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Analysis of Blockchain Technology in the Facilitation of International Trade

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1. Abstract

In this paper, I examine existing literature on blockchain technology and the applications it has in international trade to understand the future of global transactions. We find that blockchain has an exceptional prospect of increasing the efficiency, transparency, and security of international trade through applications like smart contracts and distributed ledgers, and when analyzing the current developing implementations of blockchain in the supply chain, we can see success on the horizon for blockchain in the facilitation of international trade.

2. Introduction

Our advancement into the post-industrial digital age will be met with huge foundational changes to systems that have remained fairly unchanged in recent years -- shipping, banking, finance, etc. As new technologies are developed, these institutions will undergo redesigns to increase efficiency, security, and participation. This paper takes a look at the role blockchain might play in this revolution of international trade. Blockchain and cryptocurrencies have been increasingly popularized as more investments are met with more and more success, and the next chapter of their growth will expand into sectors beyond currencies, such as supply chain management or cross-border transactions. First, I will explore the rationality and security of blockchain technology, then explain the effectiveness of this technology applied to trade, and finally examine some current implementations to gauge success thus far.

3. Blockchain

3.1. Blockchain

The foundational technology that allows cryptocurrencies to work is called blockchain. Satoshi Nakamoto, the anonymous author of the Bitcoin whitepaper that led to the currency's development, summarized his idea as "...a public ledger containing information on every transaction made within a [peer-to-peer] system," (Nakamoto, 2008). By keeping a record of transactions stored in a "block" and broadcasting all records to the entire network chain, transfers are guaranteed to be secure and transparent (Belu 2019). With heavy cryptography and consensus algorithms, users can also be assured anonymity and proof of ownership. This

decentralized digital record-keeping system can be used with any sort of transaction -- not only coins (currency), but for instance: import-export declarations, invoices, bills of lading, certificates of origin, etc (Macedo 2018). Here is where we can find applications for international trade that improve the efficiency, security, and environmental impact of global transactions.

3.2. Security Risks

Blockchains use several algorithms in order to ensure security in their transactions. Hash algorithms are implemented as cryptographic functions that change the output of a transaction so it can still be identified, but important information will not be revealed. The NSA's 2001 Secure Hash Algorithm 2 (SHA-2) is a popular and very secure hash algorithm used by major programs like Bitcoin, Linux, and SSH. In addition, asymmetric key algorithms (a combination of public and private key encryption) are used to securely encrypt data and information of blockchain users (Hileman and Rauchs 2017). These algorithms are widely accepted as the most secure encryption possible, as we do not yet possess the computing ability to attack them with brute force. Typical 160-bit hash functions provide 80-bit security, which will be unhackable until quantum computing is realized (Ganne 2018).

Blockchain is so secure in its algorithms that the only true threat is to its decentralized nature. Majority attacks, or 51% attacks as they are also known by, are results of bitcoin mining. If a single entity was able to mine enough of the blockchain that they held 51%, or the majority, of the computing power, they would have control of the entire system. They would be able to modify

transaction data, stop the verification of new blocks, and stop future mining. This sort of attack is only feasible in the early stages of a blockchain, when the transaction amounts are generally worth more than the block reward, or the amount that is received for mining one block (Lin and Liao 2017). For example, the February 2021 Bitcoin block reward was around 6.25 BTC, or about \$330,000. A current majority owner in Bitcoin would have to own around 9 million BTC, or 500 billion USD. As a blockchain system grows, majority attacks become more and more impossible, but it is important to be aware of this concept in blockchain security. Blockchain will only truly be “decentralized” as long as there is no majority owner. The likelihood (or rather unlikelihood) of the blockchain being compromised is a key difference compared to the current system of third-party financial institutions handling transactions. The inherent weakness of using a trust-based model is eliminated in blockchain.

4. International Trade Facilitation

Like previously mentioned, blockchain can be applied to more than just currencies. The technology can store any type of data, can be permissionless or restricted, and has unlimited storage and scalability. Blockchain is already being researched as a secure way to exchange information by international companies for these reasons. The United Nations Center for Trade Facilitation and Electronic Business (UN/CEFACT) ordered a white paper on blockchain for trade facilitation back in 2017, and has since been updating the 158 page document with information on blockchain applications for supply chain transparency, maritime trade, energy trade, finance, government services, healthcare, tourism and more. While I will focus on supply chain and international trade,

it is clear that blockchain has far-reaching implications on a range of industries, and will likely have a revolutionary effect in coming years. In addition, the rapid globalization and interconnectedness of trade has made for a complex and burdensome landscape of origin requirement procedures and certification processes, forming a barrier of paperwork for small and medium-sized enterprises that are attempting to globalize. Blockchain has the potential to eliminate third party data management in these processes, creating a streamlined system open to more SMEs. Further applications to be discussed include smart contracts, decentralized ledger platforms, and several developing implementations of blockchain in today's international market.

4.1. Distributed Ledgers

The primary function that blockchain could serve in B2B (business to business) transactions is as a distributed ledger technology (DLT). The utility of DLT lies in its ability to keep records completely secure, creating one shared source of truth for two parties who have no reason to trust each other. Also, a blockchain distributed ledger can facilitate immediate exchanges of data with none of the downtime of a typical third party intermediary, such as a bank or a physical record-keeping system. One of the prominent undertakings for creating this technology is called Hyperledger.

Hyperledger is an open-source, highly secure, modular DLT project intended to advance the use of blockchain technology across multiple industries. Hosted by the Linux Foundation, Hyperledger is a community project that provides guidance and support to companies hoping to implement blockchain technology. Since Hyperledger began in 2015, it has grown to include nearly a

dozen subprojects with 3.6 million lines of code, 28,000 participants, and is sponsored by over 200 companies like IBM, J.P. Morgan, FedEx, and Microsoft. Current applications include Accenture's True Supplier Marketplace and DLT Labs' DL Freight (invoice management for Walmart) being developed using Hyperledger. Trust Your Supplier, the 2020 Winner of Blockchain Revolution's Innovative Entrepreneurship in Blockchain Award in the Supply Chain Applications category, is another solution developed using Hyperledger that provides a secure platform for connecting suppliers and buyers and recording transactions (Hyperledger 2018).

Hyperledger is just one of several major DLT projects that has already generated millions in revenue. It is obvious from the amount of support and growth the company has seen that distributed ledger technology will soon become the standard for information management in international corporations. In addition to simply storing information, blockchains also allow for actions or programs to be securely recorded, which we will discuss in the following section.

4.2. Smart Contracts

Smart contracts are a way to apply the security and decentralization of blockchain to agreements between parties of any kind -- not contracts in the legal sense, but coded programs that self-execute when given conditions are met. For example, when goods are unloaded from a shipping container, funds are automatically sent to the supplier, or if the temperature in a commercial freezer gets too high, insurance payouts are automatically transferred for lost inventory.

International trade deals are heavy with paperwork -- transactions may involve multiple banks, bills of lading, cargo documents, and dozens of other important records to be kept. Smart contracts can reduce the amount of paper and people that need to be involved in a cross-border transaction significantly. Arbitration is another time consuming part of international trade that can be addressed with smart contracts. In a blockchain secure system, arbiters can easily access undisputed transaction details in order to resolve any issues or arguments, where usual arbitration can take weeks or months between teams of lawyers and companies.

While these applications of blockchain technology can be extremely useful in eliminating the use of a third party and processing multiple scenarios or inputs to produce any predetermined output, they are still written by humans and can include errors. Smart contracts are definitely a way to improve efficiency in transactions happening across the world, but include the risk of human error in their code.

5. Developing Implementations

5.1. Electronic World Trade Platform

In 2016, Alibaba founder Jack Ma suggested an electronic platform for international trade to the B20 International Business Summit. The goal was to facilitate the development and growth of SMEs on an international scale, accelerating China's globalization. Since then, the Electronic World Trade Platform (eWTP) has garnered global support. The platform runs on blockchain, ensuring the security and scalability needed for a worldwide system. Each country

will have their own eHub allowing virtual free trade at a huge scale of connection. Since it's first eHub installation in 2017 in Kuala Lumpur, countries like Belgium, Ethiopia, Rwanda and more have joined the eWTP and created eHubs of their own (Kangye 2019). This is a great example of a global trade initiative that would not be possible without blockchain technology. I expect eWTP to grow immensely in following years as more and more countries realize the power of such a scalable and secure system.

5.2. IBM Pilot Programs

IBM (International Business Machines) has been one of the global leaders in applying blockchain technology to international trade. They have developed partnerships with trade firms and banks across the world in order to design and experiment with new implementations of blockchain and test different strategies.

A few promising and illuminating examples (Belu 2019) include:

a) Singapore Customs Declaration Initiative

IBM partnered with Singapore customs to create a blockchain based customs portal which allows for instantaneous transfer of declarations from New York to Singapore. The ledger is permissioned, only allowing those with specific access to view the ledger containing all customs information in real time and in one place. This process has created new transparentness and visibility between the hundreds of people working along the supply chain, from carriers to shippers to importers, and also has helped to eliminate delays and errors in transport.

b) TradeLens

Developed as a joint solution between IBM and Maersk, TradeLens is a blockchain technology allowing international firms to exchange information and record transactions securely and instantly. The initiative also has goals of fostering collaboration and spurring innovation, hoping to create new applications for blockchain in the future.

c) Agility

Agility is another combined effort from IBM and Maersk aiming to apply blockchain technology to manage and track container shipments. The application will allow access to transaction information based on the users level of authority, and is predicted to help with risk analysis due to the immediate availability of information. Overall, the system will reduce transit costs and increase efficiency across the entire route.

6. Conclusion

As we continue to progress into this digital age of communication, blockchain has proven itself a useful tool in the revolution of international trade. Given numerous examples of developing implementations that create new levels of efficiency and transparency, as well as mounting support from some of the largest companies involved in today's international market, we can see the success that blockchain has already brought into global trade. In the moment that the rest of the world is ready to accept a paperless system, blockchain will be the foundational structure of a brand new way to trade across borders.

Citations

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