Improving shipping contracts with the use of Blockchains

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Summary: In this research, we focus on the contract between a charterer and a ship-owner in the liquid bulk ocean-shipping market. The question we answer is how emerging technologies, primarily Blockchain, can be used to make the contracting process more efficient regarding time and cost. Our research shows that while there are a considerable cost and time savings possible for certain aspects, there are some problem areas, such as the negotiations, that has to wait for the existing technology to mature.

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Bio here
Before MIT, Harshvardhan led the global operations of a Hong Kong-based ship management company. He received his Nautical Science degree from India and sailed as a navigating officer on merchant marine ships, across the globe.

KEY INSIGHTS

1. Applications built on a permissioned Blockchain can lead to improved efficiencies in the contracting process.

2. The proposed solutions must reengineer the end-to-end process to find acceptance in the real world.

3. A consortium led approach for setting up standards and protocols can lead to faster adoption of Blockchain-based solutions.

Introduction

The ocean-shipping industry consists of players from around the world. There is no central authority setting binding standards and rules for interaction among the various players. In the absence of such standards, the interactions depend on mutual trust. Stakeholders use intermediaries and additional contracts to mitigate risks of the opposite party defaulting on any condition of the contract. Intermediaries are expensive and contract hard to enforce through international courts, resulting in high dependency on established relationships. Contracts are negotiated, shared, and agreed upon using multiple communication outlets and a combination of physical and digital documents. All of this results in a complex system which is expensive in terms of time and money to execute.

Blockchain

Blockchain refers to a decentralized peer-to-peer data-structure that can record and store data on multiple computers across the network while ensuring that all parties agree to a single truth and that the recorded data is immutable. In its earliest application, this technology was used to act as a public ledger to record the generation and transaction of Bitcoin crypto-currency. Blockchain technology enables the creation of digital platforms where the benefits from network effects and shared infrastructure do not necessarily lead to dependence on a single intermediary. The flexibility in terms of what such shared data represents across settings (e.g. crypto-currency, documents, other financial assets, contracts etc.) makes it a general-purpose technology (GPT). Such technologies typically take a long time to diffuse through the economy and become mainstream but once there, they lead to gains in productivity across multiple sectors. Electricity and the internet are other examples of a GPT.

The access to a Blockchain can be regulated to achieve certain business goals. Such regulated Blockchains, no more public, are referred to as a "permissioned" Blockchain. Consortium-led permissioned Blockchains are finding wide applications in fields such as Supply Chain Management where interacting parties have a spectrum of trust levels among themselves.

Another important aspect of the Blockchain technology is its ability to run applications on a distributed database. Such applications are called Smart Contracts. These are contracts working on an IFTTT logic (If-This-Then-That), able to execute on their own once certain pre-defined parameters are met.

Analysis

The entire process of executing an agreement (Charter-party) between a ship-owner and a Charterer can be divided into three major steps, as shown in the figure below: -
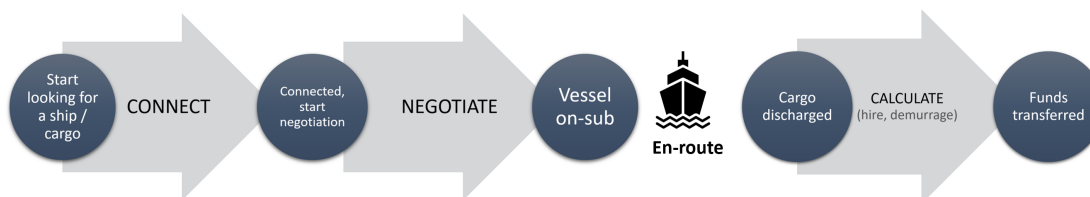

Figure 1

In the first stage, the Charterer approaches a pool of brokers to look for a ship. The main challenge at this stage is the availability of information. The charterer and the ship-owner mostly do not know each other in the spot market. The present process is time consuming and can take anywhere from a few hours to several days. This issue can be solved if the two parties interact directly on a web-based market-place platform. The charterer and the ship-owner can pass on all the relevant information to the system, and the application can query the database and display a list of matches. This can help them find each other instantly, assuming there exists a suitable match.

The next step is of negotiating terms and conditions of the carriage. Lack of price transparency, a complex and dynamic market and ambiguous charter-party wordings lead to several rounds of communication between the ship-owner and the charterer, through the brokers. It looks challenging for any technology to resolve this issue immediately. Various online solutions have come up with NLP (Natural Language Processing) algorithms to assist humans in this process. However, these algorithms are in a very nascent stage and need further research to increase accuracy.

Once the agreement is signed, the ship transports the cargo. After discharging, the calculation for hire and demurrage is done. Although mathematically simple, it is common for this process to take several days because of documentation and disagreement in figures. Subsequently, international fund transfers are done through a network of banks, taking several days for funds to arrive. A Blockchain-based self-executing smart contract is a possible solution to these problems. The terms and conditions of the agreement can be converted into a mathematical algorithm. It can take certain inputs from trusted third parties, do calculations fitting those inputs in a pre-defined if-this-then-that formula, come up with a non-disputable figure and finally execute a fund transfer. As smart contracts can be pre-loaded with funds, it would guarantee the ship-owner of receiving funds if they meet the obligations of the contract. Such a system will be trustless, and hence there will be no need for a broker for this purpose

End-to-end process reengineering

When we recommend an online platform to help the parties find each other, we see the challenge of establishing the identities as well as that of the network-effect, wherein the proposed system offers no incentive to early adopters. In the third stage, we recommended a Blockchain-based smart contract for executing a charter party agreement and propose that in such a system the contracting parties will no more need a broker to establish trust between them. However, the brokers not only establish trust but also help the parties find each other (stage 1). So if the parties are using the brokers in stage 1, they will continue using them for other associated services as well. Similarly, when we talk about a self-executing smart contract, we see that such a smart contract will not work unless we have an end-to-end document management system in place which is capable of digitally feeding the required information to the smart contract.

A consortium of various stakeholders in the ocean-freight market, such as the ship-owner, the charterer, the trader, the terminals, the customs, the suppliers, the receivers, etc. can use a single Blockchain to engage with each other. Such a consortium based Blockchain can assign tokens to its users. New joiners can buy the tokens to gain a stake in the system, and these tokens can be used as a reputation system. The participants can trade value among themselves using these tokens. As with time the system becomes more efficient and more inclusive, the value of the token will rise. This would give a good incentive to the early adopters to join the platforms and accumulate tokens.

The entire end-to-end process can be done through various applications built over the blockchain. For example, as shown in figure 2, there can be an application(2) for doing fund transfers which the charterer, the bank and the ship-owner use through a certain User Interface(2). And there can be another application to facilitate the document management among other parties. A similar application can be built for identity management of each entity, for creating a marketplace where the charterers and the shipowners can find each other or for trading cargo and any other asset relevant to the ecosystem.
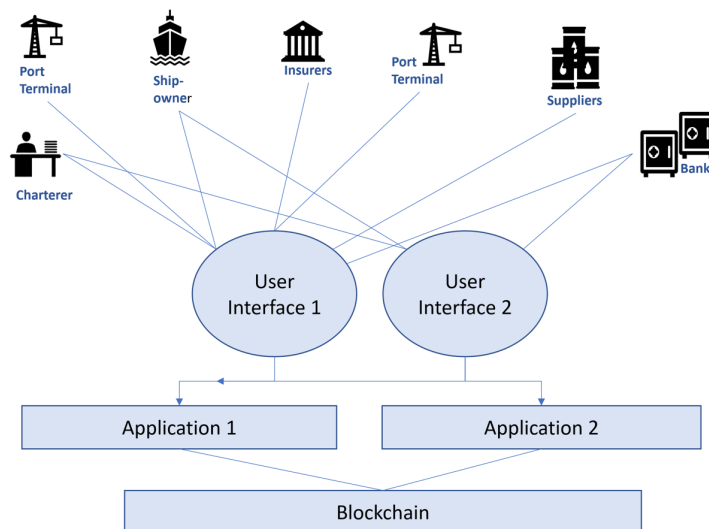

Figure 2

Figure 3 shows a possible example of an end-to-end platform for contract and document management. This example shows how in such a process the management of documents, such as a Statement of Facts (SoF), Certificate of Quantity, Bill of Lading, etc. and contracts, such as a Charter Party agreement become unified. First, the ship-owner and the charterer agree on the rates and the terms and conditions of the CP. This understanding defines the formula for calculations of hire, demurrage and other future actions. When an event such as loading or discharging operation happens, the information generated is fed into digital documents. The platform subsequently feeds this information from the digital document to the smart contract. The smart contract can be designed to generate documents such as a Bill of Lading using the information collected from other documents. Calculation of hire and demurrage followed by a fund transfer can also be next steps.
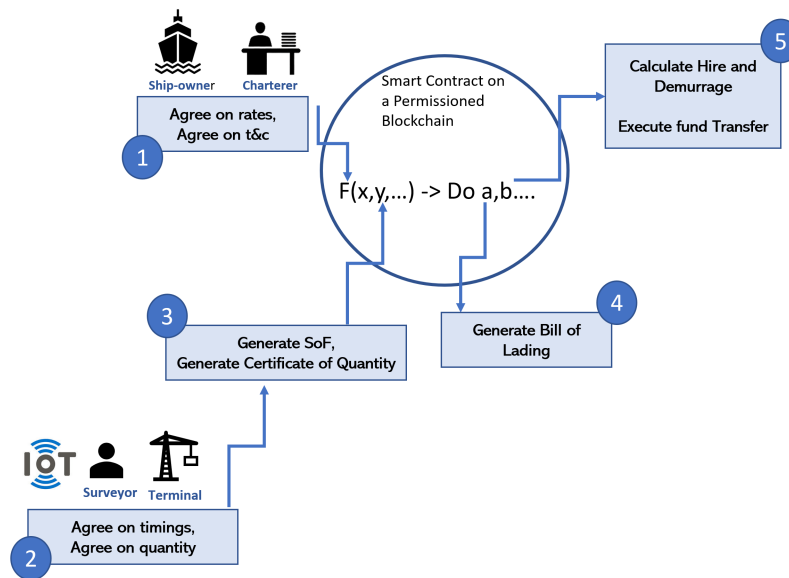
Figure 3

Legal aspects

Changes in our society and markets prompt the legislators to come up with new rules. In the context of contracting, until a few decades ago emails or another form of digital data were not considered valid by several courts in the world. But now not just email but several other forms of digital communication are considered valid. There are some states in the US (e.g., Tenesse) leading this adoption of Blockchain and smart contracts into the legal system. However, it will still take a lot of time for this to become a globally acceptable phenomenon. Till the time the legal system adapts, arbitration is expected to help the adoption of smart contracts.

Conclusions

We see that while there are a considerable cost and time savings possible for certain aspects of the contracting process, there are some problem areas, such as the negotiations, that need more research. We conclude that the proposed solution needs to offer an end-to-end contract and document management tool rather than just being an improvement for one particular step in the process. An industry-wide consortium led Blockchain-based solution has potential to find wide acceptability and impact in terms of increased efficiency.