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# **TOWARDS THE APPLICATION OF BLOCKCHAIN TECHNOLOGY FOR IMPROVING TRADE FACILITATION IN CEFTA 2006\***

UDC / UDK: 339:004.7

JEL classification / JEL klasifikacija: F13, F19, O33

Preliminary communication / Prethodno priopćenje

Received / Primljeno: March 31, 2019 / 31. ožujka 2019.

Accepted for publishing / Prihvaćeno za tisak: May 27, 2019 / 27. svibnja 2019.

### ***Abstract***

*The benefits and value drivers of customs digitalization are considerable. The key motivation is the efficiency associated with minimizing the cost of managing documents throughout the trade process, including costs associated with the exchange of documents with other countries, as well as the procurement and facilitation of those documents. Since it is of general knowledge that effective trade facilitation signifies reliability and security of the trade transactions we think that blockchain technology may be able to offer a high level of confidence in these areas to both traders and regulators. The proposal presented in this paper is focused on jointly moving all (customs) stakeholders towards a standardized integration of collaborative processes. By investigating blockchain solutions along with technology and standards, we propose a pathway to achieving an international system-to-system integration. Taking into consideration the realization of deeper integration among the countries, especially in the field of trade and digital integration, we try to analyze how blockchain technology can help support that integration. In order to analyze the possible application of this*

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\* The paper was presented at the international meeting SINCERE held in Dubrovnik 25-27 October 2018

*technology for deepening CEFTA integration through enhancing trade facilitation we briefly refer to its' positive aspects. Instead of developing individual software solutions in CEFTA countries it might be beneficial to move services to a blockchain technology platform. While currently, this might be hindered by local policies, blockchain technology will have its' influence and application in trade facilitation as it has in many other fields. With full awareness of the possible threats and challenges, it is of the utmost importance to engage in discovering the most compatible pathway to apply this technology in regional trade facilitation and deepen digital integration among CEFTA member countries.*

***Keywords: Trade facilitation, CEFTA-2002, Blockchain technology, positive aspects, deepening digital integration***

## **1. INTRODUCTION**

Today more than ever, the complexity of international trade is complemented with various technological inventions. The most important and influential international organizations in the field of trade have started to work intensely on demystifying the understanding of these technologies and assessing their impact on trade and trade facilitation and the whole international supply chain. Among the most important technological development is the blockchain. This technological development allows the creation of "original" electronic documents that cannot be copied and whose origin can be guaranteed without using a trusted third party. Until recently, blockchain technology has been mainly associated with the cryptocurrencies (mainly the bitcoin) and its influence in the financial sector. But it has been piloted and implemented in other sectors including supply-chain management, land registration, delivery of food aid. Especially, UNCTAD and UN/CEFACT expect the impact of blockchain technology to be especially profound in the areas of trade and transport.

The attributes of blockchain technology are ideally suited to large networks of disparate partners. A distributed ledger technology, blockchain, establishes a shared, immutable record of all transactions that take place within a network and then enables permissioned parties access to trusted data in real time. Applying this technology to digitize global trade processes can ease the flow of information among multiple number of trading partners and in the same time it won't be compromised on its accuracy, privacy or confidentiality. The Intelligent Tech & Trade Initiative (ITTI) launched at the World Trade Organization in 2017 recognizes that both blockchain and augmented intelligence (AI) have the potential to boost commercial exchanges, they can enable more proactive supply chains by predicting customer behavior, calculating fast and cheap shipping routes and foreseeing customer cancelations. These technologies can allow de-intermediation, increased trust and agile market access. Even more profoundly, they expect that the application of these technologies can help bridge the gap

between large MNCs and SMEs, as well as between post-industrial economies and LDCs.

The goal of this paper is to provide more insight on the possible application of blockchain technology in trade and trade facilitation mainly implemented through customs digitization. We try to explain the characteristics of this technology that are suitable for resolving certain problematic issues in international trade. We refer to the region of CEFTA-2006 where mainly trade facilitation is the issues that can help to increase trade and alleviate economic integration among few small countries. Although it might look difficult or almost impossible to apply blockchain technology in this region we think that it is of utmost importance to understand its advantages and implement it in any way or amount possible.

The paper first explains the need for customs digitization and the issues that should and could be addressed with blockchain technology. Then we explain the characteristics of blockchain technology and its suitability for trade facilitation. After that we explain the situation of the region CEFTA-2006 and the emerging need of trade facilitation. At the end we offer a pioneering possible solution for developing blockchain technology for trade facilitation in CEFTA-2006.

## **2. THE NEED FOR CUSTOMS DIGITIZATION**

A research conducted by the United Nations (2003) showed that, on average, in the region of the 21 member-economies of the Asia-Pacific Economic Partnership in one trade transaction 27 to 30 actors were involved, 40 documents were prepared, 200 items of data were entered of which at least 30 data were entered 30 times and 60-70% were entered at least twice. The losses that companies suffer through delays at borders lack of transparency and predictability, complicated documentation requirements and other outdated customs procedures are estimated to exceed in many cases the costs of tariffs (Engman, 2010). The supply chain is a complex and fragmented ecosystem through which goods and wealth travels through intricate logistical channels (Simchi-Levi, Simchi-Levi & Kaminsky, 1999). This requires exchanges of complex information between numerous stakeholders, principally between customs and other regulatory agencies in document form consisting of contracts, certificates and approvals. Due to their fragmented and physical nature these exchanges come at a high cost and provide opportunities for error and fraud (Geourjon & Laporte, 2005).

In international trade, the role of customs is that of gate-keeper as well as collector of excise and other duties and taxes. Customs is responsible for monitoring the flow of goods and can intervene if there are safety, security or other public policy reasons. However, customs officials cannot monitor all containers. Instead they perform risk assessment by analyzing information on the

shipments it will receive before the goods arrive at the border, and target high-risk containers for inspection (Tan et al. 2011). This information is obligingly provided by businesses in form of documents, nevertheless, the information in documents is often not timely, or has been altered, is inaccurate or is vague, which in turn poses safety and security risks (Klievink & Lucassen 2013). To reduce these risks, customs require additional high-quality information on which to base its risk assessments, which can be provided by digitization and ICT technologies.

Good ICT infrastructure is an important component of trade and transport infrastructure. These measures include customs automation, ability to track and trace goods in transit at every stage of the process, pre-arrival clearance, risk analysis, electronic submission of customs forms and documents, information management, and terminal operations and electronic single windows. Implementation of these measures can help reduce transaction costs and thus facilitate trade (Sourdin & Pomfret, 2012).

The benefits and value drivers of customs digitalization are considerable. The key motivation is the efficiency associated with minimizing the cost of managing documents throughout the trade process, including costs associated with the exchange of documents with other countries, as well as the procurement and facilitation of those documents. When properly automated, ICT technologies allow for information to be processed more accurately and more frequently (Neubert, Ouzrout & Bouras, 2004), eliminating the need for manual data entry and reducing human error (La Londe & Masters, 1994). Low levels of system interoperability within and between customs agencies and the relevant stakeholders continue to cause high investment costs, thus preventing the full realization of potential benefits (Murphy & Daley, 1999). Effective information sharing brings new value to any process by delivering the right information to the right people at the right time for decision-making purposes (Dinter, 2013). Current research continues to examine how value can be created from information sharing and big data in industrial B2B supply network environments, and how inter-organizational integration based on blockchain technology should be organized in this new economy (Dahlberg, Hallikas & Korpela, 2017).

## **2.1. Trade issues that should be addressed with blockchain**

One of the major issues in international trade transactions is information sharing. Within this context, stakeholders often have little information on the competence, and reliability of other parties in the process (Mishra 1996). Consequently, due to the lack of trust, businesses are averse to share information with others for competitive and/or security reason (Fawcett et al. 2007). Therefore, the greatest barrier to information sharing in customs can be identified as information confidentiality (Urcioli et al., 2013).

The second issue relates to legal considerations as this creates a highly complex process for information sharing between businesses (Karampetsou 2016). Different categories of data require different legal frameworks which conversely depend on the country in which goods are moving (Van Stijn et al. 2011). Legislation may change frequently, and even different sources of law, such as national and European law, might be applicable at the same time (Gong and Janssen 2014).

The third issue is focused on liability. According to the Hague-Visby Rules, the liability of the carrier is limited to a certain amount per package, unless the value and a full description of the goods are declared by the shipper and included in the bill of lading. Considering that making the carrier liable for the full costs would increase the shipping rates, to prevent this, the shipper omits the value of the goods and makes the goods description vague. Consequently, since the information in the ENS is based on the information in the bill of lading, the goods description in the ENS would be vague as well, even though it was originally intended to be precise enough to identify the goods (Hesketh 2010).

Therefore, in order to establish a trusted supply chain it is necessary for all parties involved in the process to be confident that the shared information can be verified, will not be misused, and conversely, kept confidential in accordance with the needs of businesses.

Novel information exchange services are likely to have a significant effect in broadening the functioning of trade facilitation and the related business models. Blockchain technology has the capacity to facilitate cross-border trading transactions, especially in the management of document approval processes. With blockchain technology the path of a shipment can be transparently and securely traced throughout the supply chain, thus enabling a more efficient way to handle document approval workflows needed to move goods across international borders.

### **3. THE IMPORTANCE OF BLOCKCHAIN FOR TRADE FACILITATION**

Since it is of general knowledge that effective trade facilitation signifies reliability and security of the trade transactions we think that blockchain technology may be able to offer a high level of confidence in these areas to both traders and regulators. The proposal presented in this paper is focused on jointly moving all (customs) stakeholders towards a standardized integration of collaborative processes. By investigating blockchain solutions along with technology and standards, we propose a pathway to achieving an international system-to-system integration. Taking into consideration the realization of deeper integration among the countries, especially in the field of trade and digital integration, we try to analyze how blockchain technology can help support that integration.

In order for a blockchain to be an appropriate solution it is necessary to determine its suitability to a defined problem through three different aspects: business context, digital assets and permanence.

*Business context* - Trade processes often require the use of intermediaries. Some of the intermediaries physically handle, process and transport goods. Others, such as banks, inspection companies, and many government agencies often act as guarantors of: the authenticity of documents or information, the truthfulness of information, and/or trustworthy behavior of parties. The last could be called “guarantor activities” and blockchain technology is set to make many of these activities disappear. Within a business context the blockchain must remove an intermediary in the process. Additionally, within a reasonable time-frame the removal of the intermediary should lower the costs and or increase efficiency.

*Digital assets* - For a successful application of a blockchain it is necessary to have digitally native assets. While customs clearance and the whole supply chain process involve a lot of paper-based documents with stamps and signatures, these assets are easily represented in a digital format. The direct management of documents will allow for faster and more secure services which could be implemented with lower costs than other existing technologies.

*Permanence* - One of the most critical aspects of adopting blockchain technology as a solution is the possibility for creating a permanent record. As the blockchain needs to be the source of trust, it is not possible to have multiple sources that conflictingly determine the state of a record. In the case of customs clearance a permanent record is highly desirable, as the main incidents of fraud occur due to improper or fraudulent information handling. A verifiable permanent record accepted by all parties would eliminate most of these incidents.

In order to analyze the possible application of this technology for deepening CEFTA integration through enhancing trade facilitation we briefly refer to its’ positive aspects. The beginning of all starts with the possibility that this technology offers, i.e. the possibility of replacing original paper documents with “original” electronic documents. These electronic documents cannot be copied and its origin can be guaranteed without using a trusted third party. The blockchain ledger permanently records all information exchanges. All stakeholders in act as nodes in the blockchain network and store a decentralized copy of the blockchain ledger. Instead of reading and storing data from a centralized database, new blockchain data is distributed and synced directly to all ledger copies of all network participants. In accordance to previously agreed rules, each party can accept or reject the new data, which upon acceptance becomes a permanent, immutable record. This prevents changes to the history a document exchange as any alteration would not be distributed with other ledger copies.

The other advantages of applying this technology for trade facilitation are derived from the possibility for easy sharing information and for securing

information. Blockchain architecture allows the definition of business rules and workflows that determine and restrict access to specific sensitive information. This information can theoretically be provided by businesses, but it is often omitted as it relates to their commercial operations. Secure control of information flow with blockchain enables the provision of otherwise inaccessible information to customs. Information sharing and confidentiality rules can be specified and controlled by the information owners according to their company's policy on access control. On the blockchain these rules are regulated via smart contracts which control the circumstances under which certain information is released. On the blockchain data access and identities are secured by cryptography. Parts of data can be selectively encrypted and decrypted and distributed among entities without granting access, or in other words, physical access to information does not imply logical access. Additionally, stakeholder identities are managed through a public-private key infrastructure which guarantees the validity of documents via digital signatures and prevents the existence of fraudulent information.

Hence, the use of blockchain technology as part of the supply-chain provides stakeholders with an infrastructure that removes the necessity to secure each step of the process. Instead of having information segmented into multiple documents obtained through (certified) intermediaries, the complete documentation flow can be consolidated as a block of information. This block will provide a transparent chain of custody, while being accessible to all stakeholders in the process such as suppliers, transporters, buyers, regulators and auditors. Having all information in one location, will not only improve the security of the system, but also help lower all costs throughout the supply chain.

#### **4. BLOCKCHAIN FOR TRADE FACILITATION IN CEFTA-2006**

Since the CEFTA Agreement came into force, the member countries have achieved full trade liberalization in manufactured products and made substantial progress in eliminating tariffs in trade in agricultural products and thus enabled stronger intra-CEFTA trade growth. However, individual countries trade flows continue to be strongly oriented towards the EU market. Thus, to further enhance intra-CEFTA trade, progress needs to be made in the reduction and elimination in the Non-Tariffs Barriers (NTBs). Additional gains from intra-CEFTA trade can be obtained by addressing existent non-tariff barriers, especially technical, sanitary and phytosanitary barriers to trade, the time and costs to import and export, and improvement of infrastructure to trade (Mojsoska-Blazevski & Petreski, 2012). A 10% reduction of the costs both in importer and exporter countries may lead to an approximately 10% increase in export, while a 10% reduction of time at the border both in importer and exporter countries may lead to a 5.5% increase in export (Tosevska-Trpcevska, K. & Tevdovski D., 2014).

According to the OECD report (2012), CEFTA member-countries need to make further progress in streamlining and undertaking coordinated approaches to tackling NTBs, such as: technical barriers to trade, sanitary and phytosanitary measures and administrative barriers to trade. With regard to Administrative barriers to trade, OECD (2012) suggests the following activities (measures) be undertaken: CEFTA parties should enhance transparency by regularly exchanging information on customs procedures through the CEFTA Trade Facilitation Web Portal; CEFTA parties need to cooperate to undertake coordinated actions for handling of documentation and automation and on operating the National enquiry points; parties should share good practice in implementing risk management and electronic data interchange; and parties need to undertake additional effort to increase the usage of pre-arrival processing and simplified customs procedures.

Streamlining the customs procedures and aligning them with the EU standards is recognized as one of the recommendations offered by UNCTAD to facilitate business in the region and thus attract investment and secure development benefits (UNCTAD, 2017).

The latest prospects for future path work and deeper integration of CEFTA-2006 has been operationalized by the Berlin Process and the idea of creating regional economic area among the CEFTA member countries until 2023. The creation of the regional economic area is supported by consolidated multiannual plan of activities and indicative time frame for its realization. The creation of the regional economic area is envisaged in deepening the integration in four fields: trade, investment, mobility and digital integration. Taking into consideration the realization of deeper integration among the countries, especially in the field of trade and digital integration, we try to analyze whether undertaking activities in those field would be supported by applying blockchain technology. Since it is of general knowledge that effective trade facilitation signifies reliability and security of the trade transactions we think that blockchain technology may be able to offer a high level of confidence in these areas to both traders and regulators.

Applying blockchain technology in the field of trade facilitation can be beneficial for the CEFTA member countries as it can address some limitations that still exist and hamper trade. Due to lack of standardization, fully automated data transfer between customs agencies and trade stakeholders is severely lacking. This creates a complicated exchange of trade documents between parties using a computer-paper-computer manual operation model. The documents are produced using the originating party information systems and are delivered on paper (or in electronic formats) incompatible with the information systems of the receiving party, requiring manual entry or scanning into those systems.

Another visible problem is the involvement of multiple parties in the document acquirement process which causes the trade transaction process to be slow and cost-ineffective. In cross-border trade facilitation in CEFTA, operators



often use forwarding agents as trusted third parties to procure relevant paper documents. Blockchain technology provides the opportunity to minimize the unnecessary use intermediaries within this and other processes (Tapscott & Tapscott, 2016). The main blockchain feature is the existence of a public ledger of transacted information. This ledger can be trustworthily managed through a cryptographically secure infrastructure that manages digital signatures and identities.

Finally, blockchain technology can address the security issue. Trade among CEFTA members is not influenced by high tariffs or other trade barriers. Trade in the region is mainly hampered by nontrade barriers which mainly refer to suspicion of the authorities in the validity of the documents issued in other countries. The application of blockchain technology offers a high level of confidence, i.e. in the documents, and thus can alleviate the problem of long inefficient administrative procedures and support trade facilitation.

#### **4. 1. Proposal for a Blockchain Solution for Trade Facilitation in CEFTA-2006**

Although we are aware of the difficulties that the application of blockchain technology might have in the region of CEFTA-2006 in this paper we propose that a possible blockchain solution for trade and customs facilitation in this region should have the following properties: it should be permissioned blockchain; it should operate among trusted nodes and it should be based on a consensus mechanism.

##### **4. 1. 1. Permissioned**

A customs platform that serves multiple stakeholders requires the use of a permissioned private blockchain. This means that blockchain access will be limited only to entities involved in the trade process that have information to share, without public access. Within this permissioned environment, all entities can act as nodes and create/submit an information block to be shared on the blockchain which will be signed with the corresponding private key. However, only designated trusted entities can validate and add a submitted block to the blockchain.

##### **4. 1. 2. Trusted nodes**

One international trade transaction can entail the involvement of numerous stakeholders. Based on the UN/CEFACT International Supply Chain Model these entities can be grouped in four distinct categories: supplier, customer, intermediary and authority. From these, all entities falling within the authority category can be identified as trusted nodes. In addition, entities from

other categories, such as financial institutions, that operate under rigorous legal procedure can also be considered as trusted nodes. Other participants in the transaction will remain as untrusted nodes. Although businesses have the incentive to keep accurate information in order to support their business activities and participate in blockchain trade, it is difficult to guarantee their local implementation of strong cyber protection. If compromised, these businesses can unknowingly generate fraudulent information that will affect the trade process.

#### **4. 1. 3. Consensus mechanism**

During a regular trade transaction, every submitted document has to be confirmed by one or more certified institutions. For example, in order to ship cargo abroad an exporter entity within the EU will usually need three documents (export declaration form, bill of lading and a commercial invoice) and two signatures (one by a customs official and by a port authority) to complete all shipping requirements. As all documents are submitted and transported in paper form, instances of fraud can occur when these documents are physically altered after their confirmation, thus interfering with the chain of trust. Considering the complexities of interactions and procedures between stakeholders, it is not possible to have a hard-coded "one-size-fits-all" consensus protocol. Instead, it will be necessary to employ a flexible blockchain architecture, such as Hyperledger Fabric, in order to separate the transaction flow and execution of untrusted code in a complex trust environment.

## **5. CONCLUSION**

International trade is relying on more and more complex international supply chains and therefore should be backed up by seriously developed technological solutions. Even more, effective trade facilitation necessitates reliability and security of the trade transactions. The physical movement of large volumes of paper documents for shipping transactions is vulnerable to fraud and human error. Conversely, the costs of processing, verifying and securing this documentation are extremely high, with a lot of human effort being wasted in the process. Blockchain technology has the capacity to facilitate cross-border trading transactions, especially in the management of document approval processes. Blockchain may be able to offer a high level of confidence in these areas to both traders and regulators. With blockchain technology the path of a shipment/container can be transparently and securely traced throughout the supply chain.

One of the most important advantages that this technology offers is the possibility of replacing original paper documents with "original" electronic documents which cannot be copied and its origin can be guaranteed without using a trusted third party. The blockchain ledger permanently records all information exchanges and all stakeholders acting as nodes in the blockchain network and

store a decentralized copy of the blockchain ledger. The other advantages of applying this technology for trade facilitation are derived from the possibility for easy sharing information and for securing information. Information sharing and confidentiality rules can be specified and controlled by the information owners according to their company's policy on access control. On the blockchain these rules are regulated via smart contracts which control the circumstances under which certain information is released.

Taking into consideration the advantages that this technology offers we think that for the region of CEFTA-2006 and for accomplishing the envisaged deeper integration especially in the field of trade and digital integration it is of utmost importance that the responsible authorities in these countries should become acquainted with its characteristics and start to think how to implement it, as soon as possible. We are completely aware that this process is hindered with many obstacles and difficulties but, on the other side, we are sure that keeping pace especially with the newest technological solutions is essential and necessary as otherwise these economies might be left out and be isolated from all economic processes in the world. This is why we offer the proposal in the paper and instead of developing individual software solutions in CEFTA-2006 countries we think that it will be beneficial to move services to a blockchain technology platform. While currently, this might be hindered by local policies, blockchain technology will have its influence and application in trade facilitation as it has in many other fields. With full awareness of the possible threats and challenges, it is of the utmost importance to engage in discovering the most compatible pathway to apply this technology in regional trade facilitation and deepen digital integration among CEFTA member countries. In this paper we try to offer the characteristics that a possible blockchain technology solution for trade facilitation in the CEFTA-2006 region should have. It should be permissioned blockchain; it should operate among trusted nodes and it should be based on a consensus mechanism.

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## **PRIMJENA TEHNOLOGIJE LANCA BLOKOVA ZA BOLJE POTICANJE TRGOVINE U CEFTA 2006**

***Sažetak***

*Koristi i dobitci od digitalizacije carine značajni su. Najveću motivaciju predstavlja učinkovitost povezana uz minimalizaciju troškova obrade dokumenata u trgovinskom procesu, uključujući troškove povezane uz razmjenu dokumenata s drugim zemljama, kao i nabavu i lakše dobivanje tih dokumenata. Budući da je opće poznato da učinkovito pojednostavljivanje trgovinske razmjene znači pouzdanost i sigurnost trgovinskih transakcija, mislimo da tehnologija lanca blokova može ponuditi visoku sigurnost u tim područjima i trgovcima i regulatorima. Prijedlog koji iznosimo u ovome radu usmjeren je na zajedničko poticanje svih uključenih dionika u smjeru standardizirane integracije suradničkih procesa. Ispitivanjem rješenja uz pomoć lanca blokova uz tehnologiju i standarde, predlažemo put k postizanju međunarodne integracije po principu sistem na sistem. Uzimajući u obzir postizanje bolje integracije među zemljama, posebice u polju trgovinske razmjene i digitalne integracije, pokušali smo analizirati kako tehnologija lanca blokova može pomoći u poticanju takve integracije. Kako bismo mogli analizirati moguću primjenu ove tehnologije u boljoj CEFTA integraciji boljim poticanjem trgovinske razmjene, kratko se osvrćemo na njezine pozitivne aspekte. Umjesto razvijanja individualnih software rješenja u zemljama CEFTA-e, moglo bi biti korisno premjestiti usluge na platformu tehnologije lanca blokova. Iako je u ovom trenutku nešto teže izvediva zbog lokalnih politika, tehnologija lanca blokova imat će svoj utjecaj i primjenu u boljoj trgovinskoj razmjeni kao što ima i u mnogim drugim poljima. Bez obzira na sve moguće opasnosti i izazove, od ključne je važnosti pokušati pronaći najpovoljniji način za primjenu ove tehnologije u poticanju regionalne trgovinske razmjene i širenje digitalne integracije među zemljama članicama CEFTA-e.*

***Ključne riječi: poticanje trgovine, CEFTA-2002, tehnologija lanca blokova, pozitivni aspekti, širenje digitalne integracije.***

***JEL klasifikacija: F13, F19, O33.***