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International Remittances Facilitations Through Central Bank Digital Currency: The Framework

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ABSTRACTS

Cross border payments have been the biggest challenges in overseas business transactions. It is characterized by frauds, lack of security, money laundering, transactions delays, and huge transactions cost. The aim of this paper is to introduce new model of cross border digital currency transactions that would use the central banks digital currency from two different countries. The model has adopted the blockchain technology to authorize smart contracts and proof of works under the monitoring of central banks from two participating countries. In this model each country would adopt its own digital currency equivalent to the fiat/cash money value.

Unlike the traditional blockchain networks which is considered to be decentralized systems, this model has deployed centralized blockchain networks under the control of central banks. All nodes in the network will be owned by central banks that would records and trace any transactions by using blockchain technology. Apart from central banks, this model includes local banks, and digital forex exchange markets as their main stakeholders to serve the customers. As a centralized system, any smart contracts and proof-of-works resulted from any desired transactions is validated by the central banks of participating countries before execution.

This system is useful to secure and speedup the transactions, prevent any frauds, and to avoid the overseas financial organizations costs that has been incurred by the customers over the years. The governments around the world would have the total control of the monetary transactions if they deploy this payments model on their economy. However, they are required to tighten the security measures to prevent any security vulnerabilities, frauds, threats, and get rid of money laundering activities. Furthermore, the study recommends on further research in different scientific areas including network protocols architecture for locking blockchain systems to avoid double spending attacks, and cyber security issues concerning exchange platforms to minimize potential theft in this digital platform.

Keywords: Cross Border Transactions, Central Banks Digital Currency, Cryptocurrency, Digital Forex Markets, Blockchain Technology

1.0 INTRODUCTION

Cross-border payments are typically carried out via the costly SWIFT payment networks, in which local banks in two different nations exchange payment order messages. The SWIFT payment system is characterized by huge fees and transaction delays [1]. Nowadays cross-border transactions are also completed using digital currencies issued by central banks and cryptocurrencies. The digital currency represents an online means of payment that differs significantly from the classic means of payments such

as cash, cheque, credit, debit or bank transfer [2].The Money transactions from one currency to another is normally performed by using physical cash currency of which the exchange rates are determined by the international forex markets. Central bank digital currency on the other hand, which allows the decentralized control of financial transactions, is one of the most exciting new inventions [3]. Digital currency has been usefully in money transfer from one country to another country or from one currency to another currency without any third-party interventions. The lack of third-party organ such as central bank for control and managing traditional digital currency have been preventing its adoptions by the most world governments. The central banks in particular country have mandatory to govern and set different policy of monetary issues. The problem with this method of digital currency transactions is associated with heavy mining cost [4], potential of money laundering [5], the cryptocurrency price instability and security concerns [6]

This study aimed to introduce new secured cross border digital currency transaction model which introduce new digital exchange systems by using blockchain technologies. In this framework, the cross-border transactions are performed under the fully control of central banks in the blockchain networks. No one is allowed to add any new node in the blockchain systems. This will help to monitor and control all transactions in the distributed ledger networks and hence oversees all exchange markets and denying any potential money laundering activities.

2. RELATED STUDIES

Several literatures have been published recently concerning the digital currency, blockchain technology, and digital exchange systems. Blockchain system is a ledger based digital technology in which each node stores respective records and if one user needs to alter, delete or add some records, it will get reflected in all the other nodes after the synchronization and re-evaluation of hash [1],[7], [8]. This act as consensus mechanism which prevent double spending [9] as well as driving force towards successfully adoption of cryptocurrency technologies at large [10].

2.1 The Role of Blockchain Technology in Digital Currency

The blockchain technology can be used to facilitate a purely peer-to-peer version of electronic cash that would allow online payments to be sent directly from one party to another without going through a financial institution [11]. The network topologies were used to timestamps transactions by hashing them into an ongoing chain of hash-based proof-of-work, forming a record that cannot be changed without redoing the proof-of-work. The blockchain technologies has been adopted into several applications due to its transparency, security, cost effective transactions, and fast transactions [12],[13]. This concept has tremendous impacts on the advancement of endless utilization of blockchain technologies into various secured systems. Several cryptocurrencies have been introduced since the embracement of blockchain technologies. Since 2009, financial services such as cross-border transactions, smart bonds, point-of-sale systems, lending and borrowing, securities trading, clearing and settlements, bookkeeping and auditing, hedge funds, credit score reports, and consortium account monitoring have made use of blockchain technology (BCT) [14]. In order to lessen the effects of decentralized cryptocurrencies, various central banks in the world have been developing their own digital currencies as a result of the market domination of cryptocurrencies. Most central banks have seen the potential of secured central bank digital currency that would replace decentralized cryptocurrency in their economic border. In this study, the design of cross border transactions using central banks digital currency have been introduced to solve several issues concerning decentralized cross border transactions.

2.2 Decentralized Cross Border Transactions (DCBT)

Cross-border payments (CBP) are payments sent from one country to another country [15]. Traditional CBP are associated with several fees such as bank fees, transfer fees, local currency to foreign currency conversions rates, exchange cost, and international credit card fees [16]. If the DCBT is performed in digital form or electronics format, the money is transferred from online local bank accounts to another bank accounts registered in different country. Normally before the transactions, the business flows must be negotiated well in advance to make the bargain deal. Besides the slowness caused by money handling bodies, the transactions cost of these CBT is also very high [17]. The problem of high transaction cost, and slowness can be solved by introducing new blockchain technology based cross-border transaction system [18]. Several businesses have been performing cross border transactions by buying (Deposit) Bitcoin from one country and sell (Withdraw) it from different country [17]. These methods avoid some government bodies eyes but it has very huge cost due to differences in vendors price of Bitcoin prices between buying and selling. The figure-1 below shows the cross-border transaction procedures that is normally performed in traditional decentralized cryptocurrencies.

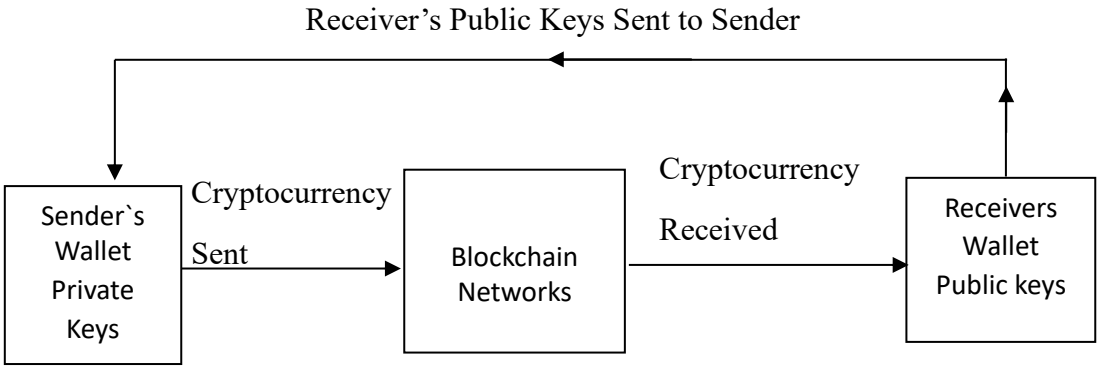

Figure-1: Traditional Blockchain payment systems

In this traditional system, the two wallets which comprises of public keys and private keys, communicates with decentralized blockchain network. The public key serves as a recipient's address for the transaction initiator, who just requires it to send a transfer request to the blockchain network in order to transfer cryptocurrency from one wallet to another. The blockchain systems will validate the existence of both accounts and authorize transaction only if the account balance has enough amount to accomplish such request. Governments discourage this system since it is a peer-to-peer network without any centralized procedures to oversee, control, validate, and authorize transactions, which might be abused by terrorist financiers and money launderers. In the proposed systems, the central banks have the mandate to control and validate all transactions across the country.

2.2.1 The Role of Central Banks on Cross Border Transactions (Exchange Market)

Central banks are the biggest and most effective participant of forex market [19]. They normally buy large amounts of foreign currency every year and trade them to local forex markets vendors. For example, the majority of Bureau-De-Change (Local Exchange Vendors) in Tanzania rely on regional central banks to purchase additional foreign currency in the event of a shortage, and occasionally they sell any excess foreign currency they have accrued to the central banks in order to balance their books. On a nutshell the central banks are the largest Bureau-De-Change in any country that facilitate both monetary policies as well as provide physical resources to the market. At the moment, digital currencies like bitcoin seem to be strong rivals to the fiat or cash currency of central banks. Additionally, their existence in the forex market

could put pressure on them to find out the way to mitigate its impact [19]. These banks have nothing to do to control or monitor the money movements or the price values of Bitcoin. However, the technology behind digital currencies may be co-opted by central banks, giving them more power and greater control and monitoring of monetary policy in their country. This study has suggested the usage of central banks digital currency which utilizes cryptocurrency-based blockchain technology to design new cross-border payment systems which is controlled by the central governments of participating countries.

2.3 Central Banks Digital Currency (CBDC)

Central banks digital currency (CBDC) is a digital forms of local fiat currency. The exchange between local currency and digital currency is based on one-fiat-to-one-digital ratio. Digital currencies have many advantages over fiat currency such as: unlimited access to central bank funds despite of any physical and geographical locations, controlled by central banks, enhanced more payment diversity, boosting financial inclusions in the country, enabling cross border transactions between two countries, and facilitates tax collections [20]. Despite these benefits, most countries are still on the discussion stage of its implementations raising concerns about several challenges include, financial stability issues and cyber security concerns [21]. The countries that have adopted central banks digital currency include China, India, Bahamas, Ukraine, and Sweden [21]. The adoptions and deployment procedures in those countries differs from the notion introduced in this study. They didn't mention the presence of physical verifications of payments request for huge transfer request which could be vulnerable to cyber attacks as most of their transactions are performed automatically. Also, in those literatures they didn't include personal interactions from central banks for all transactions above a certain limit to prevent money laundering activities which is the basis of this study. Furthermore, they have proposed a neutral digital currency without any storage limitations that could disrupt traditional banking systems. In this study the customers would be discouraged to store any digital currency beyond a number of days to minimize online theft activities. This study based on the usage of central banks digital currency to facilitate cross border payments between two countries.

3.0 METHODOLOGY

This research focuses on recently developed blockchain technologies for cross-border transactions. This will include new central banks digital currency that will be used for currency exchange. In a normal circumstances of cross border transactions by using the Bitcoin, the sender buys the Bitcoin in his local currencies by using local forex exchange vendors and the receiver on different country would sell the Bitcoin to the market and withdraw the money from local financial institutions. In this study the sender would be required to deposit the cash to the local banks that would exchange to digital currency before requesting any transfer services. The receiver on the other hand would be required to have digital account opened in the local banks to receive any foreign payment.

3.1 Inverted Cross Border Transaction Model

In this model, the governments of two countries must adopt digital currency that will be used to make cross border transactions. Normally blockchain distributed networks are decentralized in the sense that all nodes are equal and only smart contracts and consensus mechanism are deployed to authorize any transactions. This makes the whole blockchain systems to be abused by money laundering activities. This research introduces secured distributed blockchain networks of which all nodes are controlled by central banks that would fend away any money smugglers.

3.1.1 Digital Currency Adoption by Central Banks

In this new method of border transactions, each central banks of participating country should adopt digital currency of their own currency. The digital currency will be acquired by customers by exchanging their fiat/cash currency to the digital currency on the 1-on-1 ratio basis. The whole process will be monitored by central banks and every exchange and spending will be controlled by them directly. The figure-2 below shows the conceptual framework of this design.

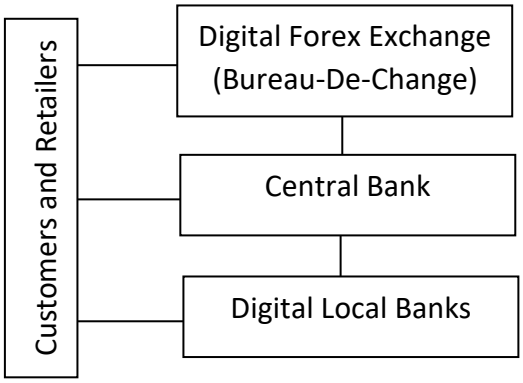

Figure-2: The Digital Currency Adoption Framework

In figure-2 above, every part of this conceptual framework has its own functions to facilitate the smooth transitions from cash money to the digital currency

1. Central Banks

Traditionally, the central banks performed zero transactions on single customers basis, rather, they are monitoring and control the monetary policy of the country and facilitating the physical financial facilities to the local financial institutions. Central banks historically have been avoiding to serve the public directly because of the sheer volume of required records-keeping and the presence of huge number of customers that would require extensive resources that can be provided by local banks [23]. In this model, the public will be allowed to open digital account on the central banks and deposits digital currency through their local financial institutions. This will be enabled by Blockchain network server that will serve as a pillar in the digital currency world. Instead of cryptocurrency spending being controlled by blockchain nodes who control, monitor and store the digital transactions, the central banks will be the one to oversee all digital payments across the country.

Apart from saving public directly, central banks also, will monitor and control all local banks and digital forex exchanges vendors directly through its blockchain networks. All distributed ledger transactions and smart contracts will be audited directly from the central banks. In this way the central banks will have the mandate of allowing or denying any suspicious digital money transactions.

2. Digital Forex Exchange Vendors (Bureau-De-Change)

In a traditional market, forex exchange vendors communicate directly with central banks by exchanging foreign currencies [23]. In this model, all Bureau-De-Change will be allowed to open digital accounts so that they can make digital transactions directly with the central banks. Also, they will be able to withdraw or deposits digital currency to customers' accounts directly from their working premises.

3. Local Banks

The financial banks will serve as a major links between the public and central banks on daily basis. The customers would withdraw cash or deposit digital currency to their account directly from local branches. The local banks would be required to open the digital account that would be under the monitoring and control of central banks. The central bank has the role of validating any digital transaction from all banks, as smart contracts will be approved through blockchain systems.

4. Customers and Retailers

The customers and the general public at large will have the access to their financial accounts on their hands. Their digital money will be on the safe hands as all transactions will be recorded by the central banks through its blockchain systems. The public are capable of accessing their funds from all financial institutions through blockchain network unlike traditional banking systems. All customers record of transitions are kept under central bank controlled blockchain networks. The customers will be able to transfer the money internally and across border through central bank exchange systems.

3.1.2 Cross Border Digital Transaction Model

Digital currency adopted by any country will virtually operates borderless. All digital financial institutions will be able to validate any digital currency worldwide through the distributed blockchain network. In a matter of seconds, one is capable of validating any digital wallet through cryptocurrency based distributed ledger systems. The figure-3 below shows the cross-border transactions model

1. Blockchain Network

The blockchain network act as a backbone of this model, it serves for both countries in the participating transactions. All financial institutions will be connected into this network to validate any transactions. The customers from Country-A will be able to exchange Digital currency-A by requesting authorization from their local central banks, if the proof-of-works are validated then the request will be sent to Country-B to access the equivalent amount from Digital currency-B. Once the hand-shake is concluded the transaction will be executed. Currently the cryptocurrency exchange market has been invaded by fraudulent vendors due to lack of centralized blockchain systems. The Bitfinex as the largest operating cryptocurrency exchange firm has emptied hundreds of millions of dollars of customer assets from its coffers [23]. The losses are caused by the poor customer funds management, lack of tighten monetary policy, and remarkably inadequate cybersecurity measures. Under two central banks control measures, none of the participating parts would be enduring any loss.

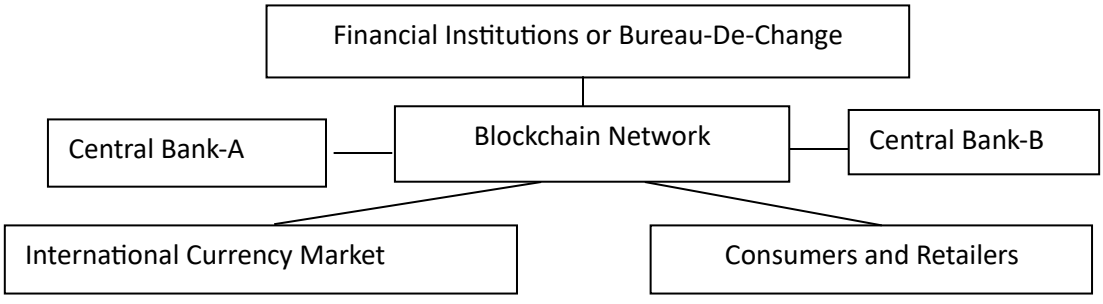

Figure-3: Proposed Digital Currency Cross Border Transactions Model

In this model each block has its functions to complete cross border transactions.

2. Central Bank-A and Central Bank-B

The central banks hold the accounts of two customers from two different countries that control and monitor any transactions. The two central banks will communicate and validate any cross-border transactions. Unlike traditional digital currency exchange firm which operates as a distributed decentralized forex market, the central banks will protect all stakeholders and prevent any suspicious activities. The main role of central banks is to validate customers existence, source of funds, and authorize or denying any transactions.

3. Financial Institutions/Bureau-De-Change

The financial institutions particularly exchange market vendors (Bureau-De-Change) has the role to play to maximize cross border transaction speed. These agents would act as exchange office holding the digital funds from two different countries. The funds will be released to the recipients only if both central banks have validated the respective transactions. In this model the financial institutions will initialize the transaction request for the central banks to allow or denying its request based on the transactions policies set by both participating countries.

4. Currency Exchange Market

The currency market will provide current international exchange rates between two participating digital currencies. In the blockchain system, the currency exchange market is regarded as the exchange rates information provider, when the blockchain nodes need the rate information, they can turn to the market for data acquisition. These rates are those recognized by both countries across the border.

5. Consumers and Retailer

Retailers and consumers are the ones to be served in this system. These customers will own accounts in one or both participation country, and cross border transactions will be performed under their request. They initiate the transfer request for the central banks to permit or denying the request based on the prior-set rules of monetary policies.

3.2 Benefits and Challenges of Proposed Systems

3.2.1 The proposed monetary systems have several benefits as compared to limitations such as

- Centralized payments systems which are controlled by the central banks
- Increase the national financial inclusion by providing access to the remote areas through mobile devices
- Monitored and controlled by the central banks that would prevent any illegal money transaction activities.
- It is secured by the blockchain systems and VPN access-controlled user interface that would prevent any security threats
- It is non-storage digital money transaction platforms that would discourage any customers from storing their money in these systems to avoid online theft.
- Cost effective cross border payments systems as it eliminates any costly third party overseas financial transaction authorizer
- Quick transactions between two individuals from different countries as compared to traditional cross border SWIFT payments systems
- It facilitates tax collections for each transaction

- Unlike decentralized cryptocurrency which has untraceable transactions, very easy to trace the sources of transactions in this mode as all users are registered in the central banks blockchain systems.
- It is very easy to trace source of revenues for each customer as all transactions are controlled by the central banks.
- Central banks wont have to worry about the total volumes of cash in the circulations as most of it will be provided by this system

3.2.2 This mode has its own limitations which would require extra attention before deployments.

- It is not decentralized in the sense that most transactions would need to be verified physically by both parties in the transaction and by the central banks for some transaction volumes that exceed a certain amount.
- It is a digital money system that can be accessed in customers premises which would invite online robbery by forcing the customer to login and perform overseas transactions.
- It is very hard to control the total money in the circulation as most users would opt to transact through digital systems.
- Exchange platforms are vulnerable to the cyber-attacks that could transfer the money abroad without their consent.

4. RESULTS AND DISCUSSION

4.1 Blockchain Technology and Cryptocurrency

Blockchain technology guarantees that all truthful users have an identical picture of the distributed ledger and that the transaction chain records that have been added to the blockchain systems cannot be changed. 24. The data is recorded in a blockchain network using extremely strong encryption, with a layer of security that is impossible to penetrate [25]. This makes blockchain technologies to be adopted in various secured decentralized networks. Several cryptocurrencies have been designed using this new security mechanism which ensures that, once the digital currency is created or transacted, there is no possibilities of making any changes to the parent chain [26]. This is very helpful to maintain cross border transactions records that would prevent any money smuggling activities across the border. In this research the cross-border transactions have been designed to make transactions between two digital currencies from different countries. This scenario could have been implemented by using single digital currency in two countries but it could have been used in criminal activities by money smugglers as there is no border in digital currencies.

4.2 Cross Border Transactions

Cross border transactions performed using cryptocurrency has several benefits including transactions are secured, blockchain systems are centralized under central banks, quick and cost-effective transactions, all records are kept by central banks, and easy to monitor and control cross border monetary services. Also, the governments will have no reason to have foreign currency reserve in their central banks. There is no need of third parties like SWIFT or CREDIT CARDS during cross border business transactions and hence no hidden fees incurred by any transacting parties.

4.3 Security Measures

Most online systems are vulnerable by several cyber attacks that include identity theft, ransomware, phishing, denial of service, SIM swapping, SQL injection, double spending, BGP hijacking attack, fake crypto market, cross-site scripting, and cross-site request forgery. Most of these attacks would be controlled by manual systems under central banks officials or local banks approval that would validate any transactions above a certain limit.

The customers' accounts are vulnerable by SIM swapping attacks if the two-way authentication security measures involving login request validation codes channeled through mobile devices are utilized in the digital currency accounts. In this framework the login request will be validated by the biometric systems that involves finger prints and customers eye scanning systems that would be for all customers request huge amount of money transfer. The central banks would set a certain limit that might require the physical verifications of both transacting parties before transaction executions which would prevent any money smuggling activities and act as security measures against un-authorized transactions, identity theft, phishing, and fake exchange markets.

Double spending attacks can occur in most decentralized digital finance markets, where an attacker tries to spend his digital money twice. In this model, the personal accounts hold the money for transaction in digital forms, the transaction is requested through user interface systems that would validate the presence of such amount in the customer's account. Once the request is received by the blockchain systems, the customer's account would be locked in the entire network to prevent execution of similar request elsewhere in the country until this request is completed. In this way no two transactions from the same account would be executed simultaneously.

Other attacks such as Border Gateway Protocol (BGP) hijacking, cross-site scripting, and cross-site request forgery are related to network routing protocols and local websites systems to fetch information concerning the victims. Unlike typical exchange systems, this model has the central bank's blockchain nodes dispersed around the nation, eliminating a single point of attack.

4.4 Online Storage Concerns

The banks are normally profited from storage of the customers fiat money by investing in various investment activities such as loans and lending, insurance services, and payments services. Financial institutions would be threatened by the introduction of digital currency since most consumers would prefer it because it would always be accessible at their fingertips. This framework has designed the way to tackle this problem by discouraging any money storage beyond twenty four hours by introducing daily storage fees and freezes the sums which has exceeded a certain number of days as agreed in the monetary policies. Only local banks and exchange vendors would be allowed to store digital currency indefinitely under the central bank's permissions.

4.5 The Monetary Value Retention Concerns.

Most central banks are concerned about the value of their digital currency to be volatile as traditional cryptocurrency. In a decentralized systems the price of cryptocurrency is determined by the total transaction volumes in the market, and market demand and supply factors. In this research, the central banks should determine the value of their currencies and dissuade foreign exchange dealers from operating outside of their borders in order to avoid world factors that would induce currency volatilities.

5. Conclusion And Recommendations

5.1 Conclusion

The governments must embrace digital technological developments to reap the economic advantages of these technologies. Cryptocurrency have been adopted by several privately owned financial institutions but the governments around the world are not willing to recognize these currencies. This is because of its decentralized nature of cryptocurrency and security concerns. However, with enough knowledge, and tighten security measures, all countries will be benefited from this technological advancement by adopting the technology to the central banks digital currency (CBDC). By using CBDC two countries would be able to make secured cross border transactions much easier than traditional ever before.

5.2 Recommendations

5.2.1 Recommendation to the Government

This study recommends that, the central banks should facilitate the transitions to the digital currency to help their country to benefits from blockchain technologies.

5.2.2 Recommendations for Further Studies

This study introduced new cross border transaction model that described the way forward but it doesn't cover any blockchain network protocols that could be used during cross border transactions. There might be network protocols to facilitate semi-automatic payment systems and monitor network traffic in the blockchain systems. Furthermore, the ideas that the users accounts are required to be locked in the entire network during transactions to avoid double spending requires more study before its implementation. Also, the causes of security vulnerabilities of existing decentralized privately owned cryptocurrency exchange firms should be studied to prevent any similar theft incurred in those firms.

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