NUS Centre for Maritime Law Report 18/05

REPORT ON THE 14TH IISTL COLLOQUIUM ON NEW TECHNOLOGIES AND SHIPPING/TRADE LAW

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Introduction

Technology is developing at a phenomenal rate, altering the dynamics of global trade. One only has to look at the rise of online retailers such as Amazon and Alibaba, and traditional high street retailers, who struggle to compete, to see the impact of technology on consumerism.[1] In the future, emerging technologies like artificial intelligence, blockchain, smart ports and unmanned ships, which have the potential to revolutionise global shipping and trade, will enter the market. Every aspect of the supply chain, from the initial purchase of raw materials, transport to the manufacturer, sale and transport of manufactured goods to the wholesaler, the sale and transport to the retailer and, finally, to the consumer, will be impacted by the rapid uptake of new technologies. However, the commercial law that facilitates global shipping and trade is not keeping pace. Therefore, it is beneficial to have scholarly discussions on this subject today, to shape the commercial law of tomorrow.

The Institute of International Shipping and Trade Law (IISTL)'s 14th Annual International Colloquium on 10–11 September 2018, 'Impact of New Technologies on Shipping and Trade Law',[2] gathered legal experts from around the world for a discussion on the legal challenges that new technology brings. The two day event was broken into six sessions covering shipping contracts, shipping practice, vessels and ports, smart ships and liabilities, artificial intelligence, litigation and insurance. The colloquium was opened by Professor Bariş Soyer, Director, IISTL, Swansea University, in dedication and remembrance of Associate Professor Theodora Nikaki (1972–2018).

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[1] <https://www.independent.co.uk/voices/editorials/amazon-corporation-tax-bill-uk-loopholes-law-government-fault-a8476386.html> accessed 10 October 2018.

[2] <http://www.swansea.ac.uk/law/istl/newsandevents/newscentre/14thannualcolloquiumoftheiistlattractsdelegatesfromaroundtheworld.php> accessed 10 October 2018.

This joint report recounts the current and future technological developments discussed at the colloquium, placing emphasis on blockchain and unmanned ships technologies, its consequential impact on global shipping and trade, and its corresponding interaction with commercial law.

1 Impact of New Technologies on Contracting in Shipping Practice (Chair: Professor Richard Williams, IISTL, Swansea University)

The session began with opening remarks by the Chair, that paper was, once, a technological development, enabling the means of recording data in agreements. However, today, paper is costlier and more inefficient than electronic alternatives and thus not fit for purpose. Even though these new technologies are acceptable to technocrats, lawyers are hesitant. The challenge was whether most, if not all, the benefits of paper could be retained in these new technologies.

Smart contracts, the BIMCO experience (Grant Hunter, BIMCO)

Mr Hunter started with the history, and the early importance, of the Internet, and pointed out that while the inventor of the World Wide Web, has been identified to be Tim Berners Lee, the inventor of the blockchain was an unidentified person going by the pseudonym, Satoshi Nakamoto.[3] Whilst a permanent record of transactions with a clear audit trail will be especially useful for supply chains, there were some risks that might arise with the use of blockchain

[3] It is ironic, that blockchain, being described as a 'shared truth', is unable to ascertain the identify of its inventor; blockchain [and distributed ledger] achieves transparency, without an intermediary by sharing the ledger with a multitude of computers, ensuring a safe and secure system.

technology, such as environmental costs,[4] little or no regulation, slow processing speeds,[5] declining relevance of establishments[6] and issues concerning interoperability.[7]

Notwithstanding these challenges, blockchain could enable smart contracts:[8] they will sit on blockchain network while running autonomous computer programs, which will self-execute 'contracts'. Mr Hunter singled out a useful application of smart contracts in the travel insurance business — if a passenger's flight was delayed, the smart contract could run automatically and the passenger would receive payment immediately; this would correct the inequity of low payouts, leading to more rightful payouts from the present situation, where only approximately 60% of insureds remain unpaid. Smart contracts faced their own set of challenges as well, such as commercial inflexibility.[9]

Blockchain and smart contracts also faced acceptance issues from the shipping industry, a hugely conservative industry. Mr Hunter reported that shipowners have resisted using any of the three electronic bills of lading accepted by P & I clubs.[10] On the other hand, charterers, some large ones, had been actively encouraging the use of electronic bills of lading. If electronic bills of lading, which had existed for a while, had found themselves to be somewhat unacceptable by industry, it may be a greater challenge to have industry players accept blockchain bills of lading, which are new to the market.

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4 Processing power requires electricity and heat, which translates into costs.

5 Increased transactions lead to slower speeds: the processing of a purchase can take up to an hour.

6 Intermediaries, including banks, risk irrelevance.

7 The risk with multiple blockchain networks is that they may not communicate with each other.

8 For example, Ethereum.

9 It is difficult to make changes using a smart contract; blockchain creates a permanent record preventing information from being deleted. However, in the shipping industry, it is quite normal to have changes — industry players are keen to explore alternative solutions other than termination.

10 Although electronic bills of lading would have been a boon for shipowners, who would be less exposed to delivery against unsecured letters of indemnity.

In closing, Mr Hunter introduced BIMCO's Mark I IDEA Charter Party Editor, SMARTCON[11] and Bunker Terms 2018.

Can Commercial Law Accommodate New Technologies in Shipping? (Professor Michael Sturley, University of Texas)

The focus of Professor Sturley's presentation was the relationship between principal stakeholders in contracts for the carriage of goods by sea and evaluating whether commercial law had been operating in accordance with its purpose of facilitating and enabling commerce.

For centuries, the central paper document in maritime commerce had been the bill of lading, which served three functions, including receipt and contract of carriage, each of which were easily achieved electronically using established technologies. The crucial question was whether the third function, document of title, could be enabled by new technologies, such as blockchain.

The acceptance of electronic substitutes for bills of lading was essentially determined by commercial relationships, with concerns expressed by carriers. These could be alleviated by demonstrating the advantages of adoption, such as cost savings[12] and legal value of the electronic substitutes.[13]

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[11] This product has a built-in Smart Con Document Genuine Document Check feature to battle fake documents.

[12] In the airline industry, the cost savings enjoyed from the switch from paper tickets to electronic tickets are in the region of 5-10%, with the per transaction costs of issuing paper tickets and electronic tickets at $10 and $1, respectively.

[13] For example, by adopting a suitable international convention that provides legal value to the electronic substitutes to paper bills of lading.

Professor Sturley illustrated that the Hague Rules, Hague-Visby Rules and Hamburg Rules[14] were liability regimes that were drafted prior the conception of electronic record technology, including blockchain, and did not provide a legal regime to govern electronic substitutes for bills of lading. Moreover, the Hague Rules, Hague-Visby Rules and Hamburg Rules did not provide door-to-door coverage, which was prevalent in the liner trade today. Multimodal transportation under a multimodal bill of lading using any of these international conventions as a liability regime for the carriage of goods by sea and interacting with other conventions, such as the Convention on the Contract for the International Carriage of Goods by Road (CMR), could result in a contract for carriage being potentially governed by numerous legal systems and legal regimes providing coverage at various points. The result might be that parties were unclear of their position.

Although there were cost savings, carriers, who were conservative and risk averse, resisted electronic substitutes because national statutes did not govern them. In order to overcome this resistance, the solution was to enact national statutes that permitted the use of these electronic substitutes.

Professor Sturley's solution to all these problems was to encourage ratification of the Rotterdam Rules,[15] which would update the liability rules and provide detailed provisions on the use of electronic transport records[16] and would also apply to blockchain, even though invented after the conclusion of the Rotterdam Rules. The Rotterdam Rules were designed to be neutral in order to facilitate whatever form of electronic commerce, rather than regulating commerce.

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[14] While there was mention of 'telex', there was no mention of electronic records.

[15] The Rotterdam Rules has to be ratified by 20 countries for it to come into force, but has, so far, been ratified by 4 countries.

[16] See Rotterdam Rules, chs 3, 9, 10 and 11.

Blockchain and Smart Contracts in Shipping and Transport (Professor Francesco Munari, University of Genoa, Italy)

Professor Munari reported on the reception of blockchain. Projects using blockchain technology, aside from cryptocurrencies, grew by 600% over the period 2016–2017, with use in finance, government and logistics.

Professor Munari explained that, notwithstanding the difference in identity of the party that performed the work,[17] there were some similarities between ancient and modern technologies *eg* 'cartolario' (ledger) and ledger technology. In the sixteenth century, there was a practice where a clerk[18] on board the vessel recorded the cargo loaded to ascertain the owner of the cargo. The clerk was required by statute to keep a safe copy of the register, deliver excerpts of these books to the shipper, and give a copy of the register to persons entitled to demand it, resembling the distributed ledger. This system eventually developed into the bill of lading. For this reason, Professor Munari concluded that the same idea, conceived at the origin of commercial law and shipping law, was compatible with technology. Additionally, blockchain could enhance the commercial experience, enabling the use of smart contracts, with performance of the delivery of goods made in conjunction with employment of IoT sensors, with little or no human labour.

Professor Munari identified two ways that ledger technology could be utilised. The first was unpermissioned ledger, where all the nodes on the network had access to the network, resulting in a global database. There appeared to be some utility with such ledgers, as there was

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[17] ie either intermediary or algorithm

[18] The clerk is a trusted person and third party *vis-à-vis* carrier and merchant.

transparency of relevant information, for example, relating to a vessel's ownership, the vessel's visit to a port of call, and possible remarks issued by the competent port authorities or classification societies.[19] A blockchain constructed in this way could record all merchant vessels and events, characterising them from 'cradle to grave', resulting in a substantial change in both the enforcement and compliance of the applicable international conventions or regional rules, and also in the simplification of access to information concerning each vessel by any potentially interested party. Accordingly, this would impact the whole spectrum of transactions concerning the sale and chartering of vessels.

The second was permissioned ledger, which could only be controlled and owned by some interested parties. Trusted actors may, exclusively, modify entries in the blocks, whereas non-trusted stakeholders can only access the ledgers to see whatever is occurring, but are not able to modify any record on the blockchain. A shipping company could utilise a ledger in this way by giving trusted access to the blockchain to the master, all agents/suppliers[20] and financial[21] and insurance[22] institutions, and clients.[23]

For the second part of the discussion, Professor Munari explored legal and industry perspectives, and smart contracts.

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[19] For example, compliance with technical standards or measures, or with environmental standards eg implementation of ballast water treatment, relevant rules for future scrapping and recycling consistently with EU Regulation 1257/2013 etc.

[20] This would enable them to modify the ledger upon the occurrence of any new event concerning the transport.

[21] To secure transactions.

[22] To pay insurance premiums.

[23] Assuming the ledger is fully trustworthy concerning the safe arrival of the good in its place of final destination, information on the blockchain could be relied on to demonstrate key facts, such as whether property has passed to a new owner and the right of a shipowner under a contract of carriage to demand payment of freight upon delivery of the goods to the consignee of the goods at the port of discharge.

Professor Munari hinted that, in digital markets, several liability rules could require reconsideration following the development in blockchain technology, for example, concerning the relevance of paramount clauses[24] and Himalaya clauses,[25] and the complex relationship between each transaction and the market in a sharing economy. He identified other legal considerations such as the risk of collusive behaviours that could arise from information transparency, and its corresponding relationship with antitrust law. Professor Munari reported that the shipping industry's resistance to modification was due to its strong composition of intermediaries. He alluded that large e-commerce movers of goods might aspire to monopolise the supply chain and have their own fleet, which would enable them to control a trillion dollar economy. Therefore, a peer-to-peer system that connects demand and supply may provide some relief to smaller players. Finally, blockchain technology should not live in a legal vacuum, and should comply with other rules and principles, such as anti-competition law,[26] possible infringements of rules on data protections[27] and security issues.

Professor Munari predicted that, although contract law was also about remedies, smart contracts would eventually replace or accompany traditional contracts, changing the paradigm of contract practice from *ex post* authoritative judgment to *ex ante* automated assessments. He added that the provisions in smart contracts had to reflect the will of the parties, and therefore, lawyers have to work with computer scientists to draft the contracts. However, he maintained that not all intermediaries will be replaced by smart contracts, as the use of smart contracts was more for

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[24] A paramount clause incorporates the Hague or Hague-Visby Rules and incorporates the seaworthiness obligation; the due diligence obligations may give way to the strict liability regime under common law due to the proliferation of information in real-time.

[25] A Himalaya clause, premised on the channeling of liability onto the maritime carrier, may become redundant in the light of a DLT system which is capable of establishing precisely when an issue arose and who is responsible for it.

[26] The availability of sensitive information among competitors may, instead, encourage competitors to engage in collusive behaviours to maximise profits.

[27] For example, compliance with GDPR and the right to be forgotten.

simple situations, rather than complex shipments of goods by sea. International legal conventions may also require updating to clearly reflect the legal position of smart contracts.

Professor Munari concluded that though the shipping industry was traditional, it was difficult to resist change and therefore, policy makers should start working to avoid abuses and uncertainties that might be related to the identified scenarios.

2 Impact of New Technologies on Shipping Practice (Chair: Lord Justice Gross, Court of Appeal, England and Wales)

The session began with opening remarks by the chair, with a call for prudence and conservativism to also be matched with readiness to explore technological issues as well. The technological experts cannot be left to their own devices in this endeavour — lawyers have to be part of the solution.

Pinning Down Delivery: Glencore v MSC and the Use of PIN Codes to Effect Delivery (James Turner QC, Quadrant Chambers, London; on behalf of Simon Rainey QC)

This discussion centred on the case of *Glencore International AG v MSC Mediterranean Shipping Co SA (The 'Eugenia')*,[28] which concerned the use of PIN codes. While this case was concerned with PIN codes, it also served to identify the potential security risks associated with the broader use of electronic systems for delivery of goods, in particular, PIN codes.

[28] [2015] EWHC 1989 (Comm), [2015] 2 Lloyd's Rep 508; [2017] EWCA Civ 365, [2017] 2 Lloyd's Rep 186.

The session began with an introduction of the PIN codes system for taking delivery of goods used in the port of Antwerp. Before 2011, the port of Antwerp operated a paper delivery system. From January 2011, they introduced, for security reasons, an opt-in system for using pin codes instead of paper delivery orders, and many of the major container operators switched to the PIN codes system. This electronic release system (ERS) works by having the holder of the bill of lading present the bill to the carrier; the carrier will, instead of using paper delivery order, send an email, with some encrypted pin codes, to the nominated email address, for the pin codes to be entered by the freight forwarder to take delivery of the container.

Essentially, the case concerned the misappropriation of two (of three) containers of cobalt briquettes whilst stored at the Port of Antwerp in June 2012; the misappropriation apparently arose because an unknown party had obtained the PIN codes and used them to take possession of the containers. The shipment of three containers was made pursuant to a negotiable bill of lading dated 21 May 2012, with Glencore (named shipper), Steinweg (named as 'Notify Parties'; Glencore's agents at Antwerp) and MSC Mediterranean Shipping Co SA (MSC; carriers; MSC provided Steinweg with a release note and three PIN codes in exchange for the bill of lading at Antwerp). The bill included an express 'Delivery Term', which formed the focus of the discussion: '[if] this is negotiable (To order/of) Bill of Lading, one original Bill of Lading, duly endorsed must be surrendered by the Merchant to the Carrier … In exchange for the Goods or a Delivery Order'; It was contended by MSC, as a defence to the misdelivery claim by Glencore, that the release note and PIN codes constituted a 'Delivery Order'. MSC's local agent in Belgium, MSC Shipping Co Belgium NV (MSC Belgium) decided to adopt the ERS from January 2011. However, it was found by the first instance court, notwithstanding MSC's argument that Glencore were to be imputed with Steineg's knowledge, that Glencore had no knowledge of the ERS at Antwerp.

The judges, Christopher Clarke LJ (CA) and Andrew Smith J (first instance), concluded that the phrase 'delivery order' must refer to a 'ship's delivery order' as defined in s 1(4)(b) of the Carriage of Goods by Sea Act 1992 (COGSA 1992), and thus must meet two criteria: the first is an undertaking by the carrier and the second is the person identified in it. However, an undertaking could not be found, as the release note contained the phrase 'discharge of the cargo will constitute due delivery of the cargo'.[29] Notwithstanding this, Clarke LJ went on to hold that the person identified in it had to be Glencore or Steinweg, a view that Mr Turner (and Mr Rainey) did not share, as it implied an undertaking to deliver to the first party to utilise the PIN code, which contrasted with the common law prior COGSA 1992, which made the ship's delivery order out to the holder of the order, instead of a particular named party. Mr Turner gave further details on this, before commenting on to other aspects of the case.

In his conclusion, digitalising paper entailed a reallocation of risks to technology, especially when the technology did not work in the way that it should; the legal ecosystem, whether statutory or contractual, would have to be aligned with practice.

Electronic Signatures in Shipping Practice (Professor Erik Røsæg, Scandinavian Institute of Maritime Law, Oslo University, Norway)

Professor Røsæg gave a presentation on the technicalities of digital signatures, asymmetric encryption, hashing, and the users interaction with them through an interface. He also mentioned that the digital signature of an electronic transport document, like a bill of lading, was akin to the assignment of that document, or the right to the cargo pursuant to the assignment, which can then be carried out by adding an electronically signed statement of the assignment to the document. The signature of the assignor referred to the assignment and the signed transport

[29] The delivery order should have provided a substitute undertaking.

document, which became a block. The next assignor included all these elements, or a representation of them, and its own assignment in the record it signed. In this way the blocks represented the transfer history of the document — a ledger. As each block included and built on the previous, no single assignor can change its tenor.

The computational work that was necessary for proofing of the ledger required much energy and perhaps might be unsuitable for shipping, though the distributed nature made it independent of a central authority.

An advantage of pen-and-ink signatures was that pen and paper were available almost everywhere; in contrast, electronic signatures were dependent on digital infrastructure. There were a number of electronic identification service providers with brand names like BankID and Commfides. Ideally, users of electronic signatures would choose a brand that was used worldwide. However, users of electronic signatures would likely want to avoid the problems of creating a monopoly, such as excessive pricing.

On the issue of liability of the infrastructure, there were no rules for strict liability and no insurance requirements in this field of law. The users of electronic signatures trusted them and used them at their own risk, even if they had no control over the infrastructure. This trust was similar with pen-and-ink signatures. Service providers often limited their liability, many to about GBP500 and thus a third party could suffer heavy losses with little compensation. Generally, there was no basic government liability for electronic signatures relied on despite being issued in error.

Professor Røsæg also mentioned the defences of forgery and lack of authority, as well as the liability in torts for loss of control of electronic signature, which could be mitigated by the courts if reasonableness required.

He concluded that, despite the somewhat undeveloped liability rules and possibilities of creating monopolies, real electronic signatures would be here to stay.

3 New Technologies, Vessels and Smart Ports (Chair: Mr Pino Musolino, President, North Adriatic Sea Port Authority)

Autonomous Shipping and Maritime Law (Paul Dean, Partner, Head of HFW Autonomous Vessel Group, London)

Mr Dean focused on Maritime Autonomous Surface Ships (MASS). He provided delegates with a summary of the levels of autonomy and an update of the current state of MASS. These vessels include a subsea survey vessel registered on the UK Ship Register, tugboats, a remotely operated fire-fighting vessel, and an electric, autonomous container ship.

The first legal challenge facing MASS, is whether they fall into the legal definition of 'ship'. Notwithstanding the lack of a statutory definition of 'ship' in Merchant Shipping Act 1995 (UK),[30] Mr Dean foresees no issue in MASS being considered a 'ship' under English law. There is no single characteristic that makes a 'ship' and each type of MASS will be considered on its own merits. English, Dutch, Chinese, German and Norwegian law define 'ship' broadly. This contrasts with the approach in the United States where in *Lozman v City of Riviera Beach*,[31] the Supreme Court said that a floating home would only be considered a ship if a reasonable observer, looking objectively at the physical characteristics and activities of the structure, would consider it to have been

[30] Section 313(1) defines ship as 'every description of vessel used in navigation'.
[31] (2013) 133 S Ct 735; 2013 AMC 1.

designed for the transportation of things and people on water. Mr Dean opined that such a definition would exclude MASS designed as tugs or firefighting vessels.

Mr Dean set out the international conventions that will apply to MASS, highlighting where they may have to be modified to accommodate MASS as all the conventions were drafted assuming crews on board. These include UNCLOS;[32] the conventions that limit liability for maritime claims;[33] the COLREGS;[34] the STCW Convention;[35] SOLAS;[36] the ISM Code;[37] LLC as amended;[38] TMC; [39] MARPOL; [40] LDC; [41] OSPAR; [42] the Paris MOU; [43] SUA Convention; [44] Intervention Convention 1969/1973; CLC and Fund Convention;[45] HNS Convention;[46] Bunker Convention;[47] Nairobi Wreck Removal Convention 2007; Collision Convention 1910; Salvage Convention 1989; Ship Registration Convention 1986; Arrest Convention; [48] Maritime Liens and Mortgages Conventions 1926/1967/1993. The Comité Maritime International has established an International Working Group (IWG) to identify legal issues surrounding the use of MASS. The group was currently analysing SOLAS, MARPOL, COLREGs, STCW, the Facilitation of Maritime

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[32] United Nations Convention on the Law of the Sea 1982.
[33] 1957 Brussels International Convention relating to the Limitation of the Liability of Owners of Sea-going Ships, Convention on Limitation of Liability for Maritime Claims 1976 and its 1996 protocol.
[34] International Regulations for Averting Collisions at Sea 1972.
[35] Convention on Standards of Certification Training and Watchkeeping.
[36] Safety of Life at Sea Convention 1974/1978/188.
[37] International Safety Management Code.
[38] Load Lines Convention 1966 as amended 1971, 1975, 1979, 1983, 1995, 2003.
[39] Tonnage Measurement Convention 1969.
[40] International Convention for the Prevention of Pollution from Ships 1973/1978.
[41] Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972/1996
[42] The Convention for the Protection of the Marine Environment of the North East Atlantic 1992.
[43] Memorandum of Understanding on Port State Control 1992.
[44] Suppression of Unlawful Acts Convention 1988.
[45] International Convention on Civil Liability for Oil Pollution Damage 1992.
[46] International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea 1996.
[47] International Convention on Civil Liability for Bunker Oil Pollution Damage 2001.
[48] International Convention relating to the Arrest of Seagoing Ships 1952.

Traffic Convention; the International Convention on Maritime Search and Rescue, SUA Convention, and Salvage Convention.

Aside from the international conventions, there were contractual and tort issues surrounding the introduction of MASS. Mr Dean suggested that, in the absence of national or international standards, English courts would likely give weight to industry codes of practice such as the MASRWG Voluntary Code of Practice.[49] There were also insurance issues and cyber events to consider. Mr Dean concluded that until there were statutory definitions of MASS or existing conventions extended to regulate MASS, there would always be ambiguity.

Smart Ports and Liabilities (Professor Dr Eric Van Hooydonk, University of Ghent)

Professor van Hooydonk presented on the subject of Smart Ports and the regulatory agenda. He described the 'perfect smart port' which will be characterised by calls by unmanned ships, automation of port operations, and digitalisation. Professor Van Hooydonk described a port where there are no people but automated much like a model train set. The presentation looked at the roles that will change or disappear with the advent of smart ports. Rather than a master on-board the ship, port authorities and port services will interact with a shore-based controller of the unmanned ship. This lead to the question how the shore-based controller (who was likely to be in another country) would interact with a port tug. The question also arose, who had command of the tow? This became more complex if the tug was also unmanned. Regulations and contracts would need to be reviewed.

[49] UK Maritime Autonomous Systems Regulatory Working Group.

The traditional responsibilities of the port manager would be automated in a smart port. For example, remote or autonomous operation of port locks, automatic surveillance of port bridges, and administrative processes would become increasingly digitized. This automation may help reduce corruption and 'facilitation money' practices in certain regions.

The harbour master's powers were found in domestic law and these regulations would need to be reviewed as traffic management, control and enforcement become automated. There were questions for international criminal law as well. For example, should the harbour master be authorised to give orders to and impose fines on a shore-based controller situated outside the jurisdiction?

Although the smart port and visiting ships would both be unmanned, the port security officer would still play an important role. Migrants, stowaways and terrorists would not disappear, thus the rules and port security would need to be reviewed.

VTS and pilotage may become merged and the local pilotage laws and regulations as well as the IMO recommendations on training and certification would need to be re-examined. Mooringmen or linesmen would disappear as mooring would be done by (already existing) automated vacuum mooring pads. As the jobs disappeared, liability issues might still arise. Port State Control rules would need to be reviewed. Freight forwarding was also predicted to look different as carriage contracts begin to be arranged digitally. Amazon had already been given an ocean-freight forwarding licence from China; freight forwarders may no longer be required.

Terminal operations were predicted to become fully automated with autonomous cranes, automated terminal trucks, smart stowage, warehousing robotics, blockchain technology to release containers (instead of pin codes) to truck drivers and eventually autonomous trucks.

This automation would lead to the elimination of the role of the classic dockworker and an increase in the transmission and exchange of data. Most of the issues in relation to data sharing could be dealt with contractually. Professor van Hooydonk concluded by highlighting that as port activities were regulated at a local or national level, no major updating of international rules was required.

4 Artificial Intelligence – Smart Ships (Chair: Dr Jur. Bülent Sozer, Piri Reis University, Turkey)

Smart Ships and Liabilities — The Elephant in the Room (Professor Bariş Soyer, Director IISTL, Swansea University)

Professor Soyer addressed the 'elephant in the room' with respect to smart ships, liabilities. He indicated that it was vital to discuss the liability of smart ships to third parties for two reasons. First, liability was interconnected with insurance. If there was uncertainty concerning the liability rules the cost was passed to insurers who in turn increased premiums. Second, the inability to predict liability costs on the part of manufacturers may hinder the development of the technology.

Professor Soyer suggested that a strict liability system would be appropriate for four reasons. One, there were a variety of things that can go wrong for a variety of reasons when a ship was navigating autonomously. Apportioning blame would be difficult, to the detriment of third party claimants. Two, a fault based system increased the number of parties involved in litigation, and thus increased transaction costs. Three, the public was unlikely to be receptive to the idea of handing responsibility to a machine. Professor Soyer drew a parallel between strict liability for smart ships and the strict liability regime for dangerous activities such as oil pollution or nuclear

damage. Four, strict liability not only protected personal and property rights of third parties but encouraged the production of more reliable systems.

Professor Soyer opined that, assuming a strict liability regime was adopted, the liability should be channelled to the shipowner (rather than the manufacturer). This would be sensible, he suggested, given the highly effective liability insurance mechanism already in operation for shipowners through P&I Clubs. This would allow shipowners to limit liability under the current Limitation Conventions. However Professor Soyer urged caution against allowing third parties to pursue the manufacturer directly as they were not subject to the Limitation Conventions and their liability could be unlimited. Professor Soyer further indicated that in the event of a shipowner seeking recourse against a manufacturer, that liability would be fault based.

In the event that two autonomous ships collided, one option was to simply apportion liability 50% each but that may not be justified if the incident occurred while in the control of an offshore operator. In that event, it may be justified to return to a fault based regime. This was similarly arguable for a collision when the autonomous ship was not in operation. The answers to these questions would affect the extent to which autonomous ships would be operated commercially.

Smart Ships — Product Liability (Professor Andrew Tettenborn, Swansea University)

Continuing the theme of the liability of autonomous ships, Professor Tettenborn discussed product liability and the effect of it on the use of electronics and cyber-control in the shipping world. The discussion centred on product liability based on negligence rather than strict liabililty. Professor Tettenborn argued that the underlying principles of the tort of negligence (the shipbuilders whose negligence results in damage to property can be sued by the owners of the property provided the loss is not too remote and causation is established) are likely to remain

unchanged. However the replacement of people by code and Electronic Data Interchange (EDI) was likely to affect three fields in particular.

The first was cargo documentation via the advent of blockchain and the digitisation of the process tracking of containers. The second was the care of cargo via automated system such as the monitoring of temperature levels in reefer transport, testing of atmosphere around bulk cargoes liable to overheating and combustion, and the stowage plans and their execution. The third was future use of unmanned ships (or the process of navigation increasingly using autonomous systems with a skeleton crew).

In Professor Tettenborn's view, product liability would not become more important in some areas of shipping litigation. For example, seaworthiness obligations; the carrier was already liable under the Hague and Hague-Visby Rules for the negligence of independent contractors. If the carrier relies on an apparently competent supplier of electronic controls and that supplier was negligent and rendered the ship unfit to carry the cargo safely, the carrier could not escape liability.

However, other aspects of the carrier's liability, such as collision, injury to crew, or under specific charters, relied on vicarious liability. But there was no such thing as a negligent computer. Therefore, it followed that if a computer malfunctioned, the shipowner was only liable for personal fault (for example failing to operate the device properly or if they ought to have known there was something wrong with it). The liability would shift to those who made the system onshore. Where the shipowner remained liable, the shore-based producer of the technology may

give further scope for third party proceedings against them. This may also provide an escape from the 'several liability rule' in collision cases.[50]

The most practical importance of third party liability was limitation. Shipowners may limit their liability subject to the LLMC 1976/1996 and this right is extended to 'owner, charterer, manager or operator'.[51] This did not cover a third party producer or provider of control services save where the entire control of an autonomous vessel had been delegated, for example to a shore control centre, in which case the delegate might be classed as the operator. Product liability claims were not covered.[52]

The 1985 Product Liability Directive (EU) created strict liability for damage caused by any defect present in a 'product' at the time of manufacture. The liability attached to the manufacturer. Professor Tettenborn explained that the Directive had limited application as it was restricted to claims for personal injury and damage to domestic property. Further, it only applied to products, not services. This raised problems as to whether computerised control systems were products or services. Professor Tettenborn's view was that a failure in hardware due to a defect existing at the time of manufacture would be a product and subject to strict liability whereas code written on a screen and transmitted must be regarded as a service.

For the reasons given, the practical impact of product liability law on autonomous shipping may be modest. Nevertheless, Professor Tettenborn urged practioners to take note of it.

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50 Merchant Shipping Act 1995 (UK), s 187(1).

51 Arts 1(2), 1(4).

52 Although the decision in the *Marc Rich & Co AG v Bishop Rock Marine Co Ltd (The Nicholas H)* [1996] AC 211 muddies the waters in this respect.

5 Artificial Intelligence – Smart Ships (Chair: Professor Guohua Wang, Head of School of Law, Shanghai Maritime University)

Who is the Master Now? Regulatory and Contractual Challenges of Autonomous Ships (Professor Simon Baughen, University of Swansea)

Professor Baughen began session five with a discussion of the role of the master and autonomous ships. Professor Baughen provided an overview of regulation and the master pointing out that 'master' is not defined in any international convention. National laws provided various definitions, for example, in the UK 'master' is 'every person (except a pilot) having command or charge of a ship'.[53] The definition in itself did not require an on-board presence and could include the shore based controller (SBC) as remote operator of the ship. Fully autonomous ships would not be included as there would no longer be a person in command or in charge if the ship was navigating using artificial intelligence. However other jurisdictions defined 'master' to require an on-board presence.

Professor Baughen also discussed manning requirements under UNCLOS and SOLAS, highlighting two specific difficulties found in SOLAS Chapter V. First, Regulation 24 required reversion to manual steering in hazardous navigational situations. Second, Regulation 15 dealt with the requirements for Bridge layout and contemplated a physical bridge on the vessel. However, Regulation 3(2) permitted an administration to grant exemptions where the absence of navigational hazards and other conditions rendered the full application of Chapter V 'unreasonable or unnecessary' and it was arguable that the existence of a virtual bridge ashore would make this provision unnecessary.

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[53] Merchant Shipping Act 1995 (UK), s 313.

The next challenge examined by Professor Baughen was the application of the COLREGs. There were three regulations where COLREGs presents a challenge for the compliance of unmanned vessels. Rule 2 gave precedence to good seamanship over COLREG provisions and this presupposed the exercise of human judgment. If the SBC was making decisions, this provision was satisfied, but not for a fully autonomous vessel. Rule 5 required lookout by sight and hearing. While this required human agency, it did not require the human to be on board but a completely autonomous vessel would not comply. Rule 18 provided the responsibilities between vessels and required that power vessels must give way to all other vessels unless the vessel was not under command or restricted in her ability to manoeuvre. Although it has been argued that manned vessels ought to give way to unmanned vessels because they were not under command or restricted in their ability to manoeuvre, Professor Baughen argued that this would only be the case in a situation where the vessel has lost communication with the shore, but not because of the nature of the vessel itself. Accordingly, unmanned vessels would be subject to the same priority.

The master was subject to personal obligations. Three conventions[54] imposed a personal duty on the master to render assistance to persons in distress at sea. However, the obligation was not absolute and limited to in so far as reasonable or without serious danger to the ship.

In addition, the master had documentary obligations. For example, reporting obligations under MARPOL and requirements that a 'blue card' is kept on board as evidence of compliance with mandatory insurance provisions. The UK's implementing legislation[55] required the certificate to be carried on board and produced on demand. Failure to do so rendered the master liable on summary conviction to a fine.

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[54] UNCLOS art 98(1), SOLAS ch V, reg 33, Salvage Convention 1910, art 11 and Salvage Convention 1989, art 10(1).

[55] Merchant Shipping (Compulsory Insurance of Shipowners for Maritime Claims) Regulations 2012, SI 2012/2267.

Although the STCW Convention 1978 applied to seafarers serving on board seagoing vessels and prima facie would not apply, the Convention placed an obligation on flag administrations to: 'require the master of every ship to ensure that watchkeeping arrangements are adequate for maintaining a safe watch'. This was implemented in the UK through the Merchant Shipping (Standards of Training Certification and Watchkeeping) Regulations 2015. These regulations required a physical presence on the bridge and required a ship to have a safe manning document which must be kept on board a ship at all times. The master must ensure the ship does not proceed to sea unless the safe manning document is on board. Neither requirement could be met by an unmanned ship. However the Secretary of State might grant exemptions from all or any of the provisions and presumably exemptions could be granted provided the Secretary of State was prepared to accept watchkeeping on the virtual bridge and prepared to accept an electronic version of the safe manning document.

Professor Baughen also considered how charterparty contracts would need to be amended to accommodate unmanned ships using the examples of NYPE 2015 and GENCON 1994. There would no longer be an onboard master to sign bills of lading, supervise cargo operations or receive instructions from time charterers. However, he suggested that this should not pose a serious problem because the shipowners' contractual obligations remained the same irrespective of who was navigating or signing bills of lading. Professor Baughen recommended that all references to the master in charterparties and bills of lading be removed and replaced with references to owners.

Cargo Operations and Autonomous Ships (Dr Frank Stevens, Erasmus University)

Dr Stevens turned the discussion to cargo obligations and the carrier's liability with respect to unmanned and autonomous ships. Dr Stevens ran through the history of cargo ships and pointed out that there was nothing new in cutting back on crew but said it was important to distinguish

between remote controlled and fully autonomous vessels. Neither had a crew on board but a remote controlled vessel was permanently monitored and controlled from the shore whereas an autonomous vessel's control system would make decisions without human intervention.

The law required that a person whose business it was to carry goods by sea must do so with a seaworthy ship. At common law this was an absolute duty, while under the Hague and Hague-Visby Rules the shipowner must only exercise due diligence before and at the beginning of the voyage. Seaworthiness included the crew. The crew was there to make sure the cargo was carried safely – crew was a means to that end, not an end in itself. Seaworthiness was a relative concept. The ship must be reasonably fit for the voyage, and care taken to ensure this was the standard of the prudent shipowner. A ship was only unseaworthy if the crew were incompetent or inefficient and a reasonably prudent owner, if they were aware of the incompetence or inefficiency, would not have put to sea.[56] The level of incompetence or inefficiency means disabling want of knowledge or disabling want of skill.[57] Unseaworthiness cases arising because of the crew were relatively rare.

For remote controlled vessels, the remote operators, arguably, equalled a crew and, as such, covered by the proper manning requirement of Art III, r 1(b) of the Hague-Visby Rules. Therefore they must be trained and knowledgeable of control systems; the vessel itself; and nautical rules such as COLREGs. Dr Stevens suggests that it was useful to have a STCW Convention for shore based controllers. Experience in manning ships, that is, sea-going experience would probably be required initially. If, however, unmanned ships took off, there would be few manned vessels left on which to train. Therefore, it was likely that training programs and systems would be required. Dr Stevens argued that NASA's control centre did not rely exclusively on astronauts who had actually been into space.

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[56] *Hong Kong Fir Shipping Co Ltd v Kawasaki Kisen Kaisha Ltd (The Hongkong Fir)* [1962] 2 QB 26.

[57] *Standard Oil Co of New York v Clan Line Steamers (The Clan Gordon)* [1924] AC 100.

The Hague and Hague-Visby Rules only required the shipowner to exercise due diligence in selecting and training the shore based controllers before and at the beginning of the voyage. Dr Stevens pointed out when the Rules were drafted once the ship had put to sea, there was little that the shipowner could do until the ship the ship called at the next port. With advances in communication technology, that logic had largely disappeared. If a ship was remotely controlled then the logic was absent. Dr Stevens, therefore, submitted that the seaworthiness obligation in respect of manning should be continuous for an unmanned ship. This could be done by reading a good faith obligation into carriage contracts in civil law jurisdictions and in common law jurisdictions an implied term could be read into the contract of carriage. As an example, inefficient operators would be replaced as soon as their inefficiency became apparent.

Fully autonomous vessels do not have any crew at all. What was meant by properly manned was relative and goal based. For the Hague and Hague-Visby Rules, all that was required was that the ship was manned to a level that was reasonably suited to carry cargo on the intended voyage. The standard was not perfection but due diligence which would lie in the selection of the systems used, the appraisal of the reliability and robustness of those systems, their protection against hacking, and cybercrime etc.

If the system malfunctioned and caused loss or damage to the cargo, the Hague and Hague-Visby Rules provided that the carrier would not be liable provided it had exercised due diligence in selecting the systems. Dr Stevens contrasted this with the situation under the CMR where a road carrier could not use the defective condition of its vehicle as a defence.

Dr Stevens submitted that where something went wrong with an autonomous ship and the owner could intervene, then they should intervene. It was arguable they were under a legal duty to do so.

One concern regarding autonomous ships was that it would become more difficult for a claimant to obtain information in legal proceedings. With cargo claims, however, this was less of a concern. If goods arrived damaged, the carrier was presumed liable and the burden of proof fell upon the carrier and not the claimant to prove an exemption.

Dr Stevens considered how the obligation to care for cargo could be fulfilled when no crew was on board a ship. This, he submitted, was not as unsolvable as it might seem. The obligation was a relative obligation which required the goods to be carried in accordance with a sound system.[58] This would depend on the type of cargo, measures required during the voyage, and the industry practices that would develop in the future. In addition, much of the care for the cargo had already come ashore. The only real problem was responding to problems or emergencies and, in that regard, the role of the crew was shrinking.

Under the Hague and Hague-Visby Rules, errors of the crew members in the navigation or management of the ship was a defence that could be raised by the carrier. This was the nautical fault exemption.[59] Dr Stevens argued that this defence was still available for remote controlled vessels, but not for fully autonomous vessels. This was because the system was not a legal entity and could not be considered a servant of the carrier. Software not doing what we want it to did not mean that someone had made a mistake and that the nautical fault exemption was unavailable. If there was fault on the part of the software developer this error was not in navigation or management of the ship and, therefore, there was no nautical fault defence.

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[58] *Volcafe Ltd v Cia Sud Americana de Vapores SA (trading as CSAV)* [2016] EWCA Civ 1103, [2017] QB 915.

[59] Hague and Hague-Visby Rules, art IV, r (2)(a).

Regulating Autonomous Cars — Lessons for the Shipping Sector (Dr George Leloudas, Swansea University)

Dr Leloudas discussed the regulation of autonomous cars to provide a comparison with and lessons for the regulation of autonomous ships. Autonomous cars were expected to operate within the next fifteen years. The advantages were argued to be reduction of serious accidents, reduction of traffic delays, reduction in CO2 emissions, and improving transportation accessibility for the elderly and people with disabilities.

There were five levels of automation in cars ranging from no automation to full automation. The Vienna Convention on Road Traffic 1968 required that a driver was always in control[60] and in all circumstances have his vehicle under control.[61] This was amended in 2016 to open the door to assisted driving but not full automation.[62]

The first car at Level 3 automation was the Audi A8 with an AI traffic jam pilot. The car can drive and change lanes in slow moving traffic up to 60km/h (the German Road Traffic Act has been amended to permit Level 3 and Level 4 cars). Dr Leloudas explained that insurers did not like level 3 automation as people needed longer to react to dangerous situations. Insurers were happy

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[60] Art 8(5).

[61] Art 13(1).

[62] The amendments in Article 8(5) bis read: Vehicle systems which influence the way vehicles are driven shall be deemed to be in conformity with paragraph 5 of this Article and with paragraph 1 of Article 13, when they are in conformity with the conditions of construction, fitting and utilization according to international legal instruments concerning wheeled vehicles, equipment and parts which can be fitted and/or be used on wheeled vehicles. Vehicle systems which influence the way vehicles are driven and are not in conformity with the aforementioned conditions of construction, fitting and utilization, shall be deemed to be in conformity with paragraph 5 of this Article and with paragraph 1 of Article 13, when such systems can be overridden or switched off by the driver.

with levels 1-2 (where the driver is actively controlling the vehicle) and levels 4-5 (high to full automation).

In the UK, the Automated and Electric Vehicles Act 2018 imposed a strict liability regime for autonomous cars. However, it was unclear when at what level of automation strict liability applied. The Act applied to cars 'adapted to be capable, in at least some circumstances or situations of safely driving themselves'[63] and liability was triggered where 'an accident is caused by an automated vehicle when driving itself…'[64] Dr Leloudas explained that human errors fall into the pre-existing fault based regime and the line would not be clear when a level 3-4 car is involved in an accident. Dr Leloudas concluded that autonomous vehicle technology was innovative but not revolutionary. A fault liability regime would not contribute to enhancing safety standards and potentially would delay the deployment of autonomous vehicles.

6 Legal Tech and Shipping and Insurance (Chair: Professor Iwan Davies, Senior Pro-Vice-Chancellor, Swansea University)

Technology and Disclosure in Shipping Litigation (Peter Eggers QC, 7 King's Bench Walk, London)

Mr Eggers' presentation involved largely the electronic disclosure procedure of shipping disputes in the UK.

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[63] Automated and Electric Vehicles Act 2018 s 1(a).

[64] Ibid, s 8(1)(a).

The starting point was the Practice Direction 31B – Disclosure of Electronic Documents – which was developed following the Cresswell Report 2004.[65] He discussed the various obligations as set out in Practice Direction 31B, such as the provision of any available searchable Optical Character Recognition (OCR) versions of Electronic Documents with the original.[66]

Mr Eggers explained that the electronic disclosure exercise entailed considerations of proportionality, volume and cost,[67] reviewing the cache of documents and determining the relevance of documents.[68] He informed those present that there was now a Disclosure Pilot for the Business and Property Courts in England and Wales, with a reformed disclosure procedure, and discussed some of its features. Additionally, he mentioned that there might be other categories of relevant documentation from electronic sources, and, due to the numerous technological advances in the management and operation of commercial shipping operations, there might be additional considerations concerning the parties' electronic disclosure obligations. Interestingly, he identified that for VHF sound recordings, it was necessary to not just disclose the automated transcript, but also the audio recording, because a conversation transcript may not reveal whether a statement is a question or an answer, especially in languages like Greek.

Mr Eggers concluded by suggesting that the electronic nature of documentation expands the nature of the exercise; it requires active case management to control that expansion, in shipping litigation, and indeed in all commercial litigation.

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65 This was a report prepared by Mr Justice Cresswell in 2004.

66 Paragraph 34 of the Practice Direction.

67 While a more rigorous system should be adopted, it does not mean that the approach to disclosure must 'leave no stone unturned': *Digicel (St Lucia) Ltd v Cable & Wireless plc* [2008] EWHC 2522 (Ch), [2009] 2 All ER 1094, [46]; *Smailes v McNally* [2014] EWCA Civ 1299, [42].

68 Predictive coding, where the relevance of a document is determined on a points basis by software analysis rather than human judgment, may be deployed in this endeavour: *Pyrrrho Investments Limited v MWB Property Limited* [2016] EWHC 256 (Ch), [16]–[24], [31]; *Brown v BCA Trading Limited* [2016] EWHC 1464 (Ch), [10]–[11].

Insurance and Artificial Intelligence – Underwriting, Claims and Litigation (Simon Cooper, Ince and Co LLP)

Mr Cooper introduced Artificial Intelligence (AI), which was perceived as the seventh most pressing business risk — higher than political risk and climate change. His discussion focused on the current and future use of AI in insurance, the challenges that Insurtech posed for insurer and insured, and the legal challenges of using AI and the implications for buyers and sellers of insurance.

Mr Cooper identified several developments in Insurtech, such as Usage Based Insurance (UBI), gamification and Robotic Process Automation (RPA). UBI employed machine learning and algorithm which were used to analyse the insurer's own data and external information from a broad range of sources to generate a bespoke risk score, enabling the creation of personalised policies and the elimination of delay and repetitive tasks using UBI in the underwriting process. There were numerous innovative applications of UBI, such as pay as you drive insurance and pay how you drive insurance.[69] Gamification adopted gaming elements to strengthen the relationship between the insurer and the insured, using risk management elements, for example, Fitbit targets in life insurance. RPA would lead to speedier underwriting decisions and quicker issuing of policy documentation, producing insurance quotations in real time.[70] However, improved AI was likely to lower the cost of developing malware and other forms of cyber-attack, making AI and cyber related losses more likely; this might result in an increased demand for cyber insurance.

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[69] Pay how you drive insurance can use telematics to monitor the insured driver's habits such as the speed preferences on different kinds of roads, braking and accelerating habits, breaks on long drives, time on motorways, and location.

[70] RPA and chatboxes interrogate the insured concerning key variables to obtain highly personalised data. This is processed this with big data, which can be obtained from location based sensors such as smart thermostats and geographical information systems, and achieves a bespoke risk assessment using machine learning and algorithms.

On claims handling, Mr Cooper explored the impact of AI, which would speed up claims handling, and its interaction with s 13A Insurance Act 2015 on payment of claims by the insurer within reasonable time. He considered whether computer systems failure arising from virus or malware would qualify as a reasonable delay. Additionally, he recognised that AI might be a double edged sword — it might assist insurers to identify fraudulent claims, but might also assist fraudsters to trigger unjustified claims payment.

Mr Cooper identified the challenges of AI for the various stakeholders. The insurer faced data protection, discrimination,[71] disruption and unpredictable exposure issues. The insured faced anti-selection and writing down issues, though they also enjoyed the benefit of quicker and more focused insurance cover. The intermediary faced irrelevance and changing business model issues. For legal challenges, one of the most important questions was liability: where did liability rest for damage caused by malfunctioning AI.[72] The follow up question was who[73] was liable[74] for damage[75] caused by the decisions taken by AI?

Mr Cooper concluded with some legal developments in the UK[76] and EU,[77] before discussing philosophical issues concerning AI made decisions and the classic trolley problem.[78]

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[71] Machine learning has a tendency to discriminate in general, on gender, on ethnicity etc.

[72] There were three models to characterise the legal personality of AI: (i) animal model, (ii) company model, and (iii) robots with legal personalities.

[73] There were three possible suspects for the person liable: (i) the person who provides the data, or (ii) the person who built the AI, or (iii) the person who validated the data.

[74] eg, contractually or in tort.

[75] This leads to a question as to what is the test for the foreseeability of the risk of the damage.

[76] For example, the Automated and Electric Vehicles Act 2018. See also, Artificial Intelligence Committee, *AI in the UK: ready willing and able* (HL 2017–19, 100).

[77] For example, European Civil Law Rules in Robotics.

[78] The trolley problem is concerned with the philosophical conundrum trying to decide who survives and who does not. It calls into question the legality of AI to perform this task and also blurs the distinction as to whether an insurer is actually insuring a loss or predicting a loss; the risk element disappears.

Conclusion

The fascinating and thought-provoking discussions on wide ranging issues concerning shipping law and technology made participation at the colloquium a rewarding one. There were several recommendations for reforms, in order to enable commercial law to progress with new technological developments. While the sessions were mostly UK and EU centric, the well-attended gathering of international legal experts at the colloquium provided an excellent opportunity for the CML researchers to study the trends abroad, enabling them to produce more informed research, and hopefully, proposals for reform, closer to home. The colloquium closed with the announcement that the Institute of Shipping and Trade Law's Library would be named after Associate Professor Theodora Nikaki (1972–2018).