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Applying Blockchain as a Boost for Logistics: A Case of Vietnam

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Abstract

In the wave of industrial revolution 4.0, Blockchain is considered a "key" technology for digital transformation and building the future information technology platform. With the ability to share real-time transparent data information, save storage space and high security, blockchain technology is one of the breakthrough technology trends, capable of wide application in many professions and fields. Blockchain is a new technology that has been mentioned a lot in recent times. If voted for today's most outstanding new technology, then blockchain and its application in many fields will certainly be. In addition, as a core in the Internet of Things (IoT), the influence and development of blockchain will go even further in the era of the 4.0 revolution. In the blockchain's influence, the blockchain is a key driver of the growth of this sector. The objective of the paper is to introduce an overview of the blockchain as well as its impact on logistics and the proposed solutions to enhance the role of blockchain in logistics of Vietnam. This paper finds out some great roles and it is necessary to apply it in our work.

Keywords: Blockchain, logistics, development, information technology

1. Introduction

In the world economic development, especially in the era of the industrial revolution 4.0, the role of information plays an even more important position. However, security issues and information asymmetry are currently issues that people are particularly concerned about. Transparency in information creates trust for stakeholders when participating in transactions, and is also the basis for promoting the growth of the economy (Czachorowski et al., 2019). Blockchain has emerged as a phenomenon of technology, with the promises it brings as a data storage place like an accounting ledger that records the transactions of a business, but this data is guaranteed safety, users cannot change, so transaction information is confidential. Transactions take place without the need for an intermediary. The use of multiple cryptocurrencies, the input of which resides on blockchains, provides exclusivity behind all interactions in the blockchain network (Kim & Shim, 2018). Blockchain with smart contracts brings many advantages to previous traditional transactions, but still has many disadvantages. Therefore, analyzing the characteristics of blockchain and its advantages and existence will be of great help in bringing blockchain into the development of many fields such as finance and banking, accounting, auditing, logistics, etc. For the logistics sector alone, what happens when using blockchain, which means eliminating third parties in transactions? And what if transactions could be verified, recorded and coordinated without the need for a third party? If this is done, it will remove the complexity of the global supply chain. And this is the promise of blockchain for the logistics industry (Kim & Shim, 2018). Blockchain is an emerging technology, so it still needs time to prove its true effectiveness. But its early applications in a number of fields such as finance, retail, etc. the most prominent is bitcoin - a cryptocurrency based on blockchain to store and confirm the exchange, for see blockchain has the opportunity to achieve great growth in the future. At that time, the business model will be leaner,

faster, traceable, transparent in the supply chain and increase automation of the commercial processes of logistics. The article was made with the following questions posed:

■ What is Blockchain? What are the characteristics of blockchain?

■ How is Blockchain applied in socio-economic fields?

■ What role does blockchain play in logistics?

■ The current situation of the logistics sector in Vietnam and solutions to enhance the role of blockchain in the logistics sector?

With the promises that blockchain brings, with an ambition to develop the economy, becoming a push for many fields, including logistics; We hope to unlock this concept to have an overview of blockchain as well as its application in socio-economic in general and logistics in particular in Vietnam.

2. Theoretical overview

2.1. Blockchain concept

Blockchain can be defined as a distributed ledger technology that can securely and permanently record transactions between parties. By "sharing" the database between multiple parties, blockchain essentially eliminates the verification of trusted transactions from the middle man (such as transactions through a bank) and records it. By facilitating migration from a centralized point to a distributed system, blockchain efficiently releases data that was previously kept in secure data stores (Czachorowski et al., 2019).

There are several other definitions of blockchain as follows:

Blockchain is essentially a distributed database of records or a public ledger of all transactions or digital events that have been performed and shared among the participants. Each transaction in the public ledger is verified by the consensus of the majority of the participants in the system. In addition, once entered, the information can never be deleted (Czachorowski et al., 2019).

According to the Wikipedia Open Encyclopedia (2018), blockchain is a decentralized database that stores information in blocks of information that are linked by encryption and expand over time. Each block of information contains information about the creation time and is linked to the previous block, along with a timecode and transaction data. Blockchain is designed to resist data change: Once the data has been accepted by the network, there is no way to change it(Czachorowski et al., 2019).

To understand blockchain technology well, we need to see how it works?

2.2. Blockchain's activities

Blockchain technology uses public key encryption and hash function to ensure data transparency, integrity and privacy; use each node in the network as a client and also a server to store a copy of the application; and apply the principle that nodes participating in the system must comply with the rules of the consensus game (Savjee, 2017), (IBM Think Academy, 2016).

It is essentially a chain of blocks linked together like a linked list, but it can be accessed backwards from the last (current) block to the first. It is really like a distributed ledger, where each transaction (called a block) in the book includes the following information stored:017), IBM Think Academy (2016)

2.3. Types of Blockchain

Types of blockchain can be divided into three types according to the principle of data read-write rights and participation in the system: Public (public); Private (private tu); and

Permissioned/Consortium (permitted). With the public type, anyone can read and write data on the blockchain, for example Bitcoin, Ethereum virtual currency applications, etc. With the Private type, the user only has read permission, not the right to write data. to the blockchain, only a trusted third party has write permission, for example Ripple. As for the Permissioned type, it adds a combination of third parties when participating in public or private, such as banks or joint-venture financial institutions using their own blockchain (Kim & Shim, 2018).

2.4. Main Features of Blockchain

The salient features of blockchain technology are:

Can't fake, can't destroy blockchains: Theoretically, only quantum computers can decode blockchains, and blockchain technology disappears when there's no Internet in the world.

Immutable: The data in the blockchain cannot be changed (can be edited but will leave a trace) and will be stored forever.

Security: The information and data in the blockchain are distributed and absolutely safe.

Transparency: Anyone can track blockchain data going from one address to another and can track the entire history on that address.

Smart contracts: are digital contracts embedded in if-this-then-that (IFTTT) code, allowing them to self-execute without the need for a third party. Specifically, a Smart Contract is actually just a small program stored in a blockchain, this Contract is made for supporters to transfer money to the project team creating the product they expect. They will transfer money to the project via smart contract and this contract automatically transfers money to the executors. When the project reaches its destination, that is, the money is automatically transferred back to the supporters. Smart contracts can also be used in the automatic provision of loans to customers of banks, in the process of requesting insurance companies or in distribution and payment companies. In this regard, Ethereum is a special system created and designed for smart contract support based on Solidity programming language (Gallay, et al., 2017).

A smart contract is a protocol for regulating contracts. A smart contract is a special protocol for contributing, verifying, or negotiating or executing a contract. Smart contracts allow reliable transactions without a third party. These transactions are traceable and irreversible. Smart contracts contain all information about contract terms and perform all expected actions automatically (Kawaguchi, 2019).

3. Blockchain application in socio-economic fields

Blockchain has many applications in socio-economic fields. We would like to introduce some prominent areas such as: currency, manufacturing and retail, healthcare and election activities. As for the application of blockchain to the logistics sector, we will introduce separately and in detail in Section 4.

3.1 For currency

Currency is one of the most popular applications of blockchain, where bitcoin is one of many currencies implemented via blockchain, which is the first and most famous application of blockchain. Many areas as well as recent initiatives show a broader application of blockchain, but it is rare to find a discussion or initiative without a reference to bitcoin. Bitcoin was created by Satoshi Nakamoto. Traditionally, people could exchange money with people they didn't know because the two trusted a third party, usually the validity of a banknote or an intermediary such as a bank or foreign currency exchange. Nakamoto's system has no hard currency and no

intermediaries, but creates a trusted system through the innovative use of cryptography and peer-to-peer networking. When one user sends bitcoin to another, the details of the transaction (such as sender and receiver addresses and remittance amount) are broadcast to the bitcoin network, so that the transaction can be authenticated by all users. Bitcoin is the largest blockchain-based currency, although several others exist with slightly different technical features. Differences are often found during mining, which can require significant computing resources. For example, some currencies use less resources than algorithms than Bitcoin. Peercoin's algorithms are designed to be less resource-intensive, and they also vary with the rate and mechanism by which new coins are created and distributed (Jović et al., 2019).

3.2 For production and retail

Blockchain technology is used by retailers and consumer goods manufacturers to drive business. For example, it can empower consumers by providing more information about each manufactured item, in particular the product's provenance. The retail industry uses blockchain from ensuring product authenticity to locating goods and protecting both customers and sellers from fraudulent transactions (Jović et al., 2019).

For this sector, Walmart, the world's leading retailer, has launched a blockchain application in Beijing, with a pilot project that tracks packages of pork - China's most popular meat - from farm to supermarket. Walmart's goal is to summon the world's food safety experts to figure out how to track the provenance of a package of food - be it mango or pork chops - with new techniques and systems. They build technology with IBM - one of the most active technology companies to promote blockchain solutions to technology departments. When pork products want to make it to a Walmart distribution center, and eventually, to the shelves of a Walmart store, they go through dozens of intermediaries from manufacturers, processors to distributors. The blockchain pilot allows the progress of each batch of produce leaving the farm to be tracked, in real time, across the country. Once the products reach individual stores, they are repackaged and distributed across the store. “The very nature of blockchain ensures that the data that is entered into a blockchain is immutable and can be stored forever,” said Changrui Ren, an IBM researcher(Kawaguchi, 2019).

3.3 For the medical field

When patients go to the doctor or get tested, their personal information as well as their results are stored on the blockchain system. Therefore, when they re-examine or transfer, this information is retrieved from the blockchain system, which will help reduce the time it takes to find information related to their medical history. Blockchain data helps improve the efficiency of medical examination and treatment when the information related to the patient's medical examination and treatment process. This helps patients reduce the cost of re-testing when they go to new hospitals, as well as helping new patients to be able to access information related to the patient's medical history and previous treatment progress. multiply. Thereby helping to improve the efficiency of diagnosis and treatment for patients.

The United States Food and Drug Administration (FDA) explores the use of blockchain to share and audit electronic medical records, clinical trial results, and data. whether health. In this way, hard-to-access data can be securely managed on a shared blockchain between stakeholders. In October 2017, this supported the United States Centers for Disease Control and Prevention (CDC) in testing a blockchain platform for health surveillance. This solution aims to manage data more efficiently during the health crisis. The CDC is expected to move from beta to blockchain implementation in 2018 (Kawaguchi, 2019).

3.4 For election activities

For activities that need trust and transparency like elections, blockchain promises to bring those benefits. Specifically, voters will be given the right to keep a copy of the voting records, of course they cannot change the records and voters will find out if any illegal ballots have been added. In addition to its application in national elections, blockchain is also used in internal elections. For example, political parties in Denmark and shareholder votes in Estonia (Kawaguchi, 2019).

4. The role of blockchain in the field of logistics

With an important role in international trade, logistics activities face many transformation opportunities as well as challenges in the industrial revolution 4.0. The current situation when there is a danger of overloading in the documents of the transaction records when the goods pass through hundreds of seaports before reaching the required destination, the need for information transparency in transactions, information Regarding goods, many stages in the logistics value chain are bound by manual processes required by management agencies, companies must often rely on data entry instructions and paper documents to comply with customs procedures.

This makes it difficult to track the origin of the goods and the status of the shipment. All of the above puts the field in need of an inevitable change. Therefore, with the positive effects that blockchain brings, the logistics industry is expected to have a big breakthrough in the near future. The positive effects that blockchain is expected to bring to the logistics industry are as follows:

4.1 Faster and more streamlined logistics in global trade

Logistics is considered the lifeblood of the modern world, with about 90% of world trade being carried out by the international transport industry each year.

Currently, global logistics still involves a lot of paperwork, which is costly in terms of time and money. This long-distance transportation process involves a lot of interlinked paperwork. In addition, paper shipping documents such as Bill of Lading are at risk of loss, forgery and fraud (Gallay, et al., 2017).

Blockchain can help ease many of the interactions in global trade logistics, including transport management, traceability, and finance. Specifically, blockchain can help optimize costs and time associated with commercial documentation and administrative management of shipments.

Maersk, the world's largest shipping company, found in 2014 that transporting a refrigerated shipment from East Africa to Europe can go through nearly 30 people and organizations, including more than 200 partners and related information between them [2].

To improve efficiency in ocean freight, Maersk and IBM have started a joint venture to establish a global blockchain system to digitize trade workflows and track shipments. The system allows stakeholders in the supply chain to see the process of goods in the chain, knowing where goods are being transported. Interested parties can see the status of customs documents, can view bills of lading and other data. Blockchain helps to ensure the security of data and a tamper-proof repository for these documents (Kawaguchi, 2019).

Accenture - A technology consulting and service provider, one of the largest consulting firms in the world, is developing a blockchain system focused on replacing traditional lobbies. Here, a network connects all parties in the supply chain and enables direct transactions, eliminating the need for intermediaries. And the result of this will drive cost reductions in the supply chain for all stakeholders, including shippers, consignees, carriers, freight forwarders, ports, customs authorities, banks and the public. insurance company(Gallay, et al., 2017).

4.2 Improve supply chain transparency

In the current economic development conditions, consumer confidence is a special concern of many companies. As a result, many projects use blockchain to improve supply chain transparency. Data about goods about how they are made, where they come from and how they are managed is stored on the blockchain system. The special thing is that this information is permanent and shared. Therefore, the participants they cannot modify the information, the information is guaranteed to be safe and confidential. Companies can use this information as proof of the legitimacy of their products (Kawaguchi, 2019).

To illustrate this, in 2017, Walmart, IBM, and Tsinghua University (China) piloted the use of blockchain to track food items, including pork in China and mangoes in the US, as they move through the supply chain for shelf storage. Walmart's testing shows that applying blockchain reduces the time it takes to track a package of mangoes from farm to store from days or weeks to two seconds (Shirani, 2018).

Walmart, along with partners, has tested on-site mechanisms to identify and remediate improper food storage throughout the entire journey from farm to store. The sensors are attached to the product and Walmart is committed to the data being blockchain-based. Bridget van Kralingen, IBM senior vice president, said that Blockchain holds the incredible promise of providing the transparency needed to help promote food safety across the entire supply chain. This is one primary reason why IBM believes so strongly in the impact of this technology on business models. And by extending IBM's food safety with Walmart and China's Tsinghua University and adding new collaborators like JD.com, the technology brings traceability and transparency to a large network of participants in the food supply chain(Gallay, et al., 2017).

4.3 Traceability and identify counterfeit products

Currently, the problem of rampant dirty food and food safety and hygiene is a burning issue of global public opinion. However, the confusion of consumers is the information asymmetry, when they cannot know if the product they are using is really a good product or not. And when something happens like food poisoning, etc. it's hard to find out where the cause comes from in the chain of operations from raw materials to finished products (Shirani, 2018).

In order to track the origin of food items, Walmart partnered with IBM in 2016 to use blockchain to track the movement of these items. First, Walmart and IBM digitally track domestic movements; specifically pork from small Chinese farms to Chinese stores and track international movements – production from Latin America to stores in the United States (Popper &Lohr, 2017). In the blockchain system, data such as farm origin, batch number, factory and processing data, expiration date and shipping details are detailed and presented to all members of the network system is known. With foodborne illness outbreaks, the system allows Walmart to trace the source in seconds (Shirani, 2018).

In addition to worrying about the origin of good and bad products, a worry of today's consumers is fake products. As the level of science and technology increases, the downside is that the ability to counterfeit products is becoming more and more sophisticated and difficult for consumers to recognize (Treiblmaier et al., 2020). To mitigate this concern, blockchain technology through establishing transparency in the supply chain from the producer to the seller and ultimately to the consumer, will help them identify fake products. For the patient, the credentials in this chain are all the more effective in avoiding the risk of receiving a counterfeit drug, as it is very dangerous.

Through barcodes or automated Identification (ID) technology, patients can be empowered to check if they have received the actual medication (Mackey & Nayyar, 2017).

4.4 Automate commercial processes in logistics with smart contracts

One of the first companies to apply smart contracts in logistics is ShipChain. ShipChain establishes a tracking system across the entire supply chain, from the moment the goods leave the factory, field or farm to complete distribution to the customer. Shipchain unifies shipment tracking on the Ethereum blockchain, using smart contracts. ShipChain contracts executed on Ethereum can be used by anyone to set up a shipping escrow. Once the shipment is completed and confirmed, the contract is stored on the main blockchain. ShipChain will primarily be an open marketplace, where shippers and carriers can connect and conduct business more efficiently and with greater transparency. However, there will also be the ShipChain web platform, which will allow booking and management of shipments using a variety of service providers and modes of transport (Wahab & Say, 2020).

The 300 Cubits project was born, this is a project that applies blockchain technology to build a decentralized platform in which information about trains, booking status, cargo status, etc. are public to both the customer and the transport company. When a ship order is made, the blockchain generates a smart contract that requires the two parties to deposit an amount in industrial shipping container tokens (TEU tokens). The shipping company will be compensated for TEU if the customer does not bring the goods to deliver, and vice versa, the customer will also receive the TEU if their cargo is left behind due to the fault of the charterer. Of course, the deposit will flow back to the pockets of both if the contract is fully complied with (Shirani, 2018).

Another benefit of smart contracts in logistics is reflected in the terms of payment to the seller. Specifically, those benefits are as follows:

- Modeling the Letter of Credits (L/C) as a smart contract means complying with the conditions and preventing ambiguity in the interpretation of the conditions of the L/C.
- Reduce L/C modification time and cost: L/C can be issued and amended instantly and digitally.
- Allows early detection of information differences: Stakeholders can look into the L/C process and can resolve discrepancies faster.

Phrases such as “early month” and “soon” are replaced by date and time ranges to clearly specify the date that the delivery, delivery, payment, etc. are allowed through the smart contract, each Events can be assessed based on documents submitted by exporters, effectively eliminating importer confusion (Teodorescu &Korchagina, 2021).

5. Solutions to enhance the role of blockchain in Vietnam's logistics industry

5.1. Current status of Vietnam's logistics industry

Talking about the current situation of the logistics industry in Vietnam, Mr. Nguyen ThoToan, a representative of Thai Son Technology Development Company, said that businesses waste money, time and risks for staff to deliver and receive goods, etc. to do procedures at the office of shipping lines, forwarding agents. Currently, logistics costs in Vietnam are still high, accounting for 16.8% of business costs, higher than the average in the Asia-Pacific region of 12.5%. In the composition of logistics costs, transportation costs account for 50%. Therefore, it is necessary to cut logistics costs for businesses, mainly to cut transportation costs such as: reducing traffic jams, reducing overload (Wahab & Say, 2020).

The infrastructure of logistics enterprises is still poor, and Vietnam's logistics costs are among the most expensive in the world. According to the Vietnam Chamber of Commerce and Industry (VCCI), the cost of transporting a container of goods from Hai Phong port to Hanoi or vice versa with a distance of 100km is 3 times more expensive than the cost of transporting a container from Hai Phong. China and Korea return to Vietnam(Gallay, et al., 2017).

The high cost compared to transnational logistics service providers operating in Vietnam is due to the fact that Vietnamese logistics enterprises are still unable to operate. limited in terms of business size and capital, experience and management qualifications, the ability to apply information technology, as well as the need for human resources to meet the needs of international operations, logistics enterprises and enterprises. The import and export industry is not fully connected. In addition, businesses also face difficulties due to lack of infrastructure connecting port areas with areas where goods are concentrated; lack of dedicated freight forwarding and service centers (Wahab & Say, 2020).

Currently, Vietnamese importers and exporters still prefer the form of importing and exporting goods, which is buying Cost, Insurance and Freight (CIF), and selling at Free on Board (FOB). Since then, the role of transportation has shifted to foreign partners. This is also a disadvantage for the development of our logistics industry (Teodorescu &Korchagina, 2021).

5.2. Solutions to enhance the role of blockchain in Vietnam's logistics industry

In order for blockchain to play its role in the ambition to develop the logistics sector and in particular in Vietnam, we would like to recommend a number of solutions such as:

5.2.1. Raise awareness of blockchain for communities and businesses, build a collaborative society

Due to the characteristics of the logistics industry, with the expected benefits of blockchain, most especially, it is increasing transparency for the supply chain, reducing the time and cost of a large volume of paperwork and shipping stages, making the operation more efficient. If logistics activities take place faster and more streamlined, blockchain businesses need a roadmap to apply this very useful and practical technology solution. According to the common opinion of many analysts, blockchain is very suitable for application in the logistics field. Especially smart contracts, improve the efficiency and speed of delivery contracts in international trade (Jović et al., 2019).

In the rapid development of science and technology, especially in the era of industrial revolution 4.0, many blockchain systems will appear. As a result of this, it is difficult to unify blockchains. Many groups will set up their own blockchains, aiming to improve market share and profitability. This is detrimental to the application of blockchain in logistics, when there is a lack of unity of individual blockchain chains (Wahab & Say, 2020).

As stakeholders enter the blockchain ecosystem, they need to understand the relationship between their business value and the technical feasibility of the blockchain. When understanding the benefits that blockchain brings to work together, these parties will promote the effectiveness of blockchain (Teodorescu &Korchagina, 2021).

Besides, the increasing cooperation of enterprises themselves with many parties, including the state, partners, agencies, even competitors. Although cooperation between competitors may seem uncommon or confusing to many people, when they have a collective effort to build a common blockchain platform, to use a single blockchain solution. create more value for them and businesses need to improve their solid foundation knowledge about blockchain. Specifically, they need to master the working mechanism of blockchain to apply in accordance with the actual

conditions at their businesses. Through that, they find a reasonable business model (Shirani, 2018).

From the current situation, Vietnamese importers and exporters prefer to buy CIF prices, sell FOB prices, it is necessary to have the cooperation of importers and exporters with logistics enterprises to switch to the trend of importing goods according to the current situation. In the form of FOB, exporting goods in the form of CIF means that the importer and exporter will be responsible for the transportation of goods, which is creating opportunities for the development of the logistics industry(Shirani, 2018).

5.2.2. Preparing in terms of technology and infrastructure for logistics businesses

Automating processes and digitizing data is the initial basis for businesses to start applying smart contracts, transparent management process, information security, etc. using blockchain in our own business (Wahab & Say, 2020).

In addition, improving the capacity of connection infrastructure for logistics enterprises is also a possible solution. When the processing speed in the blockchain system is improved, the efficiency of work will be increased. The characteristics of logistics operations with many processing stages, delays in the network and connection of businesses, make it more time-consuming and costly for businesses.

Cost is the main burden of logistics businesses. And in order to improve the competitiveness of Vietnamese logistics before the risk of being left far behind foreign logistics enterprises, the first problem is to cut costs. And upgrading the infrastructure to best apply blockchain technology is a promising solution for logistics businesses. If the infrastructure is not guaranteed, it will prolong the data run time, leading to the effect of rebound (Teodorescu &Korchagina, 2021).

5.2.3. Building processes, adjusting books for the application of blockchain technology

With the current technology trend as well as the strong support of the World Bank, blockchain is the technology of the future that all countries need to approach and have appropriate policies and make the right transition over a period of time and new great technology. Customs is the agency that is greatly affected when technology is deployed, especially in the area of logistics across borders. While large enterprises in the world have been deploying models based on cloud computing and blockchain, in Vietnam it is still a new field, there are no policies and procedures for businesses want to be at the forefront of this field(Teodorescu &Korchagina, 2021).

In order to apply blockchain, the interest, research and long-term investment solutions of the state are the driving factors for blockchain to promote its strengths. Specifically, the state should pay attention to reducing procedures, putting procedures on the blockchain system, helping businesses save time and costs. In addition, the construction of dedicated freight forwarding and service centers also helps to reduce the burden of procedures and costs for businesses(Shirani, 2018).

6. Conclusion

In the stormy flow of the industrial revolution 4.0, blockchain has become a prominent technology trend and is expected to have many positive impacts on many socio-economic fields. In international trade, the influence of logistics is very large, and the advantages and challenges facing the industry are problems that businesses in the industry need to consider in order to develop solutions. And blockchain is a potential breakthrough for this field. In particular, in Vietnam, with many experts predicting that it will become a blockchain destination in the future, blockchain applications in logistics will have the opportunity to take this industry to a new level.

On the basis of research on blockchain and its practical applications, the author has proposed a number of solutions to enhance the role of blockchain in Vietnam's logistics sector. The article also opens up many new directions for researchers to assess the impact of blockchain and the next directions of blockchain in many other fields.

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