QUT Law Review ISSN: Online–2201-7275
Volume 18, General Issue 2 pp. 306–317 DOI: 10.5204/qutlr.v18i2.755

'BLOCKS OF LADING' DISTRIBUTED LEDGER TECHNOLOGY AND THE DISRUPTION OF SEA CARRIAGE REGULATION

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The bill of lading has, for centuries, been an integral component in the maritime shipping industry. However, the stagnation in the development of this legal instrument is contrasted with the exponential rate of development in other areas of commercial practice, which highlights the financial costs and delays associated with the use of bills of lading. The purpose of this paper is to present a modern alternative to the current paper-based bill of lading system that accounts for the practical and legal requirements of the incumbent instrument and also overcomes the deficiencies inherent in paper-based bills of lading. In the context of the regulatory uncertainty of bills of lading based on distributed ledger technology, this paper discusses approaches to regulating this new technology so as to achieve the same legal effects that the traditional, paper-based bill of lading provides. This paper presents two methods for regulating distributed ledger technology when applied to maritime shipping: the first is based on the principle of functional equivalence, which can be employed in domestic legislation, and the second is based on the Model Law on Electronic Transferable Records. *I conclude that, while both approaches represent steps in the right direction, the latter would imbue this technology with sufficient legal certainty so as to spark a marine cargo carriage revolution and facilitate a productive disruption of the current industry practice.*

I INTRODUCTION

The incumbent system of guaranteeing delivery of goods in international shipping has resisted change where other business methods have been innovated. This is because, as archaic as the traditional, paper-based bill of lading ('B/L') system may be, its functionality is not replicable merely over the internet. However, emergent technologies such as distributed ledger technology ('DLT') and blockchain technologies present a viable platform to replace the paper B/L. This technology seems to solve numerous industry issues, so the primary question is not whether blockchain will transform the infrastructural basis for shipping logistics, but when will this occur. Perhaps the more important question is whether this technology warrants further regulation and, if so, in what respect? Without clear regulation of blockchain-based sea carriage records, there are serious uncertainties about the rights available to parties under sea carriage contracts. This paper will primarily assess the capacity for Australian shipping law to appropriately regulate blockchain-based sea carriage records in the same way that it regulates ordinary B/Ls. Secondly, this paper will discuss how blockchain should be regulated; both in the sense of the application of the law and also regarding the action of legislators. Part II of this paper discusses the history, function and legal status of bills of lading, while exploring the challenges that they create in respect of the marine cargo industry. Part III briefly outlines how the advent of the internet revolutionised commercial law practices but concludes that the same effect has not been seen with regard to bills of lading, thus demonstrating the unique difficulties

* Research Assistant, Melbourne Law School; Editor, *Melbourne Journal of International Law*. I wish to thank Professor Jeannie Paterson of Melbourne Law School and Luca Castellani of UNCITRAL for their valuable feedback on earlier drafts of this paper, which was submitted as part of coursework undertaken for the JD at Melbourne Law School, The University of Melbourne. All errors remain my own.

in this area. Part IV provides an explanation of distributed ledger technology and discusses how this can be applied to record commercial transactions in the maritime shipping context. Finally, Part V analyses the extent to which this technology is currently regulated and presents two solutions to this regulatory problem.

II BILLS OF LADING

A *Definition, History and Function*

In contracts of sale where goods are to be carried from one country to another, systems of trust and verification are invaluable. An importer requires confidence that the goods bargained for exist and that they will be entitled to take possession of said goods when they arrive at the port of destination. This is particularly important in the shipping industry, where contracts can be international, parties are potentially unknown to each other and a sea of maritime perils stands between the importer and the shipper. To this end, the B/L acts as a verification that goods have been shipped and it is one of the most important logistics devices to date.

Although presently in use, these devices are, nevertheless, archaic. B/Ls have likely been in existence since 1316AD,[1] rendering them 'one of the oldest and most international forms of contract under both the common law and the civil law'.[2] Throughout this history, the three functions of B/Ls have remained stable: evidence of the carriage contract; a receipt that the carrier has taken possession of the goods; and, importantly for the purposes of this paper, a document of title. This third function poses the greatest issue when attempting to apply new technologies, such as electronic data interchange ('EDI') or blockchain, to the maritime shipping context.[3] This is due to the requirement that a B/L must be 'negotiable'. However, this term is perhaps a misnomer. As opposed to a cheque or a bill of exchange, B/Ls cannot be *truly* negotiable, as the consignee cannot receive a greater benefit than that held by the consignor. In this context, 'negotiable' is treated as meaning 'transferable'.[4]

B *Issues with the Bill of Lading System: Cost and Delay*

While necessary for ensuring trust in international transactions, B/Ls can be disadvantageous in many respects. Each B/L is often sent at least three times through a courier process, costing $100 on average. With more than 50 million B/Ls being created every year, the estimated total yearly cost of this process is approximately $5 billion.[5]

In maritime logistics, the shipper must often mail physical copies of the bill to the importer of the goods. If the goods reach the importer in advance of B/L, the importer will not have the requisite document of title to present to the carrier.[6] Not only will the carrier not accrue liability

1 W P Bennett, *The History and Present Position of the Bill of Lading as a Document of Title to Goods* (Cambridge University Press, 1914) 4.
2 William Tetley, *Marine Cargo Claims* (International Shipping Publications, 3rd ed, 1988) 215.
3 John Livermore and Krailerk Euarjai, 'Electronic Bills of Lading and Functional Equivalence' (1998) 2 *Journal of Information, Law and Technology* 1 <https://warwick.ac.uk/fac/soc/law/elj/jilt/1998_2/livermore>.
4 John F Wilson, *Carriage of Goods by Sea* (Pearson, 6th ed, 2008) 131, citing *Kum v Wah Tat Bank* [1971] AC 439, 446.
5 This is excluding additional costs of banks, which are required to process the bills of lading if payment is to be made by way of a letter of credit.
6 *Sze Hai Tong Bank Ltd v Rambler Cycle Co Ltd* [1959] AC 576, 586.

— neither in trover nor under statute — for withholding the goods, but the carrier may also have to place the goods in storage. This can result in demurrage costs as well as potentially causing other economic loss due to fluctuations in market value of the goods or an inability of the importer to meet obligations under other contracts.

These disadvantages are all significant and are sufficiently commonplace so as to generate concern. Therefore, the lack of technological innovation in this industry is almost perplexing. However, industry players *have* sought to dematerialise the paper B/L. It is just that centuries of common law development, national and international regulation and industry practice has shrouded the B/L in a sacrosanct veil that is seemingly impenetrable by new technologies. Consequently, attempts to replicate the B/L in a digital form have not been successful.[7] The primary hurdle to this endeavour has not only been the want of appropriate technology, but also the outdated legal framework governing B/Ls and other negotiable documents of title.[8]

III THE INTERNET: NOT QUITE THE TECHNOLOGY TO DEMATERIALISE BILLS OF LADING

The advent of the internet allowed for enhanced activity across the commercial trade industry. Try as it might, the internet alone was unable to provide a digital alternative to B/Ls. This is due to the various 'legal obstacles' faced by EDI in the maritime industry,[9] such as the inherent inability to guarantee 'uniqueness (or singularity)'.[10] This obstacle may also be termed the 'problem of multiplicity'. EDI can easily be sent to multiple people, duplicated and re-printed. An importer merely relying on EDI faces the risk of being defrauded and the carrier faces the risk of misdelivery,[11] for which 'presentation of a fraudulent bill is no defence'.[12] Without a system whereby the importer can ensure that there is only one copy of the bill in circulation at any given time, singularity cannot be guaranteed.[13] The inability of EDI to guarantee singularity is unlikely to invoke the application of the most commonly implemented rules on carriage of goods by sea, which includes mechanisms for invoking carrier liability. A reduced ability to claim against the carrier would both increase insurance costs and discourage EDI adoption. This explains the continued reliance on the traditional B/L system.

Many of the attempts to dematerialise the B/L rely on a central registry or some form of security device to account for the problem of multiplicity. In these instances, EDI would need to be

7 David A Bury, 'Electronic Bills of Lading: A Never-Ending Story?' (2016) 41 *Tulane Maritime Law Journal* 197, 212.

8 Livermore and Euarjai, above n 3.

9 Ibid.

10 United Nations Commission on International Trade Law, *Possible Future Work on Electronic Commerce: Transfer of Rights in Tangible Goods and other Rights*, 38th sess, UN Doc A/CN.9/WG.IV/WP.90 (12–23 March 2001) 27 [95]–[96]. See also *BHP Trading Asia v Oceaname Shipping* (1996) 67 FCR 211, 222.

11 United Nations Commission on International Trade Law, *Electronic Data Interchange*, 30th sess, UN Doc A/CN.9/WG.IV/WP.69 (31 January 1996) 4 [5].

12 See *Motis Exports v Dampskibsselskabet AF 1912 Aktieselskab* [1999] 1 Lloyd's Rep 837.

13 Although traditional B/Ls are ordinarily issued in triplicate (Douglas J Whaley, Stephen M McJohn, *Problems and Materials on the Sale and Lease of Goods* (Wolters Kluwer, 2019) 501; William J Miller, *Dictionary of International Commerce* (Chapman and Hall, 1985) 29; *Lickbarrow v Mason* (1787) 100 ER 35, 40. See also *International Chamber of Commerce Uniform Customs and Practice for Documentary Credits* (2007) art 20) banks will typically require presentation of the full set before making payment on the B/L. This ensures the seller is not able to re-use any part of that set to claim payment from another source: see Alan E Branch and Michael Robarts, *Branch's Elements of Shipping* (Routledge, 9th ed, 2014) 231; Michael Furmston, *Principles of Commercial Law* (Cavendish, 2nd ed, 2001) 193. Therefore, despite the triplicity of B/Ls in *form*, they maintain legal singularity in *effect*.

verified by a 'trusted administrator'[14] — be it a person, a body or a technology system.[15] While these systems might make EDI 'work', it does so *despite* the problem of multiplicity; as opposed to solving it. However, there are obviously further issues in such systems where the authorised entity is a central one, such as fraud, corruption,[16] destruction of the central node and hacking.[17]

For large-scale innovation to occur in this environment, the dematerialisation of sea carriage documents must be done without jeopardising its ability to guarantee singularity. Unless this occurs, the legal uncertainty surrounding EDI will discourage its adoption within the shipping industry. Further, in the letter of credit context, if such EDI is incapable of serving as a negotiable document of title, banks will be hesitant to rely on EDI as security for financing payment on the letter of credit. Fortunately, the sort of technology that may be capable of achieving this outcome has recently surfaced.

IV BLOCKCHAIN: CAN IT ACHIEVE WHAT THE INTERNET ALONE COULD NOT?

A *What is Blockchain?*

When data is transferred across a DLT system, each transfer of information is represented in the form of a block being added to another chain of blocks.[18] To verify this appendage, a difficult, mathematical computation must be solved. Because the proof of this computation is distributed across multiple nodes, the information on the blockchain cannot be deleted or amended; only appended.[19] The result of this is accurate authentication of the transferor's identity and a record of data that is made *immutable*.[20] The blockchain contains the history of every token in circulation, providing proof of who owns what at any given juncture through a chain of notarised appendages. This is the key differentiation between DLT-based EDI and regular, centralised EDI.[21]

B *Application of Blockchain to Marine Shipping Logistics*

Applied to maritime shipping, DLT-based EDI can be used to record goods (as tokens), which serves to guarantee the uniqueness of the record. Upon the shipper presenting the cargo to the carrier, the carrier (or, potentially, an AI technology) will sign off on the transaction and record the description of the goods, whether the bill is claused and any other relevant information, such as the identity of the consignor and consignee. This transaction is then broadcasted and is

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14 Dirk A Zetzsche, Ross P Buckley And Douglas W Arner, 'The Distributed Liability of Distributed Ledgers: Legal Risks of Blockchain' (Research Paper No 52, Faculty of Law Research Series, University of New South Wales, 2017) 10 <http://www5.austlii.edu.au/au/journals/UNSWLRS/2017/52.pdf> archived at <https://perma.cc/Z976-EP8G>.

15 'Bills of Lading' (1995) 26(II) *Yearbook of the United Nations Commission on International Trade Law* 174, 175.

16 United Nations Commission on International Trade Law, *Electronic Data Interchange*, 30th sess, UN Doc A/CN.9/WG.IV/WP.69 (31 January 1996) 25 [92].

17 Zetzsche, Buckley and Arner, above n 13, 10.

18 Zetzsche, Buckley and Arner, above n 13, 11.

19 Jonathan Levin, *I Love the Blockchain, Just Not Bitcoin* (21 November 2014) CoinDesk <http://www.coindesk.com/love-blockchain-just-bitcoin> archived at <https://perma.cc/8GT3-4K8V>.

20 Zetzsche, Buckley and Arner, above n 13, 15.

21 Cassie Findlay, *Decentralised and Inviolate: The Blockchain and its Uses for Digital Archives* (23 January 2015) Recordkeeping Roundtable <https://rkroundtable.org/2015/01/23/decentralised-and-inviolate-the-blockchain-and-its-uses-for-digital-archives> archived at <https://perma.cc/9DR3-9FW6>.

unprocessed until it is chosen by 'miners' from a pool of transactions. Together, the chosen transactions — which, at this point, are still unconfirmed — form a block. Multiple different miners will add the same transaction to their own blocks so that each transaction ends up in a larger number of blocks (the number of which will depend on the number of miners). The transaction will not be confirmed until it has been added onto the blockchain (ie, verified). For miners to add the transaction to the blockchain, they will need a specific key, which, as previously mentioned, is created by solving highly complex mathematical problems. At this point, the transaction will be recorded on the distributed ledger and the tokens would be issued to the shipper in exchange for payment on the carriage contract. The shipper would then have possession of the tokens, with the ability to transfer them to any buyer through a sale contract and in accordance with the terms of the carriage contract. The shipper would no longer have access to those tokens and the buyer (or bank) would. The buyer and any other interested party would also have the ability observe to the immutable history of the tokens' transfer. Upon arriving at the port of destination as indicated in the carriage contract, the carrier would make delivery of the goods to the person whose public key matched the key of the latest recipient of the tokens on the blockchain. Aside from the added benefits, the outcome achieved through this method is equivocal to that which would be achieved through traditional B/Ls.

It was already mentioned that regular EDI can benefit the maritime industry by reducing both cost and delay;[22] however, DLT-based EDI would reduce the likelihood of fraud to an even greater extent. Beyond these near-sighted benefits, DLT could also act as the platform for other new technologies to interact. For example, smart contract-based letters of credit could operate so as to issue payment on the receipt of a conforming DLT-based EDI. These transactions could be analysed by AI to detect instances of fraud or money laundering. Also, Internet of Things technology could provide real-time information about the location, temperature and condition of the goods and update the blockchain with this information. These applications of DLT are outside the scope of this paper; however, they are interesting to note and they provide a wider context to explain not only how, but *why* DLT-based EDI will be an asset to the shipping industry.

V CURRENT REGULATION OF DISTRIBUTED LEDGER TECHNOLOGY IN MARITIME SHIPPING

Sea carriage documents are regulated by a combination of international and domestic rules. Most commonly incorporated are the *Hague-Visby Rules*.[23] These rules, adopted in 1924 and amended in 1968, predate the internet by decades and hence do not mention dematerialised B/Ls. Consequentially, there is uncertainty as to whether DLT-based EDI would fall within the scope of these rules. This uncertainty is a large reason for why DLT has not gained support in the shipping industry.

The *Hague-Visby Rules* will only apply if there is a 'bill of lading relating to the carriage of goods'.[24] It is unlikely that DLT-based EDI will be recognised as meeting the 'bill of lading' criteria due to the common law custom of these documents generally being in physical form. Additionally, state practice of referring to B/Ls and *other* negotiable documents of title

22 Zetzsche, Buckley and Arner, above n 13, 6.

23 *International Convention for the Unification of Certain Rules of Law relating to Bills of Lading*, signed 25 August 1924, 120 LNTS 187 (entered into force 2 June 1931), as amended by the *Protocol to Amend the International Convention for the Unification of Certain Rules of Law Relating to Bills of Lading*, signed 23 February 1968, UNTS 23643 (entered into force 23 June 1977) ('*Hague-Visby Rules*').

24 *Hague-Visby Rules*, UN Doc 120 LNTS 187, art X.

suggests that there is a distinct status reserved for B/Ls in the maritime customary law.[25] DLT therefore occupies a lower-foothold within the regulatory framework. In this sense, DLT acts as a disruptor; not necessarily of the shipping industry but of the regulations. This is known as 'regulatory disruption'.[26] In some contexts, the 'attraction' of DLT lies in its ability to transcend the law and regulations.[27] In this context — contrasted with Nathan Cortez' argument for regulation — regulation is necessary to provide legitimacy and legal effect to DLT-based EDI. This invites the question of how regulators should respond.

To address the fissure between regular EDI (and now DLT-based EDI) and B/Ls, there has been regulatory action both nationally and internationally. First, where international law has been viewed as outdated, national legislators have altered the regulatory landscape, perhaps allowing DLT-based EDI to invoke the relevant sea carriage rules. At the international level, UNCITRAL has drafted model laws that endeavour to guide legislative development so as to combat DLT's regulatory disruption.

A *Domestic Regulation: Australia as a Case Study*

Australia began its romance with international shipping law in 1924 by implementing the *Hague Rules*[28] through the *Sea-Carriage of Goods Act 1924* (Cth). This was later repealed by the *Carriage of Goods by Sea Act 1991* (Cth), which, like many other countries, incorporated the *Visby Rules*,[29] thus bringing the *Hague-Visby Rules* into Australia. Distinctively, the *Hague-Visby Rules* were amended through the introduction of federal regulations,[30] which addressed many issues with EDI (hereafter referred to as the *Amended Hague-Visby Rules*). Notably, the regulations adopted the term 'sea carriage document', which *includes* B/Ls *as well as* 'other documents of title'. This allows for the recognition of other documents of title that, while not necessarily B/Ls in the traditional sense, carry the same functional and hence legal effect. The effect of this regulation suggests a focus on the principle of *functional equivalence*.

It seems that the requirements for a negotiable sea carriage document will be met where there is a document, that document is one of title and that document of title is negotiable.[31] If these elements are satisfied, subject to the ordinary doctrine of contract formation, DLT-based EDI might be legally equivalent to B/Ls under the Australian *Amended Hague-Visby Rules*.

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25 See, eg, *Carriage of Goods by Sea Act 1991* sch 1A art 1(1)(f)(ii) ('*COGS Act*').

26 Nathan Cortez, 'Regulating Disruptive Innovation' (2014) 29 *Berkeley Technology Law Journal* 175, 175.

27 Dirk A Zetzsche, Ross P Buckley And Douglas W Arner, 'The Distributed Liability of Distributed Ledgers: Legal Risks of Blockchain' (Research Paper No 52, Faculty of Law Research Series, University of New South Wales, 2017) 1 <http://www5.austlii.edu.au/au/journals/UNSWLRS/2017/52.pdf >.

28 *International Convention for the Unification of Certain Rules of Law relating to Bills of Lading*, signed 25 August 1924, 120 LNTS 187 (entered into force 2 June 1931).

29 *Protocol to Amend the International Convention for the Unification of Certain Rules of Law Relating to Bills of Lading*, signed 23 February 1968, UNTS 23643 (entered into force 23 June 1977).

30 *COGS Act* sch 1A, as amended by *Carriage of Goods by Sea Regulations 1998* (Cth) (*Amended Hague-Visby Rules*).

31 Remembering that, in the sea carriage context, negotiable means transferable, see *Amended Hague-Visby Rules art* 1(1)(f)(ii).

1 *Document*

Unlike the interpretation legislations of the Commonwealth,[32] New South Wales[33] and Northern Territory,[34] — which define a document as including any record of information — Victoria, South Australia, Queensland and Western Australia define the scope of 'document' more narrowly. The definition's scope under the latter States refers to, at the highest level, forms of markings being made *on* articles and mediums.[35] Therefore, if the carriage contract was governed by the laws of those States, DLT-based EDI would likely not be considered a document under the *Amended Hague-Visby Rules*. Alternatively, if laws of the Commonwealth of Australia governed the carriage contract, the more expansive definition would apply. Then, if the tokens used on the blockchain are scriptable and *do* contain script that corresponds to goods, this would likely constitute a 'record of information' and, hence, be a document.

It is also not necessary for documents to be *physically* scripted; rather, the *Amended Hague-Visby Rules* specifically clarify that 'writing' includes 'electronic data interchange … and entry in a database maintained on a computer system'.[36] B/Ls typically request the signature of the shipper and carrier as an element of contract formation.[37] Per the *Electronic Transactions Act 1999* (Cth), any formal signature requirement can be satisfied through electronic communication so long as: it incorporates a method used to identify the person and their intention in respect of the information communicated;[38] the consignee consents to that requirement being met by way of the method used;[39] and either the method used was as reliable as appropriate for its purpose considering all the circumstances, including any relevant agreement[40] *or* the method is proven in fact to be able to identify the person and indicate their intention with respect to the information received.[41] This first requirement will be satisfied with respect to DLT-based EDI as this system uses a method that is indeed capable of identifying persons. This can be done in two ways. First, other persons such as the carrier will be able to view the public key of the possessor of the tokens on the blockchain and can confirm the public key of the importer. These keys are unique and are thus provide a robust method for identification.[42] Secondly, 'data can be incorporated into the transaction record and this can be encrypted or hashed before it is recorded to the blockchain'.[43] This would enable one to incorporate a greater range of data into the transaction record (making it immutable), enabling the identification of the relevant party; be it the shipper, the carrier or the importer. Addressing the second requirement, there would merely need to be a clause in the contract of carriage and contract of sale stating that the party's unique public key (or scripted information capable of

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32 *Acts Interpretation Act 1901* (Cth) s 25 (definition of 'document' para (a)).

33 *Interpretation Act 1987* (NSW) s 21 (definition of 'document').

34 *Interpretation Act* (NT) s 17 (definition of 'document' para (a)(vi)).

35 *Interpretation of Legislation Act 1984* (Vic) s 38 (definition of 'document'); *Acts Interpretation Act 1915* (SA) s 4 (definition of 'document'); *Acts Interpretation Act 1954* (Qld) sch 1 (definition of 'document'); *Interpretation Act 1984* (WA) s 5 (definition of 'document').

36 *Amended Hague-Visby Rules* art 1(1)(h).

37 See, eg, Richard Aikens, Richard Lord and Michael Bools, *Bills of Lading* (Routledge, 2nd ed, 2016) 77.

38 *Electronic Transactions Act 1999* (Cth) s 10(1)(a).

39 Ibid s 10(1)(d).

40 Ibid s 10(1)(b)(i).

41 Ibid s 10(1)(b)(ii).

42 These systems of identification are arguable more robust than traditional, orthodox identification certificates: see generally Clare Sullivan and Eric Burger, 'E-Residency and Blockchain' (2017) 33 *Computer Law and Security Review* 470.

43 GSMA, 'Distributed Ledger Technology, Blockchains and Identity: A Regulatory Overview' (September 2018) 6.

identifying the person) is intended to be used to identify that person for the purpose of a signature. On the third point, for the s 10(1)(b)(i) test, the immutability of blockchain, and hence the authentication of a person's key, will likely be sufficiently reliable. Although there will unlikely be any reliability issues associated with DLT-based identification, it is notable that the alternative s 10(1)(b)(ii) test provides an even lower threshold, only requiring that the method of identifying a person can be proven to actually the person to which the information relates. However, courts have tended to primarily apply the s sub-paragraph (i) 'reliability' test.[44] Ultimately, it is likely that DLT-based EDI is capable of constituting a signed document. If this document only contained evidence of the sale contract, then it would only be capable of being a sea carriage document. Indeed, there are further requirements for said document to be a *negotiable* sea carriage document.[45]

2 *Document of Title*

In addition to being a document, the document must be one that is capable of transferring title. Across the Australian states, this is defined generally as a document that is used as proof of the possession or control of goods.[46] This has two elements. First, the document or token must be guaranteed in its singularity; and, secondly, the document or token must represent the goods. These are both demonstrated in action through B/Ls,[47] which, as previously described, guarantee singularity and act as a record of the goods shipped.

The fact that a B/L guarantees singularity allows it to be treated as a document connoting title to the goods. Also, when the B/L is endorsed and passed from the consignor to the consignee, the shipper loses the constructive title to the goods and the importer gains said constructive title; Party A loses a right and Party B gains that right.[48] In this sense, a B/L is a negotiable document of title. These same principles are able to apply to the blockchain architecture. The tokens on a blockchain are not duplicated and distributed; rather they can only be held by a single party at any given juncture. Secondly, the scripting function of blockchain will enable the tokens to take on the representation of any good. Therefore, it is likely that the *Amended Hague-Visby Rules* will recognise scripted tokens on the blockchain as a document of title.

3 *Negotiable Document of Title*

The *Amended Hague-Visby Rules* substitute the notion of a bill of lading with the concept of a 'negotiable sea carriage document'.[49] Under these *Rules*, DLT-based bills of lading will not be functionally (and hence legally) equivalent to a negotiable sea carriage document unless they

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44 See *Bullhead Pty Ltd v Brickmakers Place* [2017] VSC 206 [170] (21 April 2017); *Russells v McCardel* [2014] VSC 287 (Bell J, 23 June 2014) [55], [57]–[58].

45 *Amended Hague-Visby Rules* art 1(1)(f), (g).

46 *Goods Act 1958* (Vic) s 65 (definition of 'document of title'); *Sale of Goods Act* (NT) s 5 (definition of 'document of title to goods'); *Sale of Goods Act 1923* (NSW) s 5 (definition of 'document of title to goods'); *Sale of Goods Act 1896* (Qld) s 3 (definition of 'document of title to goods').

47 'Bills of Lading' (1995) 26(II) *Yearbook of the United Nations Commission on International Trade Law* 174, 175–6 [1].

48 United Nations Commission on International Trade Law, *Possible Future Work on Electronic Commerce: Transfer of Rights in Tangible Goods and other Rights*, 38th sess, UN Doc A/CN.9/WG.IV/WP.90 (12–23 March 2001) 23 [82]; *The Delfini* [1990] 1 Lloyd's Rep 252, 268; Guenter Treitel and Francis Reynolds, *Carver on Bills of Lading* (Sweet & Maxwell, 4th ed, 2017) [6-002]. Borka Tushevska, Transfer of Rights Incorporated into a Bill of Lading as a Type of Commodity Security (2013) 1 *Balkan Social Science Review* 149, 161.

49 *Amended Hague-Visby Rules* arts 1(1)(f), 3(4), (7), 5, 10(7).

constitute 'negotiable documents of title'.[50] In other words, the document must authorise she who holds the tokens to take lawful possession of the goods upon delivery.[51] This is distinct from merely selling a document to another, which is reflected in the following sentiment: 'It should be borne in mind that what is being 'transferred' is not the paper or EDI message (that being just the medium), but the rights and/or title to the subject of the transaction'.[52] This demonstrates that it is not enough to simply acknowledge that a person has exclusive possession of a token that is scripted so as to describe the goods. Additionally, the goods that the token is purporting to represent must validly be the subject of the transfer and the technology must be able to facilitate this.

Negotiability, in the context of sea carriage documents, means that the 'bill may be negotiated to others so that the ultimate holder can stand in the place of the original consignee'.[53] This effect will be had where the document contains the words 'to order', 'to order or assigns'[54] or words to that effect. In essence: 'there must be something on the face of the bill which indicates that the bill is transferable before it will be correct to treat the bill as negotiable'.[55] If the B/L, however, identifies a particular person, then it will not be negotiable.[56]

This could be achieved on DLT by either incorporating this into the blockchain code, or by scripting this on the tokens. Hence, blocks of lading might attract the application of the *Hague-Visby Rules*. However, this will be largely contingent on the laws governing the carriage contract, the domestic regulations of that jurisdiction and the coding architecture of the blockchain. Furthermore, given the novelty of the technology and the absence of a clear 'functional equivalence' provision in the Australia, the legal status of DLT-based EDI under Australian law cannot be determined with certainty.

B *How it Should Be Done*

Even if this regulatory approach successfully renders DLT-based EDI legally equivalent to B/Ls and other negotiable sea carriage documents, this approach is not ideal. The remaining legal uncertainty about whether DLT *would* be considered a negotiable sea carriage document, coupled with the operational uncertainty surrounding this nascent technology will undoubtedly discourage its adoption in the maritime industry. This will be further augmented if there is continued transnational divergence in how various regulators and legislators decide to approach this nascent technology. It is already the case that some countries do not recognise EDI as legally equivalent to sea carriage documents. Furthermore, those that do, regulate EDI differently.[57]

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50 *Amended Hague-Visby Rules* art 1(1)(f)(ii).

51 Negotiability, in the context of title to goods, refers to the legal transfer of constructive title over articles through the endorsement or delivery of an instrument: D P Whiting, *Mastering Banking* (Macmillan, 1985) 122. An instrument will have this effect (ie, it will be a negotiable instrument) where it is marked 'order of', or to that effect: Carver, above n 45, 345.

52 United Nations Commission on International Trade Law, *Report of the Working Group on Electronic Data Interchange on the work of its twenty-ninth session*, 28th sess, UN Doc A/CN.9/407 (16 March 1995) 5 [6].

53 *BHP Trading Asia v Oceaname Shipping* (1996) 67 FCR 211, 222, citing *Comalco Aluminium Ltd v Mogal Freight Services Pty Ltd* (1993) 113 ALR 677, 696.

54 *BHP Trading Asia v Oceaname Shipping* (1996) 67 FCR 211, 223, citing *Henderson & Co v Comptoir d'Escompte de Paris* (1873) LR 5 PC 253. See also *Soproma SpA v Marine & Animal By-Products Corporation* [1966] I Lloyd's Rep 367.

55 *BHP Trading Asia v Oceaname Shipping* (1996) 67 FCR 211, 223.

56 *The Chitral* [2000] 1 Lloyd's Rep 529; Wilson, above n 4, 130.

57 Bury, above n 7, 214.

C *International Regulation*

1 *Model Law on Electronic Transferable Records ('MLETR')*[58]

The *MLETR* recognises that 'uncertainties regarding the legal value of electronic transferable records constitute an obstacle to international trade' and that there needs to be 'harmonization and unification of the law'.[59] Therefore, the *MLETR*'s regulatory approach is based upon two guiding principles: technology neutrality and functional equivalence.[60] Technology neutrality relates to the concept that the law should not require a specific technology system to be used. The benefit of regulating new technology this way is that the rules will remain relevant despite further technological innovation. The second regulatory principle — functional equivalence — means that an electronic version of a traditional device 'shall not be denied legal effect, validity or enforceability on the sole ground that it is in electronic form'.[61] This applies if, and only if, those two methods are functionally equivalent. This less prejudicial treatment of technological solutions is only concerned with the outcome of a particular method, as opposed to the method itself. An added benefit of this form of regulation is that it will likely encourage technology developers to innovate their dematerialised sea carriage documents so as to most closely replicate the incumbent paper B/L system. For example, the *MLETR* defines electronic transferable records as electronic records containing all of the information that would make a paper-based transferable document effective.[62] This paper has demonstrated how DLT-based EDI is functionally equivalent to B/Ls. Therefore, this would warrant, per the *MLETR*, equal treatment under the law between electronic transferable records and paper transferable documents.[63] Interestingly, the *MLETR* also specifically mentions 'token-based and distributed ledger-based systems'.[64]

The reality is that technology is developing at a pace faster than to which domestic — and especially international — rule-makers can adapt. Today, we do not have the luxury of only needing to regulate a document that has existed in practice for centuries. The principle of functional equivalency allows regulators to denote the incumbent document — ie, the B/L — as the gold standard shipping document. Only the technologies that achieve equivalent outcomes will reap the benefits of regulation. This method allows for regulation of increasingly technical innovations without having to account for the underlying systemics of the technology. If such regulation becomes widely adopted, B/Ls will eventually be rendered, first, a part of history and, secondly, a legal test by which to judge other technologies in the shipping industry.

While Australia's *Amended Hague-Visby Rules* subtly regulate functional equivalence, it is not as adequately clear as the *MLETR*. And while the approach taken by the *MLETR* is commendable, it is not binding; rather, it only provides a model and endeavours to guide

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58 United Nations Commission on International Trade Law, *Model Law on Electronic Transferable Records* (United Nations, 2018) ('*MLETR*').

59 *Model Law on Electronic Transferable Records of the United Nations Commission on International Trade Law*, GA Res 72/114, UN GAOR, 72nd sess, Agenda Item 79, UN Doc A/RES/72/114 (18 December 2017) 1.

60 *Explanatory Note to the UNCITRAL Model Law on Electronic Transferable Records* (United Nations, 2018) 23 [18] ('*Explanatory Note*').

61 *MLETR* art 7(1).

62 Ibid art 2.

63 *Explanatory Note*, above n 63 [10].

64 Ibid 34.

national legislators to revise their law to provide for harmonious and more favourable treatment of electronic documents, as opposed to being tempted to shoe-horn DLT into their existing regime. It may be argued that the non-binding nature of these rules will likely have little regulatory effect on the maritime industry. However, as will be discussed, one state has already taken the admiral step of regulating new technologies that are functionally equivalent to B/Ls through the implementation of the *MLETR*. Similar decisive action to implement the *Model Law* must be taken by more countries, otherwise the *MLETR* risks being rendered a stale agency threat at the international level.[65]

2 *Domestic Implementation of the MLETR: Bahrain as a Case Study*

It is important to note that on 29 November 2018, Bahrain became the first state[66] to implement the *MLETR* into its domestic legal system.[67] Article 10 of the *MLETR* is enacted in art 6 of the Bahrani *Electronic Transferable Records Law* (‘*ETRL*’), which operates on the principle of functional equivalence. These common articles regulate when an electronic record can be recognised as a *transferable* electronic record. The first prong of the rule[68] concerns the content of the record whereas the second prong[69] relates to the reliability of the method used to communicate the record. Both must be satisfied for the electronic record of information to be legally recognised as a transferable document in Bahrain.

For the first prong of the *ETRL*, the electronic record must contain information that would be required to be contained in a transferable document or instrument.[70] Due to the ability to write script on the tokens used on the blockchain, this would be readily satisfied. The second prong is further subdivided into three parts, which require that a reliable method be used to: (1) identify that electronic record as the electronic transferable record;[71] (2) render it capable of being subject to control from its creation until it ceases to have any effect or validity;[72] and (3) retain the integrity of that electronic record’.[73]

The first sub-prong of the *ETRL* requiring that a reliable method is used to identify that electronic record as the electronic transferable record reflects the singularity approach[74] (as opposed to the problem of multiplicity inherent with internet-based electronic records)[75] — it is this provision that outlines the core requirement of functional equivalence.[76] This interpretation comes from the fact the provision operates to require the record to identify itself as *the* electronic transferable record, not as *an* electronic transferable record.[77] As discussed

65 See Nathan Cortez, above n 25.

66 At the time of writing, it is also the *only* state to have enacted the *MLETR*.

67 *Electronic Transferable Records Law*, Law No 55 of 2018 (Bahrain); Jenny Clift, UNCITRAL Secretariat, ‘Bahrain enacts the UNCITRAL Model Law on Electronic Transferable Records’ (Press Release, UNIS/L/269, 5 December 2018) <http://www.unis.unvienna.org/unis/en/pressrels/2018/unisl269.html> archived at <https://perma.cc/NHZ8-XUWE>.

68 *Electronic Transferable Records Law*, Law No 55 of 2018 (Bahrain) art 6(1); *MLETR* art 10(1)(a).

69 *Electronic Transferable Records Law*, Law No 55 of 2018 (Bahrain) art 6(2); *MLETR* art 10(1)(b).

70 *Electronic Transferable Records Law*, Law No 55 of 2018 (Bahrain) art 6(1); *MLETR* art 10(1)(a). In this sense, when applied to a bill of lading, one would need to be able to input into the DLT-based electronic record the same information as would be contained in a paper B/L.

71 *Electronic Transferable Records Law*, Law No 55 of 2018 (Bahrain) art 6(2)(a); *MLETR* art 10(1)(b)(i).

72 *Electronic Transferable Records Law*, Law No 55 of 2018 (Bahrain) art 6(2)(b); *MLETR* art 10(1)(b)(ii).

73 *Electronic Transferable Records Law*, Law No 55 of 2018 (Bahrain) art 6(2)(c); *MLETR* art 10(1)(b)(iii).

74 *Explanatory Note*, above n 63 [94].

75 See Part III.

76 Ibid.

77 This is true for not only the English text of the *MLETR*, but also the Arabic text of the *MLETR* and Arabic text of the *ETRL*.

earlier, DLT-based EDI guarantees singularity.[78] In that sense, if that record contains information to the effect that it is *the* electronic transferable record, this can be guaranteed. The *ETRL*'s second sub-prong will also be satisfied as DLT-based EDI is capable of producing records that are under the 'exclusive control' of a person.[79] DLT allows for exclusive possession of the scripted token and thus constructive title over the goods. This ability for only one person to have exclusive possessory rights over the tokens in a DLT-based system — which, here, is also related to singularity — ensures that the requirement of control will be met. It has previously been discussed that DLT-based information is immutable.[80] Therefore, this technology could 'retain the integrity of that electronic record' and the third sub-prong of the *ETRL* will also be satisfied by DLT-based EDI. The new Bahrani law on electronic transferable records even explicitly defines 'document' as including a 'bill of lading';[81] more to the point, the satisfaction of the aforementioned tests means that a DLT-based EDI can be used in a functionally equivalent capacity and with the same legal effect as a B/L under Bahrani law.

If Australia were to also adopt the *MLETR*, the same conclusion would be drawn there: the *Model Law* would recognise DLT-based EDIs as constituting a 'transferable document' and hence it would be negotiable. As a negotiable document of title, so long as the record is able to evidence a contract of carriage, it would be recognised under the Australian *Amended Hague-Visby Rules* as constituting a 'negotiable sea carriage document'.[82] This would render DLT-based EDIs not only as a tenable new technology that could be used in shipping logistics, but as a *superior* system that would be capable of disrupting the current and long-standing industry practice of relying of paper B/Ls.

VI CONCLUSION

Although blockchain has the potential to bring many benefits to the international shipping industry, there is no international framework in force to properly regulate this technology. Consequently, this leaves uncertainty about the respective rights of parties under a carriage contract. Australia provides a useful case study as a country that, through national amendments to the primary international rules on the carriage of goods by sea, might have a legal framework compatible with DLT-based EDI. However, this is still largely uncertain and does not provide clear guidance to technologists. Nevertheless, there needs to be stronger regulation to bring legal support to DLT in the shipping context. Where the Australian law seems to incidentally regulate DLT through a principle of functional equivalence, the *MLETR* does this directly. The *Model Law* has been implemented in Bahrain and this regulatory approach will imbue DLT-based EDI with sufficient legal certainty so as to spark a marine cargo carriage revolution and facilitate a productive disruption of the current industry practice. These recent developments (both in the law and the technology) demonstrate the importance of paying more attention to how a technology functions as opposed to its mere form. Such a regulatory approach that considers function over form is truly a new technology law.

78 Part V(A)(1).
79 See *Electronic Transferable Records Law*, Law No 55 of 2018 (Bahrain) art 7(1); *MLETR* art 11(1)(a).
80 Part IV(A).
81 *Electronic Transferable Records Law*, Law No 55 of 2018 (Bahrain) art 1(e)(i) (definition of 'document').
82 *Amended Hague-Visby Rules* arts 1(1)(f).