contract execution, all participants can determine the outcome immediately without any downtime or loss of time.

We implement this system using Stratis Smart Contracts. Facilitates the development of secure, immutable(legal) processes that are clearly defined in code. We are using the Cirrus Core application with Stratis, Cirrus Core allows users to manage tokens from the Cirrus sidechain and generate SRC-20 tokens with one click. This feature removes all the difficulties historically associated with issuing tokens in smart contracts and allows individuals/businesses to send their tokens through Stratis for immediate use.

The system consists of three modules: User, Bank and Administrator. Users must register before using the system. Account must be approved by your administrator. After registration, they must choose a bank. Here, a wallet with a balance of 0 will be created in the Cirrus Core App via Stratis API. Users can manage their profiles and change their password as needed.

To make a new transaction, the user must select the country of and add the other bank information of the person he/she wants to return to and add to. They can

check the exchange rate and pay effectively. Payment points will be added to our database and Stratis API i. For example, Cirrus wallet. Users can check wallet balance and wallet transactions and even recharge wallet from the wallet page.

II.LITERATURE SURVEY

1. "A Survey on Blockchain Technology: Architecture, Consensus, and Future Trends" by Ali Dorri, Salil S. Kanhere, and Raja Jurdak. (2017)
   This paper provides an overview of the blockchain technology, including its architecture, consensus mechanisms, and applications. It also discusses future trends and challenges in the field.
2. "Foreign Exchange Market Microstructure and the WM/Reuters 4 p.m. Fix" by Martin D.D. Evans. (2017)
   This survey paper focuses on the foreign exchange market and the role of the WM/Reuters 4 p.m. fix, which is a widely used benchmark for currency rates. It discusses the microstructure of the foreign exchange market and the challenges associated with fixing exchange rates.
3. "Trade, Finance, and International Business" by Gita Gopinath and Jeremy C. Stein. (2018)
   This survey paper discusses the interplay between trade, finance, and international business. It examines the role of financial markets in facilitating international trade, the effects of exchange rate fluctuations on trade flows, and the challenges faced by multinational corporations.
4. "A Systematic Review of Blockchain: Prospects, Challenges, and Opportunities" by Yli-Huumo et al. (2016)
   This comprehensive survey paper provides an overview of blockchain technology, including its history, features, and potential applications. It also discusses the challenges and opportunities associated with blockchain adoption in various sectors.
5. "A Systematic Literature Review on Blockchain Technology: An Exploration of Applications, Challenges, and Future Perspectives" by Singh et al. (2020)
   This survey paper explores the applications, challenges, and future perspectives of blockchain technology. It covers a wide range of industries such as finance, supply chain, healthcare, and energy, and provides insights into the potential benefits and limitations of blockchain.
6. "The Globalization of International Financial Markets: What Can History Teach Us?" by Michael D. Bordo and Harold James. (2016)
   This paper surveys the historical evolution of international financial markets and examines the factors that have contributed to their globalization. It analyzes episodes of financial crises and explores the role of international institutions in shaping the global financial system.

III.SCOPE OF THE PROJECT

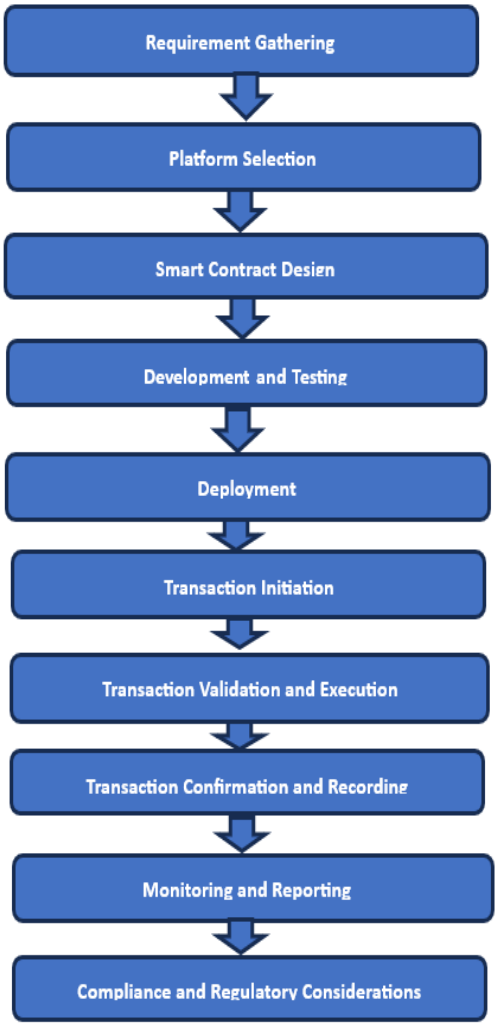
Scope of Project Businesses leveraging blockchain technology can automate their business processes while maintaining high security and transparency. Across many industries blockchain is now changing, with payment and finance industries lagging behind the scam. Recently, as the world goes through digital transformation, the payment industry needs to hire smarter skills to simplify the payment process.

IV.OBJECTIVES

1. Improve the efficiency of international trade by reducing transaction time and eliminating the need for intermediaries.
2. Reduce costs associated with international trade by eliminating intermediaries, streamlining processes, and reducing the impact of guidelines.
3. aims to improve the transparency and stability of international trade.
4.uses smart contracts to realize international trade compliance.
5. Smart contracts can be designed to enforce compliance with regulations, such as Anti-Money Laundering (AML) and Know Your Customer (KYC) requirements, mitigating the risk that does not comply.
6.With Blockchain technology, participants can facilitate cross-border transfers, promoting 's financial inclusion and economic growth.

V.METHODOLOGY

C. Project Designing



1. Requirement Gathering: Understand the specific requirements of the international transaction, such as the involved parties, the nature of the transaction, regulatory compliance, and desired automation.
2. Platform Selection: Determine if the Stratis blockchain platform is the most suitable choice for your international transaction. Evaluate its capabilities, scalability, security features, and compatibility with your specific use case.
3. Smart Contract Design: Design the smart contract logic based on the requirements of the international transaction. Define the conditions, actions, and parties involved in the contract. Use the Stratis Smart Contracts framework to write the contract code using C# and the .NET framework.
4. Development and Testing: Implement the smart contract using the Stratis Smart Contracts development tools, such as the Stratis Full Node, Stratis Smart Contracts API, and Visual Studio. Test the contract for functionality, security, and performance, ensuring it meets the requirements.
5. Deployment: Deploy the smart contract to the Stratis blockchain network. This involves compiling the contract code and deploying it onto the network. Once deployed, the contract becomes accessible and can be interacted with by the involved parties.
6. Transaction Initiation: Initiate the international transaction by invoking the relevant functions or methods in the smart contract. This can include transferring assets, verifying identities, or triggering specific actions based on the contract conditions.
7. Transaction Validation and Execution: The Stratis blockchain network verifies and validates the transaction through consensus mechanisms. Once validated, the smart contract automatically executes the predefined actions based on the contract conditions.
8. Transaction Confirmation and Recording: After the transaction is executed, the details and outcome are recorded on the blockchain as a permanent and immutable record. The transaction can be audited and verified by all participants in the network.
9. Monitoring and Reporting: Continuously monitor the status and progress of the international transaction. Generate reports and notifications to keep all involved parties informed about the transaction's progress and outcomes.
10. Compliance and Regulatory Considerations: Ensure compliance with applicable international regulations and legal requirements throughout the entire transaction process. Stratis Smart Contracts can provide transparency and traceability, aiding in regulatory compliance.

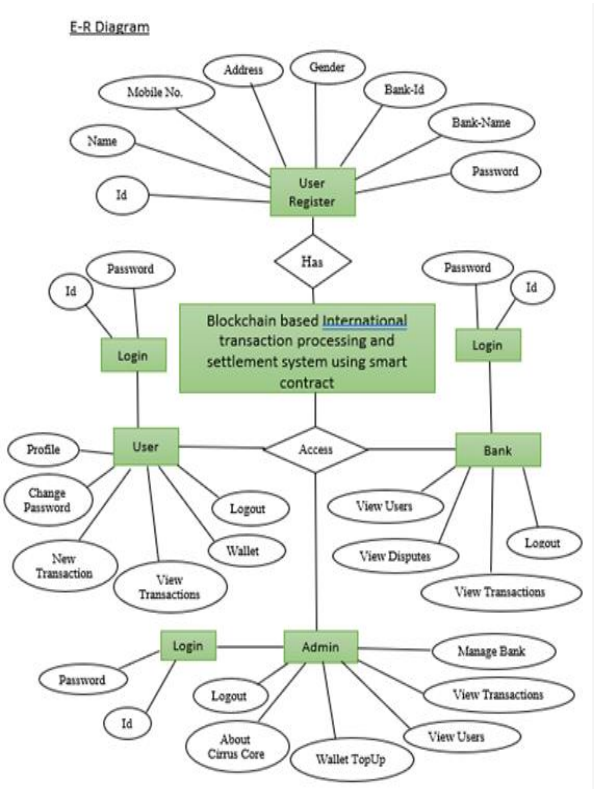
B.Project Modules and there Functioning

- The system comprises 3 modules: User, Bank and Admin.
- The user would require to register first to use the system. Their accounts will be approved by the admin. After registering, they will have to

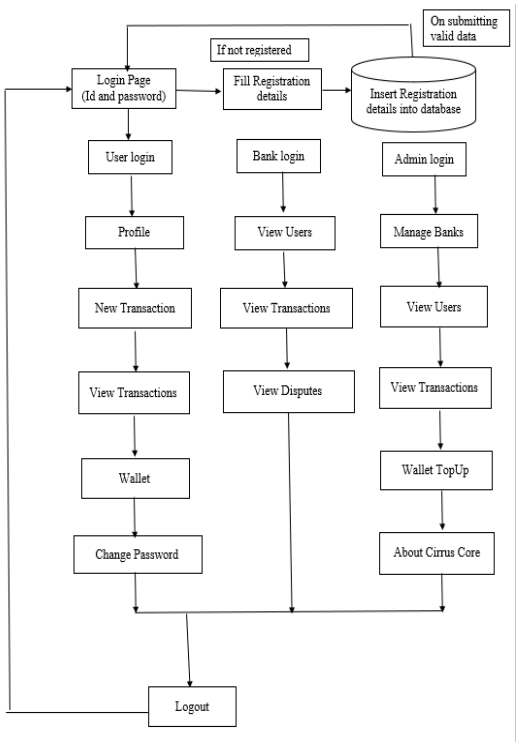
choose a bank. Here, the wallet will be created in Cirrus Core App through Stratis API with a 0 balance. The user can manage their profile and change the passwords if required.

- To make a new transaction, the user would need to choose the country and back and add other bank details of the person to whom they want to make the transaction. They can view the exchange rates and make payments efficiently. The payment details will be added to our database and Stratis API i.e., Cirrus Wallet.
- The user can view the remaining wallet amount and wallet transactions, and can even top up the wallets on the wallet page.
- On the transactions page, the user can view the entries of the payment done. They can even mark or cancel the payment as a dispute for a refund or any other cases. They can also view the entries of the payment received. They can also check if there is any manipulation.
- The bank admin can log in using their credentials. They can view all the transactions made by the user. They can search for transactions by their date or status. They can also check if there was any manipulation while making the transactions.
- The bank admin can view the dispute lists. They can either refund or not refund based on the dispute raised. If the refund is initiated, it will be done in our database as well as in Stratis API.
- The bank admin can view the user registered to their bank. They can view their wallet transactions.
- The admin can log in to the system using their credentials. They can add, update, delete and view banks.
- They can also view all the transactions made using the system. They can search for transactions by their name or status. They can even check if there was any manipulation during transactions.
- They can view all the user's accounts. They will have to approve the new user's account. They can also view their wallet information. They can also view the wallet top-up entries. The admin can use the Cirrus Core Application.

E-R DIAGRAM



C. System Architecture



VI.SNAPSHORTS

Fig 1. Home Page.

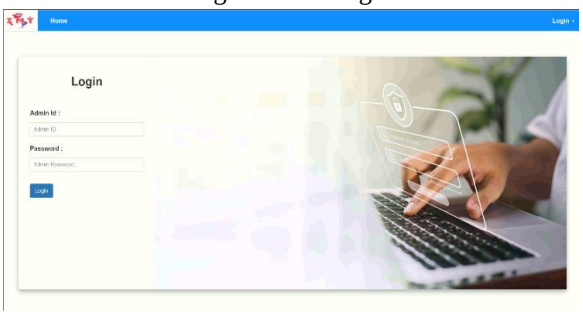


Fig 2.Admin login page.

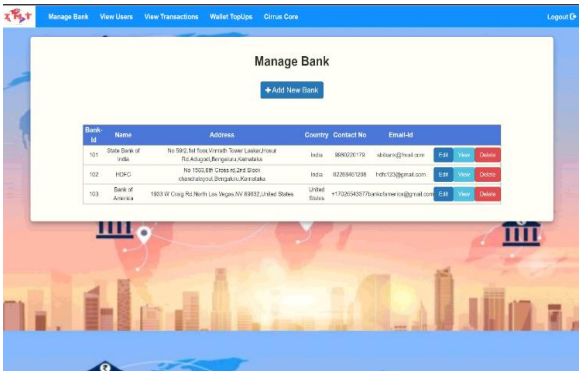


Fig 3.Bank Details

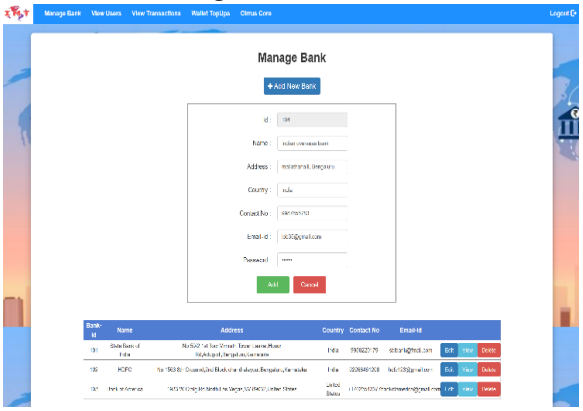


Fig 4.Admin page

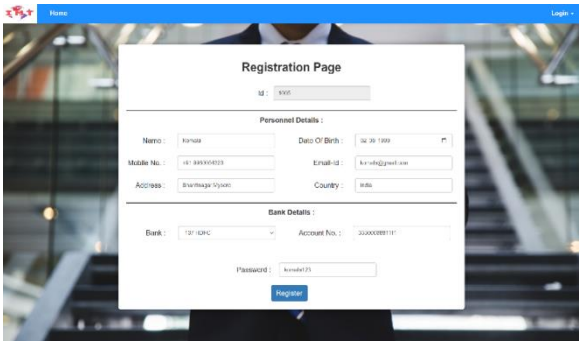


Fig 5. User Registration page

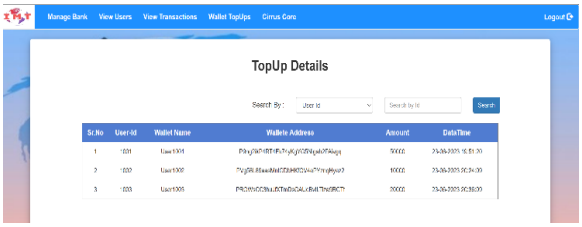


Fig 6. Wallet page

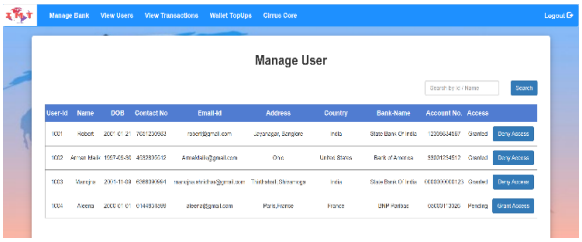


Fig 7.User Details

VI.RESULTS AND DISCUSSION

Possible outcome of our Project International Transaction Processing and Settle System has follow:

1. Secure and Immutable Transaction Records: The transaction details, including the transfer of assets or funds, are securely recorded on the blockchain. These records are tamper-proof and cannot be altered, providing a transparent and auditable history of the transaction.
2. Real-time Transaction Settlement: International transactions can be settled in near real-time using blockchain technology. Smart contracts automatically execute the necessary actions once the predefined conditions are met, facilitating swift and efficient settlement.
3. Cost Savings: By eliminating intermediaries and reducing manual processes, blockchain-based international transactions can result in cost savings. Participants can avoid fees associated with traditional financial intermediaries and

benefit from more direct and streamlined processes.

4. Increased Transparency and Trust: Blockchain provides a transparent and shared ledger that allows participants to verify and trace transactions. This transparency enhances trust among the involved parties, as they can independently validate the transaction details and ensure its integrity.
5. Improved Efficiency and Automation: Smart contracts automate the execution of predefined actions, reducing the need for manual intervention. This automation streamlines the transaction process, reducing the time and effort required for its completion.
6. Enhanced Security: Blockchain technology employs advanced cryptographic techniques to secure transactions. The decentralized nature of blockchain and the immutability of recorded data provide a high level of security, minimizing the risk of fraud or unauthorized access.
7. Cross-border Payment Facilitation: Blockchain enables cross-border payments without the need for traditional intermediaries. By leveraging cryptocurrencies or stablecoins, participants can settle transactions directly, overcoming the challenges of traditional banking systems and currency conversions.
8. Regulatory Compliance and Auditing: Blockchain-based international transactions can facilitate regulatory compliance by providing a transparent and auditable record of transactions. Stratis Smart Contracts can incorporate compliance requirements, ensuring that transactions adhere to relevant regulations.
9. Improved Dispute Resolution: The transparent and immutable nature of blockchain records can simplify dispute resolution in international transactions. The ability to trace and verify transaction details on the blockchain can help resolve conflicts more efficiently.
10. Potential for Innovation: Blockchain technology opens up possibilities for innovative financial instruments, new business models, and enhanced supply chain management in international transactions. The use of smart contracts can enable the creation of customized, automated workflows tailored to specific transaction requirements.

VI.LIMITATIONS

While international transactions using blockchain and Stratis Smart Contracts offer numerous advantages, it's important to be aware of some limitations:

Scalability: Blockchain technology, especially public blockchains, can face scalability challenges when processing a large number of transactions. As the number of participants and transaction volumes increase, the network may experience delays and increased transaction costs.

Energy Consumption: Some blockchain networks, particularly those that rely on proof-of-work consensus mechanisms, require significant computational power and energy consumption. This high energy usage can be a concern from an environmental standpoint and may impact the scalability and cost-effectiveness of international transactions.

Regulatory Uncertainty: Blockchain and cryptocurrencies are still relatively new technologies, and regulatory frameworks in different countries vary. Uncertainty surrounding legal and regulatory compliance can pose challenges for international transactions, especially when dealing with multiple jurisdictions.

User Experience and Adoption: Blockchain technology and smart contracts may have a learning curve for users unfamiliar with the technology. The user experience of interacting with blockchain-based systems and managing private keys can be complex, potentially hindering widespread adoption.

Privacy Concerns: Blockchain is designed to provide transparency and immutability, which may conflict with privacy requirements for certain international transactions. While there are privacy-focused blockchain solutions, striking the right balance between privacy and transparency remains a challenge.

Smart Contract Vulnerabilities: Smart contracts are subject to coding vulnerabilities and human errors during development. If not properly audited and tested, smart contracts can be susceptible to security

breaches or exploitations, potentially leading to financial losses or disputes.

Regulatory Compliance Challenges: Meeting regulatory requirements, such as know-your-customer (KYC) and anti-money laundering (AML) regulations, can be challenging in blockchain-based transactions. Ensuring compliance with various regulations across different jurisdictions adds complexity to international transactions.

Interoperability: Interoperability between different blockchain platforms and networks is still an ongoing challenge. In international transactions, where participants may use different blockchain infrastructures, ensuring seamless interoperability can be a hurdle.

Legal Frameworks and Jurisdictional Issues: Blockchain transactions may encounter legal complexities due to the cross-border nature of international transactions. Determining the applicable legal framework, jurisdiction, and dispute resolution mechanisms can be intricate.

Dependency on Internet Connectivity: Blockchain-based transactions require internet connectivity for participants to access the network and engage in transactions. Limited internet access or disruptions can affect the smooth execution of international transactions.

VII.CONCLUSION

In conclusion, implementing international business transactions and agreements based on a blockchain using smart contracts has far more benefits and potential improvements than the international trading process. Using Blockchain technology and smart contracts, the system can increase the efficiency, security and transparency of global transactions while reducing the dependency of the average person.

Because there is no third-party validation or verification, the system can potentially reduce transaction costs by eliminating middlemen This is especially useful for cross-border transactions, where traditional transactions () often involve many agents and complex processes. In addition, the use of smart contracts provides automation of many processes such as payment, compliance management and contract execution. This automation increases efficiency and the reduces human error, enabling faster and more reliable business operations.

However, it is important to recognize that using blockchain-based international transactions and agreements using smart contracts will face issue issues. These challenges include the management of decisions, the scalability of blockchain networks, the interaction of with existing systems, and keeping information confidential.

Collectively, through the use of blockchain technology and smart contracts, the system has the potential to transform global transactions more efficiently, providing security and access to global stakeholdersTo realize the full potential of this new approach to global businesses, further research, development and collaboration among stakeholders is essential.

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REFERENCES

[1] Nakamoto, S. (2008). Bitcoin: A Peer-to-Peer Electronic Cash System. Retrieved from https://bitcoin.org/bitcoin.pdf

[2] Zheng, Z., Xie, S., Dai, H. N., Chen, X., & Wang, H. (2017). An overview of blockchain technology: Architecture, consensus, and future trends. IEEE International Congress on Big Data, 557-564.

[3] Bank for International Settlements (BIS). (2019). Committee on Payments and Market Infrastructures: Payments Statistics. Retrieved from https://www.bis.org/statistics/payments.htm

[4] Bank for International Settlements (BIS). (2020). Cross-Border Retail Payments. Retrieved from https://www.bis.org/cpmi/publ/d95.htm

[5] Mougayar, W. (2016). The business blockchain: Promise, practice, and application of the next Internet technology. Wiley.

[6] Swan, M. (2015). Blockchain: Blueprint for a new economy. O'Reilly Media

[7] Buterin, V. (2014). Ethereum: A Next-Generation Smart Contract and Decentralized Application Platform. White Paper. Retrieved from https://ethereum.org/whitepaper/

[8] Gudgeon, L. (2019). Smart Contracts: The Essential Guide to Blockchain Smart Contracts for Beginners. Packt Publishing.

[9] https://www.researchgate.net/publication/322924318_A_STUDY_ON_PAYMENT_AND_SETTLEMENT_SYSTEM_IN_INDIAN_BANKING_SECTOR

[10] https://www.researchgate.net/publication/294426662_Financial_market_Infrastructures_A_study_on_Payment_and_settlement_system_in_India_banking_sector

[11] https://www.bis.org/cpmi/publ/d22.pdf

[12] https://www.ecb.europa.eu/pub/pdf/other/glossaryrelatedtopaymentclearingandsettlementsystemsen.pdf

[13] https://www.americanexpress.com/us/foreign-exchange/articles/blockchain-to-accelerate-payment-processing-services/