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**Electronic Bill of Lading:
Legal Framework, New Technologies, and Emerging Legal Challenges.**

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Abstract

This master thesis is a study on the evolution of the electronic bill of lading. By examining the current legal framework of the bill of lading and the industry's standards and initiatives, the objective is to assess the potential of the electronic bill and provide educated conclusions on the path ahead regarding legal recognition and industry adoption. This study inspects new technologies, such as blockchain and smart contracts, to dissect their strengths and weaknesses, find out how they fit into the existing legal framework, and pinpoint the legal challenges emerging from them. The goal is to find out if new technologies have managed to achieve the functional equivalency of the electronic bill of lading to the paper bill, and if combined with a positive legal framework, can guide the market towards its adoption.

Περίληψη

Η παρούσα διπλωματική είναι μια μελέτη πάνω στην εξέλιξη της ηλεκτρονικής φορτωτικής. Εξετάζοντας το ισχύον νομικό πλαίσιο της φορτωτικής και τα πρότυπα και τις πρωτοβουλίες της αγοράς, ο στόχος είναι να εκτιμηθούν οι δυνατότητες της ηλεκτρονικής φορτωτικής και να παρασχεθούν τεκμηριωμένα συμπεράσματα για την πορεία προς το μέλλον όσον αφορά τη νομική αναγνώριση και την υιοθέτηση από τον κλάδο της ναυτιλίας. Η μελέτη αυτή επιθεωρεί τις νέες τεχνολογίες, όπως το blockchain και τις έξυπνες συμβάσεις, για να αξιολογήσει τα πλεονεκτήματα και τα μειονεκτήματά τους, να διαπιστώσει πώς εντάσσονται στο υφιστάμενο νομικό πλαίσιο και να εντοπίσει τις νομικές προκλήσεις που προκύπτουν από αυτές. Στόχος είναι να διαπιστωθεί αν οι νέες τεχνολογίες έχουν καταφέρει να επιτύχουν τη λειτουργική ισοδυναμία της ηλεκτρονικής φορτωτικής με την έγχαρτη φορτωτική, και αν σε συνδυασμό με ένα θετικό νομικό πλαίσιο μπορούν να οδηγήσουν την αγορά προς την ευρεία υιοθέτηση της.

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List of Abbreviations

AI	Artificial Intelligence
BARECON	BIMCO's Bareboat Charter Party
BIMCO	Baltic and International Maritime Council
BOLERO	Bill of Lading Electronic Registry Organization
CMI	Comité Maritime International
DCSA	Digital Container Shipping Association
DLT	Distributed Ledger Technology
EDI	Electronic Data Interchange
GDPR	General Data Protection Regulation
GENCON	BIMCO's Standard Voyage Charter Party
IBM	International Business Machines Corporation
ICC	International Chamber of Commerce
IG	International Group of the P&I Clubs
ILA	International Law Association
IoT	Internet of Things
IMO	International Maritime Organization
LOI	Letter of Indemnity
MLETR	Model Law on Electronic Transferable Records
NYPE	New York Produce Exchange
p2p	Peer to Peer
UCC	Uniform Commercial Code of the US
UK	United Kingdom of Great Britain and Northern Ireland

UN	United Nations
UNCITRAL	United Nations Commission on International Trade Law
UNCTAD	United Nations Conference on Trade and Development
US	United States of America
USD	United States of America Dollar

1 Introduction

In a rapidly technology-evolving world, the needs of international commerce are changing. The solutions of the digital age bring forward tremendous advantages but at the same time feature unexpected legal challenges. In this environment, the shipping industry is one of the primary users of new technologies which facilitate global trade by sea, and the bill of lading, a centuries-old practice, finds itself transformed. The transition from the paper bill of lading to the electronic bill of lading started in the early days of digitalization in the previous century, but it is in the last decade where its use has seen significant increase. The revolutionary blockchain technology has undoubtedly been a game-changer in this process, and the new generation of people who have taken over trade are more technologically literate and trusting in technology. Still, the road towards the adoption of the electronic bill was long and still has a long way to go. In this journey, we can't forget the decade-long efforts from international organizations and legal scholars and practitioners who analyzed the practical and legal equivalence of the electronic bill of lading to its paper counterpart to provide solutions, achieve market adoption and international law harmonization. With the shipping industry getting more familiar with the use of the electronic bill of lading, this thesis is going to study the current regulatory regime of the electronic bill of lading and the legal issues arising from new technologies, with the aim to observe the way ahead.

1.1 A SHORT HISTORY OF THE BILL OF LADING

To understand the importance of keeping good and accurate records in maritime trade, one can observe the historical evolution of the bill of lading from medieval times. Still unknown by the eleventh century, the registry of the goods carried was kept in the book of records (or the book of lading) that was kept by the ship's Mate for practical reasons and constituted the evidence of receipt of the goods¹. Around 1350 there was a statute enacted about the registry which provided that it was the responsibility of the clerk-only to keep, and that if it stated false information the clerk would be punished severely, losing his right hand, marked on the forehead by a branding iron, and all his property confiscated, even if the entry was made by another, because it was his responsibility to keep a secure record². As trading practices altered and merchants sent their goods to distant ports using third-parties ships, the need for an independent document started to arise to mainly guard against the loss of the book of records³. Indeed, one of the firsts bills of lading, as we recognize it today, is placed

¹ The *Ordinamenta et Consuetudo Maris of Transis*, dating from 1063, contained provisions regarding the accuracy of the record, such as the Master having to be accompanied by a certified clerk, or in case of big ships two certified clerks, who made sure that the cargo was accurately recorded. This statute set out that the register served as evidence of receipt of the goods and expressly stated that the clerk was not an agent of the shipper or the captain. Similar statutes were enacted in Mediterranean ports, such as Aragon, Majorca, Valencia, Barcelona and Marseilles in the next centuries.

Sarel Francois Du Toit, 'The Bill of Lading in South African Law' (Rand Afrikaans University 2000) 18. References Polak, Bennett and Sanborn.

² Richard Aikens, Richard Lord and Michael Bools (eds), *Bills of Lading* (second edition, Informa Law from Routledge 2016). Reference McLaughlin.

³ There were already statutes who tried to guard the shippers such as of Marseilles of 1252-1255 and of Ancona of 1297, that expected the clerk to give copies of the register to the merchant if requested. The copy of the register was named "apodixia" in the law of Genoa in 1441, this being the first time that this document has its own name.

at 1390 Italy⁴, and it is issued by the Mate of the ship on behalf of the shipowner and addressed to the merchant who wished to have his goods transferred by sea and delivered to his agent in the stated port of Portonevere⁵. It contained something that looks like indorsement, meaning instructions on how and to whom the delivery should be conducted.

From that point, the three modern functions of the bill of lading would slowly emerge. First, its original purpose as receipt of the goods, then by the sixteenth century, as the evidence of the contract of carriage⁶. The bill of lading was not yet considered a transferable document, and it did not possess a proprietary function. This function appeared much later, its early foundations founded in the common-law case *Lickbarrow v Mason* (1786)⁷, where it was decided that the bill of lading was a document that was capable of transferring property⁸. In the nineteenth century, the issue of possession of the goods referred to in a bill of lading was refined, and the bill was described as a representation of the actual possession of the goods, the transfer of which equated with the transfer of the possession the goods⁹. Acquiring all three functions, the modern history of the bill of lading begins.

1.2 DEFINITION OF THE BILL OF LADING

The bill of lading is certainly easier to recognize than define. That was the Law Commission's view in the proceedings towards the UK's Carriage of Goods by Sea Act in 1992, where they opted out of defining the bill of lading, because it's usually identified by its three functions. Dictionary definitions are not very helpful in defining it either. The word "lading" is old English, the meaning of which is connected to the word "loading" and "laden"¹⁰. There are many "species" of a bill in the maritime industry, but in principle it is a legally binding paper document that holds all the necessary information to ship cargo from one point to another. A very simplified explanation of the process of issuing a bill of lading is now demonstrated: a shipper who wishes to ship a consignment of goods by sea is instructed by the carrier when and where to deliver the goods. Then the shipper is issued with a receipt by the carrier's agent, that indicates the type, and the quantity of goods handed over to the carrier and the condition the goods were received in¹¹. While the goods are in the care of the carrier, the shipper usually acquires a copy of the carrier's standard bill of lading form and will enter details like the type and the quantity of the goods shipped, including relevant remarks, and will specify the port of

Sarel Francois Du Toit (n 1) 21. References McLaughlin.

⁴ We cannot exactly pinpoint when the book or records was replaced by the issuing of the bill of lading, but most likely, the practice differed depending on the port. Some authors claim the birthplace of the bill of lading to be Italy.

⁵ Aikens, Lord and Bools (n 2) 102.

⁶ The bill of lading was treated as a well-known document by the sixteenth century. Le Guidon de la Mer from Rouen defined it as the acknowledgement of the number and quality of the goods loaded on board by the Master of the ship.

⁷ *Lickbarrow v Mason* (1786) 2 TR 63, 99 ER 35.

⁸ Aikens, Lord and Bools (n 2) 111.

⁹ *ibid.*

¹⁰ In Spanish the bill of lading is translated as "*conocimiento de embarque*" meaning "knowledge of the loading" and in French as "*connaissance*", both deriving from the Latin verb *conoscere* (to know). German, Swedish, Danish, and Norwegian follow the same pattern with "konnossement". In Italian "*polizza di carico*" means "loading policy". In Greek, "*φορτωτική*" or "fortotiki" means "loading document". In Chinese "提货单" or "tíhuò dān" means "bill for delivery of the goods" and in Japanese "船荷証券" or "funani shōken" means "cargo certificate". In most languages, the name has to do with the document's historically first function, the proof of loading the cargo.

¹¹ John F Wilson, *Carriage Of Goods By Sea* (7th edition, Pearson Education Ltd 2010) 117.

destination and the name of the consignee who will receive the consignment¹². When this process is completed, the carrier's agent will check the details and possibly add notes to it, will include the freight, and the Master or his agent will sign the bill of lading and release it back to the shipper. As a negotiable document of title, the bill of lading allows the holder of the bill to transfer the constructive property of the goods to a new holder of the bill of lading.

1.3 THE NEED FOR INTERNATIONAL REGULATION

The need for common rules in maritime commerce dates to the Rhodian maritime law¹³ that influenced the Romans, the Byzantines, and eventually *lex mercatoria*¹⁴. A sub-regime of *lex mercatoria*, *lex maritima* was the customary law for maritime matters that was widely used by merchants in the Middle Ages¹⁵. As previously mentioned, from this long tradition of uniformity of maritime law, this is where the earliest example of “unified rules” on the bill of lading can be traced. But, in modern times, the complex effects of globalization are upon us. Transnational commerce causes legal systems to clash with each other, as each system reflects differences in regulation, in the definition of terms, and public policy¹⁶. In the case of dispute, this setting brings legal uncertainty to the parties involved, that results in delays and increased costs. Because of this problem, there has been an effort by the late 19th century to unify the rules of the carriage of goods by sea.

The first attempt at unifying the carriage of goods by sea was the Hague Rules, drafted by the Comité Maritime International (‘CMI’) of the International Law Association¹⁷ (‘ILA’) and signed in 1924. The Hague Rules were criticized because they were biased in favor of the carriers which lead to them being amended twice. To address the emerging problems of the Hague/Visby Rules, the Hamburg Rules were introduced by the United Nations’ (‘UN’) Convention on the Carriage of Goods in 1978 and came into force in 1992. Quite unpopular with the ship-owners, they were ratified by a small number of countries, and they don’t have practical significance. The most recent international attempt to legislate the issue of the bill of lading was the Rotterdam Rules by the United Nations

¹² Inaccurate information from the shipper activates Article III rule 5 of the HVR and the shipper is required to indemnify the carrier against all loss arising from these inaccuracies.

¹³ The Rhodian Law’s origins cannot be pinpointed, but authors date it as far as 900 B.C. It has been preserved mostly in Justinian’s *De Lege Rhodia de Iactu* from 533 A.D. which is why some scholars like R.D. Benedict doubt its historical position.

Jacek Wiewiorowski, ‘Universality Of The Rhodian Maritime Law From the Standpoint of Neoevolutionism’ (2019) 3 GDAŃSKIE STUDIA PRAWNICZE 217.

¹⁴ Wiewiorowski (n 13).

¹⁵ Elena Orrù, ‘The Challenges of ICTs in the Shipping Sector among International Uniform Law, Codification and *Lex Mercatoria*’ in Zuzanna Pełowska-Dąbrowska and Justyna Nawrot (eds), *Codification of Maritime Law: Challenges, Possibilities and Experience* (Informa Law from Routledge 2020) 135.

¹⁶ Dimitrios Christodoulou, ‘Electronic Bill of Lading: The Legal Framework’ (Temple University 1995) 6.

¹⁷ ILA tried to achieve international uniformity for the law governing the bill of lading at the Liverpool Conference of 1882, proposing a model bill of lading that would be voluntarily adopted by an agreement between the shipper and the carrier. Its second attempt took a different approach, proposing a set of rules called “the Hamburg Rules of Affreightment of 1887” which would voluntarily be incorporated by the parties into the bills of lading. Lastly, ILA established the CMI in 1897 along several national Associations of Maritime Law.

Lijun Zhao, ‘Lex Maritima in a Changing World: Development and Prospect of Rules Governing Carriage of Goods by Sea’ in Proshanto K Mukherjee, Maximo Q Mejia and Jingjing Xu (eds), *Maritime Law in Motion*, vol 8 (Springer 2020) 768.

Commission on International Trade Law ('UNCITRAL'), which were drafted in 2008 and signed in 2009, but have not yet come into force, as only five countries have ratified them. The Rotterdam Rules explicitly allow the use of e-commerce and the issuing of electronic documents such as the electronic bill of lading. As will be analyzed later in this thesis, these harmonizing initiatives are of great importance for the electronic bill of lading.

1.4 NEW TECHNOLOGIES AND RISING LEGAL ISSUES

The end of the “paper-age” started with the introduction of computers in combination with telecommunication systems that enabled the development of new ways to transmit business data¹⁸. This new way of communication in business is referred to as “e-commerce”. The initiative to introduce international regulation for e-commerce by the instrument of a Convention was not surprising, as there have been attempts to replace the traditional paper bill of lading with its electronic equivalent since the 1980s. The process has been slow but new technologies, like blockchain, offer new solutions to old problems.

Despite this being the age of digitalization, new technologies do not just magically get implemented in commerce. The shipping sector is notoriously resistant to change, mostly due to legal uncertainty and fear of the unknown digital environment. New technologies bring forward new legal challenges that merchants will eventually have to face in conflict resolution. In most cases, there is market anxiety over cyberattacks and electronic fraud, and there is no rich case law to appease these concerns. For example, there is no decided English law case involving electronic bills of lading¹⁹. In the case of *Glencore International v MSC Mediterranean Shipping Co*, the courts held that the carrier was in breach when they delivered to the party that illegally acquired electronic PIN codes which enabled them to collect the cargo, similarly to a fraudster presenting a forged bill of lading²⁰. This does not promote trust in using technology. But, as it will be discussed later in this study, the reality is that the paper bill of lading is more susceptible to fraud, while digitalization offers advantages in many and sometimes unexpected ways. This raises an important research question on how international regulation and private initiatives can smoothly guide the shipping sector towards the benefits of the digital age.

1.5 AIM AND RESEARCH QUESTIONS

One of the main objectives of this thesis is to examine the current legal framework and soft law instruments for the implementation of the electronic bill of lading in the shipping industry. By looking into the reasons why international harmonization efforts have seemingly failed, the research question highlighted is whether there is a need for new international legislation, what is the role of soft law

¹⁸ Časlav Pejović, ‘Electronic Transport Documents’, *Transport Documents in Carriage of Goods by Sea* (Informa Law from Routledge 2020) 216.

¹⁹ The *Armstrong v Winnington Networks* case (2012) mentions the electronic bill of lading but deals with issues unrelated to the carriage of goods.

Mark Russell, ‘The Hague Rules – 100 Years Old and Still Standing’ (*Gard*, August 2024) 14 <<https://gard.no/articles/the-hague-rules-100-years-old-and-still-standing/>> accessed 30 August 2024.

²⁰ *ibid*.

instruments and market initiatives, and whether international harmonization can finally be achieved to the current patchwork of regimes.

Then, by analyzing the imminent legal challenges from the use of innovative technology, this thesis aims to answer the question whether the electronic bill of lading is finally the legal and the practical equivalent of the traditional bill of lading, especially after the appearance of blockchain technology. As technological advancements make digital solutions not only feasible but also necessary to stay competitive and efficient in global trade, it is imperative to examine their advantages and disadvantages and consider if blockchain, by filling the gap regarding authenticity and cybersecurity, is the way into the future.

The research questions of this study are:

- What are the disadvantages of the paper bill of lading?
- Are current legal regimes keeping pace with technology or do they act as a barrier instead?
- Is there a need for a new international Convention on the electronic bill of lading?
- What role does soft law play in the adoption of the electronic bill of lading?
- What are the three functions of the bill of lading, and can the electronic bill of lading emulate them?
- What is the potential of new technologies in achieving functional equivalence and market confidence for the adoption of the electronic bill of lading?
- What are the emerging legal challenges relating to new technologies in the context of the electronic bill of lading and how can legal science help to address them?

1.6 METHOD AND MATERIAL

The method of this research is to introduce in the first part of the thesis the legal framework and the industry self-regulation tools surrounding the electronic bill of lading. The study of the regulatory environment and business practices will allow the thesis to transit to its second part, where the functions of the bill of lading are analyzed with the purpose of finding out whether new technologies, and especially blockchain, can render the electronic bill of lading a true equivalent to the paper bill.

In this quest, this thesis is mostly occupied with the legal framework prevalent in Europe, including international regulations and a few domestic legislations, especially focusing on the law of the UK and Greece. As this study transitions into the legal challenges of new technologies regarding the electronic bill of lading, the point of view turns mostly law-neutral, presenting principles of both common law and civil law, but not focusing on how specific legal instruments can deal with these issues, unless they are directly related to the subject of this thesis. For example, the issue of data privacy in blockchain technology is briefly mentioned, but it is not the goal of this thesis to dwell on this specific challenge more than to raise the issue and share a general legal reflection on the subject.

The primary way of gathering information is from the works of legal scholars of maritime law, as well as from sources of information published directly on the worldwide web by companies operating in the shipping industry and P&I Clubs. Especially the legal literature on blockchain-based electronic bills of lading has been significantly increased the last couple of years, as more and more

platforms become approved by the International Group of the P&I Clubs ('IG'). The sources gathered are thus as up to date as possible.

1.7 STRUCTURE

[Chapter One](#) of this thesis is an introductory chapter aimed at giving the necessary background to the topic of this study. It includes a description of the aim and the research questions of this study, its method and material, in order to serve as a guide to the rest of the research.

[Chapter Two](#) of this thesis deals with the disadvantages of paper-based trade in general and the paper bill of lading in particular. The bill might be a century-old practice, but the usage of paper is inconvenient, expensive, prone to fraud, and environmentally taxing. As an introductory chapter to the legal framework of the bill of lading, this chapter attempts to explain why a suitable electronic alternative to the traditional bill is preferable.

[Chapter Three](#) of this thesis attempts to give an overview of the legal framework that surrounds the electronic bill of lading. It starts with the endeavor of explaining the reasons why international Conventions have failed in their task to bring international uniformity in the carriage of goods by sea. The Rotterdam Rule's articles on the electronic transport records are analyzed. Then, another regulating instrument is presented, soft law, which includes Model Laws, Guidelines, and the self-regulatory actions of private entities. Lastly, this chapter ends with how national legislations have responded to the needs of the shipping industry, to showcase how technology and the regulatory instruments mentioned above influence domestic rules. This chapter ultimately examines the role that the current mosaic of commercial law regimes plays in the adoption of new technologies for the widespread application of the electronic bill of lading.

[Chapter Four](#) of the study acts as an introduction to the presentation of new technologies and the legal challenges arising from them. By analyzing the three functions of the bill of lading and how easy or difficult it is for the electronic bill to reflect the same functions, the goal is to see if current technology combined with the appropriate legal framework can cater to the challenge of functional equivalence.

[Chapter Five](#) of this study examines modern technology trends to eventually test their ability to achieve the same legal functions as the paper bill of lading and inspire trust in the market by overcoming practical challenges. Chapter Five starts with a presentation on closed centralized registries in order to draw a comparison with open decentralized registries that use blockchain technology. The basic concepts of blockchain and related technology will be illustrated to allow for a better understanding of its potential. Blockchain will then be evaluated from the point of view of the Rotterdam Rules and the MLETR. Lastly, the practical issues concerning technology that hinder its adoption in the shipping industry will be presented in order to smoothly transition to the next chapter.

[Chapter Six](#) deals with the legal challenges surfacing from new technologies and is separated from chapter five to draw attention to its importance. This chapter begins with a discussion on property law

and recognition of intangible assets and then with the issue of singularity of the bill of lading. From then on, other imminent legal issues related to new technology will be discussed, such as cybersecurity, governing law, jurisdiction issues, and the many legal challenges of smart contracts.

Chapter Seven holds the conclusions of this study.

Part One

The legal framework of the Electronic Bill of Lading



2 The disadvantages of the traditional bill of lading

The bill of lading is a century-old practice, yet Goldby describes the paper bill as inconvenient, expensive, and insecure²¹. In this chapter, the disadvantages of the traditional bill of lading will be discussed to highlight the need for change to a functional digital system that is widely used and accepted by the international trade community. This is an introductory chapter to the legal framework of the bill of lading, to explain why a suitable electronic alternative to the traditional bill will improve efficiency and security and will benefit the environment as well²². For this to happen, it is imperative for the electronic bill to be legally recognized in order to face the market's reluctance and reap the benefits of digitalization²³. This chapter's research question is thus quite simple: What are the disadvantages of the paper bill of lading?

2.1 THE COST

A UN study from the late 1990s estimated that the global cost of processing trade paperwork was at approximately 420 billion USD a year²⁴, attributed to a vast number of trading parties and service providers communicating with paper-based techniques, incompatible business processes and systems, very little process integration, and high error rates from re-keying of data and human error²⁵. In a more recent test, in 2014 IBM and Maersk sent a shipment of flowers from Kenya to the Netherlands, and as a result a stack of nearly 200 communications documents was produced between 30 organizations²⁶. The cost of processing and for the administration of these paper documents was estimated to be up to

²¹ Miriam Goldby, 'Electronic Bills of Lading and Central Registries: What Is Holding Back Progress?' 17 *Information & Communications Technology Law* 125, 125.

²² Αλίκη Κιάντου-Παμπούκη, *Ναυτικό Δίκαιο*, vol 2 (6th edn, 2007) 446. <trans: Alikì Kiadou-Pabouki, *Maritime Law*, 2007>

²³ Koji Takahashi, 'Blockchain-Based Negotiable Instruments: With Particular Reference to Bills of Lading and Investment Securities' in Andrea Bonomi, Matthias Lehmann and Shaheez Lalani (eds), *Blockchain and Private International Law*, vol 4 (Brill Nijhoff 2023) 497.

²⁴ John Russel, 'Blockchain and Electronic Bills of Lading' in Barış Soyer and Andrew Tettenborn (eds), *Disruptive Technologies, Climate Change and Shipping* (Informa Law from Routledge 2022) 11.

²⁵ Charlotte Winter, 'E-Bills of Lading' (Norton Rose Fulbright, February 2018) <<https://www.nortonrosefulbright.com/en-gr/knowledge/publications/b20094b6/e-bills-of-lading>> accessed 3 August 2024.

²⁶ This "pilot project" was analyzed in an effort to develop a blockchain solution for the the supply chain. The same information was then added to a blockchain program using smart contracts to analyze the efficiency compared to the manual project. Zachary Cohen, 'Maersk & IBM Use Blockchain to Streamline International Trade' (*LinkedIn*, 2017) <<https://www.linkedin.com/pulse/maersk-ibm-use-blockchain-streamline-international-trade-cohen/>> accessed 21 July 2024.

1/5 of the physical transportation costs²⁷. Further analysis indicates that the paper bill of lading accounts for 10 to 30 percent of the total documentation costs²⁸. It is estimated that an electronic bill of lading could save up to 6.5 billion USD in direct costs and enable 40 billion USD in global trade²⁹. An online calculator tool allowing a company to calculate its potential monthly savings by turning to electronic bills of lading shows that if a company ships 150 TEUs³⁰ a month, and issues one bill of lading per TEU, with courier fees being around 80 USD, then the potential monthly savings by using their electronic bill of lading can be around 9.000 USD per month³¹. In addition, the physical transmission of the original paper document also complicates easy trading. A trader might wish to split cargo that is covered by one bill of lading, and what could be an easy process is much more complicated than it must³².

The cost of processing paper documents goes beyond handling costs and into what happens when a paper bill of lading arrives at its destination delayed. Modern global trade operates at a very fast pace and is very intolerant of delays. When the carrier of the goods arrives at the destination before the paper bill of lading, the carrier cannot formally deliver to someone who is not the holder of the bill of lading and does not physically possess the document³³. This can result in delays at the port of discharge, meaning demurrage fees, storage costs, and further delays to the rest of the cargo that creates a long liability chain. This problem has been well documented. The costs of these delays are variable depending on the port, but accessorial charges have been calculated to increase the total shipping cost by 10-15%³⁴.

Because this is a common phenomenon, the market's practice is to issue a letter of indemnity ('LOI'). This is a less than perfect solution; it is a costly process, and it is considered a legally risky practice. Nonetheless, many ship-owners view bills of lading and LOIs as interchangeable when it comes to the delivery of the goods³⁵. This issue was intensified during the Covid-19 pandemic because the physical circulation of the bills was harder. But if the carrier does deliver without the presentation of the bill of lading, then they are usually liable for mis-delivery based on tort and breach of contract. In this case a Court can easily dismiss the LOI for being contrary to public policy and fundamental legal principles, depending on the jurisdiction. In contrast, the electronic bill of lading can be transferred instantly through electronic means, meaning that there are no delays and no risk of the shipment arriving before the bill of lading³⁶.

²⁷ Didier Casanova and others, 'The Multi-Billion-Dollar Paper Jam: Unlocking Trade by Digitalizing Documentation' (McKinsey, October 2022) <<https://www.mckinsey.com/industries/travel-logistics-and-infrastructure/our-insights/the-multi-billion-dollar-paper-jam-unlocking-trade-by-digitalizing-documentation#/>> accessed 21 July 2024.

²⁸ *ibid.*

²⁹ *ibid.*; Stephen Girvin and Elson Ong, 'Electronic Bills of Lading, Blockchain and Distributed Ledger Technology (DLT)' in Stephen Girvin and Vibe Ulfbeck (eds), *Maritime organisation, management and liability: a legal analysis of new challenges in the maritime industry* (Hart Publishing 2021) 196.

³⁰ TEU means "twenty-foot equivalent unit" and is a measure of volume in units in twenty foot long containers.

³¹ 'Shipping the Way It Should Be Done in the 21st Century' (26 July 2022) <<https://eteu.co.uk/>> accessed 10 September 2024.

³² Russel (n 24) 12.

³³ This can happen especially during the indorsement process, when the endorser transfers their legal ownership rights to the endorsee by indorsement on the backside of the paper bill of lading.

³⁴ 'Demurrage Charges: A Comprehensive Guide' (Hillebrand, 20 September 2024) <<https://www.hillebrandgori.com/media/publication/demurrage-charges>> accessed 16 September 2024.

³⁵ Russel (n 24) 11.

³⁶ Stephen Girvin, *Carriage of Goods by Sea* (3rd Edition, Oxford University Press 2022) 197.

2.2 SECURITY ISSUES

The shipping industry deals with document fraud and fraudulent behavior as paper documents face many security issues. Bills of lading are especially exposed, with people issuing forged and switched bills of lading. The element of human error is also possible, with the bills of lading usually printed in three copies, meaning that there could be a party that wrongly holds a copy of the bill³⁷.

Under the UK law, delivery against a forged bill of lading is characterized as “mis-delivery” and there is no defense against it, not even for an innocent party³⁸. The paper bill of lading can be easy to counterfeit, and a fake document can be presented before the original bill of lading. The information written can also be changed, to seem like a clean bill of lading. Even when paper bills of lading contain security features, these are usually not properly examined. For example, in *Natixis v Marex; Marex v Access World Logistics*³⁹, there were forgeries that were passed as authentic by the warehouse staff employed to check them, while the more advanced security features in the receipts were not checked at all⁴⁰. Another scenario is the non-surrendering of the bill of lading when the cargo is received, on the basis of a LOI, where the fraudster then sells the bill of lading to an innocent third party. These issues are arising due to the rapid pace of global trade and the inability of the paper bill of lading to respond to it.

Electronic documentation is still a hot topic in the maritime industry regarding the safety of the document itself and its integrity. Many carriers still believe that a paper bill of lading guarantees more security than an electronic bill of lading. Today, especially with the use of blockchain technology as will be analyzed in the next chapters, this fear is no longer legitimate. Electronic means are still prone to cybercrime, however, as will be showcased in the second part of this thesis, fraudulent behaviors can be greatly eliminated with the use of technology.

2.3 ENVIRONMENTAL POLLUTION

The shipping industry is guilty of causing significant damage to the environment, due to the operation of vessels with fuels, but the extensive use of paper documentation also contributes to this bad reputation. There is not only the issue of deforestation, but also the energy needed for paper to be recycled, as well as the energy needed to be physically transported around the globe. According to the company Secro which provides electronic bill of lading services, for every 1000 electronic bills of lading 27,900 kg of CO2 are not emitted, 780 gallons of water are saved, and 24 trees are not cut⁴¹.

But are electronic files the solution or is this an impossible choice between two evils? Especially blockchain technology is notoriously famous for the impact it has on the environment because it demands high levels of energy. According to Digiconomist, in September of 2024, only regarding Bitcoin mining and not blockchain platforms overall, the annual amount of carbon footprint is close

³⁷ Kristoffer Koch, ‘Quest for Harmonization to Implement Electronic Bills of Lading: An International Perspective’ (University of Gothenberg 2021) 49.

³⁸ Winter (n 25).

³⁹ *Natixis -v- Marex and Access World Logistics (Singapore) Pte Ltd* (EWHC 2549).

⁴⁰ Russel (n 24) 12.

⁴¹ ‘A More Sustainable Trade With Secro’ (Secro) <<https://secro.io/sustainability>> accessed 25 July 2024.

to that of Chile's, the annual amount of energy is close to that of Poland's, and the annual amount of water consumption is close to that of Switzerland's⁴².

The most optimistic people are proposing to use renewable energy sources to fuel the blockchain servers. There is also available technology to avoid high energy demands by using other types of consensus mechanisms in blockchain⁴³. While some claim that paper can be less harmful for the environment if it is handled sustainably, this requires significant planning, resource consumption, and ongoing environmental costs. Ultimately, it can be said that electronic documents can offer substantial environmental benefits over paper, however it is imperative that energy-efficient technologies and renewable energy sources are used. It remains to be seen how electronic documents affect the global effort for a more sustainable future.

2.4 CONCLUSION

There is a global effort for the promotion of paperless trade. The United Nations Economic Commission for Europe urges companies to upgrade their IT systems and invest in new technologies such as AI and robotic process automation to harness all the benefits of digitalization⁴⁴. It warns that those who delay may find themselves in inefficient supply chains in a highly interconnected global economy⁴⁵. The United Nations Economic and Social Commission for Asia and the Pacific also adopted the "Framework Agreement on Facilitation of Cross-Border Paperless Trade in Asia and the Pacific" in 2016. This agreement encouraged the adoption of digital tools to facilitate trade, estimating that the implementation would boost Asia-Pacific exports as much as 257 billion USD annually⁴⁶. These suggestions are vital for staying competitive in the international market.

To answer the research question of this chapter, it appears that the traditional bill of lading has several drawbacks, such as the cost of issuing and transferring, and the cost of delays. Paper is also a resource that takes a toll on the environment. In this regard, digital solutions are not a perfect fix, but they do show promising environmental sustainability. Regarding the subject of this thesis, these disadvantages can be addressed by the adoption of the electronic bill of lading. It is undeniable that today, an electronic document is far more flexible and easier to handle than a paper document. In this global effort, the next question posed is why despite the advantages of paperless trade the legal framework of the electronic bill of lading struggles to turn the much conservative shipping industry towards the use of the electronic alternatives.

⁴² 'Bitcoin Energy Consumption Index' (*Digiconomist*) <<https://digiconomist.net/bitcoin-energy-consumption/>> accessed 18 September 2024.

⁴³ For example, the Proof-to-Stake model is more energy efficient than the Proof-to-Work model used in Bitcoin.

⁴⁴ 'Trade Tech – A New Age for Trade and Supply Chain Finance' (World Economic Forum) <https://www3.weforum.org/docs/White_Paper_Trade_Tech_report_2018.pdf> accessed 20 August 2024.

⁴⁵ *ibid.*

⁴⁶ *ibid.*

3 The legal framework of the bill of lading

The carriage of goods by sea has been regulated internationally mainly by using the international regulation instrument of Conventions. In this part of the thesis there is an overview of these Conventions that inherently deal with the bill of lading. Each attempt has a different political and economic context, but the competing groups affected by the negotiations have always been the same: hull and cargo interests⁴⁷. To have a glimpse of the future regarding the carriage by sea regime, one has to understand its history⁴⁸. Therefore, the history of these Conventions and the reasons why they succeeded or failed is shortly analyzed. Then, another regulating instrument is presented, soft law, which includes Model Laws, Guidelines, and the self-regulatory actions of private entities. Soft law is analyzed because the practical needs of the industry have evolved in a way that demands a much more flexible method of confrontation and resolution regarding the bill of lading. Lastly, this chapter ends with how the national legislation of countries like Greece and the United Kingdom have responded to the needs of the shipping industry, to showcase how technology and the regulatory instruments mentioned above influence domestic rules.

The objective of this chapter is to answer the question of whether commercial law is keeping pace with technology, or does it currently fail at its fundamental purpose of facilitating commerce and acts as a barrier instead⁴⁹. If that is the case, is there a need for new rules and guidelines, and what role do industry standards play in shaping both the commercial and legal environment of the bill of lading? This chapter ultimately examines the role that the current mosaic of commercial law regimes plays in the adoption of new technologies for the widespread application of the electronic bill of lading.

3.1 INTERNATIONAL CONVENTIONS

3.1.1 The Hague/Hague-Visby Rules

After the industrial revolution and the appearance of steamships by the late 19th century, it was unavoidable that the carriers of the cargo would try to get the legal advantage against the shippers when it came to their liability over the goods, even when it resulted from their own negligence⁵⁰. The principle of freedom of contract meant that carriers could impose their interests on the shippers, who had no choice but to accept those terms. The rising tensions between the cargo interests and the powerful shipowners resulted in an effort to balance the rights and obligations of all the parties involved. In the nineteenth century, individual countries started to issue model bills of lading⁵¹ which

⁴⁷ Lijun Zhao, 'Uniform Seaborne Cargo Regimes - A Historical Review' (2015) 46 *Journal of Maritime Law and Commerce* 133, 135.

⁴⁸ *ibid* 136.

⁴⁹ Michael F Sturley, 'Can Commercial Law Accommodate New Technologies in International Shipping?' in Barış Soyer and Andrew Tettenborn (eds), *New Technologies, Artificial Intelligence and Shipping Law in the 21st Century* (Informa Law from Routledge 2020) 22.

⁵⁰ Zhao, 'Uniform Seaborne Cargo Regimes - A Historical Review' (n 47) 136.

⁵¹ For example, the Liverpool Conference 1882 put forward a draft model of the bill of lading.

covered certain trades and produced legislation⁵². As a result, the first attempts at unifying the carriage of goods by sea rules started in late 19th century, resulting in the Hague Rules, drafted by the CMI in 1921 and signed in 1924, with the goal to unify all the rules governing the carriage of goods by sea and to establish a minimum level of protection to the cargo owners.

3.1.1.1 The Hague Rules

The Hague Rules were adopted in 1924, drafted by the CMI but endorsed mainly by the British Empire that considered there should have been uniform legislation dealing with shipowners' liability throughout the places it traded with⁵³. It was the first international attempt to regulate and unify the bill of lading rules in all contracting states. The rules were a compromise between ship-owning nations and those more representative of cargo interests. The result was the limitation of complete freedom of contract and setting the rule that any clause that limits the carrier's minimum liability was automatically made void. As a *quid pro quo*, carriers would benefit from certain exceptions of liability.

The official name of the Hague Rules "The International Convention for the Unification of Certain Rules of Law relating to Bills of Lading", makes clear that the international community at the time considered the best course of action to be a unified regime. The name also suggests that the Convention sets the rules about the bill of lading, which, as it will be analyzed later, is not the case. The reason why the Hague/Hague-Visby Rules are mentioned in this thesis is because they are extremely influential on shipping in an international level, and all other Conventions will be compared to them.

The Hague rules -and its amendments- are very popular even today, in contrast with the later international attempts to regulate the carriage of goods by sea. The relevant question posed in this section is why they are so popular. The first obvious observation is that when the United Kingdom adopted the rules in 1923, over 50 countries which were part of the British Empire soon followed. Then, in 1936 when the US ratified the rules there was a ratification movement from the rest of the world states⁵⁴. This is a common phenomenon where states hold off ratifying treaties until major trading nations join in, which will be mentioned again in the Rotterdam Rules sub-chapter. The second reason why the Hague Rules became so popular was the representation of private organizations during the drafting process, such as the Swedish Shipowners' Association, the British Bankers' Association, Lloyds' and others⁵⁵. This meant that the rules responded to the industry needs of the time and not the interests of politicians. The drafting process took place in the non-governmental forums of the CMI and the ILA, which also allowed for a more politically-neutral conversation⁵⁶. Only after the

⁵² For example, the USA Harter Act of 1893, the New Zealand Shipping and Seamen Act of 1903, the Australia Sea Carriage of Goods Act of 1904, the Canada Water Carriage of Goods Act 1910, and the French Morocco Maritime Commercial Code 1919.

Aikens, Lord and Bools (n 2) 116.

⁵³ It noteworthy that it was the British Empire that was the main opponent of unified rules till then, since it opposed the principle of freedom of contract between parties. To serve its interests, the United Kingdom was responsible for the preparatory work of the first draft of the Hague Rules, based on the Canadian Water Carriage of Goods Act of 1910.

Zhao, 'Uniform Seaborne Cargo Regimes - A Historical Review' (n 47) 147–149.

⁵⁴ *ibid* 148–149.

⁵⁵ *ibid* 149.

⁵⁶ *ibid* 149–150.

conclusion of the Brussels Conference of 1924 did the Hague Rules enter a formal diplomatic negotiation environment⁵⁷.

3.1.1.2 *The Visby Protocol and the SDR Protocol*

Conventions can be amended to cater to new practical problems of international commerce. The Hague Rules received much criticism because they were biased in favor of the carriers⁵⁸. The call to amend the Hague Rules and address emerging issues resulted in the Hague-Visby Rules, signed in 1968 and entered into force in 1977⁵⁹. The second amendment was made two years later, with the SDR Protocol in 1979 about the Special Drawing Rights, a unit for calculating liability⁶⁰. Despite the amendments, the fundamentals of the Hague-Visby Rules are more or less the same as the Hague Rules. The important conclusion is that as the realities of shipping changed, some amendments were deemed necessary to keep the international law up to date, while still preserving the spirit of the Rules.

3.1.1.3 *The Hague-Visby Rules*

As described in the previous sub-sections, the Hague/Hague-Visby Rules were developed gradually, with the amendments being triggered as a response to practical issues and challenges in the shipping industry. In practice today, the Hague Convention and its amendments are being treated as one entity. But while the Hague-Visby Rules are globally the main Convention on the carriage of goods by sea, in reality the regime is fragmented, with ratifying states adhering to some protocols and not others. For example, the USA, Türkiye, and others only adhere to the Hague Rules⁶¹. Singapore and Australia adhere to the Hague-Visby Rules of 1968, but not the SDR Protocol of 1979. Despite that, the simplicity of the Hague/Hague-Visby Rules and the industry's familiarity with them, provide a much desirable degree of transparency and predictability⁶².

Regarding the bill of lading, the official name of the Convention gives the impression that the Rules are about the bill of lading, but this is not the case. The bill of lading is mentioned in the Hague-Visby Rules only to accommodate for the other provisions of the Convention. This means that the Hague-Visby Rules are effected under the use of bills of lading according to article 10, but the bulk of the Convention is related to the carrier's limitation of liability⁶³. Any provisions addressing issues such as the form of the bill of lading are mostly left out of the Rules. There is no explanation what a

⁵⁷ *ibid* 150.

⁵⁸ The container revolution that happened in the second half of the 20th century changed the shipping landscape and challenged the definition of "package" in the Hague Rules. Their definition was not enough to define containers, because a sealed container would be seen as a single package. In practice, this meant that the carrier's limitation of liability "per package or unit" had to be reevaluated. *ibid* 155.

⁵⁹ *ibid* 156.

⁶⁰ In the Hague Rules the unit was calculated based on the value of gold, but due to the fluctuations of gold prices it was necessary to amend this provision.

⁶¹ The Visby Rules were quite slow on attracting contracting parties, because they formed under the political forum of UNCITRAL instead of the politically-neutral CMI and ILA, so many countries, especially developing ones did not accept the Rules.

Zhao, 'Uniform Seaborne Cargo Regimes - A Historical Review' (n 47) 157.

⁶² Russell (n 19).

⁶³ Once the Hague-Visby Rules are in effect because of the use of a bill of lading, the Rules establish the carrier's obligations from which the carrier can no longer contract out of.

“document” is, so the use of electronic bills of lading under the Hague/Hague Visby Rules creates uncertainty because the term “document” can be interpreted in various ways⁶⁴. Goldby suggests that the wording of the Hague/Visby Rules is sufficient to include the electronic bill of lading, citing the decision *The Rafaela S*⁶⁵, where it was noted that the intention of the international legislators was not to restrict the scope of the Rules but to prevent their circumvention⁶⁶. Therefore, if an electronic document acts like a bill of lading, it satisfies the definition of the document of title according to the Hague/Hague-Visby Rules⁶⁷. Nevertheless, because, as it will be analyzed further in this thesis, the electronic bill is not yet universally accepted as a document of title, nor is it safely assumed that it activates the Hague/Visby Rules, it is suggested that a Paramount Clause should be expressly included in an electronic bill of lading to incorporate the Rules if the parties wish to do so⁶⁸.

3.1.2 The Hamburg Rules

The Hamburg Rules is the “United Nations Convention on the Carriage of Goods by Sea” which was signed in 1978 and was made effective in 1992. As analyzed in the previous subsections, in the second half of the previous century, many believed that the Hague-Visby Rules were inadequate to resolve the new issues and practices of the shipping industry. The Visby Rules partly addressed the container revolution, but the overall sentiment was that the imbalances between carriers and shippers persisted⁶⁹. There was much tension between the developed states which were usually ship-owning and the developing states, many of which were former colonies and had cargo interests⁷⁰. These developing states called for a new convention to renegotiate their rights as shippers, while the ship-owning countries wished for the Hague-Visby Rules to remain enacted⁷¹. This movement led to a Convention that was formed under the auspices of the United Nations, which tried to address the container revolution and to be less biased in favor of the ship-owners.

The compromises were a difficult task to achieve. After World War II, the path towards uniformity changed from commercial efforts to politicized pressures⁷². As a result, the Hamburg Rules were more politicized, as they were under the aegis of the UN and not the CMI. This fact brought on the criticism that the proceedings did not adequately consider the realities of the shipping industry but governmental interests⁷³. This was to be expected, because the participating delegates were government officials and not practicing entrepreneurs, unless they were asked to represent their

⁶⁴ Orrù (n 15) 142.

⁶⁵ *J I MacWilliam Co Inc v Mediterranean Shipping Co SA (The Rafaela S)* [2005].

⁶⁶ The *Rafaela S* decision was about the issue of whether or not a straight bill of lading, meaning non-negotiable- activates the Rules of not.

Miriam Goldby, *Electronic Documents in Maritime Trade: Law and Practice* (2nd edition, Oxford University Press 2019) 149.

⁶⁷ Paul Todd, ‘Electronic Bills of Lading, Blockchains and Smart Contracts’ (2019) 27 *International Journal of Law and Information Technology* 339, 352.

⁶⁸ *ibid*.

⁶⁹ Olena Bokareva, *Uniformity of Transport Law through International Regimes* (Edward Elgar Publishing Limited 2019) 21.

⁷⁰ *ibid* 22.

⁷¹ *ibid* 22–23.

⁷² Zhao, ‘Lex Maritima in a Changing World: Development and Prospect of Rules Governing Carriage of Goods by Sea’ (n 17) 762.

⁷³ Zhao, ‘Uniform Seaborne Cargo Regimes - A Historical Review’ (n 47) 158–161.

countries⁷⁴. The Rules being less favorable to carriers also increased the fear that the freight costs would increase⁷⁵. The new terminology used would also increase litigation costs⁷⁶. As a result, the developed countries were in general unfavorable to the Hamburg Rules and did not ratify the Convention. On the other hand, the developing countries were also reluctant to ratify the Rules because many had adopted a state-run system of carriers, the earnings of which would be reduced by the harsher stipulations of the Hamburg Rules regarding the carriers. Eventually, the Hamburg Rules entered into force 14 years after signing, and today they have gathered only 35 ratifying states, none of which are traditional maritime powers^{77,78}. It is interesting to mention though, that while some countries have not ratified the Hamburg Rules, they have adopted some provisions in their domestic legislation, such as Canada, Australia, New Zealand, China, and the Nordic Countries⁷⁹.

Unlike the Hague/Hague-Visby Rules, the Hamburg Rules provide a definition for the bill of lading in Art. 1(7). The Rules can be seen as an attempt to further balance the rights and obligations of carriers and shippers when it comes to liability. But as the world continues to spin, technological advancements keep changing the realities of modern trade. New technologies have shifted the focus away from the carriers' limitation of liability into other issues, which lead to new attempts to regulate the carriage of goods by sea. The Hamburg Rules might have mentioned the ability to electronically sign a bill of lading in Art. 14 (3) and addressed the issue of telegrams and telexes in Art. 1 (8), but they did not touch on the topic of issuing an electronic bill of lading, which is a completely different issue to be addressed.

3.1.3 The Rotterdam Rules

The Hague/Hague-Visby Rules and Hamburg Rules are primarily liability Conventions, and very reasonably did not address electronic substitutes for the paper bill of lading, because such technology was not yet conceivable⁸⁰. Their failure to anticipate electronic commerce is understandable, but the issue of paperless trade remained internationally unregulated. This is why in the mid-1990s there was a movement to create a new set of rules that would take effect over the previous international Conventions. The Rotterdam Rules, formally known as the "United Nations Convention on Contracts for the International Carriage of Goods Wholly or Partly by Sea" was signed in 2009 after a more than a decade-long process of development. It was an effort to modernize the law governing the carriage of goods by sea and it addresses a broader range of issues than the previous Conventions⁸¹.

In this part of this study, it is important to examine the making of the Rotterdam Rules to better understand UNCITRAL's goal to facilitate electronic commerce. UNCITRAL's Working Group on

⁷⁴ *ibid* 159.

⁷⁵ Bokareva (n 69) 23–24.

⁷⁶ Zhao, 'Uniform Seaborne Cargo Regimes - A Historical Review' (n 47) 161.

⁷⁷ Ιωάννη Κοροτζής, 'Η έκδοση των ηλεκτρονικών υπομνημάτων στη σύμβαση θαλάσσιας μεταφοράς πραγμάτων μετά τις νέες ρυθμίσεις του ΚΠολΔ και του ΠΔ 150/2001' (2013) 41 Επιθεώρηση Ναυτιλιακού Δικαίου 273, 275. <trans: Ioannis Korotzis, the issuance of electronic memoranda in the contract of carriage of goods following the new provisions of the Code of Civil Procedures and Decree 150/2001>

⁷⁸ Zhao, 'Uniform Seaborne Cargo Regimes - A Historical Review' (n 47) 161.

⁷⁹ *ibid* 162; Hugo Tibergh, 'THE NORDIC MARITIME CODE' [1995] *Lloyd's Maritime and Commercial Law Quarterly* <<https://www.i-law.com/ilaw/doc/view.htm?id=366662>> accessed 16 September 2024.

⁸⁰ Sturley (n 49) 24.

⁸¹ *ibid* 29.

Electronic Data Interchange ('EDI') suggested in 1994, that they could focus on preparing “*a functional equivalent to a negotiable bill of lading or... explore the establishment of a new kind of document of title*”⁸². This was a favorable proposal that led the EDI Working Group to further discuss this subject the following year. The Group recognized the three functions of the bill of lading and that EDI can easily accomplish the two functions of acting as a receipt of the goods and as evidence of the contract of carriage. The third function of acting as a document of title was the hardest to replicate and became one the Group's central points of attention. More specifically, the issues addressed included the uniqueness of the electronic bill of lading to protect against misdelivery and facilitate secure transferring⁸³, the definition of the holder of the bill, the effects of transferring an electronic transport document etc⁸⁴. In 1996, the Commission officially launched the project that would end up producing the Rotterdam Rules, and whose first goal was regulating the way EDI can facilitate international commerce. The scope was limited to establishing uniform rules in areas that such rules did not exist or there were significant gaps regarding issues like the bill of lading⁸⁵. The Secretariat sought the assistance of the CMI to do preparatory work for the new Convention⁸⁶. The CMI's International Sub-Committee was the one to authorize adding liability issues to the agenda, but in areas that were not governed by other international liability regimes⁸⁷. Thus, one of the main goals of the Rotterdam Rules was to battle the fragmentation of legal regimes in international maritime commerce. This was the reason why the shipowners and the P&I Clubs were ready to accept them and operate according to them⁸⁸. The Rotterdam Rules also took on the opportunity to support electronic commerce, with technological neutrality in mind. Technological neutrality, an important concept in this study, is according to Ríos “*the freedom of individuals and organizations to choose the most appropriate and suitable technology to their needs*”⁸⁹. In other words, no technology must be excluded a priori⁹⁰.

Electronic transport documents have been used in the shipping industry and especially in liner carriage from the 1970s⁹¹. The Rotterdam Rules set to deal with EDI “transport documents” and “electronic transport records” in Chapter 3 and 8⁹². This Convention might not use the term “electronic bill of lading”, but the terms used cover both bills of lading and sea waybills according to the definitions of Article 1 (14-22)⁹³. The wording of the Rules can also include “a new kind of document of title”⁹⁴. It is also supported that Chapters 9, 10, and 11 of the Rotterdam Rules -regarding delivery,

⁸² *ibid*; ‘Report of the Working Group on Electronic Data Interchange (EDI) on the Work of Its Twenty-Ninth Session’ (United Nations Commission on International Trade Law 1995) A/CN.9/407 paras 106–118.

⁸³ ‘Report of the Working Group on Electronic Data Interchange (EDI) on the Work of Its Twenty-Ninth Session’ (n 82) para 114.

⁸⁴ *ibid* 115–117.

⁸⁵ Sturley (n 49) 30–31. Cites the Report of the United Nations Commission on International Trade Law 51st Session.

⁸⁶ Zhao, ‘Uniform Seaborne Cargo Regimes - A Historical Review’ (n 47) 165.

⁸⁷ Sturley (n 49) 31.

⁸⁸ Russell (n 19).

⁸⁹ Mauro D Ríos, ‘Technological Neutrality and Conceptual Singularity’.

⁹⁰ Koji Takahashi, ‘Blockchain Technology and Electronic Bills of Lading’ (2016) 22 *Journal of International Maritime Law* 202, 207.

⁹¹ Zhao, ‘Uniform Seaborne Cargo Regimes - A Historical Review’ (n 47) 165.

⁹² Art 1 (14) (18) of the Rotterdam Rules.

⁹³ Goldby (n 66) 188–189.

⁹⁴ Sturley (n 49) 29.

right of control, and transfer of rights- provide the necessary framework along with Chapter 3 to substitute the traditional documents used in maritime trade with electronic records⁹⁵.

Article 8 in Chapter 3 of the Rotterdam Rules sets out two principles. First, in paragraph (a), it provides that if both carrier and shipper consent, a transport document may be recorded electronically. Some support the view that consent that has not been expressed is also accepted⁹⁶, but this argument is not convincing, especially due to the fact that the shipping industry has not embraced the electronic bill of lading yet. The second principle in paragraph (b) is that the electronic transport record has equivalent status of a paper document. While this provision has good intentions, the reality is that even the current regime of using a paper document is not uniform or clear enough to translate the actions described in Art. 8 (b) to an electronic context, which creates even greater uncertainty to the carriers who issue bills of lading⁹⁷. This paragraph was also criticized at the time, as it was deemed that the technology available was not able to guarantee the singularity necessary for it to function as a document of title and render the electronic document equal to a paper one⁹⁸. The equivalent to endorsement (or possession) was set to be the transfer of the “exclusive control” over the negotiable electronic transport record. This was very difficult to achieve before the widespread adoption of blockchain technology, with the proposed solution being to omit the wording “exclusive”⁹⁹. But the article is characterized by technological neutrality, since there is no mention of the technology used to achieve these results which means blockchain can now be used as it will be analyzed later in this thesis.

Still, the freedom of choice by the parties involved must fulfil some requirements set up in Article 9. The contractual parties have to ensure that there are procedures that provide for (a) the method for the issuance and transfer of the record to an intended holder, (b) an assurance that the negotiable electronic document retains its integrity, (c) the manner in which the holder of the document can demonstrate that they are the rightful holder, (d) the manner of confirming that there has been a successful delivery to the holder or that the electronic record has no longer any effect or validity. According to Art. 9 (2), these procedures have to be agreed upon in the contract and they should be readily ascertainable. Once all these procedures are in place, then the electronic transport record is the functional equivalent to the traditional bill of lading. According to Art. 10, the paper document and the electronic transport record must be able to be substituted for each other.

The Rotterdam Rules could lead the way for the widespread adoption of the electronic bill of lading. But, sixteen years later, and fully into the digital age, only 5 countries have ratified the Rules¹⁰⁰. The reason is probably because they were too ambitious to regulate multimodal transport aspects¹⁰¹. The Rules’ extensive scope and ambition to answer too many questions means that a ratifying country would have to make a complete overhaul of its legal regime in favor of the new

⁹⁵ *ibid* 34.

⁹⁶ Lijun Zhao, ‘An Analysis of Transport Documents and Electronic Transport Records under the Rotterdam Rules’ in Stefano Zunarell and Massimiliano Musi (eds), *Current Issues of Maritime and Transport Law* (Bonomo Editore 2016) 16.

⁹⁷ Sturley (n 49) 33.

⁹⁸ Zhao, ‘An Analysis of Transport Documents and Electronic Transport Records under the Rotterdam Rules’ (n 96) 17.

⁹⁹ *ibid*.

¹⁰⁰ As of 2024 these nations are: Spain (2011), Togo (2012), the Republic of Congo (2014), Cameroon (2017), and Benin (2019).

¹⁰¹ Zhao, ‘Uniform Seaborne Cargo Regimes - A Historical Review’ (n 47) 167.

Convention. The Rotterdam Rules need twenty ratifications to enter into force, so their future is uncertain, with scholars wondering if it is even viable and theorizing that they could “*go down as the Waterloo of maritime law unification*”¹⁰². Other commentators express the theory that countries, like the Scandinavians and the Netherlands, hold off to ratifying to see if USA and China will ratify them first¹⁰³. Despite that, the CMI is committed to revive the enthusiasm for the Rotterdam Rules and urges the signing parties to ratify them, before regional and local reforms cause even greater disuniformity¹⁰⁴. Commenting on Mark Russell’s article about the future of the Rotterdam Rules, CMI stated that it is optimistic that one day the Rules will come into force and that there is no reason for another international effort to produce a new Convention for at least another generation¹⁰⁵.

3.2 SOFT LAW: MODEL LAWS, GUIDELINES, AND INDUSTRY STANDARDS

Soft law is a rule-setting instrument that does not have a legally binding force, or its force is weaker than of traditional law¹⁰⁶. Soft law is most commonly associated with international law, and more specifically it refers to written international instruments -other than treaties-, that contain principles, norms, and standards¹⁰⁷. This is because soft law by its definition expresses a preference and not an obligation to achieve international cooperation. Soft law is found in “codes of conduct”, “guidelines”, “communications”, “model laws” etc., produced by intergovernmental agencies and organizations like IMO and UNCITRAL, and private organized bodies like the ICC and the ILA.

Soft law also takes the appearance of the “new *lex mercatoria*”¹⁰⁸ which is a process detached from lawmakers, and instead it is created within the international merchant community, the *societas mercatorum*, that presents a strong tendency towards autonomous regulation¹⁰⁹. In this environment, codes of practice and industry standards play an increasingly important role in the regulation of international commerce. Especially standard forms and standard terms have been characterized as the most significant source of unification in shipping law, since they are flexible, easily customizable to the industry needs, and are formed without the involvement of scholars, diplomats, and politicians¹¹⁰.

¹⁰² Eric Van Hooydonk, “Unification and Codification of Maritime Law: Friends or Foes?” in Zuzanna Pełowska-Dąbrowska and Justyna Nawrot (eds), *Codification of Maritime Law: Challenges, Possibilities and Experience* (Informa Law from Routledge 2020) 14.

Russell (n 19).

¹⁰³ The USA had a leading role in the development of the Rotterdam Rules but has not ratified them yet because of critiques from the lobbies that hold the interests in US ports and terminals. The main fear from these organizations is that there will be greater cargo liability with the application of the Rotterdam Rules, leading to great uncertainty and disillusionment. Rodríguez Delgado, ‘Successes and Failures of Uniform Maritime Law Instruments: Is There Room for a New Approach?’ in Zuzanna Pełowska-Dąbrowska and Justyna Nawrot (eds), *Codification of Maritime Law: Challenges, Possibilities and Experience* (Informa Law from Routledge 2020) 73; Zhao, ‘Lex Maritima in a Changing World: Development and Prospect of Rules Governing Carriage of Goods by Sea’ (n 17) 779.

¹⁰⁴ Russell (n 19).

¹⁰⁵ *ibid.*

¹⁰⁶ Loredana Ioana Bucur, ‘Lex Mercatoria, Soft Law and a Closer Approach to Unidroit Principles’ (2018) VIII V Lex 292, 299.

¹⁰⁷ *ibid.*

¹⁰⁸ *Lex mercatoria* was the customary law of merchants in medieval times.

¹⁰⁹ Bucur (n 106) 292–294.

¹¹⁰ Andrew Tettenborn, ‘Codification – Best Left to States or to Someone Else?’ in Zuzanna Pełowska-Dąbrowska and Justyna Nawrot (eds), *Codification of Maritime Law: Challenges, Possibilities and Experience* (Informa Law from Routledge 2020) 49–51.

They might not create binding law, but their effect is implemented when the contractual parties agree, acting as a complementary form of law regulating the finer aspects of the field¹¹¹. In the shipping industry for example, the BARECON, NYPE, and GENCON standard forms regulate the bareboat, time, and voyage standards respectively. As “soft law”, these standards must comply with the legal framework chosen by the parties, taking the law and applying it in practice, and thus having a big impact on day-to-day application of binding legislation. In the electronic bill of lading, such industry practices are set by the platforms that provide electronic bill of lading services, such as BOLERO, and by standard clauses like the BIMCO electronic bill of lading clause of 2014. Because parties who wish to use electronic bills of lading might find legal obstacles due to domestic laws, the industry has developed its own regulations. For example, a platform like BOLERO makes its users to contractually agree that they recognize electronic bills of lading that are in compliance with its Rulebook, therefore circumventing the legal hinderance of non-recognition.

3.2.1 CMI Rules for the Electronic Bill of Lading

CMI is an institution established in 1897 in Antwerp, a federation of national organizations with the goal to unify maritime law internationally¹¹². It introduced the Uniform Rules for the Electronic Bills of Lading in 1990, with the goal to facilitate its use by recognizing its most important functions¹¹³. Rule 1 sets out that the use of the Rules is voluntary, depending on the agreement of the parties. This way, the Rules do not try to substitute existing laws governing the same issue, such as the Hague-Visby Rules. Instead, in Rule 6 it is dictated that the contract of carriage is subject to the international convention or domestic laws that would be compulsory applicable if a paper bill of lading was issued.

The CMI Rules acknowledge the three basic functions of the bill of lading to its electronic form. Rule 4 provides that the carrier has the obligation to give notice of the receipt of the goods to the shipper by a message at the electronic address of the shipper. The receipt message should include the information required as if a paper bill of lading was issued, such as the description of the goods with any representations and reservations, the date and place, the reference to the carrier’s terms and conditions of carriage etc. It should also include the Private Key to be used in transmissions, which is defined in Rule 2 as “*any technically appropriate form, such a combination of numbers and/or letters, which the parties may agree for securing the authenticity and integrity of a Transmission*”. According to the Rules, the shipper must confirm the receipt of the message and upon this confirmation, the shipper is the holder of the electronic bill of lading. Upon the demand of the holder, the receipt message gets updated with all the information about the shipment being loaded. According to paragraph (d), all the information contained, if updated, will have the same effect as if the receipt message was contained in a paper bill of lading. This way, the function of the electronic bill of lading acting as a receipt of goods is recognized by the Rules. Rules 4 and 5 also recognize the function of the electronic bill of lading as evidence of the contract of carriage, since the electronic message

¹¹¹ Koch (n 37) 28.

¹¹² JC Schultz, ‘The Comité Maritime International, Some Informative Notes.’ (1972) 3 Netherlands Yearbook of International Law 142, 142.

¹¹³ Farhang Jafari, ‘The Concerns Of The Shipping Industry Regarding The Application of Electronic Bills Of Lading In Practice Amid Technological Change’ (University of Stirling 2015) 191 <<http://hdl.handle.net/1893/24071>>.

contains the terms and conditions of the contract the same way a paper bill of lading does. In case of inconsistencies between the terms and the CMI Rules, the Rules prevail.

The CMI Rules are mostly concerned with the most challenging function of the bill of lading as a document of title. According to Rule 7 (a), the holder of the key has essentially the same rights against the carrier as a holder of a paper bill of lading. The endorsement of the bill is done by the use of the private key, which is unique and non-transferable, according to Rule 8. The carrier is notified by the holder in order to cancel the private key and a new private key to be issued to the new holder of the electronic bill of lading. This has been criticized, as the paper bill of lading is circulated among traders without the interference of the carrier. The circulation of the electronic bill of lading being dependent on the carrier can lead to delays, with the buyer of the goods exposed to all the consequence risks, while not being protected by the CMI Rules. The carrier is also made to be the party that is burdened with the most responsibilities in this contract proposed by the Rules¹¹⁴. The carrier would be liable for the issuing, cancelling, reissuing, and resending of the electronic bill of lading, in a process that is prone to errors¹¹⁵. The carrier essentially becomes “a registry of negotiations”¹¹⁶. Moreover, it is like the CMI Rules forgot that the carrier is not a neutral third party, but a party to the contract of carriage and may have interest in tampering with the bill of lading¹¹⁷. These are the reasons why the CMI Rules are not popular among carriers. Another issue is that while Rule 7 (4) (d) provides that the transfer of the electronic bill of lading has the same effects as the transfer of such rights under a paper bill of lading, this might conflict with mandatory national laws which cannot be discarded just by an agreement of the parties¹¹⁸. The CMI Rules also do not address the issue of system failure or provide security against fraud, because they promote an open system where anyone can trade with everyone¹¹⁹.

3.2.2 UNCITRAL Model Law on Electronic Transferable Records (MLETR)

Model Laws are an alternative way to achieve international harmonization and modernization of national laws without using Conventions. Each implementing country is free to adopt the model law and make adjustments based on its needs by using it like a guide¹²⁰. This flexibility makes the model law easier to accept, but to achieve satisfactory harmonization states are encouraged to make as few changes as possible. The adopted national legislation will not be the exact same in each country, but at least the core of it will be guaranteed¹²¹. For this reason, model laws grow increasingly important in international regulation, as a valuable soft-law instrument.

¹¹⁴ *ibid* 194.

¹¹⁵ *ibid* 195.

¹¹⁶ Christodoulou (n 16) 25.

¹¹⁷ Pejović (n 18) 226.

¹¹⁸ Jafari (n 113) 195 references Yannopoulos, Ocean bill of lading 1995.

¹¹⁹ Christodoulou (n 16) 27.

¹²⁰ ‘A Guide to UNCITRAL: Basic Facts about the United Nations Commission on International Trade Law’ (United Nations Commission on International Trade Law 2013) 14–15.

¹²¹ Koch (n 37) 68.

UNCITRAL, founded in 1966 after the Report of the Secretary-General based on C.M. Schmitthoff's study, who advocated for an autonomous law of international trade¹²², has the goal “to further the progressive harmonization and unification of the law of international trade”¹²³. In 1996 UNCITRAL adopted the Model Law on Electronic Commerce, and in 2001 the Model Law on Electronic Signatures. In 2017 UNCITRAL adopted the Model Law on Electronic Transferable Records discussed in this chapter. The goal of MLETR is to achieve functional equivalence of the paper and electronic document through the principle of technological neutrality¹²⁴.

The MLETR and the Rotterdam Rules, -which were also a product of UNCITRAL- have quite similar provisions, with the MLETR in Art. 2 having a slightly wider definition of the “electronic transferable record” than the “electronic transport record” of the Rotterdam Rules. Similarly with the Rotterdam Rules, the bill of lading falls under the definition of the term “electronic transferable record”. A key difference is that Art. 2 of MLETR allows for additional transferable documents to be included, which can be different depending on the jurisdiction, such as cheques, promissory notes, insurance certificates etc¹²⁵. On the other hand, in the Rotterdam Rules Art. 1 (18) and (19) the electronic transport record is confined to a contract of carriage, and the negotiable version of it is the equivalent of a negotiable paper bill of lading. In this case, it is supported that MLETR's wider scope is preferable because this way the actual interconnected practices of international trade are accommodated and not seen in isolation¹²⁶. By allowing the entire logistics sector to be digitalized, the advantages of paperless trade will be apparent.

The MLETR attempts to avoid any overlap with the concept of ‘negotiability’ and focuses on ‘transferability’ instead, because negotiability relates to the rights of the holder under each applicable national law¹²⁷. Surprisingly enough, transferability is not defined, due to the non-discrimination principle of Art. 7. Transferability relies instead on the functional test of Art.10¹²⁸. The criteria of this article are based upon the underlying notions of data integrity and singularity¹²⁹. In essence, the legal recognition of the electronic transferable records is achieved by providing functional equivalence to paper documents if the requirements of Art. 10 are met. These requirements are fulfilled if the record contains the required information and if there is a “reliable method” used to (a) identify it as an electronic transferable record, (b) make it capable of being subject to control, and (c) retain its integrity. The notion of integrity is an absolute one¹³⁰.

Art. 11 sets out that the control established by a person must be exclusive, and the person identifiable. The second paragraph of Art. 11 establishes that when the law permits the transfer of

¹²² ‘Report to the Secretary General (“The Schmitthoff Study”)’ (United Nations General Assembly 1966) A/6396 <<https://uncitral.un.org/sites/uncitral.un.org/files/media-documents/uncitral/en/a-6396-e.pdf>> accessed 8 September 2024.

¹²³ ‘Frequently Asked Questions - Mandate and History’ (United Nations Commission On International Trade Law) <https://uncitral.un.org/en/about/faq/mandate_composition/history> accessed 8 September 2024.

¹²⁴ United Nations, ‘Explanatory Note to the UNCITRAL Model Law on Electronic Transferable Records’ (2017) 17.

¹²⁵ *ibid* 27 par.38.

¹²⁶ Koch (n 37) 70.

¹²⁷ United Nations (n 124) para 20.

¹²⁸ Olivier Cachard, ‘Uncitral Model Law on Electronic Transferable Records: The Missing Link towards e-Shipping?’ in Barış Soyer and Andrew Tettenborn (eds), *Disruptive Technologies, Climate Change and Shipping* (Informa Law from Routledge 2022) 34.

¹²⁹ *ibid* 35.

¹³⁰ United Nations (n 124) para 100.

possession of transferable documents, this can be achieved with the transfer of control over the electronic transferable record, meaning that it allows transfer of constructive possession, a key issue of transferable electronic documents. ‘Control’ should not be confused with ‘possession’ in the MLETR. ‘Possession’ is a matter of national law that bestows rights and obligations, while the MLETR wants to establish factual control over the record¹³¹. This factual control is the process leading to uniqueness. In other words, the MLETR tries to establish the electronic document’s uniqueness and prevent copies from being made by using a reliable method that establishes the exclusive control equivalent to possession of a paper document. Of course, paper documents are not immune to fraud, but uniqueness is a notion that can present technical challenges as well. Uniqueness is the desirable result of the factual control¹³².

In Art. 12, another general reliability standard is established as well, which non-exhaustively defines what a “reliable method is”. The purpose of Art. 12 is to offer guidance, both in case of dispute and in case of designing a system for the use of such electronic documents, such as the electronic bill of lading. Art. 7 sets out that the electronic transferable record that meets these requirements cannot be denied legal recognition and effect on the ground that it is in electronic form. Of course, it is up to the parties to agree on the use of electronic trade documents, although the MLETR’s explanatory notes state that the consent does not have to be expressly indicated or given in a standard form or words, because “*it would create an unreasonable barrier to the use of the electronic means*”¹³³.

3.2.3 Industry Standards

Legal analysis of the regulation instruments applied to the electronic bill of lading is a popular discussion in legal circles, but merchants face different challenges. They need to decide which electronic bill of lading solution provider to use. Ship-owners are usually asked by the charterers to use their chosen platform, or they can sign up to the platform they believe suits their business best¹³⁴. It is highly recommended that the system used is approved by the IG. It is noteworthy that from 2010¹³⁵ till 2020, the IG had only approved six systems, while that number today has reached thirteen systems (one of which is a discontinued project). In four years, the approved electronic bill of lading provider platforms have more than doubled, signifying the rise of digital commerce and the trust placed in it. P&I Clubs have reviewed the terms of these thirteen systems, and they state that using them will not affect the insurance cover they issue, provided that such liability would also have arisen under a paper bill¹³⁶. In other words, the electronic bill of lading will be treated in this context the same way as the paper bill of lading. This development is not random, as the revolutionary use of blockchain technology changed the industry. Out of the thirteen systems approved by IG, now twelve use blockchain technology. Another obvious conclusion from studying the following short descriptions of each provider is that providers are aware of the market anxiety that open systems like

¹³¹ Cachard (n 128) 35.

¹³² *ibid.*

¹³³ United Nations (n 124) para 64.

¹³⁴ Grunt Hunter, ‘Complete Guide to Electronic Bill of Lading Adoption for the Bulk Trades’ (*Bimco*, January 2024) <<https://www.bimco.org/insights-and-information/general-information/20230828-ebf-guide>> accessed 22 July 2024.

¹³⁵ In February 2010 the IG announced that liabilities arising from paperless trade were covered, provided that the system was approved by the Group.

¹³⁶ Pejović (n 18) 219.

blockchain can make trade secrets and financial information vulnerable, so they assure their customers that extra steps are taken towards business confidentiality. In this chapter follows a concise report of the thirteen approved systems to present the characteristics of these platforms and how they market themselves to their customers. A more detailed analysis of how a few of these platforms operate will be in the next part of this study. Lastly, this section will end with an analysis on BIMCO's electronic bill of lading clause.

3.2.3.1 BOLERO

The 'Bill of Lading Electronic Registry Organization' or shortly 'BOLERO', commercially launched in 1999 and was one of the first solutions of the electronic document trade. It was approved by the IG in 2010¹³⁷. It is a centralized repository platform. According to its website, it has established itself "*as the platform-agnostic, interoperable service*"¹³⁸, using API¹³⁹ to manage the electronic bills of lading. Nowadays, the platform has already taken steps towards adapting its system towards newer technologies like blockchain. In 2020, BOLERO announced a partnership with blockchain based platforms CommChain and Envoy¹⁴⁰. As a result of pursuing innovation, in 2023, BOLERO announced that it issued nearly 140,000 electronic bills of lading, a milestone for the company¹⁴¹. BOLERO's system of operation will be discussed further down this thesis in comparison with the newest operation model available.

3.2.3.2 ICE Digital/EssDocs

EssDocs, now known as ICE Digital, was another service that appeared in 2005¹⁴². It was the second platform to be approved by IG in 2010 after BOLERO, and 19 years later, it offers solutions that "*automate and digitize trade*"¹⁴³. Similarly to BOLERO, it is a repository-based system that claims to serve 70000+ companies across 190 countries. In 2018, essDocs announced that it was working with Swisscom Blockchain AG to combine blockchain and Internet of Things technology to enable tracking of cargoes and documentation across the supply chain¹⁴⁴.

3.2.3.3 E-Title

E-Title was established in 2004 to provide digital solutions to businesses around the world¹⁴⁵. The company aims to be a neutral third party that works closely with international trade organizations and service providers. The e-Title™ solution is based on a patented, non-central registry peer to peer

¹³⁷ Hunter, 'Complete Guide to Electronic Bill of Lading Adoption for the Bulk Trades' (n 134).

¹³⁸ 'Bolero eBL-as-a-Service' (*Bolero*) <<https://www.bolero.net/bolero-ebL-as-a-service/index.html>> accessed 27 July 2024.

¹³⁹ API means "application programming interface", which is an intermediary software that allows two applications to communicate.

¹⁴⁰ Mo Muse, 'Bolero to Provide Electronic Bill of Lading As-a-Service to R3 Corda Based Trade Platforms in Latin America and Australia' (*Bolero (WiseTech Global Group)*, 22 October 2020) <<https://www.bolero.net/news/bolero-provides-electronic-bill-of-lading-to-r3-corda-based-trade-platforms-in-latin-america-and-australia/index.html>> accessed 19 September 2024.

¹⁴¹ Mo Muse, 'From 2023's Highs to 2024's Bright Start: Bolero Continues to Lead in eBL Issuances' (*Bolero (WiseTech Global Group)*, 26 March 2024) <<https://www.bolero.net/blog/from-2023-highs-to-2024-bright-start-bolero-continues-to-lead-in-ebL-issuances/index.html>> accessed 19 September 2024.

¹⁴² EssDocs was co-founded by Greek Shipowner Alexander Goulandris.

¹⁴³ 'ICE Digital Trade' (*EssDocs*) <<https://www.essdocs.com/>> accessed 28 July 2024.

¹⁴⁴ Goldby (n 66) 348.

¹⁴⁵ 'eTitle' <https://www.e-title.net/co_press.php> accessed 10 September 2024.

(‘p2p’) technology. Similarly to BOLERO, e-Title relies on the agreement of the users to treat the electronic documents issued as the functional and legal equivalents of the paper documents. More specifically, the Electronic Title User Agreement of e-Title deals with the transfer issue of the electronic bill of lading by incorporating the USA’s Carriage of Goods by Sea Act of 1992¹⁴⁶.

3.2.3.4 EdoxOnline

EdoxOnline, founded in 2012, is an Argentinian company that was the first blockchain-based platform to be approved by the IG in 2019¹⁴⁷. It was the first electronic bill of lading system that used public blockchain technology in commercial trade, enabling secure trade and saving significant funds because of it. EdoxOnline, is built in the Ethereum Blockchain and as of August of 2024, has issued over 216,323 electronic bills of lading¹⁴⁸.

3.2.3.5 WaveBl

WaveBl is an electronic bill of lading solution developed by OGY Docs under the aegis of Barclays Bank¹⁴⁹. It is part of the second generation of electronic bill of lading technology, founded in 2015 and approved by IG in 2019. The company specializes in providing public blockchain-based solutions for the digitization of trade documents, particularly electronic bills of lading, by creating a decentralized p2p system. The data is owned and controlled exclusively by Wave’s customers and p2p guarantees that documents are transmitted directly between users. This means that WaveBl is not commercially nor legally a principal in the transaction. As of August 2024, WaveBl has issued more than 545,000 electronic bills of lading in more than 136 countries and claims the 65% of the electronic bill of lading market share¹⁵⁰. WaveBL also cuts carbon emissions by over 95% compared to traditional public blockchains by using their permissioned mining blockchain infrastructure, calling this initiative “Zero Carbon eBLs”.

3.2.3.6 CargoX

CargoX was founded in 2018 and was the first company to transfer a bill of lading through blockchain. It got approved by IG in 2020. This provider specializes in blockchain solutions, and claims that it supports all major bill of lading types. It is also noteworthy that CargoX uses a combination of on-chain and off-chain data to provide a balance between the benefits of blockchain and the needs of the industry regarding the security of information. This means that the off-the-chain data storage assures business confidentiality (like Know Your Customer ‘KYC’ data), and on-the-chain data is used to track the document’s ownership¹⁵¹. It claims to have issued more than 7 million electronic documents in more than 190 countries and across more than 120 thousand companies.

¹⁴⁶ Ali Abbas Khayoon Al-Naseri, ‘The Legal Recognition of Electronic Bills of Lading’ (World Maritime University 2020) 88.

¹⁴⁷ Goldby (n 66) 343.

¹⁴⁸ ‘EdoxOnline’ (*Edox Online*) <<https://web.edoxonline.com/index.php/edoxonline-in-figures/>> accessed 27 July 2024.

¹⁴⁹ Goldby (n 66) 349–350.

¹⁵⁰ ‘Wave’ (*Wave*) <<https://wavebl.com/>> accessed 24 July 2024.

¹⁵¹ ‘CargoX’ (*CargoX*) <<https://cargox.io/>> accessed 27 July 2024.

3.2.3.7 IQAX

IQAX, a Chinese company was founded in 2021 and was approved by IG in 2022¹⁵². It uses GSBN's independent blockchain technology to increase security and efficiency, as well as the Internet of Things ('IoT'), big data and artificial intelligence ('AI')¹⁵³. IQAX was able to achieve the first synchronized transfer of an electronic bill of lading and an electronic insurance policy within the same transaction¹⁵⁴. As of August 2024, it claims to have issued more than 240,000 electronic bills of lading.

3.2.3.8 Secro

Secro is a US-based company, founded in 2021, which uses the NEM private blockchain to issue electronic bill of lading transactions. It provides an additional layer of security through QR code-based authentication process, in addition to the blockchain platform¹⁵⁵. In February 2023, SECRO also announced the completion of the world's first "end-to-end electronic bill of lading" transaction without using a private rulebook agreement between participants. Secro got approved by the IG in 2022¹⁵⁶.

3.2.3.9 TradeGo

TradeGo is another company that was founded in 2017, in Singapore, and got approved by the IG in 2023¹⁵⁷. It specializes in Chinese-focused transactions, and it uses blockchain to enable real-time transfers of electronic bills of lading. Because of its base in Singapore, it has seen quite a big success in China. It claims more than 50 industry clients in over 11 countries and regions.

3.2.3.10 eTEU

Approved by the IG in December of 2023, eTEU is a London based digital platform that works with a blockchain back-end to ensure the security and validity of the transferring process of electronic bills of lading¹⁵⁸. The digital documents are checked against unique codes to avoid tampering risks. To showcase the cost-effectiveness of paperless trade, eTeu's website has a useful calculator tool allowing a company to calculate its potential monthly savings by turning to electronic bills of lading¹⁵⁹.

¹⁵² 'Electronic (Paperless) Trading — IQAX Limited (IQAX eBL)' (*Japan P&I Club*) <<https://www.piclub.or.jp/en/news/35537>> accessed 27 July 2024.

¹⁵³ 'IQAX' (IQAX) <<https://www.iqax.com/en/>> accessed 27 July 2024.

¹⁵⁴ 'IQAX eBL Partners with COSCO Shipping Captive Insurance to Achieve the First Synchronized Transfer of an eBL and an Electronic Insurance Policy' (IQAX) <<https://www.iqax.com/en/about/newsroom/2023/12/iqax-eb1-partners-with-cosco-shipping-captive-insurance-to-achieve-the-first-synchronized-transfer-of-an-eb1-and-an-electronic-insurance-policy/>> accessed 28 July 2024.

¹⁵⁵ 'Secro' (Secro) <<https://secro.io/>> accessed 24 July 2024.

¹⁵⁶ 'Electronic (Paperless) Trading — Update to Secro Terms and Conditions (No.2)' (*Japan P&I Club*) <<https://www.piclub.or.jp/en/news/38672>> accessed 27 July 2024.

¹⁵⁷ 'TradeGo' (TradeGo) <<https://tradego.com/>> accessed 24 July 2024.

¹⁵⁸ 'Electronic (Paperless) Trading — eTEU eBL Platform' (*Japan P&I Club*) <<https://www.piclub.or.jp/en/news/38714>> accessed 10 September 2024.

¹⁵⁹ 'Shipping the Way It Should Be Done in the 21st Century' (n 31).

3.2.3.11 BRITC eBL

BRITC eBL¹⁶⁰ is a Hong-Kong based platform that uses “*cutting-edge blockchain technology*”. It was approved by the IG in April of 2024, and it supports encrypted and instantaneous transfer of electronic records, such as bills of lading¹⁶¹. This provider claims that the participants can issue and handle the electronic bill of lading while ensuring that their commercial privacy is protected.

3.2.3.12 Trace:Original™

The last platform to be approved by the IG in April of 2024 was Trace:Original™ by Swedish company Enigio. Its technology is a “patented cryptographic assurance solution”, which is centrally governed by a “hybrid distributed blockchain ledger”¹⁶². The parties who use this platform agree that the electronic bills of lading issued will be governed by the law of England and Wales, or any governing law which is compliant with the MLETR. This is a prime example of interconnection between the Model Law and private initiatives. Trace:Original™ also contributes to fulfilling the UN’s sustainable development goals by facilitating paperless trade.

3.2.3.13 TradeLens

Lastly, TradeLens was a platform developed by Maersk and IBM, which got approved by the IG in March of 2021. In November 2022 it announced its discontinuation because the level of cooperation and support needed for the project to work was not possible. It was a “*blockchain enabled digital supply chain system*” that provided electronic bill of lading services, including analytics tools¹⁶³. The digital document was provided with a unique identifier saved to the platform’s blockchain. The holder could view the bill of lading on the platform and instantly transfer it. The document could be surrendered back to the carrier for the release of the cargo either digitally or reverted back to paper. TradeLens claimed over 54 million electronic documents issued.

3.2.3.14 BIMCO Electronic Bills of Lading Clause 2014

The Baltic and International Maritime Council (‘BIMCO’) published its Electronic Bills of Lading Clause in 2014. The industry, and especially the dry cargo sector, demanded the development of a specialist provision for the use of the electronic bill of lading and BIMCO delivered after asking for the contribution and co-operation of owners, charterers, and other industry representatives¹⁶⁴. The clause is not a service provider of electronic bills of lading, such as the platforms discussed above, but a way to enable the use of the electronic bill if the charterers wish to. It also does not directly drive

¹⁶⁰ It is noteworthy by this author, that no website for BRITC eBL can be found through the Google search engine.

¹⁶¹ ‘Electronic (Paperless) Trading — BRITC eBL’ (*Japan P&I Club*) <<https://www.piclub.or.jp/en/news/39353>> accessed 10 September 2024.

¹⁶² ‘Electronic (Paperless) Trading — Enigio’ (*Japan P&I Club*) <<https://www.piclub.or.jp/en/news/39363>> accessed 10 September 2024.

¹⁶³ ‘Electronic (Paperless) Trading — Approval of TradeLens’ (*Japan P&I Club*) <<https://www.piclub.or.jp/en/news/32934>> accessed 10 September 2024.

¹⁶⁴ The owners were represented by Cetrappa, Klaveness and Hadley Shipping. Charterers were represented by Cargill, BHP Billiton and Rio Tinto. Additional assistance was provided by the UK P&I Club and the two at the time IG P&I approved electronic systems providers, Bolero and essDOCS.

‘Electronic Bills of Lading Clause 2014’ (*Bimco*, May 2014) <<https://www.bimco.org/contracts-and-clauses/bimco-clauses/current/electronic-bills-of-lading-clause-2014>> accessed 27 July 2024.

forward the adoption of electronic bills but it provides a framework for their utilization¹⁶⁵. In other words, it is an expressed clause that must be incorporated into the charterparty to bind the contracting parties.

The challenge was for the electronic format to be the “functional equivalent” to the paper medium, which is achieved in three paragraphs. **Sub-clause (a)** stipulates that the charterer has the choice to decide whether an electronic bill of lading -or waybill and delivery order- will be issued. In that case the electronic document has the same status as the paper equivalent. In the explanatory notes, BIMCO adds that it is possible for a charterer to pick more than one system during the period of a charter party. It is also important that the parties understand the need to sign-up to the chosen system or systems if they want to benefit from them, because they can’t participate without registration¹⁶⁶.

Sub-clause (b) requires the ship-owners to subscribe to the charterer’s chosen electronic bill of lading platform. The choice must have also been approved by the IG. In case the subscription has a cost, then the charterer is responsible for it.

Sub-clause (c) provides indemnity for additional liabilities arising from the use of the electronic bill of lading which are not the result of the owners’ negligence. This sub-clause was included in response to owner concerns that unanticipated liabilities might arise when they use electronic systems, even though insurance clubs provide the same cover to paper bills of lading and approved electronic systems. It should be noted in this part that insurance coverage by a Club does not apply to risks when using computer systems, such as viruses, hacking, and data leaks. If a party wishes to get insurance on such risks, it must seek cover in the commercial markets¹⁶⁷.

BIMCO urges the use of the electronic bill of lading because many problems of the paper bill of lading, which were previously presented in this thesis, can be avoided. While the BIMCO clause does not directly drive forward the adoption of electronic bills, it provides a framework for their utilization if charterers wish to do so. According to Grant Hunter, the Director of Standards, Innovation & Research at BIMCO, both types of registry systems described in the previous sub-chapters are useful (closed registry and open registry blockchain systems), but what is truly helpful is a clause in the charterparty where the parties agree to use electronic bills of adding and identify which platform they wish to use to cover the indemnities and risks¹⁶⁸.

It is relevant to this study to mention that in 2021 BIMCO also published its Electronic Signature Clause, in general support for digital contractual solutions¹⁶⁹. While drafting the clause, the drafting team considered if the clause clashes with the electronic bill of lading clause. It was concluded that the electronic signing of a bill of lading does not transform the bill into an electronic one. A bill of lading with an electronic signature can be issued in paper form. As a result, there should not be a conflict between the two clauses, but BIMCO cautions the users of the clause that if bills of lading are indeed being issued, the platform used should be approved by their P&I Club.

¹⁶⁵ Russell (n 19) 14.

¹⁶⁶ ‘Electronic Bills of Lading Clause 2014’ (n 164).

¹⁶⁷ *ibid*.

¹⁶⁸ Grant Hunter, ‘Ask Bimco: Blockchain and Electronic Bills of Lading’ (*Bimco*, January 2024) <<https://www.youtube.com/shorts/CISQeWMfJPg?feature=share>> accessed 27 July 2024.

¹⁶⁹ ‘Electronic Signature Clause 2021’ (*Bimco*) <<https://www.bimco.org/contracts-and-clauses/bimco-clauses/current/electronic-signature-clause-2021>> accessed 27 July 2024.

3.3 NATIONAL LAWS

3.3.1 Greece: Code of Private Maritime Law

Greece, one of the biggest ship-owning countries with deep tradition in the maritime industry, has entered a new era with the adoption of the new Code of Private Maritime Law, which came into effect in May 2023 (law 5020/2023). The old Code (law 3816/1958) was based on the Hague Rules of 1924, but was written in archaic language, was outdated regarding the international Conventions and industry practices, and did not accommodate new technologies¹⁷⁰. One of the main purposes of the new Code was to align national law with international Conventions and boost legal certainty, while regulating the modern forms of maritime activity.

According to the Code's explanatory notes, the reason for the obsolescence of the old Code was both the ratification of many international Conventions¹⁷¹ and the introduction of new technologies that lead to new developments in the shipping industry the last couple of decades¹⁷². The old Code ignored modern forms of operating a shipping business, both on a contractual level and at the level of transport documents. The problem was recognized to be not so much the absence of regulation -which was to be expected from the time it was adopted 66 years ago-, but *“the lack of the necessary flexibility in the existing rules to accommodate the new forms of maritime activity”*¹⁷³. The short-term goals of the new Code are to restore the coherence of the Code, promote legal certainty and transparency, and achieve modernization. The long-term goals are to make the Greek legislative framework more appealing to traders, so it will be chosen as the applicable law by the parties more often, and of course, the strengthening of the shipping industry.

The articles concerning the bill of lading are found in the second part of the Code, titled “Marine Bill of Lading and other Transport Documents”, from article 121 to article 131¹⁷⁴. The Code now acknowledges other transport documents other than the bill of lading, in physical or electronic form. Article 123 par.1 also allows the issuance of a bearer bill of lading, something that was forbidden under the previous Code¹⁷⁵. The electronic bill of lading is found in article 125 of the Code.

¹⁷⁰ Despite the previous Code not having any provisions over the electronic bill, the general legal framework in Greece allowed it since it was not explicitly forbidden. The matter of electronic signatures was resolved through the code of civil procedures, with some legal reflections over jurisdiction clauses and arbitration agreements that could result in the electronic bill not being valid due to the “signature problem”. Overall, there were no doctrinal barriers about the transition to the paperless bill of lading, but the revision of the law was deemed a good -even necessary for some- step towards modern trade and transactions.

Στέλιος Κουσουλής, *Ζητήματα Ηλεκτρονικής Φορτωτικής* (Εκδόσεις Αντ Ν Σάκκουλα 1992). <trans: Stelios Kousoulis, Issues of the Electronic Bill of Lading, 1992>, Κοροτζής (n 77).

¹⁷¹ At least 5 Titles were affected, meaning around 150 articles out of the 292 fell out of use.

¹⁷² ‘Article-by-Article Analysis of Law 5020/2023’ (Hellenic Parliament) 113 <<https://www.hellenicparliament.gr/UserFiles/2f026f42-950c-4efc-b950-340c4fb76a24/12205332.pdf>> accessed 5 September 2024.

¹⁷³ *ibid* 113–114.

¹⁷⁴ From the six articles of the old Code, now there are 11 articles of the new Code of Private Maritime Law.

¹⁷⁵ Both the Rotterdam Rules (Art. 9.c) and the MLETR (Art. 11.1.b) allow the bearer (anonymous) bill of lading but at the same time ask for control over the electronic document by identifying the rightful holder. According to the MLETR's explanatory notes, this should not be read as the electronic bill always having to include the name of the holder, but a method used to establish control as a whole and with respect to the trading parties. From a legal standpoint, this is quite a confusing stand, and it remains to be seen how it can be achieved in practice by using technology.

United Nations (n 124) para 116.

Article 125 establishes the legality of the paperless bill of lading in the Greek legal order. Its necessity was self-evident due to the revolutionary increase in the use of technology (especially during the Covid-19 pandemic), but it was also a task long due. It has been the subject of legislative initiatives in major maritime countries¹⁷⁶ with Greece falling behind. Although Greece signed the Rotterdam Rules which use the broader term of “electronic transport document”, it hasn’t yet ratified them yet. In the absence of international regulation, soft law can only go so far.

Article 124 sets the basic necessary contents of the bill of lading, that the electronic bill must include as well. These are the explicit naming of the document as a “bill of lading”, the description of the goods, the description of the ship, the port of loading and destination port, the freight and the way of payment, the date and the place of issuance, and lastly, the signature of the issuer, that can be in electronic form as well. If the document does not have any of these elements, it is not considered a bill of lading¹⁷⁷. Thus, if any of these are missing from the electronic bill of lading, it cannot be considered as such according to Greek law.

Article 125 sets the basic framework of the bill of lading without requiring a specific method, according to the principle of technological neutrality. The first paragraph establishes the choice of issuing the bill of lading in an immaterial form, subject to the agreement of the parties. The second paragraph introduces the rule of recognized legal equivalence between the paper document and the electronic one regarding the issuing, the possession, and the transfer of the bill of lading. The last paragraph is intended to encourage the use of the electronic bill of lading by allowing to change the medium of the document subject to the agreement of the parties involved. Even though the electronic bill of lading is not a regular bill of lading according to the Hague-Visby Rules and art. 118 par. 3¹⁷⁸ of the Greek Code of Private Maritime Law, it is an equivalent document and thus activates the Hague Visby Rules according to Greek Law¹⁷⁹.

The explanatory notes recognize that the project of recognition of the electronic bill of lading faces many obstacles, such as the lack of harmonization and uniformity in the international legal framework, and the market’s reluctance due to technological difficulties in ensuring the uniqueness and authenticity of the document. In other words, the market, such as carriers, shippers, and bankers, are not sure which technology to use, and the law being technology-agnostic does not help with the hesitancy to adopt paperless trade. In this case, the useful principle of technological neutrality does not help the market make decisions. For this reason, article 125 is complemented with article 288, which provides that a joint ministerial ordinance will determine the technological procedure for issuing, transferring, authenticating, and any other matter relating to the electronic bill of lading. The timeline stated in the explanatory notes for the issuing of the joint ministerial ordinance is two years, so it remains to be seen which parameters it will set¹⁸⁰.

¹⁷⁶ For example, Denmark, Finland, France, Italy, The Netherlands, Norway, Spain, Estonia, Switzerland etc. already had provisions for the electronic bill of lading.

¹⁷⁷ If the place of issuance is missing, it can be rectified if there is a place noted next to the name of the issuer according to the same article.

¹⁷⁸ This article sets out that the non-regular rout or scheduled international transportation of goods by sea is governed by the Hague-Visby Rules if there is a bill of lading or any equivalent document issued.

¹⁷⁹ Αχιλλέας Μπεχλιβάνης, *Εγχειρίδιο Ναυτικού Δικαίου* (Εκδόσεις Σάκκουλα ΑΕ 2023) 173. <trans: Achilleas Bechlivanis, *Maritime Law Manual*, 2023>

¹⁸⁰ ‘Article-by-Article Analysis of Law 5020/2023’ (n 172) 238.

3.3.2 United Kingdom: The Electronic Trade Documents Act 2023

The United Kingdom has undoubtedly rich and complex case law regarding the traditional bill of lading, but its legal landscape fundamentally changed with the introduction of the Electronic Trade Documents Act in September of 2023, which set the rules that now govern the electronic bill of lading. The Act is a much-needed effort to modernize English law. From a private contractual environment to one recognized under national law, this development will hopefully serve the benefit of the shipping industry. The goal was to modernize the law surrounding electronic trade documents in the United Kingdom, and more specifically documents used in trade whose function depends on being capable of being physically possessed¹⁸¹. Before this Act, the UK did not recognize the possession of electronic documents, because possession was associated with tangible assets. The provisions of the Act provide electronic trade documents with “possessability” and render them the same legal recognition and functionality as their paper counterparts¹⁸². The overall intended effects of the Act were to reduce transaction costs associated with paper trade, gain efficiency and encourage business growth, increase environmental benefits, and boost the security and transparency in important documentation¹⁸³.

Section 1 (1) of the Act defines the types of trade documents which can fall within the scope of the Act, by setting out three criteria to qualify. The document must be in paper form, to be commonly used in connection with trade or transport of goods¹⁸⁴, and its possession to be required for a person to claim performance of an obligation¹⁸⁵. Section 1 (2) sets out a non-exhaustive list of the paper documents that can now be issued electronically, including bills of exchange, warehouse receipts, marine insurance policies, cargo insurance certificates, mate’s receipts, and of course, bills of lading¹⁸⁶. The reference to the “bill of lading” is intended to cover all possible types of bills of lading, such as “straight” bills, “on-board” bills or “shipped” bills, provided that possession is a necessary aspect of their functionality.

Section 2 of the Act contains the definition of “electronic trade document” and sets out the criteria such a document must satisfy to qualify as such and therefore be capable of possession. Primarily, an electronic document must contain the same information as its paper equivalent to establish the link between the two forms¹⁸⁷. According to Section 2 (2), the document can be issued electronically, if subject to conditions such as using a “reliable system” to ensure the security of the bill of lading and its functionality. This means the “reliable system” must be able (a) to identify the document so it can be unique and distinguished from any copies to prevent double spending. It should also (b) protect the document from unauthorized interference, (c) secure that no more than one person can control the document at the same time to prevent double spending, (d) allow the person who holds

¹⁸¹ ‘Electronic Trade Documents Act 2023 Explanatory Notes’ 4
<<https://www.legislation.gov.uk/ukpga/2023/38/notes/division/3/index.htm>> accessed 5 September 2023.

¹⁸² *ibid*.

¹⁸³ *ibid* 6.

¹⁸⁴ The purpose of this is to narrow the range of documents that fall within the scope of the Act.

¹⁸⁵ For example, warehouse receipts are not documents of title, but their possession is required in practice.

¹⁸⁶ According to the Act’s Explanatory Notes, these documents are listed for the sake of certainty and clarity.

¹⁸⁷ ‘Electronic Trade Documents Act 2023 Explanatory Notes’ (n 181) 9.

the control of the document to demonstrate it¹⁸⁸, and finally, (e) secure that a transfer¹⁸⁹ of the document deprives the transferer of the control upon the electronic document, replicating the divestible nature of paper trade documents. Section 2 (5) of the Act is loosely based after Article 12 of the MLETR and sets out a list of non-exhaustive criteria that a Court may take into account to determine the reliability of a system, without the Act endorsing a particular type of technology.

Section 3 of the Act provides the new principle for UK law, that an electronic document has the same effect as the equivalent paper trade document. This means that a person can possess, indorse and part with possession of an electronic trade document. This section removes the historical legal blocker of not being able to possess non-tangible assets, without setting out what exactly constitutes possession of an electronic trade document, which will be assessed as a matter of common law¹⁹⁰. In common law, possession is established by two elements: factual exclusive control¹⁹¹ and intention, assessed against the control and intention of other parties who claim it¹⁹².

Section 4 dictates which are the conditions of converting an electronic trade document into a paper trade document and vice versa, ensuring that the old form ceases to have effect. Thus, the change of medium is permitted because international transactions involve contracts governed by different laws that possess different levels of recognition of electronic trade documents. It might be necessary to replace an electronic bill of lading with a paper bill. When that happens, the only thing changed is the medium and not the content of the bill of lading. For example, even if an electronic bill of lading changes into a paper bill, the date of issuance remains the same as the electronic bill of lading¹⁹³. Section 4 (1) sets the conditions of changing the form of the trade document. First, it requires a statement that the document has been converted from another medium to make the transferee aware of it and to maintain an audit trail of the document¹⁹⁴. Secondly, the contractual requirements relating to the conversion of the document must be also complied with, meaning that the parties must agree to the change. Section 4 (2) sets out the consequences of compliance with the requirements for changing the medium of the trade document. The old document ceases to have effect, and all rights and liabilities have effect in relation to the new document. If the conditions of this Section are not met, then the consequences do not follow as well. This means that when the change of medium is invalid, the document created is a new document because the old never ceased to have effect. If for example, a paper bill of lading changes to an electronic bill of lading without a statement, it continues to be an electronic trade document according to the provisions of the Act, but the paper document will not automatically cease to have effect and must be taken out of circulation to avoid undesirable results.

Section 5 is an “opt-out” provision which means that Sections 3 and 4 will not apply to the relevant electronic trade document if the parties wish to. This means that they can keep relying on

¹⁸⁸ This does not mean that the system should showcase who has the control of the document, but that if it is required to evidence their ability to exercise control over the electronic document, they can prove it on the system, by using e.g. security credentials.

¹⁸⁹ The word “transfer” here is used not in a legal manner, but a factual one. It is the electronic equivalent of physically handing over a piece of paper.

¹⁹⁰ ‘Electronic Trade Documents Act 2023 Explanatory Notes’ (n 181) 13.

¹⁹¹ Control means access and use, and the ability to limit it.

¹⁹² ‘Electronic Trade Documents Act 2023 Explanatory Notes’ (n 181) 13.

¹⁹³ *ibid* 27.

¹⁹⁴ *ibid* 17.

other mechanisms for using documents in electronic form and not rely on the possessory concepts of the Act.

The Act is concise, containing only eight sections. The Law Commission anticipates that the details will be filled gradually in practice, by the Courts. The Act's approach is characterized by technological neutrality, meaning it is light on detail to allow for a flexible framework that meets the needs of the market over time. But while technological neutrality has been a useful tool for the modern legislator, commercial certainty can undermine its advantages¹⁹⁵. The market, and especially carriers, want to feel legally certain about their practices, but there is no case law yet as a guide. The Act lists criteria that the courts “*may take into account*”¹⁹⁶, but there is a chance that a “reliable system” now may not meet the criteria in the future as new technologies evolve. The goal of the legislator was for the Act to not become obsolete in the future, but technological neutrality acts here like a double-edged sword, with the industry being reluctant to adopt paperless trade and the electronic bill of lading, because of the uncertainty. Why change something that has worked for hundreds of years? In such a state of uncertainty it will be difficult for the multiple parties in a long logistics chain of international commerce to agree on using an electronic bill of lading, and if there is agreement, to agree on which system is reliable or not.

A proposed solution is to have a register of systems which are considered reliable¹⁹⁷. The registered systems should also be audited regularly to maintain their status and create more certainty in the industry and to facilitate the adoption of electronic document trade and especially electronic bills of lading. It is also proposed to have a state sponsored system, governed by an independent and international institution, which will deal with issues created by private commercial interests in providing reliable systems¹⁹⁸. UK's ICC Centre for Digital Trade and Innovation is already working on implementing a registry of “reliable systems” as described in the Act, to assist users in choosing which system to use¹⁹⁹. The ICC Digital Standards Initiative also aims to establish “*a globally harmonized digital trade environment*”²⁰⁰. What is certain is that industry-approved standards are needed to guide the market into the adoption of paperless trade, and businesses need to re-evaluate their internal processes. For this reason, in February 2024, five months after the Act came into force, the Law Commission called for evidence to help identify the most challenging issues in international trade law that arise from electronic trade documents²⁰¹.

3.3.3 Commonwealth Countries

The UK's Electronic Trade Document Act 2023 came soon after the adoption of the Singapore Electronic Transactions (Amendment) Act 2021. Singapore was the first commonwealth country to

¹⁹⁵ Chris Chatfield, ‘The Electronic Trade Documents Act 2023: UK Modernises the Law Surrounding Electronic Bills of Lading’ (*Kennedys Law*) <<https://kennedyslaw.com>> accessed 5 September 2024.

¹⁹⁶ For example, Section 2 (5).

‘Electronic Trade Documents Act 2023 Explanatory Notes’ (n 181) 10.

¹⁹⁷ Chatfield (n 195).

¹⁹⁸ *ibid.*

¹⁹⁹ ‘Digital Trade’ (*ICC United Kingdom*) <<https://iccwbo.uk/key-policy-areas/digital-trade/>> accessed 6 September 2024.

²⁰⁰ ‘The ICC Digital Standards Initiative (DSI)’ (*ICC-DSI*) <<https://www.dsi.iccwbo.org>> accessed 6 September 2024.

²⁰¹ ‘Digital Assets: Call for Evidence and Draft Legislation’ (*Law Commission*, 22 February 2024) <<https://lawcom.gov.uk/digital-assets-call-for-evidence-and-draft-legislation/>> accessed 6 September 2024.

adopt regulation regarding electronic commerce with the original Electronic Transactions Act in 1998, that adopted the principle of functional equivalence of the electronic bill of lading. It was the first country in the world to implement the MLETR as well²⁰².

It is anticipated that other commonwealth countries will follow Singapore's and the UK's example to allow for paperless trade. In a Commonwealth report examining 54 Commonwealth economies it is stated that the introduction of legal reform to enable paperless trade across the Commonwealth will have potential for cost reductions that will enable as much as 90 billion USD and increasing trade by 1.2 trillion USD by 2026²⁰³.

Australia's Sea-Carriage Documents Act 1996 already provides for electronic bills of lading, which expressly includes electronic sea-carriage documents²⁰⁴. The Act adopts the principle of functional equivalence, affording the same legal validity to both paper and "data messages" bills²⁰⁵. The Act defines what a "data message" can be, but there are no specifications to what constitutes an electronic bill of lading, allowing the method to be agreed upon by the parties.

India's Information Technology Act 2000 aims to facilitate electronic commerce. It was produced perhaps in response to the UNCITRAL Model Law on Electronic Commerce of 1996²⁰⁶. It defines the term "electronic records", with the bill of lading falling within the definition.

3.3.4 United States of America

The bill of lading in the US is governed by the Federal Uniform Bills of Lading Act 1916. At the same time, the Uniform Commercial Code ('UCC') sets out rules about the bill of lading, including its electronic form²⁰⁷. In Section 7 the definition of a document of title expressly refers to "electronic documents of title"²⁰⁸. UCC provides how to identify the person who has control of the electronic document, and the criteria of the required system employed for reliably evidencing the transfer of the document²⁰⁹.

3.3.5 Germany: Handelsgesetzbuch

German law recognizes the electronic bill of lading since the reformation of their Commercial Code (Handelsgesetzbuch) in 2013, where provisions were included on this subject²¹⁰. More specifically, the law sets out that an electronic record that fulfills the same functions as the traditional bill of lading is recognized as such, on the condition that the authenticity and integrity of the record is maintained. Similarly to what was analyzed in the section about Greek Law, German Law also empowers an authorized Ministry to regulate the details on the electronic bill of lading through a ministerial

²⁰² Ali Abbas Khayoon Al-Naseri (n 146) 131.

²⁰³ 'Quantitative Analysis of the Move to Paperless Trade' (*Commonwealth*) <<https://thecommonwealth.org/quantitative-analysis-move-paperless-trade>> accessed 6 September 2024.

²⁰⁴ Section 4 (1) (2).

²⁰⁵ Ali Abbas Khayoon Al-Naseri (n 146) 128.

²⁰⁶ *ibid* 129.

²⁰⁷ *ibid* 125.

²⁰⁸ Pejović (n 18) 239.

²⁰⁹ Art 7-106.

²¹⁰ In § 516 (3).

Takahashi (n 23) 497.

ordinance²¹¹. The requirements of the article follow the principle of technological neutrality, so blockchain-based bills of lading are qualified.

3.3.6 Switzerland: DLT Act

In 2020, Switzerland enacted the Federal Act on the Adaption of Federal Law to Developments in Distributed Ledger Technology, which specifically provides that documents of title, like the bill of lading can be issued in the form of ledger-based securities²¹². The technical requirements concerning the document's integrity are described in the Act. The Act also made changes to the Code of Obligations, including provisions that can be applicable to the blockchain-based bill of lading²¹³. Lastly, it is relevant to mention, that the explanatory notes of the Act state that the article concerning the bill of lading is in line with the Rotterdam Rules, which Switzerland has signed but not yet ratified.

3.3.7 South Korea

The Korean Commercial Code of 2001 treats the electronic bills of lading as having the same effect as the traditional ones and grants them with functional equivalence, but only under the electronic title registry set up by the law²¹⁴. Under the Code, the Ministry of Justice supervises the operation of the title registry Korea Trade Net (or KTNET) that plays a key role in the issuance and transferring of the electronic bill of lading. This Registry does not work only domestically, but also internationally²¹⁵. Under this law, the electronic bill of lading is the functional equivalent to a paper bill of lading if registered in this quasi-public registry²¹⁶. This is an interesting approach, hence why it is mentioned in this study. In one hand, the users are confident in using this registry, on the other hand, electronic bills of lading not registered cannot be guaranteed functional equivalence, which highlights issues of legal certainty and freedom of choice in selecting what service to use.

3.4 CONCLUSION

The legal framework of the electronic bill of lading is indeed an extraordinarily complex subject. Starting with the international Conventions, the Hague/Hague-Visby Rules and the Hamburg Rules do not offer much in terms of the electronic bill of lading. On the other hand, the Rotterdam Rules do have potential. The Rotterdam's Rules first and primary focus was facilitating electronic commerce, and the goal of modernizing liability appeared on the way²¹⁷. UNCITRAL understood that achieving "functional equivalence" of the electronic transport document to the paper document was a necessary

²¹¹ According to Takahashi, in 2021, this ministerial ordinance was not yet published. In the time of writing this thesis in 2024, this author has not been able to find the ordinance, so it is assumed that it was never issued. Still, the Courts can recognize the electronic bill of lading by applying the Commercial Code.

²¹² Art. 1153a

Takahashi (n 23) 498.

²¹³ *ibid* 499.

²¹⁴ Pejović (n 18) 240; Goldby (n 66) 332.

²¹⁵ Pejović (n 18) 240.

²¹⁶ Goldby (n 66) 333.

²¹⁷ Sturley (n 49) 31.

step towards a successful regime, and thus it was a primary challenge for the drafters of the Rules²¹⁸. Perhaps the Rotterdam Rules failed with their complex 96 articles, compared to the “*brilliant simplicity*” of the 16 articles of the Hague/Hague-Visby Rules²¹⁹. The Rules have been criticized for being too complex and going beyond liability issues to address other problems such as delivery and the transfer of rights²²⁰. But, according to Sturley, it is exactly this approach that will permit the industry to rely on new technologies. The question now is whether the Rotterdam Rules can be simply updated to cater better to the industry. Mark Russell brings the example of the York-Antwerp Rules for General Average, introduced in 1864 and updated over time. When the 2004 version fell out of use, the CMI consulted the industry, and the 2016 version of the Rules is now widely adopted²²¹. The Hague Rules also catered to the need for modest amendments that would eliminate small defects after the container revolution, so the Rules would not be completely abandoned²²².

This author’s opinion is in line with the CMI’s statement that there is no need for another Convention, at least in this generation and with the current available technology. The Rotterdam Rules’ underlying principle of technological neutrality, and the concept of functional equivalence are enough to provide a satisfactory international legal framework for the adoption of the electronic bill of lading. This study is of the opinion that the proposal for an amendment of the Rules is very ambitious due to the Rules not being yet in force. This means that while the Rotterdam Rules would have been very beneficial for electronic transport records, it is highly unlikely they will come into force, and they probably won’t be the way forward towards the international acceptance of the electronic bill of lading.

If there is no need for a new Convention, then according to Zhao, there might be a need for “*a more dynamic form of self-evolving regime*” to address the root of the issue²²³. As already discussed in the recent wave of developments in domestic legislations, it is obvious that national legislators realize the need to promote digitalization for the economy to remain competitive in the international environment. It is no coincidence that the principle of technological neutrality adopted by both the Rotterdam Rules and the MLETR is incorporated in national legislations despite the market insecurity it results in. The MLETR has gained minor adherence so far, but more and more jurisdictions move towards it in their own individual way²²⁴. Countries that have incorporated the Model Law into their legislation and acknowledge the electronic bill of lading are Singapore, Bahrain, France, the UK, the UAE, and more. The G7 countries have also reported to be progressing towards MLETR²²⁵, with Germany and China considering adopting it and Japan creating a committee to submit a draft in Parliament, whose fate is still unknown since the results were expected by 2024 but have not been

²¹⁸ *ibid.*

²¹⁹ Russell (n 19).

²²⁰ Sturley (n 49) 35.

²²¹ Russell (n 19).

²²² Zhao, ‘Uniform Seaborne Cargo Regimes - A Historical Review’ (n 47) 155.

²²³ *ibid* 133.

²²⁴ Richard Allingham, Elizabeth Elliott and Reema Shour, ‘UK’s Electronic Trade Documents Act Now in Force’ (*Hill Dickinson*, October 2023) <<https://www.hilldickinson.com/insights/articles/uks-electronic-trade-documents-act-now-force>> accessed 6 September 2024.

²²⁵ *ibid.*

published as of the time of researching this thesis²²⁶. The Model Law indeed produces the results it is supposed to have. The Rotterdam Rules might not have been a success, but in this author's opinion, the MLETR, as a soft law instrument, might be a key device towards international harmonization for the adoption of the electronic bill of lading.

Furthermore, the role of individual countries is to establish technologically neutral laws and allow industry to lead the way. Yiannopoulos in 1995, observed that “*the use of electronic bill of lading is, essentially, a business rather than a legal decision*”²²⁷. He explained that while the law might try to provide the legal framework to permeate the electronic bill with the same functions as the paper bill, only the market interests will determine the use of electronic bills of lading, based on factors of economic incentives, concerns for privacy and protecting trade secrets, accuracy of information and security of transactions etc. In his words, “*such concerns call for technological rather than legal solutions.*” Based on that, it is evident that the role of the law is not to stand in the way of progress, and regulate technology as necessary when progress occurs. It also can't be ignored that the success of the Hague/Hague-Visby Rules was primarily owed to the fact that the shipping industry had a great role in the drafting process. This showcases the importance of corresponding to the industry's actual needs. This is why it is important for each jurisdiction to establish a technology neutral framework to allow for the industry practices to take effect as soft law.

Therefore, the increasing importance of private initiatives in the reality of the shipping industry is undeniable, with the market heavily self-regulating and taking initiatives to accommodate its needs. BIMCO announced in February 2023 its “25 by 25 pledge” to move towards trade digitalization. The initiative aims to commit major shippers in the bulk sector to use electronic bills of lading for at least 25% of their annual seaborne trade volume for one commodity by 2025²²⁸. In July of 2024, BIMCO announced that the initiative surpassed its first target within its first year, which highlights that the dry bulk sector is dedicated to improving operational efficiency through digital solutions²²⁹. It is also noteworthy that similarly to BIMCO, as electronic bills of lading use has grown, the Digital Container Shipping Association²³⁰ (‘DCSA’) also announced that it will achieve 100% coverage of electronic bills by 2030²³¹, after estimating that 16 million bills of lading were issued by ocean carriers in 2020 and less than 0.3% were electronic²³². These initiatives show incredible dedication towards the

²²⁶ ‘Current Status of Consideration of Electronic B/L Legislation—in Light of the Interim Draft—’ (Japan P&I Club) <<https://www.piclub.or.jp/en/news/37287>> accessed 10 September 2024; Koch (n 37) 74.

²²⁷ AN Yiannopoulos, *Ocean Bills of Lading: Traditional Forms, Substitutes, and EDI Systems* (AN Yiannopoulos ed, Kluwer Law International 1995).

²²⁸ Grant Hunter, ‘BIMCO’s “25 by 25” Campaign Reaches 25.1% eBL Adoption in First Year’ (Bimco, July 2024) <<https://www.bimco.org/insights-and-information/general-information/20240717-25-by-25-campaign-adoption-in-first-year>> accessed 27 July 2024.

²²⁹ *ibid.*

²³⁰ Digital Container Shipping Association was founded in 2019 by major liner carriers with the goal to move the container industry into the digital era. It is a nonprofit organization, that is set up under Dutch Law and approved by the Federal Maritime Commission of the US. The founding members are Maersk, Mediterranean Shipping Company, Ocean Networks Express, and Hapag-Lloyd.

Goldby (n 66) 350.

²³¹ ‘DCSA - Driving Digitalisation in Container Shipping’ (DCSA - Digital Container Shipping Association) <<https://dcsa.org/newsroom/dcsas-member-carriers-commit-to-a-fully-standardised-electronic-bill-of-lading-by-2030>> accessed 10 September 2024.

²³² ‘Streamlining International Trade by Digitalising End-to-End Documentation’ (DCSA) <https://go.dcsa.org/ebook-eb1/?utm_source=dcsa&utm_medium=display&utm_campaign=ebook-eb1> accessed 5 September 2024.

adoption of the electronic bill of lading and one cannot deny their effect. Yet, the future is still uncertain. The digital platforms analyzed in this chapter use similar yet different approaches to technology. It is to be seen if one will prevail as the best for issuing and transferring the electronic bill of lading or not, and how these companies' terms and conditions will affect the shipping industry, the way technology will evolve, and quite importantly, the legislation itself.

Lastly, the research question whether the current legal regimes keep pace with technology, or they act as barrier is now to be addressed; from a sociology of law standpoint, the supporters of technological determinism claim that the law comes on the heels of technology, often failing to react in time. This claim is now considered outdated by legal scholars²³³. But from a practical point of view, there are many different opinions on this. According to Takahashi, even a paper-based bill of lading would be a mere piece of paper in the absence of legal recognition²³⁴. Domestic legislation is not considered a sufficient way to replace paper documents with electronic equivalents, and trade practices and customs in this area are certainly not yet established to be of legal importance²³⁵. The industry is unwilling to adopt paperless trade practices without a sufficient legal basis and antiquated law does hinder progress. On the other hand, Todd, is of the assumption that it is up to the commercial parties, and not the legislators, to make appropriate provisions, even though legislative changes might be desirable²³⁶. Market regulation has historically been the way that electronic bill of lading systems have been operating so far, on the basis of existing law and not assuming that legislative change might happen²³⁷. In his view, electronic bills of lading should come first before legislative assistance²³⁸.

In this author's opinion, the legal framework for the electronic bill of lading should ideally be as harmonized as possible given the international nature of the carriage by sea trade. While the use of Conventions has seemingly failed the task, model laws like the MLETR do have the capacity to fill the gaps and achieve international harmonization²³⁹. As previously stated, the repetition of the effort of negotiating Conventions will most likely not achieve unification of the rules²⁴⁰, but soft law seems to be the solution to regulating the practical side of the electronic bill of lading, while the task of the "hard law" is to facilitate the industry by acknowledging the electronic bill of lading as the legal equivalent of the paper bill and dealing with the legal issues arising from the use of technology. In this hybrid framework of regulation, all players have valuable contributions to make. Law and practice working together is the best solution.

²³³ See the theory of co-production (social construction of technology) by Sheila Jasanoff, and "Does Technology Drive History? The Dilemma of Technological Determinism" essays edited by Leo Marx and Merritt Roe Smith.

²³⁴ Takahashi (n 23) 497.

²³⁵ Sturley (n 49) 26.

²³⁶ Todd (n 67) 431.

²³⁷ *ibid* 341.

²³⁸ Todd, in his article, has proposed possible blockchain systems might operate without legal intervention. He proposes either a model based on a chain of assignments and indemnities, or a model based on novations. *ibid* 369.

²³⁹ Koch (n 37) 78.

²⁴⁰ Zhao, 'Lex Maritima in a Changing World: Development and Prospect of Rules Governing Carriage of Goods by Sea' (n 17) 761.

Part Two

New Technologies and Emerging Legal Challenges



4 The three functions of the bill of lading

It is widely accepted in legal literature that the bill of lading has a tripartite function, which underlines the importance and the complexity of the law regarding the bill²⁴¹. In Part Two of this thesis, this chapter acts as an introduction to the presentation of new technologies and the legal challenges arising from them. The reasoning behind the choice to place the three functions of the bill of lading in this part, is that the legislative effort to grant “functional equivalence” depends on the current technology’s ability to achieve it in practice. Functional equivalence does not mean that the electronic document performs the functions the same way paper does, but that it achieves the same effects both in practice and in law²⁴². The law, like the Rotterdam Rules, can only go so far if it is technically unachievable for the electronic bill of lading to have the same effect as the paper bill. For a document to be recognized as a bill of lading, it needs to cater to all three functions regardless of its medium. Therefore, before delving into possible technological applications and what practical and legal issues they resolve or exacerbate, it is important to be reminded what the three main functions are and whether technology can achieve to replicate them, because this is the heart of the issue of accepting the electronic bill of lading. The research question presented is quite simple: What are the three functions of the bill of lading, and can the electronic bill of lading emulate them? This introductory chapter is meant to only broach the subject with the legal reflection following in the main chapters.

4.1 RECEIPT OF GOODS SHIPPED OR RECEIVED BY THE CARRIER

The Hague/Hague-Visby Rules in Article III (4) stipulate that “... *a bill of lading shall be prima facie evidence of the receipt by the carrier of goods as therein described...*”²⁴³. This function of the bill of lading as a receipt of the goods shipped or received was historically the first one to be developed, as it started as a bailment receipt²⁴⁴ used to obtain the goods at the port of discharge²⁴⁵. As a receipt, the

²⁴¹ For example, in the Law Commission that preceded the UK’s Carriage of Goods by Sea Act in 1992, it was said that no definition of the bill will be provided, but the bill is usually identified by reference to its three functions.

Aikens, Lord and Bools (n 2) 127.

²⁴² Pejović (n 18) 218, 221.

²⁴³ According to the Rules proof of the contrary is admissible unless the bill of lading has already been transferred to a third party acting in good faith. Because the bill of lading is prima facie evidence, the burden of proof falls on the carrier to prove that the goods were not as described in the bill that the carrier themselves produced.

See also, Art. 121 of the new Greek Code of Private Maritime Law.

²⁴⁴ Bailment is a common law legal relationship where the owner transfers the physical possession of the property for a time but retains the ownership.

²⁴⁵ Wilson (n 11) 118.

bill must include valuable information, such as the date on which the goods were received and the goods' description in the condition the carrier received it for transfer. This representation of fact has important commercial effects because there is a liability regime in place²⁴⁶. The bill of lading, acting as evidence, forms the basis for any cargo claims against the carrier if the goods are damaged or lost. The statements on the bill of lading also affect the negotiability of the document. This is why it is fundamentally important for the statement to be as accurate and unambiguous as possible. This is apparent in the Master's duty to examine the Mate's daily receipts and perform inspections in order to be sure that the cargo is in good condition. If the Master deems the cargo to be in apparent good order and condition, then the Master signs a "clean bill of lading", meaning that it is clean of remarks as to the condition of the cargo. If the Master finds deficiencies, then an "unclean"²⁴⁷ bill is produced, which impacts the negotiability of the bill of lading as potential buyers are hesitant to buy the goods.

The electronic bill of lading's challenge regarding this function as receipt of the goods shipped or received is the immutability of the information contained in the bill of lading. Because the information contained acts as "*prima facie evidence*" the system used to issue an electronic bill of lading must guarantee that this information cannot be tampered with. Furthermore, because of the importance of the statements, there should be a secure electronic signature system in place that banks and buyers can trust²⁴⁸.

4.2 EVIDENCE OF THE CONTRACT OF CARRIAGE

The bill of lading is not a contract of carriage itself, even though in the backside of it there are usually a lot of contractual terms printed or a reference to the "long form" bill²⁴⁹. The bill of lading only acts as evidence of the actual contract of carriage agreed (usually orally) between the contractual carrier and the shipper before the issuance of the bill of lading. The terms of the contract are deduced from the negotiations that happened before the shipment of the goods or from the carrier's sailing announcements²⁵⁰. If there is a breach of the contract prior to the issuance of the bill of lading, then

²⁴⁶ *ibid*; Todd (n 67) 353.

²⁴⁷ Other names used are "claused", "foul", or "dirty bill of lading".

²⁴⁸ Todd (n 67) 353.

²⁴⁹ This is the most accepted view in legal literature (*The Ardennes*), the opinion the Greek Courts and the Greek law (Art.121 of the Code of Private Maritime Law), but the opposite opinion is expressed as well (Debattista, and Greek legal scholars like Zekos, Potamianos, Sarlis, and Loukopoulos), meaning that the bill of lading is intended to constitute the contract and not just evidence of a previous contract. This is because the modern transportation of goods cannot possibly be on par with the transportation of goods happening during the 19th century. For the authors mentioned above, the oral contract of that time cannot be viewed the same way as the standardized contracts of carriage written in the back of the modern bill of lading. According to this view, the bill is no longer just evidence of the contract of carriage, but its legal and economical purpose grants the bill its autonomous legal standing as a contract itself. Zekos goes as far as describing the transition of the bill of lading from evidence of the contract of carriage to being **The contract of carriage** when it is transferred to a third party a metaphysical phenomenon to give emphasis to the absurdity of it. Especially now that the bill of lading can be produced in an electronic medium, standard-form contracts and contracts of adhesion will be prevailing, and the electronic bill cannot possibly be considered just evidence of the contract of carriage anymore. In Zekos' view, the bill of lading, especially the electronic one that holds the written standard terms, is now the contract of carriage.

Γεώργιος Ζέκος, 'Ηλεκτρονική Φορτωτική: Τυποποιημένη σύμβαση μεταφοράς ή ένα απλό αποδεικτικό προφορικής σύμβασης μεταφοράς' (2018) 24 Δίκαιο Επιχειρήσεων και Εταιριών 294. <transl: George Zekos, Electronic bill of lading: a standardized contract of carriage or a proof of an oral contract of carriage?, 2018, at Business and Company Law Magazine >, Wilson (n 11) 131.

²⁵⁰ Wilson (n 11) 129.

either party can claim remedies in accordance with the prior agreements²⁵¹. If there is a breach of contract after the issuance of the bill and the printed terms do not align with the oral terms, the shipper -depending on the legal system- can in theory submit oral evidence to establish the precise terms of the agreement, but in practice this might be difficult²⁵². Moreover, in the majority of the cases, the shipper will be responsible to fill in the information of the cargo to the bill of lading, so there is a chance to check the terms of the document²⁵³. It should be noted though, that once the bill of lading has been transferred or endorsed by the original holder, the new bona fide third-party holder can still claim under the evidenced contract of carriage even though they might not be one of the original parties to it²⁵⁴.

Regarding the electronic bill of lading, an issue that was initially raised, was the problem of electronic documents in general, that consisted of the contents of the document not being literally “in writing” and the consequence problem that it could not literally be produced as evidence in legal proceedings²⁵⁵. There was also the fear that the contents of the electronic document could be altered without trace. Today, as will be analyzed further in this thesis, these issues have been mostly addressed. If there are statutory provisions that recognize electronic forms of writing and signature, then this function and the function of acting as a receipt for the goods can easily be replicated today²⁵⁶.

4.3 DOCUMENT OF TITLE

The last function of the bill of lading has been characterized as a “*genius legal invention*” that is the legal embodiment of the title to the goods in paper form²⁵⁷. This function was developed because sea voyages were usually a lengthy endeavor, and the trading parties faced a considerate dilemma; the buyer of the goods didn’t want to pay for cargo that could get damaged or lost during transit, and the seller didn’t want to send the goods without getting paid or having them at the destination port with no buyer in sight²⁵⁸. Instead, the owners of cargo needed a document of title to raise credit for an international sale or sell the cargo while still in transit²⁵⁹. These were the reasons why the bill of lading evolved to represent the goods themselves, by providing constructive possession and the ability to transfer it²⁶⁰.

This function of the bill of lading gets even more complicated; according to Wilson, the function of bill of lading as a document of title exercises a tripartite function as well, in relation to the

²⁵¹ *ibid.*

²⁵² *ibid* 129–130.

²⁵³ *ibid* 130.

²⁵⁴ *ibid.*

²⁵⁵ Christodoulou (n 16) 9–10.

²⁵⁶ Girvin and Ong (n 29) 197.

²⁵⁷ Christodoulou (n 16) 5.

²⁵⁸ Anders Møllmann, *Delivery of Goods under Bills of Lading* (1st Edition, Routledge 2017) 11; Wilson (n 11) 132.

²⁵⁹ Wilson (n 11) 132.

²⁶⁰ Girvin (n 36) 88.

contract of carriage, the sale of goods during transit²⁶¹, and the raising of financial credit²⁶². Regarding the sale of goods during transit, the bill as a -negotiable- document of title is usually produced in a set of three to six originals²⁶³, in order to sell the goods while still in transit²⁶⁴. The bill of lading also plays an important role in financing the contract of sale because it is one of the documents asked from banking institutions to open credit in favor of the seller²⁶⁵.

Finally, the function of the bill of lading as a document of title finds itself in close relation to the contract of carriage, with the two functions characterized even as “parasitic”²⁶⁶. More specifically, the fact that the bill of lading in the context of the contract of carriage renders constructive possession of the goods during transit means that the holder controls the goods and is entitled to delivery on presentation of the bill, where the bill is finally “spent”. In other words, possession of the bill is equivalent in law to possession of the goods²⁶⁷, which is why it has been characterized as “a symbolic key to the warehouse”²⁶⁸ and bestowing the bill its distinct role in international trade²⁶⁹. Most importantly, the rightful holder²⁷⁰ can sue or be liable under the contract of carriage, as if he/she has been an original party of it²⁷¹. In common law, the transfer of ownership did not equate to transfer of rights and obligations due to the doctrine of privity of contract, but this has been addressed by English law with statutory and judicial devices, as well as with the implied contract approach²⁷².

All these “sub-functions” of the bill should be mirrored to the electronic document as well, and this is why this function is the most difficult to be reflected on the electronic form of the bill. This is due to the fact that it is not just information that has to be conveyed in electronic form, but the actual proof of rights or title²⁷³. The transferability of rights had been characterized in the past as the “*holy grail*” of unresolved electronic legal issues²⁷⁴. The electronic bill of lading needs to accord the holder with contractual rights and obligations²⁷⁵. If the applied law does not recognize the functional equivalence of the electronic bill of lading, this is not taken for granted, which is why registry systems

²⁶¹ The rules over international sale of goods (e.g. CISG/Vienna Convention, INCOTER MS 2000) usually require the seller to hand in the delivery documents. The documents are so important that it has been said that it is not a sale of goods but a sale of documents that is happening. For example, the “sale” of CIF documents has been characterized by English Courts as “sale of documents” instead of goods.

Εμμανουήλ Κωνσταντινίδης, *Η ηλεκτρονική φορτωτική κατά το δίκαιο της θαλάσσιας μεταφοράς* (2001) 8; <trans: Konstantinidis E., *The electronic bill of lading according to the law of the carriage of goods by sea*, 2001>

Charles Debattista, *Debattista on Bills of Lading in Commodities Trade* (4th edn, Bloomsbury Professional 2021) 7.

²⁶² Wilson (n 11) 133.

²⁶³ The buyer can protect him/herself by asking for all copies of the bill.

²⁶⁴ Wilson (n 11) 133–134.

²⁶⁵ *ibid* 135.

²⁶⁶ *ibid* 136.

²⁶⁷ Christodoulou (n 16) 6.

²⁶⁸ In *Sanders v Maclean*. (1883) Judge Bowen L.J. described the bill of lading as “A key which in the hands of a rightful owner is intended to unlock the door of the warehouse, floating or fixed, in which the goods may chance to be.”

²⁶⁹ Møllmann (n 258) 10.

²⁷⁰ The rightful holder is either the person who is identified in the bill of lading or the endorsee of the bill of lading. If the bill of lading is drafted as an “order” bill then the goods are to be delivered to the named consignee or to his “order or assigns”. If the bill dictates the delivery to be made to a named consignee only then it is a “straight” bill of lading and lacks the negotiable quality to qualify as a document of title.

²⁷¹ Wilson (n 11) 136.

²⁷² *ibid* 136, 140.

²⁷³ Christodoulou (n 16) 15.

²⁷⁴ *ibid.* cites Baum and Perritt, *Electronic Contracting, Publishing and EDI Law*, 689 (1991).

²⁷⁵ Todd (n 67) 343.

such as BOLERO, have their users agree to their Rulebook. Secondly, the electronic bill of lading should be able to maintain its integrity and be unique to avoid instances of fraud and double-spending. A carrier would never agree to issue an electronic bill of lading if there is a chance of misdelivery that will result in liability.

4.4 CONCLUSION

In modern times it is easy to assume that technology can solve all practical problems that beset international commerce. Indeed, someone not familiar with the shipping industry would wonder why a document cannot be accepted in electronic form. But the bill of lading is a very special document, the product of centuries of commercial practice and case law. The three functions of the bill of lading are of vital importance for the role it plays in the carriage of goods. Its importance is so significant that the current practices cannot be impulsively changed without considering the consequences. The first step is to evaluate if modern technology can replicate the three functions of the bill of lading. The first two functions are admittedly easy to achieve. An electronic document can easily function as a receipt of the goods and evidence of the contract or carriage with simple integrity and signature protocols. It is the last function of the bill of lading, as a document of title, that has the legal community on attention for more than three decades. In the last years the sentiment finally starts to appear, that modern technology is able to solve this gordian knot of legal complexities and practical intricacies, as will be analyzed in the next chapters of this study.

5 New Technologies

The electronic bill of lading was created to facilitate international trade, because technology can overcome traditional barriers presented by geographic, linguistic, and cultural differences between trade partners²⁷⁶. At first it seemingly failed to replicate all the functions of the paper bill, especially as an instrument which represents the possession of the goods. Today, new technologies have changed the landscape. This chapter examines modern technology trends to eventually test their ability to achieve the same legal functions as the paper bill of lading and inspire trust in the market by overcoming practical challenges. More specifically, this chapter will start with a presentation of how closed centralized registries operate to issue and transfer electronic bills of lading in order to compare them with open decentralized registries that use blockchain technology. The basic concepts of blockchain and related technology will be illustrated to allow for a better understanding of its potential. Providers of electronic bill of lading services' way of operation will be discussed, in what superficially seems like a repeat of the industry standards mentioned above in this thesis. This is not the case, as what was presented before was a concise description of each service, while in this chapter there is a more in-depth analysis of the way they operate regarding the interaction of law and technology. Lastly, the practical issues concerning technology that hinder its adoption in the shipping industry will be presented in order to smoothly transition to the legal challenges resulting from new technologies in the next chapter. The goal of this chapter is to establish some basic knowledge of how electronic bills of lading systems can operate. The research question presented is what is the potential of new technologies in achieving functional equivalence and market confidence for the adoption of the electronic bill of lading?

5.1 CLOSED CENTRALIZED REGISTRIES

Before presenting the technologies that appeared in the shipping market in the last five years, it is deemed important to mention the well tried and tested system used since the 1990s, to be able to make comparisons between them. Therefore, prior to the invention of blockchain, centralized registries were the only way to achieve something that looked like functional equivalence to the traditional bill of lading. These registries employed two contractual devices to transfer legal rights -and transfer of control- under an electronic bill of lading²⁷⁷. First, they employed novation, which is intended to transfer the contractual rights and duties under the contract of carriage to a new contract between one of the original parties and a new contracting party, thus terminating the old contract²⁷⁸. The second device is attornment, through which it is acknowledged that someone other than the original bailor of the goods is now entitled to delivery even though no legal rights exist²⁷⁹. In this case the carrier by use of attornment agrees to pass the possession of the cargo to the new owner. These devices are

²⁷⁶ Christodoulou (n 16) 6.

²⁷⁷ Girvin and Ong (n 29) 198.

²⁷⁸ *ibid.*

²⁷⁹ *ibid* 199.

A simple way to understand attornment is through its use in real estate, where a tenant acknowledges the new owner of the property as the new landlord.

implemented through the Rulebook or Users' Agreement of these providers to help them achieve the same effect as a transfer of a document of title under English Law²⁸⁰. These techniques require the heavy involvement of these Registries and thus do not exactly mirror the easy and direct transfer of rights the paper bill of lading achieves. This is the reason why the "electronic bill of lading" they provide is not considered as "a real" bill of lading by a big portion of legal scholars.

5.1.1 BOLERO

BOLERO was founded in 1999 and is the only closed registry platform to have made the full details of its operation public because its Rulebook used to be freely available online. This means that much legal research and many legal arguments have been made to its model of operation. The way this platform works is that BOLERO established a "Core Messaging Platform", where the parties whose identities have been verified, can transmit documents between each other by following signature²⁸¹ and digital encryption protocols to secure them²⁸². The carrier basically transmits a message and requires the issuing of a BOLERO bill of lading. Once the identities have been verified, the Core Messaging Platform sends the bill of lading to the shipper and a confirming message to the carrier. These transmissions and especially the "holdership", are then recorded to the "Title Registry" to keep track of the chain of ownership. If the holder wants to transfer the electronic bill, a message must be sent through the Core Messaging Platform to verify the authenticity through the shipper's signature and through the Title Registry. If the system allows it, the Title Registry is updated. BOLERO's Rulebook also allows the electronic bill to be switched to a paper bill of lading.

There are several issues with BOLERO. First, the system has to acknowledge each new transaction meaning that the electronic document is not independently negotiable. According to Goldby, this means that a new contract with the same terms replaces through novation the old contract, that is terminated and extinguished²⁸³. This way privity of contract problems are avoided. But, Todd, is of the opinion that although this process has been described as novation, it is not a conventional one. Because the BOLERO Rulebook sets out that there is a contractual nexus between all the members, all the parties of the transaction are already in a contractual relationship with each other²⁸⁴. This means that no old contracts are being terminated and no new contracts are being formed. Todd suggests seeing the novations as changes to the terms of the existing contracts²⁸⁵.

Another issue is that in order to cover for the different jurisdictions and lack of international harmonization, systems like BOLERO produce Rule Books that their members must follow and tailor their business around, which can be legally challenging and expensive²⁸⁶. There is the argument that because these documents are not literally possessable, the holder of such bill does not hold the

²⁸⁰ *ibid* 200.

²⁸¹ The messages are signed using the sender's private key and encrypted using the Core Messaging Platform's public key.

²⁸² Goldby (n 66) 336.

²⁸³ *ibid* 154.

²⁸⁴ Todd (n 67) 359.

²⁸⁵ While this is not an issue in a closed system, in an open system it poses a genuine question.

ibid.

²⁸⁶ Goldby (n 66) 329.

constructive possession of the goods either²⁸⁷. The negotiability of the bill is also challenged because a transfer demands the heavy involvement of a third party closed registry to verify it. There is also no case law about BOLERO's Rule Book and how it is interpreted which creates uncertainty in litigation²⁸⁸.

BOLERO was set up in 2000, and its vision was considered too advanced for the time²⁸⁹. It was not as successful as expected, the reason being the lack of support by large shipping carriers, banking and insurance institutions. This is due to the fact that the BOLERO bill of lading would most likely not be recognized as a bill of lading according to international conventions and various domestic legislations²⁹⁰. For example, the Law Commission of England and Wales observed that the BOLERO bill of lading is not actually a bill of lading²⁹¹. Even though all three functions of a paper bill of lading can be achieved, they are not true equivalents because the participation of the carrier and the registrar are required in each transaction, whereas a true equivalent would not. This is why in their Report, the Law Commission of England and Wales suggests that the most accurate way to refer to such electronic documents is "electronic contracts for carriage" instead of "electronic bills of lading".

5.1.2 Essdocs

essDocs (previously known as ESS-DatabridgeTM and now as ICE Digital) was piloted in 2005 and launched in 2010 to promote electronic alternatives to shipping documents especially in used for oil and gas transportation²⁹². Because it came after the pioneering work of BOLERO, essDocs was more prepared to meet the practical challenges of paperless trade, choosing to advertise to big markets with few players, like the energy trade²⁹³. Its strategy is the reason for its rapid success, with its annual growth at a rate of about 22%²⁹⁴. A crucial feature that promoted the success of the platform is that the electronics bills of lading produced are visually identical to the paper documents, creating a sense of familiarity to its users²⁹⁵. The shipper fills the fields of the bill and releases it to the carrier for its signature. The carrier will receive a notification to review the document and then sign it. Before signing it, a legal warning appears to notify the importance of the signature and the applicability of the Databridge Services & Users Agreement of the platform. It is the system's policy to show a legal notice before any action is taken regarding the electronic document²⁹⁶. When the bill of lading is signed by the carrier, the bill is released. If the holder wants to indorse it electronically, there is an indorsement "stamp" in the "back" of the electronic bill, and a tradelog that shows the document's

²⁸⁷ Huiru Liu, 'Blockchain and Bills of Lading: Legal Issues in Perspective' in Proshanto K Mukherjee, Maximo Q Mejia and Jingjing Xu (eds), *Maritime Law in Motion*, vol 8 (Springer 2020) 423.

²⁸⁸ Russell (n 19) 15.

²⁸⁹ Goldby (n 66) 338.

²⁹⁰ Francesco Munari, 'Blockchain and Smart Contracts in Shipping and Transport: A Legal Revolution Is about to Arrive?' in Barış Soyer and Andrew Tettenborn (eds), *New Technologies, Artificial Intelligence and Shipping Law in the 21st Century* (Informa Law from Routledge 2020) 11.

²⁹¹ 'Electronic Commerce: Formal Requirements in Commercial Transactions' (Law Commission) 24.

²⁹² Goldby (n 66) 338; Girvin and Ong (n 29) 198.

²⁹³ Goldby (n 66) 339.

²⁹⁴ *ibid.*

²⁹⁵ *ibid* 341.

²⁹⁶ *ibid.*

past movements²⁹⁷. The system achieves negotiability of the bill of lading by limiting the access to it only to one party, who holds the control over the document. When the bill is endorsed, this exclusive control is transferred to the transferee.

5.2 OPEN DECENTRALIZED REGISTRIES: BLOCKCHAIN

Blockchain, founded in 2008 by Satoshi Nakamoto, is a type of Distributed Ledger Technology ('DLT'). These two are related concepts, yet while all blockchains are DLTs, not all DLTs are blockchains. DLT is a decentralized p2p digital system that records transactions in multiple places at the same time. This means that it is maintained by a network of computers, that perform on certain protocols written in code. As for the "decentralized" part, it means that the information is stored in multiple copies on multiple servers which are connected to a common network, without the existence of one controlling party. In contrast, a traditional centralized system is one where there is one party, like a bank or a government body, that controls the ledger by recording, validating, and authenticating the transactions. The lack of reliance on a centralized register in blockchain is considered an incredible advantage²⁹⁸. In DLT, all the servers or computers in a system -that are called nodes- hold a synchronized ledger²⁹⁹, ensuring that the information stored in it cannot be tampered with. If one attempts to tamper with data, the other synchronized nodes compare the information and contradict it.

Blockchain was created to provide a secure platform for transactions, without the use of an intermediary, such as a bank³⁰⁰. As a type of DLT, it does what is described above, only that it structures its data in "blocks" that are "chained" in an unbreakable link on chronological order³⁰¹. Each block contains information such as the list of transactions and very importantly, the cryptographic hash of the previous block, which ensures that the chain containing the transaction history cannot be altered. The security of the system is guaranteed because a new block is only verified if all nodes of the network can confirm it is valid. The only trust needed is when a user enters the actual data of information on the block³⁰². This system prevents double-spending of digital currencies and tokens (and thus bills of lading), since each one has a unique identity, in a fully transparent and unchangeable audit trail³⁰³.

To give an example, when a transaction is entered into the blockchain, it is transmitted to the p2p network that is scattered around the world. The transaction is confirmed by the algorithm that sets the applied protocols and after the approval it gets clustered into "blocks". Finally, the blocks are

²⁹⁷ *ibid* 342.

²⁹⁸ Russel (n 24) 17.

²⁹⁹ A ledger is a registry, named after the ledger, used in accounting, where if something is entered into it, it cannot be changed.

³⁰⁰ Grant Hunter, 'Smart Contracts: The BIMCO Experience' in Bariş Soyer and Andrew Tettenborn (eds), *New Technologies, Artificial Intelligence and Shipping Law in the 21st Century* (Informa Law from Routledge 2020) 17.

³⁰¹ Other DLT technologies do not store data in a chain sequence. For example, Hedera Hashgraph uses Directed Acyclic Graph ('DAG') instead of blockchain, and records in a parallel way, making it potentially faster than blockchain. Iota also uses DAG and is designed for Internet of Things applications without the use of mining. Corda for finance institutions uses a shared ledger that shares data only when a party needs it, unlike blockchain where all nodes have equal access to a ledger.

³⁰² 'Blockchain Facts: What Is It, How It Works, and How It Can Be Used' (*Investopedia*) <<https://www.investopedia.com/terms/b/blockchain.asp>> accessed 14 September 2024.

³⁰³ Hunter, 'Smart Contracts: The BIMCO Experience' (n 300) 18.

chained together creating a history of transactions that cannot be altered because of the cryptographic hashes. Usually, a block is not considered confirmed until five other following blocks are validated (which can take up to one hour, so about ten minutes per block)³⁰⁴.

5.2.1 Key features of Blockchain

5.2.1.1 Decentralization

Registry and token systems both rely on a trusted third party to ensure the security of the system³⁰⁵. The difference is that systems based on blockchain technology remove third-party intermediaries such as brokers and banks and rely on transfer of tokens among participants³⁰⁶. There is no central authority in blockchain. The network consists of nodes that work together and process the same copy of the ledger. One of the advantages is that the p2p trade enables everyone to operate in this environment, without having to subscribe to a centralized system like BOLERO. Moreover, without central authority, the speed of transactions is improved and the costs associated with such services reduced. Decentralization also comes with advantages such as the elimination of human error, less instances of hacking attacks because there are no single points of failure, reduced concern over censorship from the administrator or governments etc.³⁰⁷

5.2.1.2 Transparency

Blockchain is transparent because the ledger is distributed, and the data stored is visible to anyone who has access to the network. In a network, each user has a unique address that is able to identify them and trace back any change. This means that it is a system resistant to fraud and corruption, since all the nodes have access to the information. Of course, the network can be either public where anyone can have access to it, or private, where private cryptographic keys are used to access it³⁰⁸. In the case of the electronic bill of lading, if the bill is to be indorsed, the party who takes possession of the bill can access it by using a private key that gives them exclusive control over the bill of lading³⁰⁹.

In the shipping industry, transparency is not only a matter of the supply chain that wishes to keep a close eye on the cargo, but also of compliance with domestic and international rules regarding illegal activities such as smuggling and trafficking, handling of counterfeit products, and environmental violations³¹⁰. Blockchain can be used to monitor the supply chain in real-time, which can benefit all the entities involved in a transaction because high transparency often leads to higher accountability.

³⁰⁴ 'Blockchain Facts: What Is It, How It Works, and How It Can Be Used' (n 302).

³⁰⁵ Pejović (n 18) 222.

³⁰⁶ Liu (n 287) 418; Pejović (n 18) 222.

³⁰⁷ Takahashi (n 90) 206.

³⁰⁸ Liu (n 287) 418.

³⁰⁹ Koch (n 37) 56.

³¹⁰ Liu (n 287) 429.

5.2.1.3 Immutability

Another key feature of blockchain technology is that it reduces replication of data and provides a permanent and unalterable audit trail³¹¹. The recording is permanent and in chronological order. Once a transaction is approved by the nodes as valid because of the consensus algorithm³¹², the record is irreversible and cannot be tampered with because of the chain³¹³. The chain is made of links between the blocks that are called “hashes”³¹⁴ or “digital fingertips”. Hashes are the essence of the immutability feature, because if a block is altered a new hash is produced which makes the block no longer valid³¹⁵. This means that it is impossible to alter an entry in the ledger without the network noticing, because the tampering would have to occur simultaneously in all the participants’ ledgers. This can be utilized to enable the possession of a document of title in a way that older technology could not achieve. Because the blockchain-based bill of lading is a unique token, it can be possessed and transferred in the same sense that a paper bill can.

5.2.1.4 Tokenization

Value or tradeable assets in blockchain are represented by “tokens”. For example, cryptocurrency like Bitcoin, used for purchasing goods and services, is a “utility token”. On the other hand, a “security token” is one that represents ownership of an actual asset, like a bond, a stock, or even a car³¹⁶. This means that the blockchain based bill of lading is a utility token that is issued by the carrier instead of a paper bill³¹⁷.

5.2.1.5 Security

Another benefit of the public blockchain technology is the infamous unhackability and security it provides³¹⁸. Before the development of blockchain technology bills of lading, both paper and electronic ones were easy to copy. A simple file like .pdf can be copied and distributed to an infinite number of people. The bill could also be tampered with, the contents of it changed, something that strikes the function of being a receipt of the goods acting as prima facie evidence for its contents. According to this function, the carrier is estopped from denying the contents of the bill. This regime is not perfect, but the combination of all the previously mentioned features of blockchain guarantee that the data cannot be altered, which provides a better contractual regime³¹⁹. Decentralization secures the network against cyber-attacks. In cases of human error, i.e. when the information appearing on a

³¹¹ Hunter, ‘Smart Contracts: The BIMCO Experience’ (n 300) 18.

³¹² Blockchain has a consensus algorithm running at the core of the network, that allows the nodes to reach a validating agreement quickly and without bias. Without such algorithm, the blockchain network loses its value.

³¹³ Jung-Ho Yang, ‘Applicability of Blockchain Based Bill of Lading under the Rotterdam Rules and UNCITRAL Model Law on Electronic Transferable Records’ (2019) 26 Journal of Korea Trade 113, 118.

³¹⁴ All the records added to the network are also hashed cryptographically.

³¹⁵ Liu (n 287) 418.

³¹⁶ ‘Cryptocurrency Security Token: Definition, Forms, and Investment’ (*Investopedia*) <<https://www.investopedia.com/terms/s/security-token.asp>> accessed 14 September 2024.

³¹⁷ Takahashi (n 90) 204.

³¹⁸ There are hacking instances that have resulted in billions of losses in cryptocurrencies, but in general, blockchain is considered a secure system.

³¹⁹ Todd (n 67) 353.

mate's receipt is not consistent with the information on the bill of lading, a blockchain-based bill of lading can be very useful in locating the exact details of the discrepancies due to the transparency and immutability features³²⁰. Especially when a blockchain network is private, there is an even higher level of security because permission is required to enter it. This, combined with built-in cryptographic protection and private keys that belong to specific individuals when signing into each transaction, means that the bill of lading can be tamper-proof³²¹.

5.2.2 Complementary technology

5.2.2.1 Smart Contracts

Smart contracts are a technology from the 1990s, that is now thriving because of its application in blockchain systems³²². Their inventor, cryptographer Nick Szabo, defined them as “*a computerized transaction protocol that executes the terms of a contract*”³²³. Because these protocols are implemented through computer programs, they are “smarter” than their paper-based ancestors³²⁴. It must be noted in this part that smart contracts and AI are not related, a common misconception because of the word “smart” in “smart contracts”.

To further explain this technology, a smart contract is a self-executing program that automates -blockchain- transactions without intermediaries' or time loss³²⁵. The written commercial contract is “translated” into coded instructions that respond to “trigger” events³²⁶. Unlike a traditional contract, a smart contract not only contains the terms and conditions, but also automatically enforces the obligations set in place. A type of smart contract, the “Ricardian contract³²⁷”, is a contract which exists in two identical versions, the written version and the informatic version (the smart contract)³²⁸. In this case, the off-chain legal agreement is executable on the chain³²⁹.

To bring a simple example of a smart contract in marine insurance, the smart contract can instruct for the automatic payment of the assured when the insured risk comes to be³³⁰. All the negotiations and actions of the parties are recorded and approved by the blockchain's protocols, which enables the contract to be performed. In the context of the bill of lading, the paper bill can be coded into the smart contract under which the goods are carried by sea³³¹. Then the carrier can issue the token in the form of this smart contract. The smart contract in this case can stipulate for example, that

³²⁰ Liu (n 287) 429.

³²¹ *ibid* 430.

³²² The Ethereum open source blockchain was launched in 2015 and enabled the creation and execution of smart contracts.

³²³ Munari (n 290) 4; Todd (n 67) 363.

³²⁴ Munari (n 290) 4.

³²⁵ Erika Rasure and Suzanne Kvilhaug, ‘What Are Smart Contracts on the Blockchain and How Do They Work?’ (*The Investopedia*) <<https://www.investopedia.com/terms/s/smart-contracts.asp>> accessed 20 July 2024; Mehdi El Harrak, ‘Do Smart Contracts Need New Conflict-of-Laws Rules?’ in Andrea Bonomi, Matthias Lehmann and Shaheez Lalani (eds), *Blockchain and Private International Law*, vol 4 (Brill Nijhoff 2023) 480.

³²⁶ Hunter, ‘Smart Contracts: The BIMCO Experience’ (n 300) 18.

³²⁷ Its name is a tribute to David Ricardo, a British political economist who contributed to the theory of international trade in the 19th century.

³²⁸ El Harrak (n 325) 483.

³²⁹ *ibid*.

³³⁰ Liu (n 287) 419.

³³¹ *ibid*.

if the receiver is the actual holder of the bill, then they are entitled to receive the goods³³². In centralized systems like BOLERO, smart contracts can deal with the issue of novation, by triggering the offer of a new contract by the carrier³³³. A system that can support successive novations is also in accordance with the CMI Rules, published 30 years ago³³⁴. This is a prime example of blockchain and smart contracts managing to achieve what technology could not in the past decades. By marrying blockchain based bills of lading with smart contracts, efficiency can be improved, and transactions costs can be reduced because of less negotiations, which can lead to wider adoption of the electronic bill of lading³³⁵. But, despite this technology thriving today, smart contracts are less than a perfect solution and come with various legal issues, as will be analyzed later in this study.

5.2.2.2 *Private Keys*

Another technology that is connected to the blockchain-based bill of lading is the use of private keys that give access to the bill and thus awards the holder with the much important concept of “exclusive control”, that is mentioned in the Rotterdam Rules and the MLETR, as analyzed previously. In most jurisdictions, some form of possession is required to be able to transfer property rights³³⁶. In the past, the difficulty lay in the fact that there was no way to electronically replicate the function of the bill of lading as a document of title that renders constructive possession of the goods. With blockchain, this is achieved by tokenization and the ability to have exclusive access and control over the token with private keys. In other words, the holder of the private key has exclusive control over the electronic bill of lading³³⁷. This way, functional equivalence to the possession of the paper bill of lading is finally achieved.

5.2.2.3 *Electronic Signatures*

A real electronic signature is not a picture of a signature attached to an electronic file. A picture of the signature of a person is called a facsimile, which is accepted as a way to sign electronic bills of lading per Art. 14 (3) of the Hamburg Rules if the law of the country where the bill is issued allows it. Facsimiles are appropriate to use for simple tasks but in commerce they pose a problem for the receiver because it is not possible to determine if the right person actually signed the document³³⁸. A real electronic signature provides assurance to the receiver that the signature indeed represents a legally binding commitment, in an even more secure way than a conventional handwritten signature because it cannot be copied, and it is linked to the person’s identity³³⁹.

Electronic signatures and private keys are related because of the use of asymmetric encryption. Asymmetric encryption involves two sets of keys, a public key used for encryption and a private decryption key to convert a message to its original readable form. In electronic signatures the private

³³² *ibid* 421.

³³³ Todd (n 67) 368.

³³⁴ *ibid.* references Goldby.

³³⁵ Russell (n 19) 17.

³³⁶ Takahashi (n 90) 208.

³³⁷ *ibid* 207.

³³⁸ Erik Røsæg, ‘Electronic Signatures in Shipping Practice’ in Bariş Soyer and Andrew Tettenborn (eds), *New Technologies, Artificial Intelligence and Shipping Law in the 21st Century* (Informa Law from Routledge 2020) 36.

³³⁹ *ibid.*

key is used to securely sign a document, and the corresponding public key is used by the other party to verify the authenticity of the signature. To put it in simpler words, the two processes involved are the digital signature creation and the digital signature verification.

An electronic signature can be verified in all copies of a document, and as it is, no copy has a special status as an original³⁴⁰. In this context, an original and unique bill of lading must be produced using other techniques and not just by using an electronic signature. The electronic signature does not prevent the bill from double-spending because the endorser can send the document with valid electronic signatures to many people.

Art. 38 (2) of the Rotterdam Rules requires the use of electronic signatures by the carrier. The Master of the ship electronically signs the bill of lading (or any other transport document) containing all necessary information and statements. Then the document is stored along with its signature in a registry according to its protocols. Blockchain specifically, overall extends the usefulness of electronic signatures, especially regarding the transfer of transport documents, since the other parties can use the public key to verify the authenticity of the document without the need for intermediaries³⁴¹.

Another solution that the electronic signatures offer in the context of the electronic bill of lading is to solve the problem of identifying both the endorser and the endorsee of the bill of lading. First, the identity of the issuer of the document can be detected because only the person with the private key can create the electronic signature matching to the public key. This means that anyone with the public key can verify the identity of the issuer. Then, the identity of the rightful holder of the bill can also be proved because only the holder of the private key can decrypt the document sent by the sender. These two functions mimic the essential function of a negotiable bill of lading³⁴². Just as a paper bill of lading transfers constructive ownership through signatures and physical possession of the bill, electronic signatures and encryption also allow the same functions to exist digitally.

5.2.3 Blockchain-based bill of lading providers

5.2.3.1 EdoxOnline

EdoxOnline requires enrolment and the parties hold two factor authentication private keys. The use of these private keys is required for actions in the system. The shipper and the carrier collaboratively fill the bill of lading, which is then approved by the carrier, signed and released to the holder using the private key³⁴³. There can be only one holder of the bill at the time. There is also a system to change the medium from electronic to paper form. One very significant tool of the platform is that it allows other parties like customs brokers, maritime agents, state authorities etc., to log in and obtain information regarding the status of the cargo, enhancing interoperability processes³⁴⁴.

³⁴⁰ *ibid* 39.

³⁴¹ *ibid* 41.

³⁴² *ibid* 45.

³⁴³ Goldby (n 66) 343.

³⁴⁴ *ibid*.

5.2.3.2 WaveBL

WaveBL's usage license is free, meaning that a user can receive documents and transfer them free of charge and without having to register or undergo any screening process. Any information required is for billing purposes, when a document is issued, which is a chargeable action³⁴⁵. As a blockchain based system, it is a decentralized network without central registry like BOLERO and essDocs. Because there is no such registry, the users of Wave are required to exchange contact information outside of Wave before they can transact. Wave has implemented a security process to make sure that the two parties have connected and proceed with the exchange of documents without mistakes³⁴⁶. The bill of lading is issued by the carrier's system and then exported to the carrier's Wave application³⁴⁷, so the possession can be transferred to the holder according to the shipper's instructions. Wave basically acts like an electronic courier between the parties. It provides its users with two kinds of electronic signatures, one standard and one blockchain (timestamp) signature³⁴⁸. The data is transmitted through a p2p transfer without going through Wave's server, because Wave does not want to act as an intermediary to the information. The blockchain technology just records the transaction happening. Wave's intention is to mirror the paper document's ability to be transferred without a central registry controlling the action.

5.2.4 International legal framework for the blockchain-based bill of Lading

Takahashi, in 2016, was one of the first legal scholars to predict and legally analyze the possible application of a blockchain-based bill of lading, long before it was a reality³⁴⁹. According to him, a blockchain-based bill of lading will not flourish unless there is support from the applicable legal systems, and currently there is an absence of a good international legal infrastructure³⁵⁰. Private agreements can only go so far because even if the parties have agreed to treat the electronic bill of lading as equivalent to the paper bill, this agreement does not bind third parties. This creates great legal uncertainty.

When the Rotterdam Rules were drafted in December 2008, blockchain technology was still in its infancy, conceived by Satoshi Nakamoto in 2008 and launched in January of 2009. There was no way the Rotterdam Rules could predict blockchain application to electronic transport documents. The MLETR on the other hand was in the works since 2011 and adopted in 2017, on the cusp of the realization that blockchain can be a groundbreaking technology used in sectors other than cryptocurrency. DLT was thus explicitly mentioned in the Model Law's explanatory notes where it is stated that the law should not discriminate between different technologies and systems, enabling the use of various models no matter if they are operating as a registry or distributed ledger or any other technology³⁵¹.

³⁴⁵ *ibid* 351.

³⁴⁶ *ibid*.

³⁴⁷ Per Wave's User Agreement, it is up to the issuer to ensure there are no inconsistencies between the visual appearance of the uploaded document and the designation on Wave.

³⁴⁸ Goldby (n 66) 351.

³⁴⁹ Takahashi (n 90) 202.

³⁵⁰ Takahashi (n 23) 496.

³⁵¹ United Nations (n 124) para 18.

Both the Rotterdam Rules and the MLETR have maintained the principle of technological neutrality to achieve functional equivalence³⁵². This is why blockchain technology is not explicitly mentioned as a solution in the MLETR, but that does not in any way mean it cannot be applied. There is only the condition that the technology chosen by the parties is able to achieve the functional equivalence of the electronic document to its paper counterpart.

There are criticisms over the combination of the model of functional equivalence and the principle of technological neutrality, that the Rotterdam Rules set³⁵³. There is a significant range between what is considered a secure system and what is not. For sure, to ensure authenticity, encryption is required, but who determines the level of it? Requirements can also change with time and circumstances. While the Rotterdam Rules could do with a more objective view of what should be required, the MLETR's approach is considered fuller³⁵⁴. While the Model Law also follows the model of functional equivalence, at least Art. 12 sets out a general reliability standard, that is based not explicitly on party autonomy but can include operational rules and industry standards³⁵⁵. Todd is of the opinion that the law should stipulate how secure a system can be and what factors are to be taken into account when choosing a system, and not leave it exclusively to party autonomy³⁵⁶.

In the next sub-chapters, the legal challenges arising using blockchain -and other- technology will be explored, with mention on how the Rotterdam Rules and the MLETR deal with issues like exclusive control over the electronic bill of lading. More specifically, blockchain can be used in Chapters 3 and 8 of the Rotterdam Rules, as well as chapter 10 about the right of control, and chapter 11 about the transfer of rights. Once all these requirements are satisfied, the provisions of the Rotterdam Rules would apply to the electronic bill of lading, because it allows the electronic bill to function as a document of title, when other technologies failed, and there is thus functional equivalence by using it³⁵⁷.

5.2.4.1 Exclusive Control

Both the Rotterdam Rules and the MLETR treat the exclusive control of the electronic record as equivalent to the possession of a traditional transferable document, because both “exclusive control” and “physical possession” fulfill the function of guaranteeing uniqueness. More specifically, Art. (9) of the Rotterdam Rules sets out that the use of a negotiable electronic transport record is subject to procedures that must provide for some minimal requirements. Art. 9 (1) (a) and (c) essentially specify that the chosen technology should provide exclusive control over the electronic record. Art. 11 (1) (a) of the MLETR also requires exclusive control over the electronic transferable record. Blockchain can certainly cater to this requirement since a token (in this case the bill of lading) is subject to exclusive control of the holder of the private key corresponding to the address of the location of the token³⁵⁸.

The uniqueness of the tokenized bill of lading is ensured as well. This was the biggest challenge with electronic records in the past, because they were easily copied, and many

³⁵² Takahashi (n 90) 207.

³⁵³ Todd (n 67) 370.

³⁵⁴ *ibid.*

³⁵⁵ *ibid.*

³⁵⁶ *ibid* 371.

³⁵⁷ Takahashi (n 90) 207.

³⁵⁸ *ibid* 208.

indistinguishable duplicates were created. Blockchain technology has made it possible to reach consensus on a version of an electronic record on a decentralized platform. This way, a bill of lading produced as a token in a blockchain network, is guaranteed its uniqueness and is subject to the exclusive control of the holder of the private key, so no more than one person can claim the same token³⁵⁹. In other words, whoever holds the private key has “possession” of the electronic bill of lading. Of course, this technology does not guarantee that the person who holds the key is the rightful holder of the bill, who is entitled to claim the delivery of the goods³⁶⁰. This is determined by the applicable law. Takahashi brings the example of a stolen private key and the transfer of the blockchain based bill of lading to a bona fide third party. This is a matter for the applicable law to decide. But his brings the study to the next issue, the identification of the holder of the bill.

5.2.4.2 Identity of the holder

The identification of the holder per Art. 9 (1) (c) of the Rotterdam Rules and Art. 11 (1) (b) of the MLETR can be achieved through the blockchain ledger as well. The public blockchain ledger displays the addresses where the tokens are kept. Usually, the holders of tokens like cryptocurrencies, use pseudonyms, meaning that they don’t display their real-life identities and the private keys that correspond to their addresses are kept secret³⁶¹. This is not an issue in a permissioned blockchain ledger, where access is only allowed to identified members, which will eventually require the intervention of intermediaries -like governments or banks- to ensure the validity of it.

It is noteworthy to mention in this part, that a blockchain system can indeed allow the holder of the tokenized bill of lading to activate the delivery of the goods without revealing its name, acting like a bearer bill of lading³⁶². The Rotterdam Rules do not make a distinction between order bills and bearer bills when defining the functions of the bills of lading in Art. 9, so this is considered possible. It is up to the will of the parties to decide what type of bill of lading they wish to issue³⁶³. But, if a tokenized bill of lading is indeed transferred between anonymous users, there will be no legal action available to a victim of fraud³⁶⁴.

5.2.4.3 Integrity

According to Art. 9 (1) (b) of the Rotterdam Rules and Article 10 of the MLETR, the electronic bill of lading should keep its integrity. This can be read in conjunction with Art. 38 (2) of the Rotterdam Rules that requires the use of electronic signatures by the carrier. A blockchain-based bill of lading is, as discussed, more resistant to tempering than other types of bills. The identification of the holders can be authenticated by electronic cryptographic signatures in the blockchain system. Blockchain technology especially promotes the usage of digital signatures and cryptography for transactions, so

³⁵⁹ Takahashi (n 23) 495.

³⁶⁰ Takahashi (n 90) 209.

³⁶¹ *ibid.*

³⁶² A bearer bill of lading is a type of bill of lading where whoever physically possesses the document is the holder of the bill, without specifying a named consignee.

ibid 210.

³⁶³ *ibid.*

³⁶⁴ Cachard (n 128) 37.

this requirement is fulfilled. Electronic signatures are more secure than handwritten ones. The digital signature also ensures the immutability of the record in the ledger, another function that cannot be replicated manually.

5.2.4.4 Indorsement

From the Latin word “dorsus” which means “back”, this is a business practice of annotating in writing on the back of the document the instruction the obligation to be performed “to order”. An electronic bill of lading does not have a “back”, but the term “electronic indorsement” is used in practice to signify the change of possession of the document of title. The transfer of the electronic transport record according to Art. 9 (1) (a) of the Rotterdam Rules and Art. 10 (1) (a) of the MLETR in practice means the transfer of the exclusive control (Art. 11 of the MLETR) over the document. It can be achieved in blockchain systems through an anti-double spend protocol and a verification process, as already explained previously³⁶⁵. For the indorsement to work properly, the platform operator should also include a feature for the receiver of the electronic bill of lading to accept or reject the transfer³⁶⁶. In the CMI Rules, Rule 7 (c) also provides that if a new holder does not accept the right of control and transfer then the transfer of the bill does not take place. The ability to accept or reject a transfer is an important feature. In a practical example, essDocs has in place a system of acceptance and legal notices for the transfer of the electronic bill of lading³⁶⁷.

5.2.4.5 Termination

Art. 9 (1) (d) of the Rotterdam Rules deals with the confirmation of delivery to the holder that results in the termination of the validity of the document. This can be easily done in a blockchain system through procedural protocols ensuring that the electronic bill of lading is now spent. The blockchain system can also ensure through procedures that the electronic form of the document ceases to be when it is switched into paper form as well, per Article 10 (2) (b).

5.3 PRACTICAL ISSUES

There are numerous challenges to new technologies. Before analyzing the legal challenges that appear due to new technologies in the next chapter, it is important to also consider various practical factors that act as obstacles for the implementation of the electronic bill of lading in the shipping industry³⁶⁸. The practical issues are well documented; the UN Trade and Development Organization (‘UNCTAD’) conducted a survey in 2003 to locate the biggest obstacles for the use of the electronic bill of lading

³⁶⁵ Goldby (n 66) 354.

³⁶⁶ Girvin and Ong (n 29) 206.

³⁶⁷ Pejović (n 18) 231.

³⁶⁸ According to Goldby, the obstacles of electronic trade documents are lack of confidence, uncertainties regarding risk and liability, absence of uniform standards, absence of technological infrastructure especially in developing countries, governmental requirements and different jurisdictions, big number of participants involved in an international transaction, and the involvement of network service providers and certification authorities.

Goldby (n 66) 1–2.

in the market³⁶⁹. It is important to keep in mind that this survey was conducted on closed registry systems. The data revealed that 51% of the responders considered the infrastructure of the market insufficient and the trading parties not being ready enough to adopt the electronic bill. 44% of the respondents thought that the legal framework is not clear enough or adequate enough to promote the use of electronic bills. 25% thought that electronic equivalents are not sufficiently secure, 10% that there are confidentiality concerns in closed registry systems, and 12% that the switch to an electronic environment is too costly. 21 years later, this survey still highlights the more common obstacles hindering the adoption of the electronic bill of lading. Blockchain technology has certainly improved aspects of security, confidentiality, and infrastructure, but there is still legal uncertainty regarding the legal framework of the electronic bill of lading and various practical concerns.

5.3.1 The membership barrier

Before the appearance of blockchain technology, the way to guarantee the security and the uniqueness of the electronic document was through closed registry systems. These intermediary systems have their drawbacks. Usually, they are many formalities, and they are very costly to gain access to as a member³⁷⁰. A system should be user-friendly and reliable, with clear conditions that its users will be required to comply with³⁷¹. A closed system is also accessible only to its members, which means that for the parties that do not wish or are unable to join³⁷², a paper bill of lading would have to be produced nevertheless³⁷³. In the 2003 survey by UNCTAD mentioned in this chapter, the biggest reason for the reluctance to turn to the electronic bill of lading was revealed to be the lack of companies wishing to join a closed registry system because the investment might not benefit them due to the necessity of registration for all parties involved³⁷⁴. For this system to succeed a big wave of registrations should be reached, something that hasn't happened yet³⁷⁵.

5.3.2 Interoperability

Interoperability is the capacity of computer systems to exchange information between them³⁷⁶. This can be a challenge both from a private-to-private service providers perspective, and from a private-to-public entities perspective. Regarding the providers of electronic bill of lading services connecting with each other, if they choose to operate using a public blockchain system, then there is seamless flow of information. Electronic bill of lading providers usually chose private or permissive blockchains for their security features, like those built by IBM³⁷⁷. This immediately creates issues of interoperability, because the lack of standards between systems can lead to problems communicating

³⁶⁹ Report by the UNCTAD secretariat, 'The Use of Transport Documents in International Trade' (United Nations Conference on Trade and Development 2003) para 79.

³⁷⁰ Goldby (n 66) 329.

³⁷¹ *ibid* 398.

³⁷² This tends to involve developing countries.

ibid 330.

³⁷³ *ibid*.

³⁷⁴ *ibid*; Report by the UNCTAD secretariat (n 369) para 78.

³⁷⁵ Takahashi (n 90) 205.

³⁷⁶ Girvin and Ong (n 29) 219.

³⁷⁷ Hunter, 'Smart Contracts: The BIMCO Experience' (n 300) 18.

with one another³⁷⁸. Ideally, an electronic asset should be transferred between two or more systems while consistently maintaining its characteristics³⁷⁹. This is why new contractual clauses must be created, to stay ahead of the issue³⁸⁰. There must be sufficient monitoring of the developments in blockchain technology in regards to legal issues to ensure that identity authentication and privacy protection will be maintained in all interacting systems³⁸¹.

The second challenge regarding interoperability, is if and why governmental agencies must be involved. It is not only beneficial, but probably also necessary, for government authorities to set up a unified platform to process electronic trade documents, because if agencies like customs authorities do not accept electronic bills due to not having authorized the use of such technology, then the shipping sector will only view digitalization as an obstacle. For example, Singapore's TradeTrust framework to promote the electronic bill of lading and deal with issues of interoperability, legal framework, and standards is a prime example of a state taking steps towards paperless trade and confronting the practical challenges of electronic commerce³⁸². South Korea has also established the e-B/L Korea platform where the electronic bill of lading has to be registered in this quasi-public registry operated by the state³⁸³.

It is important to not forget while examining this issue that the shipping industry does not exist in a vacuum. It is one of the many sectors of the maritime industry, which in turn is a part of the greater international commerce regime. For the electronic bill of lading to be a reality, the whole sector that includes finance, insurance, governments etc., should be able to accommodate paperless trade³⁸⁴. For example, a letter of credit should be compatible with an electronic bill of lading, meaning that a banking institution must be prepared to accommodate the request.

5.3.3 Market mistrust: System malfunction and data leaks

Companies are worried that in a chance of system malfunction or hacking attempt, there will be loss of business information and trade secrets. Central registries like BOLERO and essDocs have been historically distrusted because the operators of these registries have immense power over the members' information. In public blockchain systems there is also the possibility of loss of confidentiality of information, which is why most blockchain-based bill of lading providers enhance their networks with extra security features. Even on a permissioned private blockchain, the power the central body can be reduced, and the level of decentralization can help merchants to overcome their mistrust of central registries³⁸⁵.

³⁷⁸ *ibid.*

³⁷⁹ Girvin and Ong (n 29) 219.

³⁸⁰ Takahashi (n 90) 207.

³⁸¹ Liu (n 287) 426.

³⁸² Girvin and Ong (n 29) 219.

³⁸³ Goldby (n 66) 332.

³⁸⁴ Koch (n 37) 58.

³⁸⁵ Todd (n 67) 363.

5.3.4 High costs of investment and maintenance

There are high costs involved with setting up a platform for the issuing and transferring of electronic trade documents, even a blockchain-based one. Closed centralized registries usually take out insurance cover to boost business confidence. essDocs for example has a liability cover for electronic risks like security breaches, up to 20 million USD per electronic bill of lading³⁸⁶. BOLERO provides up as well up to 30 million of indemnity insurance and cyber liability insurance³⁸⁷.

Beyond the investment in technology, and associated liability risks, there are also the incredibly high levels of energy blockchain demands to operate, as it was showcased in Chapter 2 of this study. Blockchain-based bill of lading providers wish to remain competitive by offering their customers a deal that will benefit them economically, compared to paper-based trade or closed registry providers. This means that it is difficult to balance the high operation costs of blockchain and provide a market product at a competitive price-point.

5.3.5 The example of TradeLens

Open electronic bill of lading systems are very difficult to implement. A prime example is TradeLens, the IG-approved blockchain platform developed by IBM and Maersk that was discontinued in 2023 due to various practical obstacles. First, there was limited industry adoption because companies were hesitant to join due to concerns about sharing data with competitors on blockchain. Secondly, there was lack of interoperability between the blockchain system and the other systems of the supply chain. Its goal to achieve global collaboration of all the agents involved in maritime logistics was characterized as “extremely ambitious”³⁸⁸. Lastly, there were high costs in maintaining the blockchain platform, which required significant investments from shipping companies. Especially with the rise of other blockchain platforms that offer bill of lading services, Maersk and IBM decided to cease TradeLens operations and shift towards other technologies like AI.

5.4 CONCLUSION

The Law Commission of the England and Wales observed in 2001 that technology might be capable in the future of providing a true electronic equivalent of a paper bill of lading, as in that time there was no working equivalent; not only that, but as they understood it, this was not likely to happen in the near future, neither there was market demand for such an equivalent³⁸⁹. As of 2024, the near future mentioned is long in the past. It is now supported by both scholars and practitioners of maritime law that blockchain and complementary technologies can offer the solution to a true equivalent of the paper bill of lading. Overall, the blockchain-based bill of lading seems to be the functional equivalent of the traditional bill, according to the Rotterdam Rules. The Rotterdam Rules might not be activated,

³⁸⁶ Girvin and Ong (n 29) 201.

³⁸⁷ Pejović (n 18) 219.

³⁸⁸ ‘Why Maersk and IBM’s Blockchain Platform TradeLens Is Closing Down’ (*PierNext*, 26 January 2023) <<https://piernext.portdebarcelona.cat/en/technology/the-closure-of-tradelens/>> accessed 18 September 2024.

³⁸⁹ ‘Electronic Commerce: Formal Requirements in Commercial Transactions’ (Law Commission 2001) para 4.8 <<https://lawcom.gov.uk/project/electronic-commerce-formal-requirements-in-commercial-transactions/>> accessed 10 September 2024.

but UNCITRAL'S Model Law is able to influence domestic legislation towards the direction of producing rules that make good use of the available technology.

In this chapter it was presented that emerging technologies like blockchain, smart contracts, and encryption are viewed as an opportunity to achieve market adoption of the electronic bill of lading. Blockchain especially, was a long-awaited breakthrough in the digitalization of the bill, by being adaptable to global trade and commerce and bringing out positive changes. As analyzed in this chapter, it solves a lot of legal and practical issues of the paperless bill of lading. For these reasons, there is a combined industry and government effort to develop these tools; Japan formed a consortium of 14 companies in 2017 to develop a trade data sharing platform using blockchain³⁹⁰. The Dutch Blockchain Coalition is a public-private partnership that promotes the use of blockchain across various sectors including shipping³⁹¹. In July of 2024 it was announced that the coalition will conclude at the end of this year with the objectives being met and a Report being made for the findings³⁹². The Port of Rotterdam's blockchain initiative produced DELIVER in 2019, a blockchain platform focused on digitizing shipping processes, the long-term results of which remain to be fully realized³⁹³.

To answer the research question posed in the beginning of this chapter, the potential of new technologies is now widely realized by both governments and the market itself. The view of this study is that blockchain will be the main facilitator in the adoption of the electronic bill of lading because it has the potential to render it an equivalent to the paper bill. This is why new blockchain-based bill of lading providers keep appearing and getting approved by the IG. Due to blockchain's key features many legal and practical issues that kept the shipping industry from adopting the electronic bill have been resolved. This is why this study is of the opinion that once technical feasibility has been established and proven, the electronic bill of lading will eventually be recognized in the majority of nations. For now, there is still room for improvement and new legal considerations; it is always best for the law to be a step ahead of the issues created by new technologies.

³⁹⁰ 'NYK Joins "Consortium to Develop Trade Data Sharing Platform Using Blockchain Technology"' (*NYK Line*) <https://www.nyk.com/english/news/2017/20170906_01.html> accessed 6 September 2024.

³⁹¹ 'Dutch Blockchain Coalition' (*Blockchain*) <<https://dutchblockchaincoalition.org/en/>> accessed 28 September 2024.

³⁹² 'End in Sight for Dutch Blockchain Coalition' (*Cybersec* 365, 18 July 2024) <<https://www.cybersec-365.com/articles/end-in-sight-for-dutch-blockchain-coalition>> accessed 30 September 2024.

³⁹³ Miranda Wood, 'Samsung, Rotterdam Port, ABN AMRO Complete Blockchain Trade Test' (*Ledger Insights - blockchain for enterprise*, 1 July 2019) <<https://www.ledgerinsights.com/samsung-rotterdam-port-abn-amro-blockchain-trade-deliver/>> accessed 28 September 2024.

6 Emerging Legal Challenges

It has already been supported by this study that new technologies such as blockchain can resolve many problems that afflict the market-adoption of the electronic bill of lading. But new technologies bring to the surface new legal issues, a lot of times in unexpected ways. The main legal challenge of the electronic bill of lading to be the functional equivalent of the traditional bill has mainly been resolved by the use of technology, as described in the previous chapter. While technically possible, a legal point of view is also necessary. Blockchain might be able to replicate the most complex function of the bill acting as a document of title, but unless the established legal framework is compatible, there will be no progress³⁹⁴. According to Takahashi, it is the function as document of title that poses the biggest challenge, with the difficulty pinpointed to the law of property and to the challenge of the bill to maintain its uniqueness throughout its life cycle³⁹⁵. This is why this chapter begins with a discussion on property law and recognition of intangible assets and then with the issue of singularity. From then on, other imminent legal issues related to new technology will be discussed, such as cyber-security, governing law, jurisdiction issues, and the many legal challenges of smart contracts. In analyzing the legal challenges of the electronic bill of lading, we must remember that its issues are not only maritime law-related but related to private law in general³⁹⁶. This means that the proposed solutions must satisfy all the aspects of law where the electronic bill can be found. The purpose of this chapter is not to resolve these issues under one specific legal system; it is up to each country to regulate the electronic bill of lading and electronic documents in general. The purpose of this chapter is to raise points and place them in the broader international legal context as discussed in this study. The research question is evident: what are the emerging legal challenges relating to new technologies in the context of the electronic bill of lading and how can legal science help to address them?

6.1 PROPERTY LAW

The main legal issue concerning the electronic bill of lading starts with the simple admission that in traditional statutory definitions, the bill of lading is usually a physical piece of paper that can be signed, indorsed, and possessed³⁹⁷. In electronic documents, this is less of an emerging legal challenge, and more of a decades-old problem: the key feature of a document of title is that it bestows ownership to the holder, that passes with the physical transfer of the document. When ownership of the paper document equals constructive ownership of the goods themselves, the next logical question is if an immaterial electronic document that consists of binary data can be owned. If not, the function of the bill of lading as a document of title completely falls apart in the electronic bill of lading. The most important legal obstacle is the difficulty of the paperless document of title to be recognized as such by law³⁹⁸. Some scholars are indeed of the opinion that while the bill of lading became a document of title by the customary merchant law, this certainly cannot be said for the electronic bill of lading, as

³⁹⁴ Liu (n 287) 428.

³⁹⁵ Takahashi (n 90) 204.

³⁹⁶ Κωνσταντινίδης (n 261) 11. <Konstantinidis 11>

³⁹⁷ Aikens, Lord and Bools (n 2) 158.

³⁹⁸ Goldby (n 66) 3.

it has not been used long enough or widely enough³⁹⁹. Hence, this process cannot possibly be automatic, and the law must intervene and explicitly acknowledge this function in the electronic bill of lading.

Before the adoption of the new Electronic Trade Documents Act, the possession of the electronic bill of lading was a hot topic in the UK. UK law's problem lay in the belief that for a thing to be possessable it must be tangible as well, which is an express rule of English common law⁴⁰⁰. High Court Judge Stephen Morris QC commented in a Court decision from 2013, that the previous state of law was not developed to the point where electronic documents could be equated with physical things of which actual possession is possible⁴⁰¹. Ten years later, the Law Commission of England and Wales produced a final report on Digital Assets in 2023, where it named the "possession problem" as the view of the English legal system where possession is limited to "tangible things"⁴⁰². In this report, the Law Commission reached the conclusion that some digital assets are capable of being things to which personal property can relate, thus they are possessable. It avoided setting hard boundaries on the definition of this third category of things, called "digital objects", which can be not only digital things, but also carbon emissions allowances etc. The solution was to identify what characteristics would make an electronic trade document amenable to possession⁴⁰³. Firstly, that it has an existence which is independent from the parties involved and the legal system, because it is not a bare legal right. Secondly, that it is a document capable of exclusive control, because it can't be possessed by more than one person/entity at the same time. Lastly, that transferring it fully deprives the person/entity of accessing the document⁴⁰⁴. Of course, now, as previously mentioned, the provisions of the Electronic Trade Documents Act provide electronic trade documents with "possessability" and render them the same legal recognition and functionality as their paper counterparts⁴⁰⁵.

On the other hand, civil law countries track their notion of "ownership" from Roman law's "dominion" which refers to absolute ownership over property⁴⁰⁶. Each civil law country developed its own legal traditions regarding property, which do not present as uniformly as in common law countries. The recognition of ownership over electronic documents of title is thus a matter of domestic law, and can vary from place to place, as seen in Chapter 3 of this study. To overcome this obstacle, closed systems make sure that all parties are in privity of contract with each other, but in an open system, like a public blockchain platform, this is not the case, which is why ideally the sale of goods contract should provide for the transfer of possession of goods as well as of rights and liabilities⁴⁰⁷.

Moving to blockchain matters, the concept of ownership and possession of a token is accepted to blockchain users, as seen with cryptocurrencies. Cryptoassets (meaning both cryptocurrencies and tokens) according to the "Legal statement on cryptoassets and smart contracts" by the UK Jurisdiction

³⁹⁹ Todd (n 67) 352.

⁴⁰⁰ Russel (n 24) 18.

⁴⁰¹ *Armstrong v Winnington Networks* (EWHC 10 (Ch); [2013] Ch 156) 51.

⁴⁰² 'Digital Assets: Call for Evidence and Draft Legislation' (n 201) para 2.48.

⁴⁰³ Russell (n 19) 18.

⁴⁰⁴ 'Digital Assets: Electronic Trade Documents – A Consultation Paper' (The Law Commission of England and Wales) 254 para 5.47.

⁴⁰⁵ 'Electronic Trade Documents Act 2023 Explanatory Notes' (n 181) 4.

⁴⁰⁶ Yun-chien Chang and Henry E Smith, 'An Economic Analysis of Civil versus Common Law Property' (2012) 88 *Notre Dame Law Review* 2 <: <http://scholarship.law.nd.edu/ndlr/vol88/iss1/1>>.

⁴⁰⁷ Todd (n 67) 351.

Taskforce, have in general all the distinguishing marks of property and should be therefore treated in principle as such⁴⁰⁸. Digital tokens are capable of mirroring the physical attributes of paper, because they are unique, secure, and transferable. Only the fact that the process of transferring a tangible object is different than transferring a digital token, should not mean that it is incapable of transfer⁴⁰⁹. But cryptoassets cannot be physically possessed and transferred since they are virtual, thus they cannot easily fit into the existing law on document of title. Since then, the blockchain technology wave led to an increasing legal recognition of blockchain tokens and crypto as property⁴¹⁰.

6.2 SINGULARITY

A transferable document should by its nature be unique throughout its life cycle. This is a feature known as “guarantee of uniqueness” or “guarantee of singularity”⁴¹¹. This is one of the most difficult features to replicate in an electronic environment, because electronic documents can be copied and distributed very easily. Until the appearance of blockchain the legal scholars evaluating the electronic bill of lading in the market were divided on whether central registries could achieve the task of achieving singularity or not. In general, systems like BOLERO, were not considered to have fully achieved it⁴¹². This presented a significant issue both legally and in practice. The carrier must be certain of the authenticity of the electronic bill of lading presented to deliver the goods otherwise they will be liable for misdelivery. Especially in the past, electronic records were quite susceptible to tampering and duplicating attempts. Scanning a paper bill of lading as a .pdf file and emailing is obviously not satisfactory, because there is no control over the document⁴¹³. Because of this obstacle, the Rotterdam Rules were criticized for the incorporation of electronic equivalents because the required singularity of the document could not yet be achieved with the technology of the time⁴¹⁴.

Singularity is a problem for the paper bill of lading as well. The paper bill is usually issued in a set of three originals, so the traditional system is flawed as well. The buyer can protect their interests by demanding all copies of the bill. But, if the bill exists as a .pdf file or a PIN code is necessary for delivery, there is no way to know how many copies are circulating the market⁴¹⁵. In a closed system, double-spending is avoided by tasking the central moderating party to keep track of the transactions. On the other hand, an open decentralized system with the ability to synchronize all the ledgers, like blockchain, is able to keep track of all the transactions on a block-to-block basis. As previously mentioned in this thesis, a blockchain-based bill of lading exists as a token in a secure system, that guarantees its singularity and its authorized transfer through timestamps and cryptography⁴¹⁶. This

⁴⁰⁸ Lawrence Akka and others, ‘Legal Statement on Cryptoassets and Smart Contracts’ (The LawTech Delivery Panel, UK Jurisdiction Taskforce 2019) 7 <https://www.blockchain4europe.eu/wp-content/uploads/2021/05/6.6056_JO_Cryptocurrencies_Statement_FINAL_WEB_111119-1.pdf> accessed 30 July 2024.

⁴⁰⁹ Girvin and Ong (n 29) 206.

⁴¹⁰ Such as in the case of *Elena Vorotyntseva v Money-4 Limited t/a Nebeus.Com*, Sergey Romanovskiy, Konstantin Zaripov.

⁴¹¹ Takahashi (n 90) 204.

⁴¹² Zhao, ‘Lex Maritima in a Changing World: Development and Prospect of Rules Governing Carriage of Goods by Sea’ (n 17) 772.

⁴¹³ Todd (n 67) 357.

⁴¹⁴ Zhao, ‘Uniform Seaborne Cargo Regimes - A Historical Review’ (n 47) 165.

⁴¹⁵ Todd (n 67) 357.

⁴¹⁶ Liu (n 287) 423.

way, blockchain can enable the possession of the electronic bill when previous technologies failed. The function as document of title is preserved because blockchain-based bills of lading can replicate both the legal and practical objectives of the paper bill⁴¹⁷.

An unexpected legal challenge regarding blockchain is that its features that guarantee its immutability and the bill's singularity can also pose a significant obstacle in administering justice. The tokenized bill of lading finds itself in a system where if an illegal transaction is achieved, it is yet uncertain how the blockchain immutability feature will react and how this can be reversed according to contract law⁴¹⁸. What will happen, for example, if the private key that gives exclusive access to the tokenized bill of lading is stolen or even lost? The bill of lading is unique, but in this case, absolute singularity poses a problem. This problem challenges the immutability principle of blockchain and raises critical legal questions about the rule of law in such an environment. Are the legal systems prepared to provide procedures to cancel this electronic bill of lading, and how will a blockchain network accept such a change when the ledger cannot be altered? The 2016 DAO hack which resulted in millions of losses in cryptocurrencies, revealed parties that were in dispute in a blockchain system that had no access to state justice or to a dispute resolution mechanism⁴¹⁹. This led to the emergence of a blockchain-based dispute resolution mechanism inspired by private e-commerce justice systems like ODRs⁴²⁰. Despite this initiative, it is doubtful that the shipping industry can rest easy with this solution.

6.3 GOVERNING LAW AND JURISDICTION

One of the disadvantages of using blockchain technology is the very complicated issue of jurisdiction. Since blockchain-based bills of lading are not yet widely tried and tested, it is possible that the electronic bill will not include a clear governing law and jurisdiction clause, like the traditional bill of lading does. In this case, blockchain-based transactions might be subject to the jurisdiction of any node in the blockchain network that contains data stored in the system⁴²¹. In this environment, it is a very challenging task to identify the proper jurisdiction under the principles of conflict of law if there is a dispute⁴²².

Lex cartae sitae, is the principle where the law governing a document is the law where the document is situated. While this can apply to the paper bill, it cannot possibly apply to blockchain,

⁴¹⁷ Elson Ong, 'Blockchain Bills Of Lading' (NUS LAW 2018) 8/07 12.

⁴¹⁸ Matti Rudanko, 'Smart Contracts and Traditional Contracts: Views of Contract Law' in Marcelo Corrales Compagnucci, Mark Fenwick and Stefan Wrba (eds), *Smart Contracts: Technological, Business and Legal Perspectives* (Hart Publishing 2021) 77–78.

⁴¹⁹ Florence Guillaume and Sven Riva, 'Blockchain Dispute Resolution for Decentralized Autonomous Organizations: The Rise of Decentralized Autonomous Justice' in Andrea Bonomi, Matthias Lehmann and Shaheza Lalani (eds), *Blockchain and Private International Law*, vol 4 (Brill Nijhoff 2023) 550.

⁴²⁰ *ibid.*

⁴²¹ Liu (n 287) 430.

⁴²² *ibid* 431.

Of course, each legal order can make provisions about jurisdiction. For example, as already discussed in the Greek Code of Private Maritime Law sub-chapter, it is necessary for the bill to include the place of issuance, if not, then it is not considered a bill of lading. This means that under Greek law, the electronic bill of lading must include note of the place, or else it cannot be considered as the document of title discussed in this study.

since the distributed ledger has no single location⁴²³. In its stead, Takahashi, suggests, in the absence of consent to a choice-of-law, the “*lex creationis*”. This is the law under which the represented by the negotiable document of title right is created⁴²⁴. In the case of the bill of lading, it is the governing law of the contract of carriage. This is why it is imperative to build these clauses into blockchain bills of lading, as well in the form of a smart contract, not because it is a self-performing task, but because it is a vital part of the legal agreement.

Nonetheless, freedom of choice when it comes to choice-of-law clause in blockchain is also questioned⁴²⁵. The reason is that the chosen law might serve as way to avoid regulatory rules, so the regulators of a -private- blockchain network that issues bills of lading, should be authorized to approve the choice or it should be agreed that the choice-of-law should have a connection to the specific blockchain platform⁴²⁶. For example Trace:Original™ has the parties agree that the governing law is the one of England and Wales, or any law that is compliant with the MLETR. It is also suggested that the most probable scenario is that a Court will assert jurisdiction despite the existence of a choice-of-law clause, if there is an absence of a physical jurisdiction connection⁴²⁷.

6.4 CYBERCRIME, SYSTEM MALFUNCTION AND LIABILITY ISSUES

There are many benefits to the electronic bill of lading, but the risks attached to it cannot be ignored. The main risk of paperless trade is cyber risk, defined by the International Maritime Organization (‘IMO’) as “*a measure of the extent to which a technology asset could be threatened by a potential circumstance or event, which may result in shipping-related operational, safety or security failures as a consequence of information or systems being corrupted, lost or compromised.*”⁴²⁸ IMO issued in June of 2022 the “Guidelines on Maritime Cyber Risks Management”⁴²⁹, providing recommendations on cyber risk management to maritime organizations aiming to safeguard shipping from cyberthreats. The guidelines outline key elements such as identifying critical systems and personnel responsibilities, implementing risk control processes and plans to protect against a cyber event, detecting incidents promptly, responding with resilience strategies to restore systems, and identifying measures to recovering essential systems after an event⁴³⁰. This approach ensures the ongoing security and operational continuity of shipping activities.

As technology keeps evolving and new vulnerabilities are being uncovered, unexpected events can happen, and platforms should be vigilant in dealing with them. In case of a hacking incident or a glitch, there will be the issue of allocating the liability. It is a fact that code can fail, and platforms can

⁴²³ Takahashi (n 23) 520.

⁴²⁴ *ibid* 515.

⁴²⁵ *ibid* 524.

⁴²⁶ *ibid*.

⁴²⁷ Liu (n 287) 431.

⁴²⁸ ‘Maritime Cyber Risk’ (International Maritime Organization) <<https://www.imo.org/en/OurWork/Security/Pages/Cyber-security.aspx>> accessed 23 July 2024.

⁴²⁹ ‘Guidelines On Maritime Cyber Risk Management’ (International Maritime Organization 2022) <[https://wwwcdn.imo.org/localresources/en/OurWork/Security/Documents/MSC-FAL.1-Circ.3-Rev.2%20-%20Guidelines%20On%20Maritime%20Cyber%20Risk%20Management%20\(Secretariat\)%20\(1\).pdf](https://wwwcdn.imo.org/localresources/en/OurWork/Security/Documents/MSC-FAL.1-Circ.3-Rev.2%20-%20Guidelines%20On%20Maritime%20Cyber%20Risk%20Management%20(Secretariat)%20(1).pdf)> accessed 23 July 2024.

⁴³⁰ *ibid* 3.

malfunction or be held hostage. Even blockchain, a seemingly tamper-proof system still faces cybercrime challenges due to sophisticated methods of fraud. There is always a possibility that hacking can occur, as it has been proven already by the theft of millions -maybe even billions- of USD in cryptocurrencies⁴³¹. Blockchain is also a technology known for the anonymity it offers, which is not well suited in trading. Anonymity increases the risk of exposure to fraudulent transactions, unreliable parties, and potential sanctions liabilities⁴³².

This issue is bigger than the electronic bill of lading, but it is a factor of the market's reluctance to adopt paperless trade, and the legal professionals' hesitancy to urge towards the electronic bill in practice. Fraud is also not usually covered by P&I insurance, which means it has to be addressed properly because liability insurance can significantly affect trust in a system⁴³³. It has been said that the shipping industry's greatest defense against cyber disaster lies with its old-fashioned way of operation⁴³⁴. This is the reason why it would be useful for a written contract to be established as a practice, that will specify the possible risks and the apportionment of liability in case of cybercrime events or system malfunction⁴³⁵. Especially in blockchain and smart contracts, where the system is self-implemented and there is hardly any control other than the original entry of data, the question of liability is very important. For example, a complex legal challenge is who would be liable if due to a system malfunction it is unclear who is the rightful holder of the electronic bill of lading⁴³⁶. Another question is who would be liable in the case where a service provider commits an error and issues an electronic signature or a private key to the wrong person. This is not a new legal issue; For example, under the EU Regulation 910/2014 for electronic identification and trust services, the provider has negligence liability for failing to fulfill the obligations under the Regulation⁴³⁷.

6.5 CONFIDENTIALITY OF INFORMATION AND DATA PRIVACY

Blockchain comes with many advantages, but privacy of transactions is not one of them. To battle this issue, private blockchains provide better privacy than public blockchains, because only identifiable parties are allowed to join and access the data contained in the ledger. Still, in a transaction as complex as the issuing and transferring a bill of lading, where multiple parties get involved, there is always the risk that competitors who are allowed in the network can extract data and trade information that would

⁴³¹ 'The 10 Biggest Crypto Hacks in History' (*Crystal*, 25 June 2021) <<https://crystalintelligence.com/investigations/the-10-biggest-crypto-hacks-in-history/>> accessed 28 September 2024.

⁴³² Chris Chatfield, Marco Pedretti and Joanna Manthorpe, 'Electronic Bills of Lading: New Call for Evidence Looks at Practical Application' (*Kennedys Law*) <<https://kennedyslaw.com/en/thought-leadership/article/2024/electronic-bills-of-lading-new-call-for-evidence-looks-at-practical-application/>> accessed 31 August 2024.

⁴³³ For example, BOLERO and essDocs provide their customers with their own cover for cyber liability insurance, system failures and cyber fraud.

Pejović (n 18) 219.

⁴³⁴ Girvin and Ong (n 29) 217. Reference Gross, 'Paper Bills of Lading are Shipping's Best Defence Against Cyber Warfare' (2018).

⁴³⁵ Liu (n 287) 432.

⁴³⁶ Goldby (n 66) 331.

⁴³⁷ Art. 11, 13.

otherwise been undisclosed⁴³⁸. It is proposed that a “sidechains” system should be developed where each of the parties is allowed to access only data regarding the bill of lading that are of interest to it, while being denied confidential information⁴³⁹.

Besides antitrust law, competition, and trade secrets, there is also the aspect of the blockchain ledger being an open permanent record and being at odds with privacy regulations like the GDPR and the ePrivacy Directive of the EU. A blockchain system is by nature an immutable permanent ledger, because for the data contained in a block to be changed, all the nodes of the blockchain should change it as well, something extremely difficult. But when a block contains personal -and maybe sensitive- information of natural persons, like names, addresses, and signatures, the system should be compliant with data protection regulations. The GDPR does not mention blockchain application, but a blockchain system should comply with the GDPR’s principles regarding the processing and management of data, and the right to be forgotten⁴⁴⁰. This is another reason why a “hybrid” blockchain system is proposed, where the existing information is not available to all members⁴⁴¹.

6.6 SMART CONTRACTS: CODE IS LAW?

Techno-determinist Lawrence Lessig’s well known phrase “code is law”⁴⁴² took on new significance with the appearance of smart contracts. When deployed on a blockchain system, a smart contract self-executes the agreed terms and conditions without human intervention. Because blockchain’s records are immutable, it may not be possible to modify or cancel a contract. This can lead to the idea that the smart contract or the “code” is the ultimate authority, the “law” that governs the transaction. This promotes the idea that code governs digital spaces, which has been debunked in the 21st century. From Joel Reidenberg’s “lex informatica”, to Andrew Murray’s hybrid model of symbiotic regulation⁴⁴³, human judgment and legal oversight have proved to be a necessary part of the digital ecosystem, including smart contract applications. In this case, the application of smart contracts in electronic bills of lading raises many issues, discussed in this chapter.

The first challenge observed in smart contracts is that while they might offer speed and efficiency, the term “contract” is most likely a misnomer⁴⁴⁴. This is because it is yet uncertain if they constitute contracts in a legal sense, and thus if contract law can apply⁴⁴⁵. Even the usual wording of “executing” a smart contract is, in a legal sense, a misapplied term, since “execution” in contract law means the final and legally binding agreement of the parties involved, or in simpler terms, the signing of the contract⁴⁴⁶. This means that the action of complying to the contract would be best described as

⁴³⁸ Hauke Precht and Jorge Marx Gómez, ‘Usage of Multiple Independent Blockchains for Enhancing Privacy Using the Example of the Bill of Lading’ in Javier Prieto and others (eds), *Blockchain and Applications*, vol 320 (Springer 2021) 301.

⁴³⁹ *ibid* 302.

⁴⁴⁰ Article 17 of GDPR

⁴⁴¹ Munari (n 290) 12.

⁴⁴² “Code is Law” appeared in Lessig’s book “Code and Other Laws of Cyberspace” in 1999.

⁴⁴³ Andrew Murray, *Information Technology Law* (4th edition, Oxford University Press 2019) 64–71.

⁴⁴⁴ Liu (n 287) 420.

⁴⁴⁵ *ibid*.

⁴⁴⁶ *ibid* 419.

“self-implementation” and not “execution”⁴⁴⁷. Of course, on the other hand, it has been supported by legal scholars that smart contracts should be regarded as legally binding contracts if the legal principle of “offer and acceptance” applies⁴⁴⁸. If yes, then the contracting party has every right to prefer a smart contract over a written contract as their negotium, which means that contract law applies as well⁴⁴⁹. If this is the case, then the EU2000/31/EC Directive on electronic commerce provides that electronically concluded contracts have the same legal standing as traditional contracts in Article 9. This applies to smart contracts as well, but further legislation might be required as smart contracts increase in popularity and legal and practical issues keep arising⁴⁵⁰.

The second challenge comes from the fact that the traditional contract is the basis of the smart contract. IT professionals need to be hired to turn the contract into code that can be processed through a computer system⁴⁵¹. This poses a unique problem, where the IT person should be able to translate the legal clauses into code that actually corresponds to the will of the parties⁴⁵². These coded instructions may not be able to capture subtle legal reasonings, which can result in inaccurate or illegal outcomes⁴⁵³. This is why the idea that smart contracts will replace lawyers is debunked by those who understand contract law. Some wonder if a “*new breed of lawyers*” that are familiar with coding will be needed in the future⁴⁵⁴. But if a coding error is made in the transformation process, there will be several legal issues. Smart contracts are self-implemented, which is usually an advantage, but if an error occurs in the coding stage, the results will be unstoppable till someone notices⁴⁵⁵. In this case, the distribution of liability is also complex. The party that suffered loss would seek legal action against the other party that is not obviously at fault because the error was made by the entity who oversaw the coding. In this case liability might also lie with the programmer.

The third challenge is that smart contracts are fit for simple situations were incident “A” results in action “B” and not complex transactions. This is known as the “if... then” principle⁴⁵⁶. Especially in the shipping business, smart contracts are regarded as a premature technology⁴⁵⁷; not only because the automatic implementation of the contract is a very complex challenge, but even if it was mastered, each slightly different negotiated contract, like a charter party, would need to have a new code created for every transaction⁴⁵⁸. But, in the case of documents that are usually provided in worldwide standard forms and contain standard terms, such as the bill of lading, Munari thinks that these standard terms have potential to be written into code once this technology has matured⁴⁵⁹. BIMCO, for example, has

⁴⁴⁷ *ibid.*

⁴⁴⁸ El Harrak (n 325) 481; Rudanko (n 418) 65.

⁴⁴⁹ El Harrak (n 325) 482.

⁴⁵⁰ Munari (n 290) 16.

⁴⁵¹ *ibid.* 13.

⁴⁵² *ibid.*

⁴⁵³ Rudanko (n 418) 76.

⁴⁵⁴ Hunter, ‘Smart Contracts: The BIMCO Experience’ (n 300) 21.

⁴⁵⁵ Liu (n 287) 433.

⁴⁵⁶ El Harrak (n 325) 480.

⁴⁵⁷ Munari (n 290) 14.

⁴⁵⁸ Hunter, ‘Smart Contracts: The BIMCO Experience’ (n 300) 18.

⁴⁵⁹ Munari (n 290) 14.

already tested the waters with standard terms and conditions in electronic form⁴⁶⁰, but not with self-executing contracts, because it is not yet the best solution in the market due to the complexity of implementing i.e. a charter party and the amount of reliable data needed⁴⁶¹. BIMCO does work on a prototype for simpler transaction models that could benefit from smart contracts because of repetitive tasks involved, such as the Bunker Terms 2018⁴⁶². Still, the smart contract will not cover the entire agreement.

The fourth challenge of smart contracts is a prevalent one in legal circles and raises the question of how a smart contract may be enforced⁴⁶³. Firstly, a smart contract can certainly insert a clause for the choice of law or choice of forum as it is done in most international contracts. This is a necessity when a system is operated by blockchain, that has nodes scattered around the world. But it is easy to think that because the consequences of the smart contracts are automatic, provisions for dispute resolution may be omitted, which creates issues of jurisdiction and applicable law. If this is the case, it is supported that a smart contract should be subject to the law that would be otherwise applicable if the contract was made outside of the blockchain⁴⁶⁴. Secondly, if the case is indeed to be presented in front of a human judge, the smart contract would have to be reversed from code back to a natural language, which raises new legal challenges over the accuracy of the interpretation of the contract, and if there are indeed discrepancies, what terms bind the parties, those of the written contract or those encoded in the smart contract⁴⁶⁵?

It has been suggested that a “divided document” might be the solution the shipping industry can accept⁴⁶⁶. A replica of the paper bill of lading on one side and on the other, a coded program, both interconnected. In this case, in a blockchain based bill of lading, the smart contract works only as an implementation device of the actual contract, and when the terms are met by a party, there will be automatic performance by the other party⁴⁶⁷. This compromise between electronic evolution and paper-based law is not a new concept. It has been proposed since the 1990s that in documents of title the data of legal importance could be available in a paper form, while at the same time the traders could use an electronic document to conduct business in everyday life⁴⁶⁸.

Eventually, it is doubtful that the shipping industry is ready to handle control over a computer program because of the legal uncertainty if things go wrong, as described in this chapter. Smart contracts are indeed a revolutionary technology, but the legal uncertainty that characterizes this technology renders it immature for the actual application in complex transactions such as the electronic bill of lading.

⁴⁶⁰ In 2001 BIMCO launched IDEA, an online charter party editing system that kept track of the changes made to a standard form. In 2018, SmartCon was launched as well, not a software, but an add-on on secure .doc documents containing the standard charter party, that keeps track of the changes and fully audits the document no matter if the user is online or not. Hunter, ‘Smart Contracts: The BIMCO Experience’ (n 300) 21.

⁴⁶¹ *ibid.*

⁴⁶² *ibid.*

⁴⁶³ Munari (n 290) 15.

⁴⁶⁴ In the absence of choice by the parties, the law of the closest connection is applied. See for example, Article 4 of the Rome I Regulation. The *lex loci contractus*, as well as the *lex situs* are also considered.

El Harrak (n 325) 485–488.

⁴⁶⁵ Munari (n 290) 15–16.

⁴⁶⁶ Liu (n 287) 433.

⁴⁶⁷ *ibid.* 434.

⁴⁶⁸ Christodoulou (n 16) 33. References Kozolchyk, *The paperless letter of credit and related documents of title* (1992).

6.7 CONCLUSION

Because technology is dynamic, the response to it should be dynamic as well. Questions regarding property law and singularity will continue to appear as the electronic bill of lading tries to establish itself in the shipping market. Cyber-security and system malfunction will continue to happen no matter what the legal framework is and what technical security measures are taken. Smart contracts are yet an immature technology to be used for the purpose of dealing with legal challenges, especially in complex transactions. Even within a positive towards electronic trade documents legal system, markets will continue to be hesitant to adopt the electronic bill of lading despite the technical means they possess.

For the electronic bill of lading to be established as a practice, the goal is to stay ahead of the challenge and be legally prepared in case of unexpected events. International and national regulations are vital tools, but alternative contract-based instruments are needed as well⁴⁶⁹. By constructing clear liability, applicable law and jurisdiction clauses the necessary market confidence in new ways of conducting business can be achieved. Undoubtedly, these challenges are not of trivial concern, yet they are not inescapable if enough attention is paid to them.

⁴⁶⁹ Pejović (n 18) 218.

7 Conclusions

For decades, the shipping industry has steadfastly resisted innovation, but the revolutionary changes in communications and digital technologies start to show their profound impact on global economy. Digitalization undoubtedly creates new opportunities for businesses by eliminating high costs, raising speed and efficiency, and enhancing security. To deny the advantages of the electronic bill of lading is to deny the cost, logistics, and environmental impact of paper. Ultimately, the law cannot ignore the advantages and the capabilities of current technology. Firstly, the law needs to indicate the requirements technological solutions need to fill in order for the electronic bill of lading to be recognized, while ensuring the principle of technological neutrality for the purposes of innovation⁴⁷⁰. Secondly, the law should increase confidence to the market for the use of the electronic bill of lading to encourage its adoption and increase demand⁴⁷¹. The success of the electronic bill of lading heavily depends on the support of the supply chain, but support cannot be given unless there is confidence that the electronic bill will work not only the same but better than the paper bill of lading. Finally, international regulation should be as harmonized as possible, to reduce legal complexities and conflicts of law⁴⁷². The role of legal professionals in this is to stay ahead of the challenge and be ready to offer solutions.

In conclusion, because of the efforts made in the last three decades, in the last five years there has been evident market turn towards new technologies due to the appearance of revolutionary technology that redefines the practices of this industry. The IG has more than doubled the approved electronic bill of lading providers. Nevertheless, some are still doubtful whether the shipping industry will abandon its traditional practices that date back hundreds of years and that new technologies are yet to prove their worth. This study adopts a more optimistic point of view, that both legal and technological developments will advance towards a wide-market adoption of the electronic bill of lading and a wave of national law recognition in the next decades. New technologies like blockchain have the potential to result in changes in the shipping industry that match those of the shipping revolution⁴⁷³.

⁴⁷⁰ Goldby (n 66) 4.

⁴⁷¹ *ibid.*

⁴⁷² *ibid.*

⁴⁷³ Sturley (n 49) 22.

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8.6 COURT DECISIONS MENTIONED

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