



# Reanalysis of Cross-Border Payment Based on Blockchain Technology

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**Abstract.** The blockchain technology naturally matches with international trade payment method. The application of the block chain technology has been highly valued by financial institutions. The present payment remittance model transmitting by SWIFT system has some shortcomings, such as time-consuming process, expensive cost and opaque information. The development and innovative application of blockchain technology can solve the problems existing in the current payment model. This paper analyzes the payment model based on block chain technology. The new model is better to meet customers' payment requirements in cross-border e-commerce business. In order to accelerate the application of block-chain technology in cross-border payment, it is suggested to digitize and standardize the original documents, formulate international conventions for blockchain cross-border payment, formulate corresponding laws and regulations, promote the organic integration between blockchain and existing cross-border payment system, increase investment in technology research and development, and solve the potential technical problems of the platform. The new model realizes the synchronization of information flow and cash flow, which is more effective and less expensive. Customer experience is improved a lot. The model is a better choice to make cross-border payment for small and medium-sized banks and individuals.

**Keywords:** Cross-border Payment · Blockchain Technology · SWIFT System

## 1 Introduction

In July 2016, the first blockchain cross-border remittance test was successfully completed. Canada's Alberta ATB Bank and Germany's Reisebank Bank used Ripple network and blockchain technology to complete the world's first inter-bank cross-border remittance. Since 2016, present banks and blockchain technology service companies have studied the application of cross-border payments based on blockchain technology. And many present financial giants have joined blockchain financial research and applications [3]. Although the current blockchain cross-border payment has not been widely promoted, the blockchain cross-border payment undoubtedly represents a new payment trend. Cross-border e-commerce is fast developing which is characterized by small amount, high frequency payment. While the traditional SWIFT communication network cannot meet such requirements. The new cross-border payment platform based

on blockchain technology provides quite different experience, with lower cost, higher efficiency and more transparent process, which is born to small and high-frequency cross-border e-commerce payment. The aim of the paper is to learn the process and advantages of cross-border payment model based on blockchain technology, and find ways to accelerate the application of block-chain technology in cross-border payments.

## 2 Problems Existing with Present Payment Mode

In present cross-border payment system, SWIFT (Society for Worldwide Inter-bank Financial Telecommunications) has played an important role in cross-border remittance and international settlement business. SWIFT is a messaging network that financial institutions use to securely transmit information and instructions through a standardized system of codes. However, the existing problems have become increasingly prominent [2]. Marcel T. Rosner and Andrew Kang (2016) pointed out that current international payment system is in collapse, lacks transparency, and is outdated [4]. With the emergence and development of new technologies, there are a lot of block chain technology companies which can supply good solution to solve the problems present payment system encountering. The present remittance model based on SWIFT system which adopts the serial mode. And the information needs to be confirmed step by step before it can continue to transmit. In international trade, the whole international payment process by T/T (telegraphic transfer) is followed as Fig. 1.

① The remitter (Buyer) and the beneficiary (Seller) have signed a sales contract and agreed to pay by T/T.

② The remitter (Buyer) remits money and requests the remitting bank to transfer money to the beneficiary (Seller).

③ The remitting bank sends payment instruction to the paying bank (correspondent account bank) by SWIFT.

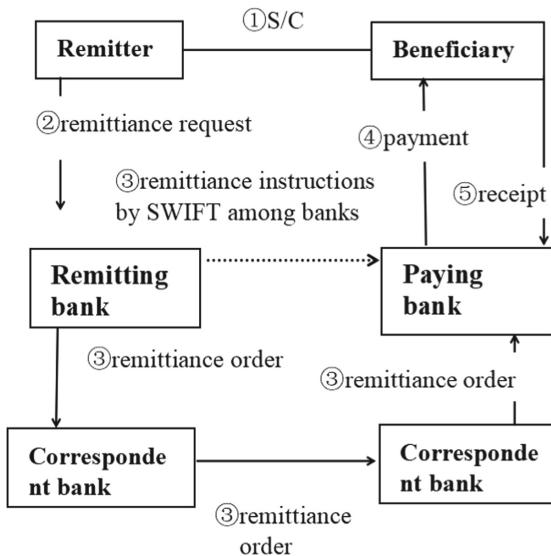
④ The paying bank notifies the beneficiary and makes payment.

⑤ Upon receipt the money, the beneficiary provides the paying bank a receipt.

During the process, different currencies and currency clearing systems are involved. Besides the participation of the remitting bank and the paying bank, the correspondent account banks are often required, which results in a large number of participating banks. More banks involved, more operation steps and more charges are required.

### 2.1 It is Inefficient in 5G Era

It is a serial remittance, a chained mode, which is a long process and takes a long time for transferring money from remitter (importer) to beneficiary (exporter), usually 3–5 working days. The SWIFT network is a concentrated and multi-layered structure. Each country has an operator. All of the remittance requests sent by banks and financial institutions will be collected and stored and verified by the regional operator before the remittance information being passed to the paying bank [5]. In order to avoid insufficient bank account cover during settlement, inter-bank communications need to wait for the response and confirmation of the other party. The long time for remittance also increases the risk of exchange rate fluctuations.



**Fig. 1.** Workflow of Present Cross-border Remittance.

## 2.2 It is High-Cost

The cost is higher and is most often defined as a percentage of the transferring amount, but with a minimum and maximum value. In addition, there are costs of the intermediary banks, so-called correspondent banks.

It is high-cost to sustain relations with multiple intermediaries. There are too many intermediary agents involved. The remitting fee is high. Both the beneficiary and the remitter need to pay the corresponding handling fees and charges, up to about 7% of the remittance amount. In present remittances, the serial mode is adopted, and the remittance information needs to be transmitted and confirmed step by step. There are at least remitting bank and the paying bank in the remittance. And when there is no current account bank between the two banks, the correspondent bank and other intermediary banks are required to join. For a series of banks to participate, each bank will charge corresponding handling fees, which will increase the remittance cost and lower the remittance efficiency. In 2016, global cross-border payment transactions accounted for 20% of global payments, but transaction fees accounted for 40% of global payment transaction fees.

## 2.3 It is Limited Transparency

The remittance information is asymmetry and the remittance process is not transparent. Relevant stakeholders cannot accurately grasp the specific nodes of the remittance, and it is complicated to check and reconcile the accounts. The serial remittance mode requires the remittance information to be transmitted and confirmed step by step. If you need to know the specific node information of the remittance, it takes time and effort to check step by step, and the procedure is complicated. At the same time, the international

environment is complex and changeable. For example, the outbreak of the Sino-US trade war in the past two years has increased the political risk and economic risks to relevant countries and regions.

### 3 Cross-Border Payment Model Based on Blockchain Technology

The SWIFT communication network plays prominent role in cross-border remittance, but there still are many other systems used for cross-border payment, such as the INS-TEX (The Instrument In Support Of Trade Exchanges) system, SPFS system (can be regarded as the Russian version of SWIFT), CIPS system (Renminbi cross-border payment system). These systems have limitations in their systems, and they are not strong enough to solve the cross-border payment problem of the present SWIFT-led system. So the influence of those systems is limited. The advent of block-chain technology and its application in the financial field provide the possibility to solve the problems existing [1]. Ripple Labs (2014) proposed that Ripple is a software that can realize seamless cross-border multi-currency payment and is easy to operate.

#### 3.1 Main Modules of Blockchain Platform

Blockchain technology has many advantages to apply to cross-border payment. By referring to the world's first open payment network Ripple, the paper is trying to establish a new cross-border payment model based on blockchain technology. The blockchain cross-border payment platform mainly relies on three modules: Messager module, Ledger/FX module, and Validator module. See Table 1. There are bank members who have a margin account in the platform and play the role of market makers to providing liquidity. It is very important to attract as many banks to join the platform as possible. Customers who have applied for membership can receive the service of cross-border payment and settlement. The platform provides the comprehensive cross-border payment service.

#### 3.2 Case Analysis

Let's take cross-border payment process for an example. Company A imported a batch of goods from company B, and suppose the two parties agreed to trade and pay through the blockchain technology platform. The specific transaction process will be operated as Fig. 2.

The whole process is as follows.

STEP 1: Importer A company and exporter B company sign an international trade contract, and both parties agree to complete the transaction through the blockchain platform system;

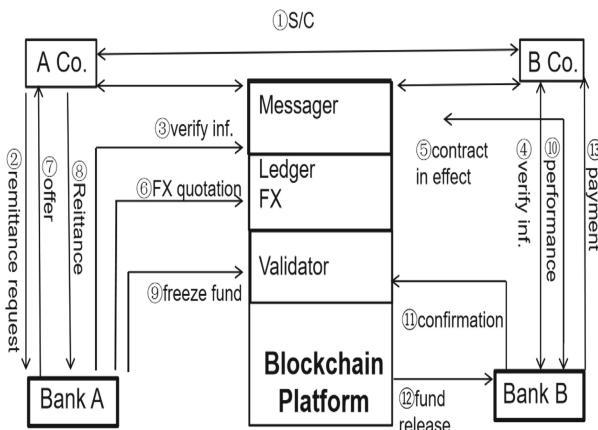
STEP 2: Company A requests its bank Bank A to remit money to Company B;

STEP 3: Bank A submits relevant information such as the remittance instruction to the blockchain system platform by connecting to the Messager module, and requests Bank B to investigate B Company and confirm the information;

STEP 4: According to the requested information, Bank B verifies whether Company B meets the relevant local KYC (know your customer)/AML (anti-money laundering) regulatory conditions and requirements;

**Table 1.** Main Modules of Blockchain Platform

Module	Function	Remarks
Messager	Provide an information channel to confirm transactions and conduct validity checks. Exchange KYC/AML, risk control information, handling fees, exchange rates and other payment related information. Before the transaction is initiated, Messager sends the information to the counterpart. The transaction and capital flow can be executed only when the information is confirmed.	Information exchange center
Ledger/FX	Provide liquidity, and record all of the bank accounts for borrowing and lending in the transaction. Establish a market maker, multi-centered foreign exchange center. Common calculation of rates and fees for transfers can aid transparency.	Foreign exchange trading center
Validator	Be responsible for designing, establishing, governing and running the systems. Confirm whether the transaction is successful and the accounting process is triggered. It is the technology center and the trust source of all participants.	Infrastructure center

**Fig. 2.** Blockchain Platform Payment Model.

STEP 5: When the verification is passed, the corresponding handling fee will be reported. Then the consensus is reached, and the smart contract (a self-executing contract with the terms of the agreement between A Co. and B Co. Being directly written into lines of code) takes effect;

STEP 6: After receiving the verification information, Bank A obtains the exchange rate quotation through the Ledger/FX module;

STEP 7: Company B reports the total cost of remittance (including remittance amount, bank A's handling fee, and bank B's handling fee) to company A;

STEP 8: After company A confirms the remittance cost, it will deposit the money to bank A;

STEP 9: Bank A freezes the remittance amount in the reserve account of the Validator module;

STEP 10: Company B performs the contract and submits the docs through the Bank B;

STEP 11: The Bank B submits and confirms the performance certificate of Company B;

STEP 12: The Validator receives the proof. Then the consensus is passed, and the funds are automatically unfrozen;

STEP 13: The Bank B credits the unfrozen funds to Company B's account, and Company B receives the money. The transaction is over.

### 3.3 Main Advantages and Changes of the New Mode

The new model based on block chain technology is a parallel mode. Comparing with the present remittances model discussed before, the new model uses distributed shared ledger and smart contracts, which can execute the agreed payment process when triggered by the contract. It is faster and cheaper. Customers can receive best exchange rates and get automated payments. The mode is more reliable and has several important advantages and changes.

#### 3.3.1 Cost Savings and Increased Speed of Payment

The reduction of participating banks has improved the efficiency of cross-border payment remittance and lowered the costs. On the blockchain platform, the remitting bank (Bank A) and the paying bank (Bank B) are directly connected to receive and pay. There is no participation of correspondent banks. The new model will completely change the current situation that the US dollar clearing must have a US dollar account bank, and the euro clearing must have a euro account bank. That means a bank who wants to expand international settlement business no longer needs to open bank accounts in currency clearing centers around the world, which will save a lot of account opening funds for banks. At the same time, the participation of intermediate account banks is eliminated, the cost and expense of remittance are reduced, and the efficiency of remittance is improved.

#### 3.3.2 Improved Transparency

The whole transaction information is automatically synchronized, and is open to all of the parties involved. The new model improves payment efficiency and saves bank

resources. On the blockchain technology platform, all of the parties (the remitter, the beneficiary, the remitting bank, and the paying bank) can clearly see the flow of funds, the node where they are, and the charges required. All of the information is clear. There is no need for customers to ask his bank for the complicated checking and reconciliation links, which would greatly improve the remittance efficiency and save a lot of bank resources.

### **3.3.3 Instant Settlement and More Data Security**

Technology solves the trust problem among participants and effectively lowers payment risks. The whole process can be traced. At the same time, the personal information is strictly protected. The cross-border remittance transactions become real-time and credible due to the algorithmic trust mechanism shared account booking system, which is difficult to tamper with. Instant settlement is realized. As the new model solves the trust problem, the remittance time, confirmation cost and exchange rate risk are greatly reduced.

## **4 Suggestions**

At present, blockchain technology is partially used in cross-border payments. How to accelerate the application of block-chain technology in cross-border payments, there are suggestions followed:

### **4.1 Formulate International Practices for Cross-Border Payments**

The lack of a unified standard is a major obstacle to realize cross-border payments through blockchain technology platform. Blockchain technology develops fast and the relative international legislation or regulation is lagging behind which will block the development and application of blockchain technology in the cross-border payment. The best solution is to formulate an international convention of practice or regulation for blockchain technology cross-border payments. The International Chamber of Commerce (ICC) designed and is managing INCOTERMS (International Rules for the Interpretation of Trade Terms) which becomes the uniform rules for international trade and greatly promoted trade efficiency. As a Non-governmental international organization, World Blockchain Organization (WBO) could take the responsibility to prepare and draft a uniform rule and practice for blockchain technology cross-border payments. Once disputes arise, the international practice can help resolving disputes and promote payment efficiency. Once the law and regulation are developed and improved, more relevant entities will join the blockchain-based cross-border payment platform, which will accelerate the application of block chain technology.

### **4.2 Formulate Laws and Regulations to Regulate and Protect Its Development**

The decentralized nature of blockchain is quite different and will overturn people's cognition and perception. It also challenges the existing laws and regulations. Therefore,

the country should deeply study and know the new technology, and at the same time, cooperate with regulatory authorities and financial institutions to jointly develop a legal supervision system suitable for the global blockchain payment and settlement. It is necessary to strengthen the dynamic supervision of the platform [2]. Also it is urgent to formulate corresponding laws to protect its development. It is necessary to require the platform to develop a set of risk control plan system. Once some unexpected problems occur, the risk control system can ensure the safety of users and their information.

#### 4.3 Establish Industry Standards

The decentralized nature of blockchain is quite different. At present, blockchain has not formed a common industry standard at home and abroad. If market participants adopt different ledgers or application cycles, there will be subsequent compatibility and connectivity issues, which will decrease the overall efficiency.

The industry development must have standardized industrial standards, which can realize the survival of the fittest in the industry, improve the product's application effect, and prevent from application risks. For financial institutions, the standardization of blockchain platform will lead healthy competition. For users, the industry standard can improve customer satisfaction and reduce costs. According to science and technology industry standard system, the industrial standard of blockchain technology should include technology development standards, application standards, operation standards, information security standards, process standards, etc.

#### 4.4 Increase Investment in Underlying Blockchain Technology Research and Development to Solve Potential Problems

Behind the rapid development of the blockchain technology, it should be soberly realized the reality of insufficient investment in the research and development of the underlying technology of blockchain. At present, most blockchain projects and blockchain teams are based on bitcoin, Ethereum, super ledger and other foreign blockchain platforms. Blockchain technology is facing security and other challenges in the development and large-scale application. The innovation of the underlying technology of blockchain is the top priority. Research and development investment should be increased in architecture, consensus algorithm, verification signature mechanism, (cross-chain) communication protocol, exclusive hardware and other aspects.

Further more, block-chain technology faces new challenge in the custody of private key passwords, the permission settings of different nodes, and the system anti-attack. It is necessary to increase investment and continuously update technology to solve potential problems.

### 5 Conclusion

In sum, the new cross-border payment platform based on blockchain technology transfers transactions and payment by using encryption currency, which realizes the synchronization of information flow and cash flow. The traditional reconciliation process is cumbersome and time-consuming. The cross-border payment platform based on blockchain

technology has the point-to-point transaction feature which can solve that problem. After successfully processing the request, the online transaction system reports the data to the blockchain by bypass. Relying on smart contracts, the real-time reconciliation process improves the reconciliation efficiency.

The new model is more effective and reduces payment cost. Customer experience is improved a lot. It is a better choice for small and medium-sized banks and individuals because it is possible for small payments to be almost free and instantaneous. More and more countries and banks pay much attention to the new cross-border payment platform. It is worthy continuing the research.

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