(Smart) Contractual Networks in the Carriage of Goods by Sea

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1 Introduction

The shipping industry is one of the sectors where technological development is seen as the next frontier in order to keep pace with modern developments. Digitisation and international trade law are fast becoming critical areas of enquiry, and is now becoming more urgent, fuelled by the COVID-19 pandemic which has brought to the fore the challenges of paper-based documentation, such as bills of lading.[1] Prompted by these modern challenges, this chapter discusses smart contracts in business networks in the context of the carriage of goods by sea. If one thinks of a 'network', one thinks of concepts such as interconnected or an intersection of people or things. Networks exist in both law and technology, and this chapter seeks to explore that commonality and how smart transactional technologies may be embedded in business networks ('smart contractual networks').[2]

Contracts are usually thought of as a bilateral transaction between two parties.[3] Drawn from socio-legal contractual scholarship, the concept of 'contractual networks' situates and views this bilateral contract as contractually networked to a series of other connected relationships and contracts in the network. Contractual networks exist in many aspects of law and socio-legal scholars have sought to show 'the opportunities and risks presented by networks' and how this may require a modification of concepts and norms.[4] The

1 See the International Chamber of Commerce, 'ICC Memo to Governments and Central Banks on Essential Steps to Safeguard Trade Finance Operations' (6 April 2020) at <https://iccwbo.org/content/uploads/sites/3/2020/04/icc-memo-on-essential-steps-to-safeguard-trade-finance-operations.pdf> accessed 21 October 2020. Also includes bills of exchange, promissory notes, commercial invoices.

2 This draws on Teubner's remark 'that business networks embed modern technologies in their day-to-day operations'. In Roger Brownsword, 'G Teubner, Networks as Connected Contracts', Hugh Collins (ed) (2012) 75(3) MLR 455, 461.

3 Although this is stated as a basic premise, it recognises that unilateral contracts may also be viewed as bilateral contracts as 'bilateral' refers to the number of promises, not the number of parties.

4 Brownsword, 'Networks as Connected Contracts' (n 2) 457. For detailed commentary on contractual networks (and connected contracts) see, Marc Amstutz and Gunther Teubner (eds.),

context of the carriage of goods by sea is viewed as a quintessential example of a network of different commercial relationships.[5] International trade and carriage of goods entail a network of connected parties (i.e. traders, carriers, banks, insurers) which all 'collectively constitute a commercial ecosystem'.[6] A contract of carriage is rarely just a bilateral contract between shipper and carrier but is also connected to the underlying contract of sale and the financing of that sale through documentary credits. Furthermore the carrier may be operating under a charterparty. Goods may also be sold whilst afloat whereby the buyer becomes a party to the contract of carriage – thereby adding a further connection to the contractual network.

Going beyond classical understandings of contract law, a networked understanding of contract law asks whether the 'network contract' modifies (or indeed should modify) the understanding of parties in the contractual network of their rights, responsibilities, and reasonable expectations.[7] By drawing on socio-legal contract theory, this chapter examines how smart contracts fit into a networked understanding of contract law, particularly insofar as it concerns third party beneficiaries.[8] Smart transactional technologies are viewed as a legal disruption therefore one might ask whether smart contracts alters

Networks: Legal Issues of Multilateral Cooperation (Oxford: Hart, 2009); Gunther Teubner, *Networks as Connected Contracts* (Oxford: Hart, 2011); Roger Brownsword, 'Contracts in a Networked World', in Larry DiMatteo, Qi Zhou, Severine Saintier, and Keith Rowley (eds), *Commercial Contract Law: Transatlantic Perspectives* (Cambridge: CUP, 2012); Catherine Mitchell, 'Network Commercial Relationships: What Role for Contract Law?' and also Rónán Condon, 'From 'the law of A and B' to Productive Learning at the Interfaces of Contract' in Rob van Gestel, and Hans-W Micklitz (eds), *Contract and Regulation: A Handbook on New Methods of Law Making in Private Law* (Edward Elgar Publishing, 2017).

5 See Brownsword, 'Networks as Connected Contracts' (n 2); Roger Brownsword, 'Smart Transactional Technologies, Legal Disruption, and the Case of Network Contracts' in Larry A. DiMatteo, Michel Cannarsa, and Cristina Poncibò (eds) *The Cambridge Handbook of Smart Contracts, Blockchain Technology and Digital Platforms* (CUP 2019). Other examples include franchises, consumer financing, letters of credit in international sales, supply and distribution, and in construction.

6 Jingbo Zhang, 'Sea Transport Documents in Banks' Hands – Bridging the UCP with Commercial Shipping Law' in Justyna Nawrot and Zuzanna Pepłowska-Dąbrowska, *Codification of Maritime Law: Challenges, Possibilities and Experience* (Informa Law from Routledge, 2020) 121.

7 See, definition of network contract below. Brownsword, 'Networks as Connected Contracts' (n 2) 456.

8 For example, the issue of third parties is illustrated in *New Zealand Shipping Company Ltd v. A.M. Satterthwaite & Co Ltd: The Eurymedon,* [1975] AC 154 where independent contractors (i.e stevedores) who were not a party to the contract of carriage were entitled to the benefit of a limitation clause in the carriage contract.

the understanding of contractual networks, or will contractual networks be shaped by technologies that underpin their operation e.g. contractual networks that will develop around blockchain? Are we likely to see a change in how judges and legislators' approach smart contracts and 'smart networks'?

Part 2 introduces the general concept of networks in law and technology. The first part explains 'technological networks', that is, smart contracts on blockchain platforms, before proceeding to introduce the socio-legal theory of contractual networks. Part 3 considers more closely networks in the carriage context, before reflecting on some conceptual and normative issues pertaining to smart contractual networks in Part 4. Part 5 then concludes. This undertaking adopts a more theoretical than doctrinal approach, but where necessary I refer to English law. There are a number of caveats as to what can be achieved with this research, but a preliminary all-encompassing caveat is the pace at which technological developments are changing and adapting, and law's response to that remains in a developing state. It bears mentioning that we are dealing with 'first-generation smart contracts'[9] and it is therefore difficult to provide conclusive answers to questions that have not yet been properly defined and where technological topographies remain elusive. Indeed, some of these issues are presently before the English Law Commission which has begun work on a project on smart contracts.[10]

2 Networks in Law and Technology

2.1 *Networks and Technology*

The commonality between networks in law and networks in technology form a starting premise for this chapter. Even though one should be cautious about drawing similarities between law and technology, scholars have nevertheless questioned whether the network-like structure of technology amplifies the network-like structure of law.[11] Exploring the congruence between technology and law is a natural tendency for scholars given that the very notion of 'smart

9 Larry A DiMatteo, Michel Cannarsa, and Cristina Poncibò, 'Smart Contracts and Contract Law' in Larry A DiMatteo, Michel Cannarsa, and Cristina Poncibò (eds), *The Cambridge Handbook of Smart Contracts, Blockchain Technology and Digital* (CUP 2019) 6.

10 Law Commission, 'Smart Contracts' available at <www.lawcom.gov.uk/project/smart-contracts/> accessed 30 October 2020.

11 Florian Idelberger, 'Connected Contracts Reloaded – Smart Contracts as Contractual Networks' in Stefan Grundmann (ed) *European Contract Law in a Digital Age* (Intersentia 2018) 205, has asked whether smart contracts can be (or should be) viewed as 'a technological materialization of the network-like structure of the law?'

contracts' points to a merging, or a colliding of law and technology. The socio-legal research on contractual networks provides a framework to explore how smart contractual networks may be conceptualised in the carriage of goods context. The socio-legal research will be discussed below but for now the main technologies will be explained.

Blockchain is a form of distributed ledger technology whereas smart contracts are computer codes that are placed on the blockchain platform. Blockchain operates according to a decentralised system (i.e a ledger) which uses a peer-to-peer system rather than a central authority. The network-like structure of blockchain operates through a connected series of blocks that records a number of transactions which is maintained across a network of computers (called nodes). The nodes could be spread within an organisation – or even globally.[12] Each new transaction (represented by a new block) requires the consensus of all participants who are represented by all nodes in the network, and every node holds a synchronised, shared ledger. Information is logged into each block and secured through digital signatures of the users. Each block is also time-stamped and creates an 'append-only purportedly-immutable, tamper-evident, ledger'.[13] The key features of blockchain are decentralisation and consensus which creates a peer-to-peer system without the need for intermediaries such as banks and lawyers.

The concept of smart contracts on the other hand is not new and indeed predated blockchain technology, having emerged in the mid-1990s.[14] However, the arrival of blockchain technology such as Ethereum, now provides a platform for the operation of smart contracts. Smart contracts are code on a blockchain platform with a self-executing feature which ensures performance when certain pre-agreed conditions are met (if 'X', then 'Y').[15] While some jurisdictions have taken steps towards regulating smart contracts (and blockchain platforms), other countries are still investigating whether to regulate, and if so how.[16] Smart contracts remain an evolving and, in some respects, an uncertain

12 Blockchain may be public (permissionless), a common example is Bitcoin, or it can be private (permissioned) with access restricted to certain participants, such as within a shipping company, or can be semi-private (such as a bank consortia). The (semi) private blockchains offer fewer advantages due to restrictions on its decentralisation feature.

13 Elson Ong, 'Blockchain Bills of Lading and the UNCITRAL Model Law on Electronic Transferable Records' 2020 JBL 202, 207.

14 N Szabo, 'Formalizing and Securing Relationships on Public Networks' (1997) 2(9) First Monday <https://firstmonday.org/ojs/index.php/fm/article/view/54> accessed 12 September 2020.

15 M Lipshaw, 'The Persistence of "Dumb" Contracts' (2019) 2 Stan J Blockchain L & Pol'y 1,4.

16 Manuel A Gomez, 'The Chimera of Smart Contracts' in Andrew Hutchison and Franziska Myburgh, *Research Handbook on International Commercial Contracts* (Edward Elgar

legal phenomenon. The uncertainty arises from its classification and its characteristics, notably whether a smart contract is a legal contract in the traditional sense, and whether smart contracts can fit into the traditional legal constructs of contract law.[17] Some argue that smart contracts are congruent with contract law as 'smart contracts are just technological manifestations of familiar contractual processes'.[18] Others argue that smart contracts have a more facilitative role which has an ex lege effect and are therefore not contracts in the traditional legal sense.[19] What scholars do agree on is that smart contracts are self-enforcing and immutable. The automation of performance raises questions about the legal enforceability of smart contracts by third parties such as courts. It remains an open question to what extent smart contracts fit into existing legal constructs of contract law, and whether we should continue to think about smart contracts in this sense is also debatable.[20]

There is a tendency to refer to innovation, or advances in technology as 'smart' (e.g smart phones, smart watches etc.) and this has also been applied to contracts. The 'smart' is intended to refer to the characteristic of smart contracts which is that it is self-enforcing but there are limitations to what smart contracts can achieve in more complex transactions calling into question the 'smart' aspect.[21] There are likely to be degrees of smart contracts which vary in 'smartness' and which may vary across different industries.[22] The advantages

Publishing 2020) 33, where he lists several examples of regulation. The English Law Commission has recently launched a project on smart contracts (see n 10).

17 Such as offer and acceptance, certainty and consideration. Kevin Werbach and Nicolas Cornell, 'Contracts Ex Machina' (2017) 67 Duke LJ 313, 317.

18 Werbach and Cornell (n 17) 324. See also Paul Catchlove, 'Smart Contracts: A New Era of Contract Use' (2017) at <http://10.2139/ssrn.3090226> accessed 12 October 2020.

19 Elena Orrù, 'The challenges of ICTs in the shipping sector among international uniform law, codification and Lex Mercatoria: The electronic bill of lading' in Justyna Nawrot and Zuzanna Pepłowska-Dąbrowska, *Codification of Maritime Law: Challenges, Possibilities and Experience* (Informa Law from Routledge, 2020) 140–1.

20 See Brownsword, 'Smart Transactional Technologies' (n 5).

21 See DiMatteo and others, 'Smart Contracts and Contract Law' (n 9) 9, referring to 'Dumb, smart contracts' versus 'smart, smart contracts'. See also, Werbach and Cornell (n 17) 317.

22 Barbara Pasa and Larry A DiMatteo, 'Observations on the Impact of Technology on Contract Law' Larry A DiMatteo, Michel Cannarsa, and Cristina Poncibò (eds), *The Cambridge Handbook of Smart Contracts, Blockchain Technology and Digital* (CUP 2019) 341. See also Mateja Durovic & André Janssen, 'Formation of Smart Contracts under Contract Law' in Larry A DiMatteo, Michel Cannarsa, and Cristina Poncibò (eds), *The Cambridge Handbook of Smart Contracts, Blockchain Technology and Digital* (CUP 2019).

of smart contracts is said to be its efficiency, its potential to reduce transaction costs, to address defective performance, and its added security.[23]

Situating this technology in the context of carriage of goods, scholars are examining how smart contracts operating on blockchain platforms may apply to bills of lading, and an appropriate legal framework to govern blockchain bills of lading.[24] The modern bill of lading is a standard form document that is issued on behalf of the carrier to the shipper of the goods and it serves as a receipt for the goods shipped; it provides evidence of the contract of carriage between the shipper and carrier; and it serves as a document of title. The traditional paper bill of lading which a carrier issues could be coded as a smart contract on the blockchain.[25] A simple example is that the carrier would issue a token on the blockchain platform in the form of a smart contract to the seller, and once the goods have been loaded onboard it will be recorded on the ledger.[26] Likewise, any subsequent transfers of the bill of lading would be recorded so that the rightful holder of the blockchain-based bill of lading is entitled to take delivery at the port of destination, and the self-executing feature will ensure that the carrier automatically performs by releasing the goods to the rightful holder. Other parties can be added to this network such as insurance companies, banks where the bill of lading is part of documentary credit transactions, public authorities involved in the seamless carriage of goods such as port and customs authorities.[27] Blockchain therefore offers the advantage of

23 For example, paper bills of lading are susceptible to fraudulent activities such as the issuing of fraudulent bills of lading and having multiple copies of bills in circulation. The immutable nature of blockchain offers enhanced security to address these issues.

24 Koji Takahashi, 'Blockchain Technology and Electronic Bills of Lading' (2016) 22 JIML 202; Miriam Goldby, 'The Rising Tide of Paperless Trade: Analysing the Legal Implications' in Baris Soyer and Andrew Tettenborn (eds), International Trade and Carriage of Goods (Informa Law from Routledge 2016) 147; Ong (n 13); Paul Todd, 'Electronic Bills of Lading, Blockchains and Smart Contracts' (2019) 27 IJLIT 339; Livashnee Naidoo, 'From the Book of Lading to Blockchain Bills of Lading: Dynamic Merchant Tradition and Private Ordering' in Andrew Hutchison and Franziska Myburgh, *Research Handbook on International Commercial Contracts* (Edward Elgar Publishing 2020) 223; Huiru Liu, 'Blockchain and Bills of Lading: Legal Issues in Perspective' in Mukherjee PK, Mejia Jr. M, Xu J (eds) *Maritime Law in Motion* (Springer 2020) 432.

25 An example is the CargoX Smart B/L™ governed by 'CargoX Blockchain Based Smart Bill of Lading Solutions Special Terms and Conditions' (version 1.0, 10 February 2020).

26 Takahashi (n 24) 204.

27 Francesco Munari 'Blockchain and smart contracts in shipping and transport: A legal revolution is about to arrive?' in Baris Soyer and Andrew Tettenborn (eds), New Technologies, Artificial Intelligence and Shipping Law in the 21st Century (Informa Law from Routledge 2020) 8.

a more efficient single platform for 'connected' parties to approve and execute contractual processes.

Blockchain-based bills of lading are not the focus of this chapter, the aim is to rather situate the bill of lading within the network structure of both law and technology. To some extent this draws a distinction between 'bonds' as they exist in the real world versus the digital world.[28] As Savelyev states a '[s]mart contract does not give rise to [a] legal bond between the parties' and even if such a bond exists it is a 'technical bond of a party with [the] Blockchain platform' which is 'more solid than a legal one'.[29] In this respect, and as Brownsword has said:

> [m]ight a transactional technology comprising networked machines or nodes be the answer to a set of questions presented by networked business relationships and in relation to which the law of contract is arguably unsatisfactory.[30]

It remains to be seen how traditional contractual 'bonds' may play out in the context of smart contractual networks and this chapter attempts to unpack that.

2.2 *Contractual Networks in Law*

Although it is arguable whether smart contracts are part and parcel of contract law, it remains relevant to consider how smart contracts may become part of the tapestry of contract law. Defining contractual networks is an important foundational premise of this chapter. A network of contracts refers to a group of contracts that pursue a common purpose and each contract (i.e. 'the network contract') contributes to the attainment of that purpose.[31] But as Mitchell points out, networks are more than 'the sum of the contractual links'[32] but rather encompass two primary features: the co-operative nature of the contractual relationships with a focus on relational norms; and a common purpose.[33]

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28 This distinction is drawn by Alexander Savelyev, 'Contract Law 2.0: "Smart" Contracts as the Beginning of the End of Classic Contract Law' (2017) 26 Information and Communications Technology Law 116, 120.

29 ibid 120.

30 Brownsword, 'Smart Transactional Technologies' (n 5) 314.

31 John N Adams & Roger Brownsword, 'Privity and the Concept of a Network Contract' (1990) 12 Legal Studies 10, 12.

32 Mitchell (n 4) 203.

33 ibid 204. See also, Alan Schwartz and Robert E Scott, 'Third Party Beneficiaries and Contractual Networks' (2015) Journal of Legal Analysis 10.

To understand networks and contract law, a starting point should be the classical understanding of contract law which sees a contract as a bilateral, reciprocal exchange between two parties. Formalism – which is associated with classical law – refers to a theory of contract law that gives preference to the written contract (form over substance). It is rules-based, favours literal approaches to interpretation, and upholds classical values such as freedom of contract and legal certainty. Informed by socio-legal analysis, scholars have argued that by focusing on bilateral relationships modelled on classical contract law, contract law misses the relational and network dimensions to contracting.[34] These relational and network dimensions – which both recognise the implicit dimensions in contracting – may be subsumed under the broader umbrella term of 'contextualism'.[35] Contextualism is sensitive to context and it emphasises values such as fairness and reasonableness. Broadly speaking, contextualism with its subsumed categories emphasises the implicit dimensions of contracting which focus on the underlying or background factors rather on than the express terms in the contract as a way to determine the reasonable expectations of contracting parties.[36] Put differently, rather than focusing on the intentions of the parties, the contract should be situated within broader contextual relations.

With that broad framework in mind, network theory views the bilateral contract as 'connected' to other contracts, such as where a bilateral contract is intended to confer a benefit on a third party.[37] Carriage contracts are

34 These include the scholarship of Stewart Macaulay and Ian Macneil on relational contracting. See also inter alia, Simon Deakin Christel Lane and Frank Wilkinson, 'Trust or Law? Towards an Integrated Theory of Contractual Relations between Firms' (1994) 21 Journal of Law and Society 329.

35 It should be noted that there are differences between relational theory and networks. See Condon (n 4) 173: "While networks can be treated as a form of relational contracting … Teubner cautions that Macneil's relational theory relies on the bilateral exchange model and does not capture the tensions in networks between co-operation and competition adequately".

36 Implicit dimensions refer to the contractual dimensions which do not appear in the formal contract and can include background social expectations, and customary understandings in sectors. These are referred to as a 'distillation of Macneil's internal and external relational norms', according to Condon (n 4) 183. See also, J Wightman, 'Beyond Custom, Contract, Contexts, and the Recognition of Implicit Understandings' in D Campbell, H Collins, and J Wightman (eds) *The Implicit Dimensions of Contract* (Oxford, Hart Publishing 2003) 143.

37 Condon (n 4) 173, states that other examples include a contract between A and B connected to contracts with C, D and E; patterns of regular trading where parties do not reduce their contract to writing; and precontractual relations between A and B.

recognised as 'a paradigm of network contracts'.[38] The reasoning of networks is that by viewing the bilateral contract as part of a network it alters the rights, obligations, and expectations of the parties. For example, in *The Eurymedon* the stevedores were entitled to rely on a limitation clause in the carriage contract to which they were not a party, so the question arose whether a third contract came into being (discussed in Part 3.2). Networks reflect a tension between cooperation and competition, and between the individual interest and the collective interest.[39] The characterisation of networks is difficult as contract law does not recognise a legal doctrinal concept of 'network contracts' although there is a general recognition of the concept of networks in business relations.[40] Recognition of contractual networks views the law of contract as taking 'a more responsive approach'[41] and can therefore also be seen as incorporating elements of relational contracting.

Largely led by Lords Steyn and Hoffman, English commercial contract law has linked the reasonable expectations of reasonable business parties to context. Likewise, the concept of networked contracts serves as a reference point for the parties' reasonable expectations. Although contextualism has been largely embraced in contractual interpretation in recent years, there is scepticism as to whether the law (through the courts) are in fact willing to embrace a more networked understanding of contract law.[42] Technology has provided a way for these networks to operate in a smarter way and to be 'shaped by the technologies that underpin their operations'.[43] This also holds true for networks in the carriage context which may evolve into a smart contractual network. Mitchell has said that '[c]ontractual networks appear dependent on contract norms while simultaneously chaffing against them' and she adds that, 'networks seems to eschew the strictures of contract law'.[44] Something similar

38 Adams & Brownsword, 'Privity' (n 31) 27–8. See also for example Brownsword, 'Networks as Connected Contracts' (n 2) 455.

39 Mitchell (n 4) 208.

40 See Brownsword, 'Smart Transactional Technologies' (n 5) 325. The Law Commission in the UK considered but rejected a doctrine for connected contracts during its consultations on privity of contract (N Adams, D Beyleveld and R Brownsword, "Privity of contract – the Benefits and the Burdens of Law Reform" (1997) 60 M.L.R. 238). See also, Marc Amstutz, 'Contract Collision: An Evolutionary Perspective on Contractual Networks' (2013) 76 Law and Contemporary Problems 169, 182; The Eurymedon (n 8).

41 Brownsword, 'Smart Transactional Technologies' (n 5) 326.

42 *Arnold v. Britton,* [2015] UKSC 36; *Marks and Spencer plc v. BNP Paribas Services Trust Company* (*Jersey*) *Limited,* [2015] UKSC 72; *Wood v. Capita Insurance Services Ltd,* [2017] UKSC 24.

43 Brownsword, 'Networks as Connected Contracts' (n 2) 461.

44 Mitchell (n 4) 200.

can be said of smart contracts and the technological networks on which they operate as they nevertheless seem to be wedded to contract law (at least in these early stages) whilst also chaffing against it.

3 Networks and the Sea Carriage Context

3.1 *Standard Form Smart Contracts?*

Standard form contracts have long been associated with commercial relationships, and in shipping and international trade the bill of lading is a well-known standard form contract. These types of contracts are also commonly known as 'contracts of adhesion' and a key criticism is the asymmetry in bargaining power in these contracts.[45] Standard form contracts are mentioned here for two reasons: the first related to its *similarity* with smart contracts and the second, related to its *compatibility* with smart contracts.

Considering the former reason, the advent of standard form contracts was viewed as a disruption much like smart contracts are now viewed as a disruption. In the nineteenth century there was an increasing emphasis on objectivity and reasonableness as opposed to consent and agreement in carriage contracts, which allowed carriers to include exculpatory clauses in bills of lading which exempted them from a range of risks and liabilities.[46] There was growing pressure for regulation to address the one-sided nature of bills of lading which was subsequently addressed through legislative reform, and later provided the impetus for international unification in order to balance the scales between carrier and cargo interests.[47] The immutability of smart

45 F Kessler, 'Contracts of Adhesion: Some Thoughts on Freedom of Contract' (1943) 43 Columbia Law Review 629. Unequal bargaining power is more acute in B2C transactions than B2B but this is beyond the scope of this paper.

46 Brownsword, 'Smart Transactional Technologies' (n 5) 317.

47 The pioneering turning point for such regulation came through the US Harter Act 1893 – a piece of domestic legislation which imposed mandatory liability rules on international carriers. The Harter Act's use as a model for domestic legislative enactments had a domino effect in other Commonwealth countries which culminated in an international liability regime for the carriage of goods by sea: the International Convention for the Unification of Certain Rules of Law Relating to Bills of Lading (The Hague Rules) (adopted 25 August 1924, entered into force June 2, 1931) 120 LNTS 155. Subsequent amendments resulted in: the Hague Rules as amended by the Protocol to Amend the International Convention for the Unification of Certain Rules of Law Relating to Bills of Lading (Visby and Hague Rules) (adopted 23 February 1968, entered into force 23 June 1977) 1412 UNTS 128, the United Nations Convention on the Carriage of Goods by Sea (The Hamburg Rules), (adopted 31 March 1978, entered into force 1 November 1992) 1695 UNTS 3, UN Convention

contracts also resembles the 'immutability' of standard form contracts which are offered on a 'take it or leave it basis'.[48] The blockchain on which the smart contract is coded is immutable therefore the smart contract cannot be modified or amended after it has been created.[49] Standard form contracts are not immutable in the strict sense of the word, but the ability to negotiate or modify a standard form contract is restricted by the inequality of bargaining power which exists between the contracting parties.

Considering the second reason, as the bill of lading is a standard form document, it is useful to point to the correlation 'between future smart contract implementations and SFCs [standard form contracts]'.[50] For instance, the sale of goods and carriage contracts entail a network of different standard form contract terms developed by sellers, carriers, charterers etc. Smart contracts can vary in their level of automation and in terms of the balance between code and traditional text in any agreement. Smart contracts exist on a spectrum with the strength of a smart contract linked to the ascending level of automation, and this may impact how it functions in a networked environment.[51] On one end of the spectrum are 'weak' smart contracts represented by a traditional written contract and with a short reference to code that implements a clause. This has been compared to the inclusion of a formula in a traditional contract.[52] At the other end of the spectrum, are the 'strongest' smart contracts which are fully automated and consists only of code.[53] The network relationship here will be

on Contracts for the International Carriage of Goods Wholly or Partly by Sea (Rotterdam Rules) (adopted 11 December 2008, not in force yet) UN.Doc. A/RES63/122.

48 Kristin B Cornelius, 'Standard Form Contracts and a Smart Contract Future' (2018) 7 (2) Internet Policy Review 1. See also, MR Patterson, 'Standard-Form Contracts in the Electronic Age' (2010) 52 (2) William and Mary Law Review 327, at <https://papers.ssrn.com/abstract=2010124> accessed 30 October 2020); R Hillman, 'Online Boilerplate: Would Mandatory Website Disclosure of E-Standard Terms Backfire?' (2006) 104 (5) Michigan Law Review 837, at <http://repository.law.umich.edu/mlr/vol104/iss5/2> accessed 21 September 2020; R Hillman & JJ Rachlinski, 'Standard-Form Contracts in the Electronic Age'(2002) 77 (2) New York University Law Review 429, at <https://ssrn.com/abstract=287819> accessed 25 September 2020.

49 This might have implications for rectification in a digital world as this 'rectification' may imply a new contract due to the immutability characteristic. Sarah Green and Adam Sanitt, 'Smart Contracts' in Paul S Davies and Magda Raczynska (eds), *Contents of Commercial Contracts: Terms Affecting Freedoms* (Oxford: Hart Publishing 2020) 196.

50 Cornelius (n 48) 4.

51 ibid 7.

52 Green and Sanitt (n 49) 197.

53 Stuart D Levi and Alex B Lipton, 'An Introduction to Smart Contracts and Their Potential and Inherent Limitations' (Harvard Law School Forum on Corporate Governance, 26 May 2018) at <https://corpgov.law.harvard.edu/2018/05/26/an-introduction-to-smart-contracts-and-their-potential-and-inherent-limitations/> accessed 20 October 2020.

governed by code as third party enforcement is removed by the parties who rely on the distributed ledger technology to carry out their intentions.[54] In the middle sits the hybrid smart contract which consists of code and a hashed reference to a traditional contract.[55] This is usually used to add natural clauses so there is the possibility of encoding an exception into the smart contract on the blockchain to allow for certain types of enforcement, such as arbitration, choice of law or dispute resolution by the courts.[56] Although smart contracts do not depend on facilitation or judicial enforcement by third parties,[57] the decentralisation feature with nodes in the blockchain network scattered in different jurisdictions may cause difficulties to arise in relation to established principles of conflict of laws.

Standardisation is the backbone of trade and shipping where commercial values of freedom of contract and certainty remain core values. Shipping contracts usually contain standard clauses, such as the Himalaya Clause (discussed next), the Clause Paramount,[58] and applicable law and jurisdiction clause etc. Some clauses may be difficult to transcribe into code because of its specificity to certain shipments.[59] The shipping industry is unlikely to abandon the bill of lading; a document that has evolved over centuries, rather the aim is to allow smart bills of lading to be recognised as functionally equivalent to paper bills of lading.[60] The standard form bill of lading and its fine print terms such as the Himalaya Clause are an illustration of how contractual networks operate in this area. The paper bill of lading will remain the model for a smart contract

54 Gomez (n 16) 335.

55 Green and Sanitt (n 49) 198: 'a hash is a cryptographically secure method of creating a reference to a particular document'.

56 See Pasa and DiMatteo (n 22) 341; Gomez (n 16) 335; Green and Sanitt (n 49) 198.

57 Sarah Manski and Ben Manski, 'No Gods, No Masters, No Coders? The Future of Sovereignty in a Blockchain World' (2018) 29(2) Law and Critique 151. See also, M Sklaroff, 'Smart Contracts and the Cost of Inflexibility' [2017] 166 University of Pennsylvania Law Review 291, at <https://ssrn.com/abstract=300889> accessed 20 September 2020.

58 In order to ensure that the protection of the Harter Act would be applied by courts in countries for which American exports were destined, a clause was inserted into bills of lading issued in the US, which came to be known as the Paramount Clause. This practice has retained its significance in modern times by incorporating, usually, the Hague or Hague-Visby Rules into the bill of lading. See Erling Selvig, 'The Paramount Clause' (1961) 10 Am J Comp L 205.

59 For example, charter parties contain specific clauses relating to weather conditions, demurrage, dispatch etc.

60 The principle of functional equivalence entails replicating the objectives of the paper bill of lading in electronic form. When choosing an appropriate choice of forum, parties should aim for legal systems that provide for this recognition of bills of lading.

bill of lading on blockchain platforms.[61] These are likely to co-exist in order to find ways in which established and standardised practices and norms can be incorporated into code, such as by identifying the type of clauses which lend themselves to self-execution.[62] It remains uncertain if standardisation in code is possible and this entails that the shipping industry re-assess its standard clauses. Market organisations, such as BIMCO, will be best suited to this task of how standardisation may play out in code.

3.2 *Himalaya Clause and Network Effects*

Although a networked understanding of contract law extends beyond issues of privity and third party benefits, there have been calls for the law to recognise that the doctrine of privity should not apply as between network contractors (as opposed to non-network parties) i.e where there is an existing contractual relationship and where consideration has been given under that contract.[63] This recognition would amount to a legal fiction as the doctrine of privity recognises that only parties to the contract are affected although some exceptions are found in statute and common law permitting third parties to derive benefits or to claim under a contract to which they are not a party.[64] The primary statute is the Contracts (Rights of Third Parties) Act 1999 ('Rights of Third Parties Act') which allows third parties to enforce contract terms where the intention to do so by the contracting parties' is present.[65]

In the carriage context, an exception to privity is found through reliance on a Himalaya Clause which has its origins in the English Court of Appeal decision of *Adler v. Dickson* (*The Himalaya*).[66] A passenger on the SS Himalaya, Mrs

61 See Grant Hunter, 'Smart Contracts: The BIMCO Experience' in Baris Soyer and Andrew Tettenborn (eds), *New Technologies, Artificial Intelligence and Shipping Law in the 21st Century* (Informa Law from Routledge 2020) 21, where he expresses an industry viewpoint that is cautious about smart contracts.

62 ibid 21.

63 Adams & Brownsword, 'Privity' (n 31) 24.

64 *Dunlop Pneumatic Tyre Co Ltd v. Selfridge and Co Ltd,* [1915] AC 847 (HL); *Scruttons Ltd v. Midland Silicones Ltd,* [1962] AC 446 (HL). See also, Bills of Lading Act 1855, s1. See Reynolds F, 'The Significance of Tort in Claims in respect of Carriage by Sea' (1986) Lloyd's Maritime and Commercial Law Quarterly.

65 Contracts (Rights of Third Parties) Act 1999, s1(1) allows a third party to enforce a term if: the contract expressly provides that he may do so (s1(1)(a)); or if the term purports to confer a benefit on him (s1(1)(b)) and subject to s1(b) on a proper construction of the contract there is nothing to indicate that the contracting parties did not intend the term to be enforceable by the third party. S1(6) extends the benefit for third parties to rely on exclusion or limitation clauses in the contract. But note the exception to the exception discussed below.

66 [1954] 2 Lloyd's Rep 267 (CA).

Adler, had been injured when she fell off a gangway and was injured. Her passenger ticket exempted the carrier from liability therefore Mrs Adler instituted proceedings against the master and the boatswain. The Court of Appeal held that in the carriage of both passengers and goods by sea, the law permits a carrier to exempt both itself and its agents from liability. However, on the facts of the case no such exemption – whether express or implied – was included in the passenger ticket therefore the Master could not rely on the exception clause. The Himalaya Clause was a commercial response to this decision and is commonly included in bills of lading by conferring on third parties, such as stevedores, agents and servants of the carrier, the benefit of the exclusions, limitations, and defences that are accorded to a carrier under the contract of carriage even though they are not a party to the contract evidenced by the bill of lading.[67] This clause remains important because the international carriage rules do not extend the protection which is afforded to carriers under these rules to independent contractors thereby leaving independent contractors open to potential claims from the owner or consignee for loss or damage to goods.[68] The Eurymedon (and cases of stevedore negligence) has exemplified the type of issues presented by networks in carriage contracts.[69]

The Eurymedon concerned two contracts and the possibility of a third contract. There was the original contract of carriage between carrier and the owners of the goods in question (contract 1), and there was a second contract between the carrier who contracted the services of stevedores to unload the cargo (contract 2). Contract 1 contained an exclusion clause which excluded the carrier for loss and/or damage unless suit was brought within one year

67 The Himalaya clause has been and continues to remain controversial but the focus here is not on this controversy. See for instance, William Tetley, 'The Himalaya Clause Revisited' (2003) 9 JIML 40.

68 For example, The Hague-Visby Rules (Art. IV, bis r. 2) and the Hamburg Rules (Art. 7, r. 2) extend the protection they give to the carrier to its servants and agents whilst acting within the scope of their employment. However, as stevedores are invariably independent contractors they cannot take advantage of these. Art. III, r. 6 of the Hague Rules and of the Hague-Visby Rules (which apply to bills of lading only) bars proceedings against the carrier unless they are brought within one year of the date on which the goods were, or should have been, delivered.

69 See for eg *Scruttons Ltd v. Midland Silicones Ltd,* [1962] AC 446 (HL)*; Port Jackson Stevedoring Pry Ltd v. Salmond and Spraggon* (*Australia*) *Pry Ltd* (*'The New York Star'*)*,* [1980] 3 All ER 257; The Eurymedon (n 8). The leading case is *Scruttons Ltd v. Midland Silicones Ltd* where stevedores, who were contracted by the carrier, were not allowed to rely on a limitation clause in a carriage contract between the owners of the goods and the carriers when the stevedore negligently damaged the goods on the basis that they were not a party to the carriage contract.

after delivery of the goods and purported to extend that exclusion clause to the carrier's agents, servants and contractors. The stevedore negligently damaged the goods whilst unloading, and the owner of the goods instituted a claim against the stevedores who sought to rely on the benefit of the exclusion clause in Contract 1 (to which the stevedores were not a contracting party). The issue was whether a third contract came into being between the stevedores and the owner of the goods.

The decision in The Eurymedon relied on the agency exception to work around the decision of *Scrutton Ltd v. Midland Silicones* where Lord Reid stated that if certain conditions were met the agency theory can be used to allow a third party to benefit by a contract thereby circumventing privity. These conditions included that the limitation clause was intended to protect the stevedores, that the carrier was contracting as an agent (in addition to his own behalf); that the carrier had authority to do so from the stevedore, and that the stevedores provided consideration.[70] The Privy Council found that these elements were present in The Eurymedon and found in favour of the stevedores.[71] The minority disagreed as the plain meaning of the exclusion clause in question was subject to the doctrine of privity and could not have been extended to third parties without more. In particular, the exclusion clause should have expressly mentioned the possibility of an additional unilateral offer to be made by the owners of the goods to any contractors that might be engaged in performing services under that carriage (Contract 1).[72]

The decision has been criticised in academic circles.[73] Lord Wilberforce in The Eurymedon based his decision on the rationale that giving effect to the limitation clause was giving effect to 'the clear intentions of a commercial document'.[74] Tetley views this approach as erroneous and that it highlights the questionable basis of the Himalaya Clause.[75] In particular the reference to the 'clear intentions' is, he argues, not logical as the bill of lading is a contract of adhesion (insofar as it concerns the shipper), and given that the stevedore was not a party to the bill.[76] The Rights of Third Parties Act is however a simpler

70 *Scruttons v. Midland* (n 70), 474 (Lord Reid).

71 The recognition of the Himalaya Clause as extending rights to third parties has been given effect to in the UK, see *The New York Star* (n 70); *The Pioneer Container,* [1994] 2 AC 324; cf *The Mahkutai,* [1996] 2 Lloyd's Rep. 1. See also *The Starsin*, [2001] 1 Lloyd's Rep. 437 at p. 462 (C.A.).

72 The details of this are beyond the scope of this chapter.

73 Mitchell (n 4) 209.

74 *The Eurymedon* (n 8) 169.

75 Tetley (n 67) 51.

76 ibid.

way to enforce a Himalaya clause than the agency theory. However, there is an exception to the exception where no rights under the Act are conferred on a third party in relation to contracts for the carriage of goods 'except that a third party may in reliance on that section avail himself of an exclusion or limitation of liability in such a contract'.[77] This has placed the Himalaya Clause on a statutory footing in the UK.

Turning to how the concept of contractual networks might evolve in relation to smart contracts, entails a two-pronged approach: 'Form' relates to whether a standard Himalaya clause is still possible and how might such third-party benefits that arise in the carriage context be encoded on smart contracts operating on blockchain platforms. If independent contractors cause damage to the cargo during unloading, how are they to derive the benefit of any limitation or exception clauses and will existing understandings of privity and its exceptions remain the same in a digital environment. The second-pronged approach focuses on issues of liability as arose in The Eurymedon, that is, how will issues of liability to be dealt with in the network particularly given the self-executing feature of smart contracts. Smart transactional technologies are therefore viewed as a legal disruption to substantive legal doctrine as there are challenges in aligning technology with law. In the carriage context smart bills of lading on blockchain are indeed a legal disruption but are also part of the evolutionary development that has been critical to the modern bill of lading today. The concept of 'disruption' therefore requires a consideration of existing or new theoretical frameworks to guide legal discourse.

The well-trodden debates in contract law and practice (discussed in Part 2.2) need to be revisited as engagement with smart transactional technologies grows. How will smart contracts fit into the network-like context discussed above? Will technology amplify the network-like structure in commercial relationships that contract law has been slow to recognise, or does technology alter the legal understanding of networks? These questions point to a second legal disruption in terms of how we think about law. In this respect, Brownsword has proposed a new theoretical framework to better respond to disruptions in law:

77 The Rights of Third Parties Act 1999, s6(5) and s6(6) which defines a contract of carriage as including a bill of lading and by virtue of s6(7)(a) is taken to have the same meaning of a bill of lading etc. as in the Carriage of Goods Act 1992. COGSA 92 specifies the documents to which it applies but does not extend to electronic bills of lading. S1(5) as amended by the Communications Act 2003, sch 17, para 119, states that the Secretary of State may make provision for the application of this Act to electronic bills of lading. However, this has not yet taken place.

> One ideal-type, 'regulatory-instrumentalism', views the rules of contract law as a means to implement whatever policy goals have been adopted by the State; the adequacy and utility of contract law is to be assessed by its effectiveness in delivering these goals. The other ideal-type is 'coherentism', according to which the adequacy of the law of contract is to be assessed by reference to the doctrinal consistency and integrity of its rules.[78]

In relation to networks, the coherentist approach is likely to encounter challenges where technology 'is not congruent or symmetrical with traditionally restrictive rules of contract law'.[79] Whereas the regulatory-instrumentalist approach views these as challenges only if they conflict with 'public policy or particular regulatory objectives'.[80] Conscious of Brownsword's theoretical framework as to how we think about the collision between law and technology, the next section outlines some thoughts on smart contractual networks in the context of sea carriage.

4 Smart Contractual Networks: Conceptual and Normative Issues

4.1 *Smart Contracts and Contract Law*

Smart contracts have an ex ante automation whereas contract law has an ex post application; smart contracts are concerned with performance ex ante whereas contract law is remedial.[81] As Brownsword citing Bygrave states:

> the assumption is that, by embedding norms in the architecture, there is 'the promise of a significantly increased ex ante application of the norms and a corresponding reduction in relying on their application ex post facto'.[82]

If the use of smart contract technologies is applied to the example of stevedores contracted by the carrier to unload the cargo, this will have to be coded

78 Brownsword, 'Smart Transactional Technologies' (n 5) 320.
79 ibid 332.
80 ibid 332.
81 Werbach and Cornell (n 17) 318.
82 Brownsword, 'Smart Transactional Technologies' (n 5) 318, citing Lee A Bygrave, 'Hardwiring Privacy' Roger Brownsword, Eloise Scotford, and Karen Yeung (eds.), *The Oxford Handbook of Law, Regulation and Technology* (Oxford: OUP, 2017) 755.

as an ex ante instruction in the smart contract. The focus is on ensuring that the act of unloading the goods is completed which will then trigger the next step. The coded instruction to the stevedore does not alter the network structure which exists in carriage contexts whether or not that technological connection can be viewed as analogous to the contractual connection between carrier, stevedore, and shipper.

In theory, the concept of self-enforcement seems to negate the need for judicial enforcement of smart contracts as enforcement in the traditional sense is replaced by technological triggers.[83] As smart contracts have an automated execution, the issues will center on the actual outcome rather than on claims for non-performance as the contractual analysis will shift from enforcement to disputes about the automated execution.[84] Self-execution suggests that the stevedore cannot fall short of its contractual obligations (i.e breach) and therefore established remedies for breach of contract, such as damages, specific performance are not relevant.[85] The appropriate contractual remedies in the analogue world remains elusive in the digital world. As smart contracts exist on a spectrum in terms of their automation, so do contracts exist on a spectrum in terms of complexity from the one-off discrete transaction to the longer-term transactions. It is generally believed that smart contracts are more suited to simple transactions than complex contracts as are found in shipping and trade transactions, such as the detailed standard form contracts of charter parties and bills of lading. There may well be a distinction between the remedy for one-off discrete transactions versus longer-term contracts, where in the former instance 'conventional remed[ies]' may be granted such as compensatory damages.[86] It becomes more complex in longer term contracts where future ongoing performance conforms more closely to the parties' expectations.[87]

The instantaneous recording and processing of information in smart contracts on blockchain and the anonymity of users on nodes in the blockchain, may, in these early stages, render the determination of liability and remedies more complicated in code.[88] The instantaneous nature points to the faster

83 See Eliza, 'Smart Contracts: Terminology, Technical Limitations and Real-World Complexity' (2017) 9 Law, Innovation and Technology 269; Christina M Mulligan, 'Perfect Enforcement of Law: When to Limit and When to Use Technology' (2008) 14 Richmond Journal of Law & Technology 1–49.

84 Green and Sanitt (n 49) 203.

85 There is a possibility of encoding such remedies in the code.

86 Green and Sanitt (n 49) 208.

87 ibid.

88 This chapter does not deal with issues of liability arising from errors in coding.

recognition of when loss occurs and the responsible party.[89] However, the rigidity inherent in smart contracts on blockchain might render it difficult to determine liability and quantify liability where there may be more than one party at fault (e.g. not only negligence of the stevedores but also the crew).[90] In theory it is possible to use ex ante coding to provide for the possible causes of non-performance and various scenarios but contracts – even smart contracts – are necessarily incomplete. In reality it is not possible to provide for every conceivable cause ex ante.

In the real world the stevedore would, in principle, be entitled to rely on the Himalaya clause in the carrier's bill of lading which in effect recognises the stevedore as being a party to the network. In a digital world does this signal the end of the Himalaya clause? This will depend on the extent to which the contract exists only in the virtual world i.e. the type of smart contract. The greater the degree of automation, the less likely it is possible to code traditional contract concepts such as good faith, commercial expectations etc, as well as standard terms such as the Himalaya Clause.[91] The congruence between contractual protective measures in code – whether for purposes of consumer protection or to extend benefits to third parties – may conflict with the 'deterministic character of code'[92] as described above in relation to stevedore damage.

The Himalaya Clause is viewed as an exception to the doctrine of privity but there is a separation of technology from law; from 'what is legally versus technically binding'.[93] 'Privity' in technology is a generalisation of the legal concept of privity, with privity being one of the objectives in smart contract design and this is taken to mean 'that knowledge and control over the contents and performance of a contract should be distributed among parties only as much as is necessary for the performance of that contract'.[94] The formalistic, immutable nature of smart contracts operating within its own closed system of code as 'rules' differs from what contract law, as traditionally understood, will enforce.

89 Munari (n 27) 6. See also, RH Weber, 'Liability in the Internet of Things' (2017) 6 EuCML, 207. Issues of liability has implications for a carrier's liability as set out in the international carriage rules (n 47) but this is beyond the scope of this chapter.

90 Liu (n 24) 432.

91 Michel Cannarsa, 'Contract Interpretation in Larry A DiMatteo, Michel Cannarsa, and Cristina Poncibò (eds), *The Cambridge Handbook of Smart Contracts, Blockchain Technology and Digital* (CUP 2019) 116.

92 Aaron Wright and Primavera De Filippi, 'Decentralized Blockchain Technology and the Rise of Lex Cryptographia' <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2580664> accessed 30 September 2020, 26.

93 ibid 26.

94 Szabo (n 14).

These are the types 'coherentist' issues which arise in attempting to align technological and legal connections in commercial networks, and to fit technology into the transactional contract model that we know and understand. As Brownsword says where these questions become difficult, 'it is probably no longer the right question to be asking'.[95] In that instance a regulatory-instrumentalist approach is preferable to address the issue of third-party beneficiaries through legislation as the Rights of Third Parties Act allows parties to design their own terms.[96] This depends on whether contract law's function in relation to smart contracts is facilitative or intended to pursue regulatory goals such as recognising the implicit dimensions which (should) exist in networks.[97] A second option, as suggested by Brownsword, is that the law could do this is by recognising the implicit dimensions of contracts, as some have called for law to recognise contract with network effects. English courts have been generally reluctant to enforce implicit dimensions such as the relational dimensions of contracts and are therefore less likely to recognise network effects explicitly. The network critique is that the law focuses on the express terms of the contract rather than on recognising that the network itself 'has norm creating power among the network participants'.[98] I argue that code does not change the structural network of carriage contracts as the 'connectivity' which exists between parties to carry out common purpose to complete a carriage by sea is maintained. Technology may, however, alter the internal operation as the expectations of the parties to the smart contractual networks may be modified as discussed below. There will be a need for network expectations to be stabilised in some way in a digital environment.[99] It remains to be seen whether the benchmark is formalist or contextualist and this requires 'some jurisprudence on the guiding principles that regulate the need for symmetry or congruence of the technological effects with the law'.[100]

4.2 *Interpretation and Theory*

Contract interpretation is a fundamental doctrine of contract law and therefore prompts the question about the interpretation of smart contracts although this will depend on the type of smart contract.[101] Formalism is inherent in the

95 Brownsword, 'Smart Transactional Technologies' (n 5) 327–8.
96 ibid 330.
97 Mitchell (n 4) 201.
98 ibid 199.
99 Teubner (n 4) 103.
100 Brownsword, 'Smart Transactional Technologies' (n 5) 328.
101 See Cannarsa (n 92) for a more detailed analysis.

operation of smart contracts operating on blockchain platforms (If X occurs, then Y happens). An analogy can be drawn between formalism and smart contracts in that the former is 'pseudo self-enforcing'[102] as 'courts serve a merely perfunctory role of reiterating the plain meaning of the words of the contract'.[103] Jeremy Sklaroff has pointed out that smart contracts come with the costs of inflexibility and that smart contracts support a formalist interpretation of contracts based on the terms of the agreement than 'broader behavior'.[104]

The most apparent issue is how to interpret code which is technical as opposed to legal language. The difference is that the emphasis is less on individual words and rather on what the words collectively means as an instruction which also depends on the level of automation of the smart contract.[105] One view is that to determine the meaning of a code it has to be run so the code is not interpreted but executed; the focus is not on code as *words* but on code as *action*.[106] A view that the code is deterministic and formal and is the equivalent of the rights and obligations in a traditional contract, would render interpretation and judicial enforcement superfluous as it views the code as the contract.[107] However, this ignores legal and policy oversight through statute to address, for instance, fraud and illegality.[108] As discussed, contracts are incomplete as it would be prohibitive to provide for every conceivable contingency, which also holds true for smart contracts even though the 'self- sufficiency of a smart contract is premised on its completeness'.[109] The incompleteness of smart contracts and traditional contracts differs though as with the latter it is possible to build flexibility into contracts through terms such as good faith, duties to cooperate or to use best endeavours, force majeure etc.[110] With smart contracts, any ambiguity will preclude self-execution. It is likely that most carriage contracts, at least for the foreseeable future, will be a hybrid – a mixture of code and language, or 'through the context of a commercial relationship where other documents may form part of the factual matrix'.[111]

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102 DiMatteo and others, 'Smart Contracts and Contract Law' (n 9) 7.
103 ibid.
104 Sklaroff (n 57) 279.
105 Green and Sanitt (n 49) 207–8.
106 ibid 203.
107 ibid.
108 ibid.
109 Pasa and DiMatteo (n 22) 342.
110 Ibid 344.
111 Green and Sanitt (n 49) 203–4. Such documents can include the need for consistency between the bill of lading and the mate's receipts.

The expectations of smart contracting parties will differ from that of the reasonable expectations of traditional contracting parties in contract law. The judicial approach is to determine the objective meaning of the parties' agreement by relying on what a reasonable person would have understood the instrument to mean.[112] Several issues can arise in 'interpreting' code; some of which are already present when interpreting traditional contracts while some issues will be specific to smart contracts. As with traditional contracts, the smart contract may fail to completely and/or accurately capture the intentions of the parties in code. Like with traditional contracts where the words in the contract may not reflect the true intention of the parties, coding presents a similar problem as the code may fail to correctly capture the parties' intentions. This is exacerbated with code as a traditional contract whether drafted by a third party (e.g a lawyer), by the parties themselves, or even as standard form contract means that parties have the ability to read and understand the natural language of the contract (whether they actually do so is another matter). Yet with code, more reliance is placed on the coder ('the drafter') as the parties may not understand the code but only the intention that the code is meant to convey.[113] If that intention is not correctly captured through code, the execution of the smart contract will not be in accordance with what the parties had agreed.

Applying the judicial approach of a reasonable person to any resultant disputes, 'highlights the tension between English law's objective approach to contractual interpretation and its regard for the intentions of the contracting parties'.[114] This may be compared to Macaulay's famous distinction between the real deal and the paper deal which highlighted the disparity between the written contract (i.e the paper deal) and the 'real deal' that governs the transaction.[115] The 'paper deal' tends to consist of clear, formal rules that are straightforward to enforce but the 'real deal' emphasises the social relations between the parties. Given this difference, resorting to the paper deal only

112 Lord Hoffman in *Investors Compensation Scheme Ltd v. West Bromwich Building Society,* [1997] UKHL 28, [1998] 1 All ER 98, [1998] 1 WLR 896, [1998] AC 896; Lord Hoffman in *Chartbrook Ltd v. Persimmon Homes,* [2009] UKHL 38; *Wood v. Capita Insurance Services* (n 42).

113 See n 49 regarding rectification. Although Green and Sanitt (n 49) state that the more appropriate method may be novation which has been used to substitute new for existing contracting parties.

114 Green and Sanitt (n 49) 206 referring to J Steyn, 'Contract Law: Fulfilling the Reasonable Expectations of Honest Men ' (1997) 113 LQR 433,433–34.

115 Stewart Macaulay, 'Non-Contractual Relations in Business: A Preliminary Study' (1963) 28 Am Soc Rev 55, 62.

would be invoking a contract that the parties did not think they had agreed upon. In a digital environment the difference arises with the 'real deal', as the 'paper deal' can be largely equated with the 'digital deal' (i.e the smart contract as code). The automation of the smart contract is focused only on the 'digital deal' thereby precluding any consideration of the 'real deal'. How, then, does the formalism of smart contracts fit in with existing theories in contract law, especially in relation to smart contractual networks? Many scholars have called for the law to embrace the implicit dimensions of contract law. Viewing the *effect* of a smart contract as analogous to the intentions of the parties (and to the express terms of the contract), would, according to Brownsword, remove some of the concerns about the congruency between technology and contract law.[116] This approach would allow technological effects to be treated as the equivalent to flexible terms and as Brownsword says 'this will simply neutralise the objection that such effects would not normally be implied'.[117] On this reading it may arguably be possible for a variation in the 'smartness' in contracts to allow for 'a contextual vision of "smartness" embedded within a relational context?'[118] Green and Sanitt state that as with the hybrid smart contracts there is likely to be an interaction with other software with which the platform interacts, such as 'third-party information providers and cloud-based storage'.[119] Green adds that:

> It is impossible to model and to predict all of these interactions, not least because many depend on real-time constraints. Characterising code as freestanding, self executing pieces of frozen conduct ignores these interactions and dependencies.[120]

The formality of smart contracts seems to operate in contradiction to judicial intervention through interpretation. The confines of smart contracts to operate beyond its technological domain limits its capacity to be relied on in more contextualised contracting practices.[121] The challenge arises with the merging of the virtual and the physical world. It remains to be seen whether legal doctrines, such as interpretation and whether contract theories which attempt to go beyond formalism, will remain relevant in relation to smart contracts.

116 Brownsword, 'Smart Transactional Technologies' (n 5) 327–8.
117 ibid 327–8.
118 Pasa and DiMatteo (n 22) 342–3.
119 Green and Sanitt (n 49) 203–4.
120 ibid.
121 Cannarsa (n 92) 115.

5 Conclusion

The term 'smart contract' is apt at describing the collision or merging of law and technology and what is frequently termed a 'legal disruption'. Academics, practitioners, and industry stakeholders are increasingly exploring how new transactional technologies align (or fail to align) with the existing legal framework. This is a necessary first step as in order to understand 'first-generation smart contracts'[122] there will need to be backward glances to existing understandings of contract law. The idea behind this undertaking was to explore whether the network-like structure present in carriage contracts may be modified on a digital platform, and how might this alter the expectations of parties in that smart contractual network. The purpose was to engage a deeper analysis of the carriage contract that extends beyond blockchain bills of lading to identify how smart bills of lading align with the prevailing networked understanding of contract law, particularly insofar as it concerns third party beneficiaries.

The principled parts have shown an imprecise relationship between law and technology but one that requires examination of the digital world through a legal lens, and to examine the legal world through a technological lens. When doing so in this chapter, it has emerged that the network-like structure in law, as seen through the example of carriage contracts, is congruent with the network-like structure in technology in that the 'connected parties' (e.g. shipper, carrier, stevedore) and the common purpose remains the same. Accordingly, the hesitancy of courts in recognising the implicit network dimensions in natural language contracts is likely to persist with smart contracts. However, the internal structure of the technological network may see the development of new norms relating to the expectations of the parties to that network which will depend on how automated the network is (recall the types of smart contracts). Much uncertainty remains about the impact of technological effects and how should this be viewed through a legal lens.

This chapter certainly does not aim to provide all the answers as blockchain and smart contract technology is still developing and the concept of digital contracts are still unfamiliar territory. Rather this chapter aims to stimulate discussion on how contractual networks, through smart contracts and blockchain bills of lading, may prevail in the context of (digital) carriage of goods by sea. Given the importance of continuity in shipping, the wording and standard clauses in shipping contracts are frequently developed and improved upon over time through standardised best practices. Whether existing best practices

122 DiMatteo and others 'Smart Contracts and Contract Law' (n 9) 6.

or new best practices, such as to accord third parties protection from liability, in relation to technology can be standardised, translated into coded and then be embedded in algorithmic standard contracts remains uncertain.

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Table of Authorities

International Treaties

International Convention for the Unification of Certain Rules of Law Relating to Bills of Lading (The Hague Rules) (adopted 25 August 1924, entered into force June 2, 1931) 120 LNTS 155.

Protocol to Amend the International Convention for the Unification of Certain Rules of Law Relating to Bills of Lading (Visby and Hague Rules) (adopted 23 February 1968, entered into force 23 June 1977) 1412 UNTS 128.

United Nations Convention on the Carriage of Goods by Sea (The Hamburg Rules) (adopted 31 March 1978, entered into force 1 November 1992) 1695 UNTS 3.

UN Convention on Contracts for the International Carriage of Goods Wholly or Partly by Sea (Rotterdam Rules) (adopted 11 December 2008, not in force yet) UN.Doc. A/RES63/122.

National Legislation

United States of America

US Harter Act 1893.

United Kingdom

Bills of Lading Act 1855.

The Carriage of Goods Act (COGSA) 1992.

Contracts (Rights of Third Parties) Act 1999.

National Case Law

Adler v. Dickson (*The Himalaya*), [1954] 2 Lloyd's Rep 267 (CA).

Arnold v. Britton, [2015] UKSC 36.

Chartbrook Ltd v. Persimmon Homes, [2009] UKHL 38.

Dunlop Pneumatic Tyre Co Ltd v. Selfridge and Co Ltd., [1915] AC 847 (HL).

Investors Compensation Scheme Ltd v. West Bromwich Building Society, [1997] UKHL 28, [1998] 1 All ER 98, [1998] 1 WLR 896, [1998] AC 896.

Marks and Spencer plc v. BNP Paribas Services Trust Company (Jersey) Limited, [2015] UKSC 72.

New Zealand Shipping Company Ltd v. A.M. Satterthwaite & Co Ltd: The Eurymedon, [1975] AC.

Port Jackson Stevedoring Pry Ltd v. Salmond and Spraggon (Australia) Pry Ltd. ('The New York Star'), [1980] 3 All ER 257

The Mahkutai, [1996] 2 Lloyd's Rep. 1.

The Pioneer Container, [1994] 2 AC 324.

The Starsin, [2001] 1 Lloyd's Rep. 437 at p. 462 (C.A.).

Scruttons Ltd v. Midland Silicones Ltd., [1962] AC 446 (HL).

Wood v. Capita Insurance Services, [2017] UKSC 24.

Bibliography

Books and Book Chapters

Amstutz M and Teubner G (eds), *Networks: Legal Issues of Multilateral Cooperation* (Oxford: Hart, 2009).

Brownsword R, 'Contracts in a Networked World' in DiMatteo L, Zhou Q, Saintier S, and Rowley K (eds), *Commercial Contract Law: Transatlantic Perspectives* (Cambridge: CUP, 2012).

Brownsword R, 'Smart Transactional Technologies, Legal Disruption, and the Case of Network Contracts' in DiMatteo L, Cannarsa M, and Poncibò C (eds) *The Cambridge Handbook of Smart Contracts, Blockchain Technology and Digital Platforms* (CUP 2019).

Bygrave LA, 'Hardwiring Privacy' in Brownsword R, Scotford E, and Yeung K (eds.), *The Oxford Handbook of Law, Regulation and Technology* (Oxford: OUP, 2017) 755.

Cannarsa M, 'Contract Interpretation in DiMatteo L, Cannarsa M, and Poncibò C (eds), *The Cambridge Handbook of Smart Contracts, Blockchain Technology and Digital* (CUP 2019) 116.

Condon R, 'From 'the law of A and B' to Productive Learning at the Interfaces of Contract' in van Gestel R, and Micklitz HW (eds), *Contract and Regulation: A Handbook on New Methods of Law Making in Private Law* (Edward Elgar Publishing, 2017).

DiMatteo LA, Cannarsa M, and Poncibò C, 'Smart Contracts and Contract Law' in. DiMatteo L, Cannarsa M, and Poncibò C (eds), *The Cambridge Handbook of Smart Contracts, Blockchain Technology and Digital* (CUP 2019) 6.

Durovic M & Janssen A, 'Formation of Smart Contracts under Contract Law' in DiMatteo L, Cannarsa M, and Poncibò C (eds), *The Cambridge Handbook of Smart Contracts, Blockchain Technology and Digital* (CUP 2019).

Goldby M, 'The Rising Tide of Paperless Trade: Analysing the Legal Implications' in Soyer B and Tettenborn A (eds), *International Trade and Carriage of Goods* (Informa Law from Routledge 2016) 147.

Gomez MA, 'The Chimera of Smart Contracts' in Hutchison A and Myburgh F, *Research Handbook on International Commercial Contracts* (Edward Elgar Publishing 2020).

Green S and Sanitt A, 'Smart Contracts' in Davies PS and Raczynska M (eds), *Contents of Commercial Contracts: Terms Affecting Freedoms* (Oxford: Hart Publishing 2020) 196.

Hunter G, 'Smart Contracts: The BIMCO Experience' in Baris Soyer B and Tettenborn A (eds), *New Technologies, Artificial Intelligence and Shipping Law in the 21st Century* (Informa Law from Routledge 2020) 21.

Idelberger F, 'Connected Contracts Reloaded – Smart Contracts as Contractual Networks' in Grundmann S (ed) *European Contract Law in a Digital Age* (Intersentia 2018) 205.

Liu H, 'Blockchain and Bills of Lading: Legal Issues in Perspective' in Mukherjee PK. Mejia Jr. M, Xu J (eds) *Maritime Law in Motion* (Springer 2020).

Mitchell C, 'Network Commercial Relationships: What Role for Contract Law' in van Gestel R, and Micklitz HW (eds), *Contract and Regulation: A Handbook on New Methods of Law Making in Private Law* (Edward Elgar Publishing, 2017).

Munari F 'Blockchain and smart contracts in shipping and transport: A legal revolution is about to arrive?' in Soyer B and Tettenborn A (eds), *New Technologies, Artificial Intelligence and Shipping Law in the 21st Century* (Informa Law from Routledge 2020) 8.

Naidoo L, 'From the Book of Lading to Blockchain Bills of Lading: Dynamic Merchant Tradition and Private Ordering' in Hutchison A and Myburgh F, *Research Handbook on International Commercial Contracts* (Edward Elgar Publishing 2020).

Orrù E, 'The challenges of ICTs in the shipping sector among international uniform law, codification and Lex Mercatoria: The electronic bill of lading' in Nawrot J and Pepłowska-Dąbrowska Z, *Codification of Maritime Law: Challenges, Possibilities and Experience* (Informa Law from Routledge, 2020) 140–1.

Pasa B and DiMatteo L, 'Observations on the Impact of Technology on Contract Law' DiMatteo L, Cannarsa M, and Poncibò C (eds), *The Cambridge Handbook of Smart Contracts, Blockchain Technology and Digital* (CUP 2019) 341.

Teubner G, *Networks as Connected Contracts* (Oxford: Hart, 2011).

Wightman J, 'Beyond Custom, Contract, Contexts, and the Recognition of Implicit Understandings' in Campbell D, Collins H, and Wightman J (eds) *The Implicit Dimensions of Contract* (Oxford, Hart Publishing 2003) 143.

Zhang J, 'Sea Transport Documents in Banks' Hands – Bridging the UCP with Commercial Shipping Law' in Nawrot J and Pepłowska-Dąbrowska Z, *Codification of Maritime Law: Challenges, Possibilities and Experience* (Informa Law from Routledge, 2020) 121.

Book Reviews

Brownsword R and Teubner G, *Networks as Connected Contracts*, Collins H (ed) (2012) 75(3) MLR 455.

Official Documentation

'ICC Memo to Governments and Central Banks on Essential Steps to Safeguard Trade Finance Operations' (6 April 2020), <https://iccwbo.org/content/uploads/sites/3/2020/04/icc-memo-on-essential-steps-to-safeguard-trade-finance-operations.pdf> accessed 21 October 2020.

CargoX Smart B/L™ governed by 'CargoX Blockchain Based Smart Bill of Lading Solutions Special Terms and Conditions' (version 1.0, 10 February 2020).

Journal Articles

Adams N and Brownsword R, 'Privity and the Concept of a Network Contract' (1990) 12 Legal Studies 10, 12.

Adams N, Beyleveld D and Brownsword R, "Privity of contract – the Benefits and the Burdens of Law Reform" (1997) 60 M.L.R. 238.

Amstutz M, 'Contract Collision: An Evolutionary Perspective on Contractual Networks' (2013) 76 Law and Contemporary Problems 169, 182.

Cornelius KB, 'Standard Form Contracts and a Smart Contract Future' (2018) 7 (2) Internet Policy Review.

Deakin S, Lane C and Wilkinson F, 'Trust or Law? Towards an Integrated Theory of Contractual Relations between Firms' (1994) 21 Journal of Law and Society 329.

Kessler F, 'Contracts of Adhesion: Some Thoughts on Freedom of Contract' (1943) 43 Columbia Law Review 629.

Lipshaw M, 'The Persistence of "Dumb" Contracts' (2019) 2 Stan J Blockchain L & Pol'y 1,4.

Macaulay S, 'Non-Contractual Relations in Business: A Preliminary Study' (1963) 28 Am Soc Rev 55, 62.

Manski S and Manski B, 'No Gods, No Masters, No Coders? The Future of Sovereignty in a Blockchain World' (2018) 29(2) Law and Critique 151.

Mik E, 'Smart Contracts: Terminology, Technical Limitations and Real-World Complexity' (2017) 9 Law, Innovation and Technology 269.

Mulligan MC, 'Perfect Enforcement of Law: When to Limit and When to Use Technology' (2008) 14 Richmond Journal of Law & Technology 1–49.

Ong E, 'Blockchain Bills of Lading and the UNCITRAL Model Law on Electronic Transferable Records' 2020 JBL 202, 207.

Reynolds F, 'The Significance of Tort in Claims in respect of Carriage by Sea' (1986) Lloyd's Maritime and Commercial Law Quarterly.

Savelyev A, 'Contract Law 2.0: "Smart" Contracts as the Beginning of the End of Classic Contract Law' (2017) 26 Information and Communications Technology Law 116.

Schwartz A and Scott E, 'Third Party Beneficiaries and Contractual Networks' (2015) Journal of Legal Analysis 10.

Selvig E, 'The Paramount Clause' (1961) 10 Am J Comp L 205.

Sklaroff M, 'Smart Contracts and the Cost of Inflexibility' [2017] 166 University of Pennsylvania Law Review 291, at <https://ssrn.com/abstract=300889> accessed 20 September 2020.

Steyn J, 'Contract Law: Fulfilling the Reasonable Expectations of Honest Men' (1997) 113 LQR 433.

Takahashi K, 'Blockchain Technology and Electronic Bills of Lading' (2016) 22 JIML 202.

Tetley W, 'The Himalaya Clause Revisited' (2003) 9 JIML 40.

Todd P, 'Electronic Bills of Lading, Blockchains and Smart Contracts' (2019) 27 IJLIT 339.

Weber RH, 'Liability in the Internet of Things' (2017) 6 EuCML, 207.

Werbach K and Cornell N, 'Contracts Ex Machina' (2017) 67 Duke LJ 313, 317.

Others

Catchlove P, 'Smart Contracts: A New Era of Contract Use' (2017) at <http://10.2139/ssrn.3090226> accessed 12 October 2020.

Hillman R, 'Online Boilerplate: Would Mandatory Website Disclosure of E-Standard Terms Backfire?' (2006) 104 (5) Michigan Law Review 837, <http://repository.law.umich.edu/mlr/vol104/iss5/2> accessed 21 September 2020.

Hillman R and Rachlinski JJ, 'Standard-Form Contracts in the Electronic Age'(2002) 77 (2) New York University Law Review 429, <https://ssrn.com/abstract=287819> accessed 25 September 2020.

Levi SD and Lipton AB, 'An Introduction to Smart Contracts and Their Potential and Inherent Limitations' (Harvard Law School Forum on Corporate Governance, 26 May 2018), <https://corpgov.law.harvard.edu/2018/05/26/an-introduction-to-smart-contracts-and-their-potential-and-inherent-limitations/> accessed 20 October 2020.

Law Commission, 'Smart Contracts' <www.lawcom.gov.uk/project/smart-contracts/> accessed 30 October 2020.

Patterson MR, 'Standard-Form Contracts in the Electronic Age' (2010) 52 (2) William and Mary Law Review 327, <https://papers.ssrn.com/abstract=2010124> accessed 30 October 2020).

Szabo N, 'Formalizing and Securing Relationships on Public Networks' (1997) 2(9) First Monday <https://firstmonday.org/ojs/index.php/fm/article/view/548 accessed 20 October 2020> accessed 12 September 2020.

Wright A and De Filippi P, 'Decentralized Blockchain Technology and the Rise of Lex Cryptographia' <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2580664> accessed 30 September 2020) 26.