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BLOCKCHAIN LETTER OF CREDIT: A SYSTEMATIC LITERATURE REVIEW

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ABSTRACT

Letter of Credit, a vital international trade instrument, painfully relies on paper and exposes to fraud. Blockchain LC, smart contracts, and the Internet of Things may overcome the problem. The research aims to systematically analyse the literature to find how blockchain can disrupt the LC. The method conducted in this research is a Systematic Literature Review. The result of the research is that from 2069 papers, 12 papers were selected to answer the research questions. It was found that blockchain disrupts current LC practices by simplifying and automating the process. Blockchain also significantly reduces the processing time and provides better transaction security. However, it is to be noted that there are factors that impede the adoption of blockchain LC, out of which legal hurdle is the most crucial. It is necessary to have collective willingness from the user and a supportive legal environment so that International trade can benefit from the blockchain LC technology.

Keywords: *Blockchain, Letter of Credit, Systematic Literature Review*

INTRODUCTION

International trade is essential. Countries that are open to international trade tend to grow faster, innovate, improve productivity and provide higher income and more opportunities to their people (World Bank, 2018). However, risks are inherent in international trade (Investopedia, 2021), such as no delivery, escrow fraud, counterfeiting, and money laundering (Paperindex Academy, 2022). Letter of Credit (LC) is one payment method in international trade. The fundamental goal of this instrument is to provide more assurance to both the buyer and seller regarding the fulfilment of each party's duties in commercial trade. LC focus on the seller's commitment to delivering the items as agreed with the buyer and the buyer's obligation to pay for the cargo within the stated term (tradefinanceglobal.com, 2022).

However, LC is known to have several weaknesses, such as usually only covering single transactions, expensive, tedious and time-consuming in terms of absolute cost, working capital, and credit line usage. Also, additional security and collateral are required for the buyer to satisfy the bank's coverage terms, lengthy and laborious claims process requires more paperwork for the seller (Allianz Trade, 2021).

Blockchain is a shared, immutable ledger that facilitates the process of recording transactions and tracking assets in a business network (IBM, 2022). A blockchain is simply a digital log of transactions duplicated and distributed across the blockchain's complete network of computer systems. Each block in the chain comprises several transactions. Whenever a new

transaction occurs on the blockchain, a record of that transaction is recorded to every participant's ledger. Distributed Ledger Technology refers to a decentralised database that several people administer.

Blockchain usage is increasing, and the research related to the blockchain has increased significantly over the years.

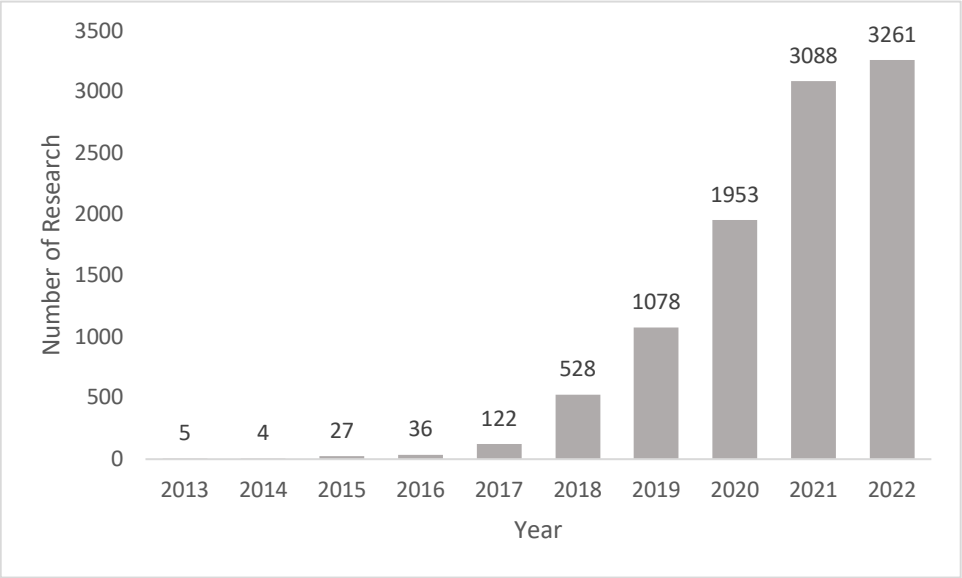


Figure 1. Number of research on blockchain
Source: ScienceDirect

Figure 1 reveals the increasing number of research about blockchain in the last ten years published in www.sciencedirect.com. The increasing attention to the blockchain also benefits trade finance as the blockchain technology merges with the LC concept.

Blockchain LC can be modelled as a smart contract between the bank and the seller to ensure payment if the trade product is delivered to the buyer under all stipulated terms. A blockchain smart contract codifies the terms and circumstances of the transaction, which is accomplished by abstracting and expressing conditional clauses pertaining to the time, place, and manner of shipment and delivery, the description and quantity of goods shipped, and the documentary evidence required for verification as separate, independent, or interdependent functions that provide a pass or fail outputs based on the input information. (Cognizant, 2017)

This study aims to identify blockchain capabilities in disrupting letters of credit through a systematic literature review. This research will be beneficial for companies, banks, and regulators that are involved in international trade, especially those that are using LC on a daily basis.

This paper will organise as follows: the next section will provide a literature review on the blockchain and a letter of credit. Then, the outlines of the systematic literature review process will be explained. Subsequently, the findings will be explained. Afterwards, the last section is a discussion followed by a conclusion of the paper and a suggestion for future studies.

Literature Review

Blockchain and Smart Contract

Blockchain, a component of distributed ledger technology, is a complete, chronological record of transactions. Transactions are organised into "blocks," which are time stamped and linked to the preceding block. Blockchains are classified into "open blockchains," which enable public access, and "permissioned blockchains," which allow access exclusively to specific persons. As a result, parties can modify blockchain technology to their own requirements (Larson, 2018)

Blockchain technology has numerous key components. One of its key characteristics is decentralisation, which means that no single person or entity controls the blockchain. Instead, each computer, is linked to the same peer-to-peer network that follows the same rules (IBM, 2022). Each computer reviews the modified transactions through "consensus" before the change is recorded onto the blockchain.

In 1996, Nick Szabo created the phrase "smart contracts," which may be described as a written collection of mathematical rules that, when activated, automate certain agreements between parties (Al-Amaren et al., 2020). While a smart contract can be a legally enforceable contract, it is most commonly used to signify that the "smart" code is validated and saved on the blockchain.

A vending machine purchase is the most basic example of a smart contract. The vending machine automatically dispenses the correct item once an individual picks an item and inputs the right amount of money.

Smart contracts are frequently used in international transactions to expedite payment (Larson, 2018). Smart contracts, for example, are used by parties to automate payment when a given condition, such as delivery, is satisfied. As a result, smart contracts safely and promptly carry out the parties' agreement, eliminating the need for a mediator or an invoice. It can also endure trust issues in trade finance (Kowalski et al., 2021).

Blockchain and smart contracts are complementary technologies that can improve trade finance, such as letters of credit (Belu, 2019; Chang et al., 2019; Samy et al., 2021).

Letter of Credit

The letter of credit or LC is the most important payment method in international trade (Belu, 2019) because it spread the risks equally among parties (Toorajipour et al., 2022). A letter of credit (LC) is a payment instrument used across borders to expedite payments in commercial transactions between buyers and sellers. LCs are a mechanism in which the bank acts as the paymaster on behalf of the purchaser by executing payment to the seller, conditional on the seller's documents complying with the LC terms. They are governed by the Uniform Customs and Practice (UCP) and formulated by the International Chamber of Commerce's (ICC) Commission on Banking and Practice. (CheHashim & Mahdzan, 2014).

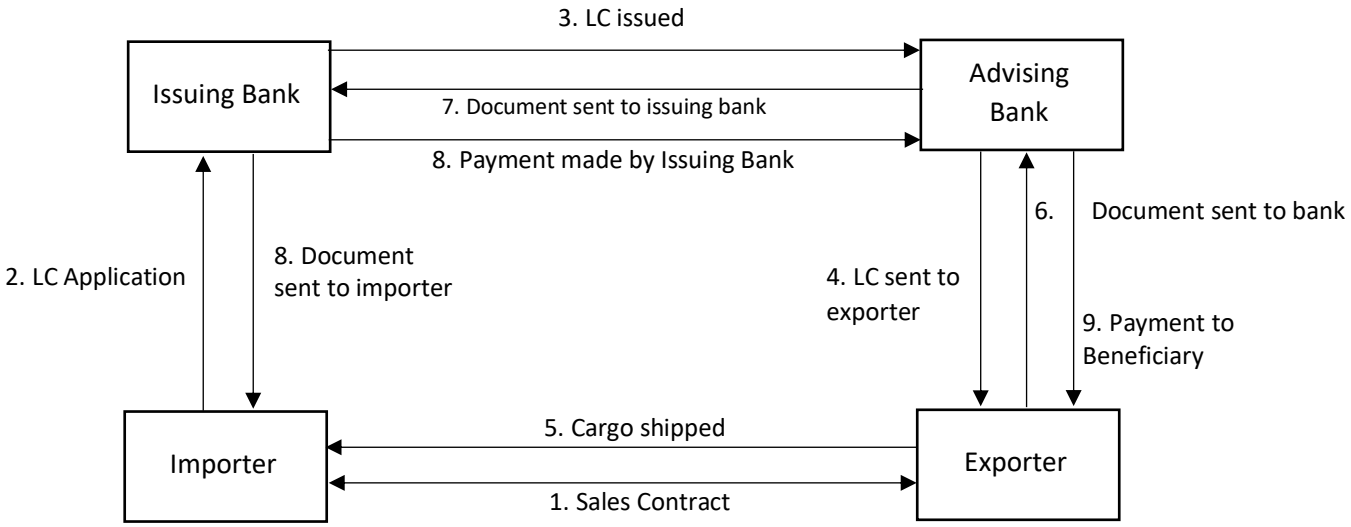


Figure 2. LC Mechanism

Source: (ICC Indonesia, 2022)

The LC process started with the exporter and importer agreeing on a sales contract. The importer then applies to open LC to issuing bank and have the LC issued and sent to Advising Bank, which will further send the LC to the exporter. The exporter then sends the cargo and the document to Advising Bank to claim the payment. Bank will check and forward the document to Issuing Bank. Provided that the document complies with the LC, Issuing Bank made the payment. It then released the document to the importer, which concluded the transaction.

RESEARCH METHODS

This research used a systematic literature review to answer the research question. Systematic literature reviews are a systematic, comprehensive, and reproducible method for collecting, identifying, screening, and synthesising literature and recorded work produced by researchers and practitioners (Okoli, 2015).

The protocol used in this study is the one advised by Okoli in his paper A Guide to Conducting a Standalone Systematic Literature Review. The overall methodological approach of this study includes the following steps:

1. Identifying objective and outcome research
2. Formulating the research question
3. Preparing search and review protocol
4. Assessing quality of studies by title screening, abstract screening, and quality assessment
5. Data extraction
6. Data synthesis
7. Reporting the result of the review

Identifying objective and outcome research

The first step of the systematic literature review is formulating the research objective and questions. This review aims to provide an in-depth view of blockchain disruption in the letter of credit. Therefore, we determined one research question:

RQ 1: How does blockchain disrupt the letter of credit mechanism?

Preparing search and review protocol

The next step of this review was preparing and planning a search strategy. The purpose of this strategy is to minimise the possibilities of research bias. The search effort was conducted through the software Harzing's Publish or Perish. The database and search strings used are listed in Table 1 below.

Table 1. Database and Search Terms

Database	**Search Terms**	**Result**
Scopus	(blockchain) AND ((letter of credit) OR (letters of credit))	22
Google Scholar	(blockchain) AND ((letter of credit) OR (letters of credit))	998
Crossref	blockchain letter of credit	1000 (max)
Semantic Scholar	letter of credit	31
	Total	**2069**

Assessing the quality of studies by title screening, abstract screening, and quality assessment

Study Selection

Not all the papers and studies collected are relevant to the research questions. Therefore, their relevancies should be assessed through the first selection process, title and abstract screening.

Inclusion Criteria in this stage are (1) Manuscript published in the span of 10 years (2012-2022); (2) Focus on the topic of blockchain letter of credit; (3) Manuscript written in the English Language. Exclusion Criteria are (1) Magazines, Books, Opinion Pieces, and Viewpoints, and (2) Not written in English.

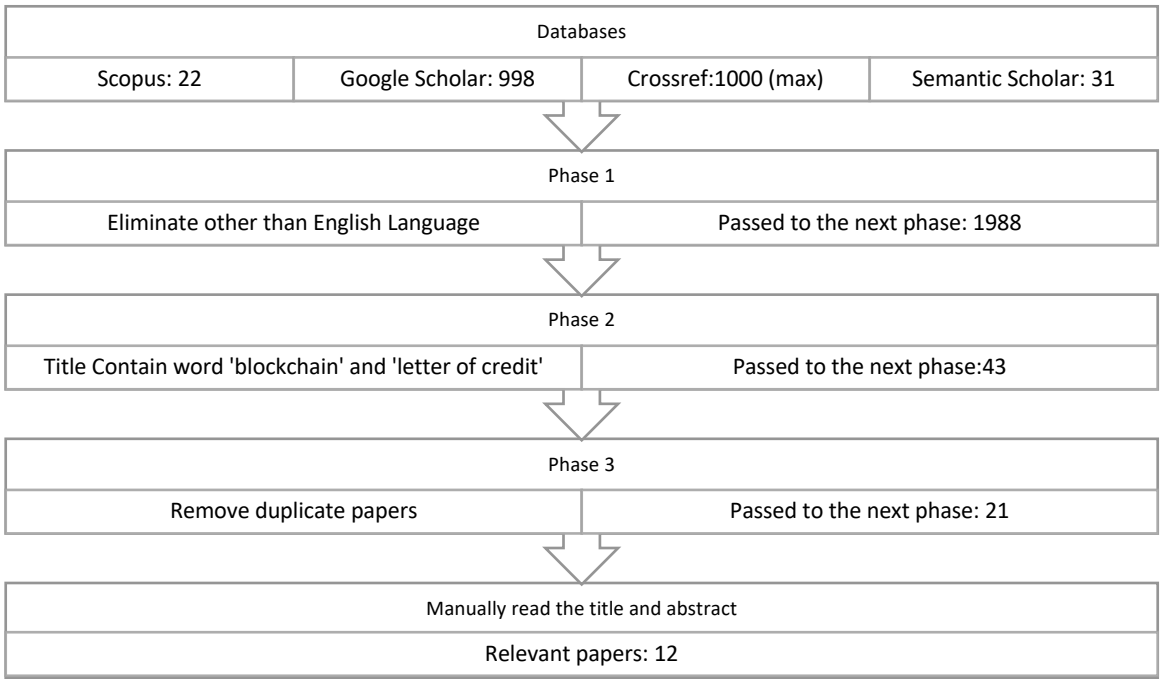
Search and Screening Process

Fig.1 shows that the papers were obtained using the search strategy on seven databases: Scopus, Google Scholar, Crossref, and Semantic Scholar. Throughout the search, we have obtained a total of 2051 papers from phase one. Before the first screening that contained the abstract and title screening process, we eliminated papers in a written language other than English. After the screening process, 63 papers were written in a language other than English. The elimination of those papers resulted in a total of 1988 papers.

Subsequently, title screening was carried out in the second phase by filtering the title containing only blockchain and letters. Excel was used for this purpose by utilising feature filter and contain with. This phase eliminated 1945 papers and resulted in 43 papers. Afterwards, the third phase, which is duplication screening, was carried out manually. After the screening process, 22 papers were found to be duplicates and eliminated, totalling 21 papers. After that, the researchers carried out the final fourth phase of the research, filtering the remaining 21 papers based on the abstract and title of each manuscript. In this stage, manual reading was used to assess

the relevancy of each paper with the RQ. From this phase, nine papers were eliminated, resulting in 12 papers obtained as the relevant manuscripts that will be reviewed in the quality assessment, data extraction, and synthesis phase.

Fig. 3. Process Search and Screening Literature



Quality Assessment

In this phase, we scored each relevant study based on the quality assessment criteria list adapted from the systematic review guidelines. The purpose is to ensure that the selected manuscripts are within the study context. There are six items, as shown in Table 2.

Table 2. Quality Assessment Table.

Quality Assessment Items	Assessment Criteria [Score]
To what extent is the weakness of traditional LC is discussed.	More than heavily relying on paper, manual process, and time-consuming [2]; only heavily rely on paper, manual process, and time-consuming [1]
To what extent the benefit of blockchain LC is discussed?	Other than increasing efficiency and fraud prevention [2]
To what extent blockchain Letter of Credit design is being discussed?	Proposed design [1]; No design [0]
Does the research provide detailed descriptions and actual cases of blockchain LC?	More than one cases [2]; one case [1]; no case [0]

Does the research discuss the blockchain LC's challenge in general?	

Data Extraction

The next stage is data extraction from relevant manuscripts that passed the screening and quality assessment process. In this stage, we extracted data which contains information about the weakness of traditional LC, blockchain capabilities of disrupting LC mechanism, and challenges in blockchain implementation. Also, we collected some basic information from the papers. We use those data to identify the distribution of primary studies.

Data Synthesis

The first step in synthesising is the open coding phase. In this phase, the researchers tried to generate as many categories as possible to ensure that this phase was open to whatever was happening in the data (Williams & Moser, 2019). The second phase is axial coding when researchers establish a link between categories from the open coding phase and then categorise them into a higher-order analytical. We categorised the main properties or categories from the open coding phase in this phase. In the last phase, we produce a theoretical scheme that becomes the analysis's centrepiece and answers the research question. Writing the storyline, reviewing notes, and using software products helped us in this stage.

RESULTS AND DISCUSSIONS

Results

There were 12 papers resulting from the screening and quality assessment phase. These papers can be found in table 3

Table 3. Selected papers

Code	Title	paper type	Cite
B1	A Blockchain-Based Approach towards Overcoming Fraud in Issuing Letter of Credit	Design	Sepanloo, Esmaeli, & Narenji, 2019
B2	Application of distributed registry technologies (blockchain) and most contractors in letter of credit settlements	Design	Ilovaysky, 2022
B3	Blockchain-Enabled Trade Finance Innovation: A Potential Paradigm Shift on Using Letter of Credit	Empirical and Conceptual	Chang, Luo, Chen, 2019
B4	Blockchain Letter of Credit: A Transaction-Level Analysis	Conceptual	Bhat, Nor, Amiruzzaman, 2021
B5	Blockchain technology for letters of credit and escrow arrangements	Conceptual	Takahashi, 2018

B6	Digitising Trade Finance Using Blockchain Technology Illustration of Letter of Credit Process	Empirical and Conceptual	Khalil, Kerbache, & El Omri, 2021
B7	Enhanced security approach powered by blockchain technology with NFC to prevent fraudulence in bank letter of credits	Design	Subramaniam, Azzuhri, & Wah, 2020
B8	Exploring blockchain technology in international trade-Business process re-engineering for letter of credit	Design	Chang, Chen, & Wu, 2019
B9	Mitigating Risky Business Modernizing Letters Of Credit With Blockchain, Smart Contracts, And The Internet of Things	Conceptual	Larson, 2018
B10	Modernising Letter of Credit with Blockchain in Oman	Design	Al Abri, Al Shukaili, Al Marqshi, Al Badi, 2019
B11	The Blockchain Revolution A Game-Changing in Letter of Credit (LC)	Conceptual	Al-Amaren, Md. Ismail, Md. Nor, 2020
B12	Use of Letter of Credit Form of Payment in the Implementation of Smart Contracts and Blockchain Technology	Conceptual	Agibalova, Ilovaysky, Kayl, Usanova, 2020

Table 4. Open Coding and Axial Coding

Open Coding		**Axial Coding**	
Code	**Freq**	**Code**	**Freq**
Transparency	4	Benefit of Blockchain	9
Traceability	2		
Solves now pay later	1		
Smart contract	7		
Lower cost	5		
Less intermediary	4		
Immutability	2		
Fraud prevention	5		
Faster payment	4		
Eliminate inefficiencies	5		
Accurate process	1		
Interoperability	1	Weakness of blockchain LC	4
Fraud can still happen	1		
Still use issuing bank	1		

Limit of entities	1		
An examination cannot be automated	1		
Add no value to the LC process	2		
User willingness to adopt blockchain LC	1	Faktor impede blockchain LC Adoption	7
Technical limitations	1		
Fraud	1		
Scepticism	1		
Regulation	3		
Need unified agreement	1		
Legal concern	5		
eUCP low adoption rate	2		
Common protocols	2		
BPO failure	1		
Bill of Lading	1		

Table 5. Code Primary Studies

No	Terms	Definition
1	Transparency	Transparent records, visible, accountable, auditable [B1], [B3], [B4], [B6]
2	Traceability	Supply chain traceability, tracking trade documents, the transfer of ownership [B1], [B3]
3	Solves pay now argue later	Blockchain allows flexible payment arrangements [B9]
4	Smart contract	Series of digital agreements, including terms and conditions promised by contract participants [B1], [B2], [B3], [B4], [B5], [B9], [B11]
5	Lower cost	Lowe transaction fee, no cost for LC confirmation, eliminate banks and paper process, automated payment, reduce processing fees. [B1], [B3], [B4], [B6], [B11]
6	Less intermediary	Check of trade documents may be conducted without third parties. [B3], [B4], [B5], [B11]
7	Immutability	Information cannot be changed or removed without the consent of its owners. [B2], [B3]
8	Fraud prevention	Monitoring and information, contract terms on blocks and permanently record alterations of contract terms on a chain. [B1], [B3], [B4], [B10], [B11]
9	Faster payment	Transfer funds in seconds instead of days [B1], [B4], [B5], [B11]

10	Eliminate inefficiencies	Speed up communications and administrative procedures [B1], [B3], [B4], [B6], [B11]
11	Accurate process	Accurate process performance [B1]
12	Interoperability	Blockchain is limited to the data in its own network [B9]
13	Fraud can still happen	Fraud by forging documents can still happen [B11]
14	Still use issuing bank	Payment is still effected through issuing bank [B5]
15	Limit of entities	Blockchain is limited to three entities. The buyer and seller should be a client of the bank [B2]
16	An examination cannot be automated	Examination of documents cannot be automated [B5]
17	Add no value to the LC process	Payment LC still by electronic transfer [B5] [B11]
18	User willingness to adopt blockchain LC	Collaborative willingness from users will be influential in its future development [B3]
19	Technical limitations	Technical limitations hinder blockchain adoption [B3]
20	Fraud	False information can still be fed into the ledger [B5]
21	Scepticism	Many have viewed bitcoin and blockchain with much scepticism [B4]
22	Regulation	Banking regulators must have the ability to track value entitlements [B1], [B2], [B12]
23	Need unified agreement	It is necessary to create unified international agreements agreed upon by states and harmonised with international standards on national law. [B12]
24	Legal concern	Legal concern hinders future adoptions. Past and present projects of electronic bills of lading have been plagued by the absence of a supporting legal environment [B3], [B5], [B6], [B11], [B12]
25	eUCP low adoption rate	eUCP does not have a high adoption rate [B5], [B9]
26	Common protocols	Technical issues on common protocols. Buyer and seller have to adopt the same protocols under the same platform [B3], [B6]
27	BPO failure	BPO was not encouraged by corporates as it is bank-focused [B6]
28	Bill of Lading	Uncertainty over whether electronic bills of lading are treated as the equivalent of paper bills of lading [B5]

Discussion

The discussion section will discuss several important findings, namely the weakness of

traditional LC and why it needs a solution that blockchain LC may offer. The discussion then continues to explain the strength and weaknesses of blockchain LC, the design process of blockchain LC, the real-life cases of blockchain LC, and the future of blockchain LC. All information is linked to the RQ of how blockchain disrupts the letter of credit mechanism.

The weakness of traditional LC

The research reveals that the pain points in LC are unnecessary manual work (Sepanloo et al., 2019), relying heavily on paper (Bhat & Nor, 2021; Khalil & Kerbache, 2021), limited ineffective automation of workflows, and poor visibility of the end to end process (Sepanloo et al., 2019).

Moreover, processing LC is complex and time-consuming. Multiple participants doing business with unfamiliar counterparties may cause communication and coordination difficulties, leading to poor user experiences (Chang et al., 2019). LC also require excessive workforce and human intervention, such as presenting the bill of lading and send via a courier, which also increases the uncertainty and traceability of the document (Khalil & Kerbache, 2021), delayed timeline (Al-Amaren et al., 2020; Bhat & Nor, 2021), which also affects the time required to complete the transaction between bank and customer. Time shortage is problematic, especially on a short-distance voyage. (Al-Abri et al., 2020)

Regarding security, LC has a high propensity to fraud, such as duplicative bills of lading (Bhat & Nor, 2021) and the risk of fraud and authenticity of documents. (Khalil & Kerbache, 2021). LC also requires Anti Money Laundering review procedure to be done manually (Bhat & Nor, 2021). Most importantly, LC is a long process to complete and often has an undesirable effect on cost (Al-Amaren et al., 2020; Chang et al., 2019).

Blockchain LC Strength and Weaknesses.

Blockchain has several features to overcome the flaws of LC, such as blockchain is distributed, immutable, and can be permissioned (Sepanloo et al., 2019). Blockchain is also multicenter and less intermediated (Chang et al., 2019). Blockchain benefits include real-time review, disintermediation, reduced counterparty risk, decentralised contract execution, evidence of ownership, automated payment, and regulatory transparency (Bhat & Nor, 2021).

Moreover, blockchain provides better transparency and security level of transactions (Al-Abri et al., 2020; Al-Amaren et al., 2020; Chang et al., 2019; Sepanloo et al., 2019). Having said that, blockchain can be used to facilitate asset transfers, Anti Money Laundering initiatives, and the Know Your Customer procedure (Bhat & Nor, 2021). Further, integrating blockchain and smart contracts mitigates counterfeiting and malicious alteration. It can be more secure, transparent, auditable, and automated (Chang et al., 2019). Blockchain eliminates the need for a correspondent bank, faster payment while preventing disputes, and most importantly, removes the need for physical document presentation and paperwork (Al-Amaren et al., 2020; Khalil & Kerbache, 2021; Larson, 2018; Takahashi, 2018). Distributed ledgers also lower costs (Al-Amaren et al., 2020; Bhat & Nor, 2021; Takahashi, 2018). Blockchain also increases the speed of the transaction. A simulation comparing paper LC and blockchain showed that paper LC concluded the transaction within 15 to 30 days, while blockchain LC was 10 to 23 hours (Khalil & Kerbache, 2021).

Blockchain and IOT can detect the discrepancies violating the letter of credit terms at any point along the supply chain. For example, the temperature changes in food cargo must be

maintained for the food not to spoil. Blockchain, smart contracts, sensors, and IOT can notify the issuer to take immediate action if the temperature changes (Larson, 2018). This approach is more advance than simple documentary credit. Blockchain, smart contracts, and IOT also can create new payment obligations, a mixture of sight and usance draft. For example, if LC requires four documents with each different value, the smart contract would pay each instalment based on the presentation (Larson, 2018).

Despite being promising, we found that blockchain LC also has weaknesses. For instance, in the LC, eight or more parties can participate. However, only three entities in blockchain LC can participate and should be under one bank's platform. The parties must be the bank's clients (B. Ilovaysky, 2022). Moreover, blockchain technology does not prevent false information from being fed into the ledger. In contrast, fraud in LC relates to the issuance of false documents. The legal hurdle of the bill of lading cannot be solved by blockchain (Al-Amaren et al., 2020; Takahashi, 2018).

One of the pain points in LC is the process of examining the document. The examination, unfortunately, cannot be automated using a smart contract since it requires the exercise of human judgement (Al-Amaren et al., 2020; Takahashi, 2018). Furthermore, If the payment is made in an electronic transfer, the blockchain does not add any value to the transaction. (Al-Amaren et al., 2020; Takahashi, 2018).

Most importantly, blockchain LC requires adequate legal regulation. Therefore, it is necessary to create unified international arrangements in this area, agreed upon by the states and harmonised with the national law (Agibalova et al., 2020).

Design Process and Real Cases of Blockchain LC

Several designs of LC transactions process using blockchain are revealed. First, the design proposed is to establish token LC created on regulators' accounts as a payment method combined with LC. Issuing banks and advising banks will transact tokens, and the regulator will receive the transaction report, which could prevent fraud (Sepanloo et al., 2019).

Second, the proposed design uses a digital ledger on Ethereum, The smart contract established between importer, exporter, and importing bank. Through smart contract, the responsibilities to pay are then submitted to the exporter bank. The order and payment responsibility are locked in the smart contract. The exporter will digitally sign the smart contract and send the cargo to initiate the transaction. A third-party agent and customs inspected before the ship sailed, and they signed the smart contract. The importer acknowledges the receipt upon receiving the goods and signs a smartcontract to trigger the payment (Bhat & Nor, 2021).

Third, the unique blockchain letter of credit design uses an escrow arrangement. Escrow is a payment method where the payer temporarily deposits funds, and escrow agents can release funds to the payee. The escrow agent utilised a smart contract with multi-signature (multi-sig), for example, two out of three, to release the payment (Takahashi, 2018)

Fourth, the LC's process incorporating Near Field Communication (NFC) enabled mobile applications into LC. The aim is to verify the document's authenticity (Subramaniam et al., 2020).

Fifth, the drafting and issuing process of the LC is established in the blockchain application. The seller dispatched the cargo and uploaded the document into the blockchain application. When the shipment reaches the country border, it requires multi sig from customs, port authorities, and tracking rail firms. They are all connected to nodes which notify all parties that the shipments have reached the destination country. The documents viewed by issuing bank

from the application and bank will mark any discrepancies for applicants' review (Al-Amaren et al., 2020).

Sixth is the combination of blockchain, smart contracts, and the Internet of Things (IOT). LC is issued in the blockchain, and IOT is used to monitor the cargo condition, such as position or temperature. Each pallet in the cargo is equipped with Radio Frequency Identification (RFID) tag, sensor and a GPS device. A smart contract generates a bill of lading based on RFID data. Since it is tamper-proof, it would mitigate the risk of fraud. Blockchain, through consensus, verified information in the document and LC. If the document is clean, the smart contract will automate the payment. If a discrepancy occurs, the blockchain will notify the issuer (Larson, 2018).

Several actual pilot project of blockchain LC has taken place. On 6th September 2016, Barclays and Wave, a blockchain start-up, initiated the first global trade under the blockchain. The goods was cheese and butter and transacted between Ornua and Seychelles Trading Company. Wave stored trading documents such as Bill of Lading (BL) in a blockchain shared ledger, which relevant parties can access. A smart contract is deployed for the transfer of ownership at the arrival of goods at the port upon BL presentation (Chang et al., 2019).

Maersk, in September 2016, initiated a tracking project from Kenya to the Netherlands, cooperating with shippers, freight forwarders, customs authorities and traders. Maersk and IBM digitised the document and created a visible shipment framework using Hyperledged fabric (Chang et al., 2019).

Russian Airlines, S7 Airlines, and Alfa bank, as an issuing bank, concluded the implementation of LC with a smart contract on 20th December 2016. The smart contract regulated the works performed on S7, the amount of the deal, the date of opening and closing, and the name of the parties (B. Ilovaysky, 2022)

On 22nd June 2017, Raiffeisen bank performed a smart contract transaction on the blockchain platform. The design connects with other systems, such as the client data catalogue, to approve or reject the client's application. The system also automatically tracks key statuses so buyers can monitor the transaction. The bank can execute the payment outside block currency based on the formalised electronic document attached to the LC (B. Ilovaysky, 2022).

Mizuho and Marubeni demonstrated blockchain LC using the hyperledger platform, reducing the transaction duration from weeks to two hours. The reduction is from using blockchain to establishing sales contracts, LC issuance, BL handover, payment and settlement (Chang et al., 2019). HSBC and Cargill performed the blockchain LC transaction via Voltron in 2018 to export soybean from Argentina to Malaysia. ING Bank and HSBC were intermediary banks to bridge the transaction between Tricon Energy (buyer) and Reliance Industries (Seller). (Chang et al., 2019).

Banco Bilbao Vizcaya Argentaria, a Spanish bank, used blockchain LC in 2018 to reduce transactions from 10 days to less than 3 hours while exporting frozen tuna from Mexico. Wave used digitised documentation and electronic signatures and allowed electronic presentation. (Chang et al., 2019).

The Future of Blockchain LC

The result of the research highlight that it is unlikely that blockchain LC is possible, at least in the present times (B. Ilovaysky, 2022). Technical issues on common protocol and collaborative willingness from the users still need to be fixed as it is essential for blockchain LC's future development (Chang et al., 2019). Another important question about blockchain LC is

whether the information such as LC clauses shared through blockchain is real since another communication is equally instant (Takahashi, 2018). It seems that companies and banks are still unsure about the technology as electronic presentations occasionally occur and paper presentations are still prevalent. In addition, the low rate of eUCP adoption reflects the uncertainty of whether the law will treat electronic bill of lading as legally equivalent to the paper bill of lading (Al-Amaren et al., 2020; Takahashi, 2018).

In 2020, 12 companies, Minehub, Marcopolo, Contour, Infosys Finacle and others, pursue blockchain technology applications in trade finance (Bhat & Nor, 2021). Blockchain is also limited to eight banks currently. They are , Bangkok Bank, BNP Paribas, CTBC, HSBC, ING, NatWest, SEB, and Standard Chartered (Al-Amaren et al., 2020). Therefore, buyers and sellers must choose from this bank only. The increasing number of banks providing blokchain LC's services will be crucial in incorporating blockchain into international trade practices. The financial industry need more companies and banks to tap into the game.

We also found that some think blockchain technology is still immature, and many benefits are exaggerated in terms of impact (Al-Abri et al., 2020). It is crucial that commercial actors and banks consider blockchain and fintech in modernising the LC as the technology helps facilitate documentary credit compliance in the process and allow applicants and beneficiary to make informed decisions about the goods throughout the shipment process (Larson, 2018). With the support from the regulator, this blockchain LC can lower the compliance cost (Takahashi, 2018), which will be crucial in adopting the blockchain LC.

CONCLUSION

The research found that the traditional LC mechanism has pain points: manual work, reliance on paper, poor transparency, complexity, time consuming, and exposure to fraud. Blockchain may benefit international trade by providing the solution to these existing problems as blockchain features can provide automation with smart contracts and IOT, better transparency, simplify and speed up the process, as well as better security level of the transaction. However, it is worth noticing the weakness of blockchain are only allows a limited number of entities in the blockchain, interoperability problems, examination of documents that still cannot be automated since it needs human judgement, and blockchain add nothing to the payment if the parties agreed upon payment outside currency block technology. Nevertheless, the most important factor is the legal issue of blockchain LC, which embedding uncertainties that limit the technology's scalability. Therefore, it is necessary to have an international arrangement about blockchain and harmonise with the national law. We also found that many design processes of blockchain LC are provided, and real-life pilot cases of blockchain LC have taken place. Blockchain LC's future will depend on the user's collaborative willingness to adopt the technology. eUCP low adoption rate reflects the uncertainties in this field, and it needs a supportive legal environment to scale up the blockchain LC adoption rate.

Future research can further investigate more cases where the blockchain LC is implemented and explore the adoption rate of blockchain LC in banks and companies involved in international trade.

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