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TITLE:

Does blockchain technology offer a solution to the remaining impediments to the more widespread use of electronic negotiable bills of lading?

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I hereby declare that I have read and understood the regulations governing the submission of LLM dissertations, including those relating to length and plagiarism, as contained in the rules of this University, and that this dissertation conforms to those regulations.

I would specifically like to thank Prof Bradfield, Ms. Richfield and my family for their patience and support.

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CHAPTER 1 INTRODUCTION

I. Aim

This chapter aims at laying the foundation into the enquiry if blockchain technology offer a solution to the remaining impediments to the more widespread use of electronic negotiable bills of lading.

II. Thesis

It will be argued that it does, because certain types of blockchains, through their functionality, can solve the limitations of a data message to be representative and the functional equivalent of a documentary bill of lading. Open and permissionless blockchains can be created with the same traditional capabilities as a paper document that can be transmitted without the aid of costly centralised 'Club' registries.[1]

Data messages in and of themselves have not been able to represent the traditional features of a documentary bill of lading as an exclusively possessable concept of 'singularity' and that can enable and facilitate the concepts of issuance and the subsequent delivery of goods upon presentment of the documentary bill of lading to the carrier at the destination port.

The traditional features of a documentary bill of lading are all contained in a singular document and has universal recognition as a document of title through the custom of merchants.[2] Data messages of title have not been internationally recognised in any international convention in force[3], or though custom[4], to be analogous to documents of title.[5]

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[1] "Club registries" refer to paid for centralised registries operated by a trusted-third party escrows that facilitate transfer of electronic documents between club members through a contractual framework, for example, Bolero or EssDOCS.

[2] *Sanders V Maclean* (1883) 11 Q.B.D. 327, 341.

[3] United Nations Convention on Contracts for the International Carriage of Goods Wholly or Partly by Sea, 2008 (Rotterdam Rules). The Rotterdam Rules were adopted by Resolution A/RES/63/122 of the General Assembly of the United Nations on 11 December 2008. Once the Rotterdam Rules become operative by the requisite number of ratifications, electronic documents of title will be recognised. See, Rotterdanm Rules Article 94 that regulates its coming into force, which is when the twentieth instrument of ratification, acceptance, approval or accession has been deposited with the UN Secretary-General. To date, only five of the aforesaid instruments have been deposited, by the following nation states, Benin, Cameroon, Congo, Spain and Togo. See United Nations 'United Nations Treaty Collection', available at *https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XI-D-8&chapter=11&lang=e*, accessed on 30 December 2019.

[4] It is in the process of being made through use and trade custom.

[5] Statute law has recognised electronic instruments of title, for example, the United States' Uniform Commercial Code-Documents of Title 5A Del. C. 1953, §7-106 recognises electronic documents of title by utilising the concept of control instead of possession, amongst other differences.

The features of a traditional bill of lading so far have been separated as distinct concepts or functionalities on pre-blockchain, closed[6] and centralised[7] Club registers. These centralised Club registers maintain which of its subscribed members have 'control' over goods that are subject to an international contract of sales and carriage by sea utilising data messages. This is restrictive to non-Club members and is trade restrictive. The data message referencing who is in control of the goods subject to the contracts do not contain imbedded information in relation to the contract of carriage or the receipt of the goods.

A subscribed Club member in 'control' of goods represented on a centralised register is ostensibly accepting a data message that is devoid of context as to what it relates to without external agreement.[8] A data message – as an electronic negotiable bill of lading – referencing control over the data message cannot exist without the platform provided from the third-party registry operator. The registry operator facilitates the change of control from one user to another. This indicates that there is no exclusive possession over the registry, only contractually facilitated control. Even though exclusive possession has not been replicated on a closed registry the information contained thereon has however been logically associated with the data message.

Blockchain is a synergy of information technology that utilises cryptography that can enable the facilitation of secure transactions on a decentralised and distributed online register by referencing transactions in a manner that is essentially immutable. Transactions are facilitated through a digital signature technique. The transactions could be the transfer of a coin or token that can be imputed to a specific individual. This can enable private entities to be able to alter a blockchain register directly without the assistance of a centralised and trusted third party.[9]

Blockchain technology provides for the option of a publicly owned, decentralised and distributed registry that does not prevent access to the system by onerous registration hurdles. The registry can be created from free and open source software (FOSS) that facilitates users to be able to transact directly with their desired peer for a 'token' in remote locations. The

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[6] Closed references the limitations to access the system, for example, the payment of subscription fees or the acceptance of a contractual framework.

[7] Centralised means control over the system requires permissioned access which is maintained by a third-party escrow.

[8] In *The Future Express* (1992) 2 Lloyd's Rep 79 at 95 the court held that it was necessary that for a custom as to transferability had to be proven. Transferability must either be recognised through statute or custom to enable a documentary intangible to obtain the status of document of title. By extension, contractually stating a document intangible is a document of title does not make it so.

[9] Satoshi Nakamoto *Bitcoin: A Peer-to-Peer Electronic Cash System*, p2, available at *https://bitcoin.org/bitcoin.pdf*, accessed on 14 November 2018.

token could be the functional equivalent of a traditional bill of lading without specialised equipment or paid subscription, making it an 'open' and 'permissionless' platform.[10]

The ability to change a blockchain register is based on knowing a hexadecimal number – a private key – which should be exclusively known and 'possessed' by a single entity.[11] If the key on a blockchain is lost or forgotten it cannot be recovered. The system operator in a pre-blockchain centralised registry, however, can redistribute permissions to the system.

A public, open and permissionless blockchain uses an open source protocol stack enabling a broad variety of users to use the platform, as opposed to limiting access to the registered users which have paid a subscription fee, or bought specialised software or hardware to have access to the system.[12]

Even if a blockchain as a register was privately owned and centralised, but facilitated decentralised and distributed access to the register for its users to directly transact, the ability to alter it is dependent on the ability to satisfy encumbrances which can be exclusively known by the 'key holder'.[13] This can facilitate a stronger form of 'possession' than pre-blockchain registers.[14] Importantly, the people that maintain the open and permissionless blockchain ecosystem have indirect control over the online ledger as the information is stored utilising their infrastructure, but the token or coin could be exclusively owned 'off' of the blockchain in an exclusively owned container.

In order to exploit blockchain technology's option of an open and decentralised registry the present data message form of an electronic negotiable bill of lading would have to be converted into a medium appropriate to function on a blockchain. This would require standardisation of a token type that allows inscription that can be exclusively possessed and transferred to others without hindrance from a centralised escrow. This would enable a documentary bill of lading to be dematerialised to a 'token' which comprises the traditional features of the documentary bill of lading facilitating the concept of singularity.

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[10] Not subject to monopolisation or copyright.

[11] If access to alter the blockchain is conditioned upon knowledge the of a private key which is 256 bits in length.

[12] Antonopoulos *Mastering Bitcoin Programming the Open Blockchain* 2 ed (2017)16.

[13] Encumbrances in this sense is exclusively referencing digital signatures, and specifically not encumbrances linked to an event that is a pre-condition of transaction related to an oracle. An oracle could encumber a blockchain transaction to only execute upon certain encoded events occurring for example, temperature regulation of a container between two ports.

[14] If centralised blockchains operators decided no longer to run the blockchain, then the key holder ceases to have access to the register as it no longer exists limiting the potential to possess.

If a data message can represent the traditional features of documentary bills of lading there furthermore needs to be recognition that the data message or token is capable of transferring rights, contractual and proprietary on an international basis. This would enable a documentary intangible of title to become an electronic intangible of title. This requires a procedural mechanism to determine whether a data message as an electronically transferable record is capable of recognition as the functional equivalence of negotiable bills of lading – which furthermore requires domestic recognition of a 'token' of title which legally permits breaking the privity of contract doctrine or similar concept and gives the holder the same rights.

The capabilities of blockchain can create a guarantee of singularity in functional equivalence of documentary bill of lading that is open to non-Club members to facilitate trade. Moving forward, blockchain may provide a real possibility of an electronic intangible that is capable of possession, even though this would still legal recognition.

III. Background to research subject

The documentary bill of lading has its origins as an entry in a 'book of lading' as a receipt for goods laden on board a ship for its transfer to a new destination.[15] Bills of lading have since their first use had other characteristics, entitlements and obligations attributable to its use.

The modern form of a documentary bill of lading is an original and unique set of documents that can act as a receipt for goods subject to an international contract of carriage for goods to be transported,[16] a memorandum of the terms of conditions of the contract of carriage between the parties,[17] and a document that has been legally recognised to be a document of title to the goods covered by it.[18]

Before the twenty-first century, international conventions relating to the use of documentary bills of lading, amongst other things, generally dealt with the evidentiary value of the document/s as a receipt of goods laden on board a carrier in conjunction with an imposed mandatory liability regime on the carrier.[19]

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[15] Chester B. Mclaughlin 'The Evolution of the Ocean Bill of Lading' (1926) 35(5) *Yale LJ* 548 at 531.
[16] Report by the UNCTAD Secretariat, *Bills of lading* (1971), New York: United Nations para 19.
[17] *Ibid.*
[18] *Sanders V Maclean* (1883) 11 Q.B.D. 327, 341.
[19] See, for example, the International Convention for the Unification of Certain Rules of Law relating to Bills of Lading, 1924 (Hague Rules). The Hague Rules were adopted at a diplomatic convention in Brussels on 25th August 1924. Also see, the International Convention for the Unification of Certain Rules of Law relating to Bills of Lading, 1924 Brussels, as amended by the Protocol of 1968 (Hague-Visby Rules). The Hague-Visby Rules were adopted at a Diplomatic Conference on 23 February 1968., United Nations Convention on the Carriage of Goods by Sea, 1978 (Hamburg Rules). The Hamburg Rules were adopted by Resolution A/RES/48/34 of the

The lack of recognition of the document of title function and rights of a holder in relation to a documentary bill of lading needed to come from other sources. According to Aiken, Lord and Bools, the recognition and the characteristic of a documentary bill of lading as a symbol of possession is its most important feature.[20] Substantive rights of the holder of documentary bills of lading are generally determined by domestic law and not through international convention.[21] For an electronic negotiable bill of lading to be recognised to have characteristics of transferability needs to come from the custom of merchants or through statutory law.[22]

As time has passed technology has improved and the problems with a documentary bill of lading have become evident. As technology has progressed there have been private attempts to dematerialise a documentary bill of lading to be able to function on an electronic platform to remedy the problems associated with a paper document by equating the legal concept of possession with the concept of 'control', known as the 'control approach'.[23]

In 2001 a Working Group IV of the United Nations Commission on International Trade Law (UNICITRAL) held that there were only three methods of dematerialising the concept of possession through the 'control approach'. The 'control approach' at this time was based on the utilisation of a centralised registry as opposed to a decentralised registry that can facilitate a unique transfer.[24]

There have been many private attempts at the control approach as effected through a centralised registry, namely, the Comite' Maritime International Rules for Electronic Bills of Lading of 1990, essDOCS, the Bolero Project, and SeaDocs experiment. The centralised registry approach, or the Club membership approach necessitates the adoption of a legal fiction as a framework of laws, as a type of contractual approach, to legally recognise the

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General Assembly of the United Nations on 9 December 1993.

[20] R Aikens, Lord R & Bools M *Bills of Lading* 2 ed (2015) para 1.37.

[21] For example, rights of the holder of a documentary bill of lading, or recognition of a bill of lading as a document of title have been recognised in the domestic law of South Africa in the Sea Transport Documents Act 65 of 2000, in England in the Carriage of Goods by Sea Act 1992, in the Russian Federation under Articles 142, 142, 149-149.5 of the Civil Code of the Russian Federation (CCRF), in the Netherlands in sections 8:481 and 8:441 of the Dutch Civil Code (DCC), in Germany in Chapter 5 of the German Commercial Code (GCC), in Article 71 of the Peoples Republic of China Maritime Law (PRCML), and in the United States of America in article 7 of the Uniform Commercial Code (UCC).

[22] In *The Future Express* (1992) 2 Lloyd's Rep 79 at 95 the court held that it was necessary that for a custom as to transferability had to be proven. Transferability must either be recognised through statute or custom to enable a documentary intangible to obtain the status of document of title.

[23] UNCITRAL *Legal Issues Relating to the use of Electronic Transferable Records* A/CN.9/WG.IV/WP.115 8 September 2011 (WP.115),, para 48.

[24] In 2001 when this report came about there were determined to be three main types of registries, government, central, and private registries. The novel idea behind blockchain flips this idea on its head because a public registry is now possible.WP.115 at 15-16.

transfer of rights[25] through a 'private key procedure'. This may not be recognised by a state.[26]A private key procedure is understood as a private password linked to entity that contractually empowers that entity to sign over control of goods to another.[27]

The United Nations Convention on Contracts for the International Carriage of Goods Wholly or Partly by Sea (Rotterdam Rules) adopted in the General Assembly on 11 December 2008[28] is an interesting International Sea Carriage Convention due to its differences to previous International Sea Carriage Conventions,[29] even though not currently in force.[30]

The Rotterdam Rules was adopted by the United Nations General Assembly before the development of blockchain technology which possibly could have influenced the manner in which the concepts were drafted. Bitcoin was the first blockchain created and first outlined in a white paper by an anonymous person/s called 'Satoshi Nakamoto' in 2008.[31]

Amongst other differences between previous International Sea Carriage Conventions, articles 8 to 10 facilitate the use of electronic transport records that are the 'functional equivalent' of documents, such as a bill of lading. The recognition is made operative through chapter 9 which sets out rights of a controlling party, and, interestingly, chapter 11 deals with the transfer of rights[32] with the use of a documentary or functionally equivalent electronic bill of lading. Until the Rotterdam Rules, the issue of transfer of rights has not been dealt with by other International Sea Carriage Conventions.

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[25] Proprietary and contractual.

[26] For example, Brazil recognises electronic bills of lading, but specifically bills of lading that are registered with the centralised registry of the Brazilian Federal Revenue system, see Brazilian Regulation Ajuste SINIEF no. 09 in October 2007. China does not have a definition of electronic bills of lading, and negotiability of a bill of lading is regulated by article 79 of the PRCML. See, Clyde & Co *The Legal Status of Electronic Bills of Lading a Report By the ICC Banking Commission* available at https://www.clydeco.com/uploads/Files/The_Legal_Status_of_E-bills_of_Lading_-_ICC_and_Clyde_Co.pdf, accessed on 20 January 2020. pp 24 and 54.

[27] B. Kozolchyk, "Evolution and Present State of the Ocean Bill of Lading from a Banking Law Perspective" (1992) 23 *Journal of Maritime law and Commerce* 161 at 239.

[28] United Nations Convention on Contracts for the International Carriage of Goods Wholly or Partly by Sea, 2008 (Rotterdam Rules). The Rotterdam Rules were adopted by Resolution A/RES/63/122 of the General Assembly of the United Nations on 11 December 2008.

[29] The Hague, Hague-Visby and Hamburg Rules.

[30] Article 94 of the Rotterdam Rules regulates its coming into force, which is when the twentieth instrument of ratification, acceptance, approval or accession has been deposited with the UN Secretary-General. To date, only five of the aforesaid instruments have been deposited, by the following nation states, Benin, Cameroon, Congo, Spain and Togo. See United Nations 'United Nations Treaty Collection', available at *https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XI-D-8&chapter=11&lang=e*, accessed on 30 December 2019.

[31] Satoshi Nakamoto 'Bitcoin: A Peer-Peer Electronic Cash System' available at https://bitcoin.org/bitcoin.pdf, *accessed* on 12 July 2019.

[32] Rotterdam Rules Articles 57 and 58.

Conventions on sea carrier liability and the use of technology to facilitate the recognition of negotiable electronic bills of lading are either not in force, or legally incapable of providing certainty as to the status of electronic negotiable documents of title.

The problem with the 'right to control' is that it does not accord neatly with physical possession and exclusivity, but is more in accord with *de facto* possession in conjunction with intention to possess, which may prevent legally recognised principles to be afforded to a person in control of an electronic record which purports to be a negotiable bill of lading. Common law writers 'stress' there is an important distinction between the legal understandings of possession as opposed to a factual situation.[33]

Even though International Sea Carriage Conventions in force do not currently facilitate the recognition across international jurisdictions of electronic negotiable transferable records of title, there is a peripheral method of procedural recognition of a type of Electronic Transferable Record (ETR). This requires certain preconditions to be present for recognition, and is based on previous UNCITRAL Model Laws.[34]

If certain preconditions are met the Model Law on Electronic Transferable Records 2017 (MLETR)[35] could facilitate the international recognition of an electronic negotiable bill of lading as an ETR. So far, the MLETR has so far been has only been adopted by Bahrain,[36] however, unilateral incorporation of MLETR will not facilitate global trade.

Technology and UNCITRAL Model Laws are interrelated as the texts were formed after the technological discovery. To see how they all interrelate I will be dematerialising technology to congruently match the policy with the technology to see how blockchains capabilities are possibly an improvement on previous attempts to dematerialise a bill of lading, and to determine whether blockchain technology should be the genus of the technology that should be legally permissible to equate to bills of lading.

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[33] A.E.S. Tay 'The Concept of Possession in the Common Law: Foundations for a New Approach' (1964) 4 *Melbourne University Law Review* 476 at 447.

[34] The previous Model Laws that are drawn on are the United Nations Commission on International Trade Law, UNCITRAL Model Law on Electronic Commerce with Guide to Enactment in 1996 with Additional Article 5 bis as Adopted in 1998 (New York: United Nations, 1999) (MLEC); United Nations Commission on International Trade Law, *UNCITRAL Model Law on Electronic Signatures with Guide to Enactment 2001* (New York: United Nations, 2002) (MLES), United Nations Convention on the Use of Electronic Communications in International Contract. *United Nations Convention on the Use of Electronic Communications in International Contracts* (New York, United Nations, 2018) (ECC).

[35] United Nations Commission on International Trade Law, *UNCITRAL Model Law on Electronic Transferable Records* (New York: United Nations, 2018) (MLETR).

[36] United Nations 'Bahrain enacts the UNCITRAL Model Law on Electronic Transferable Records' available at *https://uncitral.un.org/ru/news/bahrain-enacts-uncitral-model-law-electronic-transferable-records*, accessed on 20 December 2019.

What differentiates a bill of lading from other transport documents is its ability to be negotiated and transferred as a document of title because of its physical characteristics enabling a holder thereof to have certain abilities which are generally based on the possession of a tangible and singular set of unique documents, which are recognised amongst major trading nations.[37] These documents can be used as a tool to manage trust whilst trading at a distance.

The synergy of information technology has a trajectory of technological singularity[38] and has also reached a point where it is possible to create a functional equivalent of a traditional negotiable and/or transferable bill of lading as a document of title by leveraging the capabilities of blockchain technology, understood as a type of distributed ledger technology, or a decentralised register.[39]

New methods to internationally convey goods demand understanding of the method, user demand, legal recognition, enforcement mechanisms and practicality. Determining how to dematerialise a document of title requires an exposition of the legislative landscape and the capabilities of technology which are necessary to see where previous attempts have failed and have had success.

This dissertation aims to bridge the gap of understanding between lawyers and policy makers to understand how blockchain technology functions to elucidate how blockchain bills of lading could represent a singular concept and be a functional equivalent of the traditional negotiable or transferable bill of lading in an international context, and to furthermore see how the MLETR could provide the legislative framework for a global system regulating electronically transferable records and under what circumstances blockchain

[37] The following states recognise bills of lading to give the lawful holder the right of delivery: The United Kingdom enacted the Carriage of Goods by Sea act 1992; The United States of America recognises bills of lading under § 7-302 of their Uniform Commercial Code; The Brazilian Ajuste SINIEF no. 09 in October 2007 recognises electronic bills of lading as the same as original paper bills of lading; The United Arab Emirates recognises paper bills of lading in article 257 and 267 of Federal Law 26 of 1981 on Maritime Commercial Law; Singapore recognise bills of lading which are governed under the Bill of Lading Act (Chap. 384); The German Commercial Code recognises bills of lading and electronic bills of lading in section 521 and 516; Section 8:481 of the Dutch Commercial Code recognise bills of lading; India Recognized bills of lading in section 2 (4) of the Indian Stamps Act, 1899 and the Indian Carriage of Goods by Sea Act, 1925; Russia recognizes bills of lading in article 158(1) of the Merchant Shipping Code of the Russian Federation, No. 81-FZ of April 30, 1999; and China recognize bills of lading in article 71 Peoples Republic of China Maritime Law of 1993, negotiability of bills of lading in article 79, that governs the relationship between the holder of a bill of lading and the carrier in article 78.

[38] For an understanding of technological singularity see, Jayshree Pandya 'The Troubling Trajectory of Technological Singularity' available at *https://www.forbes.com/sites/cognitiveworld/2019/02/10/the-troubling-trajectory-of-technological-singularity/#733069386711,* accessed on 10 December 2019.

[39] Jei Yong Lee 'A Decentralized Token Economy: How Blockchain and Cryptocurrency can Revolutionize Business'. (2019) *The Journal of the Kelly School of Business, Indiana University* 2.

would be an improvement over previous attempts at the dematerialisation of a documentary bill of lading.

There is a need to regulate electronic documents of title as the technology to facilitate dematerialisation exists. Without the harmonisation of international trade law to be able to exploit comparative advantage by the utilisation of technology there will be restricted trade. Lack of harmonisation is trade restrictive because differing domestic laws decrease predictability in the settlements of disputes and encourage forum shopping which has provided incentive for the unification of certain substantive and procedural law.[40]

IV. Structure of the dissertation

In order to arrive at my conclusion, the structure of this dissertation will be set of as follows. In Chapter 2 the features of a documentary negotiable bill of lading will be explored to see how they are recognised to be capable to fulfil their prescribed use. This will enable a technology or type or method to be identified to be able to provide as functional equivalence of those features to enable electronic bills of lading to fulfil these functions.

Chapter 3 conceptually dematerialises an analogue document and differentiates it from a negotiable instrument as a technological concept. Dematerialisation of concepts creates objective criterion to be applied to UNCITRAL texts to determine what the control approach is to functional equivalence. The control approach to functional equivalence will highlighted with its shortcomings in relation to data messages that purport to be electronic bills of lading.

Chapter 4 introduces blockchain as a concept and states how a blockchain registers can maintain integrity that is integral in electronic documents of title. After the concepts are broken down the difference between a token and a coin will highlighted to illustrate how it is possible to create a token that can be an analogous to a document of tile.

Chapter 5 concludes this dissertation offering recommendations on whether the Model Law on Electronic Records (2017) should be adopted, or whether a Model law should specifically recognise blockchain technology as the genus of technology that should regulate negotiable and electronic bills of lading.

[40] Franco Ferrari 'Forum Shopping' Despite International Uniform Contract Law Conventions' (2002) 51(3) *The International and Comparative Law Quarterly* 689 at 689.

CHAPTER 2 DOCUMENTARY BILLS OF LADING

I. AIM

A bill of lading has certain legally recognised rules attached to the use of the document as a medium. A document was the technology that was available at the time to be able to function as an intangible of title through international convention, state imposition and recognised custom.

A paper bill of lading document had to become accepted as a symbol of the goods, though its transfer, to be recognised to give the holder constructive possession and thereafter symbolic delivery that enables a transfer of documents to transfer possession and ownership if certain conditions are met.

To determine if blockchain should be the genus of technology that should be recognised to facilitate the concept of a functional equivalence of a paper document bill of lading as a symbol of the goods it is illustrative to see how the paper document is used, and the manner in which it passes hands in context of its limitations.

II. Understanding bill of lading documents

The 'documentary approach' to bills of lading to is a top-down legislative method of giving legal significance to a piece of paper as a medium to facilitate trade by sea, for example, by affixing a liability regime to the use of a document that has probative value in evidence as a receipt. This is in contrast to attaching legal significance to a method of conveyance or type of trade.[41]

The top-down legislative method is in juxtaposition to the bottom-up approach of recognition of a custom, such as the common law recognition of a negotiable bill of lading as a custom of merchants through trade usage to be recognised as a document of title and a symbol of the goods subject to an international contract of carriage.[42]

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[41] The contractual approach is where liability on the carrier follows the use of contracts of carriage by sea – generally, and not specifically a document with certain characteristics; and the trade approach, is where liability is mandatorily affixed to the carrier by identifying if goods are conveyed via liner or non-liner carriers. F Berlingieri UNCITRAL General Assembly of Association Mondiale de Dispacheurs *'A Comparative Analysis of the Hague-Visby Rules, the Hamburg Rules and the Rotterdam Rules*' (Marrakesh 5-6 November 2009) 1-4 available at *https://www.uncitral.org/pdf/english/workinggroups/wg_3/Berlingieri_paper_comparing_RR_Hamb_HVR.pdf*, accessed on 20 June 2019.

[42] *Sanders V Maclean* (1883) 11 Q.B.D. 327, 341.

The modern form of a bill of lading is an original and unique set of documents that can be issued as a singular event as the embodiment of contractual and proprietary rights.[43] This original set of documents can act as a receipt for goods subject to a contract of carriage for goods to be transported on a specific vessel to a specific destination,[44] act as an acknowledgement from the carrier to the shipper that they have received the goods,[45] a memorandum of the terms and conditions of the contract of carriage between the parties,[46] and a document which has been legally recognised to be a document of title and symbol of the goods covered by it,[47] allowing the lawful holder, who may be the consignor or consignee or an assignee to have certain rights and powers.

The document/s represents rights and obligations in the form of liabilities, propriety interests and contractual entitlements. Negotiable bills of lading are different to other types of sea transport document because they can facilitate a legal holder to obtain goods from the destination port from the carrier through the possession of one of the unique, original and singular documents which could come from a set of documents that has the recognised capability to transfer possession and possibly ownership[48] – as opposed to merely being a medium that evidences the receipt of goods laden onboard a vessel that evidences a contract of carriage.[49]

(a) General problem with documents in international trade:

Paper documents are an old technology that time has highlighted its flaws. The utilisation of transferable documents is expensive,[50] slow to handle, and handwriting is difficult to determine authenticity,[51] furthermore, the United Nations Conference on Trade and

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[43] See for example, *Barber v Meyerstein* (1870) LR 4 HL 317, 330. *Lickbarrow v Mason* (1787) 2 T.R. 63, 69 (original King's Bench decision); (1790) 1 H. Bl. 357 (Exchequer Chamber); (1793) 4 Brown 57; (1793) 5 T.R. 367; (1793) 2 H. Black. 211 (House of Lords); (1794) 5 T.R. 683 (venire de novo) and (1794) 6 T.R. 131 (costs).

[44] Report by the UNCTAD Secretariat, *Bills of lading* (1971), New York: United Nations para 19.

[45] Grant Gilmore & Charles L. Black, Jr *The Law of Admiralty* 2ed (1975) 93.

[46] *Ibid*.

[47] *Sanders V Maclean* (1883) 11 Q.B.D. 327, 341; and see *Barber v Meyerstein* (1870) LR 4 HL 317, 330.

[48] Op Cit Note 43.

[49] For example, a sea waybill. See, R Aikens et al. Op Cit Note 20 para 2.15

[50] "Not only do paper documentation and procedures represent as much as 10% of goods value, they are slow, insecure, complicated and growing. The possibilities of cost reduction are in the order of 10'%, to the benefit of not only the main parties, but everyone involved, not least the authorities." Edwards A. *Bolero — A TTP project for the shipping industry. Information Security Technical Report* (1996) 1(1) 40 at 40.

[51] A documents examiners review found that experts were 57% accurate and incorrect 43% of the time in determining whether handwriting was created by the purported author. D. M. Risinger, Mark P. Denbeaux & Michael J. Saks 'Exorcism of Ignorance as a Proxy for Rational Knowledge: The Lessons of Handwriting Identification Expertise' (1989) 137 *University of Pennsylvania Law Review* 731; See also, Paul C. Giannelli 'Authentication' (1991)14(2) *Faculty Publications* 3.

Development (UNCTAD) has stated that maritime fraud exists in many forms, one type being documentary fraud which has many manifestations.[52]

(i) Fake documents

Fake bill of lading and corresponding documentation can be forged. Bills of ladings are 'generally not on paper with a complex design' and therefor easy to forge enabling the bill of lading paper to be sold 'on the street'.[53]

(ii) Multiplicity of documents

The multiplicity of transport documents poses a problem which are generally issued in sets of three[54] because a shipowner must deliver the goods to the first person who presents one of the originals to them, unless the shipowner has been notified of any other claims to the goods.[55]

(iii) Fraud buy seller

A shipped bill of lading means that trade occurs with the buyer practically being able to inspect the goods before shipment. This makes it necessary to rely completely on the document.[56]

If a dishonest seller, actually ships goods they have been known to 'sell' a good of a lower quality than that was indicated on the bill of lading. They thereafter altered the bill of lading to reflect the goods corresponding to the commercial invoice. A carrier may not even notice the difference in quality or quantity in and a bill of lading which may be completely genuine but loaded with inferior goods. [57]

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[52] Maritime fraud has been defined to be in existence where, 'Someone intentionally deceives another as to some fact or circumstance in connection with maritime activities which enables him to obtain money or goods unjustly.'[52] Report by the UNCTAD Secretariat, 'Review and Analysis of Possible Measures to Minimise the Occurrence of Maritime Fraud and Piracy' Review and Analysis of Possible Measures to Minimize the Occurrence of Maritime Fraud and Piracy', UNCTAD, Geneva, United Nations, 1983. TD/B/C. 4/AC. 4/2 at 4. Furthermore, there are many parties to an international sales contract. The parties to whom the UNCTAD refers to are 'buyer, seller, shipowner, charterer, ship's master or crew, insurer, banker, broker or agent'. Further they divide the fraud types into six categories of fraud namely, 'documentary fraud; charterparty frauds; maritime insurance fraud; deviation fraud; miscellaneous frauds; and piracy'.

[53] Other frauds exist whereby fictitious companies are selling non-existent goods, forged commercial invoices, certificates of origin and inspection, marine insurance policies. *Ibid* at 4.

[54] L. D' Arcy, C. Murray, and B. Cleave *Schmitthoff's Export Trade: The Law and Practice of International Trade* 10 ed (2000) 277. See also M. Dubovec 'The Problems and Possibilities for using Electronic Bills of Lading as Collateral' (2006) 23(2) *Arizona Journal of International & Comparative Law* 438 at 443; see also *Duyn v Shangming International (Pty) Ltd* (2003) 1 All SA 173 (C) at 177 where the court stated the general rule is for bills of lading being issued in triplicate, and further that 'the holder of any one of the bills of lading who presents it first to the agent of the shippers, is entitled to the delivery of the goods described therein'.

[55] Report by the UNCTAD Secretariat, Review and Analysis of Possible Measures to Minimise the Occurrence of Maritime Fraud and Piracy' Review and Analysis of Possible Measures to Minimize the Occurrence of Maritime Fraud and Piracy', UNCTAD, Geneva, United Nations, 1983. TD/B/C. 4/AC. 4/2 at 5.

[56] An inspection certificate can amorality the possibility of goods being of a lower quaintly or quality, but this problem may persist, until there is an automated method of determining quantity or quality of goods.

[57] Report by the UNCTAD Secretariat, Review and Analysis of Possible Measures to Minimise the Occurrence of Maritime Fraud and Piracy' Review and Analysis of Possible Measures to Minimize the Occurrence of Maritime Fraud and Piracy', UNCTAD, Geneva, United Nations, 1983. TD/B/C. 4/AC. 4/2 at 5.

Frequently goods arrive before the documents, necessitating carriers to be protected with a letter of indemnity to release goods to the consignee. A buyer, after receiving the goods and once the bill of lading arrives, can therefor on-sell the bill of lading to an unsuspecting buyer, in this event the carrier is liable to the person presenting the bill of lading whilst the person who issued the letter of indemnity cannot be traced.[58]

(iv) Effort in authentication

Fraud in the documents necessitates a buyer identify the carrier and seller by appropriate means to ensure they know who they are dealing with, but this can be time consuming.

(b) Bills of lading as a receipt for the goods.

A bill of lading is an ordinary receipt for the goods as qualified by the carrier upon receiving goods subject to carriage,[59] which are recorded on the face of the bill of lading. This is not a not a unique characteristic.[60] The tangibility of a document enables visual verification in terms of the concept of authentication. The visual verification makes it possible to identify alterations to the document, which can aid in the detection of unauthorised forgeries, and can further be used in evidence.

In common law, the person that is traditionally entitled to bind a shipowner to the terms of a bill of lading through signature is the master of the ship,[61] however, an agent of the carrier may also bind the shipowner.[62]

Even through the Hague[63] and Hague-Visby Rules[64] do not require a signature on the receipt on the documentary bill of lading, unlike the Hamburg Rules,[65] there could be negative consequences if there was no signature from the carrier or carrier's agent confirming the receipt of goods in the condition they were received.

Many nations, like, Australia, Germany, Great Britain and Japan require that a bill of lading must be written and signed by the carrier or their agent in which the consequences for

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[58]Even when a seller is proactive and helps facilitate the clearing of cargo by forwarding a non-negotiable bill of lading to the buyer, the bill of lading could be forged on the correct paper with forged bank stamps and thereby clear the cargo. Fraud in the documents can even materialise by collusion of the buyer and seller when utilising a letter of credit, when a corresponding bank receives a fake letter of credit and pays out based on forged documents to the 'seller'. Buyers, have pre-empted the seller, in that they send a forged letter of credit, sent it to the buyer and the seller sends the bill of lading without confirming the line of credit. *Ibid* 7.

[59] See Professor Jan Ramberg "Documentation: sea waybills and electronic transmission", in *The Hamburg Rules: A Choice for the E.E.C.?* (1994) 103.

[60] United Nations General Assembly, UNCITRAL, *Electronic Data Interchange,* A/CN.9/WG.IV/WP.69, 31 January 1996, (WP 69) para 24.

[61] *Grant V Norway* (1851) 10 C.B. 665, see R Aikens et al. Op Cit Note 20 para 3.53.

[62] *Ibid.* at 3.65.

[63] Hague Rules Articles 3(3)(b), and (c).

[64] Hague-Visby Rules Article III (3).

[65] Hamburg Rules .Article 15(j).

the lack thereof can differ.[66] Consequences could be, becoming null and void,[67] or preventing the document from recognition as a receipt.[68] The converse would also be true, a signature on the bill binds the carrier to contractual terms in the document. [69]

The Hague,[70] Hague-Visby,[71] and Hamburg[72] Rules refer to writing on the bill of lading that further does not refer to the material that the writing must be on paper, or that it must be manually signed to form a receipt, but it does refer to bill of lading as a document.[73] This may mean that these conventions do not enforce that a receipt of goods must be on paper.

(c) Bill of lading as evidence of the contract of carriage:

The bill of lading generally is evidence of the receipt or the contract of carriage[74] that is generally issued after the contract of carriage is concluded.[75] The evidentiary function references the terms of the contract of carriage in the short form, or the bill of lading can contain the terms of the contract of carriage in long form.[76] The bill of lading as evidence of the contract of carriage is also not a unique characteristic to bills of lading. Importantly, a contract of carriage would contain delivery terms that extinguish the period of responsibility of the carrier.[77]

A bill of lading can be evidence of the contract of carriage which imposes contractual liabilities and obligations upon the carrier, and confers contractual rights and remedies upon the holder. The rights that a holder has would be dependent on custom, contractual terms and applicable law governing the bills of lading.[78]

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[66] Editor of the XIVth International Congress of Comparative Law A.N. Yiannopoulos *Ocean Bills of Lading: Traditional Forms, Substitutes and EDI Systems* (1995) pp 12-13.
[67] In Germany and Greece, the lack of a signature on a bill of lading make the document invalid. See page Editor of the XIVth International Congress of Comparative Law A.N. Yiannopoulos *Ocean Bills of Lading: Traditional Forms, Substitutes and EDI Systems* (1995) p 13.
[68] In Belgium an unidentifiable signature prevents a bill of lading from being recognised as a receipt. In Germany and Greece, the lack of a signature on a bill of lading make the document invalid. See Editor of the XIVth International Congress of Comparative Law A.N. Yiannopoulos *Ocean Bills of Lading: Traditional Forms, Substitutes and EDI Systems* (1995) p 13.
[69] R Aikens et al. Op Cit Note 20 para 3.53.
[70] For example, Hague Rules Articles 3(3)(a) and (b).
[71] For example, Hague-Visby Rules Articles III (3) and (b).
[72] The Hamburg Rules are a development from the Hague and Hague-Visby Rules in that they accept the use of writing in the form of telegram and telex, and facilitates technological mechanisms to make a signature "…if not inconsistent with the law of the country where the bill of lading is issued" Article 1(8) and 14(3) Hamburg Rules
[73] WP 69, para 25; see Editor of the XIVth International Congress of Comparative Law A.N. Yiannopoulos *Ocean Bills of Lading: Traditional Forms, Substitutes and EDI Systems* (1995) pp 12-13.
[74] R Aikens et al. Op Cit Note 20 para 2.89.
[75] Iian Djadjev *The Obligations of the Carrier regarding the Cargo: the Hague-Visby Rules* (2017), pp 7-9.
[76] WP 69, para 24.
[77] R Aikens et al. Op Cit Note 20 paras 5.52 – 5.55.
[78] Emmanuel T. Laryea *Paperless Trade Opportunities, Challenges and Solutions* (2002) 67.

Signature on the face of the bill of lading document identifies who the carrier is as the person that has liability for the carriage referenced at the back of the bill of lading to the shipper,[79] but the issue of a bill of lading does not necessarily mean there is a concluded contract of carriage.[80]

In the English case of *Sewell v Burdick*,[81] Lord Bramwell differentiates between the relationship in the bill of lading and the contract of carriage between the shipper and consignee in respect of Bill of Lading Act 1855 in which he said:

> "There is, I think, another inaccuracy in the statute…. It speaks of the contract contained in the bill of lading. To my mind there is no contract in it. It is a receipt for the goods, stating the terms which they were delivered to and received by the ship, and therefore excellent evidence of those terms, but it is not a contract."[82]

A bill of lading can be said to be the best evidence of the contract of carriage – as an consignee or transferee may not be able to rely on anything else by the bill of lading itself.[83] In English law, in the hands of an endorsee, a bill of lading is binding as conclusive evidence of the contract of carriage.[84] This can be because the assignee of a bill of lading may not have been privy to the original contract of carriage.

In terms of the Hague[85], and Hague-Visby Rules[86] an issued bill of lading must contain a written record of the apparent order and condition of the chattel, and amongst other things, is *prima facie* evidence of the goods described therein.[87]

Under the Hague, Hamburg, and Hague-Visby Rules the description of the goods is conclusive evidence in favour of a third-party transferee.[88] In terms of the Hamburg Rules a bill of lading must contain information in relation to the goods which are necessary for

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[79] Liang Zhao & Lianjun Li *Maritime Law and Practice in China* (2017) 67. It is common shipping practice to bind the signatory on the face of the bill of lading as carrier if there is a conflict on the reverse side of the document as ; See also *Homburg Houtimport BV and others v Agrosin Private Ltd and Others (The Starsin)* [2003] UKHL 12 paras 7 and 14.
[80] See, for example, *Heskell v Continental Express Ltd*. [1950] 1 All ER 1033 at 1037.
[81] *Sewell v Burdick* (1884) 10 App. Cas. 74, 105.
[82] *Crooks v Allan* (1875) 5 Q.B.D 38, 40.
[83] *Daewoo Heavy Industries Ltd and Another v Klipriver Shipping Ltd and Another (The "Kapitan Petko Voivoda")* [2003] 2 Ll. L. Rep. 1. See also, Lian Djadev *The Obligations of the Carrier Regarding the Cargo* (2017) 9.
[84] See *Ludec v Ward* (1888) 20 Q.B.D 475 at 479. See, Laryea Op Cit Note 78 at 66.
[85] Hague Rules Article IV(5)(f).
[86] Hague-Visby Rules Article 3 (3).
[87]) Hague Rules Article 3(4) and Hague-Visby Rules. Article III (4).
[88] Note by the Secretariat, UNCITRAL, *IV. International Shipping Legislation* Yearbook of the United Nations Commission on International Trade Law, 1988, Vol. XIX Vienna, (A/CN.9/306) Para 37.

identification, amount or quantity of the chattel, amongst other details,[89] which if not stated would bind the carrier to have deemed the goods were received the goods in apparent good condition.[90]

(d) Bill of lading as a document of title

The document of title[91] function operates to alter legal relationships between the carrier and consignee, and buyer/s and seller/s.[92] The document of title function has historically been linked to originality and uniqueness of a singular set of documents, where a copy of the bill of lading would not suffice to permit the "transfer of title by endorsement; transferring the rights of suit; and obtaining delivery from the carrier".[93]

Bills of lading facilitate rights of control over property through physical possession of the documents referencing the goods that are covered by it,[94] the right receive delivery of the goods from the carrier[95] upon presentation and surrender of the document,[96] or be utilised to obtain finance utilising the documents to be leveraged as security[97] which makes it unique to other sea transport documents.[98]

A negotiable documentary bill of lading should be an original and be recognised as a document of title to have utility in conveying goods, even though copies can be utilised as a receipt and evidence.[99]

The document of title function of negotiable bills of lading represents two aspects, the ability of a negotiable bill of lading to represent ownership, and the second to be recognised

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[89] Hamburg Rules Articles 15 and 16.
[90] Hamburg Rules Article 16(2).
[91] Besides English law, documents are known in many other jurisdiction, in French Law, they are known as *titres de creance,* in Italian law they are known as *titoli de credito*, and in German law as *Wertpapiere*; see Ĉislav Pejović 'Documents of Title in Carriage of Goods by Sea Under English Law: Legal Nature and Possible Future Directions' (2004) available at *https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=10&cad=rja&uact=8&ved=2ahUKEwi4mZrgxM_nAhWIbsAKHRtBDswQFjAJegQIBBAB&url=https%3A%2F%2Fhrcak.srce.hr%2Ffile%2F13560&usg=AOvVaw0P3fOyPI0Fm-201f9bLlab*, accessed on 14 February 2020.
[92] WP 69, para 31.
[93] R Aikens et al. Op Cit Note 20 para 2.89.
[94] WP 69, para 13.
[95] See Schoenbaum, Thomas J *Admiralty and Maritime Law* (1987) 299-300; Editor of the XIVth International Congress of Comparative Law A.N. Yiannopoulos *Ocean Bills of Lading: Traditional Forms, Substitutes and EDI Systems* (1995) 4; See K. Bernauw 'Current Developments Concerning the Form of Bills of Lading' in *Ocean Bills of Lading: Traditional Forms, Substitutes and EDI Systems* (1995) 114.
[96] Kurt Grönfors *Towards Sea Waybills and Electronic Documents* (1991) 13.
[97] T. E. Scrutton *Charterparties and Bills of Lading* 17 (1964) section XIII, art 3, See also Faye Fangfei Wang *Law of Electronic Commercial Transactions Contemporary Issues in the EU, US and China 2ed* (2014) 20; *Sanders Bros v Maclean & Co* (1883) 11 Q.B.D 327; J P van Niekerk & W G Schultze *The South African Law of International Trade: Selected Topics* 3 ed (2011) 257 – 258 – [Now in 4th edition 2016]
[98] Laryea Op Cit Note 78 at 69. It has been said a sea waybill is never a document of title, see *J.I MacWilliam Co Inc v Mediterranean Shipping Co SA (The Rafaela S)* [2005] 1 Lloyd 's Rep 347 at 360.
[99] R Aikens et al. Op Cit Note 20 para 2.89.

to transfer constructive possession of the goods that are subject to an international journey which are incapable of being direct custody of by anyone besides the carrier.[100] At common law, and through the custom of merchants, bills of lading as 'title to goods' are defined as, "documents relating to goods the transfer of which operates as a transfer of constructive possession of the goods, and may operate as a transfer of the property in the goods."[101]

Before a bill of lading become a symbol of possession, a negotiable documentary bill of lading was recognised symbol of ownership.[102] Later, a negotiable bill of lading became recognised as a symbol of possession. In *Barber v Meyerstein,*[103] Lord Hatherley referenced concurringly a passage from the court *a quo,* in which Martin B stated:

> "There has been adopted, for the convenience of mankind, a mode of dealing with property the possession of which cannot be immediately delivered, namely, that of dealing with the symbols of the property. In the case of goods which are at sea being transmitted from one country to another, you cannot deliver actual possession of them, therefore the bill of lading is considered to be a symbol of the goods, and its delivery to be a delivery of them.'*[104]*

Furthermore, in *Sanders Brothers v MacLean & Co*[105] Bowen LJ stated:

> "The law as to the indorsement of bills of lading is as clear as in my opinion the practice of all European merchants is thoroughly understood. A cargo at sea while in the hands of the carrier is necessarily incapable of physical delivery. During this period of transit and voyage, the bill of lading by the law merchant is universally recognised as its symbol, and the indorsement and delivery of the bill of lading operates as a symbolic delivery of the cargo .... It 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."

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[100] *Enichem Anic S.p.A. v Ampelos Shipping Co Ltd (The "Delfini ')* (1990) 1 Lloyd's Rep 252, 268.
[101] *Lickburrow v Mason* (1787) 2 T.R. 63; *Newsom v Thornton* (1805) 6 East 17, 20; See Sir Guenter Treitel & Reynolds *Carver on Bills of Lading* 3ed (2011) 323-324 ; See also, Steven K. Williams *Cases Argued and Decided in the Supreme Court of the United States, 98, 99, 100 , 101 U.S Book 25* (1926) 892; *Sanders Bros v Maclean & Co*. (1883) 11 Q.B.D 327,337,341; *E Clemens Horst Co v Biddell Bros* [1912] A.C. 18, 23; See also, Laryea Op Cit Note 78 at 67.
[102] See *Barber v Taylor* (1839) 5 M & W 527 (151 ER 223) at 534.
[103] *Barber v Meyerstein* (1870) L.R. 4 (HL) 317.
[104] *Barber v Meyerstein* (1870) L.R. 4 (HL) 317, 330.
[105] *Sanders Brothers v Maclean & Co* (1883) 11 Q.B.D. 327,341.

The unique and original negotiable bill of lading as a paper document of title enables confidence in trade due to its singular issuance that has been recognised to be capable of transferring title by its endorsement, transferring rights of suit,[106] and enabling the rightful holder of the bill of lading to obtain delivery of the goods from the carrier.[107] Holding the document as a symbol of the goods further enables the seller to maintain control over the goods until they are paid for by the purchaser, which, if they are not paid for, the holder could on-sell the goods to another purchaser.[108]

Bills of lading can be marked "negotiable" and "non-negotiable".[109] This does not mean that a bill of lading is truly a negotiable instrument.[110] A negotiable bill of lading can be made out to "bearer", or "to order", or to "order or assigns".[111] Depending how it is marked, will depend on it whether it will operate to transfer symbolic possession and ownership.[112]

Traditionally, the concept of negotiability cannot be removed from the concept of physical possession of a unique document. [113] Negotiability in the strict sense is means that a transferee may be able to get title to goods free from defects in title which must be established by law.[114]

A paper document enables negotiation by the transfer of possession, facilitating the concept of constructive delivery, or symbolic delivery which may be required when dealing with the transfer of the ownership of moveable goods[115] that cannot be physically dealt with.[116] Furthermore, perfection of security interests may only be able to occur on basis of delivery.[117]

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[106] Through domestic law.
[107] R Aikens et al. Op Cit Note 20 para 2.89.
[108] Laryea Op Cit Note 78 at 69 -70
[109] R Aikens et al. Op Cit Note 20 para 2.36.
[110] *Ibid*) para 2.37; Under sections 33, 31 and 37 of the Federal Bills of Lading Act 1916 and sections 7-104 and 7-502 of the UCC a bill of lading is a negotiable document which enables a good faith purchaser to have an 'indefeasible title to the goods' regardless of whether the document was wrongly transferred. This is is in juxtaposition to the concept of *nemo plus iuris ad alium transferre potest quam ipse habet*.
[111] R Aikens et al. Op Cit Note 20 paras 2.37 and 2.38.
[112] *Ibid* para 2.37.
[113] K. Bernauw 'Current Developments Concerning the Form of Bills of Lading' in *Ocean Bills of Lading: Traditional Forms, Substitutes and EDI Systems* (1995) Ch 4 p 114.
[114] Anders Møllmann *Delivery of Goods under Bills of Lading* (2017) 42.
[115] For example, Article 714 (1) of the Swiss Civil Code states that: "Delivery of possession is necessary for the transfer of ownership in movable goods". Art. 925 (1) of the Swiss Civil Law states that: "Where bills have been drawn to represent goods which have been delivered to a carrier or placed in a repository, the delivery of these bills has the same effect as the delivery of the goods themselves; See also, Uniform Commercial Code § 9-313(a) for the same principal.
[116] The transfer of property need not be physically transferred in some jurisdictions to transfer property, for example, under French law, article 1583, property in goods passes when the parties have agreed to price and goods to be sold even if there is no delivery of the goods. The bill of lading can be limited to the transfer of symbolic possession and not transfer of ownership. This can be in contrast to places like Germany and South Africa where precognitions of passing property are agreement/intention and delivery of the goods, see article

A true negotiable instrument allows its transfer with the transferee being free from any defect in title.[118] Negotiability in a limited sense can mean that a there is a right to claim delivery of goods by having a duly indorsed bill of lading, as opposed to a sum of money.[119] Bills of lading are generally held to be negotiable in the limited sense.[120]

If a bearer bill of lading is issued by the carrier to the shipper, the act of transfer of the document through delivery of the document to a new holder, if the requisite intentions are present, changes ownership. This gives holder rights as against the carrier as possessor of the document.[121] If an order bill is issued by the carrier, indorsement and delivery of the document operates to effectively give the holder symbolic possession, but not necessarily ownership.[122]

This because a contract of carriage is generally made pursuant to an underlying sales contract. An underlying sales contract is made with a connection to a relevant and applicable domestic law, which may require intentions of the parties and delivery of documents to transfer property or possession in the goods through the transfer of a documentary bill of lading. [123]

A bill of lading references goods subject to a carriage contract that cannot be in physical custody during transit by anyone besides the carrier, but though the symbolic function of the document referencing goods could enable the legal holder to encumber or negotiate and transfer rights in the goods during transit.[124]

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929 German Civil Code, and *Lendalease Finance (Pty (Ltd) v Corporacion de Mercadeo Agricola & Others* 1976 (4) SA 464 (A).

[117] A distinction must be made between a casual system and abstract system in the transfer of real rights. In a purely casual system, for example, the concept of delivery is not a specific requirement for the transfer of real rights in an obligatory agreement because they are transferred upon conclusion of that obligatory agreement on the concept of consensus, see sections 711, 1138 and 1583 of the French Code Civil 1804. Bell, Boyron and Whittaker *Principles of French* 2ed (2008) 280-283; P.D.V Marsh *Comparative Contract Law England France Germany* (1996) 238-244 [Reprint]. In the abstract system the obligatory agreement and delivery are two separate juridical acts which does not transfer real rights. The 'characteristics of an abstract system for the transfer of property in South African law as distinguished from a causal system'. Schutte, PJW 'The Characteristics of an Abstract System for the Transfer of Property in South African Law as Distinguished from a Casual System (2012) (15)3 *PER [online]* Ch3. See also, Unites States of America's Uniform Commercial Code § 9-313 which requires delivery or possession to have rights; See WP.115 para 22.

[118] Barak A. 'The Nature of a Negotiable Instrument' (1983) 18(1) *Israel Law Review* 49 at 52.

[119]Ibid. See also, Carol Proctor *The Legal Role of the Bill of Lading, Sea Waybill and Multimodal Transport Documents in Financing International Sales Contracts* (unpublished LLM thesis, University of South Africa, 1996) 72.

[120] Sir Guenter Treitel & Reynolds *Carver on Bills of Lading* 3ed (2011) 396.

[121] R Aikens et al. Op Cit Note 20 para 2.41

[122] *Ibid* para 2.37

[123] See, for example, Section 17 (1) of Part III of the Sales of Goods Act; In the United States of America intention, indorsement and delivery are pre-requisites to transfer ownership, see, Steven K. Williams *Cases Argued and Decided in the Supreme Court of the United States, 98, 99, 100, 101 U.S Book 25* (1926) 892.

[124] Kurt Grönfors *Towards Sea Waybills and Electronic Documents* (1991) 11 – 12.

According to Bools documentary bills of lading is cable of transferring symbolic possession due to three factors which relate to the intention of the carrier, the transferor and the transferee. Bools[125] states that:

> "1. The bill of lading manifests the carrier's intention to deliver the goods to the presenter of the bill and not to interfere with the presenter's ability to obtain custody of the goods on arrival.
> 2. The transfer of a bill raises a presumption that the transferor no longer intends to exercise control or the goods or to interfere with the transferee's ability to obtain possession of the goods
> 3. The transfer of the bill of lading raises a presumption that the transferee intends to exercise control over the goods and to exclude all others from exercising control over the goods."

These three factors make it evident that possession and exclusivity of exercising control are extremely important. The purpose of having a unique set of original documents that evidence exclusive rights to goods is to entitle only the holder to be cable obtaining possession of the goods. If anyone could evidence the right to claim possession, there would be situations that the carrier delivers to someone that is not a lawful holder of a bill of lading. This would cause misdelivery and place liability on carrier for breach of contract.

(e) The bill of lading and the carrier

Bills of lading are generally issued in sets of three,[126] which could be traded in transit. The presentation of one of the original documents by a person entitled to the property and possession at the port of destination, entitles the holder to obtain delivery against surrender of the document, which completes the carriers obligation for the contract of carriage. This extinguishes the bill from being recognised as a document of title as it has been completed.[127]

This highlights that a bill of lading must be issued and surrendered for a holder to obtain delivery, which must furthermore be accomplished in line with the terms of the contract of carriage. The document of title function determines when a negotiable bill of

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[125] MD Bools *The Bill of Lading: A Document of Title to Goods: An Anglo American Comparison* (1997) 183.
[126] Jafari Farhang *The Concerns of the Shipping Industry Regarding the Application of Electronic Bills of Lading in Practice amid Technological Change* (unpublished dissertation submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy, Division of Law and Philosophy, University of Stirling, October 2015) 18.
[127] A. H. Hudson 'The Exhaustion of Bills of Lading' (1963) 26(4) *The Modern Law Review* 442 at 443.

lading becomes accomplished, but if there is a method of delivery that is not traditionally recognised, the contractual terms become important.

As a tangible symbol of the goods, a holder of a bill of lading can evidence they have the right to control the goods by the being in exclusive possession of the documents. The production of the document to the carrier enables the documents to be visually inspected on presentment to obtain delivery or control the goods that enable a holder to exercise rights of control.

This exclusive possession concept is important for dematerialisation purposes. Rights of control include the ability of the holder of the bill of lading to instruct the carrier to alter delivery instructions or stop the goods in transit.[128] Rights of the holder are generally attributable only to the holder. If delivery of a shipment of a negotiable bill of lading is to be accomplished through electronic means it becomes important that the delivery terms are detailed as to effectively accomplish the negotiable documents of title to prevent liability being placed upon the carrier for short delivery or misdelivery.

Bills of lading evidence a contract of carriage, or can be the entire contract of carriage.[129] Terms that are found on the bill of lading have contractual implications for the carrier.[130] Generally a negotiable bill of lading will contain the clause "one accomplished" through delivery of a bill to the carrier, "the others to stand void".[131] This enables delivery of the goods to the first presenter, which accomplishes the other bills and ends the carrier's period of liability.[132]

In English law, electronic bills of lading are not yet recognised as negotiable documents of title, but through the Club membership and the adoption of a legal framework to facilitate the transfer of rights, propriety and contractual, as the functional equivalent of a negotiable bill of lading become possible.[133] To highlight the importance of contractual terms inscribed on the documentary bill of lading and the non-recognition of electronic means of delivery, the case of *Glencore International v MSC Mediterranean Shipping Company*[134] becomes illustrative.

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[128] WP 69, paras 35-37.
[129] See *Ludec v Ward* (1888) 20 Q.B.D 475, 479. See also, Laryea Op Cit Note 78 at 66.
[130] Laryea Op Cit Note 78 at 67.
[131] See, R Aikens et al. Op Cit Note 20 para 5.53.
[132] See, *Ibid* para 3.34.
[133] The Carriage of Goods by Sea Act 1992 does not recognise an electronic bill of lading to be a negotiable document of title.
[134] *Glencore International v MSC Mediterranean Shipping Company* [2017] EWCA Civ 365.

In this case negotiable order bills of lading were issued that contained express choice of English law in conjunction with exclusive jurisdiction conferred upon the English High Court. The goods were delivered in apparent good order and condition to the carrier. The dispute concerned three different containers that contained cobalt metal briquettes as the 70th shipment in a series of shipments. The other shipments were completed without problem. MSC were the carrier and Glencore were the holder of the negotiable bills of lading and owner of the cargo.[135]

The port of destination facilitated the use of an electronic release system (ERS) which provided that a pin number would release the cargo. The holders of the bill of lading had to present the pin codes to take delivery of the goods.[136] On the 70th shipment, two containers went missing and MSC argued that the pin codes, which were governed by a system under their control, were the functional equivalent of delivery which had already been issued to Glencore, and that delivery need not be a physical act of transfer of property.[137] The terms on the bill of lading stated had the following inscription: [138]

> "If this is a negotiable (To Order/of) Bill of Lading, one original Bill of Lading, duly endorsed must be surrendered by the Merchant to the Carrier (together with outstanding freight) in exchange for the Goods or a Delivery Order."

Whilst referencing *Dublin City Distillery v Doherty* [1914] AC 823 the court stated that constructive delivery is not giving a separate person a duplicate key to a store which houses goods that are merely deliverable to a named key holder. There needed to be a 'positive act' to state that goods were more than deliverable to a named party. There must be a positive act of placing someone in a bailment relationship which requires the requisite intention which was held not to be situation in this event. *[139]*

Furthermore it was held, in terms of section 61(1) of the Sales of Goods Act, 1979 states that "the 'delivery' is a 'voluntary transfer of possession from one person to another'" which requires an 'actual surrender of possession' as a 'bilateral act' that could be made through distinct contractual arrangements.[140]

Lord Justice Clark[141] said:

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[135] *Glencore International v MSC Mediterranean Shipping Company* [2017] EWCA Civ 365 para 1.
[136] *Glencore International v MSC Mediterranean Shipping Company* [2017] EWCA Civ 365, para 3.
[137] *Ibid*, para 29.
[138] *Ibid*, para 8.
[139] *Ibid* para 30
[140] *Ibid* para 33; See, *Barclays v Customs & Excise* [1962] 1 Lloyd's Rep 81,89.
[141] *Glencore International v MSC Mediterranean Shipping Company* [2017] EWCA Civ 365, para 60.

> "It may be that a system whereby delivery against a PIN code is valid, even if presented by a thief, is sensible because of the benefits of using modern technology in place of paper. But, if that is to be done, it requires, in my view, either appropriate contractual provision or statutory imposition"

In absence of the legal recognition of negotiable electronic documents of title, contractual terms recognising electronic means to be as effective as delivery of a tangible document become paramount to equate an electronic delivery to presentment to effect delivery.

In this case, it was held that the carrier did not "divest itself of all powers of control dealing with the goods",[142] which made MSC liable because the pin codes did not constitute delivery in terms of the delivery order.[143] Importantly, the court held that delivery of goods to the first presenter is not 'a symbolic act' it is the 'actual delivery of custody of goods'.[144]

In effect, the bill of lading is the carriers promise to deliver to the holder and not to the shipper[145] because of the legally recognised symbolic character of the document which is facilitated through corporality of a unique tangible because an original document is "… susceptible to immediate visual verification on the spot".[146]

(f) Bill of lading and financing:

Mercantile practice was to utilise the bill of lading to obtain finance for a transaction by the utilisation of a factor for sale. The bills of lading were transferred to the factor which allowed the factor to on-sell the goods through the document to other assignees and securitising their financial advance.[147]

Generally, the factor in this type or relationship could be a banker or agent and considered to be a pledgee of goods. This relationship requires that the bills of lading must be recognised as a symbol of the goods to ensure that a holder of the documents can have independent actions against the carrier, otherwise attornment is required to securitise the loan through voluntary declarations of will.[148]

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[142] *Ibid* para 38.
[143] *Ibid*, para 69.
[144] *Ibid*, para 28.
[145] See Professor Jan Ramberg 'Documentation: Sea waybills and Electronic Transmission', in *The Hamburg Rules: A Choice for the E.E.C.?* (1994) 104.
[146] See K. Bernauw 'Current Developments Concerning the Form of Bills of Lading' in *Ocean Bills of Lading: Traditional Forms, Substitutes and EDI Systems* (1995) Ch 4 p 114; See also *Intercontinental Export Co (Pty) Ltd v MV Dien Danielsen* 1983 (4) SA 275 (N) at 276.
[147] R Aikens et al. Op Cit Note 20 para 6.37 – 6.39.
[148] *Ibid* para 6.39.

In English law, a bank as a pledgee generally is not considered the owner of the goods, they are known to have 'special' property in the goods, as opposed to general property in the goods.[149] A bank, as pledgee would have special property in the goods, would have an 'immediate right to possession of the goods'.[150] If a pledgee bank wants to obtain goods from the carrier, they do a positive act, like demanding delivery from the carrier to receive the goods, but in so doing may become liable for a the payment of obligations emanating from the contract of carriage to the carrier.[151] If ownership has passed from the borrower to the purchaser without the bank being paid, the bank may have problems enforcing their security rights as against the goods.

English law does not recognise an electronic negotiable bill of lading as a 'document of title'. For a bank to have security rights over the goods subject to an international contract of carriage there would need to be an attornment agreement between the carrier and bank as to when it was possible for the bank to enforce its security rights over the goods because there is no recognition as to what a 'holder' is of a data record is without external agreement. This is because for security rights to accrue to a pledge, there needs to be physical delivery of pledged item. This can be due to the publicity principal.[152]

(g) Systems and Standards of the Bill of Lading

There are two types of system that enables an entity to obtain goods at a destination port, the carrier as a system that conveys goods, and the bill of lading document that operates independently of the carrier that any entity can inspect and transfer.

Two types of common network models are client-server[153] and peer-peer[154] which are classified depending on how network nodes[155] interact with one another[156] which can be

[149] *Swell v Burdick* (1884) 10 A.C. 74
[150] R Aikens et al. Op Cit Note 20 para 5.54.
[151] Section 3 Carriage of Goods by Sea Act, 1992.
[152] See, Allen H. Merrill 'Security Interests Under Pledge Agreements' (1942) 51(3) *The Yale Law Journal* 431 at 443. See, *Powers v Motors Securities Co.,* So.2d 922 (La. App. 2d Cir. 1964); See, which is required in South African Law, see page 1 Credit Support Deed.
[153] An important difference between a client-server network and the peer-peer network is that there is a third party that facilitates or denies access to information on a network in a client- server network thereby data management is centralised on a server and specific to clients connected to the server. A system administrator manages data on the centralised server. IBM Learning Hub 'Networking' available at *https://www.ibm.com/cloud/learn/networking-a-complete-guide*, accessed on 10 October 2019.
[154] In a peer-peer network a peer would choose directly which information they directly share without the authority of a centralised service. IBM Learning Hub 'Networking' available at *https://www.ibm.com/cloud/learn/networking-a-complete-guide*, accessed on 10 October 2019.
[155] A node can be considered an actor in a network. IBM Learning Hub 'Networking' available at *https://www.ibm.com/cloud/learn/networking-a-complete-guide*, accessed on 10 October 2019.
[156] A server is a computer system that stores data or information on it, a client is the machine which facilitates user access to the information on the server through a network. A network node in a distributed system can either be a client, server, or peer. Node (Networking) and Server (Computing) accessible at

further be classified as centralised[157], decentralised[158], and distributed[159] which could require permission or be permissionless to access.

(i) Carrier as a Centralised Client-Server System

To utilise a carrier for the transport goods requires permissioned access to utilise their system as they are the 'systems administrator' which facilitates a client-server type network model with a centralised locus of control over creation and issuance of the bills of lading.

Bills of lading are issued once goods are received by the carrier, on request, a carrier is obliged to provide a 'received for shipment' or a 'loaded on board' bill of lading, [160] which can reflect whether the document is negotiable, non-negotiable, made out to bearer or the order of, facilitating transfer in a free manner, or restricted manner.[161]

This would require that a carrier documents the identity of the shipper, but not necessarily the identity of the consignee as a bearer bill of lading or a transferee of a negotiable bill of lading does not necessitate carrier involvement in the process of negotiation or transfer. This limits the role of the carrier to properly issue the document, transport the goods, receive instruction from the holder of the bill of lading, and deliver to a holder of an original bill of lading.

(ii) Documentary Network System:

After a bill of lading is issued, the documents network requires permissioned access to transfer to a new holder which does not involve carrier notification of whom the 'controlling

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https://en.wikipedia.org/wiki/Node_(networking)#cite_note-1 and *https://en.wikipedia.org/wiki/Server_(computing)*, respectively, accessed on 10 October 2019.

[157] Centralised systems: The hierarchical locus of control determines whether a system is centralised or not, if the decision-making body of an organisation or system is maintained by a relatively few members the system is centralised. Client-server network models and centralisation are connected. Brenn Hill, Samanya Chopera & Paul Valencourt *Blockchain Quick Reference* (2018) Ch 3.

[158] *Decentralised Systems:* In decentralised systems a node will not contain all the system information or control over the system. "Decentralized means that there is no single point where a decision is made. Every network node makes a decision for its own behaviour and the resulting system behaviour is the aggregate response." MaRi Eager 'What is the Difference Between Decentralised and Distributed Systems' *Medium* available at *https://medium.com/distributed-economy/what-is-the-difference-between-decentralized-and-distributed-systems-f4190a5c6462*, accessed on 2 December 2018.

[159] *Distributed Systems :*'A distributed computer system consists of multiple components that are on multiple computers, but run as a single system.' IBM Knowledge Centre 'What is distributed Computing' *IBM* available at *https://www.ibm.com/support/knowledgecenter/en/SSAL2T_8.2.0/com.ibm.cics.tx.doc/concepts/c_wht_is_distd_comptg.html*, accessed on 10 October 2019.

[160] J P van Niekerk & W G Schultze *The South African Law of International Trade: Selected Topics* 3 ed (2011) 146 [Now in 4th edition 2016]; see Art 3 Hague Rules; Art 3(3) Hague-Visby Rules; The Hamburg Rules apply to contracts of carriage by sea and not solely for bills of lading which is therein defined but Article 14 states this in relation to bills of lading, as other sea transport documents (such as a non-negotiable sea waybill) do not require a document to be surrendered for requirement of goods enumerated in Article 1 (7) which defines a bill of lading unlike the Hague and Hague Visby Rules.

[161] R Aikens et al. Op Cit Note 20 paras 2.34 – 2.42

party'[162] or person in possession is at each stage of the document's transmittance,[163] which may be facilitated through the services of a third party acting as a conduit.

As the holder chooses whether to negotiate the document or utilise it as security, and the corresponding party can choose to accept the document, the document flows in a peer-peer like network that is decentralised and distributed.[164] A person that has any dealing with the document, or accepts the terms of the document become 'peer nodes'.[165]

The shipper becomes the holder of the document once in possession of it and once they extinguish their rights of possession to the bill of lading, another 'node' obtains rights of possession and the transferor has their rights extinguished. The final holder obtains the goods from the carrier at the destination port, thus being introduced to the carrier network once more.

The ability of a bill of lading to be held by someone and understood without specialised hardware or software facilitates trade because of the open standards and interoperability of the document. The ideal electronic system would facilitate the same open standards and interoperability. Electronic Data Interchange (EDI) has been defined and:

> "…is the application-to-application exchange of electronic business-related data based on a format understood by both (all) trading partners using an electronic transmission medium in order to carry out a business transaction."[166]

A bill of lading represents an open standard to international trade. The ability of a shipowner, or authorised agent, to create bill of lading document means that governments have allowed an open standard, which is interoperable with port authorities, financial

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[162] A centralised title registry is whereby the carrier maintains a system of notification who would be the 'holder', but the functional equivalent would exclude carrier involvement in maintaining whom the 'controlling party' is.

[163] See, Section 7 Sea Transport Documents Act 65 of 2000, and Section 2 (2) Carriage of Goods by Sea Act of 1992.

[164] A bank could even just become a conduit for the documents transport. Or a bank can act as a conduit for transfer and transport of documents. J P van Niekerk & W G Schultze *The South African Law of International Trade: Selected Topics* 3 ed (2011) 146 [Now in 4th edition 2016]257–258.

[165] A node has been defined by 'Techopedia' and is a point of intersection/connection within a network. In an environment where all devices are accessible through the network, these devices are all considered nodes. The concept of nodes works on several levels, but the big-picture view defines nodes as the major centres through which Internet traffic is typically routed. This usage is somewhat confusing, as these same Internet nodes are also referred to as Internet hubs. Techopedia 'Node' available at *https://www.techopedia.com/definition/5307/node*, accessed on 30 October 2019.

[166] Christian Huemer 'Electronic Commerce: The end of the Beginning XML vs. UN/EDIFCAT of Flexibility vs. Standardisation' (2001) p1 available at *https://pdfs.semanticscholar.org/c187/6f9e4ee352a5e77413a4a0cac09a91a98dfd.pdf*, accessed on 30 October 2019.

institutions[167] and traders as they do not need any special programme to understand the document which makes it accessible.

If a standard[168] of communication was prescribed that was the intellectual property of a private entity it would monopolise EDI communications in defiance of the principal of openness - even if a method of electronic communication was not the intellectual property of another company, there needs to be minimum levels of interoperability,[169] to create a standard for communication.[170] Openness can be considered on a spectrum.

III. Conclusion

A bill of lading has many problems, but it is useful. A bill of lading has legally recognised utility due to the custom of merchants, statutory law and international convention applied against the medium that is capable of possession. This entitles the holder to specific entitlements. It is an open standard that is interoperable, and can be used in evidence if it is original and authentic which enables a document to emanate from a client-server system to a peer-peer system.

CHAPTER 3 DOCUMENTARY DEMATERIALISATION

I. Aim

UNCITRAL have created important texts that has facilitated the recognition of data messages and electronic signatures into evidence. Now they have distributed the MLETR which has built upon the previous texts in terms of the same principals to facilitate the recognition of Electronically Transferable Records (ETR). This Chapter goes through how UNCITRAL has

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[167] Uniform Customs and Practice for Documentary Credits, 1993 Revision, UCP 500 ICC Publication No. 500E, 1993 Edition. Article 13(a).

[168] Two open standards are UN/EDIFACT (United Nations rules for Electronic Data Interchange for Administration, Communication and Transport) and the XML (eXtensible Markup Language) meta-language standard. UN/EDIFACT is rather limited is its utility, but does enable different systems to exchange data speaking the same language; utilising XML to transport data and information does not require the use of specific hardware or software which makes it open. Within XLM, eXtensible Stylesheet Language (XSLT) provides the capacity of an XLM template to convert into another format for example XML to HTML – to display data across different types of file formats enabling interoperability, which further can be designed to only be able to be understood between private partners. See, Christian Huemer 'Electronic Commerce: The End of the Beginning XML vs. UN/EDIFCAT of Flexibility vs. Standardisation' (2001) p 2 -4; see W3shools 'What is XML' available at *https://www.w3schools.com/xml/xml_whatis.asp*, accessed on 8 August 2019.

[169] Interoperability has been described as 'the ability to make one type of equipment or application work with another directly, without requiring special effort from the end user', see Mostafa Hashem Sherif *Protocols for Secure Electronic Commerce* 3 ed (2016) paras 4.2.2 -4.2.4

[170] There are four stages of system integration in business-to-business commerce, namely, interconnectivity, functional interoperability, semantic interoperability and optimisation and innovation. *Ibid* at 4.2.2.

facilitated the recognition of data messages in terms of available technology and will how they attempt to procedurally recognise ETR that could function as an electronic negotiable bill of lading in line with pre-blockchain Club registries.

Knowing how a paper documentary bill of lading functions and flows does not mean that the exact electronic mechanism can be directly achieved. To create a functional version of a document requires the fundamentals of documents to be dematerialised. Above it was illustrated that documentary bills of lading allow freedom to transact in predefined arrangements. The substance of a bill of lading is a tangible document of evidence representing intangible rights that facilitates the concept of possession. As will be explained reliability, integrity and possession facilitating control are of paramount importance when dealing with negotiable documents of title which will be explained in terms of cyber security fundamentals.

II. UNCITRAL

The United Nations Commission in International Trade Law (UNCITRAL) was established by the United Nations General Assembly by resolution 2205 (XXI) of 17 December 1966 to facilitate the 'progressive harmonisation and modernisation of international trade law' to enhance predictability and legal certainty in trade and have thus far been instrumental in aiding in the domestication and recognition of laws to empower electronic commerce generally.[171]

UNCITRAL has used a flexible approach to the achieve its mandate because they use different methods to facilitate the liberalisation of international trade. They use three methods to influence the international trade area, namely legislative, contractual, and explanatory guides on how to harmonise their texts across international jurisdictions.[172]

Technological methods to facilitate electronic commerce must be made operative with a legal framework to empower legal certainty[173] which can be done through the domestication of the UNCITRAL the Model Laws surrounding electronic commerce which facilitate the legal recognition and standardisation of rules in relation to open technological standards.

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[171] MLETR.at 5.

[172] José Angelo Estrella Faria 'Legal Harmonization Through Model Laws: The Experience of the united Nations Commission on International Trade Law, p 11, available at *https://www.justice.gov.za/alraesa/conferences/2005sa/papers/s5_faria2.pdf*, accessed on 15 November 2019.

[173] United Nations General Assembly, UNCITRAL, *Possible Future Work On Electronic Commerce Transfer of Rights in Tangible Goods and Other Rights*, A/CN.9/WG.IV/WP.90, 20 December 2000, (WP.90) para 27, 29, 33, 34, & pp 35- 37; See generally, WP.115 ch II.

UNCITRAL has released important texts to facilitate electronic commerce namely, Model Law on Electronic Commerce, with Guide to Enactment, 1996 (MLEC),[174] the Model Law on Electronic Signatures, with Guide to Enactment, 2001 (MLES),[175] the United Nations Convention on the Use of Electronic Communications in International Contracts, 2005 (ECC),[176] and more recently the Model Law on Electronic Transferable Records, 2017 (MLETR).[177]

The MLEC, amongst other things, proposed a structure that could be incorporated into domestic law to legally recognize data messages[178], and negotiable or transferable documents of title,[179] which did not succeed at the facilitation of the latter.

The MLES is a text that establishes technical criteria for electronic methods to reliably assent to agreements.[180] The ECC is a product of the synergy of certain aspects of the MLEC and MLES,[181] but the ECC specifically excludes its binding rules from, amongst other things, bills of lading.[182]

The challenges surrounding the transferability and negotiability in movables was first mentioned in the twenty-seventh session of the UNCITRAL Commission in 1994.[183] By the thirtieth session the Commission stated that the main issues surrounding the dematerialisation of a negotiable and transferable document of title were 'issuing a receipt for the goods', 'giving instructions to the carrier', 'claiming delivery of the goods', and 'transferring or negotiating rights in goods'.[184]

Other important concepts to dematerialise were further expounded upon in the forty-fifth session of the Commission in 2001, in which uniqueness, possession, authentication of a holder, negotiation and delivery[185] were deemed essential.[186]

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[174] United Nations Commission on International Trade Law, UNCITRAL Model Law on Electronic Commerce with Guide to Enactment in 1996 with Additional Article 5 bis as Adopted in 1998 (New York: United Nations, 1999) (Hereinafter referred to as MLEC)
[175] United Nations Commission on International Trade Law, *UNCITRAL Model Law on Electronic Signatures with Guide to Enactment 2001* (New York: United Nations, 2002) (MLES)
[176] United Nations Convention on the Use of Electronic Communications in International Contract. *United Nations Convention on the Use of Electronic Communications in International Contracts*, New York, 23 November 2005, *United Nations Treaty Series*, vol.2898, No. 50525 at p. 3. ().
[177] United Nations Commission on International Trade Law, *UNCITRAL Model Law on Electronic Transferable Records* (New York: United Nations, 2018) (MLETR).
[178] MLEC. Article 5.
[179] MLEC. Articles 8, 17 and 19, and para 63
[180] MLEC at 8.
[181] Herbert A. C. Umezuruike 'Electronic Bills of Lading, Rotterdam Rules and the Nigerian Evidence Act' (2012) 16 *Nigerian L.J.* 50 at 51.
[182] Article 2(2) ECC.
[183]WP.90, para 1.
[184] *Ibid* para 2, for more information, see A/CN.9/421.
[185] In Austria, Germany, Netherlands the concepts of delivery and consent is a pre-requisite to pass property. §

(a) Principals Under UNCITRAL

Model laws are a legislative method that can be adapted to suit the individual needs of a state because they are not mandatory impositions on state practice which has made them quite useful in harmonisation.[187] The UNCITRAL adopt concepts of non-discrimination[188], functional equivalence and technological neutrality[189] to guide their texts.

The UNCITRAL functional equivalence approach is based on:

> "an analysis of the purposes and functions of the traditional paper-based requirement with a view to determining how those purposes or functions could be fulfilled through electronic-commerce techniques…(which) should not impose on users of electronic commerce more stringent standards of security (and the related costs) than in a paper-based environment."[190]

The UNCITRAL principal of functional equivalence, however, goes further than their concept of non-discrimination. The UNCITRAL broad description of functional equivalence facilitates any method, as long as reliable, to achieve the end goal. The requirements to be recognised would be legislated to encompass possibly too many methods of recognition. This is different to finding technological match to the functioning of a specific instrument, like only recognising the electronic equivalent of bill of lading if its life cycle and utility are a match.[191]

(b) Dematerialising a document under UNCITRAL

UNCITRAL has described a document in terms of two inter-related concepts. A document is a tangible medium which has a traditional form which has certain characteristics that enables it to be properly function evidence.

1053 Austrian Civil Code; § 433 par. 1 German Civil Code; Art. 7:9 (1) Dutch Civil Code 1992. See also, Ulrich Drobnig 'Transfer of Property' (2010) *SSRN Electronic Journal* 7-8.

[186] WP.115, para 33.

[187] Report by the UNCTAD, *Information Economy Report 2006 The Development Perspective*, United Nations (2008) 300, available *at https://unctad.org/en/Docs/sdteecb20061ch8_en.pdf*, accessed on 19 July 2019; see further, José Angelo Estrella Faria 'Legal Harmonization Through Model Laws: The Experience of the united Nations Commission on International Trade Law' p 13, available at *https://www.justice.gov.za/alraesa/conferences/2005sa/papers/s5_faria2.pdf*, accessed on 15 November 2019.

[188] The principle of non-discrimination provides that "A communication or a contract shall not be denied validity or enforceability on the sole ground that it is in the form of an electronic communication." See e.g. ECC Article 8(1) and MLEC Article 5.

[189] Technological neutrality is non-restrictive on the method used, as long as the goal is achieved which does not hinder technological development which facilitates market-driven principals to choose the most suitable technology, see WP.115, para 35.

[190] MLEC para 16.

[191] WP.115, para 31; See also, ECC para. 51.

The traditional form requirements of a paper document to be replicated for dematerialisation purposes involves an understanding of what the concepts behind 'writing', 'signature', 'original', 'dispatch' and 'receipt'.[192]

In the explanatory guide to the MLEC they expounded on the functions of paper documents. A paper document has a form and it has been useful as a medium to record writing. The functions of a document as a medium are namely, "universal legibility; inalterability over time; replicability; to have an authentication capability; a medium that is acceptable to authorities".[193]

A documentary bill of lading should be in writing and signed which would be allowable in evidence to be capable of being a recognised receipt capable of having probative force to the terms that it references and contains.[194]

There are two major types of legal systems when it comes to evidence, namely the Anglo-American/common law [195] and the Continental systems.[196] Both systems recognise the concept of authentication when it comes to the probative value of documents in evidence. The UNICITRAL Model laws have been important in their dematerialisation of traditional documents to electronic form.

Authentication of a document can be defined as, "proven of an original when it was written, printed, executed, or signed as it claims to have been"[197] which highlights three aspects of a document which could be necessary for evidence. The first is the content of the document, and the second is the signature is proof of identity of the party in relation to the content. After the MLEC, MLEC, and ECC were published it is generally accepted that data messages are admissible as evidence if:

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[192] *Ibid.*
[193] MLEC para 16.
[194] WP.115, para 9.
[195] The Anglo-American system/common law position on evidence is that there are three means of proof, namely, real, documentary and oral, as qualified by the best evidence rule. The Anglo-American system focuses on the idea that admissibility of evidence is a question for law, and weight of the evidence is a question of fact. Documentary evidence must be original and must furthermore be authenticated. See, Lin, Tan Yock. 'Making Sense of Documentary Evidence (Part I)' (1993) *Singapore Journal of Legal Studies*, pp. 504 at 504.; J P van Niekerk & W G Schultze *The South African Law of International Trade: Selected Topics* 3 ed (2011) 12 [Now in 4th edition 2016] ; Elis S Manger 'The Best Evidence – Oral Testimony or Documentary Proof?' (1995) 67 at *UNSW* 66.
[196] The Continental System generally allows a free system of evidence[196] which civil law systems lay can lay down rules relating to the probative force of documents in legislation in which authenticity can be a pre-requisite for probative force. Viktória Harsági 'Documentary Evidence in Comparative Perspective' (2011) *SSRN Electronic Law Journal* 9.
[197] S Dalby 'Authenticity/Authentication Definitions and Sources' (2004) InterPARES 2 Project International Research on Permanent Authentic Records in Electronic Systems available at *http://www.interpares.org/display_file.cfm?doc=ip2%28policy%29authenticity_definitions-sources.pdf&fbclid=IwAR0tk_PciFoEPHXbCD957U0PJUSfsmLTgHpGO-qN0y-1ujRFe9mcGRHV31c.*, accessed on 2 February 2019.

> "…the contents of the record have remained unchanged since it was sent; that the purported sender of the communication is identifiable; that the identified sender agreed to its contents; and in some cases, that extraneous information, such as the apparent date of the transmission, is accurate."[198]

III. Data Messages as Documents

States needed to give evidential weight to electronic information; legislate what an electronic signature is which requires a secure technology to enable authentication; and a prescribed method to determination of where the formation of the contract is, which may have pre-requisites for a contractual validity depending on where the contract is formed.[199]

(a) Authenticity

Authenticity means that a document or record is "what its proponent claims" thereby an originator of an electronic message plus their 'signature' is a means of authentication to confirm genuineness of a record which would be required when litigating on a dematerialised document requires a legally recognised method or procedure to authenticate an electronic record.

Electronic methods to create writing or signature are not a physical thing. An electronic signature is a method to record consensus utilising technology. It has been said that the substance of an electronic signature has been deemed to be a "matter for metaphysics rather than a physical object".[200]

It is difficult to neatly equate concepts of 'original' in an analogue paper document to that in an electronic environment. In an electronic environment a recipient of a transmitted data record would have ostensibly received an electronic copy of the data record and not the original, which is in conflict with the common law best evidence rule.[201] Without legal recognition of electronic methods of authentication electronic bills of lading would not be able to be recognised.

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[198] Christopher Reed 'Legally Binding Electronic Documents: Digital Signatures and Authentication' 35(1) (2001) *The International Lawyer,* 89 at 90.
[199] WP.90, para 29.
[200] Reed Op Cit Note 198 at 93.
[201] Wayne T. Westling 'Articles IX and X: Authentication and the Best Evidence Rule' 19(3) (1983) *Williamette Law Review* 427 at 427.

(b) Attribution

The ability to attribute data messages from an entity is given in terms of section 13 of the MLES, which is rather broad and permissive as to when an entity can have a data message attributed to the another as opposed to the actual sender.

This method is technologically neutral and an open standard but could be more secure because there are no required guarantees of who the transmitter is but that does not mean that there are not more secure methods of attribution, whilst the MLES states that the verification of a digital signature to an original data message is in reference to a given public key.[202]

(c) Recognition of data message

The MLEC[203] uses the concept of 'data message'[204] to equate to writing[205] which sets out a legal framework to empower the potential recognition of a data message in article 5 MLEC if, for example, it is useable for subsequent reference.

(d) Signature

The core ingredients of electronic signature techniques underpin electronic transactions and notably blockchain technology. The function of a manuscript signature provides evidence of three elements for dematerialisation purposes, evidence of the identity of the signatory; the signatory's intention bound; and the signature on the document to be bound by the contents of the document.[206]

There are three methods for recording consensus with electronic or digital signatures.[207] UNCITRAL have noted that states utilise the minimalist, prescriptive or a hybrid of those methods for the legal recognition of an electronic or digital signature to record consensus.[208]

(i) The minimalist approach:

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[202] MLES. para 43.
[203] MLES designates it the same Art 2(c).
[204] Article 2(a) of the Model Law (1996) defines the concept of a data message: 'Data message' means "information generated, sent, received or stored by electronic, optical or similar means including, but not limited to, electronic data interchange (EDI), electronic mail, telegram, telex or telecopy."
[205] MLEC Article 6.
[206] Reed Op Cit Note 198 at 93.
[207] A digital signature is synonymous with an advanced electronic signature and an e-signature is synonymous with an audit trail to link an individual to the genesis of a data message, see, R Sabett 'Effects of Technology Convergence and Public Key Infrastructure' (1999) 7(2) *University of Baltimore Intellectual Property Law Journal* 143 at 154.
[208] World Economic Forum 'Making Deals in Cyberspace: What's the Problem?' (2017) Geneva. *http://www3.weforum.org/docs/WEF_White_Paper_Making_Deals_in_Cyberspace.pdf.* p 7.

The minimalist approach 'equates an electronic signature with the legal significance of a handwritten one'.[209] As a shipper registers their cargo for shipment with the carrier for the carriage contract, that aspect is a semi-verified process between the carrier and the shipper – as identification documents are not necessarily a pre-requisite to complete a shipping contract, just a reasonable ability to identify parties. The correct standard for a bill of lading should be an e-signature whereby there would be an audit trail to determine the validity of signature in relation to a data-message. [210]

(ii) The Prescriptive approach:

The prescriptive approach to digital signatures 'achieves maximum legal certainty' as this approach prescribes a technology or a method to electronically sign documents. A method which could be technology specific or utilising a digital certificate could be obtained from a through a Certification Authority (CA) under a Public Key Infrastructure (PKI).

(iii)The Hybrid (Two-Tiered) approach:

This approach to legal recognition of digital/electronic signatures gives legal recognition to both methods, but more legal weight is attached to a signature under the prescriptive approach. If a type of contract requires notarisation, a digital signature should be prescribed, if not an electronic signature (e-signature) could suffice as long as a reliable method was used. [211]

Article 7 the of MLEC articulates a flexible and comprehensive approach to the use of an e-signature which applies general principles for validation. An electronic signature should 'identify the author of a document and confirm that the author approved the content of that document'[212] by means of an appropriate and reliable method for purposes of which the data message was generated and communicated.[213]

Article 6 and 7 of MLES reflect this technologically neutral and open position, but further provide that technical standards that the electronic signature may be prescribed, which

[209]Australia has adopted the minimalist approach, see section 10 of the Electronic Transactions Act 1999 (Cth) of the Common Wealth of Australia. They perceived that the market should decide which type of signature is acceptable, see Steven Mason 'The Practical Issues in Using Electronic Signatures in Different Jurisdictions' (2016) 115 at 120 *JSTOR.*

[210] That is if there is no specifically prescribed notarisation requirements or prescriptive impositions on bills of lading.

[211] The European Union, England, South Africa, utilises the hybrid approach in terms of The Electronic Identification and Trust Services Regulation (910/2014/EC) (eIDAS), the Electronic Identification and Trust Services for Electronic Transactions Regulation 2016 (No. 696), Electronic Communications and Transactions Act, 25 of 2002.

[212] MLEC paras 56-57.

[213] MLEC Article 7, and para 58, states that appropriate 'legal, technical and commercial factors may be taken into consideration'.

provides scope for a state to prescribe specific signatures for authentic acts which facilitates the hybrid approach.

(e) Original

The problem with the concept of original in documents relates to its ability to be utilised in evidence through a process of determining authenticity. A data message is transmitted in its original form in term of article 8 MLEC. There must be a 'reliable assurance of integrity of the data message sent in its final form' and that if it must be presented, it must be must be 'capable of display to the recipient' which is determined on a case by case basis by the relevant circumstances.

(f) Admissibility and evidential weight / reliability

Admissibility and evidential weight of data messages are provided for in article 9 of the MLEC. Data messages must be given due evidential weigh and must not be denied admissibility on the ground of medium and conflict with the best evidence rule as to original form. Due evidential weight is determined by the integrity of the data message, amongst other factors.

van der Merwe, whilst referencing domestic law of South Africa in relation to the aforesaid provisions, stated that there needs to be a test as to reliability of encryption programs to do 'check sums' to determine whether there are any discrepancies of the data message to see if it is reliable evidence.[214]

IV. Documents of Title as Electronic Transferable Records

UNCITRAL has built upon the previous concepts to recognise a data message as an ETR if it satisfies certain other requirements. These other requirements facilitate a functional equivalent of concepts of issuance, uniqueness, possession, authentication and delivery in terms of the control approach to dematerialisation.

The tangibility of a document allows it to be issued by a carrier which enables the quality of physical possession. The paper document itself is important as a tangible, but it can be said that the medium to record information is important and not the actual paper. Physical possession of a paper bill of lading represents rights and obligations in relation to the goods

[214] Dana van der Merwe, Anneliese Roos Tana Pistorius & Sieg Eiselen *Information Communications Technology Law* (2008) 115. [Now in 2nd Edition 2016].

the document covers that enables the ability to control goods, and is typically a precondition to receive at the destination port. [215]

The Hague, Hague-Visby[216] and the Hamburg[217] rules all refer to the 'issuance' of a bill of lading and refer to bills of lading as documents which poses a problem for the legal recognition of an electronic equivalent because issuing an intangible poses a conceptual problem in a dematerialised environment.[218]

(a) Possession and control

The UNCITRAL functional equivalent of transfer of possession is the transfer of control,[219] which has been utilised in convention and domestic law outside of the UNCITRAL.[220] Possession is deemed to be largely a matter of fact which encompasses two components, factual control over goods and the intention to exclude in exercising control. Possession has also been said to be indivisible because it is based on the exclusion to others.[221]

(b) UNCITRAL methods of control

Three methods facilitating the control approach to possession have been recognised by UNCITRAL, the 'token' model; the 'registry' model; and facilitating a person to have exclusive access to a record.[222]

(i) The 'Token' model: [223]

The token model is where a person is identified in the "authoritative copy" of the ETR which enables to be the controlling party (holder) of the record, with each new holder being contained on the record as alterations to the ETR which requires an unalterable ERT except for the ability to track modifications to the holder.[224] The ETR furthermore should not be able to be copied but must be transferable.[225]

When this commission report was given by the UNCITRAL commission, blockchain technology did not exist. Prior to the discovery of blockchain, the recognition of an ETR

[215]UNCITRAL, Legal Issues Relating the use of Electronic Transferable Records A/CN.9/WG.IV/WP.115, 8 September 2011, paras 19 – 20.
[216]Hague-Visby Rules. Articles I (b) and Hague Rules. Article 3(7).
[217] Hamburg Rules.Article 1 (7) and Part IV.
[218] WP 69, para 50.
[219] WP.115, para 43.
[220] For example, article 7-106 UCC, Rotterdam Rules Articles 50 and 51 refers to control of an electronic document of title.
[221] Fitzgerald, P.J. *Salmond on Jurisprudence* 12ed (1966) 287.
[222]WP.115, para 48.
[223]*Ibid* para 48 (a).
[224] This description is pre-blockchain when there was probably no possibility of having a token that could exist on a decentralised register.
[225] Legal possession refers to the state of being a possessor in the eyes of the law. See, for example, Michael Bridge et al *Law of Personal Property* 2ed (2017) at 10-008.

could be done with a digital object identifiers or digital rights management tool to correspond to the concept of uniqueness but these cannot be tradable as singular tokens.[226]

(ii) The 'Registry' model[227]:

A person in control of the ETR would be registered on a centralised data base in which the identity of the owner an ETR is maintained on a third-party registry, which require the registry to be secure and not necessarily the ETR itself. This centralised registry approach is pre-blockchain.

The centralised registry model[228] of electronically transferable records is one that a Trusted Third Party (TPP) regulates permissioned access to their database which identifies an entity that has exclusive control over the goods and an authenticated data record of the contract of carriage.[229]

The primary goal of the registry would be to see who has 'control' over the record.[230] Centralised registries[231] are the means by which control, ownership and factual possession over goods are transferred through a 'private key procedure'.[232]This also requires the acceptance of a legal framework to legitimise the approach.[233] The key is in effect the symbol of the goods which tentatively is the constructive possession of the goods.[234] This is important as if ownership could not pass in this manner, if the seller became insolvent the buyer would have no title to the goods with the consequences that would follow sequestration or liquidation of an unsecured creditor.[235]

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[226] WP.115, at 37.
[227] *Ibid* para 48(b).
[228] In 2001 when this report came about there were determined to be three main types of registries, government, central, and private registries. The novel idea behind blockchain flips this idea on its head because a public registry is now possible. See, WP.115 pp 15-16.
[229] *Ibid* para 48 (b).
[230] *Ibid* p 13.
[231]WP 69, paras 70 – 81.
[232] B. Kozolchyk, 'Evolution and Present State of the Ocean Bill of Lading from a Banking Law Perspective' (1992) 23 *Journal of Maritime law and Commerce* 161 at 239.
[233] Bolero made their Title Registry (TR) operative for registered members in their directory by joining a private key procedure and a messaging platform. Bolero's (TR) registers who the 'holder' of the Bolero Bill of Lading (BBL) is, and enabled correspondence of their users through their Core Messaging Platform (CMP) which is governed by their legal framework contained in their Rulebook. See, Florian Gehrke *New Attempts at Electronic Documentation in Transport Bolero – The end of the experiment, the beginning of the future* (unpublished LLM theses, University of Cape Town, 2001) 17.
[234] Clause 3.4.1 of the Bolero Rulebook is a process to transfer 'possession', through designation which is contractually agreed to have the same consequence as transfer by constructive possession of a negotiable document of title. See, for example Edwards Op Cit Note 50 at 41.
[235] Florian Gehrke *New Attempts at Electronic Documentation in Transport Bolero – The end of the experiment, the beginning of the future* (unpublished LLM theses, University of Cape Town, 2001) 29.

A TPP would create a central registry, which would facilitate the creation, 'issuance' and the 'transfer' of the electronic records.[236] Some legal systems allow 'control' to replace the concept of 'possession' facilitating a TTP to regulate the trust between the parties on the registry. This would not facilitate an open and interoperable peer-to-peer transfer that a documentary bill of lading facilitates.

To facilitate a single window solution for global trade requires an open and interoperable system. Bolero, for example used standards that made their system interoperable with other users but they still required payment of a subscription fee limiting access to potential traders. [237]

(iii) Person in control as the person having exclusive access[238].

Control is maintained on a secured information system which contains the authoritative ETR which one person has exclusive access to. Which would not be able to function effectively in an international trading system due to issues of proximity.

(c) Electronic transferable record

A data message can be an ETR if it satisfies requirements in article 10 MLETR which is a factual check to see whether an ETR has the certain characteristics. Article 10 prescribes the following principals to convert recognition of a data message to an ETR. Article 10(1) states:

> "(a)The electronic record contains the information that would be required to be contained in a transferable document or instrument; and
>
> (b) A reliable method is used:
>
> (i) To identify that electronic record as the electronic transferable record;
>
> (ii) To render that electronic record capable of being subject to control from its creation until it ceases to have any effect or validity; and
>
> (iii) To retain the integrity of that electronic record.

Article 11 of MLETR is meant to dematerialise possession through a demonstration that the entity in control is capable to facilitate concepts like 'presentation' through evidencing control.[239]

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[236] See WP.115 at 15.

[237] Bolero achieved an interoperable system, but not an open system. Interoperable because they used open technical standard to maintain their Registry through a PKI, namely X.500, in which the subscribers public key is maintained. Further they use secure messaging techniques in accordance with UN/EDIFACT standards

[238] WP.115, para 48(c).

[239] MLETR para 118.

Article 11(2) identifies that the transfer of exclusive control is recognised as the functional equivalent of transfer of exclusive possession which would facilitate the concept of delivery and surrender.[240]

Furthermore, the concept of exclusive control in article 11 is not meant to mean that a third-party agent acting on behalf of their principal prohibits the recognition of exclusive control.[241] Identifying the person in control could also furthermore be a pseudonymous name, but identifying parties does refer to the ability to identify all parties.[242]

(d) Authentication

Niles states that the protocol approach in evidence attempts to find digital guarantees of authenticity in information commination technology (ICT) evidence as opposed to attempting to directly equate paper-based authenticity with hard-copy. Eiselen, furthermore states that if there is a possibility to reliably authenticate an electronic record as to whom the issuer is through an attribution function, and if there is no other copy and therefore a unique, the electronic record could be regarded as a document of title.[243]

(e) Attribution

Attribution in terms of MLETR is the ability to attribute rights to people in terms of Article 10(a), which would require the ETR to contain information that would be required in a transferable or instrument, that can further mean more than one person can be in control on the basis of legal rights such as security rights and possessory rights.[244]

(f) Recognition of Electronic Transferable Records

Article 7 of MLETR gives legal recognition to ETRs in a similar manner that data messages would not be denied legal effect purely on the ground that they are in electronic form. Article 8 of MLETR provides a framework for permitting writing to be in the form of an ETR if available for subsequent reference.

(g) Signature

Article 9 of the MLETR recognises electronic signature ‘if a reliable method is used to identify that person’ and indicate intention to be bound, which means that an e-signature is technically capable of being a recognised method of signature or endorsement on an ETR.

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[240] MLETR para 121.
[241] MLETR para 115.
[242] MLETR para 116.
[243] Kitty Niles, Donald E. Eastlake Secure XML: The New Syntax for Signature and Encryption (2002) at 469; Seigfried Eiselen ‘E-Commerce’ in Dana Van der Merwe, Anneliese Roos W Nel et al. *Information and Communication Technology Law* (2016) at 72.
[244] MLETR para 114.

Article 15 MLETR recognises endorsements on an ETR if it can be used for subsequent reference and complies with conditions set integrity guarantees of Article 9.

(h) Original

Article 2 of the MLETR defines an ETR as an electronic record[245] that must comply with a reliable standard which retains integrity and must be capable of control, amongst other requirements.[246] Originality in an ETR is also determined in relation to the concept of integrity in terms of article 10(1)(b)(ii) MLETR.

A data record must be transmitted in its 'original form',[247] but an ETR prescribes the concept of originality and uniqueness[248] as qualified by the concepts of "singularity" and "control" which is determined if there is a reliable method to attribute control of the record that prevents unauthorised replication – it either is or is not a ETR.[249]

(i) Admissibility Evidential weight and reliability

In terms of article 12 of MLETR there is a reliability test to determine whether an ETR exists which would mean that the procedure for recognition is not a question of weight, it is to determine whether an ETR exists or not, which is determined by an appropriate reliability assessment in terms of Article 12. Article 12(a) state factors to consider and are necessary to determine whether the factual situation exists:

> "(i) operational rules relevant to the assessment of reliability;
> (ii) the assurance of data integrity;
> (iii) the ability to prevent unauthorised access to and use of the system;
> (iv) the security of the hardware and software;
> (v) the regularity and extent of audit by an independent body;
> (vi) the existence of a declaration by a supervisory body, an accreditation body or a voluntary scheme regarding the reliability of the method; and
> (vii) an applicable industry standard."

[245] Which is defined more broadly than a data message because it incorporates the concept of associated information MLETR Article 2.
[246] MLETR Articles 2 and 10.
[247] MLEC paras 63 - 65.
[248] MLETR Article 10.
[249] MLETR para 84.

V. Cyber Security Fundamentals Network Security Fundamentals

Generally, a court will be satisfied with authentication of an electronic record if the following being satisfactorily determined that the record was stored with integrity, that the record is attributable in terms of its content to the deponent, which is reliably transmitted.[250] This chapter focuses on how technological concepts achieve the concepts of integrity, attribution, original, and reliability of the data record for the purposes of authentication of a data message.

Electronic international sales contracts and related data record should facilitate assurances that an entity is dealing with a specific juristic or natural person, which allows continuous, confidential, and permissioned access to data records (contracts) that assures that the record is inalterable, except for indorsements or authorised alterations, which has assurances that transmittance is sent and received.

There are six inter-related concepts, namely, authentication, authorisation,[251] non-repudiation[252] which are tools used to maintain confidentially,[253] integrity,[254] and availability,[255] which would enable the aforesaid situation[256] which should ultimately enable the authentication of data messages and specifically transferable documents of title.

Authenticity means that a data record is 'what its proponent claims'[257] thereby reducing a data message to a fingerprint of the record which can be attached to a record and be uniquely attributed to the originator is a method of ensuring integrity and authenticity.[258] Cryptographic encryption and hashing can aid in the principals of authentication, authorisation, non-repudiation which are tools used to maintain confidentially, and integrity.

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[250] Reed Op Cit Note 198 at 90.

[251] Authorisation is defined as "access privileges granted to a user, program, or process", Confidentiality can be defined as "an assurance that information is not disclosed to unauthorised individuals, processes or devices" which can be facilitated by encryption. James Graham, Richard Howard, and Ryan Olsen *Cyber Security Essentials* (2011)2-3.

[252] Non-repudiation is a quality that ensures reliably of a message's transmission from a legitimate originator to the intended recipient, without the originator or recipient being able to easily deny the transmission having been intercepted by another person or that they received the data message. Achieving non repudiation of receipt. To overcome the likelihood of repudiation of a transmission, it becomes necessary to have a reliable 'digital signature technique' which is supported by digital certificates or has a reliable audit trail from un authenticated e-signature, see generally N Zhang & Q Shi 'Achieving Non-repudiation' (1996) 39(10) *The Computer Journal* 844 at 850.

[253] James Graham, Richard Howard, and Ryan Olsen *Cyber Security Essentials* (2011) 2-4.

[254] Integrity can be understood as data integrity, which means there is no unauthorised alterations in data storage.

[255] James Graham, Richard Howard, and Ryan Olsen *Cyber Security Essentials* (2011) 4-5.

[256] *Ibid* 1.

[257] Integrity plus a digital signature underpinned regulated by a CA/TPP under a PKI infrastructure.

[258] United Nations Commission on International Trade Law, *UNCITRAL United Nations Convention on the Use of Electronic Communications in International Contracts 2007* (New York: United Nations, 2007), 1-2.

The synergy of cryptographic encryption and hashing can achieve the qualities of authentication, authorisation and non-repudiation which are tools used to maintain confidentially, and integrity in data processing, which furthermore are integral in the functioning of blockchain technology.

(a) Cryptographic encryption

Encryption can be defined as converting plain text into cipher text.[259] The first asymmetric cryptosystem was created in in 1977 which enabled the secure transmission of data by having a mathematically related key pair, a private and a public key, which can encrypt and decrypt a data message.[260]

The private key is kept private, and only the public key is published. The public key can be attributable to an entity utilising the services of a TPP, however, there may be no attribution of specifically whom a public key belongs to. These key pairs can represent the capability of encryption and signing.

(i) Encrypted messaging

An originator of a data message could encrypt the message with the intended recipients public key, which the recipient thereof can unlock utilising their private key. Using this process the originator of a data message can be reasonably sure that the intended recipient was the only person that had access to its contents which ensures confidentiality and integrity[261] of the message, however, this is an unauthenticated method as there needs to be a reliable assurance that the public key actually being to the intended audience.

(ii) Digital signature:

An originator of a data message is tentatively the only person who knows their private key so they can leverage that capability to form a type of attestation. If the originator encrypted a data message with their private key and transmit that message to another, if the recipient knew the public key of the originator, the recipient can unlock the data message and be reasonably sure that the originator sent it.[262]

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[259] Dana van der Merwe *et al. Information and Communication Technology Law* 2ed (2016) 156.

[260] Known as the Rivest–Shamir–Adleman cryptosystem. Maria D. Kelly 'The RSA Algorithm: A Mathematical History of the Ubiquitous Cryptological Algorithm (2009) available at, *https://www.sccs.swarthmore.edu/users/10/mkelly1/rsa.pdf* accessed on 1 February 2019 at 1.

[261] Faiqa Masqsood, Muhammad Ahmed, Muhammad Mumtaz Ali & Munam Alu Shah 'Cryptography: A Comparative Analysis for Modern Techniques' 2017 2(6) *International Journal of Advanced Computer Science and Applications* 442 at 443.

[262] Whistle blowers have been known to send messages locked with their private key to notify the world that they are still alive, which the public can unlock with his public key. Rebecca Greenfield 'The Privacy Methods Edward Snowden Uses' available at '*https://www.theatlantic.com/technology/archive/2013/07/privacy-methods-edward-snowden-uses/313394/*, accessed on 30 February 2019.

(b) Cryptographic hashing

Even if a data message is encrypted, it does not mean that the recipient cannot alter the contents of the data message – or at least know if the record has not been tampered with, which is not a method on its own to ensure integrity. Data integrity means ensuring the accuracy and completeness of data over its entire life cycle.[263]

Cryptographic hashing is a means to reduce a data record to a deterministic and hopefully unique line of code which can be considered the fingerprint of a data record, also known as a digest, of the data message, which can be leveraged to reliably ensure the data message was stored with integrity of over time. [264]

A problem with the storage of data is that when processing power increases, so does the ability to manipulate data, thereby the security and integrity of hashed data over time becomes more vulnerable. [265]

(c) A digital fingerprint as a signature to achieve authenticity

Integrity and reliability are core components in authentication. It is possible to achieve the quality of authenticity by utilising an encrypted hash function attachable to a data record as an addition to the contract.

To achieve authenticity in this manner the digest of a data record contract is encrypted with the transmitters private key, which is then subsequently attached as an addition to the

[263] Boritz, J Efirm 'IS Practitioners' views on Core Concepts of Information Integrity' (2005) 6(4) *International Journal of Accounting Information Systems* 260 at 272.

[264] Cryptographic Hashing is a one-way deterministic algorithmic programming function that compresses data into a –hopefully- unique line of code, with a fixed length output. Deterministic means that the same data after hashing must 'answer' the same hash value/ fingerprint. If there are two hash outputs that are the same for different 'data records' or 'inputs', then a 'collision' has occurred, meaning that two entirely different data sources have the same value- which means it is not a unique fingerprint. If this occurs then there is no guarantee of originality and integrity. One main uses of hashing are in digital signatures and message authentication which is a functional equivalent of message integrity. C G Thomas, Robin Thomas Jose 'A Comparative Study on Different Hashing Algorithms' (2015) 3(7) *International Journal of Innovative Research in Computer and Communication Engineering* 169 at 171.

[265] Secure Hash Algorithm- 1 (SHA-1) is a method to hash data and is currently insecure because information technology continually improves. Since 2010 its use has drastically declined as a hacker exemplified its ability to produce collisions. SHA-1 key length is 160 bits in length. As the length of the hashed output increases so should the security and integrity of data hashed. As technology improves over time the integrity of archived data records may be compromised. A bit is also known as a binary digit and is the most basic unit of data in telecommunications and computing. Each bit is either represented as a '1' or '0' and this can be executed in various systems through a two-state device. – See definition of bit on Techopedia 'Bit' accessible at www.techopedia.com/definition/23954/bit, accessed on 30 July 2019. C G Thomas, Robin Thomas Jose 'A Comparative Study on Different Hashing Algorithms' (2015) 3(7) *International Journal of Innovative Research in Computer and Communication Engineering* 169-175 at 172; See, further, Raaed K. Ibrahim, Ali SH. Hussain, Roula A. Kadhim ' Implementation of Secure Hash Algorithm SHA-1 by Labview' (2015) 3(4) *International Journal of Computer Science and Mobile Computing* 61 at 61. Key length makes it more difficult to decipher. A hashing algorithm called MD5 was 128 bits in length was determined by 2004 to produce collisions.

data record contract, which is then encrypted by the recipients' public key and transmitted to them. [266]

The data record is identifiable in this regard by its digest. As the digest, signed by the transmitters private key which is attached to the contract, and as the originator should be the only person who should have access to it, that should reliably bind the originator and deponent specifically to that digest. The recipient would be able to decrypt the contract because they have exclusive knowledge of their private key, and further would know that the contract was signed specifically by the transmitter if the recipient knew the transmitters public key. This is an unauthenticated method, because the parties to the contract have no verifiable method to attribute a data message to a specific person.[267]

(d) Public key infrastructure

Utilising a Public Key Infrastructure (PKI) is one of the most secure ways of transacting using the internet and uses more security protocols than analogue transacting that is a functional equivalent of traditional signature, however, it is more onerous as it has tracking ability through its use.[268] Public Key Infrastructure combines 'cryptography, digital signatures, digital certificates[269], and Registration Authorities (RA) and Certification Authorities (CA) [270].

A CA or Trusted Third Party (TTP) through a RA, can enforce physical identification of an entity to link a public key to an individual, thereafter the CA or TTP issues them a verifiable digital certificate to their public key – even though physical identification is of persons is burdensome. Generally digital signatures[271] can be considered message content

[266] United Nations Commission on International Trade Law, UNCITRAL United Nations Convention on the Use of Electronic Communications in International Contracts 2007 (New York: United Nations, 2007) pp 1-2.
[267] In 1999 Adobe created the first digital signature attachable to PDF. Adobe 'White Paper on Transform Business Processes with Electronic and Digital Signatures' (August 2018) p 4, available at *https://acrobat.adobe.com/content/dam/doc-cloud/en/pdfs/adobe-transform-business-processes-with-electronic-and-digital-signature-solutions.pdf?fbclid=IwAR2ZDLPjBQGYGc9DeOJVPwDaM-Ly2GmNvWx84IxYr-LioPCvnO5SQmIKUZc)*, accessed on 20 November 2019; Cryptographic hashing is not necessarily a signature; it is a method to determine congruency between data messages by its hashed output. This enables an entity to compare a fingerprint of a digital document with that document in future. XML further allows endorsements on certain parts of a data message, leaving the other parts untouched. Dana van der Merwe, Anneliese Roos, Tana Pistorius et al *Information Communication Technology Law* (2008) 117.
[268] Randy Sabett 'Effects of Technology Convergence and Public Key Infrastructure' (1999) 7(2) University of Baltimore Intellectual Property Law Journal 143 at 152.
[269] A digital certificate is a 'a certificate-based digital ID issued by an accredited CA or TTP under a PKI', see Adobe 'What is a digital Signature' available at *https://acrobat.adobe.com/us/en/sign/capabilities/digital-signatures-faq.html?fbclid=IwAR21dSXGVj5UMBARZNhhCz-gJ8ty4G7oT9Bs-viv8UCNSjHEPBT1JXHMpaA#*, accessed on 20 December 2020.
[270] In which can be considered a trusted third party or escrow; Alana Maurushat 'Multi-Lateral Recognition of PKI Certification Authorities in the Asian Region: Transborder Data Flow and Information Privacy Issues' (2005) 35(3) *Hong Kong Law Journal* 569 at 572.
[271] In 1999 Adobe created the first digital signature attachable to PDF, see Adobe 'Digital Signatures'

being signed with some private information unique to the sender verified by a digital certificate being issued by a CA or TTP.[272]

(i) Electronic signature versus digital signature

All kinds of signatures created by an electronic process are electronic signatures, however they can be differentiated. Two types of electronic signatures can be classified as either digital signatures or electronic signature, which is dependent on the how attribution is achieved.

(ii) Electronic signature

Electronic signatures are different from authenticated digital signatures, in that e-signatures do not use a third party to link an entity to a public key with a digital certificate.[273]

An electronic signature can be an 'electronic sound, symbol, process attached to or logically associated with a record and execute or adopted by a person with the intent to sign the data record' which uses a secure audit trail, such as linking an IP identifier or hash markers to an individual. E-signatures only require non-authenticated single party registration. [274]

(iii) Digital signatures

A digital signature is a specific method of electronically signing a document utilising a digital certificate issued by Certification Authority (CA) as a TPP which attributes a public address to an entity under a Public Key Infrastructure (PKI).[275]

The core processes in cryptographic hashing and encryption can ensure the qualities of authentication, however, they do not by themselves achieve the qualities of uniqueness and singularity that a dematerialised bill of lading require. Even though threat of non-repudiation can be ameliorated by the use of a public-key crypto-system by authenticated attestation

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https://acrobat.adobe.com/.../cap.../digital-signatures-faq.html, accessed 22 February 2019;
There are three core algorithms involved with a digital signature, which are combined in a process, to form a digital signature, namely a key generation algorithm, a signing algorithm and a verification algorithm, see 'What is a digital signature, how it works' *https://www.cryptomathic.com/news-events/blog/what-is-a-digital-signature-what-it-does-how-it-works.*

[272] N Zhang & Q Shi 'Achieving Non-repudiation' (1996) 39(10) *The Computer Journal* 844 – 853 at 850. 170 at 845; Alana Maurushat 'Multi-Lateral Recognition of PKI Certification Authorities in the Asian Region: Transborder Data Flow and Information Privacy Issues' (2005) 35(3) *Hong Kong Law Journal* 569-595 at 572. 188 at 575; See, Vereinte Nationen, Commission on International Trade Law, *UNCITRAL Promoting Confidence in Electronic Commerce: Legal Issues on International use of Electronic Authentication and Signature Methods* (Vienna: United Nations, 2009) 23.

[273] T Pistorius 'Click-wrap and web-wrap agreements' (2004) 16(4) *South African Mercantile Law Journal* 568.

[274] Adobe 'White Paper on Transform Business Processes with Electronic and Digital Signatures' (August 2018) pp 4 – 5, available at *https://acrobat.adobe.com/content/dam/doc-cloud/en/pdfs/adobe-transform-business-processes-with-electronic-and-digital-signature-solutions.pdf?fbclid=IwAR2ZDLPjBQGYGc9DeOJVPwDaM-Ly2GmNvWx84IxYr-LioPCvnO5SQmIKUZc*, accessed on 20 November 2019.

[275] *Ibid* 4.

through digital signature techniques under a PKI it is not the functional equivalent of the analogue process of signature because of the tenuous security protocol.[276]

VI. Conclusion

Traditionally UNCITRAL have recognised methods of control that revolve around the concept of control because there is no explicit control over a record before blockchain. Even so, recognised technology is trusted event though there are many limitations. Authentication techniques are important when it comes to data message. Authentication and exclusive control are important when it comes to ETR. MLETR does not focus on the rights attributable to a person in control of an ETR. This would either require statutory enactment of consequences that should attach to the use of ETR otherwise, the custom of merchants at some point may recognise the person in control of the record as someone who has constructive or symbolic possession.

CHAPTER 4 BLOCKCHAIN BILLS OF LADING

I. Aim

Previous EDI attempts at dematerialising a documentary bill of lading revolved around the use centralised registry which has highlighted the legal and practical problems associated with the use thereof. To determine whether blockchain has any utility in solving these legal and practical problems previous attempts at dematerialisation understanding the problems of centralised registries will be highlighted and then blockchain will be broken down to show that certain types of blockchains could solve these problems.

II. Problems with the centralised registry approach

In terms of the centralised registry approach, there are two aspects that facilitate the transfer of the ownership or possession – the data record as receipt and evidence, and the private key. There is uncertainty if the two separate parts can be a bill of lading. In a documentary bill of lading the document represents, the memorandum of evidence, the receipt and the title.

A transferee ostensibly receives rights based on the issuance of the private key and acceptance of control, but the purpose of the acceptance is based on surrounding

[276] Faiqa Masqsood, Muhammad Ahmed, Muhammad Mumtaz Ali & Munam Alu Shah 'Cryptography: A Comparative Analysis for Modern Techniques' 2017 2(6) *International Journal of Advanced Computer Science and Applications* 442.at 442-444.

circumstances of shipment. It has been said to be uncertain which aspect is the contract of carriage and the rights to goods, as they are interrelated.

Transferability of a paper document comes with indorsement along with physical delivery,[277] but in terms of the registry model, 'transfer' is completed with an electronic affirmation registered on the TPP's registry. The acts of delivery, and indorsement and delivery in the registry model is problematic for concepts of possession as the holder's identity merely changes.

The TPP whom maintains the centralised register would maintain a level of control which is not exclusive of the parties. There has been unwillingness of confidential traders to endorse the centralisation of transaction information. Competitors and banks' have discomfort in the of the centralisation of the register which can be controlled by a competitor.[278]

The centralised registry method further requires payment to be a Club member. If the control approach through a centralised registry were to be followed, this would not be a true functional equivalent and it would disturb centuries of legal developments back to the point of the Book of Lading in the 11th Century.[279] To have possession of an electronic message on a registry would seem to more akin to the eleventh century practice of merchants having a book of lading as a register.[280]

Without a tangible or distinct electronic record separated from the carrier a holder may not be able to obtain possessory rights nor seek contractual remedies arising from the contract of carriage which would accrue to a consignee or endorsee after delivery or delivery and indorsement.

III. Blockchain

Blockchains are a chain of authenticated blocks of transactions. Good, open and permissionless blockchains are probabilistically immutable and electronically distributed, peer-to-peer online ledgers, which references all transfers of coins or tokens between users since the creation of the first block of the blockchain and once tokens are created. The blockchain system or protocol is regulated by code created by people, which means there are

[277] Indira Carr *International Trade Law* 4 ed (2010) 115.
[278] B. Kozolchyk, 'Evolution and Present State of the Ocean Bill of Lading from a Banking Law Perspective' (1992) 23 *Journal of Maritime law and Commerce* 161 at 228.
[279] Elson Ong 'Blockchain Bills of Lading' (August 2018) University of Singapore Working Paper 18/07 6 available at *https://law.nus.edu.sg/cml/pdfs/wps/CML-WPS-1807.pdf*, accessed on the 20 March 2019.
[280] *Ibid* at 6.

differences in the way each blockchain functions and its utility, not all blockchain are created equal.[281]

An electronic coin has been defined by Satoshi Nakamoto as the 'creator' of Bitcoin as, 'a chain of digital signatures', which references the use of asymmetric key cryptography in the security in the system and how a unit of value is transferred.[282]

In effect a public and permissionless blockchain is a distributed register which facilitates the token approach to transfer possession of an electronic record which facilitates the concept of singularity, originality and uniqueness. Blockchain is like an online double entry accounting system[283] that mains distributed fault tolerance.[284]

Blockchains can be characterised by the generation they come from, however, the mechanisms that make a blockchain work are variations of the same processes. Generation one blockchains can be considered simply as online ledgers which record the transactions of its users, Generation two blockchains can be considered online ledgers which can run smart contracts[285] and Generation 3 blockchains increase the possibility of interoperability of the blockchains by having interoperable blockchains networks by standardising the code to create a token, amongst other differences.[286]

There are two common types of blockchains, namely, public and permissionless, and private and permissioned blockchains. A blockchain can facilitate permissioned and permissionless aspects at the same time if the blockchain facilitates modular and interoperable frameworks[287] that would enable the quality of 'authorisation'[288] through the issuance of digital certificates or ordering services.[289]

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[281] Sherif Op Cit Note 169 at 360.
[282] Satoshi Nakamoto *Bitcoin: A Peer-to-Peer Electronic Cash System,* p2, available at *https://bitcoin.org/bitcoin.pdf,* accessed on 14 November 2018.
[283] Like a double accounting system because the debits don't necessarily equal the credits because the transaction costs of changing the state of the ledger are can be included in the transaction. Antonopoulos Op Cit Note 12 at 18.
[284] The problem of maintaining fault tolerance over unknown distributed groups is known as the Byzantine Generals Problem. See, *Ibid* at 184.
[285] Smart contracts can be considered a contract written in computer code, such as 'pay to the order of X' once a certain date or condition is met.
[286] Stephan Cummings 'The Four Blockchain Generations' available at *https://medium.com/altcoin-magazine/the-four-blockchain-generations-5627ef666f3b,* accessed on 5 March 2019.
[287] Creative Commons Contributions an Introduction to Hyperledger (July 2018) p10, available at *https://www.hyperledger.org/wp-content/uploads/2018/07/HL_Whitepaper_IntroductiontoHyperledger.pdf* accessed on 20 December 2019.
[288] James Graham, Richard Howard, and Ryan Olsen *Cyber Security Essentials* (2011) 105
[289] IBM A White Paper on An Introduction to Hyperledger p 28 available at *https://www.ibm.com/blogs/systems/blockchain-how-should-you-organize-your-peers*/ accessed on 20 November 2019.

(a) Public permissionless blockchains:

Open and permissionless blockchains maintain distributed consensus over the integrity of the ledger by a 'consensus mechanism' to achieve fault tolerance.[290] Permissionless and public blockchains are not centralised and have no hierarchy in the system, meaning no network node is more important than another, like Bitcoin.[291] This further means this is not a centralised registry because all the nodes play a part in the functioning of the system,[292] which only requires a computer and internet facilitating an open ecosystem.

(b) Private and permissioned blockchains

In permissioned private blockchains access to interact with the blockchain is curtailed, as one entity, or a consortium of entities would prevent access to the system without specific permissions regulating in what capacity a user may engage with the protocol.

This means there is a degree of centralisation in this type of blockchain, from maintaining consensus of the ledger to permissioned access to transact.[293] There is a possibility to have a centralised blockchain that facilitates peer-peer engagement.

IV. Achieving Integrity, Authentication, Reliability, Possession and Confidentiality

To be able to transfer coins to another party and have a record of it, the following nodes are necessary: a wallet[294]; a transaction verification node, a full copy of the entire ledger (the blockchain itself) and routing nodes.[295] How these parts enable the security of a blockchain require a separation of concepts.

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[290] To maintain fault tolerance over a network of a distributed ledger between known and unknown entities requires different securities in terms of consensus methods and assurances, amongst other differences. To main trust over a distance between unknown participants, the securities should be higher than between known participants because there is either no trust, or a portion of trust between users, respectively, see Dr. Arati Balinga White Paper on Understanding Blockchain Consensus Methods (April 2017) p 5 available at, accessed on 2 October 2019; See Marko Vukolic 'Rethinking Permissioned Blockchains', p 1, available at *http://vukolic.com/rethinking-permissioned-blockchains-BCC2017.pdf* accessed on 10 July 2019.

[291] Antonopoulos Op Cit Note 12 at 172.

[292] *Ibid* at 171.

[293] For example, one peer in a permissioned private blockchain could have permissions to be an auditor of the blockchain, whilst another peer may only have permission to make transfers of tokens which can be managed by digital certificates with certain permissions issued by a certification authority or TPP See, Paige Cabiance 'What's the Difference Between Public, Private and Permissioned Blockchains?' Medium (28 September 2018) accessible at *https://medium.com/nakamo-to/whats-the-difference-between-a-public-and-a-private-blockchain-c08d6d1886a0* accessed on 10 June 2019. See also, Robert Brinkman 'Blockchain: How should you organize your peers?' *IBM* (16 November 2017) accessible at *https://www.ibm.com/blogs/systems/blockchain-how-should-you-organize-your-peers/* accessed on 19 May 2019.

[294] It is useful to separate the idea of the wallet and the blockchain register conceptually, because will be shown they are separate to one another and the wallet is an interface that allows changes in the state of the register.

[295] Antonopoulos Op Cit Note 12 at 172.

(c) Security, reliability and integrity of the block in a blockchain:

Coins are created by code though a trigger event[296] which requires a mechanism to ensure that the entire network has the same updated ledger to ensure only a unique entity has exclusive possession over a coin.

Consensus of a blockchain is maintained since the creation first block[297] of a blockchain. If there was not an authenticated copy of the entire blockchain ledger, then there would be no guarantee of singularity or uniqueness of coins.

Each block in a blockchain is a data structure which contains certain information, notably the block header hash. The block header hash is a cryptographic hash digest of the integral information relating to references to transactions in the block it relates to.[298]

Large data sets can be represented by as a digital fingerprint of smaller transactions as a singular cryptographic hash value. A blockchain transaction is referenced in a cryptographic hash value in a block on a blockchain. By combining the previous block hash, and the hash of the block it relates to, the blockchain as a whole is secured.[299] This can afford the blockchain network the attribute of being immutable.[300] This facilitates integrity and reliability of the whole blockchain which can be considered a digital fingerprint of the entire set of transactions.[301]

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[296] Generally, as a reward for confirming a block of transactions. The Bitcoin protocol allows the creation of 'cryptocurrency' known as 'bitcoin' through 'Coinbase', see Bitcoin 'Coinbase, Coinbase Field' available at *https://bitcoin.org/en/glossary/coinbase*, accessed on 1 December 2019. Coinbase which is like a parallel process or analogous to minting, without which there would be nothing to transfer, see Antonopoulos Op Cit Note 12 at 25. The Bitcoin protocol facilitates the creation of bitcoins out of the ether by rewarding a 'mining node' for confirming and authenticating a block of transactions, see Mining nodes' are a specific node in the peer-to-peer network which authenticates and confirm transactions by finding a valid proof of work for new blocks through cryptographic hashing, see, Antonopoulos Op Cit Note 12 at XXVII.

[297] A block has been defined as, 'A grouping of transactions, marked with a timestamp, and a fingerprint of the previous block. The block header is hashed to produce a proof of work, thereby validating the transactions. Valid blocks are added to the main blockchain by network consensus.' Antonopoulos Op Cit Note 12 at at XXIII.

[298] In terms of the Bitcoin protocol if a malicious attacker were to try to reverse a block of transactions, they would need more computational power than half of the mining nodes. Hanna Halaburda 'Blockchain Revolution without the Blockchain' (2018) 61 (7) *SSRN Electronic Law Journal* at 9.

[299] Antonopoulos Op Cit Note 12 at 197. Each block in the blockchain has a block hash digest referencing its contents which uniquely identifies that block. If there is any tampering with that block, and the block is re-hashed, the digest will be different. All transaction identifiers (hash values) are individually hashed together to eventually form the root, which further references previous block headers. Antonopolos states that 'The block header consists of three sets of block metadata. First, there is a reference to a previous block hash, which connects this block to the previous block in the blockchain. The second set of metadata, namely the difficulty, timestamp, and nonce, relate to the mining competition. The third piece of metadata is the Merkle tree root. The Mercle tree root is the final addition of all transaction hash values, and can be understood as a 'data structure used to efficiently summarize all the transactions in the block'.

[300] *Ibid* at 306.

[301] *Ibid* at 201 - 202

Peer-peer network participants transmit data messages as transactions through a digital signature technique which allow the alteration of the blockchain state through verification by a consensus mechanism which are governed by the rules of the state machine[302] which govern when transactions are valid.

The state machine enforces consensus rules to append references to transactions to the distributed ledger to prevent malicious actors spending the same coin more than once facilitating the concept of uniqueness or guarantee of singularity through tracking and ensuring the integrity and reliability of the blockchain.[303]

(d) Authentication, Uniqueness, Singularity and Possession

As transactions are generally a chain of digital signatures, this means that there is a link between a key pair[304] and the transfer of data referenced on the blockchain. A user's keys are contained in an exclusively owned 'wallet'.

A wallet provides access to change the state of a ledger through private key transfer which would only be recorded on the blockchain as a reference to the transaction itself, there are no user addresses, no coins or balances recorded on the blockchain.[305] Narrowly, a 'wallet'[306] 'refers to the data structure used to store and manage a user's keys'.[307]

If an entity were to lose the private key, they lose access to the coin or token which then is forever lost on the blockchain network – this indicates that possession is capable in this token model through the concept of exclusion.[308] Importantly to view the ledger, other participants that maintain the blockchain are preremptory and so from that sense, the blockchian is not necessarily exclusive.

(e) Transactions: possession, uniqueness and singularity

Coins are encumbered by a locking script[309] as each input in a transaction references a previous transaction output.[310] To be able to unlock a coin a user must have the private key

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[302] Any abstract system that manages the transition between valid states is referred to as a state machine, see Samuel Brooks 'Blockchain: The Infinite State Machine' (2017) available at *https://medium.com/@samuel.brooks/blockchain-the-infinite-state-machine-ffc39f32e182*, accessed on 4 October 2018.

[303] Andreas M. Antonopoulos & Gavin Wood *Early Release Raw & Unedited Mastering Ethereum Implementing Digital Contracts* 2018 at 9-10 'entitled 'components of a blockchain'. The ability to spend or utilize the same coin for two separate payments utilising the same money is known as the double spend problem.

[304] Public and private key cryptography.

[305] Antonopoulos Op Cit Note 12 at 119.

[306] A wallet does not have to be an application, the ability to change the state of the ledger is just by transferring the private key that facilitates the change of state of the ledger. A key is a string of numbers and letters.

[307] Antonopoulos Op Cit Note 12 at Ch5 entitled "Wallets".

[308] *Ibid* at 58.

[309] This can be encumbered in different manners, as this is in relation to the Bitcoin protocol. see *Ibid* 124.

[310] Bitcoin 'Introduction' available at *https://bitcoin.org/en/transactions-guide* accessed on 2 December 2019.

relating to the coin. A user will have knowledge of the unique private key, which is maintained in an exclusively owned wallet, that facilitates the ability to digitally sign a transaction to be able to transmit to another's public address thereby facilitating transfer of a coin without the need of the assistance of a TPP in a centralised registry.[311]

(f) Attribution of a blockchain transaction

Transactions are pseudonymous[312] because of the transfer of coins is affected utilising the principals of asymmetric cryptography.[313]

Entities are identified as a cryptographically hashed public key facilitating the pseudonymous identification of individuals. Public and permissionless blockchains are not a guarantee of privacy, but a guarantee of openness to the system.[314] A public key could also be registered to someone utilising a TPP facilitating the concept of attribution. Furthermore, entities are able to view the transactions on transparent[315] blockchains by viewing the ledger. This prevents documentary fraud through transfer of completed documents of title being re-issued to unsuspecting buyers.

(g) Unique coins

Blockchain wallets can be created to enable a coin to be embed with metadata within it. [316] A unique coin embedded with meta-data[317] can represent a negotiable or non-negotiable, divisible or non-devisable[318] tangible referenced off-chain which can require a multi-signature[319] to transfer. This coin could reference an asset external to a blockchain through

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[311] Antonopoulos Op Cit Note 12 at 1.

[312] Bitcoin ' Some Things You Need to Know' available at *https://bitcoin.org/en/you-need-to-know*, accessed on 12 July 2019 which states that, "All Bitcoin transactions are stored publicly and permanently on the network, which means anyone can see the balance and transactions of any Bitcoin address. However, the identity of the user behind an address remains unknown until information is revealed during a purchase or in other circumstances" like through a trusted third party.

[313] A block of a blockchain is a 'container data structure that aggregates transactions' for inclusion in the blockchain. The block is made of a header which contains metadata referencing core components of an immutable transaction which further facilitate the characteristics of the blockchain, See Antonopoulos *Mastering Bitcoin Programming the Open Blockchain* 2 ed (2017)196.

[314] J.P Morgan Centre for Commodities 'Global Commodities Applied Research Digest Special Feature: Cutting-Edge Innovation in the Cryptosphere', Sf7-sf8, *available at http://www.jpmcc-gcard.com/wp-content/uploads/2019/03/Special-Feature-GCARD-Summer-2019.pdf#page=2*, accessed on 2 December 2019.

[315] Viewing all transactions on the Bitcoin network is possible on *https://www.blockchain.com/explorer*. The possibility to scramble transactions is also possible, see Monero and Z-Cash.

[316] Nikhilesh De ''Colored Coins' Startup Coinprism is Shutting Down' (30 March 2019) available at https://www.coindesk.com/blockchain-startup-coinprism-to-shut-down-in-2-days, accessed on 1 April 2019.

[317] Ibid, these have been referred to 'colored coins' and can be thought of as old technology, as one of the main coloured coin wallets 'Coinprism' has shut down due to Ethereum being a more functional token for the purpose of asset marking.

[318] Antonopoulos *Mastering Bitcoin Programming the Open Blockchain* 2 ed (2017) 280.

[319] *Ibid* at 82.

agreement stating what coin relates to.[320] This type of coin is useful only due to its provenance and usefulness of the wallet. A coin is not exactly created, it is 'tagged'.

(h) Coins versus tokens.

Blockchain tokens are different from coins, in that a token can be built to work on a blockchain as a standard. A token can contain a much larger amount of information than altering metadata on a coin through a specialised wallet.

The system that secures a token on a blockchain revolves around the same principals, but the functionality of the capability of the blockchain will differ, such as the ability to execute a smart contract. [321]

(i) Types of tokens on the Ethereum blockchain

Standardisation of tokens has facilitated the creation of a token which can be deemed readable and accessible by the standard Ethereum wallet if it contains certain mandatory operational aspects in its implementation.[322] The standard, besides containing certain pre-requisite information, allows other functionality to be alterable by the developers of the tokens.[323]

Two open standards have been developed for the creation tokens on the Ethereum blockchain, fungible tokens and non-fungible tokens.

The ERC20 token was introduced in 2015 by Fabian Vogelstellar that is a standard for fungible tokens which are identical tokens of the same class,[324]and ERC – 721 tokens which is a standard for the creation of unique tokens.[325]

Whilst ERC20 tokens have the balances tracked that belong to entities, and under which conditions a token can be transferred[326], the ERC721 token tracks each ID of the token and who owns it.[327] Both tokens as a standard as able to support metadata such as a thumbnail

[320] *Ibid* at 278.
[321] Antonopoulos & Gavin and refer to a smart contract as "to refer to immutable computer programs that run deterministically in the context of an Ethereum Virtual Machine as part of the Ethereum network protocol" Andreas M. Antonopoulos & Gavin Wood *Early Release Raw & Unedited Mastering Ethereum Implementing Digital Contracts* 2018 at p 96 entitled 'What is a smart contract?
[322] *Ibid* at 189 entitled 'Using Standards'; For a list of wallets that can accept ERC 20 tokens go to the address. *CargoX* 'Will my Ethereum wallet Support CXO token?' available at https://cargox.io/wallet-CXO-token-support/, accessed on 2 December 2019.
[323] Antonopoulos & Wood Op Cit Note 303 at 190 entitled 'Extensions to Token Interface Standards'.
[324] *Ibid* 173 entitled 'The Erc20 Token Standard'.
[325] ERC – 721 'ERC – 721' available at http://erc721.org/, accessed on 16 July 2019.
[326] Antonopoulos & Wood Op Cit Note 303 at 190 entitled 'The ERC20 Token Standard'
[327] *Ibid* 187 entitled 'ERC721: Non-fungible Token (Deed) Standard'.

image, title, description and special asset classes.[328] This can allow a token to represent the concept of evidence, receipt and act as an electronic record of title in a singular 'thing'.

V. Blockchain Token Bills of Lading through CargoX

The first blockchain based bill of lading was created by CargoX utilising the Ethereum blockchain which completed its first trial on the 19 August 2018.[329] CargoX has leveraged the ERC-721 and ERC-20 standards to create tokens that can that represent goods and be the protocol to smart contracts which are executable on the Ethereum blockchain.[330]

(a) CargoX and PKI

CargoX acts as a TPP facilitating a PKI through their portal which carriers would integrate with to enable them to issue to a shipper's public address the token representing chattel the shipper wants to ship. CargoX leverage the Ethereum blockchain to issue the token, and capabilities of the Interplanetary Filing System[331] (IFPS)[332] to maintain the integrity of transport documents that are accessible through their decentralised application.

(b) Systems of CargoX

The document and token creation process would be in a client-server type model and the token and transfer process would be achieved through a permissioned and peer-to-peer network. The standardisation of the token limits interoperability unless another blockchain could receive the token whilst simultaneously extinguishing it on the Ethereum blockchain.

(c) Decentralised applications and issuance

Decentralised Applications (DApps) are a smart contract integrated with a web interface allowing a web application to be built on top of a blockchain. DApps can include a messaging protocol platform and a storage protocol.[333] CargoX allows carriers, or agents of

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[328] Tommy Nicholas, Matt Russo & John Zettler *et al.* 'EIP 1046: ERC20 Metadata Extension' *Ethereum* available at *https://eips.ethereum.org/EIPS/eip-1046* accessed on 2 December 2019.

[329] CargoX 'A day to remember: The first ever blockchain-based CargoX Smart BILL OF LADING has successfully completed its historic mission during a trial shipment from China to Europe (21 August 2018) available at *https://cargox.io/press-releases/full/first-ever-blockchain-based-cargox-smart-bl-has-successfully-completed-its-historic-mission* accessed on 10 December 2019.

[330] CargoX *'Business Overview and Technology Blue Paper',* p 34 *available at https://cargox.io/CargoX-Business-Overview-Technology-Bluepaper.pdf* accessed on 20 February 2019.

[331] This allows a peer-peer transfer of documentation and view a file through a computer files hash amongst other things.' IPFS powers the Distributed Web A peer-to-peer hypermedia protocol designed to make the web faster, safe and more open' available at *https://ipfs.io/ accessed* 2 December 2019.

[332] CargoX 'Definition of *Terms'* available at *https://developer.smartbl.io/terms.html*, accessed on 2 December 2019.

[333] *Ibid* 16 entitled 'From General-Purpose Blockchains to Decentralized Applications (DApps)'.

carriers to leverage their platform by giving them special permission create and issue 'Smart Bills of Lading'[334] and issue them to registered shippers.

(d) Functionality of a smart bill of lading

A Smart bill of lading can be issued to function like a bearer, negotiable or non-negotiable bill of lading; to be viewed transparently or be kept confidential; or can be encumbered to only be able to be negotiated and transferred upon multiple digital signatures from multiple owners of a token. [335]

The duality of the transport documents and the token infers that there is an electronic record logically associated with the token and contains information that the token does not have the capacity to contain, which could be for example the contract of carriage.

The carrier will utilise the dApp of CargoX to create a Smart bill of lading which is alterable to be able to possibly reflect the goods as a receipt, and potentially evidence of the goods having been received from the carrier and the token of title to be able to negotiate and transfer the token.[336]

VI. Conclusion:

A blockchain allows a token representing goods to be transferred through the blockchain as an ETR without further interference from the carrier, but remotely underpinned by the services of a TTP which would facilitate the concept of possession enabling issuance, negotiation, delivery, and presentment through transferring the token between wallet holders and back to the carrier at the port of destination.[337] This facilitates a client-server and peer-peer systems of engagement that are open to the public.

The ability to create a token that either identifies a specific good, or a class of goods enables the characteristics and guarantees of uniqueness, singularity, originality in an intangible that can be possessed through the capabilities of a wallet that is exclusively owned. This means that traditional concepts that are associated with possession can possibly extended to a token on a blockchain if the system is deemed to be reliable.

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[334] See further, CargoX Smart B/L available from https://smartbl.io, accessed on 20 July 2019.
[335] Antonopoulos & Wood Op Cit Note 303 at 10 entitled 'Birth of Ethereum'.
[336] CargoX 'Overview' available at *https://cargox.io/platform/overview/* accessed on 20 December 2019.
[337] Hariesh Manaadiar 'A Review of CargoX's Blockchain based Smart Bill of Lading and how its works' *Shipping and Freighter Resource* (3 October 2018) accessible at *https://shippingandfreightresource.com/cargox-blockchain-based-smart-bill-of-lading/* accessed 2 December 2019; According to the author, as it stands annexation of the data message representing the contract of carriage and token are to be decided.

As a blockchain can be altered to become confidential by leveraging techniques of cryptography blockchains can further solve problems of confidentiality and centralised registries.

As blockchains can be viewed by external parties and letters of credit are paid based on the conformity of documents there is scope for a smart contract to automatically execute a payment obligation if the ETR conform to the credit applied for.

CHAPTER 5 CONCLUSION

Blockchain, as a genus of technology, can create tokens that represent goods that can *de facto* be legally possessed if it is based on a public and permissionless blockchain. Blockchain is still in nascent development which to prematurely legislate that only blockchain based tokens can be an electronic equivalent of negotiable documents of title would be rather limiting.

The current token on the Ethereum blockchain does not contain all the elements of a traditional bill of lading in any event that would possibly restrict the its recognition under the Hague and Hague-Visby Rules. If, however, a blockchain token can be completely possessed, can be issued, endorsed and delivered with metadata that is can be a documentary bill of lading in the short or long form, it may not prevent the applicability of the Hague, Hague-Visby or Hamburg Rules as there is no specific definition of what a document is. The previous the problems associated with data messages is that exclusivity, singularity and uniqueness could not be recreated, whilst under a blockchain a coin or token remain exclusive.

The core ingredients of MLETR are rules of recognition and procedural steps to recognise an ETR that facilitate attributable and exclusive control[338] of an ETR that is identified as such.[339]An ETR is an electronic record[340] which complies with article 10 of MLETR and which is therefore technologically neutral and does not discriminate against different types of technology which is exceptionally important as we do not know what the capabilities of the future will hold. This exclusivity concept would correspond with requirements for delivery as per the *Glencore* case supra.

Possession and ownership are relative, because someone cannot possess or own something after they cease to exist. Even though there is a distinction between exclusive

[338] MLETR Article 11.
[339] MLETR Article 10(b)(i).
[340] An electronic record is defined as "information generated, communicated, received or stored by electronic means, including, where appropriate, all information logically associated with or otherwise linked together so as to become part of that record, whether generated contemporaneously or not". MLETR Art 2.

possession and exclusive control, the legal differentiating factors are trade prohibitive. The romanticism of classical legality in context of an electronic world going into the fourth industrial revolution seems futile because the twenty first century *lex mercatoria* is "technologically driven, global and borderless"[341] and is "grounded in commercial practice directed at market efficiency and privacy" which should be a pragmatic approach to trade and dispute resolution and not an imposition on state practice.[342]

The purpose of trade is to maximise efficiency to enhance freedom, legislation prohibiting freedom in contract is not efficient as law generally follows practice. It is best to have an open policy to technology that can perform a function that through a reliable procedure can permit freedom in contract. If states decide not to implement the MLETR or alter it to suit their needs, or make it only apply exclusively to blockchain based tokens at the least there will be certainty in the legality.

> "In all mercantile transactions the great object should be certainty: and therefore, it is of more consequence that a rule should be certain, than whether the rule is established one way or the other. Because speculators in trade then know what ground to go upon."[343]

It is my submission that due to the recognition of ETRs is a procedural mechanism and contains fewer limitations than a convention it should be domesticated. If it is modified to only be applicable to blockchain based bills of lading it would be in conflict with the control approach as expounded in the Rotterdam Rules

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