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Not Just for Illicit Trade in Contraband Anymore¹:

*Using Blockchain to solve a
millennial-long problem with Bills of
Lading*

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¹ See e.g., Lawrence Trautman, *Virtual Currencies; Bitcoin & What Now After Liberty Reserve, Silk Road, and Mt. Gox?*, 20 RICH. J.L. & TECH. 13 (2014) (discussing the use of Bitcoin, a technology based on blockchain, for illicit trade online via darknets, deep webs and Silk Road in particular).

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ABSTRACT

The bill of lading is one of the most important documents in international trade today. First introduced in ancient times, the bill of lading in its current form has not changed much over the last two centuries if not millennia; the bill of lading is an anachronistic paper document that still needs to be physically couriered along with the shipped goods. To date, all attempts to update the bill of lading, for example, by using electronic forms, have thus far failed to gain widespread adoption by the industry. The use of blockchain technology may break this impasse. In this paper, we will review the application of new solutions to updating the bill of lading, in particular, analyzing the legal, ethical and social issues associated with using blockchain in this area and highlighting why, while seemingly similar previous attempts have failed, blockchain can prevail.

Contents

I. INTRODUCTION.....	63
II. HISTORICAL LEGAL OVERVIEW	68
III. CURRENT COSTS	74
A. Delayed arrival and high costs	75
B. Fraudulent issuance.....	77
C. Other types of contracts.....	80
IV. ALTERNATIVE SOLUTIONS THAT HAVE FAILED	82
A. Blockchain as a solution	86
1. Blockchain Background.....	86
2. WAVE.....	89
3. What makes WAVE different	89
V. UNIFIED LAWS AND TREATIES FOR INTERNATIONAL BUSINESS TRANSACTIONS	90
A. The international community should act according to one unified law approved and/or ratified by all relevant stakeholders.....	91
B. Reduce transaction costs	91
VI. INTERNATIONAL SHIPPING CONVENTIONS.....	93
A. The International Chamber of Commerce (ICC).....	93
B. The International Institute for the Unification of Private Law (UNIDROIT).....	94
C. The United Nations Convention on Contracts for the International Sale of Goods.....	95
D. The Hague-Visby Rules(1968).....	96
E. United Nations Convention on Contracts for the International Carriage of Goods Wholly or Partly by Sea ("the Rotterdam Rules").....	99
VII. WAVE'S SOLUTION	101
A. Fraud Prevention.....	102
B. Negotiability	104
C. Supporting current trade flows.....	106
1. Endorsements	106
2. Timestamps	108
VIII. LEGAL ASPECTS.....	109
A. Document of Title.....	109
B. The validation of the international law.....	112
C. A look to the future.....	113
1. Liability issues	113
2. Authority for registry system	114
IX. SOCIAL ASPECTS	114
X. CONCLUSION	116

I. INTRODUCTION

The Bill of Lading is arguably one of the most significant legal documents associated with the commercial transport of goods by sea.² The bill of lading (BOL or B/L), is both “written evidence of a contract for the carriage and delivery of goods sent by sea for a certain freight”³ and the basic transportation contract between the shipper-consignor and the carrier.⁴ Nevertheless, it doesn’t really have an established concrete definition, but rather it is best appreciated as the sum of its functions which include: a) a receipt for the goods delivered; b) clear evidence regarding the terms covered by contract of carriage,⁵ and c) a document of title to the goods in transport. In the seminal 1791 case of *Lickbarrow v. Mason*,⁶ the court specifically recognized that the BOL transfers both the possessory rights and also the ownership of goods, provided that this was the intention of the parties when endorsing the bill.⁷

Some also include a fourth function of the BOL: d) a transferable contract of carriage;⁸ i.e., that the bill of lading is a contract of carriage between the carrier and the third party endorsees.⁹ Each term and clause

² Adascalitei Oana, *Implications of the bill of lading usage in the process of goods transportation by sea*, 14 ANALELE UNIVERSITATII MAR. CONSTANTA 183 (2013); *Berisford Metals Corp. v. S/S Salvador*, 779 F.2d 841, 845 (2d Cir. 1985) (“A negotiable or order bill of lading is a fundamental and vital pillar of international trade and commerce, indispensable to the conduct and financing of business involving the sale and transportation of goods between parties located at a distance from one another.”).

³ *Black's Law Dictionary* 497 (8th ed. 2004).

⁴ *S. Pac. Transp. Co. v. Commercial Metals Co.*, 456 U.S. 336, 342 (1982).

⁵ *SS Ardennes (Cargo Owners) v. SS Ardennes (Owners)*, [1951] 1 KB 55 (Eng.); *Sewell v. Burdick*, [1884] 10 App. Cas. 74 (Eng.); *Crooks v. Allan*, [1879] 5 QBD 38 (Eng.).

⁶ *Lickbarrow v. Mason*, [1787] 2 TR 63, 100 ER 35, 39 (Eng.).

⁷ Oana, *supra* note 2, at 184.

⁸ S. BAUGHEN, *SHIPPING LAW*, 8 (3d ed. 2004).

⁹ EMMANUEL T. LARYEA, *PAPERLESS TRADE: OPPORTUNITIES, CHALLENGES AND SOLUTIONS* 66 (KLUWER L. INT’L 2002).

within the bill of lading is important and each "has in effect the force of a statute, of which all affected must take notice."¹⁰

There are at least three types of bills of lading. A straight bill of lading is a U.S. innovation, which is not negotiable.¹¹ Negotiability here refers to transferability.¹² The straight BOL may not be transferred to anyone but the named consignee. Many jurisdictions do not accept these as either a bill of lading or even a document of title.¹³

A second type, called an order bill or Bearer bill of lading, can be transferred to subsequent endorsees. The holder is assumed to be the owner:¹⁴ "delivery will be made to whosoever holds the bill. Such bill may be created explicitly or it is an order bill that fails to nominate the consignee whether in its original form or through an endorsement in blank. A bearer bill can be negotiated by physical delivery."¹⁵

The third type is a hybrid of the first two and is the most common in practice.¹⁶ It can be used as either a straight bill or an order bill, depending only on minor differences in wording.

¹⁰ *S. Pac. Transp. Co. v. Commercial Metals Co.*, 456 U.S. 336, 343 (1982).

¹¹ Bills of Lading, 49 U.S.C. § 80103 (1994).

¹² *Kum v. Wah Tat Bank Ltd (PC)* Privy Council [1971] 1 Lloyd's Rep. 439 (Eng.).

¹³ Bills of Lading and Analogous Shipping Documents Ordinance (1997) § 3(2) (H.K.) ("References in this Ordinance to a bill of lading do not include references to a document which is incapable of transfer either by endorsement or, as a bearer bill, by delivery without endorsement; but subject to that, do include references to a received for shipment bill of lading."). *See also* *JI MacWilliam Co. Inc v. Mediterranean Shipping Co. SA (The Rafaela S)*, [2003] EWCA (Civ) 556 (Eng.).

¹⁴ Carriage of Goods by Sea Act (1924) (Eng.); Bill of Lading Act (1855) (Eng.).

¹⁵ *Bearer Bill of Lading*, <http://definitions.uslegal.com/b/bearer-bill-of-lading/> (last visited Sept. 6, 2018).

¹⁶ Daryl Y.H. Lee & Poomintr Sooksripaisarnkit, *The Straight Bill of Lading: Past, Present, and Future*. 18 J. OF INT'L MAR. L. 39, 39-40 (2012).

In the simplest application for the use of a BOL, a shipper of goods¹⁷ contracts with some form of transportation service such as a steamship line (i.e., the carrier¹⁸), and obtains instructions from the carrier regarding the time and place of delivery. In return for their services, the carrier is provided with a receipt indicating the type, condition and quantity of the goods to be delivered. From the moment that this receipt is provided to the carrier, the carrier has legal obligations and liabilities regarding the safekeeping of the goods.¹⁹ The carrier also becomes accountable to fulfill their obligations in passing the goods along to their next or final destination.²⁰ The bill of lading is prima facie evidence of the receipt, by the carrier, of the goods.²¹ Succinctly: the bill of lading is "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."²²

Practically, the shipper typically obtains an unfilled copy of the carrier's standard bill of lading. The shipper then enters the relevant details for the shipment of the goods, including the type and quantity of the goods being shipped, the port of destination, and name of the consignee, along with any other relevant information. Once completed, the carrier's agent will compare the shipper's completed document with

¹⁷ 46 U.S.C. app. § 1301(c) (2012) ("The term "goods" includes goods, wares, merchandise, and articles of every kind whatsoever, except live animals and cargo which by the contract of carriage is stated as being carried on deck and is so carried.").

¹⁸ *Id.* § 1301(a) ("The term "carrier" includes the owner or the charterer who enters into a contract of carriage with a shipper.").

¹⁹ *Id.* § 1302 ("Subject to the provisions of section 1306 of this Appendix, under every contract of carriage of goods by sea, the carrier in relation to the loading, handling, stowage, carriage, custody, care, and discharge of such goods, shall be subject to the responsibilities and liabilities and entitled to the rights and immunities set forth in sections 1303 and 1304 of this Appendix.").

²⁰ *Id.*

²¹ The Hague Rules as Amended by the Brussels Protocol art. 3, Rule 4, Feb. 21, 1968, 1412 UNTS 127.

²² *Sanders v. Maclean* [1883] 11 QBD 327 at 341 (Eng.).

his own, and the carrier or his agent will calculate the relevant data for the cargo and enter it on the bill of lading. The carrier will sign the bill and release the signed bill to the shipper in return for the delivery of receipt, and the payment of shipping the cargo when due. The shipper can then dispatch the bill of lading to the buyer (the receiver) or to a bank in a case where the shipment represents part of an international sales transaction involving documentary credit.²³ In the alternative, the bill of lading can be used as security for loans and advances.²⁴

The buyer must have the bill present at the port of discharge, and in return for its surrender, he will receive the goods. Notably, under maritime law, the carrier is only allowed to deliver the goods to the person who presents the **original** bill of lading, or a *carta declaratoria*, from the carrier.²⁵ “Absent a valid agreement to the contrary, the carrier (the issuer of the bill of lading) is responsible for releasing the cargo only to the party who presents the original bill of lading. ‘Delivery to the consignee named in the bill of lading does not suffice to discharge the carrier where the consignee does not hold the bill of lading.’”²⁶ Failure to do so is misdelivery.²⁷

All ocean-going shipments from United States ports to ports of foreign countries and vice versa are bound by the U.S. Carriage of Goods by Sea Act (COGSA).²⁸ Among other things, the Act sets

²³ PLS Logistics, *A Comprehensive Guide to Completing a Bill of Lading*, PLS LOGISTICS, July 15, 2015, <http://info.plslogistics.com/blog/a-comprehensive-guide-to-completing-a-bill-of-lading>.

²⁴ *Friedlander v. Texas & Pacific R. Co.*, 130 U.S. 416, 424 (1889).

²⁵ *Velco Enters., Ltd. v. SS Zim Kingston*, 858 F. Supp. 36, 39 (S.D.N.Y. 1994).

²⁶ *Allied Chem. Int'l Corp. v. Companhia de Navegacao Lloyd Brasileiro*, 775 F.2d 476, 482 (2d Cir. 1985).

²⁷ *David Crystal, Inc. v. Cunard Steam-Ship Co.*, 339 F.2d 295, 300 (2d Cir. 1964).

²⁸ 46 U.S.C. app. § 1300 (“Every bill of lading or similar document of title which is evidence of a contract for the carriage of goods by sea to or from ports of the United States, in foreign trade, shall have effect subject to the provisions of this chapter); *see e.g.*, *Kawasaki Kisen Kaisha Ltd. v. Regal-Beloit Corp.*, 130 S. Ct. 2433, 2440 (2010) (“COGSA governs the terms of bills of lading issued by ocean carriers

minimum liabilities for carriers, and invalidates any BOL that attempts to lessen those liabilities.²⁹ COGSA also requires that each Bill of Lading include certain statutory terms.³⁰ The carriers that issue COGSA bills of lading are regulated by the Federal Maritime Commission.³¹ The Harter Act³² also bears on Bills of Lading. Under the Harter Act, “[a] carrier may not insert in a bill of lading or shipping document a provision avoiding its liability for loss or damage arising from negligence or fault in loading, stowage, custody, care, or proper delivery. Any such provision is void.”³³

In the first two sections of this paper, we aim to review the historical evolution of the bill of lading up until and including its current iteration. Section III will demonstrate the (wasted) costs associated with the use of the paper-based bill of lading in the 21st century. Section IV will describe many of the failed attempts of an electronic system and why a blockchain-based idea is different. Section V will review the current law framing the uses of bill of lading. In section VI we present

engaged in foreign trade. 49 Stat. 1207, as amended, note following 46 U.S.C. § 30701, p. 1178.”).

²⁹ 46 U.S.C. app. § 1303(8) (“Any clause, covenant, or agreement in a contract of carriage relieving the carrier or the ship from liability for loss or damage to or in connection with the goods, arising from negligence, fault, or failure in the duties and obligations provided in this section, or lessening such liability otherwise than as provided in this chapter, shall be null and void and of no effect) *see generally* Vimar Seguros y Reaseguros, S. A. v. M/V Sky Reefer, 515 U.S. 528 (1995) (considering whether the entire bill of lading was invalidated by a clause (3, Governing Law and Arbitration) that required “[a]ny dispute arising from this Bill of Lading [to] be referred to arbitration in Tokyo by the Tokyo Maritime Arbitration Commission (TOMAC) of The Japan Shipping Exchange, Inc., in accordance with the rules of TOMAC and any amendment thereto, and the award given by the arbitrators shall be final and binding on both parties” due to the proceeding arbitration potentially imposing lesser liabilities than those under COGSA).

³⁰ *See generally* 46 U.S.C. app. § 1300.

³¹ Pub. L. 109–304, § 7, Oct. 6, 2006, 120 Stat. 1523 (codified as 46 U.S.C. § 40101(1)).

³² Harter Act, 46 U.S.C. § 30702 (2006).

³³ *Id.* § 30704.

blockchain in general, and Wave's implementation in particular as a feasible solution (i.e., how the use of blockchain technology can prevent fraud, how it allows the bill of lading to keep its negotiability feature, and how it can improve the flow of trade.) Finally, section VII reviews the relevant legal considerations of using blockchain, and section VIII covers the potential social impact of employing blockchain as a financial technology (fintech) tool.

II. HISTORICAL LEGAL OVERVIEW

The bill of lading emerged from the evolution of *lex mercatoria* (Merchant Law), an extra-territorial set of laws, based on merchant custom and varied legislation,³⁴ together with Maritime law. "The affairs of commerce are regulated by a law of their own called the Law Merchant or *Lex Mercatoria*, which all nations agree in and take notice of, and it is particularly held to be part of the law of England which decides the causes of merchants by the general rules which obtain in all commercial countries..."³⁵

Much of *Lex Mercatoria* was developed in courts that relied on oral and unwritten proceedings, leaving historians with little to no caselaw to follow in the evolution and development of the early bills of lading. It is not until around 1538 when researchers finally gained access to any early case law, such as *the Thomas*, where a copy of the bill of lading describing salt delivered on the ship "The Thomas" is part of the case record.³⁶ In the 1544 case of *John Evangelyst*, court records also included a bill of ladings for wines and records from a 1539 case,

³⁴ INDIRA CARR & PETER STONE, *INTERNATIONAL TRADE LAW* 66 (Routledge 2014).

³⁵ Samantha Peel, *The Development of the Bill of Lading: Its Future in the Maritime Industry* 25 (Mar. 2002) (citing 1 LORD BLACKSTONE, *COMMENTARIES* 273 (1765)).

³⁶ WILLIAM P. WP BENNETT, *THE HISTORY AND PRESENT POSITION OF THE BILL OF LADING AS A DOCUMENT OF TITLE TO GOODS* 9 (1914).

Hurlocke and Saunderson v. Collet, including a description of a bill of lading that acted as title for the goods and as a document that was provided to the buyer to allow him to demand delivery of goods from the master.³⁷ Bills of lading in other languages, including Spanish (*The Brandaris*, 1546), French (1549), Dutch (1554) and Italian (1564), eventually emerged in early caselaw.³⁸ Similarly, another case from this era, *Chapman v. Peers* (1534) noted that liability only attached to those goods that were officially recorded.³⁹

The lack of documented bills of lading can be attributed to the fact that originally many traders did not make any use of documentation when transporting goods, because merchants themselves were “peregrinators, moving constantly about in unending pursuit of profit” and delivered the goods themselves.⁴⁰ However, as international trade activity increased, and independent carriers emerged the need for documentation increased as well, particularly in order to prevent a rising number of disputes and to use documentation as a proof of receipt and ownership of a shipment.

Although we lack all but the most recent (relative to the age of ocean-going trade) historical evidence of the evolution of the BOL over the last couple of centuries, it is likely that the bill of lading did not appear suddenly, but rather developed over time, as did other instruments in commercial law. For example, an antecedent to the BOL can be found as far back as Roman times where recovered documents,

³⁷ *Id.* at 9-11.

³⁸ *Id.* at 10-11.

³⁹ PERCIVAL E. W. THORNELY, *THE HISTORY OF THE LAW MERCHANT AND NEGOTIABILITY* 23-24 (E. Pouteau London 1904).

⁴⁰ Raymond De Roover, *The Organization of Trade*, in *THE CAMBRIDGE ECONOMIC HISTORY OF EUROPE FROM THE DECLINE OF THE ROMAN EMPIRE* 42 (Postan, Rich & Miller III 1963).

thought to have acted as receipts, described the condition and weight of the goods delivered.⁴¹

And, while some might argue that this lack of historical evidence proves that the bill of lading is no more than a couple of hundred years old,⁴² most would agree that traces of the bill of lading stretch back to at least the year fifteen of the common era (15 AD) where a record has been found that provides details regarding the transport of wheat to Alexandria, Egypt.⁴³ Some have even found evidence of bill of lading-like documents tracing back another half millennium to the Nile Island of Elephantine:

Hosea and Ahiab agree to deliver Barley to Government officials in Syene . . . You have consigned to U.S. barley . . . (exact amount) . . . and our heart is satisfied therewith. We shall deliver the grain . . . We will render an account before [the company commander and the authorities of the Government House and the clerks of the treasury . . . [And if we do not deliver all the grain that is] yours in full we shall be liable (to you) silver . . . and you have a right to our wages from the Government House . . . you have the right to seize our wages until you are indemnified in full for the grain.⁴⁴

According to this timeline, the need for written proof of transport initially led to the first statutory convention governing maritime trade in the Latin West: *The Ordinamenta et Consuetudo Maris* of Trani from 1063.⁴⁵ These rules required that every master have a clerk who, sworn to fidelity, would enter all the goods received from the shipper into some form of record.⁴⁶ Also, supposedly, according to

⁴¹ Sarel F. Du Toit, *The Evolution of the Bill of Lading*, FUNDAMINA VOL. 1 12, 13 (2005).

⁴² Daniel E. Murray, *History and Development of the Bill of Lading*, 37 U. MIAMI L. REV. 689, 690 (1983).

⁴³ Magnus Ivarsson, *World Wide Trade, a manual affair. A study of the current position of the electronic bill of lading* 15 (2011).

⁴⁴ Peel, *supra* note 35, at 45.

⁴⁵ Du Toit, *supra* note 41, at 16.

⁴⁶ Chester B. McLaughlin, *The Evolution of the Ocean Bill of Lading*, 35 YALE L.J. 548, 557 (1926).

Desjardins, *Le Fuero Real*, a document from 1255, noted that owners of ships should have a manifest, i.e., a “register [of] all the articles put on board ships, giving their nature and quantity.”⁴⁷

Later, newer legal conventions started to develop with the growing appreciation that the merchant has to have a document simply to prove to a third party what he sent, when he sent it, and to whom he sent it. For example, the *Statuta Civitatis Massilie* (Statutes of Marseilles) of 1253-1255 were the first legal conventions that forced the issuing party, the clerk, to give the party who ordered the goods, the merchant, a copy of the register, which is an older version of the BOL, if he asked for it.⁴⁸

Statutes regarding the use of something similar to bills of lading were eventually passed in 1258 and 1350 requiring that only the clerk be believed regarding the ship’s manifest and instituted harsh punishments for clerks that lied regarding the contents of the manifest.⁴⁹ Nothing could be loaded or unloaded unless in the clerk’s presence.⁵⁰ Further, a 1397 statute of Ancona, Italy stated that a copy of the register had to be left in the port of departure.⁵¹

In examining known copies of bill of lading-like documents up until this point, the bills tended to have three commonalities: acknowledgement of receipt, reference to the goods being on a specific ship, and a promise to deliver to a specific person at a specific place.⁵² Notably, until the 14th century, the predecessor of the modern bill of lading was a type of registrar or book. Later on, the book of lading evolved into bills of lading that gradually adopted a more contractual

⁴⁷ ALAN MITCHELHILL, *BILLS OF LADING: LAW AND PRACTICE* 1 (2d ed. 2013).

⁴⁸ S.F. Du Toit, *The Evolution of the Bill of Lading*, 11 *FUNDAMINA: A J. OF LEGAL HISTORY* 12, 18 (2005).

⁴⁹ McLaughlin, *supra* note 46, at 551-52.

⁵⁰ *Id.*

⁵¹ Peel, *supra* note 35, at 44.

⁵² *Id.*

function. Together, these and other laws likely evolved into some important aspects of the modern Bill of Lading, wherein a copy is given to the shipper and the master (original) is surrendered upon delivery of all goods described in the document.

As further proof of the longstanding nature of many of the aspects of the current BOL, the collection of maritime customs and ordinances in Catalan, *The Book of the Consulate of the Sea (Consolat de Mare)*,⁵³ from the 14th and 15th centuries, contains many of the same provisions as these earlier versions of the Bills of Lading.⁵⁴

The earliest documents resembling the modern Bill of Lading come from northern Europe. One example is the law of the Hanseatic cities from 1591.⁵⁵ Further developments of the bill of lading can be found again in Northern Europe during the 17th century.⁵⁶ For example, *Le Guidon De La Mer* was a code of maritime law which seems to treat the bill of lading as a well-known document.⁵⁷ Specifically, the code defined it as “the acknowledgement which the master of the ship makes of the number and quality of the goods loaded on board.”⁵⁸

⁵³ See, e.g., Stanley S. Jados, CONSULATE OF THE SEA AND RELATED DOCUMENTS online at The Library Of Iberian Resources Online <https://libro.uca.edu/consulate/consulate.htm>; see also Nicholas J. Healy, International Uniformity in Maritime Law: The Goal and the Obstacles, 9 Cal. W. Int'l L.J. 494, 494 (1979) (“The most significant of the codes was the *Consolat de Mar* - the Consulate of the Sea - an elaborate compilation of judgments promulgated in Barcelona, which was used as a *corpus juris* or restatement of the maritime law and which had a profound effect on its development.”).

⁵⁴ Chacón, Víctor Hugo. “The Origin of the Obligation of Practicing Due Diligence in Maritime Transportation.” In *The Due Diligence in Maritime Transportation in the Technological Era*, pp. 15-99. Springer, Cham, 2017, at 44.

⁵⁵ Levin Goldschmidt, *Handbuch des Handelsrechts* 653 (1868).

⁵⁶ Bennet, *supra* note 36, at 8.

⁵⁷ McLaughlin, *supra* note 46, at 551-52.

⁵⁸ McLaughlin, *supra* note 46, at 552 (quoting Desjardin, *Traité de Droit Commercial Maritime, Tome Quatrième* (1885) sec. 1, art. 904).

Additionally, *Le Guidon De La Mer* specifically mentioned the need for multiple copies of the BOL: a first copy to be sent to the person who would accept the cargo; a second copy to the Master to whom he had to deliver the cargo; and a third copy, to the consignee (the purchaser of the goods), only as a notice of the shipment.⁵⁹ Notwithstanding these multiple copies, possession and ownership were not transferred with the document itself, and therefore, the shipper remained the owner of the goods.⁶⁰

In modern international shipping, only the consignee can receive the goods—unless he endorsed the BOL to another party—which makes the latter the owner of the BOL and the corresponding goods.⁶¹ Notably, there was no evidence of endorsement⁶² of an actual bill of lading in this code until an admiralty case from 1539 in which the court considered transferees of a bill of lading to clearly have the authority to demand the goods, from the master of the ship, finally enshrining the bill of lading as a legitimate document of title.⁶³

Eventually, the bill of lading, as it is used today, became a formal document in the 18th century.⁶⁴ Although the bill of lading's attainment of status as a document of title took almost 500 years, the bill of lading was always a receipt for the goods shipped. And since the 19th century, the bill of lading has also functioned as evidence of the contract of carriage and as an outline of detailed contractual clauses.⁶⁵ In the United States, the Carriage of Goods By Sea Act⁶⁶ is the current law for bills of

⁵⁹ *Id.*

⁶⁰ *Id.*

⁶¹ 4.3.6-Contracts-Title to and endorsement of a bill of lading, INTERNATIONAL TRADE CENTER, <http://www.intracen.org/coffee-guide/contracts/title-to-and-endorsement-of-a-bill-of-lading/> (last visited Oct. 25, 2018).

⁶² *Id.*

⁶³ BENNETT, *supra* note 36, at 10-11.

⁶⁴ McLaughlin, *supra* note 46, at 554.

⁶⁵ Du Toit, *supra* note 41, at 24.

⁶⁶ Carriage of Goods by Sea Act (COGSA), 49 Stat. 1207 (codified as amended, *see* 46 U.S.C. § 30701 note, formerly found at 46 U.S.C. app. §§ 1300 to 1315).

lading for all common carriage between the United States and foreign jurisdictions (this is the U.S. version of the Hague Rules of 1924, formally the "International Convention for the Unification of Certain Rules of Law relating to Bills of Lading, and Protocol of Signature").⁶⁷ However, the Pomerene Bills of Lading Act of 1916⁶⁸ also remains somewhat relevant to U.S. transactions.⁶⁹

III. CURRENT COSTS

Arguably one of the most important innovations in recent times has been the standardized shipping container, which greatly increased the efficiency of ocean-going trade. The swift progression of shipping technology, and particularly the introduction of containerized complex shipping,⁷⁰ eventually contributed to the loss of credibility of the paper bill of lading.⁷¹ In so doing, the introduction of containerized shipping has likely destroyed decades of international efforts toward bill of lading uniformity.⁷²

In an effort to counteract the limited credibility of the BOL, the modern international shipping system includes many redundant costs which would be easily reduced in a more efficient and credible system.

⁶⁷ *Convention & Protocol of Signature Thereto, Between the United States of Am. & Other Powers Respecting Bills of Lading for the Carriage of Goods by Sea.*, 51 Stat 233 (Nov. 6, 1937).

⁶⁸ Pomerene Bills of Lading Act, 49 U.S.C. §§ 80101 to 80116.

⁶⁹ *Underwood Cotton Co., Inc. v. Hyundai Merchant Marine (American), Inc.*, 288 F.3d 405, 411 (9th Cir. 2002) (citing 46 U.S.C. app. § 1303(4) "Provided, that nothing in this chapter shall be construed as repealing or limiting the application of any part of chapter 801 of title 49.>").

⁷⁰ See generally, MARC LEVINSON, *THE BOX: HOW THE SHIPPING CONTAINER MADE THE WORLD SMALLER AND THE WORLD ECONOMY BIGGER* (2016).

⁷¹ Michael F. Sturley, *Uniformity in the Law Governing the Carriage of Goods by Sea*, 26 J. MAR. L. & COM. 553, 560 (1995).

⁷² *Id.*

The most prominent shortcoming of the traditional bill of lading is its physical nature. Paper requires physical transportation from shipper to receiver.⁷³ It should come as a surprise to many that such a large and important industry to the world economy is still paper-based and has not yet embraced the digital revolution. Nevertheless, while most of the business world moved to digital systems, the oversea trading industry has been reluctant to embrace this change.⁷⁴ Whatever benefits the current paper-based system still provides, it also results in a number of costly problems including delayed arrival, insufficient or inaccurate information, high cost of transport and fraudulent issuance of the bill of lading.⁷⁵

A. Delayed arrival and high costs

Delayed arrival and high costs are among the most obvious disadvantages of the traditional paper bill of lading. Delay in transporting the physical bill of lading between parties can cost hundreds of dollars per day, per container, in direct costs such as port fees.⁷⁶ In a 1989 report, the Commission of the European Community estimated that “in the transport industry, the cost of raising conventional documents and the attendant delays involved in their issuance and verification constitute 10 to 15% of total transportation costs.”⁷⁷ This

⁷³ Susan Beecher, *Can the Electronic Bill of Lading Go Paperless*, 40 INT'L LAW. 627, 633 (2006).

⁷⁴ See, e.g., E-Bills of Lading, NORTONROSE, Feb. 2018, <http://www.nortonrosefulbright.com/knowledge/publications/163594/e-bills-of-lading>.

⁷⁵ *Electronic Data Interchange*, United Nations Commission on International Trade Law Working Group on Electronic Data Interchange, (1996) http://www.uncitral.org/pdf/english/workinggroups/wg_4/wp-69.pdf.

⁷⁶ Beecher, *supra* note 73, at 633-34.

⁷⁷ A. N. YIANNPOULOS, OCEAN BILLS OF LADING: TRADITIONAL FORMS, SUBSTITUTES, AND EDI SYSTEMS 18 (1995).

percentage is very high, and could be significantly reduced in an electronic solution.

Typically, with cargo or container vessels, many paper bills of lading are issued. This generates a paper trail which is very expensive to keep track of. Each bill of lading passes through various hands before arriving at the buyer who, by convention, can exercise ownership rights over the goods and demand delivery from the carrier.

The successive physical delivery requirement necessitates the use of expensive courier companies, which creates substantial costs to the entire industry and to the customers at the end of the delivery chain.⁷⁸ Additionally, the sheer volume of paper makes the process of their transport very slow.⁷⁹ Moreover, obviously any unexpected changes in the speed and the method of shipping, as well as unexpected changes in navigation, actually serve to worsen the problem of getting the right copies of the right BOLs to the right parties at the exact right time, not too early and not too late.

Another reason for delays is due to insufficient information regarding the shipped goods. By convention, the carrier must survey the goods, and if there are discrepancies, must alter the ship's manifest and amend the bill of lading after arriving at the port and before releasing the goods.⁸⁰

Further introducing problems, commodities such as oil are typically sold many times (sometimes 30x) while on their voyage from shipper to receiver.⁸¹ This requires the paper BOL to be couriered

⁷⁸ See, e.g., Jaka Mele *Top 5 Issues of Cargo Shippers and Carriers Regarding the Bill of Lading*, MEDIUM, Jan. 10, 2018, <https://medium.com/cargoxio/top-5-issues-of-cargo-shippers-and-carriers-regarding-the-bill-of-lading-6d5117b45a8e>.

⁷⁹ PAUL TODD, *CASES AND MATERIALS ON INTERNATIONAL TRADE LAW* 375 (2003).

⁸⁰ Beecher, *supra* note 73, at 632-34.

⁸¹ F. L. de May, *Bills of Lading Problems in the Oil Trade: Documentary Credit Aspects*, 2 J. OF ENERGY & NAT. RESOURCES L. 197, 199 (1984).

quickly enough to get the necessary endorsements from each successive seller. These multiple sales in transit result in a situation wherein the goods arrive at the final destination port before the proper documentation (BOL) does. Since the cargo cannot be released without the consignee presenting the entitling documents, this often results in substantial delays and significant demurrage costs.⁸² In some cases, shipment delays can devalue the goods, or even render them worthless if, for example, seasonal goods arrive at their destination after the season is over.

Finally, if the carrier decides to release the commodity without receiving the entitling document, for example, if the documents are hopelessly delayed or even currently misplaced, many liability issues can arise.⁸³

B. Fraudulent issuance

When dealing with paper, it is not hard to create a fake or blank form, particularly given the strong incentives and the importance of the bill of lading.⁸⁴ The carrier is typically not under any obligation to verify

⁸² Erik A. Muthow, *The Impact of EDI on Bills of Lading: A Global Perspective on the Dynamics Involved* 3 (1997) (unpublished L.L.M. Dissertation, University of Cape Town) (on file with the University of Cape Town Libraries, University of Cape Town).

⁸³ Gavin Magrath (Magrath O'Connor), *Release of Cargo Without Presentation of Bill of Lading*, FORWARDERLAW (June 30, 2012), available online at http://www.forwarderlaw.com/library/view.php?article_id=834 https://web.archive.org/web/20160516063839/http://www.forwarderlaw.com/library/view.php?article_id=834 (“Knowingly releasing goods without presentation of the BL by the consignee constitutes a *fraud*. Therefore, the forwarder could be held responsible for all damages that flow from the fraud. This includes the *freight and related charges*, the *cost of the cargo* wrongly converted, and potentially *consequential damages*.”) (emphasis in original).

⁸⁴ UNCTAD Secretariat, United Nations Conference on Trade and Development (UNCTD), *Review and Analysis of Possible Measures to Minimize the Occurrence of*

the legality of the document.⁸⁵ As such, there are many cases of fraudulent bills of lading.⁸⁶ Examples of fraud include falsifying the bill of lading to impersonate the consignee, changing the right of delivery, or creating a false endorsement in the criminal's favor. Additionally, fraud can include misdating the date of loading so as to transfer liabilities or change costs,⁸⁷ misrepresenting the cargo's quantity or quality, falsely claiming the cargo is "clean on board," was shipped below deck, or was in a different port of loading to avoid boycotts, quotas, embargos, and other trade restrictions.⁸⁸ Further, fraud includes instances when the goods described in the bill of lading do not exist, were never shipped, or were shipped outside the contractual shipment dates.⁸⁹

One recent egregious example included a case in the Netherlands in which a carrier's local agent was bribed to note that forty-four containers of goods had shipped, when in reality only nine had shipped. The court found the carrier liable for the fraudulent bill of lading and the missing thirty-five containers.⁹⁰

Maritime Fraud and Piracy, U.N. Doc. TD/B/C.4/ AC.4/2 (Sept. 1, 1983) available at http://unctad.org/en/PublicationsLibrary/c4ac4d2_en.pdf.

⁸⁵ Oana, *supra* note 2 at 183.

⁸⁶ *E.g.*, *MSC Mediterranean Shipping Co. V. Metal Worldwide*, 884 F. Supp. 2d 1269 (S.D. Fla. 2012) (shipped dirt instead of the scrap metal described in the bill of lading).

⁸⁷ *See, e.g.*, *United City Merchants v. The Royal Bank of Can.*, House of Lords, [1982] 2 Lloyd's Rep. 1 (HL) (Eng.).

⁸⁸ Mohammed El Hawawy, *Fraudulent Bills of Lading*, AL TAMMI & CO. (June, 2013), <http://www.tamimi.com/en/magazine/law-update/section-5/june-issue/fraudlent-bills-of-lading.html>.

⁸⁹ *Antedated Bill of Lading*, SHIP INSPECTION, <http://www.shipinspection.eu/index.php/chartering-terms/63-a/4314-antedated-bill-of-lading-2> (last visited May 23, 2018) (citing a November 1986 London conference wherein a barrister, Mr. J. R. Russell, presented a paper on "Modern Bills of Lading").

⁹⁰ HR 4 april 2003, NJ 2003, 592 m.nt. van K.F. Haak (*Damco Maritime International BV/Meister Werkzeuge Werkzeugfabrik GmbH*) (Neth.).

Given the potential value of each BOL, it is likely that counterfeiters will invest substantial efforts in creating passable fraudulent BOLs. With a counterfeit BOL, the defrauder can collect the goods from the consignor or obtain bank credits on the basis of forged documents with fake signatures.⁹¹

Some deceitful parties might even fraudulently sell the same cargo to multiple parties when in transit. This is facilitated by the fact that normally the bills of lading are issued in sets of three. When there is more than one copy of the bill of lading, it makes it possible to use the other copies in manipulative ways, including selling cargo that is still in transit simultaneously to multiple unsuspecting parties.⁹²

Recent case law from the English High Court⁹³ has held that the cost of this fraud should typically fall on the shipper/owner as they “control the form, signature, and issue of the bills of lading and so are best placed to prevent delivery of cargo against production of fraudulent bills of lading,” regardless of whether they delegated these functions to their charterers. Moreover, given that owners were “under an obligation to care for the cargo entrusted to them and to deliver it in accordance with the bill of lading ... [it is] better for the loss to fall on the innocent ship-owner.⁹⁴ As such, some carriers will include “Maersk clauses” in their bills of lading, which will remove any liability from the carrier if the goods are delivered against a fraudulent bill of lading. These have been found to be acceptable in at least the English courts.⁹⁵

⁹¹ Beecher, *supra* note 73.

⁹² *Id.*

⁹³ *Motis Exports Ltd. v Dampskibsselskabet AF 1912 Aktieselskab and Aktieselskabet Dampskipsselskabet Svendborg* [1999] 1 Lloyd's Rep 837 (Eng.).

⁹⁴ *Delivery of Cargo Against Fraudulent Bills of Lading*, STEAMSHIP MUTUAL, (updated Jan., 2000), https://www.steamshipmutual.com/publications/Articles/Articles/Delivery_Cargo_2.asp.

⁹⁵ Jeremy Smith, *Bills of Lading Clauses: The Legal Background*, ANNUAL SURVEY OF LETTER OF CREDIT LAW & PRACTICE (2006).

These and other issues have resulted in a growing mistrust with BOLs in the commercial world. It is therefore necessary to change the paper bill of lading with a trustable, reliable, transparent, and cost-effective digital alternative.

C. Other types of contracts

With the advent of containerized shipping, new intermediaries have emerged in the international shipping sphere. For example, Non-Vessel Operating Common Carriers, (NVOCCs) are defined as a common carrier that: (A) does not operate the vessels by which the ocean transportation is provided; and (B) is a shipper in its relationship with an ocean common carrier.⁹⁶ The NVOCC will typically buy cargo capacity in bulk, allowing smaller stakeholders to bundle up with other small stakeholders to fill one or more containers.⁹⁷ “An NVOCC simultaneously holds two transportation roles—as a carrier vis-à-vis the shipper to which it offers service, and as a shipper vis-à-vis the ocean common carrier from which it obtains service.”⁹⁸ NVOCCs typically issue their own bills of lading to their customers (called house BOL), as the master bill of lading will typically show the NVOCC, or their agent as the consignee.⁹⁹

Further, carriers are required to publish the terms of their bills of lading. As contracts of adhesion, the terms are non-negotiable and

⁹⁶ 46 U.S.C. § 40102(16) (2018).

⁹⁷ See *NLRB v. Int’l Longshoremen’s Ass’n*, 447 U.S. 490, 496 n.8 (1980) (holding that NVOCCs perform a function similar to overland freight forwarders and are regulated by the Federal Maritime Commission).

⁹⁸ Non-Vessel-Operating Common Carrier Service Arrangements, 70 Fed. Reg. 45626 (proposed Aug. 3, 2005) (to be codified at 40 C.F.R. pt. 531).

⁹⁹ *All Pacific Trading, Inc. v. Vessel M/V Hanjin Yosu*, 7 F.3d 1427, 1430 (9th Cir. 1993) (“The original shipper of the cargo receives a bill of lading from the NVOCC upon delivery of the cargo to the NVOCC. The NVOCC receives an entirely separate bill of lading from the actual carrier, on which the owner of the cargo may or may not be named.”).

nearly identical between carriers.¹⁰⁰ As such, some courts have determined that the terms apply even when the actual bill of lading has not been issued.¹⁰¹

In addition, since the 1970's there has been a substantial increase in service contracts,¹⁰² given inadequacies of the bills of lading.¹⁰³ While these service contracts incorporate the bill of lading by reference, they are more negotiable.¹⁰⁴ Some courts have also found that "where the parties' relationship is governed by a separate contract, that contract acts as the contract of carriage and bills of lading are mere receipts."¹⁰⁵ In some cases, courts have even found oral agreements to trump bills of lading terms.¹⁰⁶

¹⁰⁰ Beecher, *supra* note 73, at 630.

¹⁰¹ See *Delphi-Delco Electronics Systems v. M/V NEDLLOYD EUROPA*, 324 F. Supp. 2d 403 (S.D.N.Y. 2004).

¹⁰² In the US, service contracts were expressly permitted under Shipping Act of 1984, 46 U.S.C. app. §§ 1701 et seq., §1702 "(19) "service contract" means a contract between a shipper and an ocean common carrier or conference in which the shipper makes a commitment to provide a certain minimum quantity of cargo over a fixed time period, and the ocean common carrier or conference commits to a certain rate or rate schedule as well as a defined service level--such as, assured space, transit time, port rotation, or similar service features; the contract may also specify provisions in the event of nonperformance on the part of either party").

¹⁰³ Beecher, *supra* note 73, at 627, 630.

¹⁰⁴ *Id.*

¹⁰⁵ See *Delphi-Delco Electronics Systems*, 324 F. Supp. 2d at 425; *Great White Fleet (US) Ltd. v. DSCV Transport Inc.*, 2000 WL 1480404, at *2 (S.D.N.Y. Oct. 5, 2000).

¹⁰⁶ *Eimskip v. Atlantic Fish Market, Inc.*, 417 F.3d 72 (1st Cir. 2005); But, *c.f.*, *Wallace Steel, Inc. v. Ingersoll-Rand Co.*, 739 F.2d 112, 115 (2d Cir. 1984) (finding that oral testimony did not vary the terms of the written contract); *Calchem Corp. v. Activsea USA LLC*, 2007 WL 2127188, at *3 n.11 (E.D.N.Y. July 25, 2007) (holding that under the Carriage of Goods by Sea Act ("COGSA"), Pub. L. No. 97-31, "a bill of lading may not be modified by extrinsic or parol evidence").

IV. ALTERNATIVE SOLUTIONS THAT HAVE FAILED

It seems obvious, but it needs repeating: an electronic form of bill of lading would significantly cut down the processing time of trade documents, potentially provide the added security of encrypted communication, eliminate the need for rekeying information and the risk of documentary transcription error and fraud, and reduce paperwork and costs connected with the processing of the bill of lading.¹⁰⁷

There have been a number of efforts to develop a usable electronic bill of lading.¹⁰⁸ This is a reflection of the billions of dollars in savings that can be reaped from switching over to an electronic system.¹⁰⁹ However, likely at least partially due to psychological reasons and fear of change, most stakeholders have been loathe to switch.¹¹⁰

One of the first serious attempts at designing an electronic signature for the bill of lading was the Seaborne Trade Documentation System (SeaDocs).¹¹¹ SeaDocs was launched in 1986 and managed by the London based SeaDocs Registry. It was the first commercial project designed to be an Electronic Data Interchange (EDI) for transport documents and was part of a joint initiative of Chase Manhattan Bank

¹⁰⁷ Miriam Goldby, *Electronic Bills of Lading and Central Registries: What is Holding Back Progress?* 17 INFO. & COMM. TECH. L. 125 (2008) (discussing the advantages of substituting the paper bill of lading with an electronic record).

¹⁰⁸ John Livermore & Krailerk Euarjai, *Electronic Bills of Lading: a Progress Report*, 28 J. MAR. L. & COM. 55 (1997); see also Nick Gaskell, *Bills of Lading in an Electronic Age*, LLOYDS MAR. AND COMMERCIAL L. QUARTERLY: 233 (2010) (available at <http://ssrn.com/abstract=2616139>).

¹⁰⁹ Tobias Eckardt, *The Bolero Bill of Lading under German and English Law*, SELLIER, EUR. L. PUBL., 2004.

¹¹⁰ Beecher, *supra* note 73, at 639.

¹¹¹ Oluwaseun Ajaja, *Electronic Bills of Lading: An Easier Way to Sea Carriage* (October 30, 2015), 114 (available at <http://ssrn.com/abstract=2707960>).

and the International Association of Independent Tanker Owners (INTERTANKO).¹¹² SeaDocs was not a pure electronic system, but rather it intended to be a bridge between paper and electronic systems. Counterintuitively, the SeaDocs solution was based on both paper and electronic records. SeaDocs failed quickly due to practical, and not necessarily legal considerations.¹¹³ Traders were unwilling to record their transactions in an untrustworthy central registry which could lead to fraud, tax inspections and other undesirable externalities.¹¹⁴ Additionally, the SeaDocs method was expensive and the traders' liabilities were not clearly established. Other factors that led to its demise included: (i) commodity traders' concerns that recording their transactions in a central registry would open them up for inspection by both their competitors and tax authorities; (ii) consignees, such as the ultimate purchasers of crude oil, were concerned that the system serviced competing intermediaries and speculators; (iii) banks were worried that their competitors would have full and exclusive control, but the liability of participants was not clearly established.¹¹⁵

The Bill of Lading Electronic Registry Organisation (BOLERO) began in 1989, created by SWIFT and Through Transport Club (TT Club).¹¹⁶ Bolero claims that they offer secured databases to provide authentication of documents.¹¹⁷ The main issue with the Bolero system is that it lacks closure and confidentiality of messages exchanged between users. For example, messages in the system are visible to all the parties using Bolero. Further, encryption for documents and messages is optional, creating differing and inconsistent levels of security across the platform, depending on the particular transaction. It

¹¹² *Id.*

¹¹³ Marek Dubovec, *The Problems and Possibilities for using Electronic Bills of Lading as Collateral*, 23 ARIZONA J. OF INT'L & COMP. L. 437, 449 (2006).

¹¹⁴ A.N. Yiannopoulos *supra* note 77, at 23.

¹¹⁵ Laryea, *supra* note 9, at 79-80.

¹¹⁶ Dubovec *supra* note 113, at 452.

¹¹⁷ Bolero, <http://www.bolero.net/> (last visited Oct. 25, 2018).

is important to note that Bolero (and ESS documents) is still commercially used today but in very few cases.¹¹⁸

Comite Maritime International (CMI) developed a set of rules in 1990 in response to the SeaDocs incident. These rules were essentially a regulatory framework on which interested parties could develop a viable solution. They didn't establish or provide any central authorities, rather they were limited to simply providing a proposal on best practices that focused on a decentralized system.¹¹⁹ The rules affirmatively support the use of electronic documents as substitutes for written documents.¹²⁰

In the 1990s, another attempt, TradeCard¹²¹ made an effort to generate secure electronic bills of lading. "TradeCard attempted, unsuccessfully, to convince banks that its system was preferable to their letter-of-credit systems."¹²² Unfortunately, TradeCard was also prone to fraud from malicious users. Additionally, electronic bills of lading were handled by companies providing paperless trading services using a

¹¹⁸ David A. Bury, *Electronic Bills of Lading: A Never-Ending Story*, 41 TUL. MAR. L.J. 197, 221 (2016) ("However, like SEADOCS and the CMI model, the Bolero Project has been largely unsuccessful, primarily because of its failure to attract support from larger carrier operations and the banking industry.").

¹¹⁹ Laryea, *supra* note 9, at 80.

¹²⁰Comite Maritime Int'l (CMI) Uniform Rules for Sea Waybills (Rule 11: "The carrier and the shipper and all subsequent parties utilizing these procedures agree that any national or local law, custom or practice requiring the Contract of Carriage to be evidenced in writing and signed, is satisfied by the transmitted and confirmed electronic data residing on computer data storage media displayable in human language on a video screen or as printed out by a computer. In agreeing to adopt these Rules, the parties shall be taken to have agreed not to raise the defence that this contract is not in writing.").

¹²¹ U.S. Patent No. 6,151,588 (filed, Feb. 9, 1998).

¹²² TradeCard, Inc. v. S1 Corp., 509 F. Supp. 2d 304, 314 (S.D.N.Y. 2007).

proprietary software, and their services were expensive and prone to a variety of fraud.¹²³

The @GlobalTrade system was designed to use nonnegotiable waybills with some clauses that were functionally similar to the negotiable bill of lading.¹²⁴ The waybills were subject to CMI's rules for Sea waybills,¹²⁵ making their legality and regulatory structure somewhat clear.¹²⁶ This system employed a centralized Documentary Clearance Center (DCC).

EssDOCS¹²⁷ is popular with dry bulk and tanker shipping that works by, to some degree, mimicking the paper BOL. Like Bolero, it relies on contracts between the parties to overcome any legal concerns associated with the system. The contract requires all parties to subscribe to a Database Services and User Agreement (DSUA). It does not have a central registry.¹²⁸

No bill of lading alternative can succeed without the recognition of both national and international laws. They should be legal equivalents to standards bills of lading. Moreover, to make a digital version successful, the digital version should be able to claim that jurisdictions will both uniformly deal with such electronic documents and compel parties to abide by them. While no litigation

¹²³ Anastasia Pagnoni & Andrea Visconti, *Secure Electronic Bills of Lading: Blind Counts and Digital Signatures*, 10 ELECTRONIC COM. RES. 363, 368. (2010).

¹²⁴ Dubovec, *supra* note 113, at 454.

¹²⁵ Comité Maritime Int'l (CMI) Uniform Rules for Sea Waybills, *available at* <http://www.comitemaritime.org/Uniform-Rules-for-Sea-Waybills/0,2729,12932,00.html>.

¹²⁶ *Id.*

¹²⁷ ESSDOCS, <http://www.essdocs.com/> (last visited Sept. 7, 2018).

¹²⁸ RICHARD AIKENS, RICHARD LORD & MICHAEL BOOLS, *BILLS OF LADING* 50 (2d ed. 2015).

has yet to occur for either GlobalTrade or EssDOCS, both currently lack the aforementioned criteria, among other relevant requirements.¹²⁹

A. Blockchain as a solution

1. Blockchain Background¹³⁰

In 2008, a pseudonymous individual named Satoshi Nakamoto released a white paper describing a cryptocurrency named Bitcoin.¹³¹ Bitcoin launched the following year, but its founder's identity remains anonymous to this day.¹³²

Bitcoin is a decentralized digital currency which relies on blockchain technology, also attributed to Nakamoto. Bitcoin promised to be a currency that “was based on cryptographic proof instead of trust, allowing any two willing parties to transact directly with each other without the need for a trusted third party. Transactions that are computationally impractical to reverse would protect sellers from fraud, and routine escrow mechanisms could easily be implemented to protect buyers.”¹³³ Bitcoin, like other decentralized currencies, raises numerous legal and regulatory concerns, many of which have yet to be resolved.¹³⁴

¹²⁹ David A. Bury, *Electronic Bills of Lading: A Never-Ending Story*, 41 TUL. MAR. LJ 197, 229 (2016).

¹³⁰ Aaron Wright & Primavera De Filippi, *Decentralized Blockchain Technology and the Rise of Lex Cryptographia*, SSRN 4-8. (Mar. 10, 2015), <https://ssrn.com/abstract=2580664>.

¹³¹ Satoshi Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System*, BITCOIN.ORG (2008), <https://bitcoin.org/bitcoin.pdf>.

¹³² Adrian Chen, *We Need to Know Who Satoshi Nakamoto Is*, NEW YORKER, May 9, 2016, <https://www.newyorker.com/business/currency/we-need-to-know-who-satoshi-nakamoto-is>.

¹³³ Nakamoto, *supra* note 131.

¹³⁴ See EDWARD V. MURPHY ET AL., CONG. RESEARCH SERVS., BITCOIN: QUESTIONS, ANSWERS, AND ANALYSIS OF LEGAL ISSUES 9-10 (2013) (discussing the legal

Blockchain technology, however, is legally more neutral. It can be simplistically described as a distributed trust system with a transparent and permanent ledger.¹³⁵ The term “blockchain” is derived from the basic components of these ledgers, wherein ‘blocks’ of data are ‘chained’ together using cryptographic signatures.¹³⁶

Blockchain is like an electronic ledger that contains the history of the transfers in every transaction. “To ensure that only legitimate transactions are recorded into a blockchain, the network confirms that new transactions are valid and do not invalidate former transactions.”¹³⁷ After each transaction is completed, the new blockchain in its entirety is saved on every computer node in the network. A new block of data will be appended to the end of blockchain only after the computers on the network reach consensus as to the validity of the transaction. “Once the block has been added to the blockchain, the information is immutable and transparent to all. Blockchain transactions are non-recursive, meaning they cannot be repeated once validated in a block.”¹³⁸ Only those chains that represent the majority consensus from the nodes are considered reliable. It becomes a permanent record that all

problems for bitcoin); see also Primavera De Filippi, *Bitcoin: A Regulatory Nightmare to a Libertarian Dream*, INTERNET POL’Y REV. 3 (2014).

¹³⁵ Stephaan Cloet, *Blockchain for Dummies*, LEXOLOGY (May 20 2016), <http://www.lexology.com/library/detail.aspx?g=2ac6e066-78e4-4237-a25b-6f0a5215e324>; World Econ. Forum, *Deep Shift Technology Tipping Point and Societal Impact*, WEFORUM.ORG, 24 (Sept. 2015), www3.weforum.org/docs/WEF_GAC15_Technological_Tipping_Points_report_2015.pdf.

¹³⁶ *Id.*

¹³⁷ Peters & Panayi, *Understanding Modern Banking Ledgers through Blockchain Technologies: Future of Transaction Processing and Smart Contracts on the Internet of Money* (Nov. 18, 2015) *arXiv preprint arXiv:1511.05740*, at 3.

¹³⁸ Vince Tabora, *Databases and Blockchains, The Difference is in Their Purpose and Design*, HACKERNOON, Aug. 4, 2018, <https://hackernoon.com/databases-and-blockchains-the-difference-is-in-their-purpose-and-design-56ba6335778b>.

of the computers on the network can use to coordinate an action or verify an event.¹³⁹

All of the more than 1900 cryptocurrencies currently in existence rely on blockchain technology.¹⁴⁰ Blockchain 2.0 is a newer iteration of the technology that allows for other uses, such as peer to peer verification, without a trusted third-party intermediary.¹⁴¹ While Blockchain, like many technologies, is ostensibly amoral, it can be used not only to facilitate illegal trade,¹⁴² but also to help governments collect taxes and to record land registries.¹⁴³

An important characteristic of a blockchain is that it is practically and effectively immutable, which mean that one cannot change a record placed on blockchain.¹⁴⁴ As such, it is secure, transparent, relatively fast, and potentially scalable.¹⁴⁵ These characteristics continue to attract attention from many financial institutions that appreciate these qualities in their financial tools,

¹³⁹ Wright & De Filippi, *supra* note 130, at 6-8.

¹⁴⁰ COIN MARKET CAP, <https://coinmarketcap.com/all/views/all/> (last visited Sept. 15, 2018).

¹⁴¹ Kurt Fanning & David P. Centers, *Blockchain and Its Coming Impact on Financial Services* 27 J. OF CORP. ACCT. & FIN. 51, 57 (2016).

¹⁴² Monica J Barratt, *Silk Road: eBay for drugs* 107 ADDICTION 683, 683-84 (2012); Marie Claire Van Hout, & Tim Bingham, 'Silk Road', *the Virtual Drug Marketplace: A Single Case Study of User Experiences*, 24 INT'L J. OF DRUG POL'Y 385 (2013); 13th European Security Conference & Exhibition, *Virtual Currencies: Safe For Business and Consumers or Just for Criminals?*, Hague Doc, Erik R. (Apr. 2, 2014).

¹⁴³ Victoria Louise Lemieux, *Trusting Records: Is Blockchain Technology the Answer?*, 26 RECORDS MGMT J. 110, 122-125 (2016); John Merriman Sholar, *Bitcoin as Currency and Catalyst*, 9 INTERSECT: THE STAN. J. OF SCI., TECH. AND SOC'Y 1, 101 (2016); David Yermack, *Corporate Governance and Blockchains*. (Nat'l Bureau of Econ. Res, Working Paper. No. 21802, 2015).

¹⁴⁴ Sherree DeCovny, *Chips Off the Old Blockchain* 26 CFA INSTITUTE MAGAZINE, Nov./Dec. 2015, at 24.

¹⁴⁵ Kyle Croman et al., *On Scaling Decentralized Blockchains*, PROC. 3RD WORKSHOP ON BITCOIN AND BLOCKCHAIN RES. (2016).

including banks, insurance companies¹⁴⁶ and those in the diamond trade who need to establish chains of custody.¹⁴⁷

2. WAVE

Wave is a blockchain-based decentralized application that connects all members of the international trade supply chain via a P2P network and allows a confidential direct exchange of official trade documents.¹⁴⁸ Documents of title, primarily BOLs, are connected to the blockchain in a way that allows title transfer, endorsements, and surrender. All is behind the scenes, automatic, and under layers of cryptography.

3. What makes WAVE different

Many companies provide uniform trading rules to allow buyers and sellers to agree on the format of documentation, such as Bolero.net.¹⁴⁹ For example, APL Ltd. provides container shipping and global transportation services, but also offers electronic bills of lading, including internet-based services and the ability for a shipper to print out a bill of lading in its own offices.¹⁵⁰ While these companies employ some form of encryption to control the number of copies, they still allow anyone to print the BOL in their own office, thus raising concerns of fraud.¹⁵¹ Blockchain, as described herein, would limit the security concerns inherent in all the other solutions to date.

¹⁴⁶ Michael Mainelli & Alistair Milne, *The Impact and Potential of Blockchain on Securities Transaction Lifecycle*, SWIFT INSTITUTE, WORKING PAPER NO. 2015-007, (May 9, 2016).

¹⁴⁷ Michael Mainelli & Mike Smith, *Sharing Ledgers for Sharing Economies: An Exploration of Mutual Distributed Ledgers (aka blockchain technology)*, 3 J. OF FIN. PERSP. 38, (2015).

¹⁴⁸ WAVE THE KEY TO PAPERLESS TRADE, <http://wavebl.com/>, (last visited Sept. 7 2018).

¹⁴⁹ Bolero, *supra* note 117.

¹⁵⁰ Helen Atkinson, *Electronic Bills of Lading Near*, 3 JOC.COM 24 (2002).

¹⁵¹ *Id.*

Banking intransigence also poses a large impediment to change in the area of BOLs. Changing the way banks have operated for decades can be extremely difficult, and the practice of having only one original bill of lading is firmly entrenched. In a digital system, banks would have to adapt to using a novel software-based solution. Wave's use of the blockchain technology solves this problem. Because blockchain is decentralized and transparent, two or more parties can rely on it without needing a bank to serve as the trusted third party.¹⁵²

Indicative of this growing acceptance of blockchain, in October 2015, Barclays signed with Wave to facilitate trade through their application using blockchain technology.¹⁵³

V. UNIFIED LAWS AND TREATIES FOR INTERNATIONAL BUSINESS TRANSACTIONS

The incorporation of blockchain technology, in addition to requiring participation by all stakeholders, may also require formal acceptance through changes in international law.

Fortuitously for blockchain, after years without unified legislation in the modern era, the international community has come to an understanding that unified rules must be applied.¹⁵⁴ Uniformity has also been a driving force in the development of U.S. law in this area for the past century.¹⁵⁵ The U.S. Supreme Court, in reviewing COGSA, noted that the statute was "lifted almost bodily from the Hague Rules of

¹⁵² See generally, Nakamoto, *supra* note 131.

¹⁵³ Pete Rizzo, *Wave Brings Blockchain Trade Finance Trial to Barclays*, COINDESK (Oct. 15, 2015), <http://www.coindesk.com/wave-blockchain-trade-finance-barclays>.

¹⁵⁴ Atkinson *supra* note 150.

¹⁵⁵ Sturley, *supra* note 71, at 533.

1921, as amended by the Brussels Convention of 1924.”¹⁵⁶ Moreover, the courts have also noted that the legislative history “leaves no room for doubt that the two dominant objectives of Congress were to ensure uniformity in the basic rights and responsibilities arising out of bills of lading”¹⁵⁷

A. The international community should act according to one unified law approved and/or ratified by all relevant stakeholders

The United Nations Convention on Contracts of the International Sales of Goods¹⁵⁸ (herein "Vienna convention" or CISG) is the current treaty that unifies international sales law. “The purpose of the CISG is to provide a modern, uniform and fair regime for contracts for the international sale of goods. Thus, the CISG introduces certainty into commercial exchanges and decreases transaction costs.”¹⁵⁹ As a result, the Vienna convention helps to reduce inefficiencies caused by the different social, economic and legal systems of different parties.

Like the CISG, any new unified law ought to reflect the unique specifications of the international business transactions system. This includes a discussion of borders, tariffs, and licensing of imports and exports.

B. Reducing transaction costs

Without a unified law, the importer and the exporter will have to navigate two or more disparate legal systems. Simplistically, this can

¹⁵⁶ Robert C. Herd & Co. v. Krawill Machinery Corp., 359 U.S. 297, 301 (1959).

¹⁵⁷ Mitsui & Co. v. American Export Lines, Inc, 636 F.2d 807, 815 (2d Cir. 1981).

¹⁵⁸ United Nations Convention on Contracts for the International Sale of Goods (Apr. 11, 1980).

¹⁵⁹ *Id.*

result in battling jurisdictions that interpret each contract differently, resulting in a higher cost of doing business. The existence of a unified law should allow parties to form contracts more easily and cheaply, potentially leading to increased trade and enhancing aggregate efficiency.¹⁶⁰

A unified law should also lead to increased efficiencies and transparency between the parties since they will know what to expect and which law governs international business transactions. Furthermore, uncertainties regarding the interpretation of contracts will be reduced.

Additionally, more than a unified law, diverse jurisdictions require a unified interpretation of that law: As the court in *Sky Reefer* ironically¹⁶¹ noted, “we decline to interpret our version of the Hague Rules in a manner contrary to every other nation to have addressed this issue. . . [C]onflicts in the interpretation of the Hague Rules not only destroy aesthetic symmetry in the international legal order but impose real costs on the commercial system the Rules govern.”¹⁶²

¹⁶⁰ David W. Leebron, *Claims for Harmonization: A Theoretical Framework*, 27 CAN. BUS. L. J. 63, 77 (1996).

¹⁶¹ U.S. courts are likely one of the primary reasons for the lack of uniformity with international convention, due to their interpretations of the COGSA. *See* Sturley, *supra* note 71, at 570-71 (citing, for example, *Couthino, Caro and Co., Inc. v. M/V SAVA*, 849 F.2d 166 (5th Cir. 1988) (describing the Development of the Fair Opportunity doctrine) and *Tessler Brothers (BC) Ltd. v. Itaipacific Line*, 494 F.2d 438, 1974 A.M.C. 937 (9th Cir. 1974) (demonstrating the effect of the Fair Opportunity Doctrine on international uniformity)). *See also* Sturley, *supra* note 71, at 566-67 (noting that there is also a circuit split within the United States Judiciary which creates even internal domestic inconsistency in the application of the international conventions).

¹⁶² *Vimar Seguros y Reaseguros, S. A. v. M/V Sky Reefer*, 515 US 528, 537 (1995) (citations omitted).

VI. INTERNATIONAL SHIPPING CONVENTIONS

In order to design and implement a unified law, various governments and interest groups around the world, as well as the United Nations, have founded a number of forums responsible for the unification of the relevant private law. It is clear from all of these international attempts that there is a need for external parties to enforce good faith, simplicity, transparency, and clarity in international trade.

A. The International Chamber of Commerce (ICC)

The International Chamber of Commerce (ICC) is an inter-governmental organization that represents the interests of companies, setting rules and resolving disputes.¹⁶³ Because its member companies and associations are themselves engaged in international business, ICC has seemingly unrivalled authority in making rules that govern the conduct of business across borders. The ICC has successfully established the Uniform Customs and Practice for Documentary Credits (UCP), which is a set of rules on the issuance and use of Letters of Credit.¹⁶⁴

The ICC has also created Incoterms (International Commerce Terms), which is a series of pre-defined commercial terms for international business transactions.¹⁶⁵ Using those terms, parties determine who pays the cost of each transportation segment, who is

¹⁶³ *Who We Are*, ICC, <https://iccwbo.org/about-us/who-we-are/> (last visited Oct. 25, 2018).

¹⁶⁴ Int'l Chamber Of Commerce, *Uniform Customs and Practice for Documentary Credits*, ICC PROD. NO. 600E (July 1, 2007).

¹⁶⁵ Int'l Chamber of Commerce, *Incoterm Rules 2010*, (2010), <https://iccwbo.org/resources-for-business/incoterms-rules/incoterms-rules-2010/>.

responsible of loading and unloading goods, and who bears the risk of loss at any given point during an international shipment.¹⁶⁶

B. The International Institute for the Unification of Private Law (UNIDROIT)

The International Institute for the Unification of Private Law (UNIDROIT) was founded in 1919 to publish suggestions and guidance without nationalistic political pressures.¹⁶⁷ UNIDROIT published the Principles of International Commercial Contracts (1994)¹⁶⁸ which interpreted the clauses in contract of sale.

In 1964, UNIDROIT nominated a committee to legislate a unified international sale law to generally promote international trade and to make that trade less complicated by national discrepancies.¹⁶⁹ Only thirteen countries signed the convention.¹⁷⁰ In 1980, The United Nations Commission on International Trade Law (UNCITRAL), a UN organization that creates and develops rules in the field of international trade, established the United Nations Convention on Contracts for the International Sale of Goods (CISG or Vienna convention). The CISG

¹⁶⁶ *Id.*

¹⁶⁷ UNIDROIT, <https://www.unidroit.org/about-unidroit/overview> (last visited Oct. 25, 2018).

¹⁶⁸ Int'l Inst. for the Unification of Private Law [UNIDROIT], *Principles of International Commercial Contracts*, at 90-100 (1994).

¹⁶⁹ *Convention Relating to a Uniform Law on the International Sale of Goods*, Sept. 30, 2013, <https://www.unidroit.org/instruments/international-sales/international-sales-ulis-1964>.

¹⁷⁰ *Convention Relating to a Uniform Law on the International Sale of Goods (ULIS)*, Aug. 20, 2015, <https://www.unidroit.org/status-ulis-1964>.

merged two parts of the Hague Convention.¹⁷¹ As of December 29, 2015, eighty-four states have adopted the CISG.¹⁷²

C. The United Nations Convention on Contracts for the International Sale of Goods

The Vienna convention will govern the legal issues of the transaction if both parties in the trade are in countries that are signatories to the convention.¹⁷³ Notably, the CISG is not the contract, but the legal system which fill the gaps in a contract.¹⁷⁴ Further, two parties can condition the terms of CISG voluntarily by mentioning it in their contract or asking the court to interpret their contract by the spirit of the CISG.¹⁷⁵

Despite efforts to unify the convention, there is still a major need for good faith examination of the goods: Article 7 states that any interpretation of the convention should focus on its international character, and promote uniformity and good faith in international trade.¹⁷⁶ Section II is about conformity of the goods and third-party claims. For example, Article 35(3) states that the seller is not liable to

¹⁷¹ *Convention Relating to a Uniform Law on the International Sale of Goods*, http://www.uncitral.org/uncitral/en/uncitral_texts/sale_goods/1980CISG.html (last visited Oct. 25, 2018).

¹⁷² *CISG: Table of Contracting States*, PACE L. SCH., <http://www.cisg.law.pace.edu/cisg/countries/cntries.html> (last visited Sept. 11, 2018).

¹⁷³ U.N. Comm'n on Int'l Trade Law, U.N. *Convention on the Contracts for the International Sale of Goods*, at 1, U.N. Sales No. E.10.V.14 (2010) [hereinafter CISG].

¹⁷⁴ See generally, Garro, Alejandro M., *Gap-Filling Role of the Unidroit Principles in International Sales Law: Some Comments on the Interplay between the Principles and the CISG*, *Tul. L. Rev.* 69 (1994) 1149.

¹⁷⁵ See, generally ALLISON E. BUTLER, *A PRACTICAL GUIDE TO THE CISG: NEGOTIATIONS THROUGH LITIGATION*, (2007), Chapter 2 Application of the CISG.

¹⁷⁶ CISG, *supra* note 173, at 3.

“any lack of conformity of the goods if, at the time of the conclusion of the contract, the buyer knew or could not have been unaware of such lack of conformity.”¹⁷⁷ Article 38 states that “[t]he buyer must examine the goods, or cause them to be examined, within as short a period as is practicable in the circumstances.”¹⁷⁸

As described in the historical overview, there is a lot in common from the ancient Merchant Law to the main modern normative framework (the Vienna convention). Today, Article 35 of the CISG states that “[t]he seller must deliver goods which are of the quantity, quality and description required by the contract,” which has to be identical to the BOL.¹⁷⁹

D. The Hague-Visby Rules (1968)

The Harter Act¹⁸⁰ was an unsatisfactory compromise that came into being at the end of the 1800’s as a result of general dissatisfaction with carriers contracting out of their liabilities.¹⁸¹ After the first World War, the Hague Rules were adopted by the CMI, and were signed into law in 1924 in Brussels.¹⁸² Although the United States was one of the motivating forces behind drafting the convention, and was a signatory to the convention, it did not ratify the convention.¹⁸³ It was not until the passage of the Carriage of Goods by Sea Act (COGSA)¹⁸⁴ in 1936, not

¹⁷⁷ *Id.* at 11.

¹⁷⁸ *Id.*

¹⁷⁹ CISG, *supra* note 173, at 10.

¹⁸⁰ Act of February 13, 1893 (Harter Act), ch. 105, 27 Stat. 445 (1893) (codified as amended at 46 U.S.C. § 30702 (2012)); Frederick Green, *The Harter Act*, 16 HARV. L. REV., 157-77 (1903).

¹⁸¹ Benjamin W. Yancey, *The Carriage of Goods: Hague, COGSA, Visby, and Hamburg* 57 TUL. L. REV. 1238, 1240-41 (1982).

¹⁸² The International Convention for the Unification of Certain Rules of Law Relating to Bills of Lading, Aug. 25, 1924, 51 Stat. 233, 120 L.N.T.S. 155.

¹⁸³ Yancey, *supra* note 181, at 1242.

¹⁸⁴ Carriage of Goods by Sea Act, ch. 229, Pub. L. No. 74-521, 49 Stat. 1207 (1936).

necessarily as a result of the ISIS,¹⁸⁵ that the U.S. implemented the convention.¹⁸⁶ COGSA reversed the Supreme Court's *Isis* opinion, but otherwise left the Harter Act in place.¹⁸⁷ After the passage of some time, CMI drafted another set of rules in Stockholm known as the Visby Rules.¹⁸⁸ Although the convention is in force and many maritime countries have ratified the convention, the U.S. has yet to do so.¹⁸⁹ As such, while courts have found the Protocol to "reinforce the conclusion suggested by the language and purposes of COGSA, [t]he Protocol, however, does not replace COGSA."¹⁹⁰

For the more than thirty countries that have ratified the protocols,¹⁹¹ the Hague-Visby Rules provide a set of international rules for the international carriage of goods, covered by Bills of Lading, by

¹⁸⁵ *May v. Hamburg-Amerikanische Packetfahrt Aktiengesellschaft*, 290 U.S. 333, 339-40 (1933) ("The *Isis*, a vessel of about 7,000 tons, sailed from loading ports on the Pacific coast with cargo destined for Bremen, Hamburg, and Antwerp. She was then seaworthy in hull and gear, and fitted in all respects for the intended voyage. In the Weser River, not far from Bremen, Germany, her first port of discharge, she stranded by reason of negligent navigation.").

¹⁸⁶ *Yancey*, *supra* note 181, at 1243.

¹⁸⁷ *See, e.g.*, 46 U.S.C. app. § 1311 (1932) (regarding the Act's effect on other laws) ("Nothing in this chapter shall be construed as superseding any part of sections 190 to 196 of this Appendix, or of any other law which would be applicable in the absence of this chapter, insofar as they relate to the duties, responsibilities, and liabilities of the ship or carrier prior to the time when the goods are loaded on or after the time they are discharged from the ship.").

¹⁸⁸ Protocol to Amend the International Convention for the Unification of Certain Rules of Law Relating to Bills of Lading, Feb. 23, 1968, 1412 U.N.T.S. 127.

¹⁸⁹ *DCI Mgmt. Grp. Inc. v. M.V. Miden Agan*, 03 Civ. 448 (DLC) 2004 WL 1078667, at *2 (S.D.N.Y. May 14, 2004).

¹⁹⁰ *Allied Int'l Am. Eagle Trading Corp. v. S.S. Yang Ming*, 672 F.2d 1055, 1063 (2d Cir. 1982) (quoting *Mitsui & Co. v. American Export Lines, Inc.*, 636 F.2d 807, 820 (2d Cir. 1981)).

¹⁹¹ *See, e.g.*, Wikipedia, *Hague-Visby Rules*, https://en.wikipedia.org/wiki/Hague%E2%80%93Visby_Rules#Ratifications (as of May 26, 2018, 02:06 GMT).

sea.¹⁹² The Hague-Visby Rules cover the period from when the goods are loaded to the time they are discharged from the ship. They are aimed at promoting uniformity and are a modern counterpart to ancient merchant law. For example, the aforementioned statutes of Marseilles specified the importance of issuing a BOL. Article III of the Hague-Visby Rules similarly requires the carrier to issue a BOL to the shipper, and Article III(4) establishes the BOL as prima facie evidence that the carrier received the goods.¹⁹³

Lord Bingham of Cornhill provided a succinct history of the relevant events that led to the adoption of the Hague Rules, US COGSA and the Hague-Visby Rule:

[T]he genesis of the Hague Rules lay in a view, widely shared among cargo interests, that carriers, in issuing bills of lading containing or evidencing the terms of carriage contracts, had routinely included conditions exonerating themselves from liability to an extent which was unacceptably prejudicial to the other parties to such contracts. Steps to address this problem had already been taken by the United States in the Harter Act 1893, by New Zealand in the Shipping and Seamen Act 1903, by

¹⁹² The International Convention for the Unification of Certain Rules of Law Relating to Bills of Lading, *supra* note 182, Article 1 (as amended by Protocol to Amend the International Convention for the Unification of Certain Rules of Law Relating to Bills of Lading, *supra* note 188) [hereinafter *Hague-Visby Rules*]; *Daval Steel Prod., a Div. of Francosteel Corp. v. M/V ACADIA FOREST*, 683 F. Supp. 444, 446 1988 (S.D.N.Y. 1988) (describing the Hague-Visby rules as the, “International Convention for the Unification of Certain Rules Relating to Bills of Lading (the “Hague Rules”), the Visby Amendments thereto and the SDR Protocol, 6 Benedict on Admiralty 1-11, 1-30 and 1-32.4 (7th ed. 1988) (collectively the “Hague/Visby Rules”)); *see generally* Francesco Berlingieri, *A Comparative Analysis of the Hague-Visby Rules, The Hamburg Rules and the Rotterdam Rules* (2009) and Benjamin W. Yancey, *The Carriage of Goods: Hague, Cogsa, Visby, and Hamburg*, 57 TUL. L. REV. 1238 (1982) for a comparison of the different sets of rules over time.

¹⁹³ *Hague-Visby Rules*, *supra* note 192, Article 3(3).

Australia in the Sea-Carriage of Goods Act 1904 and by Canada in the Water Carriage of Goods Act 1910. However, many felt that there remained a need for greater uniformity internationally.¹⁹⁴

In 1978, the Hamburg rules were developed under the auspices of the Federal Republic of Germany. The rules have been enacted by very few countries, and not the United States.¹⁹⁵ Nevertheless, numerous countries have incorporated select aspects of the Hamburg rules into their own statutes — effectively defeating the purpose of the rules by creating wide variability in the use of the rules.¹⁹⁶

E. United Nations Convention on Contracts for the International Carriage of Goods Wholly or Partly by Sea ("the Rotterdam Rules")¹⁹⁷

The Rotterdam Rules were adopted by the UN General Assembly in 2008.¹⁹⁸ The principle goal of the Rules was to create a modern and uniform law concerning the international carriage of goods by sea in order to reduce transaction costs, increase predictability and stability, and engender greater confidence in international maritime commerce.¹⁹⁹ The idea was to facilitate e-commerce and to establish a legal framework for electronic equivalents of paper transport documents. So far, twenty-five countries have signed and four have

¹⁹⁴ *Ji MacWilliam Co. Inc. v. Mediterranean Shipping Co. SA (The RAFAELA S)* [2005] UKHL, 2005 WL 353340 (Eng.).

¹⁹⁵ *Ferrostaal, Inc. v. M/V Sea Phoenix*, 447 F.3d 212, 217 (3d Cir. 2006).

¹⁹⁶ Sturley, *supra* note 71, at 561-64.

¹⁹⁷ United Nations Convention on Contracts for the International Carriage of Goods Wholly or Partly by Sea, G.A. Res. 63/122, U.N. Doc. (Dec. 11, 2008).

¹⁹⁸ *Id.*

¹⁹⁹ *Id.*

ratified these conventions.²⁰⁰ The United States has yet to ratify them.²⁰¹ With the input of CMI, the Rotterdam Rules sought to incorporate electronic records into the aging paper-based BOL system.²⁰²

Some of the concerns regarding uniformity could be alleviated by the Rotterdam electronic records, but “today’s maritime e-commerce is not yet mature technology.”²⁰³ For now, because the majority of countries have not ratified any convention, regulation alone may be inadequate to solve all of the aforementioned concerns of uncertainty and disputes between the parties.²⁰⁴

²⁰⁰ *The Rotterdam Rules – Where Does The US Stand*, PNG LOGISTICS, <http://pngl.com/the-rotterdam-rules-where-does-the-us-stand/> (last visited Sept. 12, 2018).

²⁰¹ *Kawasaki Kisen Kaisha Ltd. v. Regal-Beloit Corp.*, 130 S. Ct. 2433, 2448 (2010).

²⁰² Rotterdam Rules, Chap 1.11 11. “Consignee” means a person entitled to delivery of the goods under a contract of carriage or a transport document or electronic transport record”; 1.18 18. “Electronic transport record” means information in one or more messages issued by electronic communication under a contract of carriage by a carrier, including information logically associated with the electronic transport record by attachments or otherwise linked to the electronic transport record contemporaneously with or subsequent to its issue by the carrier, so as to become part of the electronic transport record, that: (a) Evidences the carrier’s or a performing party’s receipt of goods under a contract of carriage; and (b) Evidences or contains a contract of carriage; 1.19 19. “Negotiable electronic transport record” means an electronic transport record: (a) That indicates, by wording such as “to order”, or “negotiable”, or other appropriate wording recognized as having the same effect by the law applicable to the record, that the goods have been consigned to the order of the shipper or to the order of the consignee, and is not explicitly stated as being “non-negotiable” or “not negotiable”; and (b) The use of which meets the requirements of article 9, paragraph 1; 1. 20 20. “Non-negotiable electronic transport record” means an electronic transport record that is not a negotiable electronic transport record.

²⁰³ Lijun Zhao. *Uniform Seaborne Cargo Regimes--A Historical Review*, 46 J. MAR. L. & COM. 133, 165 (2015).

²⁰⁴ Elizabeth Hayes Patterson, *United Nations Convention on Contract of the International Sale of Goods: Unification and Tension Between Compromise and Domination*, 22 STAN. J. INT’L L. 263, 274 (1986).

VII. WAVE'S SOLUTION

As alluded to above, implementing blockchain technology in international trade has the potential to deal with many of the aforementioned concerns. In contrast to past (failed) efforts to digitize the BOL, blockchain technology does not require that all parties decide anew on an alternative third party to trust; the system creates trust through the algorithm and the independent miners and their consensus process. It creates trust where there is trustlessness. Wave provides a particularly effective solution utilizing blockchain technology. In this section, we will demonstrate why Wave might work.

Wave is a blockchain-based software platform that connects all members of the international trade supply chain to a decentralized network and enables them to directly exchange documents, including bills of lading.²⁰⁵

Wave can digitize the process of forwarding the bill of lading to all relevant stakeholders. A digitized process will save time and costs by negating the need for couriers. If properly encrypted, it can also be more secure, thus negating the need for extensive, time consuming manual validation. Because Wave's method occurs via blockchain, the entire process is transparently documented.

Legally, a blockchain-based digital bill of lading and a paper bill of lading should be equally enforceable. Chapter 3, Articles 8-10 of the Rotterdam Rules deal specifically with electronic transport records (i.e., digital records) and recognize that analog bills of lading and identical electronic versions are legally equivalent. As such, under the Rotterdam Rules, all provisions that reference analog transport documents include,

²⁰⁵ WAVE, <http://wavebl.com/> (last visited Sept. 12, 2018).

by definition, electronic transport documents as well.²⁰⁶ Further, Article 8 provides that "[a]nything that is to be in or on a transport document under this Convention may be recorded in an electronic transport record, provided the issuance and subsequent use of an electronic transport record is with the consent of the carrier and the shipper."²⁰⁷

A. Fraud Prevention

The international banking system handles most monetary transfers electronically, without any real threat of fraud.²⁰⁸ Similarly, switching from bills of lading to a digital system such as Wave would reduce the risk of fraud.

In the digitized world, paper counterfeits are not a concern. Wave, for example, employs complex security measures including electronic signatures and encryption to prevent digital counterfeits.²⁰⁹ More specifically, imagine that the original bill of lading is associated with a digital signature, i.e., a unique key that consists of a long combination of numbers and letters.²¹⁰ Only the issuer of the original bill of lading will have this key necessary to modify the bill of lading,

²⁰⁶ Francesco Berlingieri, *A Comparative Analysis of the Hague-Visby Rules, the Hamburg Rules and the Rotterdam Rules*. Paper delivered at the General Assembly of the AMD, Marrakesh (2009): 5-6.

²⁰⁷ *Id.* at 57.

²⁰⁸ P. Mallon, *The Legal Implications of Electronic Commerce in International Trade*, 8 *COMPUTERS & L.* 24 (1997); R.B. Kelly, *The CMI Charts a Course on the Sea of Electronic Data Interchange: Rules for Electronic Bills of Lading*, 16 *TUL. MAR. L.J.* 349, 366 (1992); Robert P. Merges and Glenn H. Reynolds, *Toward a Computerized System for Negotiating Ocean Bills of Lading*, 6 *J.L. & COM.* 23, 29-30 (1986).

²⁰⁹ See, e.g., Shavit, *The Next Wave, The Blockchain Technology*, Presented at the Fifth Annual Conference on the Governance of Emerging Technologies May 17-19 2017, Phoenix Arizona, <http://conferences.asucollegeoflaw.com/get2017/files/2014/06/Shavit-The-Next-Wave-Blockchain-Technology.pdf>.

²¹⁰ *Id.*

therefore only he will have the ability to modify or endorse (transfer) it.²¹¹

As presented in section IV.A.1., a blockchain-based list of transactions associated with a bill of lading is further unlikely to be forged because adding a new verified block to blockchain requires significant computational power, that brute force computational power typically coming from a cohort of independent miners.²¹² This makes it unlikely for attackers to corrupt the chain with false information, unless said attackers have the majority of the computational power of the entire network, a vanishingly small likelihood.²¹³

In addition, to ensure that only legitimate transactions are recorded on the blocks, the network is designed to confirm that new transactions are valid and that they do not invalidate former transactions in earlier ledgers.²¹⁴ In using the blockchain, a new block of data is appended to the end of the blockchain if and only after a large number of independent nodes on the network reach a consensus as to the validity of the transaction recorded in that ledger.²¹⁵

After a block has been added to a verified blockchain, it can no longer be deleted, and the transactions it contains can be accessed and verified equally and transparently by everyone on the network.²¹⁶ “It becomes a permanent record that all of the computers on the network can use to coordinate an action or verify an event.”²¹⁷

²¹¹ *Id.*

²¹² *See, e.g.*, text accompanying *supra* note 133.

²¹³ *See, e.g.*, “How Bitcoin Mining Works” COINDESK, Jan. 29, 2018, <https://www.coindesk.com/information/how-bitcoin-mining-works/>.

²¹⁴ *Id.*

²¹⁵ *Id.*

²¹⁶ *Id.*

²¹⁷ Wright & De Filippi, *supra* note 130, at 8.

B. Negotiability

Most agree that the current climate of international trade necessitates some form of electronic system for a modern bill of lading. A principal concern is that the bill of lading will lose an important feature: negotiability.

As described above, there are at least two kinds of bills, straight bills of lading (non-negotiable) and negotiable bills of lading.²¹⁸ Any transfer of the negotiable bill of lading is also a transfer of title to the goods represented within the bill of lading. The negotiable bill of lading can be transferred by physical delivery or endorsement by the current owner. This is a very important feature, especially when there are resales of the same goods from the original buyer to a new buyer or when dealing with documentary credit.²¹⁹

There are three elements that an electronic bill of lading must have in order to replicate a negotiable paper bill of lading: (1) possession of the bill of lading constitutes constructive possession and control over the goods it represents; (2) the bill of lading may be used to transfer title to the goods; and (3) the bill of lading is used to provide security in the goods it represents.²²⁰ The digital solutions attempted thus far have been unsuccessful because they failed to optimally replicate the negotiability feature.²²¹

As described in the previous section, Wave's system makes it possible to determine the owner of the bill of lading at every moment in

²¹⁸ See, e.g., text between notes 12 and 16.

²¹⁹ Stasia Williams, *Something Old, Something New: The Bill of Lading in the Days of EDI*, 1 *TRANSNAT'L L. & CONTEMP. PROBS.* 555, 561-62 (1991).

²²⁰ Dubovec *supra* note 113, at 441; Abhinayan Basu Bal, *Electronic Transport Records: An Opportunity for the Maritime and the Logistics Industries*, 81 *J. OF TRANSP. L., LOGISTICS & POL'Y* 17 (2014).

²²¹ Dubovec *supra* note 113, at 457.

time. As such, it is possible to transfer ownership of the goods through the system and to endorse the bill of lading.²²²

In addition, the Rotterdam Rules reference the issue of negotiability.²²³ In particular, Chapter 3, Article 9 provides for procedures for the use of negotiable electronic bills of lading and Article 10 provides the necessary draft documentation to be added to the electronic bill of lading.²²⁴

Article 9. Procedures for use of negotiable electronic transport records

1. The use of a negotiable electronic transport record shall be subject to procedures that provide for:

(a) The method for the issuance and the transfer of that record to an intended holder;

(b) An assurance that the negotiable electronic transport record retains its integrity;

(c) The manner in which the holder is able to demonstrate that it is the holder; and

(d) The manner of providing confirmation that delivery to the holder has been effected, or that, pursuant to articles 10, paragraph 2, or 47, subparagraphs 1 (a) (ii) and (c), the electronic transport record has ceased to have any effect or validity.

²²² See, e.g., WAVE, <http://wavebl.com/> (last visited Sept. 12, 2018).

²²³ United Nations Convention on Contracts for the International Carriage of Goods Wholly or Partly by Sea, G.A. Res. 63/122, U.N. Doc. (Dec. 11, 2008).

²²⁴ *Id.*

2. The procedures in paragraph 1 of this article shall be referred to in the contract particulars and be readily ascertainable.

Article 9, subsection (a)-(c), copied in full above, provides the necessary minimum requirements for a bill of lading to be recognized as negotiable.²²⁵ Wave's system, by its very definition, fulfills those procedures: (a) the method for the issuance doesn't change; (b) the document retains its integrity due to the use of electronic signatures (as described in the Fraud Prevention section, above); and (c) at any single moment in time there is only one holder of the bill of lading. The rest of the parties can only see a copy if they have received it from a previous holder. Every party can see in the system if he has the original document or merely a copy. The holder can show that he has the original bill.²²⁶

C. Supporting current trade flows

A paper bill of lading often lacks documentation of damage to the goods, revenue recognition, or sanctions to parties in the transaction. Electronic systems like Wave automatically document all transfers, and blockchain timestamps the transfers. It is therefore clear who owned the good when any damage occurred.

1. Endorsements

An endorsement of a bill of lading by the current owner of the BOL can affect the transfer of title. In international shipping, only the named consignee can take delivery of the goods. Only the person who has title at the time of assignment can assign the title to someone else

²²⁵ Williams, *supra* note 219, at 566-67.

²²⁶ For an in depth and technical discussion as to how Wave's system works, *see*, e.g., A Method of Distributed Management of Electronic Documents of Title (EDT) and System Thereof, U.S. Patent No. 20180075028 (filed Mar. 15, 2018).

by endorsement. A bill of lading assigned to a certain consignee can only be endorsed by that consignee, not the shipper or any other party.²²⁷

Before a buyer pays for goods he must determine that he is assigned as the consignee, and also check that all the intervening endorsements provide for an unbroken chain of title to assure himself ownership. For example, if consignee X placed an order from the oversea supplier and wants to later pass the ownership of the goods to consignee Y, he must endorse the bill of lading (which is signed originally to him) by signing the back side of the original bill of lading and mentioning “please deliver cargo to consignee Y” or the equivalent wording. The use of endorsements importantly enables customers to take delivery of the goods on a timely basis. Endorsements minimize storage costs that can result from delays of following the chain of custody from one buyer to another and can also prevent losses caused by market conditions or the quality of the received goods. The law will typically shield a shipper from liability for handing over the goods to the endorsee, provided the endorsement is proper.²²⁸

In the current paper-based system, endorsements are done by handwritten signatures.²²⁹ A bill with many endorsements is usually messy and sometimes even faded due in part to the handling of the physical paper. All of this makes it logically difficult to see all of the endorsements, and which logically makes it difficult to confirm that the endorsements show an unbroken chain of title.

In order to replace handwritten endorsement signatures, digital signatures must obtain the same legal functionality as their paper

²²⁷ See, e.g., 4.3.6-Contracts-Title to and Endorsement of a Bill of Lading, INTERNATIONAL TRADE CENTER, <http://www.intracen.org/coffee-guide/contracts/title-to-and-endorsement-of-a-bill-of-lading/> (last visited Oct. 25, 2018).

²²⁸ *Bills of Lading*, GARD AS, 20 (Mar. 2011), www.gard.no/Content/72486/Bills%20of%20lading%20March%202011.pdf.

²²⁹ See *infra* note 227.

counterpart. These functions include evidence, ceremony, approval, efficiency and logistics.²³⁰ Moreover, the digital signature must provide authenticity (the signer of the document is who he says he is) and integrity (the content of the document was not tampered with).²³¹ Attempts to modify the document should automatically invalidate the signature.²³²

If the industry moves to a digital method, these endorsements must also become electronic. This will make the endorsements more organized and easier to track. Currently, only China and Australia have legislation permitting the use of digital signatures in electronic bills of lading.²³³

2. Timestamps

In blockchain technology, every transaction has a timestamp that determines exactly when that transaction occurred.²³⁴ As described above, the use of blockchain creates an electronic ledger which contains all the information about the bill of lading, including the identity of its owner at any given time. This is an important feature that can solve common disputes very easily.²³⁵ In contrast, the physical transfer of the paper bill of lading is not always documented or clear and therefore often creates uncertainty. This uncertainty can be particularly damaging in an insurance context.²³⁶

²³⁰ Melissa Newland & Timo Vuori, *The Use of Digital Signatures on a Bill of Lading*, 2, 1st Australian Information Security.

²³¹ See American Bar Association, Section on Science and Technology, Division on Electronic Commerce and Information Technology, Committee on Information Security, *Digital Signature Guidelines* (Aug. 1, 1996), apps.americanbar.org/dch/thedl.cfm?filename=/ST230002/otherlinks_files/dsg.pdf.

²³² Newland & Vuori, *supra* note 230.

²³³ *Id.*

²³⁴ Satoshi Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System* (2008), <https://bitcoin.org/bitcoin.pdf>.

²³⁵ *Id.*

²³⁶ Dubovec, *supra* note 113, at 437.

VIII. LEGAL ASPECTS

A. Document of Title

As described above, a bill of lading should serve at least 3 functions: (1) evidence of contract of carriage, (2) a receipt for the goods, and (3) documentation of title.²³⁷ It is broadly agreed that the first two functions are easily replicated by the electronic bill.²³⁸ The main legal (and technical) issue is the last—its function as a document of title, particularly with regard to negotiable bills of lading. In this section we demonstrate that blockchain, and Wave's platform in particular, is able to replicate the document of title function.

The document of title function reflects three uses of the bill. The possession of the document constitutes constructive possession and control over the goods; the document may be used to transfer title; and the document can be used to provide security over the goods to financial institutions. Typically, these uses require signatures, uniqueness (singularity), and possession. These requirements are obvious for physical bills but become less intuitive for electronic bills.²³⁹

Electronic or digital signatures in electronic platforms are already widely accepted as part of e-commerce. For example, the 1996 United Nations Commission on International Trade Law - Model Law on Electronic Commerce (MLEC)²⁴⁰ and the 2001 UNCITRAL Model

²³⁷ Beecher, *supra* note 73, at 628; Williams, *supra* note 219, at 555, 560; Dubovec, *supra* note 113, at 441; Basu Bal, *supra* note 220, at 25; Pollard v. Vinton, 105 U.S. 7, 8 (1881).

²³⁸ Dubovec, *supra* note 113, at 441; Basu Bal, *supra* note 220, at 26.

²³⁹ Basu Bal, *supra* note 220, at 26.

²⁴⁰ *UNCITRAL Model Law on Electronic Commerce with Guide to Enactment 1996*, United Nations Publication, Sales No. E.99.V.4, http://www.uncitral.org/pdf/english/texts/electcom/05-89450_Ebook.pdf. Legislation based on this model law has been adopted in 54 jurisdictions; for a detailed list, See UNCITRAL, *UNCITRAL Model Law on Electronic Commerce (1996)*, UNCITRAL,

Law on Electronic Signatures aimed to establish criteria for digital based trade, including the establishing of “technical reliability for the equivalence between electronic and hand-written signatures.”²⁴¹

There is a need for bills of lading to be singular and unique because they embody the rights of title to the transported goods. Multiple copies that entitle the same goods would cause loss of faith in the system. Uniqueness and singularity are required by Article 9, paragraph 1 (a)-(c) of the Rotterdam Rules but the specific requirements are abstract as they call for legal and business solutions, but not technical solutions.²⁴²

Electronic technology may enhance uniqueness and singularity. Blockchain technology, in particular, is an optimal solution. For example, the current practice for issuing a physical negotiable bill of lading involves issuing at least three copies. In Wave's platform, on the other hand, there is only one original document, and copies are labeled as such. If there is a commercial need for three original bills, Wave's system can also support this by showing to every party whether they possess one of the originals or a mere copy. Similar technologies have already been broadly adopted for properties that need to be strictly

http://www.uncitral.org/uncitral/en/uncitral_texts/electronic_commerce/1996Model_status.html (last visited Sept. 13, 2018).

²⁴¹ *UNCITRAL Model Law on Electronic Signatures with Guide to Enactment 2001*, United Nations Publication, Sales No. E.02.V.8, http://www.uncitral.org/uncitral/uncitral_texts/electronic_commerce/2001Model_signatures.html.

²⁴² Basu Bal, *supra* note 220, at 29.

registered, including real-estate,²⁴³ mortgages,²⁴⁴ and cryptocurrencies like bitcoin.

Legal systems often describe the physical possession of the bill of lading as part of the concept of control.²⁴⁵ Most approaches to the problem of singularity agree that control can be satisfied through a reliable registry system, such as the attempted Bolero system, described above.²⁴⁶ A lack of reliable registry systems contributed to the failure of previous attempts to develop electronic bills of lading.²⁴⁷

Fortunately, the idea of control is inherent to blockchain-based systems like Wave. Blockchain, as described above, is a decentralized system which allows the user to make transactions with unknown or untrustworthy parties.²⁴⁸ Prior to the invention of blockchain, two parties needed a trusted centralized 3rd party to ensure and insure the transactions. In blockchain, all transfers are transparent and verifiable.²⁴⁹ Blockchain protocols ensure that transactions are valid and never recorded to the shared repository more than once, enabling people to coordinate individual transactions in a decentralized manner without the need to rely on a trusted authority to verify and clear all transactions.

²⁴³ *The Great Chain of Being Sure About Things*, THE ECONOMIST, <http://www.economist.com/news/briefing/21677228-technology-behind-bitcoin-lets-people-who-do-not-know-or-trust-each-other-build-dependable?fsrc=scn/tw/te/pe/ed/blockchains> (last visited Sept. 13, 2018).

²⁴⁴ Cascarilla, Charles G. *Bitcoin, Blockchain, and the Future of Financial Transactions*, 32 CFA INSTITUTE CONFERENCE PROCEEDINGS QUARTERLY (2015).

²⁴⁵ Basu Bal, *supra* note 220, at 29-34.

²⁴⁶ Basu Bal, *supra* note 220, at 32.

²⁴⁷ *See, e.g.*, John Livermore & Krailerk Euarjai *Electronic Bills of Lading and Functional Equivalence*, 2 J. INFORM. L. & TECH. (1998), https://warwick.ac.uk/fac/soc/law/elj/jilt/1998_2/livermore/; Nicholas Demetriou, *Electronic Bills of Lading: Why it's Different This Time*, BALTIC BRIEFING (Mar. 4, 2015), <http://thebalticbriefing.com/guest-column/electronic-bills-of-lading-why-its-different-this-time/>.

²⁴⁸ *See generally*, Nakamoto, *supra* note 131.

²⁴⁹ *See, e.g.*, text accompanying *supra* note 133; *see also* COINDESK, *supra* note 213.

Only one person has the control over the bill at any time and it is therefore equivalent to physical possession.²⁵⁰

B. Validation under international law

The recently enacted Rotterdam Rules demonstrate that in international trade and commerce, a uniform law for all the countries would be preferable to a heterogeneous legal system. Unfortunately, the vast majority of countries have not yet ratified or adopted these rules, thereby effectively negating the efforts of the drafters.²⁵¹ In general, the law develops slower than technology, and all the more so for international law.²⁵² While new international laws may be introduced in the future, the Rotterdam Rules and the MLEC currently provide the necessary legal framework for the use of blockchain technology.²⁵³

²⁵⁰ *Id.*

²⁵¹ *Status: United Nations Convention on Contracts for the International Carriage of Goods Wholly or Partly by Sea*, United Nations Publications, Sales No. E.09V.9, http://www.uncitral.org/uncitral/en/uncitral_texts/transport_goods/rotterdam_status.html (last visited Sept. 13, 2018).

²⁵² See, e.g., Lyria Bennett Moses, *Understanding Legal Responses to Technological Change: The Example of in vitro Fertilization*, 6 MINN. J.L. SCI. & TECH. 505, 508 (2004) (“Our intuition that the law faces problems following the introduction of a new technology is correct, and is reflected in metaphors of law struggling to keep up.”); see, also Vivek Wadhwa, *Law and Ethics Can’t Keep Pace with Technology*, MIT TECH. REV., April 15, 2014, <https://www.technologyreview.com/s/526401/laws-and-ethics-cant-keep-pace-with-technology/>.

²⁵³ See, e.g., Koji Takahashi, *Implications of the Blockchain Technology for the UNCITRAL Works*, http://www.uncitral.org/pdf/english/congress/Papers_for_Programme/30-TAKAHASHI-Implications_of_the_Blockchain_Technology_and_UNCITRAL_works.pdf.

C. A look to the future

Implementing blockchain technology in bills of lading may give rise to new legal issues. We would like to emphasize two particular issues.

1. Liability issues

International shipping is a broadly inclusive industry that combines financial institutions, shipping companies' retailers, manufactures, importers, exporters, and a myriad of other stakeholders. The bill of lading connects them all. For all of its centrality within the complex system, it is a relatively simple instrument that had evolved minimally over decades if not centuries.

Introducing a new technology raises concerns regarding liability for system errors, communication failure, or system breakdowns. There will be growing pains as blockchain is accepted by this vast industry. It might be trivial to suggest a paper backup in case of unforeseen problems and concerns, however, the cost of such a redundancy would be prohibitive.²⁵⁴ However, without a paper backup, how can we confirm transactions, deal with mistaken identities, or prevent the crippling externalities of cybercrimes?²⁵⁵ Who will be liable for the repercussions of those system failures? Perhaps, like other digital system attempts, international groups could agree to insure against such liabilities.²⁵⁶ Alternatively, new contractual agreements can include

²⁵⁴ David A Bury, *Electronic Bills of Lading: A Never-Ending Story*, 41 TUL. MAR. L. J. 197, 198 (2016) (suggesting that the cost of the paper-based bills of lading system amounts to hundreds of billions of dollars annually).

²⁵⁵ *Switching from Paper to Electronic Bills of Lading*, MARSH (September 2016), <https://www.marsh.com/content/dam/marsh/Documents/PDF/UK-en/Switching%20from%20Paper%20to%20Electronic%20Bills%20of%20Lading.pdf> (last visited Sept. 13, 2018).

²⁵⁶ *Circular 12/15: Electronic (Paperless) Trading Systems*, UKPANDI (June 22, 2015), <https://www.ukpandi.com/knowledge-publications/article/circular-12-15-electronic-paperless-trading-systems-133819/> ("The International Group has agreed

clauses that seek to limit the liabilities associated with the growing pains of these new technologies.

2. Authority for registry system

There is no international law governing the blockchain registry. Blockchain is a decentralized, self-regulated system.²⁵⁷ By design there is no third party involved in the procedure. A future interesting function could be the eventual creation of a central authority that will supervise the registry system and police it.

IX. SOCIAL ASPECTS

Wave's technology brings the advanced blockchain technology to the maritime industry, updating centuries-old methods of doing business. It has the potential to be highly disruptive.

The most prominent issue with the paper Bill of Lading is the time delay that it creates. The paper bill must be physically transported between stakeholders. The average delay before the paper document is ready for pickup from the carrier is three days but can take up to seven.²⁵⁸ Following this, the documents must be passed to the consignee's customs broker, which would take an additional four

to cover liabilities arising in respect of the carriage of cargo under three electronic trading systems – Bolero (www.bolero.net), ESS (www.essdocs.com) and the e-title system (www.e-title.net/).”

²⁵⁷ Blockchain Team, *The Block Chain – A New Regulatory Paradigm*, BLOCKCHAIN.COM (Sept. 10, 2015), <https://blog.blockchain.com/2015/09/10/the-block-chain-a-new-regulatory-paradigm/>; Bitcoin Magazine, *Top 4 Reasons Banks Should be Excited About Blockchain*, BITCOIN MAGAZINE (Nov. 3, 2015), <https://bitcoinmagazine.com/articles/top-reasons-banks-should-be-excited-about-blockchain-1446583077>.

²⁵⁸ Beecher, *supra* note 73, at 633.

days.²⁵⁹ The customs broker is responsible for surrendering the document to the carrier within one to two business days. If a bank is involved in the process, the seller's bank and the buyer's bank must each review the document themselves. Each bank gets a limited amount of time and must transmit the bill by courier to the next relevant party. If the bank finds inconsistencies in the documents, they must contact the parties and determine whether they agree on a revised inconsistency version, or not. If they disagree, the process of contracting is revisited, causing slowdowns and inefficiencies.²⁶⁰

In addition to these inefficiencies, there are other inefficiencies that make a blockchain based bill of lading a logical choice. For example, there is a serious shortage in steel containers.²⁶¹ As the prices continue to rise, carriers are charging more for demurrage (penalty associated with cargo not being promptly picked up), and refrigerated containers or special equipment incur higher rates. A delay in transmitting the bill can cost hundreds of dollars per day.²⁶² By substantially shortening the time and costs associated with transporting and verifying bills of lading, Wave's technology could bring substantial cost savings that would be transferred to the consumer.

Additional cost savings stem from reduced fraud. Wave's implementation of blockchain technology creates transparency in the transactions. Transparency forces shippers to acknowledge what is in each container, preventing them from deceiving customs, tax, insurance and other authorities. This reduced fraud results in savings by carriers, shippers and consignees that can be passed on to the consumer. It also

²⁵⁹ *Id.*

²⁶⁰ *Id.* at 634

²⁶¹ Henning Gloystein, *Shipping container price spike points to global trade growth*, REUTERS (Apr. 3, 2017), <https://www.reuters.com/article/us-container-shipping/shipping-container-price-spike-points-to-global-trade-growth-idUSKBN1750LV>.

²⁶² Beecher, *supra* note 73, at 634.

reduces tax fraud resulting from improper or fraudulent bills of lading,²⁶³ bringing greater revenues to the government.

Other groups may also benefit from Wave's technology. The ability to trade cargo at sea more easily and a more standardized system would make it easier to monetize bills of lading. This could in turn create opportunities for other new financial instruments such as smart contracts that would automate other related contractual obligations within international shipping.²⁶⁴

X. CONCLUSION

The bill of lading is a key document in international trade. In section II, we reviewed the legal history of the bill of lading, which was first introduced in ancient times and hasn't changed much since the 18th century. We showed in section III that the use of an anachronistic document in today's world creates many externalities. Two examples are fraudulent bills or bills that arrive after the cargo. We argued in section IV that a digital solution can solve these problems. We then introduced blockchain, Wave, and why Wave's blockchain-based platform can solve problems that other digital forms of bill of lading could not.

In sections V and VI, we reviewed relevant international laws, treaties and conventions. We demonstrated in chapter VII how Wave's solution can save time (and money) and prevent fraud while maintaining its crucial negotiability feature, which may improve current trade flaws. Then we showed in chapter VIII why the legal framework today allows

²⁶³ See, e.g., Dubovec, *supra* note 113, at 451 (noting that shippers are loathe to use a centralized database as that opens them up to inspection by tax authorities).

²⁶⁴ Kristoffer Nærland, et. al., *Blockchain to Rule the Waves-Nascent Design Principles for Reducing Risk and Uncertainty in Decentralized Environments* (Dec. 2017), https://pure.itu.dk/ws/files/82337540/N_rland_et_al._2017.pdf.

the U.S. to use Wave's platform and why the bill of lading keeps its role as a document of title. We discussed the legal aspects associated with it and in chapter IX in addition to the social aspects.

Our conclusion is that a digital solution is needed and that Wave's blockchain based platform can be such a solution. This is not theoretical. Wave's technology has already been used in the field, and other major carriers are seeking to build their own competing systems.²⁶⁵ In general, the law evolves slower than technology; however, the stakeholders' actions notwithstanding, international law seems to have already understood that the technology will provide a revolution in the international trading industry: It has already provided for e-commerce, digital signature, and the (platform agnostic) Rotterdam rules which set the stage for the optimal version of an electronic forms of bill of lading. It is up to the various stakeholders in the international shipping and related industries to adopt a corresponding technological solution. We suggest Wave.

²⁶⁵ David Pimentel, *Wave Completes Blockchain Bill of Lading Pilot*, BLOCKTRIBUNE (Nov. 21, 2017), <https://blocktribune.com/wave-completes-blockchain-bill-lading-pilot/> (last visited Sept. 13, 2018).