



Application Analysis of Blockchain in Business

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ABSTRACT

Blockchain has aroused widespread interest in many fields. As a distributed digital ledger, blockchain has transparency, traceability, and irreversibility in recording transaction information, and has been welcomed by many industries and investors. This paper aims to discuss two main applications of blockchain: in supply chain management and reducing transaction costs in the financial field. By analyzing relevant cases and data, this paper discusses the significant impact of blockchain technology in these two fields. Potential risks of adaptation are also considered. Blockchain can enhance the traceability and efficiency of supply chain management and avoid losses caused by fraud and transaction costs in the financial field. As blockchain has not been widely used, its technical cost and use standard setting deserve attention. Considering the risks of adoption, it is very important to set standards for the scope of participants and the type of blockchain to ensure security before applying blockchain to specific fields.

Keywords: *blockchain, supply chain, remittance, financial markets.*

1. INTRODUCTION

In 2008, Satoshi Nakamoto first introduced the concept of bitcoin and blockchain. Bitcoin is a type of digital currency, and blockchain is the basic technology to support transactions of bitcoin [1]. Since blockchain was developed for cryptocurrency networks, its characteristics are considered to have great potential in financial and non-financial areas and attract large investments.

Basically, a blockchain is a distributed ledger, or decentralized system of recording all transactions or digital events irreversibly shared by all known participants. Decentralization means all the transactions on the blockchain happen directly between the parties without third-party intermediaries like lawyers, or brokers; the validity of the transaction is protected by a digital signature, balance checking, and double payment checking. Because it's a distributed database, each party has access to the entire database equally. Furthermore, updated transactions are "packaged" into new blocks linked into the entire chain, making it almost impossible to change or cancel every single transaction that has already been recorded in the former blocks. Due to the

unique mechanism, blockchain has high transparency, high efficiency, and security.

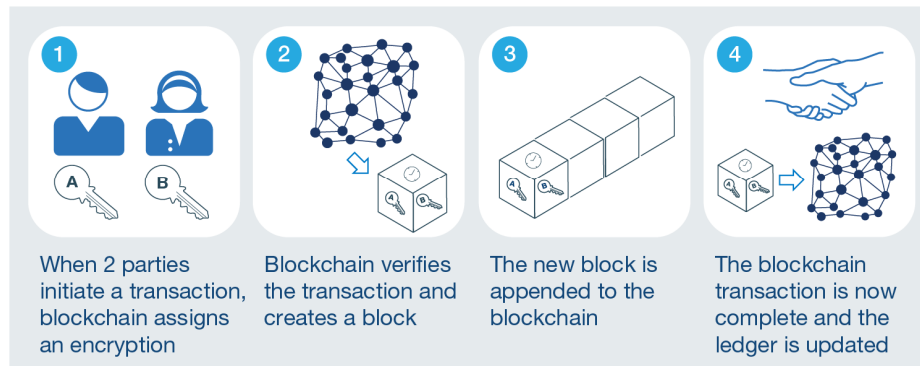
The great potential of blockchain has been recognized by global industries: massive investments in blockchain have been incurred, and attitudes from senior executives in different industries are supportive. In 2017, blockchain startups raised \$1 billion in venture-capital funds, which keeps increasing [2]. Deloitte's 2021 Global Blockchain Survey investigated senior executives' attitudes towards blockchain applications in their organizations globally. 80% of respondents thought that blockchain, digital assets, and cryptocurrency applications would bring new revenue to their respective industries [3].

One of the main applications is reducing huge transaction costs in the financial area. In addition to applications in the financial area, blockchain applications in supply chain management are also worth attention. Some corporations are initiating pilot projects, including Walmart. In this paper, these two applications of blockchain, supply chain management and payment systems, were discussed. Specific cases and crucial data were analyzing to illustrate the influence of blockchain in supply chains and financial services. Graphical methods were used for intuitive illustrations of important data. General scientific methods of analysis and synthesis of

information are used to evaluate different perspectives towards the impact and further improvement of blockchain applications in supply chain management and financial areas. Although blockchain seems to have a promising future, it has not been widely applied in multiple industries. Many cases are still in the idea or development stage. Doubts and concerns are emerging about the potential risks of blockchain.

Blockchain is an exciting invention, but it's important to recognize its true value in specific areas. Through this paper, whether blockchain truly can solve problems, raise revenue, and add value to supply chain management and financial areas is evaluated. Its risks and adaption problems are also considered, which provides reference significance and realistic consideration for these industries that may apply blockchain in supply chain management or payment systems.

How to create a blockchain transaction



McKinsey&Company

Figure 1 How to create a blockchain transaction

2.2. Development of blockchain market

It's estimated that the global blockchain market will grow at a compounded annual growth rate of 68.4%. With

a \$4.9 billion market share in 2021, the market forecast will be \$67.4 billion in 2026 (Figure 2) [5]. Blockchain is rapidly developing, and more corporations are adopting business patterns with blockchain.

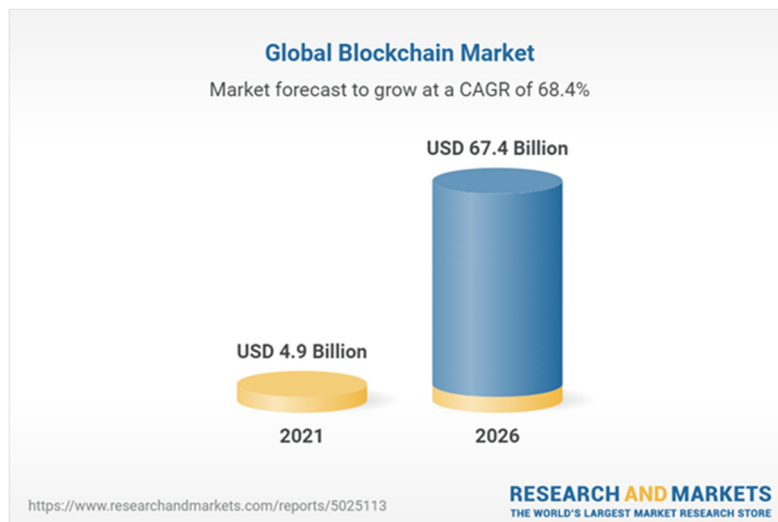


Figure 2 Block Chain Market Report 2021 – Global Forecast to 2026

3. APPLICATIONS IN SUPPLY CHAIN MANAGEMENT

One of the fields significantly influenced by blockchain is supply chain management [6]. After the idea of blockchain can be used in the supply chain, Enterprise resource planning (ERP) systems are mostly used to effectively manage resources and provide real-time tracking of activities. In large, multi-national businesses, supply chain management is much more complicated, ERP systems are limited in their ability to be highly traceable for grey market products, which may cause revenue loss for businesses. The advantages of blockchain are beneficial to improve a transparent and complete supply chain system.

3.1. Problems in traditional supply chain system

Traditional supply chain system, which uses financial ledgers and enterprise resource planning systems, is not able to record and share information flows, inventory flows and financial flows among all the parties [7]. It's common to encounter delivery errors, grey products, and late payment in a large and complex supply chain activity. When retailers send orders to suppliers, then suppliers request loans from banks, sophisticated audits, examinations, and documentation are involved to verify and make loan decisions, which do not allow every party to have access to all the relevant information about the order.

3.2. How blockchain adds value

Blockchain will improve supply chain management by recording all the information about a transaction among participants, which enhances transparency and traceability [7]. Combined with smart contracts, blockchain can record every inventory, bill, and order in time sequence. All the parties involved in the supply chain will share one version of the distributed ledger. Additionally, "Blockchain can reduce the risk of fraud on high-value goods such as diamonds or pharmaceuticals, help companies understand how individual components and finished goods pass through each subcontractor, and reduce revenue losses due to counterfeit and grey goods" [8]. Enhancing monitoring materials and products will also bring confidence and better services for customers.

3.3. Potential problems of application

However, using blockchain technology requires setting a new standard in supply chain systems. According to some researchers, the supply chain should use private blockchain among known parties [7]. Because all the information in a blockchain can be viewed by participants, some data related to confidential information of a company may be collected by other

competitors and brokers to trade stocks, which may influence the company's earnings. Therefore, blockchain used in supply chain should be private and only shared by parties having qualifications to enter. However, some researchers believe that when all parties in supply chains are known and trusted, blockchain is not always required as a one-of-a-kind solution; a cloud-portal or decentralized peer-to-peer connections may suffice [4], with no additional technical or training costs. There is no convincing evidence to show the unique value that blockchain brings to the supply chain, because blockchain is not widely used.

3.4. Application of Walmart Canada to blockchain

Walmart, Co. is a successful example of using private blockchain in a supply chain system to eliminate payment problems and boost efficiency. Walmart Canada delivers more than 500,000 orders annually across Canada. Each shipment requires recording data points of stop locations, fuel cost, and temperature updates [9]. Invoices have over 200 data points incorporated, which means 70% of invoices need reconciliation efforts, which results in increasing audit workload and transaction cost [9]. They discovered that the root of the problem is that multiple information systems are unable to effectively connect Walmart Canada and its carriers. To cope with the problem, a distributed ledger network called DL Freight was introduced to Walmart Canada's supply chain systems. It can update information automatically and timely among parties involved in the transactions. With DL Freight, less than 1% of invoices require reconciliation now [9]. The case of Walmart Canada indicates blockchain has great potential in improving supply chain management. It makes inventory flows, financial flows, and information flows visible to key stakeholders involved in transactions, reduces transaction costs, and establishes a high level of trust between Walmart and carriers.

4. REDUCING TRANSACTION COST

4.1. Remittances

In addition to the supply chain, blockchain can be applied to remittances, more specifically, cross-border payments. In traditional financial payment systems, intermediaries play an important role in the complex process of bookkeeping, transaction reconciliations, and balance reconciliations. Due to different clearing procedures in each country, a remittance requires nearly 3 days to arrive [10]. Moreover, driven by international trade, cross-border payments total around \$600 billion annually, which is estimated to increase 3% a year; fees are generally 2 – 3% of transaction value [11], which is a huge intermediary cost.

Blockchain makes it possible to finish a payment in minutes rather than several days in traditional systems, which can save time and cost. Besides, based on the decentralized structure and digital signature, blockchain may become a potential solution to fraud and reduce regulatory fines in cross-border business. McKinsey & Company has estimated that blockchain-based systems reduce losses of revenue from fraud by \$7-9 billion, regulatory fines by \$2-3 billion, and operating costs by up to \$1 billion in banks (Figure 3) [11].

Blockchain solutions for onboarding, regulatory compliance, and fraud could save banks significant amounts.

Savings potential from blockchain-based solutions, \$ billion

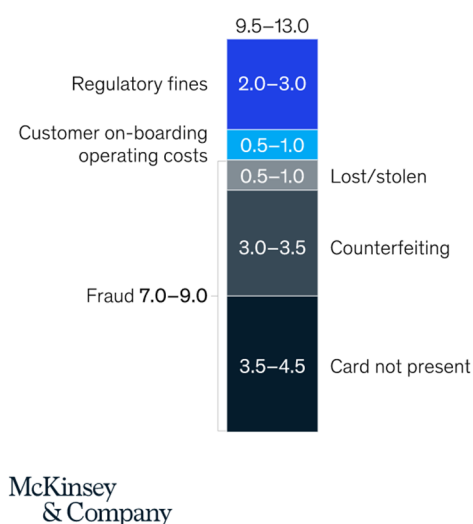


Figure 3 Application of Blockchain in Cross-Border Payments (USD)

4.2. Financial markets

Blockchain also works in financial markets. It's known that in initial public offerings (IPO), private companies should hire underwriters or investment banking firms to arrange financing for companies by finding investors to buy newly issued securities. Examples are that companies issue stocks through blockchain in secondary markets. NASDAQ has collaborated with a company called chain.com7 to implement private securities transactions in blockchain based on smart contract. It makes transactions more efficient and traceable. Medici is also developing a cutting-edge stock market based on Bitcoin 2.0, in which smart contracts greatly improve contract negotiations and reduce the use of paper documents [12]. Transactions will be implemented once the conditions on both sides of the transaction are met. Intermediaries, like brokers, underwrites, or banks, are not necessarily needed, which saves transaction costs and time for companies.

5. POTENTIAL RISK

Blockchain's competitive advantages help to solve many problems in supply chain management and financial services. As a breakthrough technology, its potential concerns about adoption need consideration. Crosby mentioned that moving historical business documents or frameworks to a new blockchain may involve time and cost [12]. Executing a transaction in a blockchain for the first time also needs to download the whole history of data as the number of blocks is increasing tremendously. It may take a long time and cause inconvenience when people try blockchain for the first time.

Another common concern is regulation. Because blockchain is decentralized, there is no central organization responsible for potential risks. However, it depends on different governmental systems. In some countries, the economy is more controlled by governments, in which case blockchain adoption faces more challenges and special regulations. It's necessary to set a standard for blockchain in every country as it's an advanced technology that brings both returns and risks.

6. CONCLUSION

Based on synthesizing information from different perspectives, blockchain, as a distributed ledger of recording all transactions or digital events among all known participants, with its traceability and transparency, can share inventory flows, financial flows, and information flows among key stakeholders, reducing the number of grey products and invoice reconciliations, which is difficult to achieve in traditional supply chain management. It's also promising to play an important role in financial services and financial markets by reducing transaction costs and implementing fast stock exchanges without intermediaries.

It's highly suggested that industries actively take advantage of blockchain to solve low efficiency and non-transparency problems. Considering the risk of adoption, and it's necessary to set a standard and regulations, for most companies, it's more secure to adopt private blockchain combined with current systems. The cost of downloading historical data to a new blockchain is expensive, which may need more research to reduce it. Further research is needed to provide valid evidence of blockchain's revolutionary and irreplaceable value for companies still on the sidelines. In addition to the supply chain and financial areas discussed in this paper, blockchain is developing rapidly in non-financial areas like public health and government regulation as well, which are also worth attention.

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