

Smart Contracts: The Use of the Blockchain Technology in Trade Finance

What would be the impact of the Blockchain's implementation regarding the handling of physical documents and the business processes in trade finance for companies located in Geneva?

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Declaration

This Bachelor Project is submitted as part of the final examination requirements of the Haute école de gestion de Genève, for the Bachelor of Science HES-SO in International Business Management.

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Executive Summary

Today, the commodity trading industry, and specifically the trade finance sector, suffers from inefficient and costly processes. In this Bachelor thesis, we will study the commodity trade finance world, identify its weaknesses and try to strengthen them with a new technology: The Blockchain.

We will explore the different theoretical aspects related to the Blockchain, but also to the Smart Contracts, and the trade finance generally. We will discuss all the participants, the processes and what is required by the industry in general, and situate Geneva's position in the equation.

Further, we will compare the different business processes in order to point out the weaknesses mentioned above, and see how they could be improved using Blockchain technology.

From theoretical conceptions, passing by observation and study of business processes, to practical explorations like the creation of a Smart Contract and the analysis of real case studies and by complementing them with the Blockchain and Smart Contracts technologies, our journey will be long and well fulfilled.

Finally, we will discuss some of the issues and opportunities that could face the trade finance industry regarding the business processes with a potential implementation of the Blockchain.

Would it be efficient? Can we trust this technology? What would be the impediments to its adoption? How would the parties involved in trade finance react to these technology? How can we see the future for an entire industry, which is one on the most significant part of Geneva?

We will try to answer all those questions.

It has been demonstrated and substantially discussed that Blockchain could and would be a revolution in trade finance. Due to large amount advantages could bring in the industry in addition to resolve some of the issues of the "old business world".

Finally, we will propose a potential solution that could fix everyone's problems regarding for the commodity trading market. The creation of a unique platform, based on Blockchain technology and centralizing all the participant at the same place and allowing the creation of Smart Contracts between each other. This would permit an easier way to establish new regulations for the entire business regarding Blockchain and make it binding to everyone, all by being able to monitor more easily potential issues that could occur during the implementation process.

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1. Introduction

1.1 Subject's Presentation

In comparison to other financial markets, the physical commodities markets still labor to catch up with the technological progresses driven by our digital age. The requirement of documentation exchanged by the parties in transactions and the fact that they are still hugely paper based creates heavy and inefficient processes. The waste of time, and by consequences of money, generated by manually checking, monitoring and transferring those physical documents, causes risks and thus compromises the transactions' security.

As our business world is becoming more and more digitized, a new technology is now required to complete the digitalization of these markets and thus enter in a new international trade's era.

Blockchain's technology and Smart Contracts have the potential to become the solution. A significant reduction of the operational costs and the risks involved in transaction, in addition to an improvement of processes' efficiency could be achieved through those technologies.

However, using Smart Contracts through a Blockchain-based platform in commodity trading will require crucial collaboration between the leading companies around the world before spreading to more actors in the market.

The question is: Are Blockchain and Smart Contracts technologies the solution to improve those business processes and the transmission of documents worldwide?

Furthermore, could Geneva, being an international commodity trading's hub in the world in addition to be a pioneer in the use of Blockchain for public administrations, encourage or enhance the development of such technologies for private companies?

This is what we are going to discover with this report.

1.2 Literature Review

Since the discovery of the potential improvements that could be achieved through the Blockchain and the countless applications industries could take advantage of using this technology, researches and investigations have been pursued to determine the potential outcome that could result from a use of the Blockchain and the Smart Contracts.

Trade finance is one of the numerous sectors which showed the potential to enjoy significant improvement regarding the current way of proceeding. In order to understand, visualize and comprehend the potential implications that Blockchain's implementation could bring on the commodity trading market, and more precisely in trade finance, reports, studies, articles and white papers covering this subject have highly been produced.

Among the companies publishing such documents, Cognizant, leader in digital markets worldwide, published a series of white papers between August 2017 and May 2018 (four of the five papers have been published within this period, the fifth has not been published yet) in which they examine the potential outcome that could result in trade finance from a use of the Blockchain technology.

The potential Blockchain's implementation in trade finance makes no doubt regarding the positive outcomes that could result from a Blockchain's global use. The technology could reshape trade finance's landscape by "making it easier to reduce disputes and fraud to provide delivery and payment certainty, enable transparency of trade assets movement, and facilitate the flow of trade receivables" (Varghese, Goyal, 2017, Part 1).

In accordance, the business processes involved in trade finance, especially some of the payment methods, suffer from high inefficiency due to processes' complexity, and resulting in high costs and operational delays. Thus, payment methods, such as Documentary Letters of Credit or Documentary Collections, which "have historically provided effective risks mitigation for trading parties through bank facilitation in the trade finance transaction" (Varghese, Goyal, 2017, Part 2) showed a steady decline in their use.

According to an ICC's (International Chamber of Commerce) study, the volume of Letters of Credit used from 2013 to 2016, declined of around 9% regarding the volume of MT700s (a SWIFT messages used by banks for the issuance of Letters of Credit) and which account for approximately 90% of transactions requiring Letter of Credit worldwide (Varghese, Goyal, 2017, Part 2).

The August 2016 World Economic Forum, in collaboration with Deloitte, also had a close look on “The future of financial infrastructure” (World Economic Forum, 2016) in which they studied and discussed the potential applications of the Distributed Ledger Technology (DLT), the Blockchain.

More specifically, regarding trade finance, they pointed out the processes in effect and their potential improvement through Blockchain’s use. “This analysis was based on over 12 months of research, engaging industry leaders and subject matter experts through interviews and multistakeholder workshops” (World Economic Forum, 2016) engaging more than 180 people experts in their fields mostly in banking system and service providers.

The result of this research indicated the inefficiencies present within the trade finance’s processes and explained the potential benefits that would be highlighted using the Blockchain technology.

In addition to the transparency and the cost savings that the technology would bring, the possibility to automate Letters of Credit through the use of Smart Contracts, thus capturing and storing the transaction’s information has been expressed as a potential opportunity in trade finance. This being a major step forward in the improvement of the current business processes in trade finance (World Economic Forum, 2016).

However, digitization of documents with the purpose to digitalize entire business processes is not new, and the idea did not come up with the appearance of the Blockchain. Almost ten years ago, in 2009, the third edition of the book: *International Trade Documentation*, written by Edward G. Hinkelman, already referred to “Electronic Documents”. At this time, electronic commerce was already “in its early stages”, even if this conception of digitalization “should result in significant reductions in paperwork and savings of time and money” already back in the days, almost a decade later commodity trading and trade finance still suffer from processes inefficiencies due to the paper-based transactions (Hinkelman, 2009).

The reasons: these electronic documentation systems were most of the time designed for governments or regional trading pacts, and were not “customer based”, meaning they were not supposed to serve exporters and importers needs.

In addition, the difference between the processes, structures and regulations regarding the documents “were often incompatible from one nation to another”, furthermore people “will continue to require paper documents as “backups” for the electronic ones”.

Finally, the questions of digital signature being legally recognized was still unresolved, and people did not trust enough the technology, back in the days, to recognize “the legal status of “electronic originals””. Therefore, still requiring original papers for crucial documents, such as the bills of lading, when it came to international trade (Hinkelman, 2009).

Today, with Blockchain technology, we could resolve those issues, and make the commodity trading and trade finance finally enter into the twenty-first century.

Companies such as Ernst and Young, Crédit Suisse, UBS, Goldman Sachs, Mercuria, Dreyfus, ING, BNP Paribas, or even financial technologies companies (FinTechs) are interviewed every days and articles appears in specialized newspapers such as Le Temps, l'AGEFI, Global Trade Review, the Economist, The New York Times and much more regarding Blockchain and its potential applications.

In order to conduct this research, other articles, papers and reports found online have been studied and compiled in order to extract what is done today in the commodity trading sector and in trade finance, but also to be informed on what has been and still continue to be done regarding the Blockchain and the Smart Contracts generally speaking.

1.3 Goals and Report's Organization

The objective of this report is to analyze whether or not the Blockchain technology and the Smart Contracts could be a viable solution in trade finance regarding the handling of physical documents for companies in Geneva. In order to complete this study, I wanted to have a big overview of all the factors that could be impacted by the use of those technologies. I also wanted that someone having never heard about neither Blockchain, Smart Contracts, trade finance, business processes nor any documents used, is not lost while reading my work.

In this way, this report is organized in four parts. The first one, theoretical foundations, will cover all the theoretical aspects of the Blockchain, the Smart Contracts and Trade Finance with the different payment methods, documents used and the Pledge. This in order to introduce the general topic and to acknowledge the different subjects. In order to compile the information in this part, I mainly relied on white papers, official websites and course books to be the most precise possible.

In the second part, the analysis, I will explain how I conducted my research explaining more into details the methodology of my work. Further, the collection of data and examination of the actual business processes in trade finance and regarding the documentary letter of credit will allow to discuss the potential changes and impacts that could result from a use of the Blockchain and Smart Contracts.

To illustrate the changes that could arise, we will then go through several case studies of disputes that happened between companies and that were adjudicated before the court. We will then examine aspects of the disputes, extract issues and try to solve them using Blockchain and Smart Contracts to see if they could be a viable solution. In addition to that, we will go more into details of a Smart Contract created especially for this report and try to better understand how it works.

Then we will discuss all the elements explained in the previous parts in order to determine if an implementation of the Blockchain is feasible in a near future in terms of opportunities, but also issues that it could encounter and the questions that it rises.

Finally, in the conclusion, we will summary all the report's findings and observe how Blockchain's implementation, if any, would impact the trade finance world regarding the handling of physical documents, and what would it mean for the commodity trading market in Geneva.

2. Theoretical foundations

2.1 The Blockchain

2.1.1 Origins

In order to better understand what is the Blockchain technology itself and how it works, we need to explore its origins and discover why this technology has been created in the first place. The Blockchain was born at the same moment as Bitcoin, the famous cryptocurrency created by Satoshi Nakamoto, pseudonym of the supposed programmer or group of individuals that invented and launched the Bitcoin.

At the beginning, the main goal of Bitcoin and the Blockchain was to create a transactional and operational system that would no more require the control of trusted thirds parties, such as banks or governments, all by avoiding the double-spending issue regarding electronic transactions. Blockchain became the mean to achieve this goal by being the transactions' register of Bitcoin.

2.1.1.1 The Double-Spending Issue:

The double-spending issue can be explained as the use of the same asset for two separated transactions. Indeed, one of the main purposes of Bitcoin's creation was to avoid the duplication of bitcoins in order to execute payment to two or more other parties. In other words and speaking roughly, it was to make impossible to "copy and paste" a certain amount of a cryptocurrency and thus, theoretically, make infinite use of it.

The official Bitcoin's website defines this issue and illustrates it as follows:

"Double-Spending within BTC is the act of using the same bitcoins (digital money files) more than once. If I buy an apple for \$1, I cannot spend that same \$1 to buy an orange. If I could, money would be worthless since everyone would have unlimited amounts and the scarcity, that which gives currency value, would disappear. The Bitcoin Core network protects against double-spends by the verification of each recorded transaction within the Bitcoin Blockchain which utilizes a Proof-of-Work (PoW) mechanism.

The Blockchain, which is an open and immutable ledger, ensures that the transactions are finalized by its inputs confirmed by miners. The confirmations make each unique bitcoin and its subsequent transactions legitimate. If one tried to duplicate a transaction the original blocks' deterministic functions would change showing the network that it is counterfeit and would not to be accepted.

Once a transaction is confirmed, it's nearly impossible to double-spend it. The more confirmations that a transaction has, the harder it is to double-spend the bitcoins. By solving the double-spend problem, digital currency has now become viable" (Bitcoin.com, 2017).

2.1.1.2 Blockchain's History

The 31st of October 2008, Satoshi Nakamoto published a white paper called: "Bitcoin: A Peer-to-Peer Electronic Cash System" in which he stated that the commerce on the Internet was too dependent on financial institutions regarding the electronic payment, and as a result "still suffers from the inherent weakness of the trust based model" (Nakamoto, 2008). Furthermore, to prevent the double-spending issue that could happen regarding any digital data, "the only way to confirm the absence of a transaction is to be aware of all transactions" (Nakamoto, 2008). Thus the Blockchain's system appears to be the optimal solution, as it solves both issues.

Few months later, the 3rd of January 2009, the first block is mined: the Genesis Block. Blockchain was officially born. Few days later, the 12th of January 2009, the first Bitcoin's transaction was confirmed and executed. The value of a Bitcoin was established on the 5th of October 2009. This exchange rate of USD 1 for 1'309.03 Bitcoin was calculated on the basis of the cost in electricity that is required for a computer to mine a Bitcoin. The 6th of February 2010, the Bitcoin market was established as a mean of currency exchange, proving the full efficiency of the Blockchain as Bitcoin's underlying technology and allowing its full development worldwide (History of Bitcoin, [online])

The fact that Bitcoin was going public in 2008 and officially launched in early 2009 is not a coincidence. The 2008 financial crisis severely eroded the people's trust in financial institutions, and Bitcoin could have been the solution and a refuge to avoid the control of central authorities over people's money. Bitcoin appeared to be a viable solution to the conventional financial system and thus could be seen as a more sensible alternative for individuals.

The Blockchain system used behind the Bitcoin quickly spread worldwide. Proving its efficiency with time, the technology demonstrated the potential to expand its use to other markets.

"Blockchain is to Bitcoin, what the internet is to email. A big electronic system, on top of which you can build applications. Currency is just one."

(Marr, 2018)

Today, according to Don Tapscott, one of the world's recognized expert on technology's impact on business and society, Blockchain is now “the next generation of the Internet” and he defines it as follows:

“Blockchain is a vast, global distributed ledger or database running on millions of devices and open to anyone, where not just information but anything of value — money, but also titles, deeds, identities, even votes — can be moved, stored and managed securely and privately. Trust is established through mass collaboration and clever code rather than by powerful intermediaries like governments and banks.”

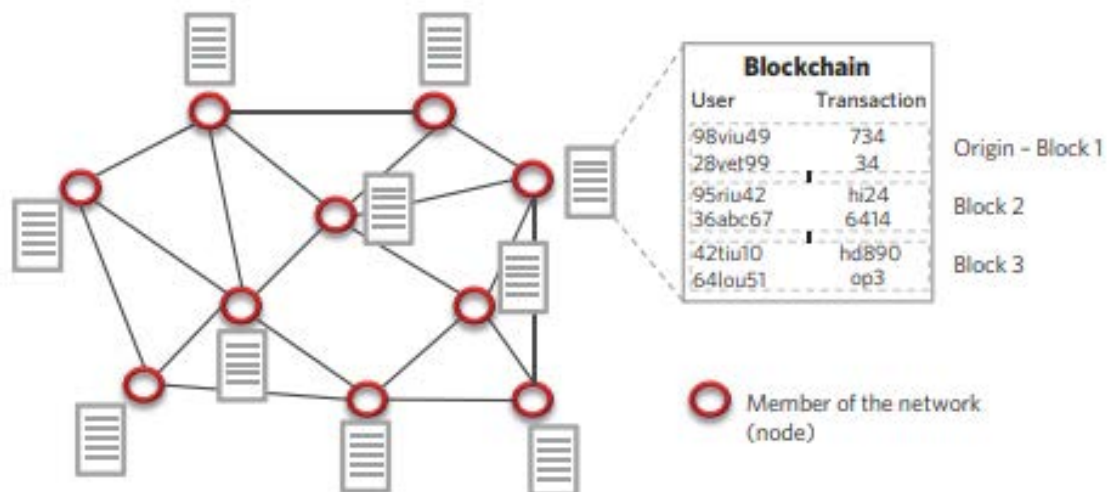
(Don & Alex Tapscott, 2016)

2.1.2 Definition

Roughly speaking, we can consider the Blockchain as a giant database which allows to store and transfer information in a transparent and secure way without a controlling third-party needed.

By principle, the Blockchain is distributed, meaning that it is shared by all its users without intermediaries, which allows to confirm the validity of the data stored within a chain. Doing so, the data stored are then protected, unchangeable and unforgeable.

Figure 1: Blockchain: The Distributed Ledger



(Burelli and al., 2015)

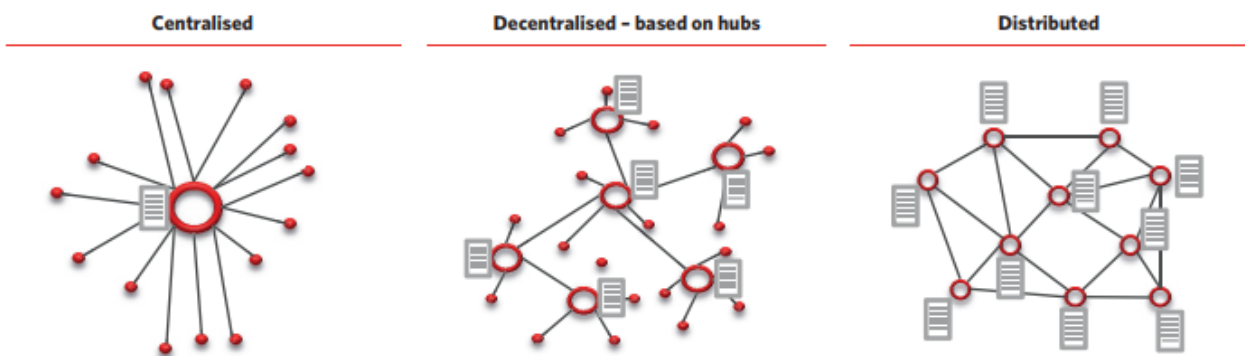
“The Blockchain is an incorruptible digital ledger of economic transactions that can be programmed to record not just financial transactions but virtually everything of value.”

(Don & Alex Tapscott, 2016)

The Blockchain's distributed system, allows to record every transactions happening in the network, thus guaranteeing the security, the immutability and the traceability of the data shared all by allowing significant audit measures.

This guarantees the complete access to the users in addition to the possibility to check and verify the information recorded since the creation of the chain. No intermediaries are anymore needed, which allows to run operations without the control of a central governance.

Figure 2: Distributed Ledger Compared to Centralized and Decentralized Ledgers



(Burelli and al., 2015)

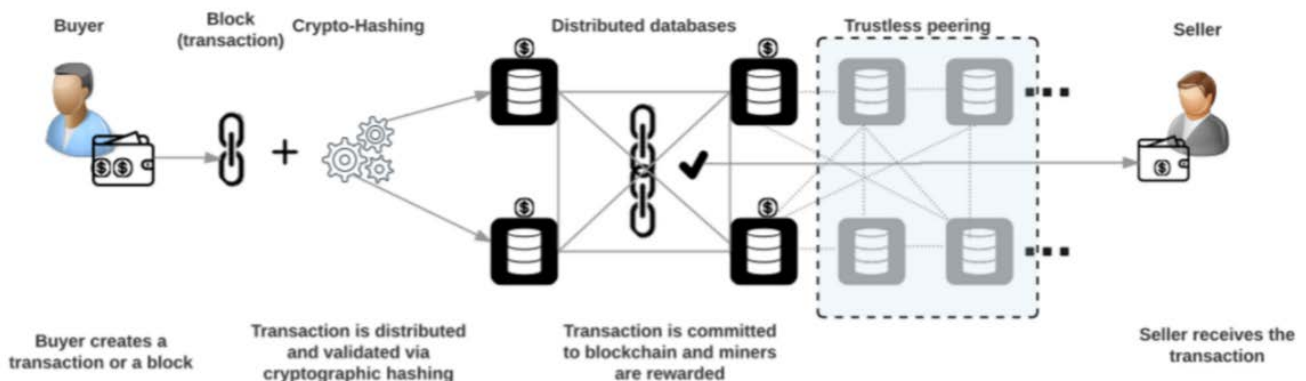
The information's transmission is done Peer-to-Peer, meaning that each operation will be registered by all the parties, called nodes, rather than by a central authority. Nodes are computers connected to the Blockchain and which validate and transfer the information related to transactions.

Every time a transaction is registered, updated or executed, the nodes will distribute the information to the other nodes, link it to the transaction previously done and record everything directly on the platform. This system allows to secure the irreversibility of the records on the chain and ensure that no information can be altered making the data available forever on the network.

We can distinguish two types of blockchains, the private and the public.

The public Blockchain makes everyone on the network having access to the data and able to check the validity of the information, document, currency provenance, etc. from the beginning of the chain to the end operation.

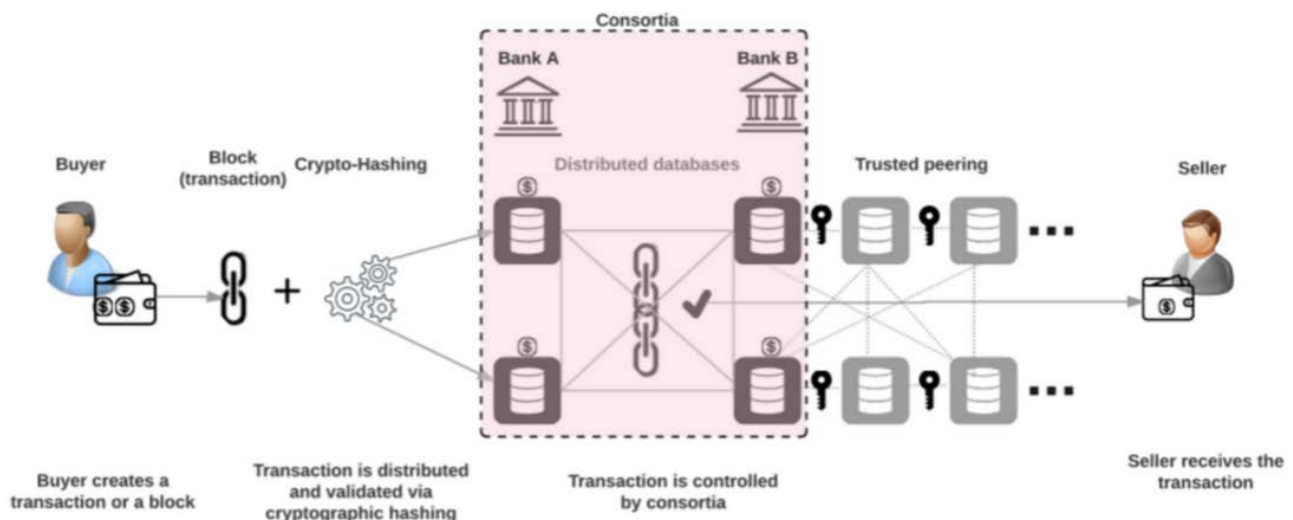
Figure 3: Public Blockchain



(Geek4geek [pseudonym], 2018)

A private Blockchain will restrict the access of the data to several actors who will be directly involved in the transaction. It will be more commonly used by companies wishing to execute transaction in a professional context. The number of parties having access to the chain will be limited to the number of parties involved in the transaction and their direct impact and power on the chain, limited to their role.

Figure 4: Private Blockchain



(Geek4geek [pseudonym], 2018)

2.1.3 Functioning

The famous investment group Goldman Sachs gives us a good definition and explanations of the Blockchain's process, how it works and what it means for the users.

"A Blockchain needs to do two things: gather and order data into blocks, and then chain them together securely using cryptography.

The transaction information is recorded and shared with the other computers in the blockchain network. On the network, the record is combined with other transactions into **a block**—like a traditional computer database. Each transaction is time-stamped. When a block is complete, it also gets its own time stamp. So all information is sequential, which helps avoid duplicate entries.

The completed block is sent out across the network, where it is appended to the chain. Other participants on the network may be sending out their own blocks at the same time.

But the time stamps ensure that data is added in the right order, and all participants have the latest version.

The key to a Blockchain's security is something called **a hash**. It is a bit of cryptographic math that makes the links between blocks virtually unbreakable. **A hash function** takes the information in each block and uses it to create the hash, a unique string of characters. The hash from one block is added to the data in the next block. So when the next block goes through the hash function, a trace of it is woven into the new hash. And so on, throughout the chain.

So if there is any attempt to alter a previously created block, the hash that is encoded in the next block will not match up anymore.

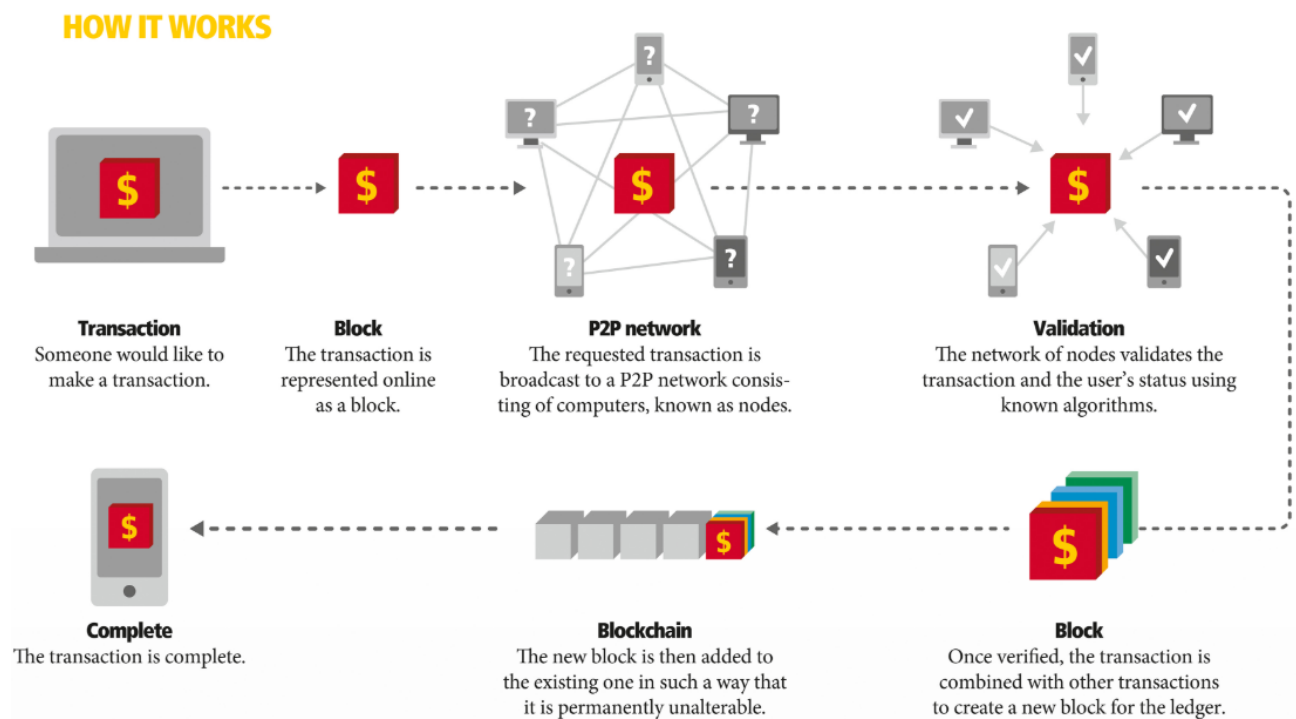
This mismatch will continue through all subsequent blocks denoting an alteration in the chain. Since all participants have a copy of the entire blockchain, they can detect any tampering.

So when the hashes match up across the chain, all parties know that they can trust their records." (Goldman Sachs, [online])

2.1.3.1 Blockchain's Motor:

The computers connected to the Blockchain's network have the mission to replace the centralized entity involved in transactions, such as banks, with the exception that they carry out the transactions 24/7, 365 days per year. They calculate mathematical problems, called "hash", through algorithms calculations in order to find blocks and then register them on the Blockchain. This is called: Mining.

Figure 5: Mining Process



Source: DHL. Explained Blockchain Full. Delivered.dhl.com [online]. [Accessed on the 8th of July 2018]. Available from: <http://www.delivered.dhl.com/content/dam/delivered/master/issues/2017-03/images/issue-3-17-p25-explained-blockchain-full.jpg>

Mining allows to decentralize the system, ensure the well-functioning of the transactions and maintain the network alive.

The integrity of the network can only be compromised if 51% of the total computers on the network are. Which means that the more miners are present on the network, the more secure is the Blockchain, but also the faster are the creation of blocks in the chains. However it is very complicated for a computer to "mine the Blockchain", as the algorithms are very complicated and require a large amount of energy to perform those calculations.

2.1.3.2 Main Uses of the Blockchain

The Blockchain technology could deliver many outcomes in several domains. First of all, it allows transaction of numerical assets, called “tokens”. These tokens can have the following purposes:

“Payment tokens: Payment tokens (synonymous with cryptocurrencies) are tokens which are intended to be used, now or in the future, as a means of payment for acquiring goods or services or as a means of money or value transfer. Cryptocurrencies give rise to no claims on their issuer.

Utility tokens: Utility tokens are tokens which are intended to provide access digitally to an application or service by means of a blockchain-based infrastructure.

Asset tokens: Asset tokens represent assets such as a debt or equity claim on the issuer. Asset tokens promise, for example, a share in future company earnings or future capital flows. In terms of their economic function, therefore, these tokens are analogous to equities, bonds or derivatives. Tokens which enable physical assets to be traded on the blockchain also fall into this category.

The individual token classifications are not mutually exclusive. Asset and utility tokens can also be classified as payment tokens (referred to as **hybrid tokens**). In these cases, the requirements are cumulative; in other words, the tokens are deemed to be both securities and means of payment” (Finma, 2018).

Secondly, Blockchain’s technology can serve as a numerical ledger and serve as a proof regarding the validation, references, traceability and security of numerical and physical assets. This could also allow to establish trustable identity and electronic signatures through the Blockchain.

In Geneva, an innovative project has been put in place in order to establish the identification and the use of electronic signatures qualified with the Blockchain. “This will notably allow to identify the parties involved in a legal Smart Contract and to sign it numerically with a Cantonal legal jurisdiction” (egovernment, innovation 2018/2019).

This would allow the abolition of physical or paper signatures, and execute a whole process’ transactions through the Blockchain. This would be a major breakthrough if it happened to be applied in trade finance.

Finally, the most relevant Blockchain application would be to combine it to Smart Contracts, self-executing programs allowing to automate processes. Smarts Contracts will be explained more into details within the next part: *2.2 Smart Contracts under Blockchain*.

2.2 Smart Contracts under Blockchain

2.2.1 Definition

Basically, Smart Contracts are computer programs using a simple procedure of inputs turning into outputs. In other words, we can compare them to the “IF” function in Microsoft Excel, meaning “If this, then that”. If they exist theoretically for more than 20 years, the recent progress made regarding the technologies around the world put them back at the center of attention.

These computer protocols are very helpful when it comes to the verification, negotiation or performance related to the contract. Due to high facilitation, they could one day replace Documentary Letters of Credit, the result would then be a reduction of the operational costs involved and the risks involved, in addition to significantly increase the processes’ efficiency.

Thus, in trade finance, they are contracts turned into codes involving the conditions and requirements of a sale contract, a letter of credit or any other contract in order to conclude a transaction. For example, if in a sale contract a specific quantity of a product is required, it will be transcribed into code following a predefined logic. If the quantity is correctly met according to the contract’s terms, then the smart contract will process the transaction automatically.

“Smart contracts are by definition self-executing, once certain pre-defined conditions are met, and designed to allow for the exchange of (digital) consideration and/or objects in the real world. In other words, once the conditions agreed upon by the parties and implemented in the code are met, this code will perform certain actions, automatically, with no human interaction needed or tolerated” (Trüeb, 2017).

Smart Contract have the potential to delete ambiguity of traditional contracts, as once turned into code it gives series of ones and zeros there is only yeses or noes, no maybes are possible. The code is not interactive. This allows fast and efficient processes for the parties, as once the Smart Contract is coded they just have to follow step by step the process of the contract until its termination.

Smart Contracts that lean on Blockchain would make execution’s terms and conditions unforgeable. In addition to establish easier faster and cheaper transactional processes. However, there is serious interrogations to take into account before even thinking of a possible implementation that we will explore in the part: 4. *Discussion*.

The legitimacy and the enforceability of such contract have to be discussed, defined and agreed by all participants on the markets in order to obtain a viable and trustable use of Smart Contracts.

The change happens during the verification of the said contract's clauses. Indeed, it is the technology in itself that will check if every contract's terms and conditions of the contract are respected and not a third party or the parties involved in the transaction themselves. The machine doing so, this would reduce the risk of human mistakes, misunderstandings all by simplifying the interactions between the parties.

Of course, the automation of contracts through programs have been done before, however the major change that the Blockchain is bringing to this process is the transfer of digitized assets. In the past, in order to be able to transfer assets, money or property title, the parties concluding a transaction had inevitably to pass through a third parties, such as banks, notaries, etc., to transfer the assets involved. "A smart contract executed on a Blockchain makes possible the automated and secure transfer of digitized assets". (UChange, 2016).

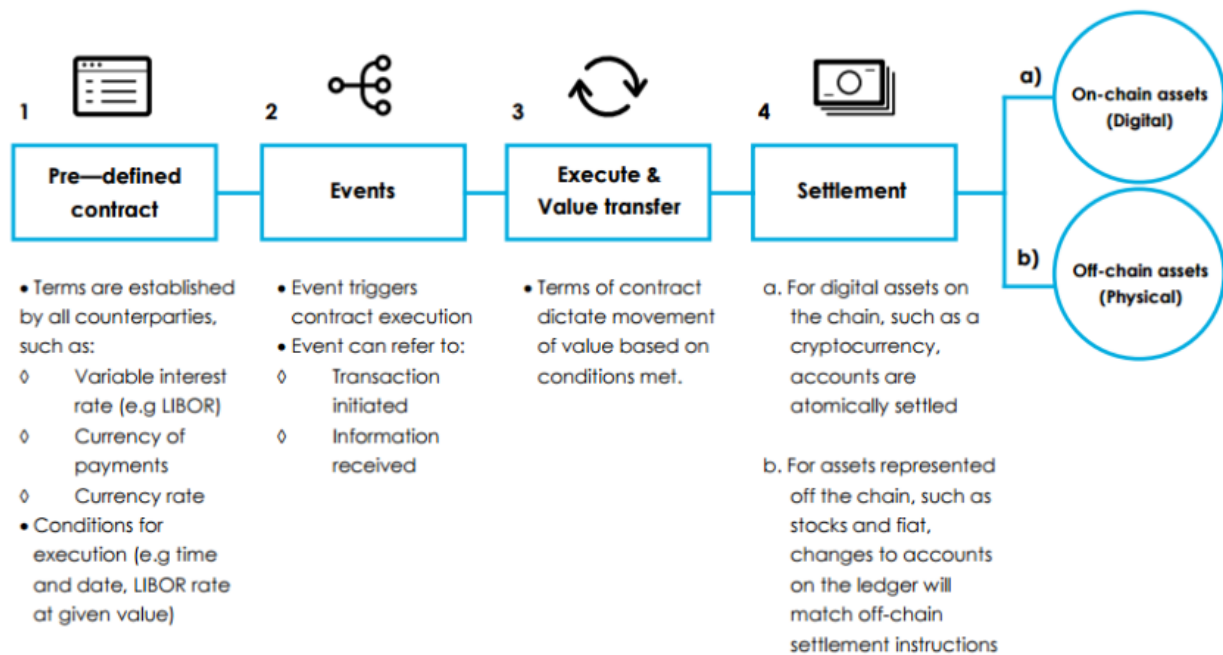
2.2.2 Functioning

In principle, a Smart Contract will be self-verified and self-executed, as it will check by itself the information and data available in order to decide whether or not it shall be executed. Meaning that if the conditions required are gathered and validated, the Smart Contract will deliver the outcome promised within its code. Moreover, a Smart Contract will be tamper resistant, as once it has been coded, and that the contract starts, it will be impossible to change or to stop.

This has its advantages just as its disadvantages. For example. It will allow the parties to execute faster reviews of the contract at cheaper costs, however if the contract's code contains a mistake, or that the code is bad with no security incorporated in order to modify it if needed, the funds engaged could be definitely frozen as the contract will block itself. This is why, the Smart Contracts will absolutely need to be reviewed, controlled and approved by audit companies operating in the technologies' sector, such as Financial Technology companies (FinTech), consultants or specialists.

Thus, once the Smart Contract has been established, with the terms and conditions discussed and approved by the parties, it will then execute itself by any events happening related to the transaction such as a documents received, an information about the cargo confirmed, etc. The Contract will then compute automatically the inputs received, related to the events that happened, compare them with the terms and conditions and then deliver or not the output, often payment.

Figure 6: Smart Contract's Process



Source: BLOCKCHAINHUB, Smart Contract. *Blockchainhub.net* [online]. [Accessed on the 22nd of July 2018]. Available from: <https://blockchainhub.net/smart-contracts/>

2.2.2.1 The Platform

In order to make a Smart Contract work, the parties involved in the transaction need to define the platform that will host the Blockchain, and thus the said contract. Among the most famous ones, we can distinguish Bitcoin, Ethereum, Nem, Stellar or Waves, each having their own coding languages and specifications.

However, regarding trade finance, it is more likely that big companies will use more specialized platforms like Corda, a platform created by R3, a consortium of companies working with Blockchain, and developed especially for businesses, or companies like We.Trade which provide directly the interface built on the IBM Blockchain Platform, powered by Hyperledger Fabric, to conduct their transactions.

2.2.3 Opportunities and Challenges

2.2.3.1 Opportunities

Smart Contracts can have many benefits. They are connected 24/7, 365 days per year, which, compared to financial institutions for example, can be very valuable, especially in international trade. Thus, a smart contract can execute itself all days of the years, banking holiday and weekend included, at any hour of the day.

In addition, Smart Contracts will be executed in real time, meaning that as soon as an action will be executed by a party, the Smart Contract will deliver the proper outcome certainly and instantaneously.

Through the code established to create the Smart Contract, parties will be able to manage risks, such as fraud or human intervention errors, all by reducing the contract's costs about around 30% per contract.

They are fast and efficient automated processes which provide no place for ambiguity.

They are automated processes which are fast and efficient, in addition to provide no ambiguity, as Smart Contracts are turned into formal code which is designed to be read by a machine.

2.2.3.2 Challenges

Even if Smart Contracts could have many benefits, we still need to be careful when coding and putting them online. Indeed, the coding of a Smart Contract can be very complex depending on the terms and conditions of the contract, as well as the number of parties involved in the transaction.

Of course, more the base of the contract is complex, more the code will be accordingly. Make sure that all the rules, laws, conditions, warranties, risks, etc. have been captured, and that the proper action is to be undertaken respectively is quite complicated.

“Smart Contracts demonstrate great promise for parties who understand their purpose, but it is important that parties recognize their limitations before they deploy them, and ensure their counterparty does likewise” (Allen and Overy, 2017).

In addition, a Smart Contract wrongfully coded can cause worse issues. Once a Smart Contract is activated, it is impossible to stop or modify, except if it contains a specific clause ensuring a possible modification during the contract's operation.

So if the contract contains mistakes and is still launched, the consequences can be dramatic. A transfer of asset, or a delivery of payment can be performed without a party's agreement, or even worse, the contract can block itself and freeze the assets or money engaged.

Just like in November 2017, where the Parity wallet froze around 500 million Ethers on the Ethereum platform due to a coding error of Smart Contracts, for an amount being worth between USD 150 and 300 million (Wan and Rice, 2017).

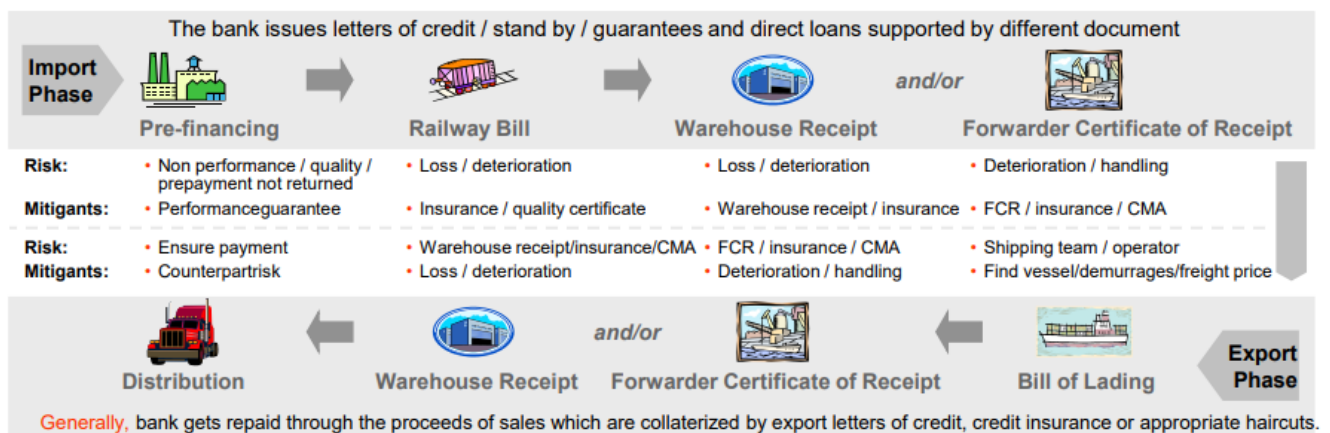
And this is not an isolate case. Thus, precautions have to be taken through proofs-of-concept and trials before engaging significant amount of money or important assets.

2.3 Trade Finance

2.3.1 What is Trade Finance

Trade finance is the international trade's pillar that affords delivery and payment assurance to both sellers and buyers. Trade finance is provided by financial institutions, usually banks, whose roles is to take care of risks regarding the transactional activities, all by being careful to the country risks, especially in emerging markets, in order to allow the self-liquidation of the specified transaction. "For this reason, trade finance is often described as the fuel for global commerce" (Varghese, Goyal, 2017, Part 1).

Figure 7: Trade Finance's Transactional Chain



(UBS Switzerland AG Geneva, 2016)

However, the parties involved in a trade can suffer from business risks and uncertainties such as "process inefficiencies, variance and fluidity in trade regulations and requirements across geographies, and the operational and logistical complexities that arise when a large number of entities interact" (Varghese, Goyal, 2017, Part 1).

2.3.1.1 Trade Finance Participants?

Figure 8: Participants in Trade Finance



(World Economic Forum, 2016)

The importer/buyer requires a product or a service from the seller. His objective is to obtain the goods all by securing the potential risks involved and he is responsible for “listing and clearly communicating to the seller which documents are required. Once the document package is received, either directly from the seller, or indirectly from the seller through the banks, the buyer examines the documents for consistency and accuracy. Problems with documents can lead to receiving unwanted or incorrect goods, problems securing goods from the shipping company or clearing a shipment through customs” (Hinkelman, 2009).

The exporter/seller provides a product or a service required by the buyer. His objective is to obtain payment in exchange of the goods, all by securing the risks involved and is responsible for “preparing and presenting documents in accordance with the terms of the contract for the sale of goods, the documentary collection or documentary letter of credit. If the documents are incorrect or inconsistent there is a risk of having them refused, wasting time and money, and possibly imperiling the transaction itself” (Hinkelman, 2009).

The import and export banks assume the risks respectively for the buyer and the seller depending on the method of payment established between the buyer and the seller. In exchange for the risks taken, they ask for payment and, in case of a Documentary Credit for example, they are in charge of inspecting the documents provided in order to ensure their compliance with the contract and accordingly deliver payment to the seller and further, require reimbursement from the buyer.

The inspection company are in charge of verifying the features of the goods shipped and compare the result with what is required by the documents. They offer a service in exchange of payment by the seller or buyer, depending on the contract clauses.

The shipping or freight company are in charge of transporting the goods from point A to point B at the expense of the buyer or the seller depending on the contract clause. They provide a service in exchange of payment. The goods can be transported by truck, train, ship or aircraft.

The customs are the import and export countries' authorities and are responsible for controlling the goods shipped and ensure that the cargo is legally shipped from the export country and do not represent any danger for the import country.

The correspondent banks are in charge of providing services for the buyer's or seller's banks. They offer a service in exchange of payment and can be requested to advise, confirm, negotiate or reimburse the documents (World Economic Forum, 2016).

2.3.2 All starts with a Sales Contract

Every transaction starts with someone willing to purchase something from someone else. The parties, respectively the buyer and the seller (often respectively the importer and the exporter), enter into a formal written agreement in which both parties agree on the product's type, quantity and price, the responsibilities and rights, the terms and the conditions. The sales contract can be issued either by the seller or the buyer, however the party drafting the contract will have on one hand the advantage of establishing directly the contract's clauses to its will, but on the other hand in case of dispute the disadvantage to be subject to strict interpretation. In this case, if a clause in the contract is not clear enough, or can be misunderstood the liability will go to the party having drafted the contract (Hinkelman, 2009).

According to the Uniform Commercial Code (U.C.C.), a contract for sale "includes both a present sale of goods and a contract to sell goods at a future time.

A sale consists in the passing of title from the seller to the buyer for a price.

The goods, or conduct including any part of a performance, are "conforming", or conform to the contract, when they are in accordance with the obligations under the contract.

Termination occurs when either party pursuant to a power created by agreement or law puts an end to the contract otherwise than for its breach. On termination all obligations which are still executory on both sides are discharged but any right based on prior breach or performance survives.

Cancellation occurs when either party puts an end to the contract for breach by the other and its effect is the same as that of termination except that the cancelling party also retains any remedy for breach of the whole contract or any unperformed balance" (Uniform Commercial Code, 2002).

In addition, it is with the establishment of a sale contract that both parties will design the way to pursue and deal with the transaction, as well as the law and rules under which the transaction has to be settled, and the payment method. These information will then specify the different documents required, and thus the other parties that will be involved in the transaction.

2.3.3 Different methods of payment

When the parties are negotiating the sales contract's terms, it is crucial to define the payment method that suits the most to both parties.

“Negotiating appropriate payment terms is one of the most important aspects of a sale contract and agreed payment terms should be precisely referred to in the contract.”

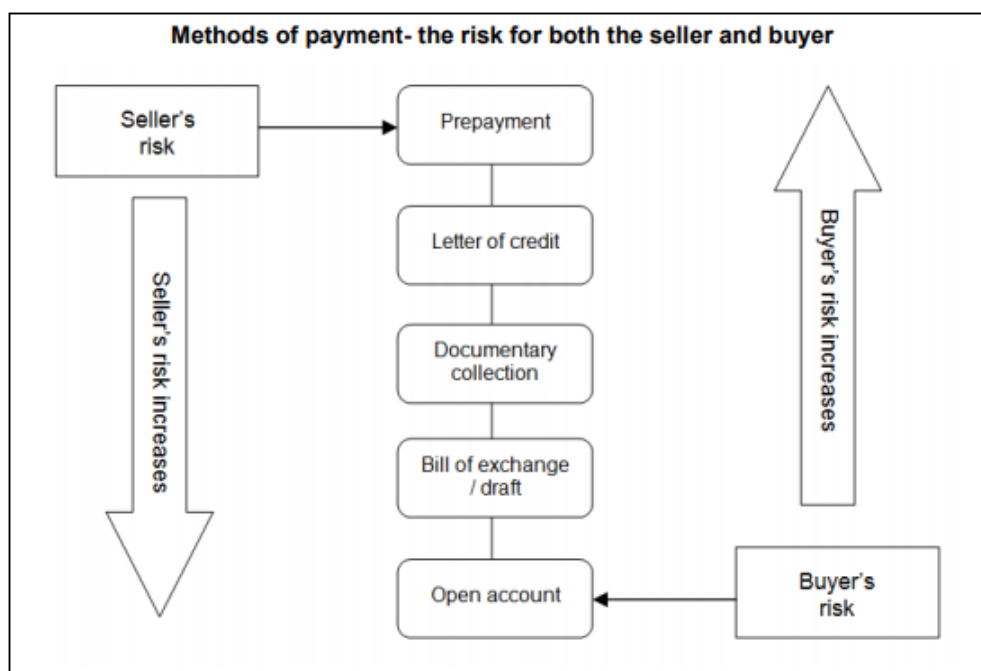
(International Trade Centre, 2010)

Depending on the parties' relationship, the past transactions that have been properly conducted or even the companies' reputations, the method of payment can differ from one contract to another.

To complete an international transaction both parties need to effect or receive payment for the cargo shipped. “To succeed in today's global marketplace and win sales against foreign competitors, exporters must offer their customers attractive sales terms supported by appropriate payment methods. Because getting paid in full and on time is the ultimate goal for each export sale, an appropriate payment method must be chosen carefully to minimize the payment risk while also accommodating the needs of the buyer” (U.S. Department of Commerce, 2008).

In order to ensure payment, the most commonly methods used, which include different risks from the point of view of the seller or the buyer, can be showed as follows:

Figure 9 : Methods of Payment and Risk



(International Trade Centre, 2010)

2.3.3.1 Prepayment/Cash-in-Advance

Prepayment, or cash in advance, is the riskier payment method for the buyer, where he will pay for the goods before their shipment. Thus the buyer has no security or guarantee that the goods will indeed be delivered once the payment has been done. On the other hand, this is the safest method for the seller, where he is sure to obtain payment otherwise he will never deliver the goods.

From the buyer point of view, this method includes many risks. In addition to the lack of certainty to be delivered, the buyer will have to face a period of time where he could lack of liquidity and have cash-flow issues. Given that the buyer will have to engage money for the transaction and will not have possession of the goods, he will thus not be able to dispose of them at his convenience.

Regarding the competitiveness, prepayment is probably not the most profitable solution for the seller, especially if the buyer has other alternatives to obtain the goods. To be chosen by the buyer, the seller will have to offer the best prices compared to potential competitors, which would not be in his best interest (U.S. Department of Commerce, 2008).

With prepayment, banks just have a slight implication. As this method is very straightforward, banks will only be involved if the payment requires a bank wire transfer.

For all these reasons, prepayment method will mostly be used for transaction involving small amounts or if the relationship between the parties is strong and that the buyer trusts enough the seller to obtain the good (Hinkelman, 2009).

2.3.3.2 Documentary Letter of Credit

Documentary Credit (D/C), technical term better used in Europe, compare to Letter of Credit (L/C) used in USA and Asia, is one of the most secured methods of payment regarding international transactions.

“Letter of credit (L/C) is the historic and popular term (and abbreviation) used because such credits were and are transmitted in the form of a letter from the buyer’s bank. However, the formal term is “documentary” letter of credit because of the importance of documents in the transaction” (Hinkelman, 2009).

The letters of Credits are separated contracts issued by a bank (the issuing bank) at request of the buyer (the applicant) and in favor of the seller (the beneficiary). They represent a commitment by the issuing bank to pay the beneficiary only if the terms and conditions, usually the delivery of specific documents, required by the L/C are met and done within the stipulated period, called validity date. (U.S. Department of Commerce, 2008).

“A credit by its nature is a separate transaction from the sale or other contract on which it may be based. Banks are in no way concerned with or bound by such contract...

(UCP 600 Art. 4, 2007)

L/Cs are governed under the Uniform Customs and Practice (UCP) and whose the actual latest version is UCP 600¹ and which gives all the binding rules that have to be followed by the parties using any documentary credit.

Using a Letter of Credit is more convenient when the seller has any doubt on the buyer’s credit information but is satisfied with the buyer’s bank creditworthiness. The main purpose of an L/C is to secure the buyer’s payment through one or several banks, which will ensure the seller to be paid and the buyer that the transaction has been properly performed through the receipt of precise documents as evidences that the goods achieved their final destination in good conditions as agreed in the contracts.

¹ « The Uniform Customs & Practice for Documentary Credits (UCP 600) is a set of rules agreed by the International Chamber of Commerce, which apply to finance institutions which issue Letters of Credit – financial instruments helping companies finance trade. » (<https://www.tradefinanceglobal.com/letters-of-credit/ucp-600/>)

“However, because L/Cs have many opportunities for discrepancies, documents should be prepared by well-trained professionals or outsourced. Discrepant documents, literally not having and “i dotted and t crossed,” can negate the bank’s payment obligation” (U.S. Department of Commerce, 2008).

This is why it is considered as the most difficult payment method, due to the large amount of work and verification that has to be engaged, but deliver the best security for the parties by involving banks representing them. The notion of strict compliance has to absolutely prevail when using a Documentary Credit. Everything that is required under a Documentary Credit has to be respected and provided within the period of time stated.

2.3.3.2.1 *Documentary Credit and Standby Letter of Credit*

The Documentary Credit is considered as a payable instrument and ensures the seller to obtain payment from the bank against the presentation of the documents. The seller only obtains payment if the original documents are presented to the paying bank and compliant with what requested in the Documentary Credit within the period of time given (Barras, 2018).

The Standby Letter of Credit represents an insurance for the seller in case of buyer’s default to pay. The Standby Letter of Credit is always payable at sight, meaning that the payment has to be done immediately, usually 5 banking days, once the documents required have been presented.

2.3.3.2.2 *Unconfirmed and Confirmed Documentary Credit*

A Documentary Credit can either be unconfirmed or confirmed. With an unconfirmed documentary credit, only the issuing bank will be responsible for providing payment against the seller’s presentation of documents. The issuing bank’s responsibility is then to ensure payment. However, as the issuing bank, often in the buyer’s country, is the only institution that provides security to the seller, this last has to take into account several risks, such as the sovereign risk, the country risk and of course the issuing bank risk (Barras, 2018)

In order to mitigate those risks or even eliminate them, the seller can ask for a confirmed Letter of Credit. Thus, the transaction will require another party, a confirming bank, which will provide a first payment against the seller’s presentation of documents, and then will be repaid by the issuing bank after transferring the said documents. This way, the undertaking to pay the seller is shared by the issuing bank and the advising bank, which double the security for the seller to obtain payment (Barras, 2018)

2.3.3.2.3 Documentary Credit Execution

A Documentary Credit can be made available in different ways:

By sight : Once the bank receives the documents, it has 5 banking days in order to verify them and if the documents are compliant, the payment is done immediately.

By deferred payment: Once the bank receive the documents, it will pay some time after the shipment day, it can be 30, 60, 90 days, etc. depending on the contract terms.

By acceptance (with the use of a Bill of Exchange): basically the same process as the documentary credit available by differed payment, except that it will require a bill of exchange (or draft), which is mandatory for a credit available by acceptance, as proof and insurance to obtain payment.

By negotiation: Another bank rather than the issuing bank can give immediate value of the documents (after verification of compliance) (Barras, 2018).

2.3.3.3 Documentary Collection

The U.S. Department of Commerce describe the Documentary Collection (D/C) as “a transaction whereby the exporter entrusts the collection of a payment to the remitting bank (exporter’s bank), which sends documents to a collecting bank (importer’s bank), along with instruction for payment. Funds are received from the importer and remitted to the exporter through the banks in exchange for those documents. D/Cs involve using a draft that requires the importer to pay the face of the amount either at sight (documents against payment [D/P] or cash against acceptance²). The draft gives instruction that specify the documents required for the transfer of title to the goods.” (U.S. Department of Commerce, 2008).

“In a documentary collection transaction, the seller uses banks as intermediaries to ensure that the documents conveying title to the shipment are not transferred to the buyer until payment or suitable promise of payment) has been made. Is a “documentary” collection because documents form the basis of the procedure. Documentary collection transactions require a great deal of documentation” (Hinkelman, 2009).

In terms for the parties, the Documentary Collection is half-way between the prepayment and the open account, all by reducing the operational costs that would be involved with a Documentary Credit.

As it does not establish a contractual agreement between the parties such does the Documentary Credit, and that it does not imply a security for the seller that a bank will ensure that payment will be made, Documentary Collection’s employment as payment method will highly depend on the parties’ relationship and the level of trust (U.S. Department of Commerce, 2008).

² Depending on the nature of the bill of exchange (sight or term bill of exchange).

2.3.3.4 Bill of Exchange/Draft

The bill of exchange, or draft, is used to secure the payment to the seller. It is a written instrument, signed by a person (drawer) such as a buyer, and addressed to another person (drawee), typically a bank, ordering the drawee to pay a stated sum of money to yet another person (payee), often the seller, on demand or at a fixed determinable future time acting as a separate contract which makes payments binding and protect the seller by the law. It can appear as a simple piece of paper, however still is an important document in order to manage credit and to obtain financing (Hinkelman, 2009).

The definition of a Bill of Exchange explained in the *Bill of Exchange Act of 1882* is still observable today and can be explained as follows:

“An unconditional order in writing, addressed by one person to another, signed by the person giving it, requiring the person to whom it is addressed to pay on demand or at a fixed of determinable future time a sum of certain in money to or to the order of a specified person, or bearer” (The Bills of Exchange Act, 1882).

Most of the time, bill of exchange will be used in a documentary collection transaction, the seller sends to a bank or directly to the buyer a formal demand in writing requiring payment against presentation of the full set of documents required. Bills of exchange are either payable at sight, then said at sight, or it can be payable at a future specific date or determinable date, such as 30, 60 ,90 days after reception of documents, then the bill of exchange is called “Time Draft” (Hinkelman, 2009).

“The use of a bill of exchange/draft as the payment method should be agreed between exporter and buyer at the time the sales contract is negotiated. Upon shipment of the goods, it is issued and signed by the exporter, which gives the exporter and not the buyer full control over its issuance. To enhance the certainty of payment, a bank can add its guarantee to the draft. The bank can do this by simply signing the draft. Once signed by the bank, the bill is called a banker’s acceptance. The bank will of course charge a fee for taking the drawee’s payment risk” (International Trade Center, 2010).

2.3.3.5 Open Account

A payment in open account is the opposite of the prepayment. The credit risk passes from the buyer to the seller, meaning that the seller will deliver the goods to the buyer and only when the goods are received the buyer will pay the seller, often after a period of time, this can be 30, 60, 90 or even 180 or 360 days after shipment (U.S. Department of Commerce, 2008).

Open account terms are also common, however, this time this is the seller who has no guarantee to be paid once he delivered the goods that is why this payment method is most of the time used in transaction “where the exporter/seller sufficiently trusts that the importer/buyer will pay for the shipment at a later date. Obviously, this is the best arrangement for the importer/buyer in terms of cash flows and cost, but it is consequently the highest-risk option for an exporter” (Hinkelman, 2009).

Just like prepayment, with open account banks just have a slight implication. The method being also very straightforward, banks will only be involved if the payment requires a bank wire transfer.

2.3.4 Documents in International Trade

2.3.4.1 Role of the documents

Depending of the payment method, several documents will be required in order to conclude the transaction. The Documents will thus have different roles for the parties involved. These roles are explained in the book: A Short Course in International Trade Documentation written by Edward G. Hinkelman.

For the seller and the buyer, the documents will serve as a mean of record of the transaction in order to keep a track of what have been done and register it in the company's accounting. As proof, the documents will also be used as receipt stating that the right amount of goods has been delivered properly. In addition, they will serve for export and import clearance to ensure that the seller has the right to sell the goods, as well as proving their origin and will allow to the authorities to confirm what goes in and out of the respective countries. Finally, the instructions and information regarding the transaction have to be stated in the documents, such as who is in charge of handling and transporting the goods, in addition to who is in charge of the documents' inspection and acceptance.

For the shipping company or the freight forwarder, the documents will provide the different instruction of where the goods have to be delivered in addition of the conditions of shipment and the instructions to handle the shipment. They will also of course serve as record of the transaction for accounting purpose.

The banks involved in the transaction will use the documents required as basis for financing and also track the transaction's process. They will contain the different instructions for the document's collection and the requirements in order to performing payment. Of course, the different documents will also serve as accounting tool.

The insurer will use the documents in order to evaluate the potential risks regarding the transaction and thus quantify the value of the insurance that has to be organized. In case of loss of the cargo the insurer will refer to the documents as trail in order to either recover the cargo or determine the best suitable option to follow.

For the exporting and importing countries, the documents will serve as proof of right of export and import, and see if the cargo does not represent any health or sanitary dangers. The authorities will use the documents as tool in order to assess duties and use the results for the statistical information of the respective countries.

For all the parties, this is the documents that will provide the proof of ownership and possession throughout the transaction (Hinkelman, 2009).

2.3.5 Key Documents

The following points are the documents that are commonly used in trade finance. These documents are most likely to be transformed in the future with the use of Blockchain's technology. However, in order to understand what would be the impact in trade finance with their digitization through Smart contracts, we have to know the purpose and the use of each of them.

2.3.5.1 Commercial Invoice

A commercial invoice, as the name suggests it, is the invoice issued by the seller stating the amount of money to be paid by the buyer for the goods engaged in the transaction. "The commercial invoice is the key transaction or accounting document describing a commercial transaction between a buyer and seller. It is issued by the exporter/seller. It identifies the seller and buyer, gives identifying numbers such as invoice number, the date, shipping date, mode of transport, delivery and payment terms, and a complete list and description of the goods being sold including quantities, prices, and discounts. It is virtually identical to a domestic commercial invoice. Export Invoice are often signed by the exporter and state the country of origin of the goods" (Hinkelman, 2009).

Regarding a deal requiring a letter of credit, the Article 18 a. of the UCP 600 states that a commercial invoice "must appear to have been issued by the beneficiary, must be made out in the name of the applicant, must be made out in the same currency as the credit and need not be signed" (UCP 600 Art. 18, 1933).

2.3.5.2 Bill of Lading (B/L)

The bill of lading is the most important document when it comes to international trade. It is a document of title to deliver possession to its rightful holder. It can also be used as a receipt, an evidence of the contract of carriage and, if the transaction requires it, can become a contract of carriage.

"A bill of lading is a document issued by a carrier to a shipper (exporter/seller/consignor), signed by the captain, agent, or owner of a vessel, furnishing written evidence regarding receipt of the goods (cargo), the conditions on which transportation is made (contract of carriage), and the engagement to deliver goods at the prescribed port of destination to the lawful holder of the bill of lading.

A bill of lading is, therefore, both a receipt for merchandise and a contract to deliver as a freight. It can also serve as the title document, in which case whoever holds it can claim possession of the goods. There are a number of different types of bills of lading and a number of issues that relate to them as a group of documents” (Hinkelman, 2009).

Under UCP 600, the information and rules of the bill of lading can be found under the articles 19 to 25.

“The Bill of lading is a negotiable instrument that can be transferred merely by endorsement or delivery. Endorsement of such a document transfers the rights to money or goods as described in the negotiable instrument to the holder of the document” (Hinkelman, 2009).

In order to convey possession, a bill of lading can be endorsed and delivered how many times we want, as it contains the words: “to order”. If it is “blank endorsed” it just needs to be delivered, not endorsed again.

2.3.5.3 Import and Export Declaration

The import and export declarations are the formal statement made by the importer and the exporter to their respective authorities and which identify “the seller, buyer, goods shipped, date of issuance, country of origin and country of final destination, quantity, description and cost of the goods, and shipping details” (Hinkelman, 2009).

These documents are required by the different countries in order to “control imports and exports, assess duties, and compile trade statistics” (Hinkelman, 2009).

2.3.5.4 Certificate of Origin

A certificate of origin will usually be issued by the chamber of commerce of the country to the exporter, however in some countries, other authorized authority such as ministries or customs authorities can also issue Certificates of Origins. “This document declares the country of origin of the goods shipped. It is typically required by the importer for the import authority of the country of import, but may also be required by the export authority. In the most straightforward transactions the exporter/seller makes a notation on the export declaration or at the bottom of the invoice.

If a shipment is made between countries that are members of a trade pact, this document will attest that the goods originated in a member country” (Hinkelman, 2009).

The International Chamber of Commerce (ICC) states that the certificate of origin “certifies that goods in a particular export shipment are wholly obtained, produced, manufactured or processed in a particular country. They also serve as a declaration by the exporter.” (International Chamber of Commerce, [online])

Further, the ICC explains that two types of certificate of origin exist and can be issued by the chambers of commerce: The Non-Preferential and Preferential Certificates of Origin.

The first one “certifies that the goods’ country of origin does not qualify for any preferential treatment. These are the main type of COs that chambers issue and are also known as “ordinary COs.” And the second one “certifies that goods are subject to reduced tariffs or exemptions when they are exported to countries extending these privileges. COs may be needed to comply with Letters of Credit, foreign Customs requirements or a buyer’s request”

2.3.6 Other Documents

Other documents are also to ensure the well settlement of a transaction.

2.3.6.1 Insurance Documents/Certificate

In order to secure the transaction and mitigate the risks, one of the party has to provide an insurance to the cargo (the party in charge of providing insurance will be designated by the Incoterm³ used for the transaction.

“This document, issued by the insurance company or its agent, provides proof of insurance for a shipment. In the most straightforward transactions, insurance is provided by the carrier and may be noted on the bill of lading itself.

Insurance provides an indemnity against the risk of loss or damage with regard to a specified contingency or peril. There are number of types of insurance used in international trade. These include coverage against risk of loss or damage to cargo, damage to foreign production facilities, and kidnapping and ransom insurance for foreign-based personnel.

A document indicating the type and amount of insurance coverage in force on a particular shipment. It is used to assure the consignee that insurance is provided to cover loss of or damage to cargo while in transit” (Hinkelman, 2009). Under UCP 600, the article related to the insurance documents and coverage is the article 28.

³ Incoterms are a set of rules established by the International Chamber of Commerce (ICC) to the use of domestic and international trade terms.

2.3.6.2 Inspection Certificates

In order to assess the cargo's viability and certify that it does not represent any danger, inspections have to be carried out. The companies in charge of this task have to be neutral and independent and have to be accredited to perform those inspection and to issue official certificates. However, it is possible that some time the goods' manufacturer or even the shipper issues the inspection certificate (Global Negotiator, [online])

Inspection certificates are extremely important in international trade, as the continuation of the transaction depends on it, the company in charge of the inspection ascertaining whether or not the cargo is in line with the requirements of the sale contract.

"An inspection certificate, which is issued by an independent trustable company, verifies whether or not the goods are in conformity with the sales contract in regards to quality, quantity, tariff classification, import eligibility and price of the goods for customs purposes" (Advancedontrade.com, [online]).

Generally, the inspection is done prior to shipment and the certificate is issued and signed by the inspector right after the inspection's finalization.

The inspection company can run several categories of inspections and issue the related certificates depending on the cargo shipped and the requirements, such as sanitary, fumigation, veterinary, public health, etc.... certificates. Certificates of quantity and quality may also be required in order to assess that the goods are completely conformed to what is required under the contract.

"It is often required by the importer or the import authorities. It may also be required by certain nations as a means of controlling fraudulent transactions that circumvent exchange control regulations (i.e. overstated quantities or under-declared valuations). An import license may require a "clean report of findings" by an authorized inspection organization before the goods can clear customs or payment can be made" (Hinkelman, 2009).

Specifically to the oil market, authorities can require an ullage report. This certificate is exclusively used regarding tanker vessels and measures the "free space left in the tanks after loading liquids in bulk" (Ship Inspection, [online]). This way allows to determine the quantity of oil, or other liquid, that has been shipped.

2.3.6.3 Letter of Indemnity

Another document specific to, and very frequently used in, oil trade is the Letter of Indemnity. This document allows to obtain payment although the bill of lading is not available, due to the time of transfer required.

“Its primary purpose is to obtain payment on a timely basis whereas bills of lading are not available when payment becomes due, because of the slowdown of circulation of documents.

LOI facilitates utilization and payment of documentary credits (it reduces to a large extent the risk of discrepancies since the examination of documents is limited to the invoice and the LOI which are simply to be issued by the beneficiary as a mirror (copy/past) of how they are called for under the D/C” (Barras, 2018).

A Letter of Indemnity “serves to protect the carrier/owner financially against possible repercussions in connection with the release of goods without presentation of an original bill of lading. A letter of indemnity is used in cases in which the goods arrive at the port of destination before the original bill of lading. The issuance of the letter of indemnity allows the purchaser to take immediate delivery of the goods, thus saving himself time, additional demurrage, storage expenses, insurance costs, etc.” (Global Negotiator, [online]).

2.3.6.4 Packing List

« A packing list is a document prepared by the shipper listing the kinds and quantities of merchandise in a particular shipment. A copy of the packing list is often attached to the shipment itself and another copy sent directly to the consignee to assist in checking the shipment when received. It is also called a bill of parcels” (Hinkelman, 2009).

The seller issues a packing list in to indicate “the net and gross weights, dimensions and contents of all shipping pieces (boxes, crates, bundles, etc.) in a shipment. Each packing list should reference the shipment for which is made, and the line item totals should agree with the relevant commercial invoice.” (Global Negotiator, [online]).

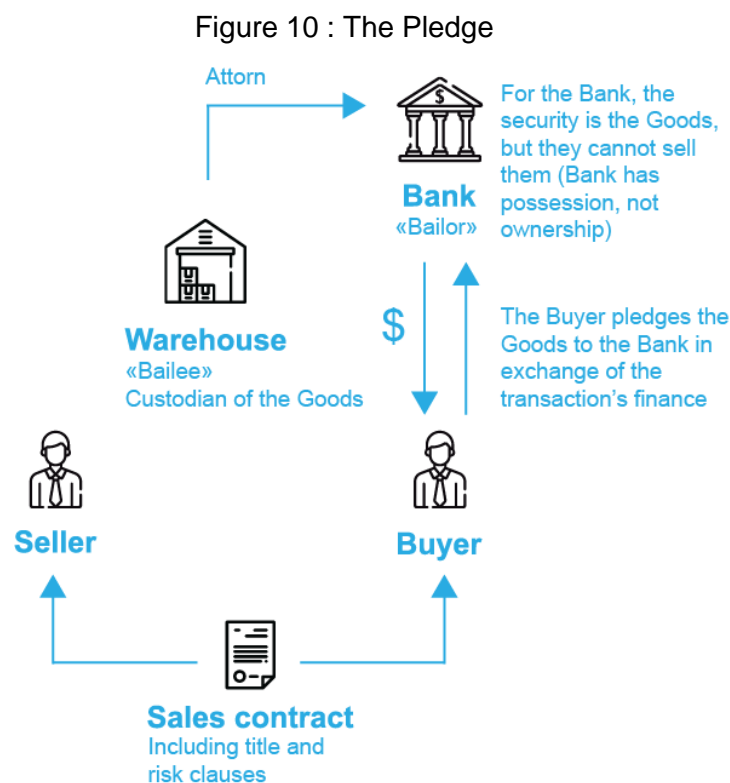
Ideally, the packing list is issued for cargoes containing more than one shipping piece. Indeed, in addition to provide information about the quantities of the goods shipped, “they aid in identifying lost cargo, especially for carrier and insurance claims, they permit selective inspection by customs authorities, and many government require them for large shipments and they provide a “map” of the shipment, enabling the buyer to easily unpack and stock the shipped goods” (Global Negotiator, [online]).

2.3.7 Pledge and Collateral Management in Trade Finance

2.3.7.1 Pledge

When any creditors finance a transaction, they will always look for security. In order to secure their position, the creditors, usually banks, will take possession of the goods involved in the transaction, the ownership still being retained by the debtor, as security for the debtor's payment or any other obligation to be realized.

"A pledge is a type of bailment. As the delivery of the asset forms the fundamental basis of creating a pledge, only assets that can be reduced into possession, such as tangible properties or documents of title, can be pledged in law" (Yung, 2013).



Source: adapted from Geneva Business School of Administration, commodity trading major course, 2017-2018. Icons from Freepik [pseudonym] and available from: www.flaticon.com

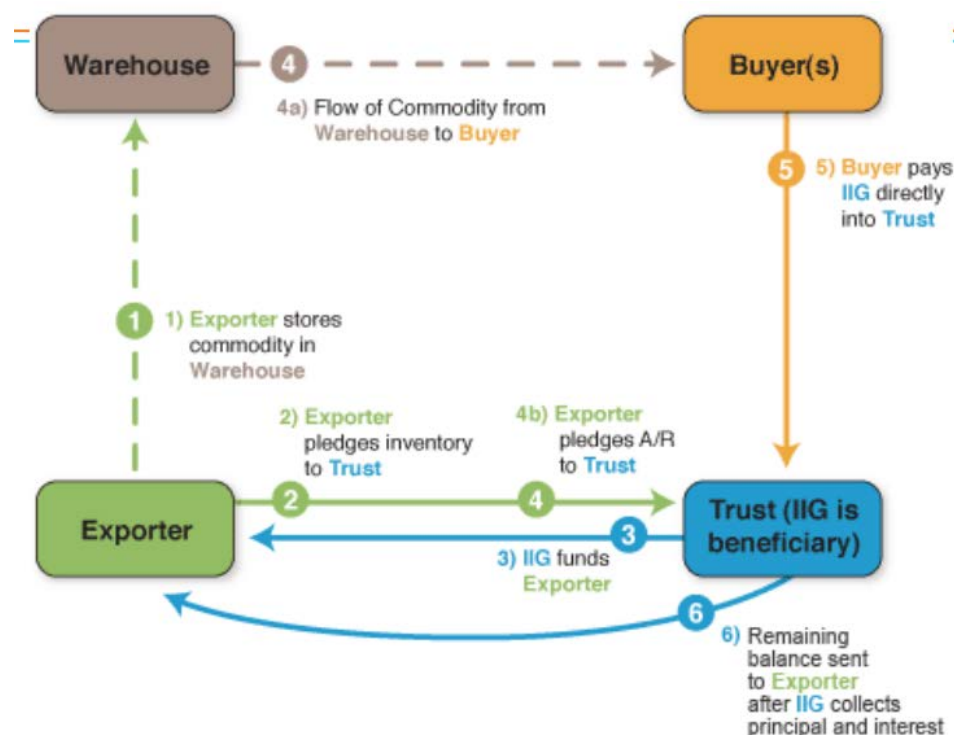
We can compare a pledge as a form of bailment. If the debtor does not honor its obligation to reimburse the creditor, then the latter will use the goods involved in order to recover his loss. Under English Law, a pledge can be created in two ways: the first one is actual delivery, meaning that the creditor will have the goods physically in his hands, and the second is constructive delivery.

Most frequently, a pledge will be achieved by constructive delivery through a document of title such as a bill of lading. The delivery is then “symbolic”, meaning that the creditor has possession of the goods through a document. However he only obtain ownership in case of debtor’s failure to pay or bankruptcy. Then, only in case of default, the creditor has the right to sell the goods directly.

Another constructive delivery can be done through an attornment. This is the most commonly used method in international trade regarding pledge. With an attornment, a third party (Warehouse Company or Collateral Manager) will hold the goods on behalf of the creditor and only release them or act upon creditor’s request or instructions.

In order to continue a pledge, bank can use a Trust Receipt. A Trust Receipt is a document which is used to continue a pledge and that helps banks to secure their goods whenever a transaction is going on (Piller, Trade Finance Structure 2018).

Figure 11: Pledge’s Process



(Piller, Trade finance structure, 2018)

2.3.7.2 Collateral Management

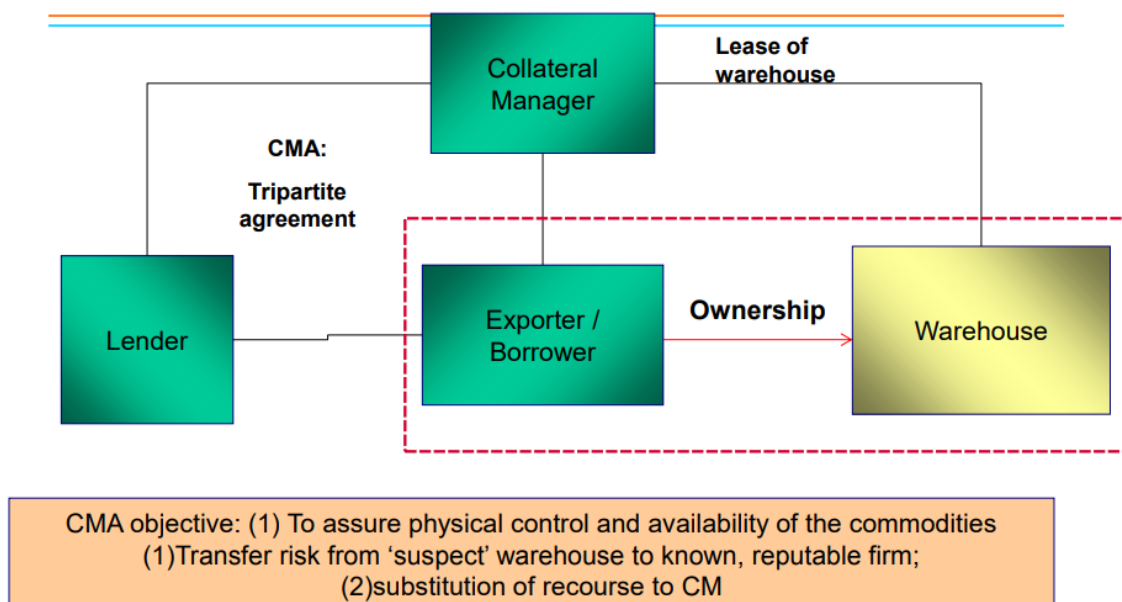
In the case the goods have to be stored somewhere waiting to be further transferred in order to be sold, the creditor, usually banks, can establish a Collateral Management Agreement (CMA). This to ensure physical control and availability at all time of the goods stored. The party responsible for the management of the warehouse or the goods will then issue to the owner of the goods a warehouse receipt. Usually, in case of collateral management or pledge, the goods' owner will request an issuance of warehouse receipt in the name ("to order") of the lender.

"The collateral management hugely depends on the reliability and honesty of local people "on the ground"

(Piller, 2018)

The fact that collateral management requires people to be on the field raise the question of trust and the potential frauds that could arise from people dishonesty.

Figure : Collateral Management Agreement (CMA)



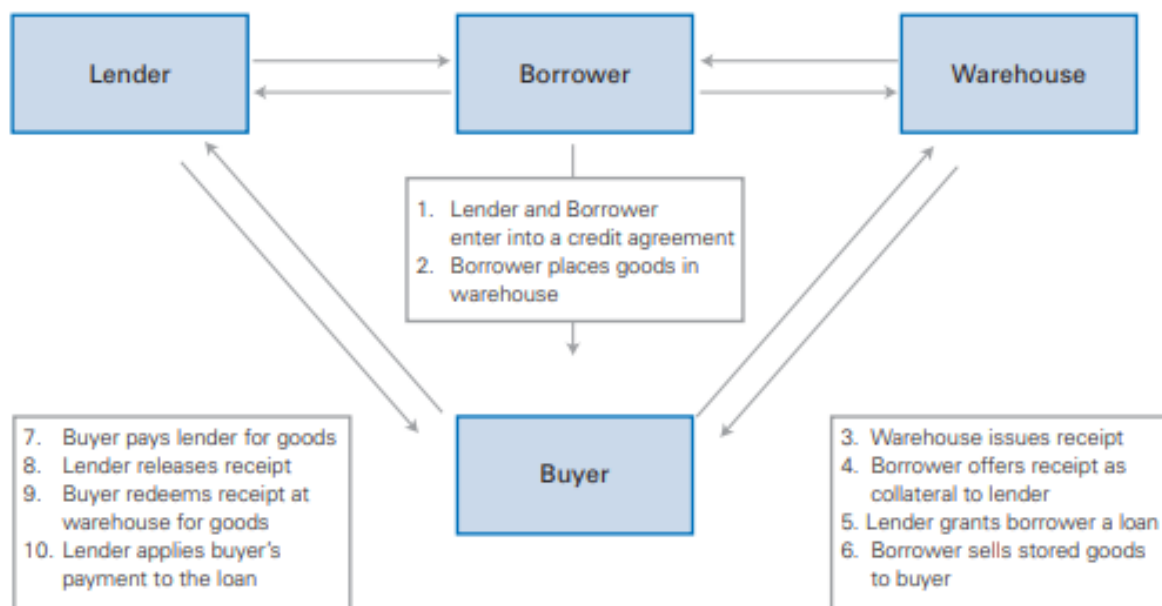
(Piller, Financing the commodity 2018)

2.3.7.2.1 Warehouse Receipt

In collateral management the party in charge of keeping the goods in the name of the rightful owner issues a warehouse receipt. This document acts as an enforceable contract (under English Law) between the warehouse operator (the bailee) and the party placing the goods in custody (the bailor). Thus, the warehouse receipt evidences the reception of the goods and “conveys the right to withdraw a specified amount and quality of the commodity at any time from the warehouse. Depending on the type of warehouse (public, private or field warehouses) the parties’ arrangement can vary.

The warehouse manager is liable for guaranteeing the safety and quality of the stored commodity. The warehouse receipt can then be transferred to a bank, which provides a loan equivalent to a certain percentage of the value of the stored commodity” (Höllinger and al., 2009).

Figure 13: The Use of Warehouse Receipt



(Höllinger and al., 2009)

The warehouse receipt can be a negotiable, or non-negotiable (depending on the underlying law) document of title which does not necessarily require a signature and that can just be transmitted by hand. Thus, just like the bill of lading, it is imperative that the warehouse receipt contains the words “to order” in order to make it transferable. If the warehouse receipt is endorsed to order to the name of a specific person, then it becomes non-negotiable (Piller, Financing the commodity, 2018).

Thus, just like the collateral management, a warehouse receipt rely on the integrity on the party issuing it. As it undertakes the functions of local property rights and assess of the warehouse quality, the security and inspection system, as well as the legitimacy of the management in place.

“In the end, a Warehouse Receipt is only as good as the company that issues it”

(Piller, Financing the commodity, 2018)

That is why, big issues can arise, such as the famous fraud in Qingdao Port in 2014, where several warehouse receipts were issued regarding the same goods. This “double-spending” of warehouse receipts is one of the main concern regarding collateral management.

“In warehouse receipt finance, the bank shifts its credit risk from the borrower to the entity issuing the warehouse receipt – the warehouse operator. The financial strength of the warehouse operator is therefore crucial for the proper functioning of a warehouse receipt system” (Höllinger and al., 2009).

3. Analysis

3.1 Methodology

The question of a potential implementation of the Blockchain and the impact related in trade finance regarding the business processes and the handling of physical documents being a very specific subject, I had to address to specialists in their field. People working directly with Blockchain and Smart Contracts in FinTechs, specialists in trade finance in the banking system or even traders involved in the commodity trading markets.

This is why a qualitative research was more appropriate in order to obtain the information required. To do so, I created a survey to be sent or discussed directly with the people concerned (Survey available in the *appendix 7.1*).

Then, I had several opportunities to attend several conferences on the Blockchain and its potential applications. Notably, on the Blockchain and Bitcoin Conference by BBC Switzerland, the 21st of February, at the Kampinski Hotel in Geneva. The Blockchains & Crypto-monnaies conference organized by Clusis, on the 8th of May at the Geneva School of Business Administration, in Geneva. And the Blockchain for Good by GreenBuzz Geneva, on the 18th of July, also in Geneva.

Further, in order to observe what would be the impact regarding Geneva more specifically, I compiled data found on official websites of companies, associations and Geneva's state to determine the importance of the commodity trading market, the trade finance involvement and the awareness regarding Blockchain in Geneva.

Moreover, to observe the potential impact that Blockchain would have regarding the business processes, I studied the actual procedures regarding the trade finance in general and then focusing more on the Documentary Letters of Credit's process. Then I compared the current processes with what they would be under the Blockchain in order to deduct what would be issues involved, the solutions to them and the potential benefits of such implantation if any.

Finally, in complement of my researches, I coded a simple Smart Contract as a test and a proof-of-concept. The contract coded (available in the *appendix 7.2.7*) is based on a Letter of Credit and only involved two different parties, an issuing bank and a seller (the coding not being part of my cursus and only having a slight insight of it, I chose to make it the more simple in order to just obtain an general overview of what a Smart Contract looks like).

3.2 Data collection

3.2.1 Survey and Interviews

The purpose of my survey was to, firstly, determine the position of the companies people are working in regarding a potential adoption, or a possible implementation, of the Blockchain in their work, and if so, identify what are or would be the potential positive and negative outcomes.

Secondly, if the companies are in a preliminary stage with only a slight insight of the Blockchain, to discover what potentially hold them back. What are the limiting factors and obstacles companies are facing, and what would be hindering the Blockchain's implementation in the commodity trading market regarding trade finance processes and the transmission of the documents digitally.

As the questions were quite specific to the topic, the number of people who would have been involved in trade finance regarding commodities and aware about the Blockchain and its functioning was quite limited. I had to be quite selective, as the most susceptible people to know about the subject would probably be managers and who are doing it.

I contacted 25 persons in total, from whom I had 11 positive answers and 6 granted me an interview (phone call or meeting directly in their office), the 5 remaining directed me to other people or were not enough involved to answer my questions. Due to summer holiday, amount of work or unreachable reasons, 14 persons gave no answer at all. From the people reached, 5 work in Fintechs, 14 are or were employed in banks, 3 work in commodity trading companies, 1 is working for an inspection company and 2 work in consulting companies.

The interviews granted are transcribed in *appendices 7.2*. The relevant results will be developed and incorporated in the discussion part.

3.2.2 Commodity trading in Switzerland and Geneva

The STSA (the Swiss Trading and Shipping Association), is a non-profit and non-political association created in 2014 and whose mission is “to provide a neutral platform of exchange for professionals of the commodity trading industry and to enhance the understanding of this industry in the general public”. The STSA “acts as the umbrella organization for the sector, bringing together the 3 regional associations (Geneva trading and Shipping Association, Lugano Commodity trading Association and Zug Commodity Association), 190 members and institutions, and over 100 professionals participating in STSA Committees and expert Working Groups” (STSA, About, [online]).

The following information have mostly been taken from their official website in the purpose of collecting general data and information on the commodity trading market, the related businesses in addition to the principal actors active in Switzerland and Geneva.

3.2.2.1 Switzerland:

According to the STSA around 550 companies, employing about 13'000 people, are established in Switzerland and directly involved in the commodity trading and shipping sectors.

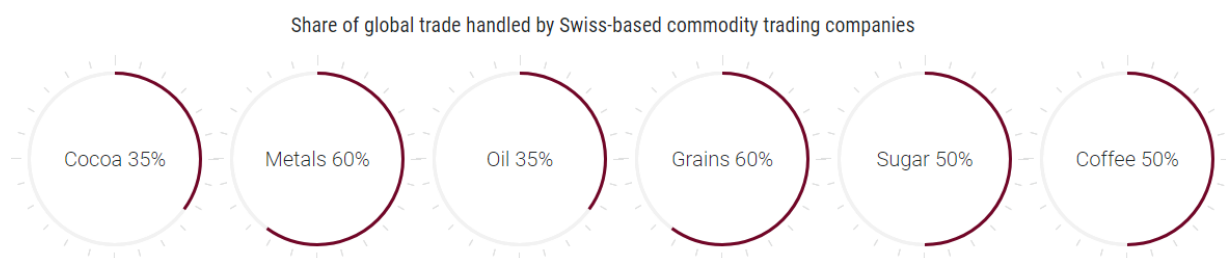
Trade finance and the related services, such as inspection, certification, insurance, banking system, etc. include an additional 20'000 jobs for the commodity trading market.

Switzerland's geographical location, highly qualified workforce, infrastructures' quality, political, legal and monetary stability, passing by the banking expertise and the related services make of the country an excellent environment for commodity trading's business. (STSA, About, [online]).

Fiscal policies are also very attractive to multinationals, and the sole commodity trading sector represents 22% of Geneva's tax receipts and 10% and 19% respectively for Zug and Lugano.

All those elements have made Switzerland becoming a major hub for commodity trading, where 1/3 of Oil and Oil by-products world's exports are conducted. Being the number one country worldwide regarding the trade of Grains and Oil Seeds, the commodity trade finance, inspection and certification, Switzerland is also the number one in Europe regarding Sugar and Cotton (with London), accounting for 22% of commodities' global volume shipped worldwide. (STSA, Industry Insights, [online]).

Figure 14: Switzerland, the Global Commodity Trading Hub



Source: STSA. *Stsa.swiss* [online]. [Accessed on July 22 2018]. Available from: <https://stsa.swiss/>

Mostly of these commodities are traded in the Lake Geneva region, with “world’s 35% of cereals and oilseeds, 50% of coffee, 50% of sugar, 35% of rice, and 35% of oil” (République et Canton de Genève, [online]).

Switzerland is also designated as a “Crypto Nation” and a pioneer regarding new technologies, making it worldwide leader in cryptocurrency and Blockchain.

3.2.2.2 Geneva:

Enjoying the influence of number of international organizations, a strong concentration of financial institutions and growing presence of international trade companies, Geneva is described as a “worldwide center for diplomacy, international co-operation and is designated as the third European financial center after London and Zurich” (STSA, Industry Insights, [online]).

Many other advantages such as the fiscal policy, the international airport’s proximity, the partnerships between banks, shipping companies and services providers, combined with high qualified and multilingual employees and high level of formation have made of Geneva a worldwide leader in the commodity trading market.

3.2.2.2.1 Commodities:

Geneva gathers around 400 trading companies, making the city a worldwide leader in commodity trading. Actually, “the world’s largest trader in cereals and vegetable oils, and in Europe the largest trader in sugar and cotton” (Geneva financial center, [online]) “with respectively 15 million tons and 1.2 million tons per year” (STSA, Commodity trading companies, [online]).

“Geneva is the world’s Number One hub for the trade of grains and oil seeds, handling alone one-third or approximately 75 million tons of the global free trade in these commodities and three-fourths of trade in Europe (including the CIS countries)” (STSA, Commodity trading companies, [online]).

Regarding the crude oil and oil-based products, the STSA estimated that about 3 billion tons are traded each year worldwide (around 1.9 billion tons of crude oil and 1 billion tons of refined products) and that “Geneva ties with London as Europe Number One oil trading hub with roughly one-third or about 700 million tons per year of the world’s free oil trade in terms of physical trade (STSA, Commodity trading companies, [online]).

Geneva is also present on “special commodities” market. Always according to the STSA, “a number of less tangible commodity-trading activities should be mentioned as they involve large volumes and large amounts, although we do not dispose of figures to quantify this trade. All of them are traded in Geneva.

First, electricity. Several major trading companies based in Geneva, such as Cargill, RWE, Koch, Semptra, are trading electricity.

Second, CO². In the wake of the implementation of the Kyoto protocol, CO² certificates have become a commodity which is traded on a large scale in the European Union. In this way, the polluter pays by buying certificates and industrial companies having invested in reducing CO² emissions recover. Several of our Members are trading CO² certificates.

Finally, besides commodity derivatives, freight also has its derivative market (FFAs) which are actively traded in Geneva” (STSA, Commodity trading companies, [online]).

3.2.2.2.2 Banks

The Geneva’s success regarding the commodity trading market has with no surprise attracted many financial institutions to specialize in trade finance. According to the Geneva Financial Center: “104 banks, including 23 commercial and investment banks, 3 private bankers and 46 foreign-owned banks, in addition to 895 independent financial advisors, more than 3’000 financial intermediaries, 589 insurance companies, 1’336 accounting firms, and more than 600 lawyers and notaries” (Geneva financial center, [online]) are present in Geneva’s areas providing expertise, insurance, certification and other services. Today, Geneva is “the world leader in trade finance, handling 40% to 60% of global transactions” (République et Canton de Genève, Commodities trading and trade finance, [online]).

“Geneva is the world banking center for commodity and trade finance. BCGE, BCP, BNP Paribas, BCV, Crédit Agricole, Crédit Suisse, ING, Société Générale and UBS all have their headquarters or offices in Geneva or Lausanne for this business. In addition to the classical commodity and trade finance products, such as transactional financing, pre-export finance, inventory finance, country risk coverage, etc. banks in the Lemanic Region offer a large range of products for the shipping industry.

Historically very strong in short-term financing, Geneva banks have in recent years developed medium and long-term structured financing. A particular strength of the Geneva banks is their specialization in Emerging Markets, such as Russia, ex-CIS, Africa and South America.

Commodity trade finance departments are currently working on the testing and introduction of new advances such as distributed ledger technology” (STSA, Banks, [online]).

3.2.2.2.3 Inspection and certification:

“Two of the world’s largest security and verification companies, Société Générale de Surveillance (SGS) and Cotecna are headquartered in Geneva, with other leading companies such as Intertek also present along the shores of Lake Geneva.

Security and verification companies are a crucial part of trading, intervening at loading and discharging to certify that weight, volume and quality of cargo is in conformity with the contract. Such companies also provide other services, like certification and collateral management” (STSA, Inspection and Certification Companies, [online]).

3.2.2.2.4 Ship-owners:

“Switzerland is an important magnet for shipping interests. Mediterranean Shipping Company (MSC), the second largest global shipping line, has its worldwide headquarters in Geneva and a number of companies are based along the shores of Lake Geneva.

Several STSA member shipping companies fly the Swiss pavillion such as Suisse Atlantique. In addition, several shipbrokers, such as Riverlake Shipping, specializing in tanker chartering, are operating out of Geneva. Other brokers, such as RBS based in Paris also have offices in Geneva” (STSA, Ship-owners, operators, ship-brokers, agents, [online]).

3.2.2.2.5 Consultants

“A number of companies provide support services to trading companies, bringing their expertise in legal, tax, intellectual property, compliance and corporate governance issues.

STSA partners, whether they be law firms - Schellenberg Wittmer, Bär & Karrer, Chabrier & Partners, Holman Fenwick Willan Switzerland - or the Big 4 consulting groups -Ernst & Young, Deloitte, KPMG, PWC - are highly respected in their particular fields.

Besides these well-known names, dozens of companies, from auditing firms, consultants and law firms to specialized service providers, such as insurance brokers, providers of operational services to the trading industry, as structuring of finance, demurrage handling or specialized employment agencies, are active in this field across the various commodity trading hubs in Switzerland.

Besides these, a number of firms such as Petroconsultants and Petro-Logistics are involved in specialized services such as oil exploration and engineering consulting” (STSA, Consultants, [online]).

3.2.3 Blockchain for Geneva

As we can see, Geneva is a crucial actor in the whole sector of commodity trading worldwide. This is why the actions engaged by the companies established in Geneva regarding a potential use of Blockchain technology are essential.

For its part, Geneva's canton does not lag behind technologies' progresses. Indeed, Geneva was the pioneer regarding Blockchain's use for state's administration in Switzerland. Thus, in March 2017, throughout a presentation happening in a "Café de la République numérique", event having the aim to gather people interested in new technologies and their potential applications, "Genève Lab", the public innovation laboratory of the general direction for information systems (DGSI), presented its project for using Blockchain regarding the delivery of Register of Commerce's electronic documents.

"For the first time in Switzerland the Ethereum Blockchain was tested by a public administration in order to reinforce and secure the delivery of electronic extracts and allowed to the general public:

- To command online numeric extract with its receipt when ordering a certified Register of Commerce's extract delivered on paper.
- To verify that this electronic extract has been delivered by Geneva's state." (République et canton de Genève, Genève numérique, [online])

The main plan being to extend the Blockchain's use to other Geneva state's Registers and other public administration, all being part of the strategic plan of "Swiss Cyberadministration", a development project made by the Swiss Confederation, the Cantons and the Communes in order to deliver authorities' electronic benefits.

More recently, and in the continuity of the Register of Commerce's project, Geneva is working on an innovation plan which would allow, through the Blockchain, to identify the parties of a legal Smart Contract and sign it numerically, making it applicable and valid under the law and the canton's jurisdiction (egovernment, innovation 2018/2019).

If this project become fully implemented and works, the consequences for public administrations and then for businesses in Geneva would encounter major changes. Giving legal validity and security to electronic signature, could revolutionize the trading, and business, world.

3.3 Business Processes in Trade Finance

3.3.1 Smart Contracts and Trade Finance

Regarding trade finance, Smart Contracts could become a viable solution in the future, replacing paperwork and increasing coordination between the parties involved in a transaction. The use of this technology combined with the possibilities offered by the Blockchain could be used as risk mitigation all by improving the processes currently used. As of today, and taking the example of Documentary Letters of Credit, the processes are hugely impacted by the amount of paper documents required which often includes delays. Smart Contracts may replace traditional Documentary Credits.

A video on YouTube made by Deloitte, clearly explains the process involving Smart Contract and the potential benefits to take advantage of. Here is the transcription of the audio:

“Existing models are complex, inefficient and costly, requiring multiple parties and significant level of manual processing. Banks have high operating costs and risks of fraud losses, while buyers and sellers face a platter of paperwork and delays resulting in a poor customer experience. Multiple pain points exist, most notably complete his manual revue of financial agreements, dependence on intermediary corresponding banks for payment, shipment delays due to numerous communication points and paperwork, high probability for fraud with disparate systems.

The Smart Contract will represent the obligation of the buyer to pay the seller for the goods upon receipt of the goods, as a Blockchain powered's Smart Contract that underpins the flow.

As a first step, the purchase order is created by the buyer and a corresponding Smart Contract is created on the Blockchain codifying the obligation. Having the complete details of the order on the Blockchain allows financiers, institutions, like today's banks, who provides credit facilities to the buyer, or a financial guarantee to the seller, to review the terms of the purchase order in real time.

Once the financier provides guarantee of payment, which is captured on the Blockchain, the seller proceeds to prepare for shipment of the goods. Using the provided assurance, the seller which shipped the goods and linked the envoys to the transaction on the Blockchain.

Similarly in the supply chain, the shipping company would be able to provide shipment tracking details including bill of lading, and the import and export customs agents, in respective countries, would be able to provide clearance details that are written onto the Blockchain.

Finally, when goods are received by the buyer and inspected, Blockchain will enable capture of acknowledgment and receipt. The payment to the seller will then be triggered based on rules and conditions coded in the Smart Contract.

If the buyer is unable to make the payment upon receiving the goods, payment default rules will automatically ensure payment to the seller based on assurance provided by the financier. In this case the funds would be settled from financier to the seller.

In this future vision, Blockchain enables us to question current orthodoxies. Instruments such as letters of credit are replaced by smart contracts that allow data to be reviewed and actioned upon in real time.

Banks are able to reduce manual processes, potential for fraud and counterparty risks. Financial obligations are enforced through codification of business rules, and cryptographic and immutable algorithms.

New infrastructures built on this technology also have the potential to allow banks to change existing practice of factoring and invoice financing. Documents such as invoices can become tradable assets that banks can repackage, resale and securitize. Enabling the creation of new markets and revenue opportunities.

When the seller invoices the buyer, banks can obtain immediate line of sight into payment obligations and provide instantaneous short term financing, resulting in improved economics of capital allocation.

For example, the seller can benefit from such capabilities by enabling on demand invoice financing solicitation from multiple banks, regardless of whether they are an existing customer of the bank or not. The seller can receive funds in real time with minimal touch points of manual paperwork.

In summary, Blockchain proposes deep foundational re-architecture, redrawing processes and transforming existing business models. We (Deloitte) believe that while the technology can be used to realize cost efficiencies in existing business models, the opportunities for realizing second order benefits through new products and services are boundless (JC Awe [pseudonym], 2017).

3.3.2 Blockchain's Potential Benefits

"The positive properties of Blockchain technology look set to address some of the key challenges facing the trade finance sector. For example:

- Capabilities around transparency and consensus will help mitigate the ever-present risk of documentary fraud and hopefully reduce the cost of transaction reconciliation between and within banks.
- The traceability associated with Blockchain could potentially provide assurance and authenticity of products in the supply chain.
- The immutability and digital uniqueness inherent in this technology also offers the potential to provide a secure transfer of value and deliver a solution to the trade finance problem of endorsement.
- The challenge of maintaining Chinese walls or data privacy among counterparties to trade transactions could be overcome by utilizing tokenization as a form of cryptography, whereby parties are only allowed to access permissioned information.
- Because of the distributed nature of Blockchain, there is an indicative promise of resilience and robustness; this could potentially be broadly adopted at a reasonable development cost.
- Smart contracts offer the possibility of self-executing contracts triggered by the efficient exchange of digital data, potentially revolutionizing the long-serving Letter of Credit.

The Internet of things (IOT) which is still in the early stages of application to trade finance could be used to move physical assets while they are simultaneously tracked and purchased" (Anglo African, 2017).

3.3.3 Description of the Business Processes

The World Economic Forum meeting on "The future of financial infrastructure" highlighted the business processes regarding trade finance, as well as pointing out the issues comprised in those processes and proposing solution for the future all by demonstrating the potential benefits of the adoption of such processes' changes. They are described with what follows.

3.3.3.1 Current Process

Figure 15: Current-State Process Description



(World Economic Forum, 2016)

- “1) An importer and exporter agree to the sale of a product at a future date and time.
- 2) The financial agreement is captured within an invoice, which identifies the quantity of goods sold, price and delivery timeline.
- 3) The importer provides a bank with a copy of the financial agreement for review.
- 4) The import bank reviews the financial agreement and provides financials on behalf of the importer to a correspondent bank, which has established a relationship with the export bank.
- 5) The export bank provides the exporter with the financing details, which enables the exporter to initiate the shipment.
- 6) A trusted third-party organization inspects the goods for alignment with the invoice.
- 7) Local customs agents within the export country inspect the goods based on the country code.
- 8) The goods are transported by freight from Country A to Country B and local customs agents within the import country inspect the goods based on the country code.
- 9) Following inspection, the goods are delivered to the importer, which provides a receipt notification to the import bank.
- 10) Upon receiving notification, the import bank initiates the payment to the export bank through the correspondent bank.” (World Economic Forum, 2016).

3.3.3.2 Identification of Problems

How we can see, this process is very long, complex and thus painful. The stages that could create an issue in the process can be described as follows:

Figure 16: Current-State Pain Points



(World Economic Forum, 2016)

- “1) **Manual contract creation:** the import bank manually reviews the financial agreement provided by the importer and sends financials to the correspondent bank.
- 2) **Invoice factoring:** exporters use invoices to achieve short-term financing from multiple banks, adding additional risk in the event the delivery of goods fails.
- 3) **Delayed timeline:** the shipment of goods is delayed due to multiple checks by intermediaries and numerous communication points.
- 4) **Manual Anti-Money Laundering (AML) review:** the export bank must manually conduct AML checks using the financials provided by the import bank.
- 5) **Multiple platforms:** since each party across countries operates on different platforms, miscommunication is common and the propensity for fraud is high.
- 6) **Duplicative bills of lading:** bills of lading are financed multiple times due to the inability of banks to verify their authenticity.
- 7) **Multiple versions of the truth:** as financials are sent from one entity to another, significant version control challenges exist as changes are made.
- 8) **Delayed payment:** multiple intermediaries must verify that funds have been delivered to the importer as agreed prior to the disbursement of funds to the exporting bank.” (World Economic Forum, 2016).

3.3.3.3 Potential Solutions

By using the Blockchain technology, we could transform these processes in order to create more fluid flows, more transparency, faster exchanges, and thus hugely decrease related costs.

Figure 17: Future-State Process Description



(World Economic Forum, 2016)

The processes related to trade in the future could be improve as we can observe:

“1) Following the sale agreement, the financial agreement is shared with the import bank through a smart contract.

2) The import bank reviews the arrangement, drafts the terms of the letter of credit and submits it to the export bank for approval.

3) The export bank reviews the letter of credit; once approved a smart contract is generated to cover the terms and conditions of the letter of credit.

4) The exporter digitally signs the letter of credit within the smart contract to initiate shipment.

5) Goods are inspected by a third-party organization and the customs agent in the country of origin (all requiring a digital signature for approval).

6) The goods are transported by freight from Country A to Country B and inspected by local customs agents prior to being received by the importer.

7) The importer digitally acknowledges receipt of the goods, which initiates payment from the import bank to the export bank via a smart contract.” (World Economic Forum, 2016).

3.3.3.4 Related Benefits

The benefits of establishing Blockchain technology and applying it to the trade finance processes can be significant:

Figure 18: Future-State Benefits



(World Economic Forum, 2016)

“1) **Real-time review:** financial documents linked and accessible through DLT are reviewed and approved in real time, reducing the time it takes to initiate shipment.

2) **Transparent factoring:** invoices accessed on DLT provide a real- time and transparent view into subsequent short-term financing.

3) **Disintermediation:** banks facilitating trade finance through DLT do not require a trusted intermediary to assume risk, eliminating the need for correspondent banks.

4) **Reduced counterparty risk:** bills of lading are tracked through DLT, eliminating the potential for double spending

5) **Decentralized contract execution:** as contract terms are met, status is updated on DLT in real time, reducing the time and headcount required to monitor the delivery of goods.

6) **Proof of ownership:** the title available within DLT provides transparency into the location and ownership of the goods.

7) **Automated settlement and reduced transaction fees:** contract terms executed via smart contract eliminate the need for correspondent banks and additional transaction fees.

8) **Regulatory transparency:** regulators are provided with a real-time view of essential documents to assist in enforcement and AML activities.” (World Economic Forum, 2016).

3.3.4 Process regarding Documentary L/Cs

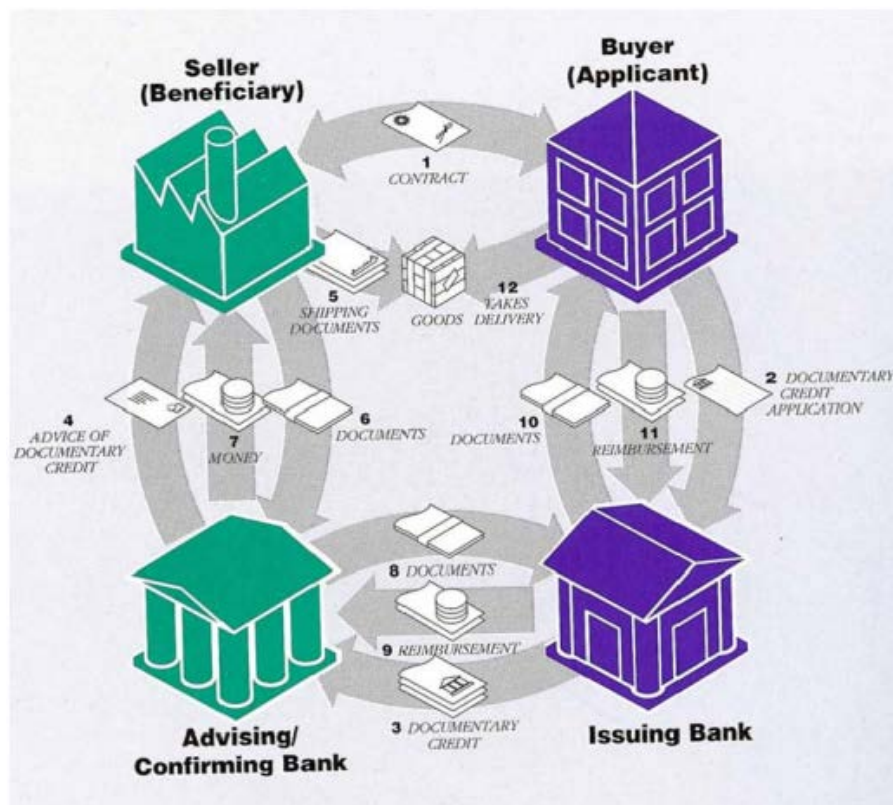
The Documentary Letter of Credit can be considered as the most complex method of payment, and thus business process, regarding the handling of documents for a single transaction. The number of parties involved, their responsibilities regarding those documents as checking, reviewing, validating or amending, all by physically deliver the said documents to the next party all along the process, make inefficient, time consuming and costly financial agreement.

That is why we would assume that if we manage to implement Blockchain through a process as complicated as the Documentary Letter of Credit, we should be able to establish it in more straightforward processes such as Prepayment or Open Account.

3.3.4.1 Current Process

The current procedure, still in effect since centuries⁴, can be illustrated as follows:

Figure 19: Current Documentary Credit Process



(International Trade Center, 2010)

⁴ The first introduction of UCP regulations regarding Documentary Credit being in 1933, however we can retrace the use of letter of credit up until the beginning of the 19th century (letter of credit from Thomas Jefferson to Captain Meriwether Lewis and Captain William Clark (<http://store.iccwbo.org/Content/uploaded/pdf/ICC-The-Complete-UCP-Uniform-Customs-and-Practice-for-Documentary-Credits-Texts-Rules-and-History-1920-2007.pdf>))

The figure 19 can be further explained in details with what follows, according to the International Trade Center's book (International Trade Center, 2010):

- “1) The buyer and the seller conclude a sales contract providing for payment by letter of credit.
- 2) The buyer/applicant instructs his bank – the issuing bank – to issue the L/C in favor of the seller as beneficiary.
- 3) The issuing bank asks the beneficiary's bank (a bank nominated by the beneficiary) to advise the L/C (the advising bank)
- 4) The advising bank notifies the beneficiary that the L/C is open.
- 5) Once the beneficiary receives and reviews the L/C and finds that it meets the terms of the sales contract and that she can meet the requirements stated in the L/C, she is in a position to ship the goods (if the Beneficiary does not agree with the terms as stated in the L/C, a process of negotiating with the importer through the banks will have to occur until exporter and importer agree the L/C text.
- 6) Upon shipment, the exporter sends the required documents to the bank where the L/C is available (the nominated bank)
- 7) The bank examines the documents against the letter of credit. If they meet the L/C requirements, the bank will pay, accept or negotiate according to the terms of the L/C.
- 8) The bank which receives the negotiable documents (the corresponding bank in the exporter's country) sends the documents to the issuing Bank.
- 9) The Issuing Bank examines the documents and, if the documents meets the L/C requirement, reimburses in pre-agreed manner the Confirming Bank or any other Nominated Bank that has paid, accepted or negotiated under the L/C.
- 10) When the documents have been examined by the Issuing Bank and are found to comply with the L/C, they are released to the buyer.
- 11) The Issuing Bank obtains reimbursement from the Buyer according to the credit agreement between the two.
- 12) The Buyer forwards the transport document to the carrier or its agent to effect delivery of the goods.” (International Trade Centre, 2010).

We can observe that this procedure is quite complex. At least four parties are directly involved and this is without counting the indirect parties issuing some documents required under the L/C, such as the inspection companies, the customs authorities, the shipping companies, the insurance companies, etc. All of this making this process inefficient, slow, too much paper based. In addition, to require letter of credit from a bank is not free of charge, and each transaction has a different cost from another.

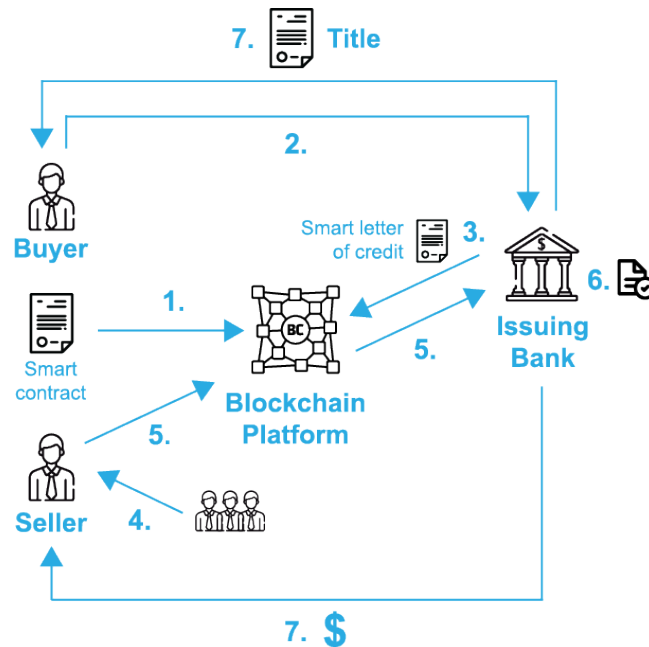
A report from the ICC in 2017 stated that the average value of an L/C reached USD 463'000 in 2016, which shows clearly the significant costs generated by the use of Letter of Credits (International Chamber of Commerce, 2017, p.92).

Furthermore, there are risks to take into account, notably the risk of fraud but also human risks that are automatically implied in such process, as all checking, verification, validation, etc. is done by human being, in addition to the “basic” credit risk, country risk, risk regarding shipment, etc.

3.3.4.2 Process under Blockchain

The Process regarding the documentary Letter of Credit could be simplified through the Blockchain using Smart Contracts. In this case, the process can be described as follows:

Figure 20: Documentary Credit Process under Blockchain



- 1) The buyer and seller enter into a sale contract (smart contract) on a platform using the Blockchain's technology.
- 2) The buyer request a Smart Letter of Credit to the issuing bank.
- 3) The bank will review the smart Letter of Credit, issue and confirm it on the Blockchain.
- 4) The different parties involved in the transaction (agents, inspectors...) will issue the different documents required, such as the Bill of Lading, the certificates of quality and quantity, certificates of origins, etc.
- 5) The seller present those documents to the bank electronically (using the Blockchain).
- 6) The checking is done automatically in order to confirm the compliance of the documents with the Letter of Credit's conditions and highlight any discrepancies.
- 7) If everything is compliant and correct, the bank will sign off everything. Thus, the title to the assets is automatically transferred to the buyer and payment is made simultaneously to the seller. (Lotto Persio, 2016) (<https://www.gtreview.com/news/asia/banks-blockchain-innovation-letters-of-credit/>)

By using Blockchain technology, we could observe significant improvements of the procedure. Blockchain and Smart Contracts, in addition to reduce the risk of fraud, could increase the processes' efficiency in term of time for the transmission and verification of the documents involved, thus shortening the cash cycles all by allowing the monitoring of the operation in real time.

“The application enables exporters, importers and their respective banks to share information on a private distributed ledger (see the seven steps below). The trade deal can then be executed automatically through a series of digital Smart Contracts. The parties involved in the transaction can visualize data in real time on their devices and see the next actions to be performed.

Using Blockchain technology to execute LCs can help streamline the manual processing of import/export documentation, improve security by reducing errors, make companies' working capital more predictable and increase convenience for all parties through mobile interaction.

The seven steps to a Blockchain-based Letter of Credit (LC) transaction:

- 1: The importer creates an LC application for the importer bank to review and stores it on the Blockchain.
- 2: The importer bank receives notification to review the LC and can approve or reject it based on the data provided. Once checked and approved, access is then provided to the exporter bank automatically for approval.
- 3: The exporter bank approves or rejects the LC. If approved, the exporter is able to view the LC requirements and is prompted to view through the application.
- 4: The exporter completes the shipment, adds invoice and export application data and attaches a photo image of any other required documents. Once validated, these documents are stored on the Blockchain.
- 5: The documents are viewed by the exporter bank, which approves or rejects the application.
- 6: The importer bank reviews the data and images against the LC requirements, marking any discrepancies for review by the importer. When approved, the LC goes straight to completed status or is sent to the importer for settlement.
- 7: If required due to a discrepancy, the importer can review the export documents and approve or reject them.” (Lotto Persio, 2016)

3.4 Case studies/issues solved using Blockchain

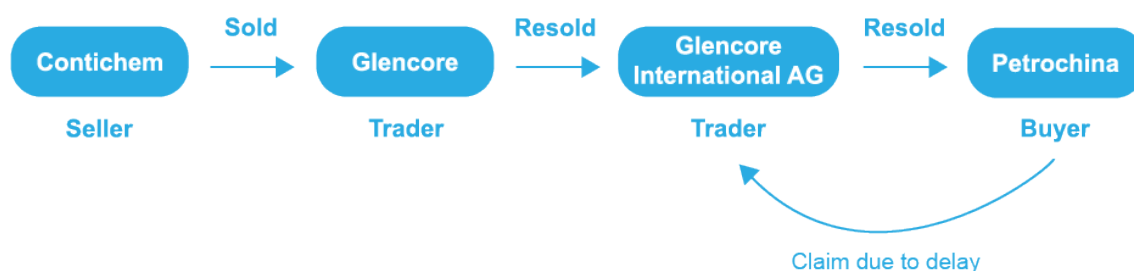
In order to better understand and observe the potential benefits and solutions that Blockchain could bring in trade finance, and in the commodity trading business in general. We will take three case studies of disputes which passed in front of Court of Justice, explain them, define the issues and try to resolve them using Blockchain's technology. Of course, we will not analyze into details, but focus on one issue of each cases and try to solve it using Blockchain. This, in the purpose of observing if with a Blockchain's implementation we could prevent such issues from happening again.

3.4.1 Contigroup vs Glencore

3.4.1.1 Case's Summary

The first case involves Contigroup Companies, Inc. (Contichem) and Glencore A.G. (Glencore) and was brought before the Royal Court of Justice in London in the end of the year 2004. This dispute arose after a delay occurring in the delivery of liquid petroleum gas and the description of what happened and the issues encountered is explained as follows with the first clause of the judgment with the introduction of the case.

Figure 21: Contigroup v Glencore's Case



"In this action the Claimant, Contigroup Companies, Inc. ("Contichem") claims the unpaid balance of the price of a cargo of butane that it sold to the Defendant, Glencore A.G. ("Glencore") in 2002. Glencore resold the cargo to an associated company, Glencore International A.G. ("Glencore International") which in turn resold it to Petrochina Zhejiang Huadian Resource Co. Ltd. ("Petrochina").

Under the terms of the sale contract (and the sub-sale to Glencore International) the cargo should have reached Wenzhou in Eastern China by 10 June 2002; and under the sub-sale contract with Petrochina delivery was to take place by 12 June 2002. In fact the cargo reached Wenzhou and started unloading on 15 June 2002. Petrochina claimed against Glencore International in respect of the delay, and that claim was settled for US\$172,899.67. The question for me is whether Glencore is entitled to a like sum in damages against Contichem, which it can set off against Contichem's claim" (Judgment: Contigroup Companies Inc. v Glencore AG, 2004).

3.4.1.2 Issue's Explanation

What is important to take back is the fact that we have four parties involved in different contracts regarding the same cargo deliverable in two lots regarding two different goods, propane and butane. The first sale contract, between Contichem and Glencore, was settled on the end of April 2002 and regarded the delivery of between 43'000 and 45'000 metric tons of propane and butane. However, "On 2 May 2002 the sale contract was varied. The second lot sold by Contichem ("Lot 2") was to be solely butane; and the delivery date range was narrowed so that arrival had to take place not later than 10 June." (Judgment: Contigroup Companies Inc. v Glencore AG, 2004, Clause 8).

The vessel nominated for the delivery of the "Lot 2" was the "Sunway". Once Glencore resold the cargo of propane to Glencore International, this last entered into a sale contract to resell the cargo to Petrochina, in which was stipulated:

"4. Quantity.

25,000 metric tons maximum 10% less in Seller's option.

2,000-10,000 metric tons Propane (Min. 2,000mt for propane) and 15,000 to 23,000 metric tons butane in Seller's option 10% more or less on declared quantities of each grade, not to exceed 25,000 metric tons in total" (Judgment: Contigroup Companies Inc. v Glencore AG, 2004, Clause 13).

Further it is explained that the sale was "for a delivery of a single cargo made up partly of propane and partly of butane, not for a mixture of the two" (Judgment: Contigroup Companies Inc. v Glencore AG, 2004, Clause 14).

Here we can clearly see that the Sunway's cargo would not fit the contract's specifications. However, Glencore International planned to find an arrangement if an issue would arise and, if needed, renegotiate the contract's terms by providing propane through another way.

The question of delay was not even taken in consideration when the deal was made. Unfortunately, the unexpected delay made the transaction happen differently.

We will not discuss how and why the cargo was delayed in this dispute, however what is interesting is what happened in the clauses 16 and 17 of the judgment. Respectively:

“16. On 22 May 2002, Contichem notified Glencore by e-mail that the Sunway's estimated time of arrival at Ras Tanura was the morning of 26 May 2002; and on the following day, Contichem further narrowed the delivery dates to 6 to 10 June 2002. If the Sunway left Ras Tanura quickly it would just be possible for it to reach Wenzhou by 10 June, the last date for delivery under the sale contract. For 26 May was the last day a ship could leave the Gulf for Eastern China to be sure of arriving by 10 June; though a ship might make it if it left very early on 27 May. Moreover on 23 May Contichem again narrowed the delivery dates, though the final date of the range remained 10 June 2002.

17. On 28 May 2002, Glencore UK Limited (on behalf of Glencore International) sent the following fax to Petrochina.

"Kindly note our intention to deliver Propane and Butane on board the vessel "Sunway", eta 10th June, 2002."

As, however, those at Glencore were well aware, the Sunway was only carrying butane.” (Judgment: Contigroup Companies Inc. v Glencore AG, 2004, Clause 16 and 17).

With the explanations above, we can clearly observe an issue which tends to be common in commodity trading: the lack of transparency and the miscommunication, intentional or not. In this case, not hesitating to “lie” its customer, Glencore International deliberately entered into a sale contract knowing they were in breach of contract since its establishment. In addition, Glencore International chose deliberately not to declare the Sunway that they planned to deliver, knowing the vessel would not fit with the requirements.

Even if Glencore International could have found a further agreement or that the shipment would have arrived on time, the matter of “manipulation” or even “ethics” from Glencore International can raise serious question on the business practices of the company.

3.4.1.3 Blockchain's Solution:

By using the Blockchain's technology coupled with the Internet of Things (IoT), we could have avoided this dispute. The registration of the first contract (between Contigroup and Glencore) on the Blockchain through a Smart Contract, would have allowed the transmission of data in real time.

With an additional geolocation system of the tanks or the vessel, this would have allowed all the parties involved to have access at any time and in real time to the right information regarding the goods. Then, this would have given directly to the end customer (in our case Petrochina) all the tools to avoid such situation.

Of course the question is: Is it not already possible with the means we dispose of?

It is true that, today, thanks to the Internet we can locate every vessel everywhere around the world at any time. It is also true that the transmission of information is as well instantaneous through the use of emails or phone calls. However, the transparency between the parties involved in a transaction, especially if the goods concerned are resold several time, can be affected.

The parties need to trust each other, and when it comes to profit, sometime we need more than people words to trust. The system of Blockchain could allow a full transparency for all the parties, and an increased visibility regarding what has been done, what is exactly being shipped and where is it, where it goes, from where it comes, etc.

Thus we can imagine that these transactions could have happened this way:

- 1) Contichem and Glencore would enter into a Smart Contract regarding the sale of a cargo of propane and butane deliverable in two lots and register the full terms and conditions of the contract.
- 2) The Smart Contract is registered on the Blockchain, regrouping all the parties involved in the transaction (banks, authorities, shipping company, etc.) having access to information according their rights on the Smart Contract.
- 3) Contichem and Glencore update the contract according to the new requirements and the Smart Contract register these new data on the Blockchain.
- 4) Glencore resell the contract (the cargo) to its associate Glencore International. Glencore International take the place of Glencore in the Blockchain as new buyer.

- 5) Glencore International and Petrochina enter into a new smart contract regarding a cargo of propane and butane. Glencore International plan to use the cargo of the first Smart Contract to deliver Petrochina. While Petrochina has the possibility to see the origin of the goods they are buying, the designated vessel and the cargo on board with all its features. Petrochina is informed through the Blockchain that the cargo does not match the contract's requirements.

Then 2 solutions are possible. Either, Petrochina and Glencore International redefine the contract terms and conditions and still proceed to the transaction. Or, Petrochina, knowing that the vessel does not contain any propane, decides to revoke the contract and to find another supplier with the adequate cargo, and Glencore International finds a new buyer for the cargo being shipped.

3.4.2 Bulgrains vs Shinhan Bank

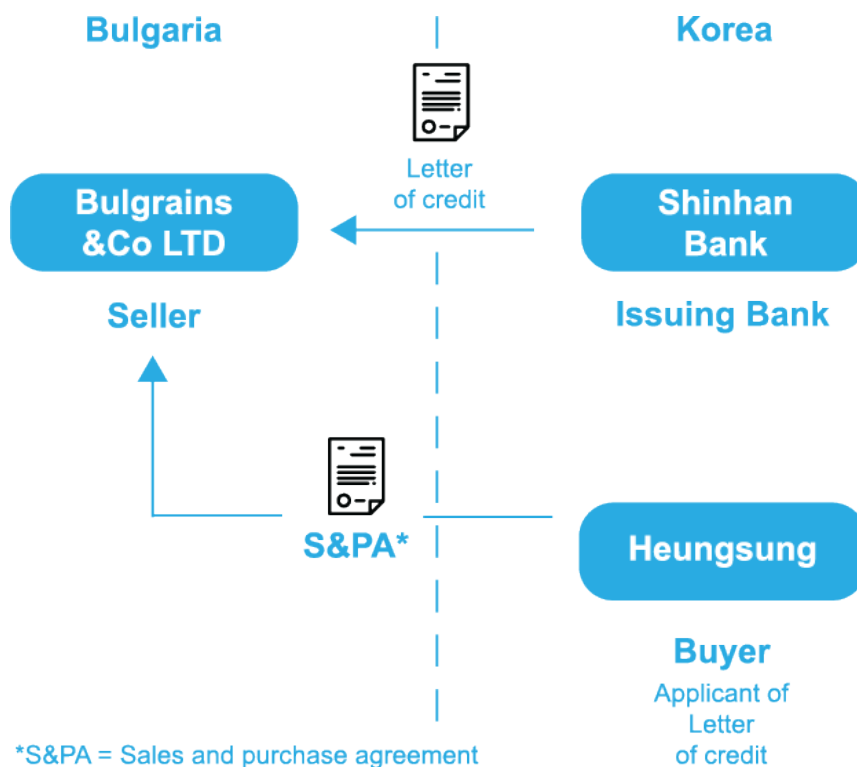
3.4.2.1 Case's Summary

This case, settled in court in July 2013, happened between Bulgrains & Co limited (the claimant) and Shinhan Bank (the defendant), the first one being a Bulgarian trading company and the second one a Korea Bank. The subject of this dispute is regarding the potential discrepancies of the documents provided by Bulgrains and the Letter of Credit issued by Shinhan Bank upon request of Heungsung Feed Company Limited, a Korean company who bought 3'00 metric tons of wheat from Bulgrains.

The claimant proceeded against Shinhan Bank for claiming payment due, a sum of USD 825'000. Sum that Shinhan Bank refused to pay due to the said discrepancies.

The case was further dismissed by the High Court of Justice Queen's Bench Division, for the reason that discrepancies were indeed established between the sales and purchase agreement, between Bulgrains and Heungsung, and the Letter of Credit issued by Shinhan Bank.

Figure 22: Bulgrains v Shinhan Bank's Case



Icons from Freepik [pseudonym] and available from: www.flaticon.com

3.4.2.2 Issue's Explanation:

As expressed in the judgment, a Letter of Credit is a “legal document separate from the contract between the parties which therefore has a legal life of its own” (Judgment: *Bulgrains & Co Ltd v Shinhan Bank*, 2013, Clause 5).

The purpose of a Letter of Credit, as seen previously, is to provide security of payment for the seller in exchange of the delivery of the rightful documents required under the L/C.

In this case, the notion of *Strict Compliance* that a Letter of Credit has to have with the related documents is the dispute's subject. Indeed, in order to be valid and binding the documents in relation of the transaction have to be exactly the same, word for word, as stated on the Letter of Credit, otherwise the Bank could refuse to perform payment.

Here, “there was a discrepancy between the name of the beneficiary as it appears on the letter of credit (where it appears *Bulgrains Co Limited*), and allegedly it was markedly different, referring to *Bulgrains & Co Limited* on one of the documents presented. And, in addition, on the commercial invoice the description of the goods does not conform to that in the letter of credit.” (Judgment: *Bulgrains & Co Ltd v Shinhan Bank*, 2013, Clause 9). This goods' description is detailed in the clause 15, where we learn that the letter of credit concerned “wheat bran pellets in bulk” and the commercial invoice implied “Bulgarian wheat grain pellets” (Judgment: *Bulgrains & Co Ltd v Shinhan Bank*, 2013, Clause 15).

As according to the article 15 of the UCP 600 it is stated that “a nominated bank acting on its nomination, a confirming bank, if any, and the issuing bank must examine a presentation to determine, on the basis of the documents alone, whether or not the documents appear on their face to constitute a complying presentation.” (ICC Uniform Customs and Practice for Documentary Credits (UCP 600), 2007, Article 14), it is not the bank's role to verify if there is different companies have almost the same name, or if it is one single company. The principle “on their face” refers to checking directly what is contained in the documents, thus the two discrepancies were valid, and not treated as potential typo.

3.4.2.3 Blockchain's Solution:

In this case, the solution offered by the Blockchain is simple. As each parties will be linked together using clear IDs in order to connect on the Blockchain, the discrepancy regarding the name of the company would never occur. Given that the Letter of Credit, turned into a Smart Contract, will refer to parties' electronic addresses, just like an IP address.

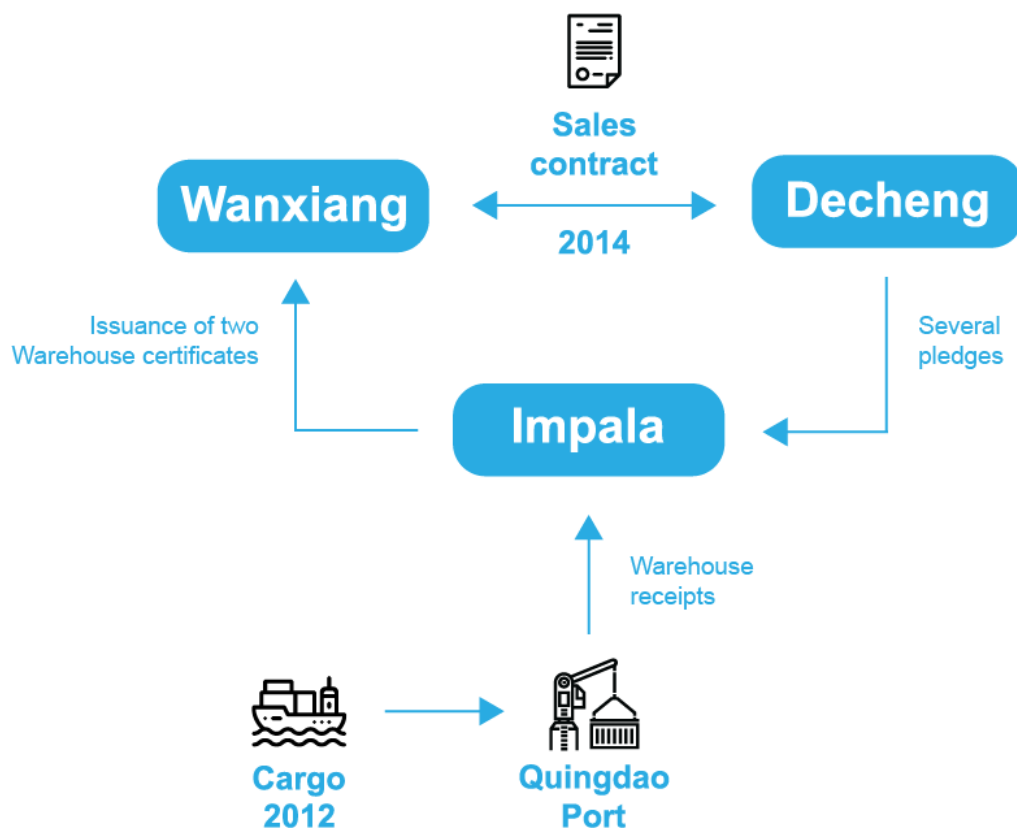
Regarding the second discrepancy, regarding the description of the goods, Blockchain and Internet of Things (IOT) should also resolve this issue. As the goods' description will be coded in the Smart Contract and registered on the Blockchain, informing the parties about the origin, the quality, the quantity, or any other information on the goods, a discrepancy would be immediately recognized by the Smart Contract itself, and the transaction will then be stopped.

3.4.3 Impala vs Wanxiang

3.4.3.1 Case's Summary:

This last case involves the companies Impala Warehousing and Logistics (Shanghai) Co Ltd and Wanxiang Resources (Singapore) PTE Ltd and was brought in front of the High Court of Justice in March 2015. The issue of the case is regarding a cargo of aluminium ingots stored in Qingdao, China. Wanxiang pursued Impala in order to recover the goods whose Impala was the bailee, as when they requested them, the warehouse appeared to be empty. To better understand this case, we can schematize it as follows:

Figure 23: Impala v Wanxiang's Case



Icons from Freepik [pseudonym] and available from: www.flaticon.com

In 2014, Qingdao Decheng Resources Co. Ltd (“Decheng”) and Wanxiang Resources (Singapore) PTE Ltd (“Wanxiang”), two trading companies, concluded a Sale and Purchase Agreement regarding 5004.34mt of aluminium ingots stored in Qingdao. Before this, the goods involved were brought from Russia in the end of the year 2012 and then stored over a year at a bonded warehouse operated by Qingdao Port Co. Ltd. Dagang branch with the collaboration of the claimant, Impala Warehousing and Logistics (Shanghai) CO.

3.4.3.2 Issue's Explanation:

The main issue arose from a massive fraud of Decheng which had already pledged the same cargo several times. Without going into details of the resolution of the case brought by the court, we can understand that the triggered action is the pledge of the same goods multiple times which led to the issuance of several warehouse receipts to multiple parties regarding the same goods. All the question a jurisdiction, Collateral Management Agreement or even the contractual or non-contractual clauses to be understood in the dispute would not be argued if Decheng would not have committed fraud from the beginning, and of course if any other issues would have happened.

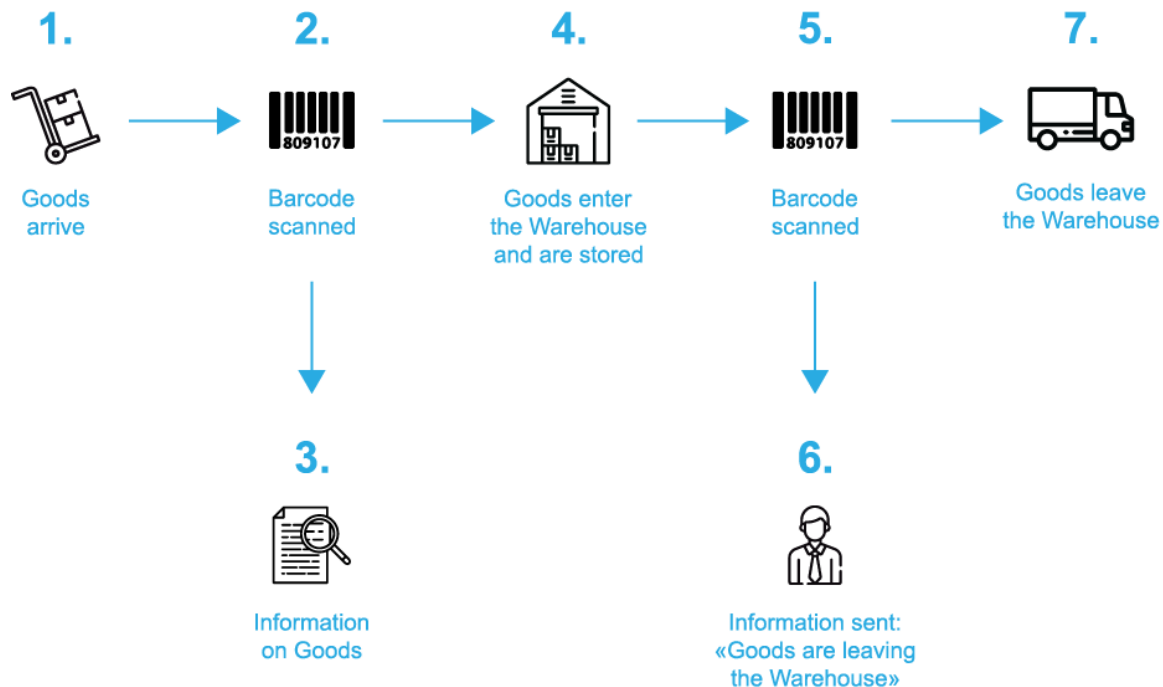
The fact that Impala leased the warehouse and just seemed to issue the warehouse certificates upon Decheng's requests without any check can seem to be quite irresponsible. As for each certificates they issue in their name, they take the responsibility to deliver the goods at any time to the rightful owner of those certificates. The fact that Impala did not operate the warehouse and did not even seem to do its own stock accounting, given the fact that "some suspicion has fallen on the third party company which executed the stock report" (Judgment: Impala Warehousing and Logistics (Shanghai) Co Ltd v Wanxiang Resources (Singapore) PTE Ltd, 2015, Clause 29). Thus, we can observe that Impala did not control the warehouse's operation nor the goods, and by consequence they would be in the impossibility to mitigate the risks properly.

This put into the light the main issue regarding the Collateral Management in commodity trading: The eye in the warehouse (M. Lambert, 2018, Interview, Appendix 7.2.1). If we cannot have a total and transparent view on what is happening within the warehouse with the goods, then the risk of fraud regarding the issuance of warehouse certificates/receipts will never be mitigated.

3.4.3.3 Blockchain's Solution:

Using the Blockchain technology combined to the Internet of Things could be a solution to avoid these kind of issue in the future. Instead of relying directly on the personal involved in the warehouse's administration/management, we could imagine to use a system of bar codes which would be automatically scanned when entering and leaving the warehouse in order to always have the right amount of goods stored, in addition to the related information such as the quality, the origin, the owner, etc. to avoid a potential issue of switching the goods within the warehouse.

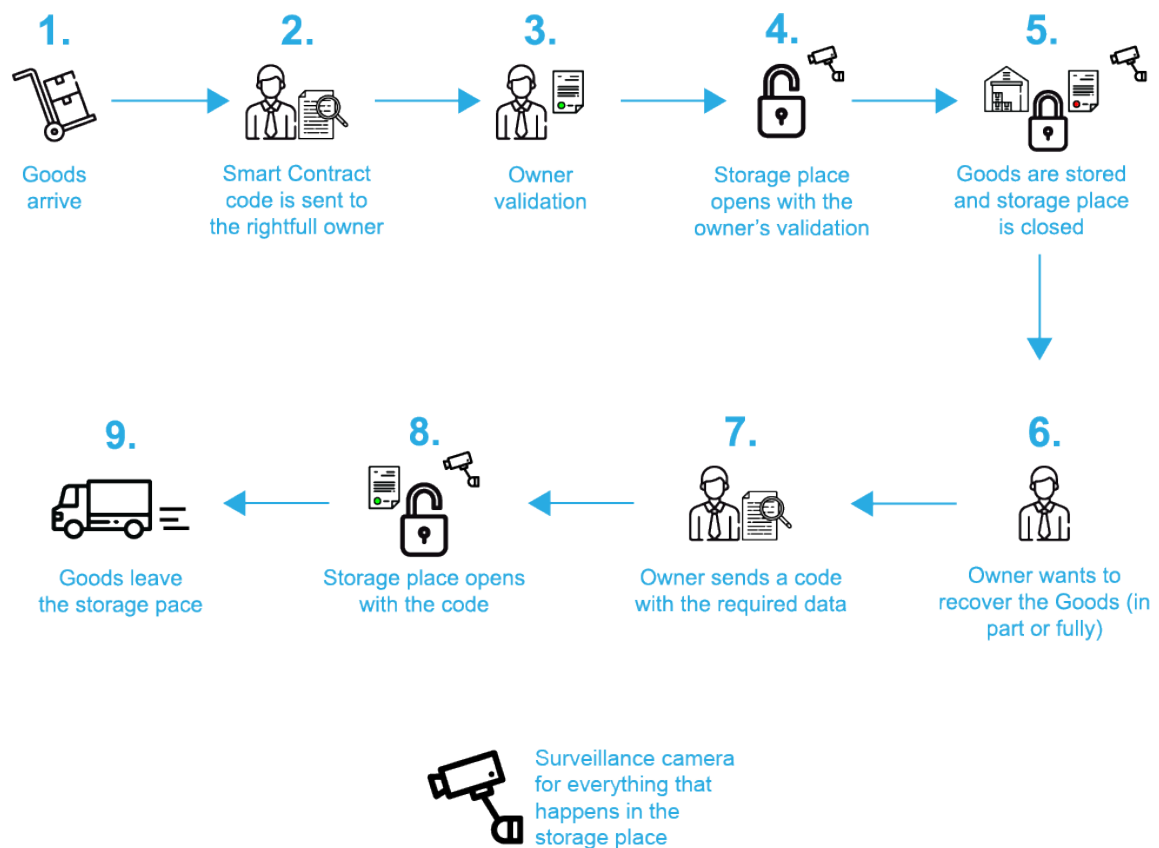
Figure 24: Blockchain's Solution



Icons from Freepik [pseudonym] and available from: www.flaticon.com

In addition to this system, we could imagine big cages within the warehouse which would only open on request of the rightful owner of the certificates. This could be done from distance, electronically and instantaneously using the potential specific codes in the Blockchain.

Figure 25: Blockchain Solution 2



Icons from Freepik [pseudonym] and available from: www.flaticon.com

Combining this two solution and adding a surveillance camera system that would be put in place within the warehouse, and whose accesses would be granted to a specific person working in the company that holds the warehouse certificates/receipts for the specific period of time in which the goods have to be moved, would reduce significantly the risk of fraudulent actions.

3.5 Creation of a “Smart Contract”

3.5.1 Coding a Smart Contract (using Ethereum Remix Platform)

In order to better comprehend how a Smart Contract would work, I decided to try to code mine (available and described in the *Appendix 7.2.7*). In order to do so, I contacted a former student, Jimmy Paris, who was recently graduated in “Informatique de Gestion” at the HEG and was working as teacher’s assistant. We decided to use Ethereum Remix, an Ethereum free platform (offline of the Blockchain) which allows to practice coding Smart Contracts, and code the Smart Contract using Solidity as “code’s language”.

The Smart Contract created was on a basis of a Documentary Credit sample seen in the Commodity Trading major class I followed.

The contract is very simple, as I had never done such things as coding before during my studies, in addition it is very complex to code a Smart Contract by adding all the clauses, terms and conditions, to ensure that the Smart Contract will deliver the proper outcome regarding the inputs of the parties, etc. Thus, it only implies a buyer and a seller. The seller providing the different documents to the issuing bank, which will in turn check them and decide to accept them or not and so validate the contract or not.

At the end, the “Smart Contract” we wanted to code, is not really one. As it does not execute itself, but only allows to the parties to share and transfer to each other the documents instantaneously and securely using IPFS protocol (discussed in the next part: *3.5.2 IPFS protocol for Documents’ Exchange*). Thus, we can more properly designated it as a *Documents’ Transfer System*.

3.5.2 IPFS protocol for Documents’ Exchange

“The InterPlanetary File System (IPFS) is a peer-to-peer distributed file system that seeks to connect all computing devices with the same system of files” (Benet, [online]).

The use of codes in order to create Smart Contract can be very expensive, especially if parties try to code an entire documents within the Blockchain. This is called “gas” and are the transaction costs in order to make the contract work. On Ethereum Remix, as a free and offline platform, the gas does not matter. However, on a real Blockchain’s platform, the gas costs money and thus establish a limit to the code’s length, before needing to pay more.

So, the use of this separated protocol will allow to exchange documents within the Blockchain only by using a small codes which will act like a signatures or digital print as the unique ID of the documents uploaded.

In order to better visualize this process, we can explain it as follows:

A seller has a smart contract with a bank, which hosts an IPFS service.

A document is required under the contract and to be provided by the seller to the bank digitally.

The seller will then upload the document using IPFS, which will generate and give back a unique “link” in exchange of the document and will act as an ID. Then, this ID will be included in the contract and each time one of the parties involved in the transaction has to check or obtain the document, it will just need to copy and paste this ID from the smart contract to the IPFS server and the original document will be provided.

The security is provided by the “link” generated by the IPFS and the fact that the platform is decentralized, just like the Blockchain. Each time the document is modified or is subject to any change, this “link” will be totally different. It is guarantee unbreakable, as if any changes are done in the document (example just add an “s” to a word) the signature generated by IFPS will be completely different and thus unusable on the Smart Contract. Then, the party entering this link through the platform, will directly be provided with the original document uploaded.

Of course, not all the parties will have access to those documents, some might just have a look on them, other will have the possibility to get the original documents back or even could not access it at all. For example, the Bill of Lading uploaded will not be accessible by all parties and only be available to its rightful owner. All is a matter of code in the Smart Contract.

3.5.3 Smart Contract with IPFS

Regarding the smart contracts, a transaction on the Blockchain could be described as follows:

Always using the example of a seller and a bank using the IPFS protocol, the bank will issue the contract (Letter of Credit) directly on the platform with all the information, terms and conditions, documents required, the parties having rights or not over certain aspects of the contract, etc. The contract will then be registered on nodes which in return will dispatch the contract to other nodes and enter it into the Blockchain.

The bank will then furnish this interface to the participants of the transactions, in order to allow them to consult the contract, issue the right documents, validate them and ensure the next steps of the deal until its termination.

The seller will be able to send the document required under the letter of credit directly on the platform used to host the smart contract (example: Ethereum) without needing to pass through the bank's own server in order to upload the document. The nodes will then confirm to the seller that all the documents uploaded have been received and give a proof of the transaction.

Then the parties that have the authorization to consult or that have to approve the documents will have access at any time directly on the network. They will just have to request to obtain the document directly in the smart contract and will obtain the ID of the document on the IPFS or will be able to approve it directly on the platform.

4. Discussion

4.1 Implementation of the Blockchain

4.1.1 Opportunities

As we observed, the Blockchain technology can bring many benefits, not only in trade finance, but also in many other domains, such as the health system, the real estate, insurances, notaries, etc. In addition to the challenges that could be faced and the opportunities that could be offered, discussed in the previous parts, by Blockchain and Smart Contracts, others can be added.

4.1.1.1 Processes' efficiency and security

Due to the system of nodes allowing the immutability and the impossibility to change the data registered, in addition to the full transparency coupled to an availability of the data and a possibility of checking at any time, the Blockchain would allow to establish faster and more secure processes, thus decreasing the risks and the costs involved in trade finance's transactions. Smart Contracts combined with the Internet of Things, providing information in real time about goods shipped and electronic notifications throughout the reception of documents and self-checking protocols, would afford full transparency at any time during the process. This significantly reducing the transaction's cycle from its establishment to its settlement.

Regarding the security for the parties, the Blockchain could permit a trusted and immediate delivery of documents of title, all by eliminating the risk of frauds due to double-spending or invoicing. The data could be auditable at any time and from the beginning of the activities on the Blockchain, which would allow a full traceability, and thus a legitimacy of documents' certainty. Due to its complex architecture, the Blockchain is perceived as one of the most secured technologies, reducing the risks of cybersecurity.

Through standardized business processes involving Smart Contracts, the terms and conditions executing and checking themselves, could remove human risks all by increasing timing efficiencies. Business processes' automation through Smart Contracts would reduce, or even eliminate the need of a third party's involvement for a transaction, depending of the payment method, thus cutting down duplicated tasks such as checking of documents and creating more efficient and accurate transactions. (Mercuria, 2018)

4.1.1.2 Digitization and Digitalization

The difference between digitization and digitalization can be explained as follows:

The digitization will mostly refer to the transformation or the transition from physical document to numerical ones, thus with the potential to increase processes' efficiency. So, we can consider that a paper document scanned on a computer has been digitized.

Digitalization is more related to business processes. Indeed, we will use a certain technology in order to enhance the business models. In other words, the Blockchain technology could help to digitalize trade finance's processes through the digitization of documents (I-Scoop, [online]).

Thus, the Blockchain technology could create significant ways of improvement's opportunities regarding the business processes in commodity trading and especially in trade finance. However, the willingness to update business processes is not new and attempts have already been made in order to improve procedures and ways of working.

Until the beginning of the twenty-first century, the commodity trading "processes for handling documentations were firmly entrenched in the nineteenth century. Paper was the key. Copies were king. Some countries (e.g. Columbia) required from 24 to 36 copies of certain import documents so that each of the agencies, bureaus and commission within the government would have their own set for their files" (Hinkelman, 2009).

With entry in the digital era and the appearance of technologies such as the Internet or computer systems, came the possibility to implement changes. However, even today, international trades still require huge amount of paperwork, to be transferred between the parties all along the transaction. So, if the idea of transforming the processes regarding the handling of documents appeared around twenty years ago, why is it not implemented today?

Well, for three reasons: the people's slow incentive to change, the diversity of the systems which makes them incompatible between different countries, and the people's lack of trust regarding the legal aspect of digitized documents (Hinkelman, 2009).

Today, Blockchain can solve two of those issues. The technology has established a system which can be used worldwide in a standardized way. No more incompatibility regarding hardware or software systems like in the good old days. Today, a single technology could be used worldwide and be compatible with all the computers and IT systems available everywhere.

Then, regarding the legal aspects of digitized documents or signatures, their authenticity and potential enforceability, people are currently working on the resolution of this, with promising

results. Just like in Geneva, with the example provided in the 3.2.3 *Blockchain for Geneva's* part.

Thus, only remains the people's slow incentive to change. Researches have demonstrated that it is in the human nature to distrust change. People's mind goes through several steps from denial to finally reach acceptance or, in our case, implementation. This process takes time, and people need have proof that a new system will work to start to trust it.

According to M. Lambert (in the interview given on 3rd of July 2018, see *Appendix 7.2.1*), digitization of documents would lead to faster and smooth processes, as all documents would be shared between the parties and available instantaneously. The features of Blockchain combine to the digitization of the documents would then save costs in addition to enhance risk management and increase the working capital management.

The major barrier that could encounter the digitization process, would be regarding the physical paper documents which will still be required for areas such as customs clearance.

A high level of investment will be needed, at least at the beginning of the technology's adoption. Indeed, new programs or software will have to be created or improved which would lead to significant changes within companies' business processes.

4.1.1.3 Tokenization of Assets

Another opportunity with the establishment of Blockchain would be the tokenization of assets.

“On a Blockchain network, the trade asset can be digitized by using cryptotokens to denote custody or ownership of the bearer. By tokenizing the trade asset, its transfer between trade transaction participants on a Blockchain network can be conducted in parallel with the movement of the physical asset, establishing a clear chain of asset provenance” (Varghese, Goyal, 2018, Part 3).

As we have seen with the part 3.3.1 *Smart Contracts and Trade Finance*, the current business processes suffer from many inefficiencies which could lead to serious issues. Thus, challenges such as “delivery risks due to insufficient shipment visibility, increases costs due to documentary inefficiencies and loss from documentary fraud” (Varghese, Goyal, 2018, Part 3) could be addresses.

Figure 26: Trade Transport Pain Points



(Varghese, Goyal, 2018, Part 3)

The use of Blockchain and the assets' tokenization would then ensure “delivery assurance to the buyer, enhance shipment status visibility and speed shipment release data” (Varghese, Goyal, 2018, Part 3).

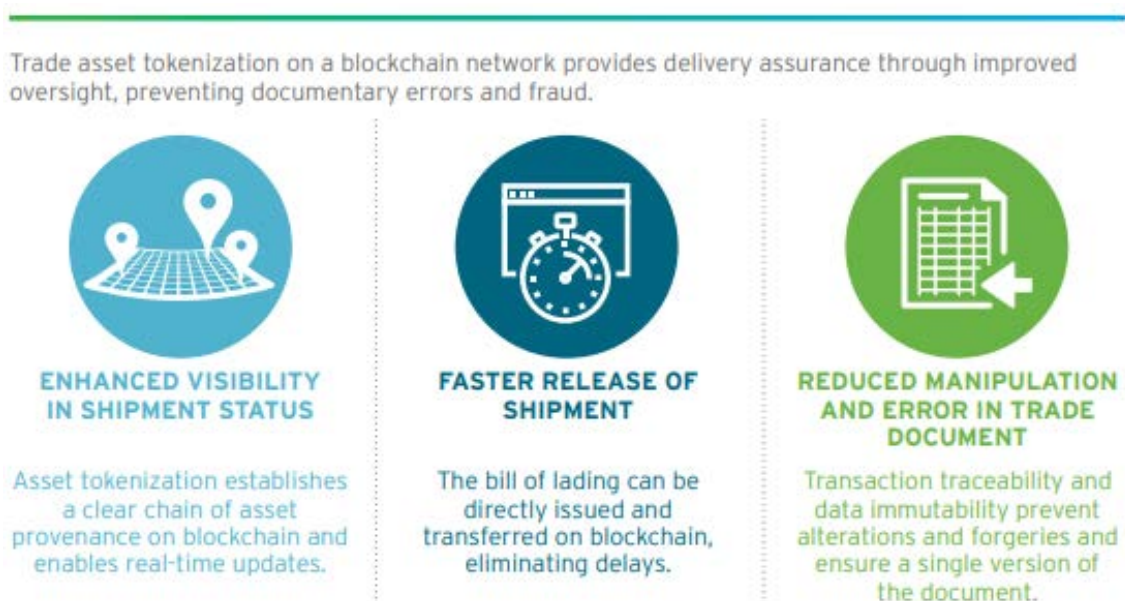
In addition, “transaction traceability and immutability of information on Blockchain can substantially reduce documentary fraud in a number of ways.

Instead of multiple copies of originals issued for documents such as bill of lading, only one digital instance is generated, which eliminates the possibility of forgeries for the importer.

Each party on the Blockchain network, based on their permissions, can view the data uploaded from other sources but can only add or modify information for which they are responsible.

No party can alter original data on its own without consensus because all entries on the Blockchain are clearly traceable to their source, and information in documents is pre-filled using the data immutably stored on Blockchain. Transaction traceability also supports related processes, such as high-seas trading, through quick and easy transfer of documents among multiple parties” (Varghese, Goyal, 2018, Part 3).

Figure 27: The Benefits of a Single Version of Truth



(Varghese, Goyal, 2018, Part 3)

4.1.2 Issues

According to Public Eye, commodity trading sector has always be vulnerable to several issues. “Lack of contract transparency, Corruption, Illegal commission payment, trade with politically exposed persons (PEPs), Commodity laundering, aggressive tax evasion, and involvement in subsidy fraud” (Public Eye, [online]).

If Blockchain could resolve those issues and create such opportunities of improvement regarding the trade finance’s business processes, some factors are still to take into consideration and could hugely delay or even abolish its implementation worldwide.

4.1.2.1 Global Consensus required

Given that the way of trading has not much changed since centuries, and that there is number of participants in the market working in collaboration with additional service providers, an implementation of the Blockchain would require a global agreement worldwide between all the concerned actors. Sellers, buyers, banks, inspections companies, customs authorities, shipping companies, insurance companies, etc. will have to agree between each other on the use of a single platform hosting Blockchain technology to perform transactions in the future. Thus, the main factor hindering Blockchain’s development about this is regarding the actors who will use the Blockchain, and not the technology in it-self.

4.1.2.2 Lack of Standardization

In international trade, the complexity of a contract and thus of a transaction is driven by the terms and conditions of such contract which can significantly differ from one to another. In order to use a Smart Contract in the different commodity trading’s markets, we will need to establish standards regarding different aspects regarding the creation and understanding of trade contracts. Thus, naming convention, for example Documentary Credit in Europe versus Letter of Credit in U.S.A., rules regarding documents, whose function can differ from a country to another, and many other ways of working have to be discussed and be modify in order to be more easily standardized through Smart Contracts. New standards will need to be established through the different industries, which in addition to take a lot of time, seems very unlikely to happen.

4.1.2.3 Fears of Change

In addition to the fact that usually people are not always thrilled by change, especially on the workplace, and thus slow the adoption of the new processes. We also have to take into account the fact that people could be afraid of potential risks they imagine. Coming back to the digitization of documents, “There are also concerns regarding the potential for digitization to increase the risk of fraud. While fraud risk will be reduced due to less manual intervention, it is feared that it could create the opportunity for new ‘techno-fraudsters’ to enter the arena to, for example, electronically forge documents, change beneficiary names and duplicate b/l’s for double negotiations” (Bonacina, 2016).

Of course, actions will need to be taken in order to deal with troubles which could occur during the implementation phase, however the way people are sometimes setting their own barrier will not play in the advantage of new possibilities.

4.1.2.4 Legal Impact of Smart Contracts

If one day Smart Contracts have indeed the potential to replace physical contracts in trade finance, such as Letter of Credit, there is plenty of concerns to be careful. First of all, if Smart Contracts went to replace actual contracts, they would become, by definition, contracts binding under the Law. “A legally enforceable contract enables parties to coordinate their actions and trust that their commitments to each other will be fulfilled” (Werbach, Cornell, 2017).

As legal contracts there is issues to be resolve. In a paper written by Kevin Werbach and Nicolas Cornell called “Contracts Ex Machina” and published in 2017, some element were put forward regarding the legal system.

First of all, the fact that actual contracts are designed by and for humans, a machine could not make the difference or recognize terms and meanings. An example of contract clause that might be agreed and settled for a transaction is the “use of best effort”, where the parties have “to exercise their “best effort” to perform their contractual obligations. The provision is a more specific definition of the implied covenant to act in good faith” (Contract Standards, [online]). However, as the code of a Smart Contract is not interactive, there is no grey, only black and white. So how to include in the code what would be perceived as the “best effort”? How to code something that is normally decided by human judgment?

According to M. Lambert, three subjects have to be addressed regarding the legal side of these new technologies. (M. Lambert Interview, see *Appendix 7.2. 1*).

First, the legal space. Indeed, it is obvious that the laws are not the same in every countries. However, Smart Contracts on their side, face no barriers and can be used worldwide. Thus, how could we deal with transfer of ownership, for example, which is not regulated everywhere the same way and does not pass through Smart Contracts yet.

Then the question of regulations and systems to put in place. Today, regulations are relying on centuries of jurisprudence. But the establishment common systems of arbitration will take ages.

Finally, the enforceability people will give to these technologies. People need to trust a technology before to use it in their businesses, and this trust will come through the adaptation of juridical systems on this subject.

In order to resolve those issues, governments, companies and people need to agree with each other, standardize international trades' procedures and establish common ground to the Blockchain's use. Which, in the current conjuncture, will probably never happen.

4.1.3 Interrogations

Looking forward, we could ask ourselves, is the Blockchain and the Smart Contract the universal answer to solve the issues above among other? Is there any other issues or interrogations that Blockchain is susceptible to raise?

For example, do the companies which will implement Blockchain and Smart contract in their daily activities, supposing they will one day, will replace traditional fiat currencies by cryptocurrencies, already existing or potential new ones, in order to perform payment more easily through Smart Contracts?

Could the security for the parties involved in a transaction can be confirmed through Blockchain technology and be taken as unconditional proof? Just like in China, where in July 2018, the Hangzhou's tribunal accepted for the first time a proof brought by the Blockchain. A proof considered as "admissible, viable and credible" (Verdon, 2018).

Then the asset's transmission and documents of title could they be considered as immutable, viable and convey ownership properly all along the business processes in a secure manner?

Given that computer programs and technologies will take more and more space and responsibilities within the industry, how companies will handle the introduction of these new business processes and business models? How will they evolve accordingly? Will they totally change their ways of proceeding and replace the workforce on the field for the benefit of machines? As the Internet of Things combine with Smart Contracts and Blockchain would allow the transfer of information worldwide instantaneously all way through the supply chain, could they be programmed to operate without human intervention? Thus, adapting to any events happening to the cargo shipped or to the goods features' modification during the goods' transfer or storage.

4.1.4 Blockchain's Impact

"Massive amounts of information are now available, and with the advent of AI (Artificial Intelligence) and faster computing power, the global commodities market is becoming much more transparent. There are now companies that are tracking vessel movement, storage levels and predicting with large degree of confidence, destination of cargos and their quantity and description. As the Internet of Things (IoT) develops into the commodities supply chain, this transparency will only become greater.

Much like when the futures exchanges moved from open outcry to screen traded, this is the dawn of a new age and companies who keep up and ahead of this change will benefit. However, it is important that any changes to processes and procedures in the markets will allow parties who are using Blockchain to continue to trade with those who have yet to make the technological transition" (Mercuria, 2018).

"The use of Blockchain's technology in trade finance is highly significant. It could allow faster, more secure, more transparent and at cheaper costs transactions by changing value chain interactions and the complexity in the operations. The potential benefits that the Blockchain could offer in trade finance, such as automation of transactions, tokenization of the trade assets, or even the digitization of instruments would enhance trade processes' efficiency, remove fraudulent risks and increase the visibility regarding the supply chain for all parties involved" (Varghese, Goyal, 2017, Part 1).

In addition, to resolve the double-spending issue that could happen in trade finance, meaning in our case, the issuance of the same document to different parties regarding the same cargo or goods, an adoption of the Blockchain would also prevent the falsification of contracts or documents and significantly reduce the risk of misinterpretation related to contract's clauses and fraud on the goods.

Today, the real revolution that Blockchain could bring in the trade finance industry is regarding the time. By combining the Blockchain to the Internet of Things, all by adding Smart Contracts would allow so increase business processes' efficiency significantly. The ability to track from any goods, anywhere in the world, knowing their features, their origin, or any other information about them in a certain and instantaneous way, coupled to the possibility of sharing of data and documents securely and in real time through Blockchain, is already time saving. However, if we add to this, the Smart Contracts technology, which will then allow to self-execute transactions, the gain is even bigger. This would be the real revolution. The time saved for a single transaction, reduced to several weeks to only few days. All of this by significantly decreasing the risks and costs involved.

5. Conclusion

We have seen that Blockchain technology could offer large amount of opportunities in the trade finance industry despite its first purpose and can be adapted in order to fit in today's requirements and needs. However, this technology, not fully mastered yet, also creates concern for people and as we still tend to be confused when it comes to Blockchain's full exploitation, people will still need other confirmations and Proof-of-Concepts. That is why, after years of studies and tests, Blockchain is still in its early stages.

Big companies around the world are already operating transactions by involving little by little the Blockchain, in order to observe the outcomes delivered. We tend to think that the Smart Contracts could exploit their full potential regarding standardized transactions, rather than with commodities which require more specific obligations, for example some soft commodities like coffee, cotton or grains.

In addition, the main pain point to resolve will be in regard to legal spaces and regulations that governments need to establish for this new way of working. Common agreements need to be found, in order to provide standardized and coherent business rules that will have to be followed worldwide.

To do so, I think that several platforms need to be used in trade finance. In order to secure neutrality and fairness, I think that a new one should be specifically created for the commodity trading industry and regroup all the participants on the market. This platform should be introduced by an independent FinTech and absolutely not by a big trading companies, governments or any other party directly involved in operations.

The large amount of actors will benefit from the improved security their number brought to the technology, meaning that it would be much harder to compromise, all by adding simplicity in the data sharing and use.

Furthermore, I think that laws and regulations established from governments would be easier to test and implement for a specific platform containing all the global commodity transactions, rather than settle those rules here and there in function of separated transactions.

I think that today, the general knowledge about the industry is sufficient to create a set of regulations to be followed in advance, and not bringing them afterwards. The business knows how to do when a vessel is late. It knows what to do when a party does not fulfil its contractual obligations. It knows what to do when a payment is unable to be made. And much more.

So I think that the commodity trading world can move forward with what it has acquired in the past, and not to forget everything just because a technology could have an impact on the business processes. Just because the Blockchain could allow less paperwork does not mean that all this paperwork made in the last centuries will become meaningless or obsolete.

To come back to this hypothetical platform stated above, in order to set up a level of transparency suitable for everyone, because if all the companies in the world are regrouped on a single platform, maybe some of them would not want that their neighbors know what there are doing. So, why not to think about a platform to be both public and private.

Meaning the platform being public at a larger scale a becoming potential private at lower one, respective to the transactions executed. Thus, traders would still find incentives of doing their jobs and trying to obtain the best margin possible for each transactions.

The platform would be then represented as a chain of command or a company hierarchy. With on the top the general commodity trading industry, where all the buyers, sellers, shipping companies, banks, inspectors, etc. could connect themselves and thus be centralized. Then this block would divide in the different industry's features, such as oil, metals and soft commodities, which each of them would be divided into more specifications and so on and so forth until be divided into distinct products. We could also divide it into different business zones in order to clarify event better the process.

The platform becoming private at a certain level in order for companies to execute transactions, for example regarding the amount of money engaged, all by keeping information about the transfer of the commodity available to everyone in order to still ensure transparency.

Thus the set of regulations could thus directly be established at each level and be spread to every participants accordingly. Risks in commodity trading could also be dealt with more easily and consequences in case of direct misbehavior, for example fraud, could result in a banishment temporary or definitive from the platform. This eradicating all incentive for fraud, given that business could not be done anymore.

These are just ideas in order to go further in a potential Blockchain's adoption. I do not know if such a system would be possible to achieve, technically (public Blockchain becoming private), as well as ideologically, meaning if it would fit with people requirements, views and expectations on the business.

However, what I do know for a fact, is that in order to make these technologies work at a world scale, and make the Blockchain's revolution become true by passing from a Proof-of-Concept to a potential global implementation, time and efforts will be hugely required.

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7. Appendices

7.1 Survey

General questions:

- 1) In which “side” of trade finance is your company involved in?
 - Trading (buy and sell)
 - Banking/ Financing (Issuing, Confirming, Advising, Negotiating or Reimbursing Bank)
 - Inspection (Certificates)
 - Insurance (Documents or Certificates)
 - Other: ...
- 2) In average, how many documents are involved in a transaction requiring trade finance?
 - 2a) Which ones are the most recurrent?
 - 2b) Approximately, how much cost a paper based transaction in terms of general costs in order to emit and gather all the documents?
- 3) Where are the major difficulties in the supply chain regarding the process of documents' handling and what are the parties involved?

Blockchain and smart contracts questions:

- 4) What is your company's position regarding Blockchain and Smart Contracts technology in term of understanding and knowledge?
 - Unknown
 - Heard About (nothing more)
 - Understandable (quite vague)
 - Familiar (know what it is theoretically)
 - “Expert” (know how to implement it practically)

If "Expert":

4a) in which context/Commodity? (Does the type of commodity will impact the outcome of the Blockchain use? (Some more favorable than others to the use of Blockchain)?

- Oil/ - cotton/ - coffee/ - ...

4aa) what was the outcome?

4aaa) what was the reason of the blockchain and Smart contract implementation?

- Profitability (less costs)
- Faster transaction
- More secure (less risks)
- Trust
- Trend
- Other: ...

For others (Unknown/Heard About/Understandable/Familiar):

4b) Are you planning to get more involved or even try to implement it in a near future?

- Yes

process? 4ba) Where are you (which stage) in the implementation

- No

back? 4bb) Why? What are the factors that are holding you

What is inherent to its implementation?

5) According to you, are the Blockchain and Smart Contract technologies going to "revolutionize" Trade Finance?

- Absolutely not
- Probably Not
- Undecided
- Probably
- Definitely

5a) Why?

5b) if probably or Definitely: What do you think would be the time horizon for the blockchain to be fully implemented worldwide?

- Days/Months/Years

5ba) what would be the main impediments to a fully adoption of the Blockchain?

6) Do you think that Emerging Markets/Countries would be a barrier or an enforcer to a worldwide use of Blockchain in international transactions?

- Yes

- No

6a) Why?

6aa) what would be the key issues that will most likely be encountered?

6ab) what would be the impact for Geneva?

7) Have you “fears”, or on the opposite, good expectations for the future regarding a global use of the blockchain?

- Yes

- No

7a) Why?

7b) what would it mean in the nature of the job? What changes it would implied?

8) What would be the major legal barrier to overcome in Switzerland to shift to a fully automated smart contracts use?

9) If the Blockchain is fully implemented and used worldwide, where would you put the major risk of its use in the processes?

-Documents

- Fraud

- Job efficiency

- Risk Mitigation and Control

- Others

10) Which “platform” do you think it is more likely to be used regarding international trades (Foreign platform (ex. Ethereum), Swiss platform (new ones that could be created in the future)?

11) How do you think the Blockchain would change the way you are actually dealing with collateral management?

11a) would it have a significant impact on the processes and the parties?

-Yes

-No

12) How many people are working directly with the documents in the Company (checking the L/Cs for example)?

... People

12a) If Blockchain is 100% adopted, how many would people would be remaining (dismissed, move to another place, change the nature of the job)?

... People

13) What would be the impact regarding the legal aspects of the company (On attornment/jurisdiction/...) (Example: China, where the W/H R. is a document of title)?

14) If fraud is not fully eliminated and still remains in a way or another, what do you think the impact would be regarding Blockchain? (Example: issuance of W/H R. in a paper version, even if transaction requiring the Blockchain)

14a) Would it change something significantly/Do you think that if Blockchain does not meet the expectations enough, people could go totally go back to the "old fashioned way"?

7.2 Interviews and Feedbacks

7.2.1 Interview with M. Jean-François Lambert

(Phone call, 03.07.2018)

Call starts:

Romain Collet: Hello, M. Lambert. Thank you again a lot for your time and your availability. Maybe we could start by talking a bit about your professional experience and your background.

Jean-François Lambert: Well, quickly and simply, I created the commodities financing activities at HSBC from the trading side, meaning from the product side. I conceived the project, sold it to the bank, implemented it and managed it. This was my last activities. Before that, I used to work in trading for a long time ago, structure trade, worked with commodities but not only.

I have a long experience in international trades, I have an international trade's fund and I worked in France during 6 years on all emerging countries, for the CCF (Crédit Commercial de France). After finishing my project done this for HSBC, I went to London in order to develop structured finance. I become commercial manager for the trade activities worldwide and then I took the responsibilities I just explained.

RC: Wow, thank you very much. And in your carrier did you heard about or even executed transactions using the Blockchain technology?

JFL: No, I am consultant since around 2016, and when I stopped working for HSBC there was only few works already done with Blockchain especially within "big banks". There was only theoretical work on this technology. And as you mentioned, no body executed real operations. There is a lot of banks that have a "Proof-of-Concept", that do operations, however these are operations with no regulated flows or if they are, they are regulated flows with always the same usual suspects. Meaning, a buyer, a seller, all of this is a bit artificial if you want. My point is that they are not implementing anything, there is no implementation for now. Everybody realizes that this technology can bring very deep modifications, whose we are going to talk about. However, the truth is that, as of today, there are missing things which for now make us stay on the "potential" side. And anybody wants to miss this opportunity so everybody has an eye on it. This is called the FOMO (Fear of Missing Out), which motives the banking sector today.

RC: So they know about the technology, they have a motivation, they already "get a foothold" in this area, in case of an opportunity occurs in order not to miss it.

JFL: Exactly. And so in fact, everything is still artificial. However, one day it will eventually unblock. But for now it is artificial.

Me: So according to you, the Blockchain and the Smart Contracts' technologies will in a sense revolutionize the trade finance's world? Does these technologies could do that?

JFL: They might do it... They might do it in a very deep way. But I do not believe in a REVOLUTION. I believe in an EVOLUTION. Because, regarding Blockchain, the banks have a look on it today. It is not your subject, but I think it is good for you to know it.

They look at this technology in order to reduce their costs. Meaning, a ledgers' decentralization would mean more flexible back offices, offices less humanly populated, which means potentially substantial savings and a complete architecture change shift of the entire bank support structure. The support structure I mean, the ones who support the different jobs. Again it is not your subject, but I think that banks are interested in the first place by that. Then it could be open or closed Blockchains, and also intern Blockchain.

This is a new type of organization. So as of today, I think, that when we talk about Blockchain, and we forget about the client for a second, the interest of the banks is this, to reduce their costs. Do not forget that the banker job is a job where the ratio revenue over costs is very bad, especially in Europe. The cost income ratio, which is a fundamental driver, is very bad.

There are a lot of costs. A European bank should always have around 70% of costs for 100% of revenue, which would be a super ratio. You can observe intuitively that it is not so good, it seems not very good. It means that the added value is hard to find.

This is the case with banks. Classical banks are at 80% costs compared to revenue, some are even up to 90%. In Asia, where the labor is cheaper, there we can go down much lower. But again, it is a bit artificial.

Knowing that we are in an environment where in order to earn money banks need high interest rates, if interest rates are low they will not plummet tomorrow morning, given the fact that there is no inflation.

So, if the interest rates will not sensitively and quickly improve, the perspective to observe an increase of the banks' revenues is quite low. It is real, but more complicated to achieve. Thus, there is a focus on costs. And there, the Blockchain could have an impact.

In any case, all banks have a serious eye on it and try to reinvent their processes. And all the big banks' service providers are doing it too (such as Swift, etc.). This is to show you that we are not talking about a small revolution. Here there is a real revolution that is true.

Then, how fast this revolution will happen, and this is where I think we always want to talk about revolution, but revolutions are really rare.

It is true that there was one from caravans to cars. And that is true that we did not come back, but we did not achieve this in one day.

RC: It means that, for example, when we speak about the Internet, it was a revolution and it has brought something totally new. The Blockchain would then be an evolution of the Internet, roughly speaking, in order to connect the people between them in an easier way.

JFL: Yes, but even with the Internet, because you are too young but I remember, I was director of a Bank in Hong Kong in 1990-1991, and we saw the appearance of the Internet very well. We all had computers, etc. However, we did not managed to know what to do with them.

From this point of view, we are a bit in the same stage with the Blockchain. We see well the technology, but nobody can really articulate what we are going to do with it.

A lot of people are looking for, like the famous FinTechs, etc. There is a lot of very interesting and revolutionary ideas and notably the one regarding the Smart Contracts. And we admit that the Blockchain will significantly reduce the cases of fraud, because the problem is that. If there were centralized ledgers it was because we needed trust third parties. Today with Blockchain we say: "We decentralize. Yes, but can we trust it? Yes of course, there is no issue because the technology prevent the fraud."

In a simplified way of speaking, this is the interest of the Blockchains. We will not argue on that and consider that it is true and valid, for argument's sake. If it is true, the Blockchain's technology can allow an extremely attractive evolution in this sense, and because of the smart contracts, it will allow an acceleration of what is the real subject: the DIGITALIZATION.

Today, the real subject is that when we finance an operation, when we make an operation, the paperwork is complex and heavy to deal with. Each party has its own payment method, own process, do accept emails or not, etc. The Digitalization, in a very secure way, can bring considerable changes.

This is what everyone is looking for. Imagine from the moment we can digitalize, we will have to change everything. No more back office will be needed, things will have to evolve very quickly. So, this digitalization can bring modifications that I consider as essential. However it still has to happen. Now I do not know if it falls into your work, if you prefer to ask me your question directly otherwise I might to deviate from the subject quickly.

RC: No, no, go ahead, honestly the digitization of the documents is a part of my work and I would like to explore all the possibilities. Given the fact that it is one of the project that could lead to an improvement of the business processes with their digitalization, so it is exactly what I will try to define.

JFL: It is certain. However, this digitization of the documents is absolutely essential. Because, from there we have a fluid process, not only fluid but we have a process that is fast. And we have a process that is so fast that it is instantaneous. This is the revolution.

THE REVOLUTION IS THE TIME.

The value of the time does not have any more the same measure. In a digitalized system, of the Blockchain type and thanks to the Blockchain, the information can be shared at a high speed and in real time. That will change the operating modes in international trade, but also of the entire business world. And of course of the business world with the finance and in the business, between the people buying and selling, people transiting, but also the ones providing a service to the others.

So this is the essential revolution. Now, if we go further, for me it is a needed revolution but not sufficient. It is a revolution in a sense that, yes we digitize the documents, however in my opinion, we are so obsessed by the Blockchain in itself, that we do not pay attention, and that is the problem, to the fact that the Blockchain will not set up by itself, other things will occur. Or maybe nothing will. But for now, I will not give you my obstacles, I am going to tell you that, for me, what we need and what will combine with the Blockchain.

The first thing that will combine with the Blockchain is, and there are new technological revolutions that will appear, and there is one in particular that is essential which is THE INTERNET OF THINGS.

Because the Internet of Things could give you information extremely reliable on the position (GPS, etc.), the condition, the nature of the goods. We can have everything. This is an extraordinary revolution. But in itself, we cannot do anything with these information. However, if we combine the Internet of Things with the digitalization through Blockchain, in order to have the information in time of what goods, what quantity, what condition, what situation, if we combine what the Internet of Thing brought with what the Blockchain could bring, this would be the revolution. Because in real time I can know who owns a good, if everything that should have be settled according to my contract has been done, in an instantaneous way.

Today, as a result, banks will finance a company that will buy a good. Banks will finance a stock. Banks will finance the resale with a receivable, a client discount, etc.

However, what banks cannot easily finance is what is in transit. However, today's world relied on global supply chains with a large amount of goods in transit. And all of this is financed through companies' equities or banking lines, for the most solid ones, that are not linked to the operations.

Tomorrow, if I know who has what, if I know what quality, thanks to Internet of Things, I do not see why there would not be new financing ways, new financing types that would emerge. Because more certain information will be available on events.

For example, I can see that Romain sold to Jean-François, and Jean-François just resold to François and François resold to Claude. And if, at each stage, we have the precise information, the banks, for example, or other investors could agree to finance the passage of the goods from François to Claude instantaneously. Knowing that we have the absolute information on the cargo's quality.

So, GPS, Internet of Things, Blockchains and Smart Contracts through digitalization are the four technologies which could, by being combined, revolutionize international trade. For me, this is the evolution.

Now, why has it not happened yet? Because, the Internet of Things exists, we could equip all containers with it. Smart Contracts exist. Blockchain works. So, why are we still at the Proof-of-Concept stage? Why are we still in the testing phase and looking for improvement?

Saying, Natixis made this operation with Mercuria, etc. HSBC made an operation with Cargill, this is the first one. By the way, everyone is saying that it is the first time, it is the first one, etc. What is happening? This is the real question. And what is happening is that there is an issue. There is even two. There is two problems.

The first issue is the legal space. And this issue of legal space is huge. Yes, we have the information but the property transfer does not happen through Smart Contract. Thus, there is an issue and as long the property will not pass through Smart Contracts, as long as it will not be the case, you could have all the technology in the world, and nothing will change.

RC: Totally, we would need that everybody on the same page, with the same laws, the same regulations.

JFL: This is the second issue: the regulations. There is the legal aspect and the regulations aspect. Countries operate with different systems, different choices, change control, etc.

So, clearly the juridical systems are different, rights are different. How to arbitrate? There is no jurisprudence. We will need years and years in order to put everything in place. Because, once you implemented everything, that we accepted the Smart Contract between Singapore and the UK for example. Well the UK is not part of the European Union anymore, it is going to be complicated. And we tend to go to a split off world rather than to a united one, as you can see what is happening: trade wars, protectionism, people's selfishness frustrated by the globalization, etc.

So, before we meet around a table, as you mentioned, and that we managed to agree on common regulations, and before that those common regulations are translated in the different countries' laws, and before that lawyers could express legal opinions on the validity of those translations, meaning the legal aspect's translation not the language translation, and before that a company accepts them as valid, it will take years.

Even if it has all of this, to act accordingly whereas the system would not had been tested, because laws and regulations have to be tested, if you say: "It is okay Jean-François, you can trust me we can work together, etc. and if something happens we are protected by the law".

I would answer: "OK but if we agree on a common law, I know there is a jurisprudence, I know if I am protected or not. If you tell me that you want to settle a contract under Gibraltar's law I will tell you no we do not trade together. If we choose the English law, I say why not." I know that. Why do I know that, not because my lawyer told me so, but because I know that if I have a valid claim to present in front of an English court compared to the contract I signed, I know I will have no problem to obtain a favorable judgment.

But tomorrow, as we are in a non-tested world, an electronic world, etc. How am I sure, despite all the juridical opinion I can dispose of, that I will be comfortable and that I can have all my contracts, or a big part of my business, in Smart Contracts and digitalized? Knowing that I do not have any more papers and any more insurance to go in court and to not be dismissed.

Thus, it will take years. Meaning that we are in a very paradoxical world, where it is the technology which drives ideas, and this is the technology which moves forward much faster than the machine and which interests everybody. Because we are all interested, the banks, the buyers, the sellers, the service providers of any kind. However, the juridical system will take a much more time to adapt. And this is the challenge. I do not see this juridical system accelerated very quickly. Because we are in a world which becomes, on the contrary, much more selfish and closed, uncommunicative.

I would even say that we live in a world where a fundamental contradiction is being born between the way it is organized, the global supply chains, and people and governments' aspirations. The "me first", "make America great again", "Italia to Italians", etc. And these are, in my opinion, the two obstacles.

On the other hand, it is a good news that the technology is evolving, because the technology will put pressure, the different businesses will act accordingly, saying it has to change, it has to evolve, we have to move. But, before it impacts 30% of worldwide trades, even between two developed countries, even between two developed continents, and that those 30% are treated digitally, I am not even sure you will assist to this in your life.

RC: So for now, it will remain, let's say, blocked with international, big companies such as for example Total, Cargill, Mercuria, etc. which will trade with other companies that they know well, with banks they are used to work, with laws and regulations that they know, and which will enjoy this technology between them. And thus, meaning much less opening possibilities for new companies, smaller ones or that want to make new deals.

JFL: Exactly. The market shares where everyone will bid, where everyone wishing to finance could bid, etc. will encounter a limit. All of this has a limit. The limit is the enforceability. And this enforceability go through the upgrade of juridical systems.

Just to let you know, there is still some countries' juridical systems where a fax or an email is not accepted as a signature. Even in a sophisticated country such as Switzerland. There is some things that you can do using electronic signatures and other it is impossible.

Try to buy an apartment and to not go and sign in front of a notary. You realize how heavy is a process to buy an apartment? It is the same everywhere in the world. You can see that the juridical system still remained based on important and basic things.

RC: That is totally true. And we will need a lot of time for any small change and for people to trust this new system.

JFL: Yes. Thus, baby steps. The technology is faster than its shadow. We try to find solutions, but the revolution, meaning to turn the 20th century's page with the Letters of Credit, etc. and all the documents arriving three weeks later than the cargo, etc. which is the real life, and to move to the online-on time era, with the absolutely certain information will take time.

It is maybe true on the technical plan, but before this can happen, before that all this technological advantage could be used by companies, it will take a lot much more time than we think. A lot of people will certainly explain you that it will not take long, however this is because we are all attracted by the technological evolution.

RC: Yes, that is true and I really have the feeling that we absolutely want to be “dependent” of this technology and absolutely put it forward and we give a lot of importance to it.

JFL: Yes, but it is a legitimate importance, but in the first we have to execute a reality check.

RC: Well thank you a lot, you answer almost all the questions I wanted to ask you with your explanations. Maybe just if, in the theoretical aspect, we start more and more to use that technology, and then realize that it is not working as we expected, do you think that we will try to improve and fill in the gaps or put a major stop and get back to the “old-way” and to not look for any other solutions?

JFL: No, the world proves every days that we never go back. So the technologies constantly evolve. Each mistake leads to new decisions and new trials. So no, we do not go back on the progress. Furthermore, companies will not take the risk to use a new technology that is not absolutely safe.

So yes, there can be issues. For example when you change your IT system, it never happens as planned. There is maybe 1 over 1000 companies that comes back to the previous system by saying: “We made a mistake, we stop”. They can come back temporarily, because they are still in parallel run, both systems are running. But if they have to go back to the old system it is very temporary.

RC: And how do you think that the Blockchain’s technology could deal with and secure the collateral management for the banks?

JFL: You know the problem with collateral management is “the eye within the warehouse”. All the frauds, all the issues with the collateral management is: “the cargo is not here”.

Then, of course, if we can use a Blockchain’s system in order to issue warehouse certificates, unforgeable, this would be very attractive. But once again, uniqueness of things and acceptance of the digitized warehouse receipt through the different law systems is the key.

From the moment we agree to say that it is unforgeable, the information transmitted through the Blockchain is a very safe information, if it is properly formatted. Once again, the problem is its enforceability. I think it is quite naive to think that there will be no more frauds because of the blockchains. There will be no more those frauds, but there will be others.

RC: This is what we discussed with M. Piller. Let’s imagine a transaction done through Blockchain and that we incorporate the collateral management of the goods and that all of this is dealt with electronically.

How could we be sure that the warehouse which issued the warehouse receipt through the Blockchain, meaning a digitized document, did not issue other receipts in paper format to other parties, other companies for the same goods all by avoiding to say that warehouse receipts were already issued for those goods?

JFL: Exactly. But that is because we are still in a transition phase. And even if the warehouse delivers a warehouse receipt and someone can still let the goods leave without authorization, because the person locally in charge is a “subcontractor” and is under pressure. Thus, you have your warehouse receipt, but you do not have the goods anymore.

The world is made of those frauds. So I am not sure that the collateral management will develop itself in an extraordinary way because of the warehouse receipts. They will be integrated, I easily agree on it, and this will be a very substantial advantage. However, once again, this comes back to our subject: the legal systems. How would we be legally protected?

RC: That is true. In order to make it work we would need that the entire be on the same page, with same regulations, same laws and processes.

JFL: Exactly. And this will never happen... We can make it zone by zone. But you see, take the example of the European Union, each of the countries could not even agree on the same tax system. In Ireland, a company will pay 12% taxes, In Germany it will pay 30%, in France 33% and in Belgium 38%. And we are talking about the European Union. We never went so far for an integrated system for different countries.

RC: So for now, it will be limited for big companies that know them well, with big banks which know them too and which finance the transactions with legal systems that are known and accepted by all the parties.

JFL: Yes, and I think that the first success of Blockchain will probably be regarding the internal processes of the organizations rather than the substitution of the operating modes. The passage from the ancient world to the new one is not a passage, it is a journey.

RC: That is true. Well thank you a lot for your time, you really helped me a lot. You talked about subjects I did not think about and that are crucial in this domain. Again, thank you very much.

JFL: You're welcome, do not hesitate to contact me if you have any other questions and hang in there!

RC: I will, thank you very much. Have a good evening.

End of the interview.

7.2.2 Interview Mrs. Marie Debombourg

(Phone call, 12.07.2018)

Romain Collet: First of all, thank you for according me some of your time to help me in my thesis.

Marie Debombourg: It is my pleasure. I have your word document. Do you have any more questions to ask?

RC: I would like to ask if you would accept recording this session, so it can use it to transcript our interview.

MD: Yes please go ahead.

RC: To start can you please talk about your professional roadmap which I got to know about through LinkedIn. Could you do a summary and talk about your experience with Blockchain.

MD: Alright. After HEG, where I did the same program as you with commodity trading as major course, I joined the company WeCan.Fund which positioned itself on the creation of platform of crowdfunding and very oriented on delivering transparency for financial transactions which means we diverted many projects on Blockchain. I joined the start-up right after my graduation.

RC: Perfect, Thank you. Did you have time to see the questions I sent you?

MD: Yes, absolutely. It is true that many questions were regarding the companies who use the technology, but we are in charge of coding and developing it, which is quite different. To help you, let me explain what we do. So we create the platforms of crowdfunding for the companies and allow those who want to use Blockchain to create a connection directly through Smart Contracts on the Blockchain.

So, we are more like the engineers who work on the creation of code rather than the use. There are certain questions that I will be able to answer as we have developed certain processes for commodity trade finance, but unfortunately not all the question concern us, as it will be more applicable for the companies who use it instead of us, who code for companies to use the system. You should ask the questions to companies like Mercuria, for example, as they would be more aware of the technology in your precise field of study.

So, I suggest you that we can discuss your questions in the order in order for you to better understand.

RC: Yes, it is perfectly fine for me, it will help me a lot.

MD: So the 1st question is about the trade finance in the society, and what it represents. Basically, the suppression of intermediaries and of waste of time, because there is a huge loss of time, especially in commodity trading where the most important is the duration of the transaction. Because as until the Letter of Credit is not delivered, which is the most important part, the work cannot progress.

To answer the second question on the part Blockchain plays in is that it reduces the cost and most importantly the duration in commodity trading and it also brings transparency which helps for the inspection for example. As you have noticed everything is noted directly on the Blockchain. It is a platform available for everyone the insurer, the inspector, the goods' producer, etc. All of them will connect on the platform and provide the data on the goods, the seller about the product, the shipping company on where they are, the inspector even confirm the information. All of this will create several transactions, several nodes, in several blocks, which pass from one block to another in order to register all the transaction chain. If one block is not validated, the chain is broken and will not continue.

In trading it will reduce the costs, for banking and financing it will remove the intermediaries. The inspection will be helped as everything is transparent, it will allow to certify to the insurance company that the documents are originals. That is already 5 advantages.

For the second question, I would say that what will be more impacted are the Letter of Credit and the Bill of Lading, the other documents are helping to handle the delivery of the transaction.

For the third question, the biggest issue will be for all actors to be on the same page, at least the same chain. That what is most likely to cause trouble within the supply chain regarding the documents. Because currently, as you have seen, we have a huge amount of paperwork to check, to sign, to validate, etc. with Blockchain could be easily dealt with as everyone can log on to get same information at the same time.

The solution would be that everyone realize that the whole transaction could pass through the Blockchain. Also, the problem of location, for example if the producer does not have the access to the Internet, mobile phone or a computer and that he has to deliver his product in another country, this could cause problems.

To solve this there are certain platform which were created in a way that we do not need to log on the Internet to use the Blockchain. Companies developed a Smart Phone which does not need to log to the Internet. I do not know how it works, but I have seen this recently and is used in distant countries, and it works.

Concerning the Smart Contracts, in the fourth question, the position of the company is very clear. It will facilitate the task, anything that can be automated, will be. This helps in the exchange and reduce the time consumption.

The only thing to pay attention to will be the security of the electronic signatures, which should be verified and certified for their authenticity. Regarding the users, or experts, is there a commodity susceptible to use the Blockchain more than another? I know that there are certain commodities which require less procedures. For example, cotton will require less time than coffee or rice, which will get ruined quicker or products' crops which will more depend on the weather.

In the first time, use Blockchain in crude oil market and then in other commodities would be a solution. However, it is important to remember that anything has been put in place yet. It is really a Proof-of-Concept.

RC: Yes! I discussed it in another interview, that there is no implementation yet. People just have a Proof-of-Concepts, but the work is in process to introduce it in the market smoothly.

MD: Exactly. But it will definitely revolutionize trade finance. Even this year, because network is already installed and we are already passing into production. It is very quick. It is simply the choice of the Blockchain and actors involved who are going to log into the platform.

The risk is that everyone would form their own internal Blockchain between the traders, the producers and the inspectors, when the goal is to have a common platform where everyone connect them. Which will eventually happen, in a second time. Firstly, there will be trials.

Regarding emerging markets, I do not think they will be a barrier. I think they will be the first ones to test the technology, as the commodity comes from them. So, I think that it will not be an issue, but what could cause problems would be the regulations in each countries. As the goods go from country to country, and the rules and regulations change from country to country as well.

RC: That is exactly what I have concluded, that the biggest problem will be to adapt the rules and regulations of different countries and to bring everyone on the same page, so that everything is done in the same way for everyone.

MD: Yes! That is true, it will be complex at the beginning as everyone makes deal his own way. But we have to start somewhere, and after that we can establish rules and regulations.

Regarding Geneva, as it is an international hub with the presence of international trading market, but I do not think there will be a direct impact on Geneva, but more like on individual companies.

Geneva actually has a very positive impact on the Blockchain, and as a lot of company want to settle in Geneva for the sake of facilities and regulations, it could have an impact of them.

RC: Do you think global use of Blockchain will have more of a positive or a negative impacts.

MD: Clearly positive impacts, because people will gain more by working with Blockchain, rather than wanted to destroy it. It will be more expensive for them to destroy it.

RC: So, do you think that a Blockchain's implementation will impact people who are currently doing the physical administrative work? Will the nature of the job change or Blockchain will even take away their jobs?

MD: Clearly their job will change, but not necessarily annulled as they will still have to verify the documents and make that everything is in order on the Blockchain. Indeed, they will have to be trained for the new system, but they would be able to double their productivity, meaning checking more documents for example and in an easiest way. So yes, the job will change, people's tasks will change, but it will not taking away the jobs.

Regarding the major risk, it will clearly be regarding the beginning of the process, when the first documents will be entering into the Blockchain and to be sure that they are originals. As they are impossible to change afterwards. The person who checks the first document will have to be attentive. The biggest risk, I imagine, is the change in the technology and that Blockchain comes to disappear. These for me are the major risks for the blockchain.

Then, I think that Ethereum will be the main platform to be used. Swiss platforms are more implemented for Crypto-moneys.

For the collateral management, will depend on the parties taking part in the chain. But commodity trading is a special world, as I said before there are everyone, farmers, producers, banks, traders, inspectors, shipper, the buyer, the seller, etc. Thus, it is quite pertinent to create a Blockchain for everyone for each commodities, as some parties will never trade within each other.

RC: What would be the outcome of a company, for example a warehouse company, which work with Blockchain and still continue besides to provide paper documents. For example, provide electronic warehouse receipts on the Blockchain, and provide others, regarding the same goods, but in paper? How could we trust them?

MD: So it means that the Blockchain is not implement on the whole process. If not everyone in the supply chain is using the technology, this could generate big issues. If the Blockchain is used at the beginning of the process, for example between the producer and the inspector, and then that is goes back to paper until the bank, here we have a huge risk. The idea is for everyone to have access to the platform from A to Z of the process until the goods are delivered. If the person is trading apart from the Blockchain there is communication error.

RC: But the people will trust more the paper rather than the transaction by blockchain?

MD: For now yes, but eventually everyone will be on the Blockchain and will trust the transaction and documents more than paper.

RC: Finally, last question, do you think if the blockchain does not work as expected, we will come back to the old ways?

MD: I do not think so. I think they will not cancel the Blockchain but will find a solution for the issue.

RC: Thanks a lot for your time and your insight.

MD: It was my pleasure. Do not hesitate to contact me if you need more information and keep me updated on the progress.

RC: Sure, Thank you again, Goodbye.

End of the interview.

7.2.3 Interview with M. Richard Watts

(Phone call, 17.07.2018)

Romain Collet: First, thank you very much for your time and for receiving me in your office. So, as I explained you, I would like to determine the actual knowledge of people regarding Blockchain and its potential use in trade finance also involving the smart contracts.

Richard Watts: Well it depends what area you are looking at, but essentially, within the world projects and we are looking at the moment is Smart Contracts in financial systems. First of all, I think that it is a reflection of where we stand today in terms of trade. Trade has not moved forward fundamentally in 200 years. The way of we do things is remarkably inefficient, I think that we count on because that has been a pressure to increase efficiency.

Margins toward it can be quite attractive. I think now people are looking into this a lot more, I think that has been a bit of a reduction in ethical knowledge within the trading companies. As the commodities' world is too vast, Smart Contracts could regulate the flows. So we are looking to the Blockchain as a way to achieve that. Whenever I look at something like this, I always try to identify the why. And that is what worries me a little bit in Blockchain moment is that we have not really established what we are trying to do.

Now, if the aim is to avoid fraud, then are million and one things that we could have done over the last 50 years that we do not do. If the aim is to say well, business today is incredibly insecure, fine, but we do still use paper Bills of lading which are printed on paper and assigned by someone. And so this makes no security to that.

So I think that it is all about increasing efficiency. It is also about the fact that people cost too much and try to reduce some of these enormous costs in the processes. And if we have been going through the same changes maybe 10 years ago, it would have been much more focused on putting in place the processes within companies as opposed to putting in automated processes, which essentially comes to the same thing but when we involved people it is more expensive. So what is actually the angle of the moment seems to be, and it depends a little bit who you talk to in the industry, simplify it.

Imagine, you have a transaction, you have a purchase and a sale. And what we are going to do is using Blockchain technology to underlie it to essentially provide a certain level of security. And the idea is, when you got your seller and your buyer, they will not do that direct transaction. The first stage would be: they negotiate. So they talk about what they are going to do.

Once that is decided, then they put in place a Smart Contract. That Smart Contract will basically be a mirror image of what has been negotiated. And essentially within that Smart Contract you are going to have different details about what are the obligations of the parties. Now, we cannot that Smart Contracts are going to say that the transaction is FOB (Free On Board), the Smart Contract is not going to say that it is FOB, because the Smart Contracts does not know what FOB is. We are going to tell it: This is where the risk is transferred.

I am not sure how the Smart Contracts will replace or supplement existing contracts, whether the long term like essentially is that once you negotiated, then you bring Smart Contract and that is the contract. I would not be remotely surprised if we end up for a long period of time with a paper contract and a Smart Contract purely for financing side.

And so the Smart Contract is purely on the financing side because that is quite interesting. Because if we imagine the Smart Contract that appears in the financing side as a box, then we will be able to put all the conditions like for example A,B,C,D and E in it, and then F comes out. F being cash. A,B,C,D and E being the documents.

Then the question is: how do you structure it so that, because as far as the buyer's concern, the only thing he cares about is he gets rights' goods. As far as seller's concern, the only thing he cares about is to get paid. So essentially, all what we are doing is this box here first of all needs to provide some kind of insurance to the seller that he will get paid. So in the same way you deal with an open credit today. So the complicated bet comes when you say well what are these facts need going and so here more simply you have in the box the Bill of Lading, the inspection documents, the certificate of origin, the insurance certificate and maybe something else.

And so essentially the way it works, and this is something that people are still discussing to see how to actually make it work, and the current state of the consortium I do not know enough into details to be able to talk to you about that. There must be a long way past this. But basically, the idea is to when you say: who issues these documents. So this box is a platform, in which we have the ship-owner, the inspection company, the chamber of commerce, the insurance company. They all are given access. So regarding the Bill of Lading, the ship-owner will be given access and he will be allowed to complete fields like: this quantity of this cargo was loaded on board of my vessel on this date. This is the shipper, this is the consignee, etc.

So as fast as the seller sets the price straight forward, one issue for me is that, as I said when we look at the seller and the buyer and their interests, the seller knows that in order to get paid the right documents have to be submitted. So what he does today is he receives all the documents from all people, checks them, complies them and presents them.

In order for the system to work, the documents theoretically have to either bypass the seller or they would be uploaded, the confirmation would be given and then the seller would have the right to approve them. What exactly happens if he rejects the documents, I am assuming they would have to go back to hands and there will be discussion and then will have to replace them. But this is a little bit complicated situation. Now, the thing is if you look at different type of trade to work with, there are couple of trades that have gone through so far on Blockchain, I do not know if you looked at Dreyfus' website, they put quite interesting case studies over Blockchain. They published it in October last year. Look at the first one done, the first one done was Mercuria. Not to say oil.

I think that at the moment there are a lot of applications, there are a lot of questions to be answered, and the people who do have the answers are not necessarily willing to share those answers today. Because, obviously everyone is working in their own bubble. The problem is that is going to have an obvious outcome, where we are going to end up with a load of different administrations. We are going to end up with 10, 20 different platforms. The thing is that it only works as one. Otherwise it is a waste of time.

RC: Yes, we will need to be all at the same page, using the same platform and playing the same rules.

RW: But if you know anything about trading, people don't play nicely together. So it is all a question of establishing the financial interest and I will be willing to bet that the implementation, and you asked when it is going to come into place and how long it is going to take, I would be willing to bet that the implementation is going to be very, very quickly for intra-group trade. You know Cargill buys from Cargill, sells to Cargill, and it would make a lot of sense like that. I think that then the next is going to be intra-large companies, and then the next is going to be intra-trading companies. And then, way down the line, 10 to 15 years down the line, is actually using in the real world. And I do not see any real way of getting a short cut to that. The thing is if you are exporting goods from Ivory Coast, how are you going to get the Ivory Coast's Chamber of Commerce to come onto a platform the goods' origin?

Ok, it is not rocket science, but it is change. And people don't like change. So, I can see a lot of potential, but I can see a lot of issues. I think that there are a lot of projects going on, also on the shipping side, not only for traders. I just think that at the moment it is a space where it is very interesting to investigate, but difficult to know exactly what was done. It is a little bit all over the place at the moment, but it seems to be slowly moving towards a bit of understanding of where we are going.

RC: In addition, for my work my advisor and I thought about coding my own smart contract, so with the help of an assistant at the HEG who finished its cursus in “Informatique de Gestion” and already worked with Smart Contracts, we code a simple one with just two parties, the issuing bank and the seller, to see how the transmission of documents would work. And there is all this question of contract’s settlement and the seller will have to gather all the documents, then provide them to the bank, which will then check, validate or refute them. Then if everything is in order, the issuing bank will confirm the contract which will self-executes itself.

RW: So it is not truly a Smart Contract, because the bank is checking and confirming.

RC: Yes, so it would be more a program that allows to transfer the documents then? In other words, the seller upload the documents on the platform, actually we used Ethereum Remix, and the bank has a direct access to them, can check and validate them or not. To be honest, we only design the code in the simplest way, as I never have done this before given the fact that it is not part of my cursus. So, we did not include all the other parties, such as the Chamber of Commerce, the shipping companies, etc. which will need to also have access to the platform to directly upload their documents.

RW: It is interesting what you are saying, because what you are describing there, essentially is a document transmission system.

RC: Exactly. It is not a contract in itself, there is no terms and conditions that have to be followed, and the code does not execute itself according to the inputs of the parties. In order to make it work, we use an IPFS (InterPlanetary File System) protocol for the documents’ transmission, because I have been told that it could be too expensive to code all the contract’s conditions and rules. So we focused on the simplest way to transfer the documents in a secure and instantaneous way. As the longer the contract is, the more expensive it is. And given the fact that we are targeting to cutting costs, I thought it would make no sense to decrease the costs from one side, and increase them on the other.

All would be done through this IPFS platform, also linked to the Blockchain, where we put all the documents directly on the IPFS which in return will generate a unique code, acting as the ID or the footprint of the document uploaded. The ID looks like an URL link that we will then put it on the Contract.

The parties will then have access to this link, only the parties allowed by the contract’s code, and when copy and paste it in the IPFS system, the original document will be delivered. If anything is changed in the documents, the clauses or anything else that is on the IPFS, the system will generate a complete different link.

RW: And then when we open it the document has not changed. Now the thing is that there is two ways of doing that. Either scan the document and treat it as an image, or you can actually treat it as a document through a text. As far as scanning it is concerned, yes, but we are not really moving forward. Well, today, why do we need the original documents anyway? We mainly need them for customs, and so can you printed out the system and give it to the customs? The real question is: why these documents exist? What are those documents?

We have the invoice that we do not need. We have the Bill of Lading, inspection certificate, certificate of origin, fumigation certificate, insurance certificate... Why these documents exist?

The first, the bill of lading, as you know it is a receipt for cargo that has been put on board, it is evidence of the details of the contract, and it is a document of title. So, essentially you are using it as a document of title in this situation. But we cannot ignore the other purposes because these are documents with tremendous amount of jurisprudence behind them. You know, there is hundreds of years of legal fights over them. And that I think is a big issue that we have: the legal aspects.

We are not talking about legalizing regulations. We are talking about contract law. We are talking about the fact that a couple of words that are written on the contract can make a difference from millions dollars. The people deciding the terms have to be people from trade. Have to be operational people. The people coding the contracts are not. So the question is: How much flexibility are going to be built in these Smart Contracts? Or, are they going to code a new one for every contract? And as you said, the costs are going to make no sense. It costs so much to code each contract that it will not change so much on the actual job. There are number of issues like this. I do worry a little bit that some of the people who are focusing on this things at the moment, they are focusing on only on quite narrow area of business. But you need to take into account every scenario. Also, to what extent are these systems going to be used as barrier to entry. Is this just going to reinforce the positions of the big guys? Very possibly. If you take something like grain, I mean what is the 80% or 90% of the world trade grains is controlled by 4 companies? Do we want to reinforce that?

The one thing I do know for certain, is that we need change. We need to improve efficiency in the industry. Are we going to end up saying: no we are not going to code a new Smart Contract for each contract, because we are going to oblige everyone to use standardized contracts. I mean, standardized contracts are potentially an interesting recourse, but then again it goes completely against the DNA of a trading company, which is, you know, "we make our money by buying cheaper and selling more expensively and doing the job in the middle".

The problem is: Is that actually relevant today? Is that true today? I am not sure. The problem is the opportunities for making money are there, but they come hand to hand with opportunities of losing money.

And again, people are going about: “the beauty of Blockchain is that it comes with change”. What if the technology needs to be changed? What is there is something wrong to start off with, there will be, on a regular basis. So, somebody will have the power to alter it. Altering it today, or going back in time and altering it, has exactly the same effect. So it is not actually as solid and locked down as people would have believed. And then people say: “Oh yeah, but the beauty of Blockchain is that it is distributed. But the Blockchain is question will be a closed Blockchain. We might be using something like Ethereum to provide the security, but the actual transactions, and the information of what is going on, will be limited to who has full view of the transaction. The bank, the seller and the buyer. So it is going to be tricky.

The main problem is that incredibly real world things. You have to deal with all these things and think about all the different scenarios. Are the banks the best people to put in place these kind of contracts? I think they have a very interest indeed.

MUSK came out with a very nice system, that could be the best system in the world, but we do not use it. We are not putting all of our business on your system. And I think that we are going to end up with about 10 different systems, in oil, in grains, in metals for big companies, small companies, etc. And then I guess that some of them are going to be easier to use. But I do also worry about the details, about the possessions. Because, today if you receive a paper document, terms and conditions, you have to physically put your signature above of it. If you agree to terms and conditions on a website, you will probably get passed towards terms. It is quite well accepted that when people are dealing with things on digital platforms, they are a lot less meticulous. So, is it to be a question where you have a box and somebody is putting together this contract and he has to go down and tick yes, tick no for all the terms and conditions? And I also worry a little bit about the long term, how our company is going to handle that. Are they going to end up with less people, and are thy still going to retain any atypical agreement? Are we going to find ourselves in a world where you have external companies which, basically like today when you have a legal problem, people go to the lawyers, there could be a situation where you have a company full of operators and when I have an operation problem you go to them.

RC: So yes, there are main changes that the Blockchain could bring on what it is done today, much more regarding the way with deal with processes, I mean internal processes within companies that are on the trade side and the banks.

RW: Yes, but the problem is that banks are highly expensive today. If the banks do not have confidence in the volume of your business, they will turn around and say: “you pay us an administration fee, and if you do your business we will take that fee off and if you do not we will keep the money.” Today, it is USD 200'000... USD 200000 just to open and run an account.

And so the banks are looking to improve their profitability and be more productive. Today, with the explosion of the compliance services, they have become very expensive ways of doing trade.

Now, my dream to the future, it that Blockchain replaces the banks. The banks will not be checking documents anymore. The banks will simply be making payments. I just want to go to the bank and say: “Hi, you are a part of this, and if this get clicked then you make the payment, but you are not running this”. Because the banks today want to be running this. Because, they want to keep control. Because they are terrified that the things go out of their hands.

RC: So, in this world, if a payment is requiring a letter of credit, would it be a company that will issue the letter of credit directly to the buyer and do not pass through a bank anymore? As, with the letter of credit, the banks are taking the credit risk of the buyer and secure the seller to obtain payment is the documents are properly provided.

RW: So the banks are taking the credit risk, because they have a lot of cash. So, there is simply two things that are achieved through a letter of credit. One is the guarantee to the buyer to be paid, only if the right documents are presented. And a guarantee to the seller that the documents will only have value because the payment is made. So, essentially, if you would had an escrow element into this, and so essentially this system sets up bank accounts where the buyer puts the value of the cargo, or a bank confirms, that they guarantee, that they have placed this value cargo, then the seller can go ahead and provide the documents and the seller gets paid.

Banks today provide two roles: financing and transactions. I would say that their role in transactions could be reduced tremendously, and I think that their role in financing, if it not attached to the transactions, could more easily be replaced. Because today, hedge funds and different financial institutions, they are worry about this because they do not have the ability to handle the transactions. So they do not give up trade finance. If the ability to handle transactions is taken out of their hands, and they were financing, with the security to the contract that would be put in place to protect them, then they could open up a lot more sources for trade finance.

RC: So it would be crucial for them to be implied directly from the beginning in this.

RW: If they do not want to be pushed aside. Banks do not innovate for the benefit of someone else. Banks do what is in the interest of their bottom-line, more based on my personal experience.

With all of this solution, it is the escapement of the intermediaries. The problem is, the intermediary is the bank, yes, but the intermediary is also the trader. So, you could easily find yourself in a situation where you have the shipper, the trader, the buyer, the seller and the receiver, and exclude some of them.

That is what I like about all this, it opens up lots of opportunities and possibilities. However, again, I am very concerned for the people who are going to lose their jobs. I mean, most of those working in trading are not coders, who do not have that kind of knowledge. So the real question is: What can we still bring?

I do not have any worry that we are going to end up not needing people in trading. But I think that the people who are involved in trading are going to be more specialized people. I think that they are going to be more technical people and I think that they will be able to solve problems as opposed to handle the routine.

Maybe law firms will end up developing a whole consultancy witness to provide a service.

Anyway, I am fundamentally convinced that everything we are achieving here, we can achieve it without Blockchain. It is nice to see that things are moving, but I do not think that nothing would not have been possible 10 years ago. People say: "You can secure a Bill of Lading". Just put a code on it. We had possibilities for a long time. So it would be interesting to see if you could resolve today's issues without Blockchain and then compare to Blockchain solutions that are offered.

So, yes, about Blockchain and Smart Contracts that is basically my thoughts.

RC: Well thank you very much for your time and your help. You sincerely helped me a lot and I am very grateful for that. And I will keep you informed about my work's conclusion.

RW: Yes, absolutely, I would be interested.

End of the Interview.

7.2.4 Interview M. Fabien Gillioz

(Phone call, 18.07.2018)

Romain Collet: On a more legal aspect, what are the roadblocks that blockchain and smart contracts in trade finance could encounter?

Fabien Gillioz: Today, we talk about « smart contracts », but it is actually only a code. It is a sequel of “If X, then Y”. The smart contract works under a transactional logic, but does not take into account the legal aspect, for example whether the signatory is minor. So, in theory, if the contract is abusive or null, to which extend is it possible to have the contract cancelled by a judge?

In my position, since 2016, we have seen a significant number of problematics around ICOs, Blockchain and smart contracts, so we decided to affiliate to Swiss Legal Tech Association and we wrote a white paper on smart contracts.

Last year, I attended the Legal Hackathon organized by the Swiss Legal Tech Association in Zürich, where R7 Developers and attorneys had 48 hours to develop the prototype of a platform that could revolutionize the legal aspect of smart contracts. We specifically designed a platform with an integrated litigation resolution process. Today, arbitration is the best way to resolve a litigation with smart contracts thanks to the New York Convention (valid in 149 countries). So, it could be possible to render arbitral award directly into Blockchain, and even more specifically, program your smart contract with an “arbitration library”: In case of litigation, the arbitration library would suspend the smart contract and require a third-party decision.

We are currently working with the SCAI (Swiss Chamber’s Arbitration Institution) to create an arbitration term specifically for smart contracts. We chose a used case of commodity trading, and we are implementing the code into a smart contract.

RC: I thought that when a code was written in a smart contract, it could never be modified afterwards.

FG: Exact. That is why we have to pre-code this arbitration library into the smart contract. The code of a smart contract is immutable. But the functionality of the code can be killed and written again. The previous lines of code can still be seen.

RC: So today in Switzerland, should a completely new law system be created, or can the current transaction law be used?

FG: Concretely, Article 1 of the Code of Obligations stipulates that “The conclusion of a contract requires a mutual expression of intent by the parties » and that « The expression of intent may be express or implied ». So as long as the two parties agreed and that the terms are precise, the contract is valid. Problems can arise in cases like a cession, where a written proof is required for the contract to be valid, and this is difficult to do on the Blockchain.

In the Swiss law, only a few modifications on certain interpretations would be required. I am also a part of the Blockchain Taskforce that works mainly on ICOs, and we made a few propositions to the FINMA and the Federal Council via Mr. Schneider-Ammann, on whether to have a broad comprehension or to change law texts. But a global law revision is unnecessary.

RC: Ok so that is for Switzerland, but what happens when a transaction is made for example with China under English law?

FG: That is the challenge. The idea is to anchor a hub for litigation resolution in Switzerland in the context of Smart Contracts. In the case of international contracts with arbitration clause inside the Blockchain, there must be a counterpart in the real world to deal with these problems.

In Switzerland and most particularly in Geneva, we have the advantage to be the world’s reference of arbitration. We have a typical clause that can be used to solve litigation all around the world. There is a very short mechanism of resolution, with short term deadline.

The idea is that the arbitrators who will take care of the litigation are developers who understand Smart Contracts and who could give their decisions directly inside the Blockchain. And thanks to the New York Convention, the award will be valid in 149 Countries.

RC: Are you specialized in ICOs, coding and laws, or more on the legal aspect?

FG: I am an attorney, and I am working alternatively on this Smart Contract project, we actually won the second prize for our platform prototype at Legal Hackathon. We work a lot with Smart Contracts and ICOs and we have gained significant knowledge on the technical aspects and problematics. I do not code myself, but we have the legal aspect, the “ecosystem” aspect, and the concrete Smart Contracts implementation in Switzerland.

RC: Regarding what you have said, it would be really possible to implement regulations on a global scale for Blockchain use?

FG: We are taking part of a current project from ISO on clauses for Smart Contracts that sets standards, there is another work called “Accord Project” which tries to develop their own standard, but the real question is will these standardized Smart Contracts be used or not because their development is very costly. A lot can be done without Smart Contracts.

There are still a lot of bugs, and regarding the amounts involved, it can be problematic in case of an error.

Eventually, if Smart Contracts keep their promises it will be very interesting. Then the platform we are developing will help creating a pool of experts, attorneys, arbitrators and university students who will work on Smart Contracts standardization with coding that is valid in the Swiss law. This will be put in place in the next five years. The foundations have already been built.

RC: So, these international Smart Contracts will replace selling contracts or credit notes, but could we consider using the Blockchain platform without creating Smart Contracts?

FG: Yes. Today we can use Blockchain for documents only, and the rest is happening off-chain. Ultimately, the idea would be to make transactions in crypto, if required, via accounts or wallets, with an API that manages the Smart Contract, and everything would work automatically.

We are talking about commodity trading, but in the future, it could also be used for employment contracts, pay rolls, etc. We are not there yet, but the idea is to generalize these systems.

The problem is that no one will use them if they are not standardized and secure. The possibility to call a third party in case of litigation will help with that. The arbitrator could even change the Smart Contract inside the Blockchain. It is a back-up plan. We approached commodity trading companies and they told us that this was the solution they needed.

RC: My Bachelor thesis is about Smart Contracts and Blockchain, and what will be the impact of Blockchain over documents management in trade finance. If I understood well, Smart Contracts are not necessary when parties just need to share documents and save time?

FG: For the moment, a lot of transactions are easier made off-chain, because transfers are made in currencies, and because Smart Contracts still have bugs and problems, that is why we are working on them.

RC: I have to talk about the legal aspect of these implementations. In your opinion, what should I pay attention to?

FG: The Blockchain as it is today may not be the Blockchain that we will all use tomorrow. I do not know if you ever heard of Hashgraph, which is a similar technology as Blockchain. They require a lot of energy.

We try to be a Blockchain Nation, states are slowly understanding what it means, there are lots of implementations to take place in the future. And it is bigger than just the web, it touches all transactions. It includes banks, notaries, compliance, taxes, etc. Legally today, a lot of Blockchain companies are created.

The electronical signature took eleven years to be put in place, and it is still not working today. So, you can imagine how much time it will take for Blockchain, even if we hope it will be quicker. The state is taking action now, and they want to help accelerate the process. For ICOs, we have imperatives regarding transfers. But to create a company via Blockchain for example, you can imagine that there are articles of the CO that can be removed. It will be easier and more flexible.

RC: Thank you very much for your time and your explanations.

FG: You are welcome.

End of the interview.

7.2.5 Feedback M. Guy Barras

(Mail Exchanges, 05.07.2018)

After a discussion via mail exchanges, M. Barras answered directly to the survey I submitted to him. Here are his answers:

- What is your company's position regarding Blockchain and Smart Contracts technology in term of understanding and knowledge?

- Unknown
- Heard About (nothing more)
- Understandable (quite vague)
- Familiar (know what it is theoretically)
- "Expert" (know how to implement it practically)

As far as I understand from my formal employer (Credit Suisse), this bank is incorporating the Trade Finance activity into the global new technology project for "Block-chain".

If "Expert":

- In which context/Commodity? (Does the type of commodity will impact the outcome of the Blockchain use?

Credit Suisse is assessing the possible application of Blockchain technology in the general context of "Trade Finance". As of today it is difficult to ascertain the global application of this technology for "Trade Finance".

-What was the outcome?

Still under process in the context of the general project of Credit Suisse for Blockchain applications.

- What was the reason of the Blockchain and Smart contract implementation?

- Profitability (less costs)
- Faster transaction
- More secure (less risks)
- Trust
 - Trend
- Other: ...

If applicable, the main reason for a possible general implementation of Blockchain technology for Trade Finance is "Profitability".

If Unknown/Heard about/Understandable/Familiar:

- Are you planning to get more involved or even try to implement it in a near future?

- Yes

-Where are you (which stage) in the implementation process?

- No

-Why? What are the factors that are holding you back?

-What is inherent to its implementation?

As I understand Credit Suisse is highly involved in development Blockchain technology in various line of banking product.

- According to you, are the Blockchain and Smart Contract technologies going to “revolutionize” Trade Finance?

- Absolutely not

- Probably Not

- Undecided

- Probably

- Definitely

-Why? Explanation and Discussion

Probably or Definitely:

For “generic and simple” Trade Finance Transactions, this new technology will certainly emerge.

However, for more complex “Trade Finance Transactions, such as “Commodity Trade Finance”, there are many issues and obstacles still to be challenged The most important challenge for banks (financing traders) remain the security over the goods (mainly materialized by the appropriate transfer of title made by endorsement through bills of lading. As of today the bills of lading remain the most important document for legally transferring title of goods. The market is not yet matured for accepting smooth transfer of title through electronic documents. (Legal problem are still to be resolved).

- If probably or definitely: What do you think would be the time horizon for the Blockchain to be fully implemented worldwide?

For generic and simple Trade Finance transaction one may assume that an horizon of 5 to 10 years seems reasonable for implementing a secured and accepted Blockchain method of settlement. For more complex transaction it is difficult to predict the possible results due to legal constraints.

- What would be the main impediments to a fully adoption of the Blockchain?

Legal aspects and undisputable security.

- Do you think that Emerging Markets/Countries would be a barrier or an enforcer to a worldwide use of Blockchain in international transactions?

Yes, because of possible lack of financial resources and/or sovereign powers.

- What would be the key issues that will most likely be encountered?

Legal aspects.

- What would be the impact for Geneva?

If Geneva is open-minded with this new technology it will have a positive impact if Geneva is taking the lead for this new technology. However a deep change will occur since a lot of working forces (as today needed) will have to be transferred to the monitoring of the Blockchain technology.

- Have you “fears”, or on the opposite, good expectations for the future regarding a global use of the Blockchain?

Yes due to deep modification of the competences of work forces.

- What would it mean in the nature of the job? What changes it would implied?

Many type of competences (becoming obsolete) will disappear due to automation of many tasks monitored through the Blockchain technology.

- What would be the major legal barrier to overcome in Switzerland to shift to a fully automated smart contracts use?

As long as a mutual and agreeable international method of application of smart contracts is not legally and internationally governed, accepted and implemented the general use of smart contract remain extremely challenging.

- If the Blockchain is fully implemented and used worldwide, where would you put the major risk of its use in the processes?

- Documents
- Fraud
- Job efficiency
- Risk Mitigation and Control
- Others...

Legal disputes due to possible inconsistency of rules and applications.

- How do you think the Blockchain would change the way you are actually dealing with collateral management?

Radically because Blockchain can easily replace human resources for monitoring collateral management. However legal aspect and uniform rules remain the biggest obstacles.

- Would it have a significant impact on the processes and the parties?

Yes (see above comments).

- If fraud is not fully eliminated and still remains in a way or another, what do you think the impact would be regarding Blockchain?

(Example: issuance of W/H R. in a paper version, even if transaction requiring the Blockchain)

One may assume that an appropriate Blockchain technology should eliminate the risks of fraud in the processing of the commercial documents. This new technology must prove that it is totally secured. If not the future of this technology is questionable.

- Do you think that if Blockchain does not meet the expectations enough, people could go totally back to the "old fashioned way"?

Not totally but partially. Some tasks might be eliminated (process of documentation). For the rest the "old fashioned way" will remain.

7.2.6 Feedback Mrs. Elodie Pilot

(Phone call, 09.07.2018)

Mrs. Pilot, former employee at BNP Paribas, ING, Louis Dreyfus and Crédit Agricole, and who started her own FinTech company granted me a phone call interview. However, due to technical issues, no record of the conversation was possible. Here is what I noted down direct this interview.

Today, most of the documents involved in trade are physically shipped, through companies such as DHL. In average, between around 50 and 100 documents are sent independently. The commodity trading, and particularly trade finance, can be considered as “old” jobs, requiring the use of faxes and whose the trust do not rely so much on the digital, but much more of physical papers.

The Blockchain could be a viable solution to that in the future. According to Mrs. Pilot, the adoption of the technology will be quick, however its launch and implementation will last much longer.

The companies have great interest to look after this technology. Comparing the commodity trading industry to the mobile phone industry, when the smart phones appeared on the market, the “old” phones gradually disappeared, and companies which did not adapt suffered a lot.

The issue with Blockchain technology is that this technology is not mature enough yet, as well as the market. It will take time.

Regarding Geneva, the place is very important for the sector, with lots of banks, trading companies and service providers in the area, in addition to attractive tax policies.

For the moment, Blockchain arouses the craze, however it is less and less sure that Blockchain will be used. Compared to the Internet that we do not use so much, only to transfer emails.

According to Mrs Pilot, a private Blockchain does not make any sense, given the fact that the major strengths of the technology are the security and the immutability provided by its decentralized system.

The example of Mercuria and Crédit Agricole which both want to create and use their own platform launches the race to who is going to have the right platform which will be used by others. Thus, allowing to charge fees for each transaction performed on the platform and thus increasing the company's benefits.

Regarding cargoes, the digitization of the Bill of Lading is an important factor. Today, B/L are almost always traded by paper, costing around USD100 per document.

The real future will be regarding Smart Contracts. The jobs of Smart Contracts' auditor will be a great job opportunity for the future. On the other side, current jobs such as operators and clerks for documents checking will be over.

In summary, the main advantage of the Blockchain will be regarding the weekly or recurring transactions of permanent contracts which just require few changes on the contract. The system will allow to duplicate the transaction in a much easier way.

At the end, the main purpose of a Blockchain platform is its neutrality through the amount of users on it and on the same platform.

7.2.7 « Smart Contract » created: The Code and its Explanations

<u>Code</u>	<u>Explanations</u>
1) pragma solidity ^0.4.0;	1) Compiler (turns the data (text) into 1s and 0s (binary system) to be read by a machine)
2) contract LettreCredit {	2) Name of the contract
3) address IssuingBank; address Seller;	3) Variables (parties involved in the transaction)
4) string IDDocLettreCredit;	4) Identifier (digital print) of the Letter of Credit that comes from the IPFS
5) mapping(string => bool) ConditionDocuments;	5) List of the IDs of documents to provide and their state of validation ("False" = Not validated, "True" = Validated)
6) string[] IDDocuments;	6) List of the IDs of Documents (in order to find them more easily)
7) bool ContractValidation;	7) Gives "False" if not validated, "True" if validated
8) constructor(address _Seller, string _IDDocLettreCredit) public {	8) Constructor (function) called during the creation of the contract (public = available to all parties)
9) IssuingBank = msg.sender;	9) Register who is the Issuing Bank msg.sender corresponds to the public address that calls the function (call = ask for an action). In our case, the party coding and issuing the contract)
10) Seller = _Seller;	10) Register who is the Seller
11) IDDocLettreCredit = _IDDocLettreCredit;	11) Register the letter of Credit
12) ContractValidation = false; }	12) The contract is NOT VALIDATED by default
13) modifier onlyIssuingBank(){	13) Custody clause of the functions callable only by the Issuing Bank
14) if (msg.sender != IssuingBank)	14) If the caller does not match with the Issuing Bank's address
15) revert(); else _;	15) Block the call here Otherwise Continue the call
16) modifier onlySeller(){	16) Custody clause of the function only callable by the Seller

17) if (msg.sender != Seller)	17) If the caller does not match with the Seller
18) revert(); else _;	18) Block the call here Otherwise Continue the call
19) function getIssuingBank() public view returns (address){ return IssuingBank; }	19) Returns the public address of the Issuing Bank
20) function getSeller() public view returns (address){ return Seller; }	20) Returns the public address of the Seller
21) function getIDDocLettreCredit() public view returns (string){ return IDDocLettreCredit; }	21) Returns the ID of the Letter of Credit
22) function sendIDDocument(string _IDDocument) onlySeller public{	22) Sends a new ID of document to provide (action only available for the Seller)
23) IDDocuments.push(_IDDocument);	23) Add the ID of the document to the list
24) ConditionDocuments[_IDDocument] = false; }	24) Indicate that the Condition of the Document is NOT VALIDATED by default
25) function getIDDocument(uint _numDocumentReceived) public view returns (string){	25) Gets back the ID of the Document received according to the reception's order (the figure of the order to provide in the parameters)
26) return IDDocuments[_numDocumentReceived-1]; }	26) Return the ID of the Document called
27) function validateDocument(uint _numDocReceived) onlyIssuingBank public{	27) Recover the ID of the Document regarding its position in the list (order)
28) string memory IDDocument = getIDDocument(_numDocReceived); ConditionDocuments[IDDocument] = true; }	28) Define the Condition of the Document as VALIDATED
29) function validateLettreCredit() onlyIssuingBank public{ ContractValidation = true; }	29) Allows to define the Contract/Letter of Credit as VALIDATED
30) function getNombreDocuments() public view returns (uint){ return IDDocuments.length; }	30) Returns the number of documents provided (total of documents)

31) function getConditionDocument(uint _numDocumentReceived) public view returns (bool){	31) Get the condition (validated or not; "True" or "False" of a Document regarding its position in the list (position to provide in the parameters)
32) string memory IDDocument = getIDDocument(_numDocumentReceived); return ConditionDocuments[IDDocument]; }	32) Recover the Document ID regarding its position in the list (given by 26))
33) function getConditionContrat() public view returns (bool){ return ContractValidation; } }	33) Returns the Condition of the Contract/Letter of Credit by the Issuing Bank (True = Validated, False = Not Validated)

To better understand the code:

"=" means "if it is"

"!" means "if it is not"

_; means "continue the coding path"

A "string" is a chain of characters (in text format)

A "bool" is a binary value, giving "True" or "False"

"[...]" means "a set of data" (for example, list for the documents)