A Study of The Possible Impacts of Artificial Intelligence on the Current Regulations

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The PhD course is considered a long academic journey, and its details are written between the first and final pages of this thesis. The core of this academic journey, as it can be said, is spending the most time in pursuit of knowledge and providing a solution for research legal issues. This journey, nevertheless, was not without challenges. Navigating the challenges of the journey and pushing the research forward into a new normal is not an easy task, sometimes. However, I count myself fortunate to work under the supervision of Dr Richard Caddell, and my heartfelt thanks to him. Throughout my PhD journey, I learned and benefited from his guidance and expertise. He was a supportive, helpful, and welcoming supervisor. This thesis could not have been completed without his support. Indeed, there are no proper words to express my profound gratitude and respect for my lead academic supervisor, Dr. Richard Caddell. I would like also to express thanks to my second academic supervisor Dr John Lewis for his guidance and advice. At the first meeting, Dr. Lewis advised me to start writing and provided me with some sources to read. I took his advice seriously and started to write this thesis from that time. Despite how many times I revised the chapters of this thesis, I found that writing at the beginning of a PhD course is an effective approach. Dr. Tianyi Jiang, who acted as the Review Panel Convenor, must be thanked for her efforts.

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Abstract

This thesis considers the potential impact of Artificial Intelligence systems on the current regulations. Artificial Intelligence is a broad concept and its integration into the public and private sectors has been increasing. It will be used to replace human labor and its applications are many, such as robots, autonomous cars, and autonomous system vessels. Connected to this, it might be accepted to say that self-driving or self-navigation vessels would not exist without artificial intelligence systems. These systems are a trend worldwide at the current time and a hot topic due to their expected opportunities and risks. This study investigated autonomous systems vessels and it argues that there is a lack of a comprehensive legal framework for artificial intelligence systems and said vessels. In addition, this thesis examined the current legal framework concerning the operation of said vessels and argued that there are regulatory gaps and barriers. For example, remote control centers and remote masters are considered new concepts, their definitions, roles, and functions are not regulated in the current regulations. This is a legal gap that needs to be addressed. In the legal barriers context, it is not clear whether or not said vessels could fit under the current legal definition of a vessel. This thesis also argued that the registration and navigational rights are questionable. Additionally, the vicarious liability regime is not an appropriate legal ground to cover the expected risks of said vessels. Put simply, vicarious liability is designed to cover employee fault and artificial intelligence is not an employee, it is also neither a natural person nor a legal person, it is a system. Therefore, it is recommended that strict liability could be appropriate legal ground for a compensation claim that may arise from said system risks. These arguments may have implications for developing the current legal framework in the future. To sum up, the operation of said vessels requires a new legal framework or amendment to the current one and in this regard, much will be said in this thesis.

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CHAPTER ONE

INTRODUCTION

1.1 Background

Today, the world is witnessing rapid developments in technology. This development has been described repeatedly as the fourth industrial revolution.[1] As a result, Big Data Analytics, the Internet of Things (IoT), and Artificial Intelligence (AI) use have started to expand into the structure of public and private sectors, and smart cities can be taken as an example.[2] The integration of both information technology (IT) and operational technology (OT) constitutes a fundamental element of the digital transformation process in any application area.[3] However, it can be said that the digital transformation will unavoidably accompanied by an impact. This impact is expected to substantially change the current practice in which consumers, industries, or businesses operate. As evidence, these technological developments have been seen to be disruptive to the current practice as critiqued by Simon Baughen.[4] Linguistically, the words 'disruptive technology' used "*to describe any situation in which an industry is shaken up and previously successful incumbents stumble"* by many researchers and consultants.[5] The notion is that transformative technologies developed further and integrated into many sectors such as healthcare, education, and also military.[6] The development is moving forward. Even the shipping

[1] Mehrangiz Shahbakhsh, Gholam Reza Emad, and Stephen Cahoon, 'Industrial Revolutions and Transition of the Maritime Industry: The Case of Seafarer's Role in Autonomous Shipping' (2021) 38 The Asian Journal of Shipping and Logistics 10.
[2] Georgios Kavallieratos, Vasiliki Diamantopoulou, and Sokratis K. Katsikas, 'Shipping 4.0: Security Requirements for the Cyber-Enabled Ship' (2020) Vol 16(10) IEEE 6617.
[3] Ibid.
[4] Simon Baughen, 'Disruptive Technologies, Climate Change and Shipping Law' (Swansea University, 2020).
[5] Joakim Stromberg and Philip Thorman, 'Disruptive Innovation Theory in the Paper – and Packaging Industry: Applying Clayton Christensen in a New Context' (Master Thesis, Uppsala University, 2019) 15.
[6] Roman Dremliuga and Mohd Hazmi bin Mod Rusli, 'The Development of the Legal Framework for autonomous Shipping: Lessons Learned from a Regulation for a Driverless Car' (2020) Vol 13(3) Journal of Politics and Law 295.

industry, which has traditionally been viewed as conservative [7] and relies on traditional principles,[8] is not immune from the impact of artificial intelligence systems.[9] To be precise, several academic scholars pointed accusing fingers at artificial intelligence, as the main driver behind disruptive technologies.[10]

Artificial intelligence indicates a wide range of applications, leading-edge analytics, and logic-based approaches that imitate human behavior, and processes including learning, decision-making, and problem-solving.[11] Therefore, it can be said that artificial intelligence plays an important role in the operation of autonomous system vessels,[12] autonomous cars,[13] robots,[14] and drones.[15] In other words, said innovations are considered significant applications of artificial intelligence systems. In addition, the phrase artificial intelligence in its simplest terms can be understood as the process of simulating human intelligence via machine processes, according to Baris Soyer and Andrew Tettenborn.[16] Machine learning (ML), which is known as a branch of artificial intelligence, uses algorithms to give the above-mentioned innovations the ability to

[7] Louise Vogdrup-Schmidt, 'The Shipping Industry Is Too Conservative And Passive' (Shipping Watch, 23 June 2015) < https://shippingwatch.com/Services/article7817989.ece > accessed 13 March 2021.
[8] A. v.raghav Sharma, 'Maritime Autonomous Surface Ships: Caught Between the Devil's Advocate and the Deep Blue Sea' (Master Dissertation, World Maritime University, 2019) 1.
[9] K. Wróbel & A. Weintrit, 'With Regard to the Autonomy in Maritime Operations – Hydrography and Shipping, Interlinked' (2020) TRANSNAV Journal 745.
[10] Vasile-Daniel Pavaloaia and Sabina-Cristiana Necula, 'Artificial Intelligence as a Disruptive Technology – A Systematic Literature Review' (2023) 12(5) MDPI 1.
[11] Nikolaos-Alexandros Preifanis and Fotis Kitsios, 'Investigating the Influence of Artificial Intelligence on Business Value in the Digital Era of Strategy: A Literature Review' (2023) Vol 14(2) MDPI 1.
[12] Erik Veitch and Ole Andreas Alsos, 'Human-Centered Explainable Artificial Intelligence for Marine Autonomous Surface Vehicles' (2021) Vol 9(11) Marine Science and Engineering 1.
[13] Mohsen Soori, Behrooz Arezoo, Roza Dastres, 'Artificial Intelligence, Machine Learning and Deep Learning in Advanced Robotics, a Review' (2023) Vol 3 Cognitive Robotic 54.
[14] Ibid.
[15] Hicham Slimani, Jamal El Mhamadi, and Abdelilah Jilbab, 'Assessing the advancement of Artificial Intelligence and Drones' Integration in Agriculture Through a Bibliometric Study' (2024) Vol 14(1) International Journal of Electrical and Computer Engineering (IJECE) 878.
[16] Baris Soyer and Andrew Tettenborn, *Artificial Intelligence and Autonomous Shipping: Developing the International Legal Framework* (1st edn, Hart Publishing, 2021) 1.

learn from data with the possibility of programming said innovations for object identification and path planning.[17] In addition, artificial neural networks will be used in deep learning, which is a type of machine learning, in order to help computers learn from volumes of data.[18] Together, these technologies will enable the development of autonomous systems to perform a wide range of tasks.[19]

In this study, the focus will be on the expected impact of autonomous system vessels on the current regulations in Saudi Arabia. These vessels are designed with the ability through artificial intelligence in order to make their own navigational decisions in addition to the ability to make actions autonomously.[20] This system will be used to replace the master and crew on board the vessel. The arguments in favor of said vessels are that the introduction of said vessels will reduce operation costs, decrease environmental risk related to such vessel operations, and also will reduce vessel collisions which are mainly based on human errors.[21] However, these arguments will not be evaluated in this thesis because they are technical and economic arguments. This thesis will present that the legal status of autonomous system vessels is not clear. It is not clear because said vessels are a new concept and different from the traditional vessels. Therefore, it is not an exaggeration to say that the law for said vessels is not written yet. As evidence, both international regulations and many national regulations do not provide legal definitions for said vessels. According to Erica Yvonn Jungblut, the introduction of said vessels will trigger two

[17] Mohsen Soori, Behrooz Arezoo, Roza Dastres, 'Artificial Intelligence, Machine Learning and Deep Learning in Advanced Robotics, a Review' (2023) Vol 3 Cognitive Robotic 54.
[18] Ibid.
[19] Ibid.
[20] Baris Soyer and Andrew Tettenborn, *Artificial Intelligence and Shipping Autonomous Shipping: Developing the International Legal Framework* (1st edn, Hart Publishing, 2021) 1.
[21] R. Glenn Wright, *Unmanned and Autonomous Ships: An Overview of MASS* (1st ed, Routledge , 2020) 21.

opposing issues namely, there is a lack of international regulations governing said vessels and the international community needs to test whether or not the autonomous systems are as safe as conventional vessels.[22]

At an international level, the International Maritime Organization (IMO) has positively engaged in the discussion regarding the prospect of the said vessel.[23] This engagement can be described as the first step from the IMO,[24] and the aim of this step was to understand the magnitude of the issues that required to be addressed.[25] In June 2017, the Maritime Safety Committee's (MSC), at its 98th session, noted that the technological solutions were being developed with the lack of clarity on the correct application of existing IMO instruments.[26] The MSC discussed how said vessels can operate safely, securely, and environmentally sound.[27] This discussion ended by that "*the use of Maritime Autonomous Surface Ships (MASS) creates the need for a regulatory framework for such ships and their interaction and co-existence with manned ships. This document invites the Committee to undertake a regulatory scoping exercise to establish the extent of the need to amend the regulatory framework to enable the safe, secure and*

[22] Erica Yvonn Jungblut, 'The First Step in Regulating Autonomous Ships: An Assessment on the Interim Guidelines Maritime Autonomous Surface Ships Trials and Its Legal Significance in International Regulatory' (Master Thesis, The University of Norway, 2020) 1.

[23] Tiago Vinicius Zanella, 'The Environmental Impact of the Maritime Autonomous Surface Ships' (2020) 17(39) Veredas do Direito 396.

[24] International Maritime Organization, 'IMO Takes First Steps to Address Autonomous Ships' (IMO, 25 May 2018) < https://www.imo.org/en/MediaCentre/PressBriefings/Pages/08-MSC-99-MASS-scoping.aspx> accessed 17 February 2021.

[25] Oda Loe Fastvold, 'Legal Challenges for Unmanned Ships in International Law of the Sea' (Master Dissertation, The Arctic University of Norway, 2018) 2.

[26] International Maritime Organization, 'Autonomous Ships: Regulatory Scoping Exercise Completed' (IMO.org, 25 May 2021) <https://www.imo.org/en/MediaCentre/PressBriefings/pages/MASSRSE2021.aspx> accessed 13 April 2024.

[27] Maritime Safety Committee, Maritime Autonomous Surface Ships Proposal for a Regulatory Scoping Exercise, (MSC 98/ 20/2)<https://mlaus.org/wp-content/uploads/bp-attachments/6563/MSC-98-20-2-Maritime-Autonomous-Surface-Ships-Proposal-for-a-regulator...-STP.pdf> accessed 12 April 2021.

environmental operation of MASS within the existing IMO instruments."[28] In the IMO's strategic plan for 2018 to 2023, the issues surrounding said vessel were expected to be identified.[29] This strategic plan has also mentioned to a crucial strategic objective which is to "*integrate new and advancing technologies in the regulatory framework*".[30] This can be seen as a big-picture goal to pave the way for the said vessel.

In May 2018, the Maritime Safety Committee's (MSC), at its 99th session, started to develop a framework for the Regulatory Scoping Exercise (RSE).[31] In December 2018, the MSC approved the framework for RSE, at its session MSC 100.[32] This framework contained definitions, and degrees of autonomy, in addition to a methodology for conducting the exercise and plan of work.[33] The aim of this RSE is to review the current regulations and identify legal barriers, knowledge and legal gaps, and also attempt to find out how these issues could be addressed.[34] Addressing legal issues can be done by either adjusting the current regulations or developing new codes.[35] In June 2019, the Maritime Safety Committee's (MSC), at its the 101st session,

[28] Maritime Safety Committee, Maritime Autonomous Surface Ships Proposal for a Regulatory Scoping Exercise, (MSC 98/ 20/2)<https://mlaus.org/wp-content/uploads/bp-attachments/6563/MSC-98-20-2-Maritime-Autonomous-Surface-Ships-Proposal-for-a-regulator...-STP.pdf> accessed 12 April 2021.
[29] Björn Pundars, 'Autonomous Shipping in Changing the Structures: Future Implications on Maritime Education and Training' (Master Thesis, The *Novia University* of Applied Sciences, 2020) 17.
[30] A.v.raghav Sharma, 'Maritime Autonomous Surface Ships: Caught Between the Devil's Advocate and the Deep Blue Sea' (Master Dissertation, The World Maritime University, 2019) 1.
[31] International Maritime Organization, 'Autonomous Ships: Regulatory Scoping Exercise Completed' (IMO.org, 25 May 2021) <https://www.imo.org/en/MediaCentre/PressBriefings/pages/MASSRSE2021.aspx> accessed 13 April 2024.
[32] Ibid.
[33] International Maritime Organization, 'IMO Takes First Steps to Address Autonomous Ships' (IMO, 25 May 2018) < https://www.imo.org/en/MediaCentre/PressBriefings/Pages/08-MSC-99-MASS-scoping.aspx> accessed 17 February 2021.
[34] Dr Katrina Kemp, Robert Veal, and James M. Turner, 'Autonomous Ships: Policy, Regulation, and Liability' (24 February 2021) <https://www.youtube.com/watch?v=cmvhlO5j3cg > accessed 2 March 2021.
[35] Ibid.

approved the 'Interim Guidelines for MASS Trials'[36] The aim of these Guidelines is to assist, *inter alia*, coastal State, flag State, and also port State to ensure that said vessel systems and related infrastructure are conducted securely, safely, and with due regard for the protection of the environment.[37] The obligations and responsibilities of the relevant coastal State, flag State, and also port State with respect to autonomous system vessel trials are established by the individual instruments.[38] It is the responsibility of a flag state administration to authorize a vessel to participate in a trial.[39] The MSC indicated that compliance with the intent of mandatory instruments must be ensured and the on board and remote control operators must be qualified for operating said vessels subject to the trial, among others.[40] These Guidelines indicate an explicit endorsement on behalf of the maritime community to regulate the said vessels.[41]

In May 2021, the Regulatory Scoping Exercise (RSE) for safety treaties was completed by the MSC, at the 103rd Session of the IMO MSC,[42] and approved a circular providing the outcome.[43] This outcome highlights a number of high-priority issues that need to be addressed.[44] This includes that there is a need to develop terminology and definitions for said vessels.[45] There is

[36] International Maritime Organization, 'Autonomous Shipping' (IMO.org, 14 June 2019) <https://www.imo.org/en/MediaCentre/HotTopics/Pages/Autonomous-shipping.aspx> accessed 20 April 2024.
[37] International Maritime Organization, 'Autonomous Shipping' (IMO.org, 14 June 2019) <https://www.imo.org/en/MediaCentre/HotTopics/Pages/Autonomous-shipping.aspx> accessed 20 April 2024.
[38] Ibid.
[39] Ibid.
[40] Ibid.
[41] Erica Yvonn Jungblut, 'The First Step in Regulating Autonomous Ships: An Assessment on the Interim Guidelines for Maritime Autonomous Surface Ships Trials and its Legal Significance in the International Regulatory Landscape' (Master Thesis, The University of Norway, 2020) 19.
[42] IMO (n 36).
[43] International Maritime Organization, 'Maritime Safety Committee, 103rd session (MSC 103) (IMO.org, 14 May 2021) <https://www.imo.org/en/MediaCentre/MeetingSummaries/Pages/MSC-103rd-session.aspx> accessed 18 April 2024.
[44] International Maritime Organization, 'Autonomous Ships: Regulatory Scoping Exercise Completed' (IMO.org, 25 May 2021) <https://www.imo.org/en/MediaCentre/PressBriefings/pages/MASSRSE2021.aspx > accessed 18 April 2024.
[45] Ibid.

also a need for an internationally agreed definition.[46] In addition, the meaning of 'crew', 'master', and also defined 'responsible person' for the operation of said vessels should be clarified.[47] Other essential issues comprise addressing the functional and operational requirements of the remote control center and the possibility of regarding remote control operators as seafarers.[48] In addition, common potential gaps were identified across several safety treaties related provisions containing manual operations; provisions related to actions by personal; and watchkeeping.[49]

In October 2021, at its Session 104th, the MSC agreed to adopt goal-based instruments for said vessels, and the MASS Working Group should be re-established, starting at MSC 105.[50] The phrase goal-based instruments can be taken to mean a high level of standards and procedures that must be met through regulations. Therefore, said instrument can take the form of a MASS Code, and address the numerous gaps and themes found by the RSE.[51] In June 2023, further progress on the development of a goal-based instrument to regulate the autonomous system vessels was made.[52] At its MSC 107 session, the MSC noted that the Joint Maritime Safety Committee, Legal Committee Group, and Facilitation Committee (MSC-LEG-FAL) Working Group on Maritime

[46] International Maritime Organization, 'Autonomous Ships: Regulatory Scoping Exercise Completed' (IMO.org, 25 May 2021) <https://www.imo.org/en/MediaCentre/PressBriefings/pages/MASSRSE2021.aspx > accessed 18 April 2024.
[47] Ibid.
[48] Ibid.
[49] Ibid.
[50] International Maritime Organization, 'Maritime Safety Committee (MSC), 104th session' (IMO.org, 8 October 2021) < https://www.imo.org/en/MediaCentre/MeetingSummaries/Pages/MSC-104th-session.aspx> accessed 19 April 2024.
[51] International Maritime Organization, 'IMO Seminar on Development of a Regulatory Framework for Maritime Autonomous Surface Ships (MASS) (6th September 2022) <https://www.imo.org/en/OurWork/Safety/Pages/MASS.aspx > accessed 13 April 2024.
[52] International Maritime Organization, 'Maritime Safety Committee (MSC 107)' (IMO.org. 9 June 2023) < https://www.imo.org/en/MediaCentre/MeetingSummaries/Pages/MSC-107th-session.aspx> accessed 20 April 2024.

Autonomous Surface Ships (MASS-JWG) met in September 2022 and April 2023.[53] This Working Group had developed a table to identify preferred options for addressing common issues such as the role, responsibilities competencies required of the master and crew, and the identification and meaning of the term 'remote control operator' and 'their responsibilities'.[54] It was expected that the IMO would adopt a non-mandatory-based MASS Code through the MASS-JWG meeting at the end of May 2024.[55] However, the Maritime Safety Committee revised the roadmap for the development of a code to regulate autonomous ships in May 2024, at its session (MSC 108).[56] The Committee, therefore, agreed to revise said Roadmap as follows; May 2025 - finalize and adopt non-mandatory MASS Code; First half of 2026 - develop framework for an experience-building phase (EPB); 2028 - commence development of the mandatory MASS Code, based on the non-mandatory code, and consider amendments to SOLAS (new chapter) for the Code's adoption; And by 1 July 2030 - adoption of the mandatory Code, for entry into force on 1 Jan 2032.[57]

At a national level, several studies have been conducted to explore the impact of said technological development on the current regulations in several jurisdictions. The outputs of these studies were that the current regulations are not sufficient to address the expected issues of autonomous systems vessels. This study will focus on the regulations of Saudi Arabia. It argues that there is a lack of legal framework to govern autonomous system vessels and also the current

[53] International Maritime Organization, 'Maritime Safety Committee (MSC 107)' (IMO.org. 9 June 2023) < https://www.imo.org/en/MediaCentre/MeetingSummaries/Pages/MSC-107th-session.aspx> accessed 20 April 2024.
[54] Ibid.
[55] Ibid.
[56] International Maritime Organization, 'Autonomous Shipping' (IMO.org) < https://www.imo.org/en/MediaCentre/HotTopics/Pages/Autonomous-shipping.aspx> accessed 24 September 2024.
[57] Ibid.

regulations are not sufficient to address its expected issues. As evidence, Article 6(G) of the Executive Regulation for the Registration of Ships and Marine Units requires that a vessel must be certified by the classification society for the purpose of registration into the public record. This certification has to be in compliance with SOLAS and other relevant international regulations, according to Article 7 of the same regulation.

In addition, it is not clear whether or not autonomous system vessels could enjoy the right to navigation within Saudi maritime zones. This is a legal issue that may arise with the introduction of said vessels. In principle, internal waters are subject to the sovereignty of a coastal state according to Articles 4 of the Statute of Maritime Delimitation of the Kingdom of Saudia Arabia and 2(1) of UNCLOS. Article 9 of the Navigation License Regulations in Saudi Arabia provides that a vessel has to be licensed for the purpose of sailing and operation. Further, Article 5 of said Regulations requires safety and registration certificates in order to get a navigation license. This means that the possibility of autonomous system vessel navigation is doubtful according to the above Articles. This doubt will extend to the navigation of said vessel in the territorial waters. This is because the sovereignty of a coastal state extends to territorial waters according to Article 4 of the Statute of Maritime Delimitation of the Kingdom of Saudia Arabia and 2(3) of UNCLOS. The right of innocent passage, according to Articles 6 of the Statute of Maritime Delimitation of the Kingdom of Saudia Arabia and 17 of UNCLOS, is a restriction to territorial sovereignty. However, exercising the right of innocent passage through the territorial waters shall comply with all laws and generally accepted international regulations, according to Articles 9(3) of the Statute of Maritime Delimitation of the Kingdom of Saudia Arabia and 21(4) of UNCLOS.

However, said vessels are not in compliance with generally accepted international regulations and as evidence, the IMO works to develop new code for this purpose.

Moreover, it can be argued that the introduction of said vessels may create a gap in the current regime of vicarious liability. To clarify this, vicarious liability is designed to cover an employee's faults. As evidence, Article 92 of Commercial Maritime Law provides that a shipowner or a charter party will be civilly liable for a harmful act of a master, crew, pilot, or others who are in service of a vessel. However, a fully autonomous system vessel is controlled and navigated by artificial intelligence, and artificial intelligence is a system, not an employee. This means that vicarious liability is not an appropriate regime to cover the expected risks of the operation of said vessels. There is a need to amend the above mentioned Article to cover autonomous system risks or develop a new law in this regard.

What is more, said vessels rely on data for the purpose of navigation. Data around the vessels will be collected through cameras and sensors to enable remote control operators and artificial intelligence systems to control and navigate the vessel. However, it can be said that data is not regulated by maritime law. It is not clear whether or not the Personal Data Protection Law is applicable. If this law is applicable, then it can be said that the introduction of said vessels will challenge several provisions of the Personal Data Protection Law. For example, Article 11(1) of said law requires the consent of data subjects before collecting data. This is a principle in said law and must be satisfied. However, it is not clear how this principle will be satisfied by autonomous system vessel owners and or operators.

In this backdrop, the legal issue does not need further explanation, the legal issues raised are clear. The notion of autonomous system vessels is to replace the humans on board the vessels with remote control centers and artificial intelligence systems. This shift presents a hard regulatory barrier in front of said vessels and legal gaps in the current regulations which require regulatory intervention. This intervention could develop a new law to govern the new development or amend the current regulations and bridge the legal gaps in the current regulations. At the international level, the IMO has started to review the current international regulations to address the expected legal issues. However, at a national level, it can be said that this legal issue is not addressed and or not examined yet. This study is significant, and its significance lies in its originality. There is an expanding literature on autonomous system vessels and artificial intelligence legal issues, but none in English from a Gulf perspective. This study will also be important due to the stated objectives of Saudi Arabia to be a world leader in autonomous cities and functions. Autonomous system vessels are not introduced in the service yet, and its introduction to the services is expected. However, the application of autonomous system vessels may raise many legal issues that need to be addressed and in a very important legislative priority in the future. Therefore, it can be said that autonomous system vessels provide a strong case study for issues that will arise in this wider context.

1.2 Objectives of this Study

The main objective of this thesis is personal. It is also to contribute to the discipline of law. The autonomous system vessel is a new, vital, and it is a complicated topic in recent times. Its complexities may be that understanding the legal barriers requires one to draw knowledge from several fields. In other words, it requires an interdisciplinary study to understand its legal issues,

if this expression is accurate. Within academic literature, this topic has not been explored thoroughly enough from a legal perspective. The lack of academic engagement can provide a reasonable justification for this thesis. In addition, it will lead to thesis questions which will lead to an increase in the understating of said vessels. Moreover, this thesis attempts to contribute to the development of law. The developments of technology, in particular artificial intelligence, are ahead of the current regulations which require the current regulations to be reviewed. Therefore, this thesis attempts to identify the legal implications of the development of said technology on laws. Therefore, the primary aim of this thesis is to explore the concept of autonomous system vessels in depth in addition to analyzing and evaluating the current regulations to address the expected legal issues.

1.3 Research Questions

With reference to the above-mentioned legal issues, the primary focus of this thesis is to examine the possible implications of artificial intelligence systems (autonomous system vessels) on the current regulations. Specifically, the discussion will be centered around autonomous system vessels, as one of the artificial intelligence applications. Therefore, this thesis will be guided by the following questions:

i. What is the concept of autonomous system vessels? And how do these vessels work?
ii. To what extent the current legal framework can accommodate said vessels?
iii. Who will be liable, under the laws of Saudi Arabia, for damage and or collision that might be caused by artificial intelligence systems?

1.4 Research Methodology

It goes without saying that the legal challenges caused by technological development are not easy to solve, particularly when said development is moving so fast. Since legal challenges are expected or a doubtful case, it is then imperative to understand the legal issue. Understanding and addressing legal issues can be done through research projects. In general, academic research can be defined as a process of identifying and investigating a certain issue to acquire knowledge or to find a solution.[58] Research methodology, therefore, is the process of a direct approach through said research to reach reliable findings.[59] This approach, with respect to its data, can be qualitative (using words), quantitative (using numbers), or mixed. This research will employ a qualitative research approach. This is because of that this research attempts to understand the legal implications of artificial intelligence systems, namely autonomous system vessels, through non-numerical data. Therefore, qualitative methodology is the suitable for this research. This research will heavily rely on primary and secondary sources to answer the formulated inquiries.

For example, relevant data will be collected from books, journals, articles, online sources, academic studies, cases, conference papers, academic thesis, doctrines, national, and international laws. This data will be gathered from available Arabic and English sources. Solid data will be collected to answer research-stated questions.

Data will be collected to explore autonomous system vessels and how said vessels may work for an in-depth understanding. The aim of this method is also to analyze collected data and to find

[58] Sudhhansu Ranjan Mohapatra, 'Legal Research Methodology: An Overview' (2014) Vol 8(10) JETIR 442.
[59] Ibid.

the difference between said vessels and conventional vessels, and the expected legal issues such as a lack of legal frameworks. This method will be applied in chapter two of this research. After that, this research will move forward to analysis and interpret some of the legal rules in international and national laws. The purpose of this is to explore which rules may challenge the introduction of said vessels. This method, if this description is correct, is a doctrinal method. According to Terry Hutchinson, a doctrinal approach " provides a systematic exposition of the rules governing a particular legal category …" in addition to " … analysis the rules and explain the area of difficulties and, perhaps, predict the future".[60] It is the most common methodology employed in legal research.[61]

In addition, this research will adopt a comparative approach in Chapter Three. In legal definition of a vessel, for example, a comparison will be made with the legal definition of a vessel in Saudi Arabia, United Arab Emirates, Qatar, and the United Kingdom. The purpose is to find whether or not the regulations of selected states share the same legal issue. This comparison will move to cover the registration requirements, for the same purpose. Chapter Four will focus on the Saudi and International Laws, a comparison will not be made in this Chapter. This is because of that the position in the United Arab Emirates and Qatar is the same as that in Saudi Arabia and this Chapter will focus more on principles that are employed by national states, such as the sovereignty of a state, innocent passage, and freedom of navigation. These principles are inherent in international laws. A comparison approach will also be employed in Chapter Five. However, a

[60] Terry Hutchinson, Researching and Writing in Law (2nd edn, Thomson Legal & Regulatory Limited, 2009) 7.
[61] Salim Ibrahim Ali, Zuryati Mohamed Yusoff, and Zainal Amin Ayub, 'Legal Research of Doctrinal and Non-Doctrinal' (2017) Vol 4(1) IJTRD 493.

comparison will only be made to some of the provisions of Saudi Personal Data Protection with the General Data Protection Regulations (GDPR).

1.5 Research Structure

This thesis is divided into six chapters. **Chapter One,** this chapter, provided a general overview of the direction of this thesis. It started with a clear introduction to the development of technology and the legal issues. It illustrated the position of the IMO and its previous and current meetings in this regard. In addition, the objectives of this thesis and also questions that will guide this thesis have been introduced clearly. This chapter provides a summary of each chapter for ease of exposition of this thesis. It is followed by **Chapter Two**, which will present an overview of said vessels. It will explore said vessels concept, the level of autonomy, and situational awareness systems as the onboard human will be replaced by artificial intelligence. This chapter will also illustrate how data and information will be collected and how will be sent to remote control operators. In addition, the concept and function of remote-control centers and artificial intelligence will be explored. Furthermore, some of the projects testing the notion of said vessels will be illustrated, such as Maritime Unmanned Navigation through Intelligence in Networks (MUNIN), Advanced Autonomous Waterborne Applications (AAWA), and *YARA Birkeland* projects.

Chapter Three will explore the legal position of said vessels from a doctoral perspective. This chapter contains two main subchapters. The first subchapter will start with the meaning of a vessel from an international Conventions perspective namely, UNCLOS and COLREGs. After that, it will explore the definition of a vessel under selected national legislation. This evaluation

aims to explore whether or not said vessels can fit within the scope of the legal definition of a vessel. The second subchapter will assess the registration regime. It will start with the concept of registration. Then it will move to explore the duties of State Parties under the UNCLOS. State Parties' discretion to set the registration requirements will also be explored. This chapter will also demonstrate the registration requirements under flag States' national laws. By the end of this chapter, it will be clear whether or not said vessels meet the current registration requirements.

Chapter Four will attempt to bring said vessels under the UNCLOS. It will explore internal, territorial, and high seas regimes. It aims to demonstrate whether or not said vessels can operate in any of the above-mentioned maritime zones. The principles of state sovereignty, innocent passage, and also the freedom of navigation will be analyzed. **Chapter Five** will evaluate the current vicarious liability regime. It will argue that artificial intelligence applications will challenge the current rules. In addition, it will argue that there is a gap in the maritime law in relation to data protection. There is a need to bridge this gap or an interpretation of the current rules to clarify whether or not these rules be applied to said vessels. **Chapter Six** will summarize key points in the research and provide conclusions and recommendations.

CHAPTER TWO

TERMINOLOGIES OF AUTONOMOUS SYSTEM VESSELS

2.1 Introduction

The development of autonomous technology has been growing significantly. This is not a secret. At the current time, more and more military and civilian autonomous system vessels have started to appear.[62] For example, said vessels can be used in maritime areas for military surveillance, marine exploration, water rescue missions, water quality sampling, and also for fishery industry assistance.[63] The advantage of these vessels is that these vessels can be used to perform much more prolonged and dangerous missions than manned vessels.[64] Connected to this, it helps to reduce the expected risks that could happen to humans in a complex maritime environment.[65] However, this rapid development is expected to challenge the current legal framework.

To be precise, the main technical structure of said vessels is different from manned vessels. For example, these vessels will be controlled by a remote control center or artificial intelligence systems.[66] This means that the on-board crew and master missions will be shifted to remote control operators or autonomous intelligent systems. This is the main legal challenge. However, it might be accepted to say that neither the said vessels nor their implications on the current regulations are understood without understanding these vessels synoptically.

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[62] Kaizhou Gao, Minglong Gao, Mengchu Zhou, and Zhenfang Ma, 'Artificial Intelligence Algorithms in Unmanned Surface Vessel Task Assignment and Path Planning: A Survey' (2024) ELSEVIER, 1.
[63] Ibid.
[64] Ibid.
[65] Ibid.
[66] Henrik Ringbom, Erik Rosag, and Trond Solvang, *Autonomous Ships and the Law* (1st edn, Routledge, 2021) 9.

This chapter aims to address the first question of this thesis. For this reason, an exploratory research approach will be applied. This method will be used to gain a deep understanding of autonomous system vessels in order to pave the way for other chapters. This chapter will provide details about said vessels to observe how it is different from manned vessels. Therefore, this chapter will go further to touch on the terminologies in its technical sources, and it will be divided as follows. First, it will explore the concept of autonomous intelligent system vessels. Second, it will illustrate the level of autonomy of said vessels. Third, the situational awareness will be examined. Fourth, the situational awareness systems will be explored, as in autonomous system vessels, data and information will be collected by Radar, Electronic Chart Display and Information System, Automated Identification System, Video and Infrared (IR) Cameras, and Laser Imaging Detection and Ranging (LiDAR) to enable remote control operator and onboard autonomous systems to supervise and control the vessels during the voyage. Fifth, communications capability will be explored as to how data will be sent to remote control centers. This chapter will illustrate the use of Medium and High-Frequency Radio, Cellular, Satellite, and Microwave communications for sending collected data to remote control operators. Sixth, the technical capability will be illustrated. This chapter will explore the role of remote control operators and intelligent artificial systems in navigating said vessels. Seventh, several projects were conducted to explore the autonomous vessels will be discussed, such as Maritime Unmanned Navigation through Intelligence in Networks (MUNIN), Advanced Autonomous Waterborne Applications (AAWA), and *YARA Birkeland* projects. The contribution of this chapter is to bridge the knowledge gap about autonomous system vessels in legal literature.

2.2 The Concept of Autonomous Vessels

The concept of autonomous intelligent system vessels or unmanned vessels is quite new. This concept arose with the development of new technologies. As a consequence, the concept of said vessels has no clear or solid legal basis in the international conventions and the majority of domestic regulations and many legal instruments have initially had to consider whether unmanned vessels are analogous to manned vessels, which arguably fails to treat these craft as a specific class of ship. On this basis, the International Maritime Organization (IMO) has developed a theoretical concept as a common basis for understanding said systems. As evidence, the IMO uses the term Maritime Autonomous Surface Ships (MASS) in its official materials.[67] The background for IMO official materials, *inter alia*, was that the IMO's Maritime Safety Committee (MSC) decided to take a proactive role in regulating autonomous intelligent system vessels in 2017.[68] Therefore, defining said vessels was one of the priorities to set out the regulatory framework. On this basis, an autonomous vessel is defined as "a ship which, to a varying degree, can operate independently of human interaction."[69] This definition provides two indications. Firstly, it indicates that the operational tasks are divided between humans and technology.[70] In its simplest terms, humans and technology would work together in conjunction with the delegated functions to guide and navigate the ships safely from port to port. Secondly, the definition also provides a sliding scale which means that the operational tasks might be

[67] International Maritime Organization, 'Interim Guidelines For MASS Trials' (IMO.org, June 2019). < https://safety4sea.com/wp-content/uploads/2020/04/IMO-MSC.1-Circ.1604-2019_06.pdf > accessed 11 March 2024.

[68] Erica Yvonn Jungblut, 'The First Step in Regulating Autonomous Ships: An Assessment on the Interim Guidelines for Maritime Autonomous Surface Ships Trials and its Legal Significance in the International Regulatory Landscape' (Master Thesis, The Arctic University of Norway, 2020) 3.

[69] Henrik Ringbom and Felix Collin, 'Terminology and Concepts' in Henrik Ringbom, Erik Rosag, and Trond Solvang (eds), *Autonomous Ships and The Law* (Routledge 2021) 7.

[70] Henrik Ringbom, Erik Rosag, and Trond Solvang, *Autonomous Ships and the Law* (1st edn, Routledge, 2021) 7.

performed by technologies "… to a varying degree."[71] This will be explained further in the following paragraph.

2.3 The Level of Autonomy

The level of autonomy is another issue that requires exploration. From one country to another, the notion of autonomous vessels has been subjected to several categorizations in the initial attempts to address these ships. The IMO, in its turn, has issued the final thought in this regard. Said vessels have been categorized into four degrees of autonomy. This categorization is considered a basis for adopting new procedures and regulations in addition it is considered a shifting point from merely an idea to a physical reality on the seas. This might be a reasonable step toward a more reliable implementation. Degree One of the said vessels will be the starting point. This type of vessel will be designed with automated processes and decision support.[72] Some operations may be automated, and seafarers will be on board a vessel in order to operate and control other shipboard systems and functions.[73] This can be taken to mean that the seafarers on the shipboard take control despite the level of autonomy.[74] Although this level of autonomy is considered an example of a problematic situation, it does not represent a complex scenario in comparison to fully autonomous intelligent system vessels.

Degree Two of autonomous intelligent system vessels can be seen as an advanced level of autonomy. This prototype of the vessel will have humans on board, but they will not control it.

[71] Henrik Ringbom, Erik Rosag, and Trond Solvang, *Autonomous Ships and the Law* (1st edn, Routledge, 2021) 7.
[72] R. Glenn Wright, *Unmanned and Autonomous Ships: An Overview of MASS* (1st edn, Routledge , 2020) 42.
[73] Henrik Ringbom and Felix Collin, 'Terminology and Concepts' in Henrik Ringbom, Erik Rosag, and Trond Solvang (eds), *Autonomous Ships and The Law* (Routledge 2021) 7.
[74] Wright (72).

The control and operation functions are delegated to the operators in the Remote Control Centre (RCC) or the Shore Control Centre (SCC).[75] The operators would be seated in a remote facility,[76] and would " … *receive all information and data through radars, sensors, satellites, and other systems in the vessel*."[77] After that, all received data would be processed by the remote control operators and then the commands would be sent back to the vessel in order to guide it to reach its destination.[78] These commands would be implemented by the vessel's electronic system rather than humans.[79]

Degree Three of said vessels is categorized as a vessel that is remotely controlled and without a master and crew on board the vessel.[80] This type of vessel is wirelessly connected with the SCC,[81] which means that the SCC team will lead said vessels remotely from one port to another. However, it can be noticed that this type of vessel will be operated by remote control operators, which means that the human will be a vital element in the operation of this level of autonomy.[82] In practice, it has been said that Degree Three of autonomous vessels is not as complex as *Degree Four* of fully autonomous system vessels.[83] This is because Degree Three of autonomous system vessels will be controlled by remote control operators, whereas fully autonomous system

[75] Pol Deketelaere, 'The Legal Challenges of Unmanned Vessels' (Master Thesis, Gent University, 2016) 2.
[76] Krzysztof Wrobel, Mateusz Gil, and Chong-Ju Chae, 'On the Influence of Human Factors on Safety of Remotely- Controlled Merchant Vessels' (2021) Appl. Sci 11(3), 1 < https://doi.org/10.3390/app11031145 > accessed 12 September 2021.
[77] Deketelaere (n 75).
[78] Ibid.
[79] Ibid.
[80] R. Glenn Wright, *Unmanned and Autonomous Ships: An Overview of MASS* (1st ed, Routledge , 2020) 42.
[81] Deketelaere (n 75).
[82] Wrobel, Gil, and Chae (n 76).
[83] Krzysztof Wrobel, Mateusz Gil, and Chong-Ju Chae, 'On the Influence of Human Factors on Safety of Remotely- Controlled Merchant Vessels' (2021) Appl. Sci 11(3), 1 < https://doi.org/10.3390/app11031145 > accessed 12 September 2021.

vessels will be controlled and directed by autonomous systems. This will be explained in the following paragraph.

Degree Four of autonomous system vessels, which represents the most complicated system, is fully autonomous vessels.[84] This vessel system is able to make decisions and determine actions during the operation without human intervention.[85] The only aspect of human control is determining the destinations of the vessel. The notion is that the autonomous system will replace the master and crew to navigate the vessels from one port to another. In addition, this system is developed further to avoid the collision.[86] It is a sophisticated system and mainly relies on Artificial Intelligence.[87] During the voyage of the vessel, a variety of sensors surrounding the vessel would continuously collect the needed data and send it to the onboard computer.[88] Subsequently, the onboard computer would process the taken data and commands would be sent accordingly to the rudders, engines, and other cargo care and navigational equipment.[89] However, these types of vessels will be linked to remote control centers to intervene when the situation requires that, for example, for emergency reasons.[90]

2.4 Situational Awareness

Undeniably, situational awareness is highly important in decision-making. According to Mica R. Endsely, the term situational awareness can be defined as "… the perception of the elements in

[84] R. Glenn Wright, *Unmanned and Autonomous Ships: An Overview of MASS* (1st edn, Routledge , 2020) 42.
[85] Ibid.
[86] Pol Deketelaere, 'The Legal Challenges of Unmanned Vessels' (Master Thesis, Gent University, 2016) 2.
[87] Ibid.
[88] Ibid.
[89] Ibid.
[90] Ibid.

the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future".[91] As it can be noticed, the general model of situational awareness includes three distinct levels. While Endsley, in the above quote, named these levels of situational awareness as perception, comprehension, and projection, these levels are also named by Nicholas Hansen as perception, understanding, and anticipation.[92] In the Maritime domain, Hansen gave a brief description of the Three Level Model of situational awareness, as follows. Level One is perception, and this step entails one to perceive the environment through multiple sensors and integrating the data into a single combined view of the surroundings.[93] Level Two is understanding, and this step requires attaching semantic meaning to the perceived environment.[94] Level Three is anticipation, and this step will be based on previous experience and knowledge extrapolating the current situation into the near future.[95] The navigator is required to apply these levels of situational awareness for safe navigation according to several Rules of COLREGs namely, rule of overtaking,[96] head-on situation,[97] crossing situation,[98] action by give-way vessel,[99] and action by stand-on vessel.[100] Traditionally, these tasks are implemented by on board master and crew. With regard to autonomous intelligent system vessels, these vessels are expected to be designed in a way to obtain situational awareness. For example, situational awareness for autonomous intelligent system vessels

[91] Mica R. Endsley, 'Toward a Theory of Situation Awareness in Dynamic Systems' (1995) Vol37(1) Sage Journals 23.
[92] Nicholas Hansen, 'Situational Awareness for Autonomous Marine Vessels' (PhD Thesis, Technical University of Denmark, 2023) 29.
[93] Ibid.
[94] Ibid.
[95] Ibid 30.
[96] COLREGS, Rule 13.
[97] COLREGS, Rule 14.
[98] COLREGS, Rule 15.
[99] COLREGS, Rule 16.
[100] COLREGS, Rule 17.

translates into the capabilities of remote operators and on board reasoning systems to process the data and information provided by sensors.[101] These requirements will be explored as follows.

2.5 Situational Awareness Systems

Replacing on board master and crew with artificial intelligence required a large number of situational awareness systems. For example, remote control operators and or artificial intelligence systems require access to the data on the vessel's surroundings to control such vessels' navigation. [102] Such data, to be collected, requires the use of several types of environmental sensor systems such as Radar, Electronic Chart Display and Information System, Automated Identification System, Video and Infrared (IR) Cameras, and Laser Imaging Detection and Ranging (LiDAR).[103] These systems are fundamental to achieving comprehensive situational awareness for autonomous intelligent system vessels in order to ensure proper supervision and traceability of decision-making.[104] This will explored further below.

2.5.1 Radar

One of the most important situational awareness tools for the operation of autonomous intelligent system vessels is the radar. It is an equipment that is used for navigation. In other words, the proper use of Radar helps to obtain a warning of a risk of collision, and also the Radar is used for plotting or equivalent systematic observation of detected objects.[105] The use of Radar is required according to Rule 7(b) of the 1972 International Regulations for Preventing Collisions at Sea

[101] R. Glenn Wright, *Unmanned and Autonomous Ships: An Overview of MASS* (1st edn, Taylor & Francis Group, 2020) 65.
[102] Henrik Ringbom, Erik Rosag, and Trond Solvang, *Autonomous Ships and the Law* (1st edn, Routledge, 2021) 9.
[103] Ibid.
[104] Wright (n 101) 123.
[105] Ibid 117.

(COLREGS). This Rule provides that " proper use shall be made of radar equipment if fitted and operational, including long-range scanning to obtain early warning of a risk of collision and radar plotting or equivalent systematic observation of detected objects".[106] Paragraph (c) of the same Rule provides that " assumptions shall not be made on the basis of scanty information, especially scanty radar information".[107] This Rule is written for manned vessels where the master and crew rely on the human sense and human interpretation of environmental conditions.[108] In addition, the seafarers rely on navigation charts and instruments based on such seafarers' experience and knowledge to perform safe navigation.[109] In the case of autonomous intelligent system vessels, R. Glenn Wright suggests that the International Maritime Organization should impose an obligation upon state members to ensure adequate sensor capabilities available in order to provide remote control operators and on board reasoning capabilities the information needed to make all decisions properly.[110] Radar systems will be required to help remote control operators and autonomous systems to view aids to navigation and land masses by using radio waves in order to detect objects and also determine such objects' range, angle, and velocity.[111] This radar may also help to produce velocity data concerning an object in addition to tracking course, speed, and closest point of approach to determine the danger of collision.[112]

[106] COLREGS, Rule 7(b).
[107] COLREGS, Rule 7(c).
[108] R. Glenn Wright, *Unmanned and Autonomous Ships: An Overview of MASS* (1st edn, Taylor & Francis Group, 2020) 117.
[109] Ibid.
[110] Ibid.
[111] Ibid 123.
[112] Ibid 124.

2.5.2 Electronic Chart Display and Information System

The Electronic Chart Display and Information System is another important navigational system useful for situational awareness and collision avoidance. This is a navigation computing system that displays electronic navigation chart information.[113] In other words, it is a geographical information system presenting data from an electronic navigational chart beside other information from navigational sensors such as the instant position of a vessel, heading, route, and speed.[114] The use of electronic charts as an alternative to paper navigation charts allows for regular and comprehensive updates shoreside and while vessels are en route.[115] The use of ECDIS is mandatory, and its performance standards were first published according to the IMO Resolution A.817(19) decisions in 1995.[116] In 2006, the late edition of these regulations was published with the IMO Resolution MSC.232(82) decisions.[117] The regulations containing ECDIS carriage requirements have been added to Regulation 19 of Chapter V of the International Convention for the Safety of Life at Sea (SOLAS) and it became mandatory in 2012.[118] Therefore, this system will be used in the operation of the autonomous intelligent system vessels to provide remote control operators and onboard autonomous systems the situational awareness.

[113] R. Glenn Wright, *Unmanned and Autonomous Ships: An Overview of MASS* (1st edn, Taylor & Francis Group, 2020) 124.
[114] Agnieszka Lazarowska, *Safe Trajectory Planning for Maritime Surface Ships* (1st edn, Springer, 2022) 10.
[115] Wright (n 113) 124.
[116] Idris Turna, and Orkun Burak Ozturk, 'A Causative Analysis on ECDIS-Related Grounding Accidents' (2019) 15(8) Ships and Offshore Structures 792.
[117] Ibid.
[118] Ibid.

2.5.3 Automated Identification System

Automated Identification System is also another system used for situational awareness. This is a mandatory vessel tracking system for commercial and passenger vessels over (300) tons.[119] This system works by acquiring the Global Positioning System (GPS) coordinates and exchanging a vessel's navigation status, identity, position, course, and other information, with nearby vessels, offshore installations, and also base stations.[120] This data is broadcasted via marine radio or satellite, and normally, a combination of Global Positioning System (GPS) and Very High Frequency (VHF) radio communication is used.[121] The signals of the Automated Identification System (AIS) are relied upon to supplement radar in order to avoid collisions and also for situational awareness.[122] These signals are used also at the Vessel Traffic Service for searching and rescue operations in addition to accident investigations.[123]

2.5.4 Video and Infrared (IR) Cameras

Video and Infrared (IR) cameras are of great importance due to the applicability of said equipment to achieve safety. It is worth noting that collisions between small and large vessels normally cause loss of life and maritime pollution.[124] The issue was that large vessels fail sometimes to detect small vessels at night and also in poor visibility.[125] This leads to urgent situations and even maritime collisions. Therefore, Infrared (IR) cameras will be fundamental

[119] Marte Hvarnes Evensen, Safety and Security of Autonomous Vessels Based on the Yara Birkeland Project (Master Thesis, University of Bergen, 2020) 32.
[120] Ibid.
[121] Ibid.
[122] Ibid.
[123] Ibid.
[124] Zongjiang Gao, Yingjun Zhang, and Shaobo Wang, 'Lightweight Small Ship Detection Algorithm Combined With Infrared Characteristic Analysis For Autonomous Navigation' (2023) 11(6) Marine Science and Engineering, 1.
[125] Ibid.

surveillance sensors for autonomous intelligent system vessels.[126] Infrared (IR) equipment can compensate for the deficiencies of radar and Automated Identification System (AIS) for the detection of small vessels.[127] The use of infrared video cameras to provide 360-degree visibility of the vessel's environment in a vessel will enhance situational awareness both internal and external to the vessel.[128] In addition, it will provide remote control operators and onboard autonomous systems needed data for making decisions.[129] Rather than providing a video, it has been said that many cameras include artificial intelligence technology that, probably through collaboration with other sensor systems, allows the camera itself to recognize objects and events of significance.[130] Video surveillance will also help to mitigate security vulnerabilities and this includes continuously monitoring critical areas on and surrounding the vessel.[131]

2.5.5 Laser Imaging Detection and Ranging (LiDAR)

The LiDAR imaging system is considered one of the situational awareness technologies. It is a high-precision sensor that can provide environmental data for safe navigation. This sensor is used to detect an object and also measure the time it takes to reach that object.[132] Therefore, it generates a very detailed 3D map of the environment.[133] This sensor can image an object from a great distance, it relies exclusively on lasers and it has resolution in the signals they receive.[134]

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[126]Zongjiang Gao, Yingjun Zhang, and Shaobo Wang, 'Lightweight Small Ship Detection Algorithm Combined With Infrared Characteristic Analysis For Autonomous Navigation' (2023) 11(6) Marine Science and Engineering, 1.
[127] Ibid.
[128] R. Glenn Wright, *Unmanned and Autonomous Ships: An Overview of MASS* (1st edn, Taylor & Francis Group, 2020) 124.
[129] Ibid.
[130] Ibid.
[131] Ibid.
[132] Sebastian Ohland, and Axel Stenman, 'Interaction Between Unmanned Vessels And COLREGS' (Bachelor's Thesis, Novia University of Applied Sciences, 2017) 8.
[133] Ibid.
[134] Tomazani Maria, 'Safety Of Maritime Autonomous Ships' (MASS) (Master Thesis, University of Piraeus, 2023) 26 – 27.

Currently, this sensor is being used in Google's autonomous cars in combination with radar, cameras, and ultrasound.[135] In the maritime domain, this system is developed to replace look-out crews.[136] The notion of the LiDAR sensor is to exchange significant data with the remote control center.[137] However, it has been said that the current Lidar sensor is considered insufficient for most uses on autonomous intelligent system vessels.[138] The downside of this sensor is that it is very susceptible to weather phenomena such as precipitation.[139] In addition, LiDAR consists of fast-moving parts that can be prone to malfunction.[140] Therefore, it is suggested that LiDAR sensors should be tested and developed for the use of said vessels.[141]

2.6 Communication Capability

Reliable communication between autonomous intelligent system vessels and remote control operators is needed to maintain effective monitoring and safe operation.[142] During the operation of said vessels, the required data use is low, however, a high-capacity data service may be required in unexpected situations.[143] The necessary data can be shared between the autonomous intelligent system vessels and the remote control center through one or a combination of

[135] Sebastian Ohland, and Axel Stenman, 'Interaction Between Unmanned Vessels And COLREGS' (Bachelor's Thesis, Novia University of Applied Sciences, 2017) 8.
[136] Shinji Iwanaga, 'Legal Issues Relating to the Maritime Autonomous Surface Ships' Development and Introduction to Services' (Master Thesis, World Maritime University, 2019) 40.
[137] Ibid.
[138] Tomazani Maria, 'Safety Of Maritime Autonomous Ships' (MASS) (Master Thesis, University of Piraeus, 2023) 27.
[139] Sarang Thombre and others, 'Sensors and AI Techniques for Situational Awareness in autonomous Ships: A Review' (2020) 23(1) IEEE, 64.
[140] Ohland and Stenman (n 135).
[141] Maria (n 138) 27.
[142] Adriaan Elings and others, 'Report of Autonomous Sailing Interconnectivity' (2016) Rotterdam Mainport University of Applied Sciences 6.
[143] Ibid.

methods.[144] This depends upon the distance of said vessels from terrestrial networks while operating.[145] Anyway, it has been said that collected data will be sent to remote control operators by utilizing Medium and or High Frequency Radio, Cellular, Satellite, and Microwave communications.[146] These options will be described in the following paragraphs.

2.6.1 Medium and High Frequency Radio

Medium and High Frequency Radio is used for general communication between vessels and shore. In addition, this service can be used between two vessels. This radio is used to allow vessels to address the confusion via communicating with other vessels or shore to clarify the intent and perception.[147] Radio of Medium and High frequency is low in comparison with Very High Frequency, which is used on channel 16 by vessels in the same and the range of this frequency does not go beyond 40 nautical miles, this feature allows the radio waves to bend over the horizon.[148] The range of medium frequency is reliable up to 150 nautical miles, while high-frequency distance can reach more than 200 nautical miles.[149] The distance depends on frequency and weather conditions.[150] In international waters, vessels are required to carry Medium and High Frequency Radio according to Regulation 19 of Chapter V of the International Convention for the Safety of Life at Sea (SOLAS).[151] Autonomous intelligent system vessels can make great use of said radio frequencies, especially when said radio frequencies are

[144] R. Glenn Wright, *Unmanned and Autonomous Ships: An Overview of MASS* (1st edn, Taylor & Francis Group, 2020) 156.
[145] Ibid.
[146] Henrik Ringbom, Erik Rosag, and Trond Solvang, *Autonomous Ships and the Law* (1st end, Routledge, 2021) 9.
[147] Ole Anreas Alsos and others, 'Maritime Autonomous Surface Ships: Automation Transparency for Nerby Vessels' (2022) Vol 2311 Journal of Physics: Conference Series, 1.
[148] Ibid.
[149] Ibid.
[150] Ibid.
[151] Ibid.

supplemented with email, teletype, navigational telex (NAVTEX), and weather facsimile services.[152]

2.6.2 Cellular Communication

Cellular communication can be used for the operation of autonomous intelligent system vessels. This network will support communication of the huge volumes of data said vessels generate.[153] It should be noted that the availability of 5G cellular networks is appropriate for the transfer of autonomous intelligent system vessel data only while the vessel is in port or when said vessel is close to the shoreline.[154] Beyond this range, 4G Long Term Evolution is a wireless data transmission that will provide data exchange at slower data rates than 5G cellular communications.[155]

2.6.3 Satellite Communication

Autonomous intelligent system vessels can utilize existing satellite services to exchange data and information for greater distances and in remote control centers.[156] These satellite services are provided by many companies such as Inmarsat and Cospas-Sarsat, while there is a widespread subscription to satellite services with Inmarsat Fleet Xpress which supports more than ten thousand vessels by January 2019.[157] The ever-expanding broadband connectivity via satellite links is part of a number of satellite services companies' efforts in order to launch tens of

[152] R. Glenn Wright, *Unmanned and Autonomous Ships: An Overview of MASS* (1st edn, Taylor & Francis Group, 2020) 156.
[153] Ibid 157.
[154] Ibid.
[155] Ibid.
[156] Ibid.
[157] Ibid.

thousands of small satellite networks into Low Earth Orbit in addition to Highly Elliptical Orbits that will provide broadband to cover the entire earth.[158] These serviced companies include Boeing, Amazon, SpaceX, OneWeb, LeoSat, and others which will launch and use their own satellites.[159] Low Earth Orbit, however, might be a suitable one for exchanging data due to the short distance between satellites and users.[160]

2.6.4 Microwave Communication

Wireless wide area network (WAN) technology can be used in order to establish broadband connectivity between autonomous intelligent system vessels and remote control centers.[161] This can be achieved through the use of microwave platforms which can trace vessel positions.[162] The advantage of this broadband communication is that it is secure and this is because the communications are limited between the involved participants.[163] The above-mentioned technology can also provide broadband vessel-to-vessel communication that could enable the exchange of navigation and engineering data based on Very High Frequency Radio, visual, and or sound technology.[164] For instance, imagery of objects or events discovered to be important by an automated reasoning system on autonomous intelligent system vessels could be exchanged with other vessels, whether these vessels are manned or unmanned.[165] The capability of broadband will also provide a means for remote control operators to enable autonomous

[158] R. Glenn Wright, *Unmanned and Autonomous Ships: An Overview of MASS* (1st edn, Taylor & Francis Group, 2020) 157.
[159] Ibid.
[160] Ibid.
[161] Ibid.
[162] Ibid 158.
[163] Ibid.
[164] Ibid.
[165] Ibid.

intelligent system vessels to be operated from other vessels within a coverage area.[166] Wireless wide area network technology can also provide another channel for offloading big amounts of data and this includes background environmental data for crowdsourcing and data mining subsequent to the accomplishment of each voyage.[167] The range of broadband communications capability can reach twenty miles from the vessel.[168]

2.7 Technical Capability

Technical capability is the main driver behind the development of autonomous intelligent system vessels. In the same context, technical capability has to exist when a vessel is built.[169] According to Henrik Ringbom and others, Remote Operability and Artificial Intelligence Systems are the technical capabilities for the said vessels' operations.[170] This point will be illustrated as follows.

2.7.1 Remote Control Centre

Remote Control Centre is quite a new concept in the maritime industry. This center will be established for operating and monitoring purposes.[171] According to R. Glenn Wright, the Remote-Control Centre lies at the heart of the operation of autonomous intelligent system vessels.[172] This is because of that Degree Two and Three will be operated under direct control and instruction from remote control operators. This notion of the Remote-Control Center aims to

[166] R. Glenn Wright, *Unmanned and Autonomous Ships: An Overview of MASS* (1st edn, Taylor & Francis Group, 2020) 158.
[167] Ibid.
[168] Ibid.
[169] Henrik Ringbom, Erik Rosag, and Trond Solvang, *Autonomous Ships and the Law* (1st edn, Routledge, 2021) 9.
[170] Ibid.
[171] Krzysztof Wrobel, Mateusz Gil, and Chong-Ju Chae, 'On the Influence of Human Factors on Safety of Remotely- Controlled Merchant Vessels' (2021) Appl. Sci 11(3), 2 < https://doi.org/10.3390/app11031145 > accessed 3 October 2021.
[172] Wright (n 166) 87.

replace the master and crew on board the autonomous systems vessels with Remote-Control Operators. This means that part of the master and crew roles and responsibilities will be shifted to remote control operators. However, the legal position of said center in the maritime legal framework is not clear. On this basis, it is expected that this will cause uncertainty in the current legal framework. In addition, it will leave the door open for unanswered legal questions. This center has to be regulated before it physically takes a place on the maritime map. For this purpose, it can be said that understanding the concept and the function of the Remote-Control Centre is highly important and a step forward in perceiving the gap in the current regulations. This section will be structured as follows.

2.7.1.1 The Concept Of Remote Control Centre

It is no exaggeration to say that the concept of the Remote-Control Centre will cause a dramatic change in the current practices. This change will extend further into the management and infrastructure of said vessels.[173] As evident, this can be seen in transforming the full or part of authority from the shipboard to the said center. In particular, take vessel management, supervision, and monitoring as vital examples. It is proposed to delegate these functions to be implemented from a different location rather than on the board of the ship.[174] This can be done through radio communication, which depends on the satellite link instead of the ship's wiring alone.[175] The other part of the authority will be delegated to an automated reasoning system on

[173] R. Glenn Wright, *Unmanned and Autonomous Ships: An Overview of MASS* (1st edn, Routledge, 2020) 87.
[174] Ibid.
[175] Krzysztof Wrobel, Mateusz Gil, and Chong-Ju Chae, 'On the Influence of Human Factors on Safety of Remotely- Controlled Merchant Vessels' (2021) Appl. Sci 11(3), 1 < https://doi.org/10.3390/app11031145 > accessed 12 September 2021.

the shipboard.[176] Thus, it can be said that the remote control center consists of visual control that visually monitors the video and situation coming through closed-circuit television (CCTV), equipment, and sensors.[177] In addition, it consists of data control that gathers and analyzes data such as vessel navigation information, route information, and also energy efficiency analysis.[178] As it can be noticed, with no doubt, the remote control center will be the heart of the operation.[179]

2.7.1.2 The Function Of Remote-Control Centre

As it is pointed out above, the concept and functions of remote-control centers are new in the maritime industry. It is a dedicated area that is reserved for the necessary tasks to remotely operate the vessel. In other words, the said center will work as an alternative method to monitor and control autonomous intelligent system vessels.[180] This is because the master and crew duties on the board of the said vessels will be divided between the autonomous systems and humans in the remote-control center. This division will be based on the level of autonomy. To clarify this point, navigation, maneuvering, berthing, and unberthing functions will be delegated to remote control operators, with regards to the operation of Degree Two and Three of autonomous system vessels. On this basis, remote control operators will monitor, supervise, and remotely control the said vessels.[181] This is a proposed operational method for autonomous system vessels. However,

[176] R. Glenn Wright, *Unmanned and Autonomous Ships: An Overview of MASS* (1st edn, Routledge, 2020) 87.
[177] Minchol Ji, 'A Study on the Legal Status and Responsibilities of the Master in Autonomous Vessels: The Case of General Remote Operators' (Master Thesis, World Maritime University, 2022) 21.
[178] Ibid.
[179] Wright (n 176).
[180] Rana Saha, 'Mapping Competence Requirements For Future Shore Control Centre Operators' (2023) Vol 50(4) Taylor & Francis 415.
[181] Ibid.

the physical attendance of master and crew on the board of autonomous system vessels is not only for performing the operational duties, but also part of the legal requirements to ensure safety at sea. Technologically, this approach may work. However, many states have compulsory pilotage regimes and may not allow autonomous system vessels to operate such state internal and territorial waters without humans. This may constitute a legal barrier in front of the operation of autonomous system vessels.

2.7.2 Artificial Intelligence System

From its name, 'Artificial Intelligence' appears evident that it deals with artificial not natural applications.[182] However, there is not a precise definition of Artificial Intelligence and generally accepted by the community.[183] At a national level, the Saudi Data and Artificial Intelligence Authority published Principles and Ethics of Artificial Intelligence, in August 2022.[184] These principles and ethics have been determined as Fairness, Privacy and Security, Human Centred AI, Benefits, Reliability and Safety, Transparent and Explainable, and Responsibility. These principles have been explained in the publication of Saudi Data and Artificial Intelligence Authority to be taken into consideration by any sector aims to develop technologies or solutions rely on the artificial intelligence. In this publication, artificial intelligence has been defined as "… a set of technologies that enable a machine or system to learn, understand, acting, and feeling." However, this is not a legal definition of artificial intelligence, as there is a lack of a

[182] Frank Emmert-Streib and others, 'Artificial Intelligence: A Clarification of Misconceptions, Myths and Desired Status' (2020) Vol 3 Frontiers in Artificial Intelligence, 1.
[183] Ibid.
[184] Saudi Data & AI Authority, Artificial Intelligence Ethics Principles (1st edn, August 2022, SDAIA) https://istitlaa.ncc.gov.sa/ar/transportation/ndmo/aiethicsprinciples/Documents/%D9%85%D8%A8%D8%A7%D8%AF%D8%A6%20%D8%A3%D8%AE%D9%84%D8%A7%D9%82%D9%8A%D8%A7%D8%AA%20%D8%A7%D9%84%D8%B0%D9%83%D8%A7%D8%A1%20%D8%A7%D9%84%D8%A7%D8%B5%D8%B7%D9%86%D8%A7%D8%B9%D9%8A...pdf

particular legal framework governing the AI systems in the Kingdom of Saudi Arabia at the current time.

In the European countries, by comparison, the European Parliament has established a legislative resolution of 13 March 2024 on the proposal for the Artificial Intelligence Act. The purpose of this Act is to ensure a high level of protection of health, safety, fundamental rights stated in laws including preventing harmful effects of Artificial Intelligence Systems, and to support the innovation.[185] This Act also provides specific requirements for high-risk AI systems and obligations for operators of such systems.[186] Article 3(1) of said Act defined AI systems as " … a machine-based system designed to operate with levels of autonomy, that may exhibit adaptiveness after deployment and that, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, consent, recommendations, or decisions that can influence physical or virtual environments …".[187] This Article, therefore, defined artificial intelligence as a 'machine-based system'. This definition will be important to distinguish the artificial intelligence from software systems.

In addition, Artificial Intelligence can be understood as " the capability of a machine to imitate intelligent human behavior" and it can be also understood as " a computer system able to perform tasks that normally require human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages".[188] Hence, artificial

[185] EU Artificial Intelligence Act 2024, Article 1(1)
[186] Ibid, Article 1(2)(c)
[187] Ibid, Article 3(1).
[188] Hung Nguyen, 'Artificial Intelligence and its Impact on Workforce' (Business Management Thesis, Centria University of Applied Sciences, 2019) 3.

Intelligence will be used for autonomous system vessels.[189] To clarify, artificial intelligence will control and navigate said vessels fully autonomous intelligent system vessels (Degree Four of MASS).[190] This system will support said vessels to be self-navigated if these vessels do not depend on preprogrammed instructions.[191] Continuously, these vessels process data gathered by the on board sensors and form independent decisions regarding navigation.[192] From a technical point of view, autonomous systems' ability to achieve required goals can be through different methods, and these methods can be divided into two categories.[193] First, this system may follow preprogrammed rules.[194] For this purpose, several projects have planned to create huge knowledge databases that encompass predetermined explicit rules and also concepts that algorithms utilize in decision-making.[195] Second, machine learning can also be used to accomplish goals, instead of programming explicit rules.[196] In this regard, utilizing learning algorithms which will allow the system to learn from its experience.[197] However, developers may need to train machine learning by providing such a system with a huge number of examples in order to accomplish the desired tasks.[198] For example, technology developers may use machine learning systems and train these systems on situational awareness.[199] Undoubtedly, machine

[189] R. Glenn Wright, *Unmanned and Autonomous Ships: An Overview of MASS* (1st edn, Taylor & Francis, 2020) 52.
[190] Erica Yvonn Jungblut, The First Step in Regulating Autonomous Ships: An Assessment on the Interim Guidelines for Maritime Autonomous Surface Ships Trials and its Legal Significance in the International Regulatory Landscape (Master Thesis, The University of Norway, 2020) 5.
[191] Ibid.
[192] Ibid.
[193] Henrik Ringbom, Erik Rosag, and Trond Solvang, *Autonomous Ships and the Law* (1st end, Routledge, 2021) 10.
[194] Ibid.
[195] Ibid.
[196] Ibid.
[197] Ibid.
[198] Ibid.
[199] Ibid.

learning will play an important role in the development of autonomous system vessels,[200] and this learning algorithm is associated with Artificial Intelligence.[201]

2.8 Conducted Projects

So far, several projects have been launched to explore autonomous intelligent system vessels in-depth. These projects also aim to identify the need if the notion of said vessels is applicable. These projects can be seen as stepping stones to successful implementation. Some of these projects will be discussed briefly as follows.

2.8.1 MUNIN

The project Maritime Unmanned Navigation through Intelligence in Networks (MUNIN) is a cooperative research project.[202] This project was co-funded by the European Commission under this Commission's Seventh Framework Programme,[203] and it was initiated in collaboration with eight partners from Norway, Sweden, Ireland, and Iceland,[204] in 2012.[205] The aim of this project was to develop a technical concept for the operation of autonomous intelligent system vessels in addition to evaluating its technical, economic, and legal feasibility.[206] In other words, this project

[200] Henrik Ringbom, Erik Rosag, and Trond Solvang, *Autonomous Ships and the Law* (1st end, Routledge, 2021) 10.
[201] R. Glenn Wright, *Unmanned and Autonomous Ships: An Overview of MASS* (1st edn, Routledge, 2020) 55.
[202] Yewen Gu, Julio Cesar Goez, Mario Guajardo, and Stein W. Wallace, 'Autonomous Vessels: State of the Art and Potential Opportunities in Logistics (September 2019) NHH Norwegian School of Economics Paper 06/2019, 1 < https://openaccess.nhh.no/nhh-xmlui/bitstream/handle/11250/2612601/0619.pdf?sequence=1 > accessed 16 March 2024.
[203] Ibid.
[204] Ziaul Haque Munim, 'Autonomous Ships: A Review, Innovative applications, and Future Maritime Business Models' (2019) Vol 20(4) Taylor & Francis Group 266.
[205] Jiacheng Ke, 'The Future is Coming: Research on Maritime Communication Technology for Realization of Intelligent Ship and Its Impacts on Future Maritime Management' (Master Thesis, World Maritime University, 2017) 16.
[206] European Commission, 'Final Report Summary: Maritime Unmanned Navigation through Intelligence in Networks' (Transport) COM (2016), para 1.

is a test of an autonomous intelligent system vessel simulation,[207] that will be able to make decisions but will be controlled by a shore-based operator.[208] The MUNIN project concluded that the autonomous operation of autonomous intelligent system vessels can be envisaged during deep sea voyages only, and through remote control operators, as the deep sea voyage length ratio is considered a significant economic factor for operational efficiency.[209] However, this project does not encourage the autonomous operation of said vessels in congested waters or during the approach,[210] to avoid a potential collision with other vessels and installations. In addition, the above-mentioned project identified several imperative systems and entities that have to be available to implement autonomous ships as prototypes.[211]

The project team of MUNIN proposed an Advanced Sensor Module (ASM) to take care of the lookout duties on the board of the vessel.[212] This system will automatically detects, classifies, and it also will identify targets in the surrounding area of the said vessel by using sensor fusion techniques which are based on radar, an automatic identification system, 'established navigational sensors', in addition to a 'daylight and an infrared camera system'.[213] The ASM system will allow for a complete evaluation of a possible risk of collision.[214] The project team of

[207] Jiacheng Ke, 'The Future is Coming: Research on Maritime Communication Technology for Realization of Intelligent Ship and Its Impacts on Future Maritime Management' (Master Thesis, World Maritime University, 2017) 16.
[208] Thanasis Karlis, 'Maritime Law Issue Related to the Operation of Unmanned Autonomous Cargo Ships' (2018) WMU J Marit Affairs 1.
[209] European Commission, 'Final Report Summary: Maritime Unmanned Navigation through Intelligence in Networks' (Transport) COM (2016), para 1 – 2.
[210] Ibid 2.
[211] Ibid.
[212] Ibid.
[213] Wilko C. Bruhn, Hans-Christoph Burmeister, Matthew T. Long, and Jonas A. Moræus, 'Conducting Look-out on an unmanned vessel: Introduction to the advanced sensor module for MUNIN's autonomous dry bulk carrier' (The 10th International Symposium ISIS, Germany, 2014) < https://www.researchgate.net/publication/265716495> accessed date 28 April 2024.
[214] Ibid.

MUNIN also proposed an Autonomous Navigation System (ANS) to enable the autonomous intelligent system vessels to follow a predefined voyage plan, and this system will have the ability to adjust the route autonomously to avoid expected collision situations or other reasons, such as significant weather changes.[215] In addition, the project team of MUNIN proposed an Autonomous Engine and Monitoring Control (AEMC) system to shift the concept of the autonomous ship from an idea to reality.[216] This system will serve to control and monitor each engine room component, and it also works as a transceiver for the Shore Control Centre (SCC).[217] These systems are expected to autonomously control the engine room and emergency handling.[218] Finally, the project team of MUNIN proposed a Shore Control Centre in order to monitor and control the said vessels remotely.[219] The concept and functions of this center are illustrated above.

2.8.2 AAWA

The Advanced Autonomous Waterborne Applications (AAWA) is also another research project that costs €6.6 million and this project is funded by the Finnish Funding Agency for Technology and Innovation, Tekes.[220] This project is led by Rolls-Royce to explore the economic, technical, legal, and social challenges that should be addressed before the operation of autonomous

[215] European Commission, 'Final Report Summary: Maritime Unmanned Navigation through Intelligence in Networks' (Transport) COM (2016), para 1 – 2.
[216] Ibid 2.
[217] European Commission, 'Maritime Unmanned Navigation through Intelligence in Networks' (Final Report: Autonomous Engine Room) COM (2015) 314286 Final.
[218] Ibid.
[219] European Commission (n 215).
[220] Esa Jokioinen, 'Remote and Autonomous Ships - The Next Steps' (2016) Advanced Autonomous Waterborne Applications (AAWA) Partners, 5 < https://www.rolls-royce.com/~/media/Files/R/Rolls-Royce/documents/customers/marine/ship-intel/aawa-whitepaper-210616.pdf > accessed 21 February 2021.

intelligent system vessels.[221] The aim of this AAWA initiative was to make the specifications and preliminary designs for the said vessels.[222] This project was executed by universities, equipment manufacturers, vessel designers, and also classification societies,[223] which was launched in 2015 and completed in 2017.[224] In the first phase of the project, the AAWA has examined the existing state of the maritime industry in addition to what can be learned from other industries.[225] The initial conclusions were that the technologies needed in order to make autonomous and remote control vessels a reality exist, and the development of decision support systems for autonomous intelligent system vessels will be a gradual and iterative process and it has to be subject to extensive simulation.[226] It is also concluded that the operation of said vessels will be, at least, as safe as existing vessels.[227] However, it is expected that new types of risk will arise and there is a need to identify and address the expected risks.[228] In addition, there is a need to amend or change some of the regulations and this could happen if there is a political will.[229] Connected to this point, it is suggested that the legal challenges of constructing and operating autonomous intelligent system vessels should be explored at national and international levels.[230] The Second and Third phases of the AAWA project will be built on the basis of findings from the first phase, in order to develop the legal, technical, and safety specifications for proof of the

[221] Pol Deketelaere, The Legal Challenges of Unmanned Vessels (Master Thesis, Ghent University, 2017) 13.
[222] Esa Jokioinen, 'Remote and Autonomous Ships - The Next Steps' (2016) Advanced Autonomous Waterborne Applications (AAWA) Partners, 5 < https://www.rolls-royce.com/~/media/Files/R/Rolls-Royce/documents/customers/marine/ship-intel/aawa-whitepaper-210616.pdf > accessed 21 February 2021.
[223] Ibid.
[224] Deketelaere (221) 14.
[225] Jokioinen (n 222).
[226] Ibid 5.
[227] Ibid.
[228] Ibid.
[229] Ibid.
[230] Ibid.

concept of said vessels.[231] The Second phase of the AAWA project, for example, includes the development and testing of specific technological solutions by utilizing simulators and tests.[232] Arrays of the sensor have been tested in a range of operating and climatic conditions. It has also created a simulated autonomous ship control system that allows the behavior of the entire communication system to be investigated. The AAWA white-paper has been published to confirm the reality of remote and autonomous vessels, and this is due to the availability of technologies needed to make the said vessels exist.[233] The AAWA white paper suggests that the task is to find the optimum way in order to combine the said vessels and technologies reliably and cost effectively.[234] In addition, this project explored the legal implications of said vessels and concluded that the existing maritime law framework does not anticipate said vessels.[235] The AAWA white paper expects remote control vessels to operate in near sea areas by 2025, and also expects remote control and fully autonomous system vessels to operate in the far sea areas between 2030 and 2035.[236]

2.8.3 YARA Birkeland

YARA Birkeland is another project of autonomous intelligent system vessels. This project has an overall length of 79.5 meters.[237] It is approximately a 3500-ton container carrier, and it is also the

[231] Jia Chyuan Chong, Impact of Maritime Autonomous Surface Ships (MASS) on VTS Operations (Master Thesis, World Maritime University, 2018) 26.
[232] Ibid.
[233] Esa Jokioinen, 'Remote and Autonomous Ships - The Next Steps' (2016) Advanced Autonomous Waterborne Applications (AAWA) Partners, 5 < https://www.rolls-royce.com/~/media/Files/R/Rolls-Royce/documents/customers/marine/ship-intel/aawa-whitepaper-210616.pdf > accessed 21 February 2021.
[234] Ibid.
[235] Ibid 54.
[236] Kangqun Chen, 'Research on Safety Management of Maritime Autonomous Surface Ships' (Master Thesis, World Maritime University, 2018) 15.
[237] R. Glenn Wright, *Unmanned and Autonomous Ships: An Overview of MASS* (1st edn, Taylor & Francis, 2020) 74.

first fully electric and autonomous container vessel with zero emissions.[238] This project is a collaboration one.[239] The vessel was designed by engineering company Marin Teknikk (Gurshoy) and this vessel was built by Vard (Alesund) company at a cost of approximately NOK 250 million, with approximately NOK 133.6 million support from the Norwegian government enterprise ENOVA.[240] In 2020, Romanian's Vard Bralla company together with Norwegian Nard Brevik company delivered the hull and the vessel.[241] Technology development is being achieved by Kongsberg company and the vessel is owned and operated by agricultural products company Yara International ASA (Oslo), both companies in Norway.[242] The operation of this vessel is expected to reduce the operation of diesel-powered truck haulage by 40,000 journeys a year, this is expected to happen by transporting containers between Yara's Porsgrunn production plant from land to sea.[243] This project is a commercial vessel, it is made to sail between three ports in southern Norway, within 12 nautical miles from the coast.[244] This vessel has been commercially operating since the spring of 2022.[245]

2.9 In Conclusion

In this chapter, an attempt has been made to explore the notion of autonomous system vessels, and how these vessels work. This chapter found that the concept of said vessels is quite new and

[238] Oda Loe Fastvold, 'Legal Challenges for Unmanned Ships in International Law of the Sea' (Master Dissertation, The Arctic University of Norway, 2018) 2.
[239] Tiago Vinicius Zanella, 'The Environmental Impact of the Maritime Autonomous Surface Ships' (2020) 17(39) Veredas do Direito 396.
[240] R. Glenn Wright, *Unmanned and Autonomous Ships: An Overview of MASS* (1st edn, Taylor & Francis, 2020) 74.
[241] Ibid.
[242] Ibid.
[243] Ibid.
[244] Simon Baughen, Who is the Master now? Regulatory and Contractual Challenges of Unmanned Vessels, Barış Soyer and Andrew Tettenborn (eds), *New Technology, Artificial Intelligence and Shipping Law in the 21st Century* (1st edn, Routledge, 2020) Chapter 10, para 1.
[245] Anni Lindberg, Impact Assessment of Green RoPax Shipping Corridors – The Case of Decarbonizing the Helsinki – Tallinn Corridor (Master Thesis, Abo Akademi University, 2023) 24.

it is different from traditional vessels. According to the IMO, an autonomous vessel can be defined as "… a ship which, to a varying degree, can operate independently of human interaction …". According to Henrik Ringbom and others, the above-mentioned quote can be taken to mean that humans and technology would work together to navigate the vessel from one port to another. In addition, this quote provides that the navigation tasks might be performed by technologies "… to a varying degree …". After that, this chapter has illustrated the level of autonomy. The level of vessel autonomy can be different from one state to another. However, this chapter has explored the one identified by the IMO. Said vessels are divided into four degrees of autonomy. Degree One will be designed with automated processes and decision support. Some of the operational tasks will be automated and the seafarers on board will be able to operate and control other shipboard systems and functions. The idea of this automation might be to reduce the number of seafarers. Degree Two will have humans on board but they will not control it. The control and operational functions will be delegated to the remote control operators. Degree Three of said vessels will be without humans on board the vessels and these vessels will be controlled and navigated from a remote control center. Degree Four of said vessels will be navigated by artificial intelligence systems and there will be no humans on board the vessels. Technologies developers introduced situational awareness systems to replace the on board human. For example, Radar, Electronic Chart Display and Information System, Automated Identification System, Video and Infrared (IR) Cameras, and Laser Imaging Detection and Ranging (LiDAR) should be used to enable remote control operators and onboard autonomous systems to supervise and control the vessels. These systems will collect the data around the vessels and send it to the remote control operators by Medium and High-Frequency Radio, Cellular, Satellite, and Microwave communications. Once remote control operators receive the data, they will control

and navigate the vessels based on the data they receive. Depending on the level of automation, data gathering and processing will be done through an artificial intelligence system. In addition, fully autonomous vessels will be navigated and controlled by artificial intelligence when this system obtains the required data. Technically, the notion of autonomous intelligent system vessels is applicable, and several research projects conducted to prove its applicability such as Maritime Unmanned Navigation through Intelligence in Networks (MUNIN), Advanced Autonomous Waterborne Applications (AAWA), and *YARA Birkeland*.

On this basis, it can be said that autonomous intelligent system vessels are expected to cause a historical change in the current practice. The is due to technological development, especially the acritical intelligence systems, that would enable said vessels to sail autonomously or through remote control with less or without seafarers and crew on the board. This operational approach is markedly different from the conventional one. It is this gap in which the legal uncertainty and questions spring forth. In general, there is a lack of legal framework to govern the artificial intelligence systems in Saudi Arabia, such as the EU Artificial Intelligence Act. In addition, there is a lack of legal framework to govern the autonomous systems vessels, remote control center, and remote control operators. Therefore, the proverbial legal challenges will start when questions such as, to what extent said vessels fit under the scope of the current regulations. Can said vessels accurately achieve the element of the legal definition of a vessel? Additionally, other propositional questions such as, to what extent said vessels would enjoy the right of navigation? And who will be liable for a collision, if it occurs? These are the real legal barriers, and it is quite a laborious challenge that outweighs the concept of vessels itself. Addressing these prominent questions is the main purpose of the following chapters.

CHAPTER THREE

LEGAL DEFINITIONS AND REGISTRATION REGIME

3.1 Introduction

As previously discussed, the notion of autonomous systems vessels is unique. It is completely different from manned vessels, in particular, when it comes to the concept, design, and also to the method of operation. The concept of autonomous systems vessels is divided into four categories, and thus dependent on the level of autonomy. On this basis, it is evident that a new operational approach would be introduced such as Remote Control Operators and Artificial Intelligence Systems. For example, *Degree One*, *Two*, and *Three* of autonomous vessels would be managed, monitored, and controlled remotely by remote control operators. However, the operation of these types of vessels would be less complicated in comparison to the operation of *Degree Four* which will be fully autonomous. Tied to this point is that Remote Control Operators' intervention might happen to control fully autonomous vessels when it is required. In addition, the design of autonomous vessels will be changed, it would have no bridge, or at least, this bridge would be smaller than what it is in the conventional vessels. A primary argument of this thesis is that there is a lack of a legal framework, especially at the national level, to govern artificial intelligence systems and said vessels as one of its applications. In addition, this thesis argues that employing artificial intelligence systems with the absence of its legal framework, would have potential implications on the current regulations. It is unclear whether or not autonomous system vessels can be qualified as vessels as defined by law. Added to this point, autonomous system vessels may challenge the current registration legal requirements as the concept of these vessels and its operations are different from the conventional ones.

This chapter will be divided into two subchapters. The first subchapter will attempt to explore whether or not autonomous systems vessels can fit under the legal meaning of a ship. Without understanding the legal definition of a vessel in a proper sense, it is not an exaggeration to say that the discussion does not rely on a solid basis, where regulations that will be examined are centered around the vessel. Therefore, this subchapter will start with the UNCLOS and then COLREGs, to determine the legal meaning of a vessel. After that, this subchapter will move on to examine the legal meaning of a vessel under Saudi Laws, whether or not autonomous system vessels can fit under the current legal definition. In addition, it will compare the legal definition of a vessel under said jurisdiction with the relevant law in the United Arab Emirates, Qatar, and in the United Kingdom. The purpose is to find whether or not selected laws share the same in defining a vessel. This comparison will also help to recognise the legal issue and address it. The second subchapter will examine the registration regime to find whether or not said regime will be challenged by the new development of technology. In other words, it attempts to find whether or not the current regulations constitute barriers on front of said vessels. This subchapter will start with the concept of registration. In addition, it will move to the duties and obligations of the flag states in addition to the freedom of the flag states to fix registration requirements. This subchapter will also use a legal analysis approach to analyze the regimes of registration in the above mentioned states. Put simply, it aims to identify the legal issue and explore how and why the current legal maritime framework does or does not apply to autonomous systems vessels. A preliminary conclusion is that autonomous systems vessels can fit within the scope of the legal definition of a vessel if the generally accepted international standards and regulations are amended. This is the main picture of this chapter, and much will be said below.

3.2 The Legal Definitions of a Vessel

3.2.1 Introduction

The definition of ship plays a major role in the written legal discourse. It is a strong direct link between the law and language. Moreover, the definition could also be described as a general *endoxa* that may have various pragmatic functions and propositional structures.[246] The aim of this structure is to avoid uncertainty and to justify the application of a particular law to the case. This theoretical background leads to the question of whether or not the autonomous vessel could legally be considered a ship. This is the question that goes to the heart of interpretation, such as the meaning of the language in correlation to the rules of law that are laid down by it. As the late Bill Tetley once articulated, the legal definitions of vessel and ship differ from one convention to another due to the fact that they are "… very much a function of the subject matter concerned …".[247] Therefore, the interpretation of legal text could be extended further for better explanatory scope in respects to others convention and regulation. To this end, the UNCLOS, COLREGs, and the selected national laws will be explored for the purpose of this study, as follows.

3.2.1.1 International Definitions

3.2.1.1.1 The Definition of Vessel in UNCLOS

The UNCLOS is considered the basis of modern international law of the sea. This Convention is a remarkable achievement in establishing needed rules of the law to govern the regime of the

[246] Fabrizio Macagno, 'Definitions in Law' (2011) 2 Bulletin Suisse De Linguistique Appliquée 216 < https://ssrn.com/abstract=1742946 > accessed 11 February 2022.
[247] Eric Van Hooydonk, 'The Law of Unmanned Merchant Shipping – An Exploration' (2014) 20 JIML 406.

activities above and below sea and ocean. In other words, it deals with the rights and obligations of state parties in each maritime zone. In particular, this Convention lays down the navigational rights and duties which are widely accepted and respected by state parties. Prior to an examination of the implication of the notion of autonomous systems on some provisions of the UNCLOS and national legislations, it is important to consider whether autonomous system vessels are considered vessels within the meaning of the above-mentioned Convention, as far as this Convention is concerned. To begin with, it is important to note that the terms 'ship' and 'vessel' are used interchangeably in the UNCLOS.[248] This Convention sought to differentiate between commercial and non-commercial ships. Take Article 29 of the UNCLOS as a prime example. This Article states that " … 'warship' means a ship belonging to the 'armed forces' of a State bearing the external marks distinguishing such ships of its nationality, under the command of an officer duly commissioned by the government of the State and whose name appears in the appropriate service list or its equivalent, and manned by a crew which is under regular armed forces discipline."[249] The origin of this definition extends further back into paragraph 2 of Article 8 of the 1958 Convention on the High Seas.[250] Therefore, it should be noticed that the use of the general language of the words "… armed force …" is meant to include the integration of the various branches of the armed forces in different countries, such as seagoing craft that are operated by some armies, air forces, and coast guards.[251] Thus, the clarification of the meaning of warship by Article 29 of UNCLOS is worth the effort. The importance of this Article, as stated

[248] Robert Veal, Michael Tsimplis, and Andrew Serdy, 'The Legal Status and Operation of Unmanned Maritime Vehicles' (2019) 50(1), Ocean Development & International Law, 26.
[249] UNCLOS, Art 29.
[250] Bernard H. Oxman, 'The Regime of Warships Under the United Nations Convention on the Law of the Sea' (1984) 24 Va. J. Int'l L 813.
[251] Ibid.

by Professor Bernard H. Oxman, lies in the distinction between applicable rules to warships and those rules that apply to commercial ships.[252] One of these rules, for example, non-governmental ships and non-warships must be registered under flag State before engaging on the high seas.

Turning now to the definition of the term ship, and how the meaning of a ship could constitute under the UNCLOS. The answer to this question is debatable. In fact, the UNCLOS did not provide a legal definition for a ship. This lack of definition left a state of considerable uncertainty as to the legal status of autonomous systems vessels, along with legal issues in relation to applying the provisions of UNCLOS to said vessels. In fact, there are two leading defensible arguments both in favor and against autonomous systems vessels qualifying as vessels. An argument brought in favour of autonomous systems vessels is that the absence of a definition of a vessel can interpreted to mean that autonomous systems vessels are not excluded from the UNCLOS.[253] However, an argument can be made here that autonomous systems vessels do not fit into the legal meaning of a vessel. The notion is that the UNCLOS is a product of its time. At the time of drafting said Convention, the autonomous systems vessels were not in the minds of drafters. In the same context, the author Youri Van Logchem argues that autonomous vessels are not covered by the meaning of the term 'ship' under the UNCLOS.[254] The absence of a legal definition can be interpreted to mean that the object is clear, it is meant to be a manned vessel.[255] According to Matt Bartlett, it is important to read the UNCLOS in the context of the ordinary

[252] Bernard H. Oxman, 'The Regime of Warships Under the United Nations Convention on the Law of the Sea' (1984) 24 Va. J. Int'l L 813.
[253] Youri Van Longchem, 'International Law of the Sea and Autonomous Cargo Vessels' In Baris Soyer and Andrew Tettenborn (eds), *Artificial Intelligence and Autonomous Shipping: Developing the International Legal Framework* (1st edn, Bloomsbury Publishing, 2021) 36.
[254] Ibid 37.
[255] Ibid.

meaning of the text, *per* Article 31 of the Vienna Convention.[256] Connected to this, a plain reading of the said Convention would lead to that a vessel is what is meant to be a manned vessel.[257] For example, Article 94 of the UNCLOS requires a flag state to ensure that a vessel is in charge of a master and officer.[258] To conclude this section, whether or not autonomous system vessels fit into the meaning of a vessel in the UNCLOS is debatable. However, it can be argued that the autonomous systems vessels will be excluded from the meaning of a vessel in the UNCLOS, on the basis of Article 94 and other provisions in the same Convention, which will be discussed in the next subchapter.

3.2.1.1.2 The Definition of a Vessel in COLREGs

A definition of a vessel in the Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREGs), needs to be carefully discussed. This is because of the Rules of COLREGs apply to all vessels upon the high seas and all waters connected to the high seas and are navigable by seagoing vessels, according to Rule 1 of said Convention.[259] Therefore, it is a very important starting point to explore whether or not the Rules of the above mentioned Convention apply to autonomous systems vessels. It is acknowledged that discussing a legal definition of a certain subject in-depth is a prerequisite for examining other provisions in the same law. The notion is that it is not worth doing-discussing whether or not the Rules of COLREGs can be applied to autonomous systems vessels while these vessels are excluded from the legal definition. The legal definition of a vessel is laid down in Rule 3(a). This Rule stipulates

[256] Matt Bartlett, 'Game of Drones: Unmanned Maritime Vehicles and the Law of the Sea' (2018) Vol 24 Auckland University Law Review 66, 76.
[257] Ibid.
[258] UNCLOS, Art 94.
[259] COLREGs, Rule 1.

that " … the word 'vessel' includes every description of water craft, including non-displacement craft, WIG craft and seaplanes, used or capable of being used as a means of transportation on water …".[260] To some extent, providing a legal definition of a vessel at the front of the provisions of law is a logical approach to illustrate the scope of the application of that law. From systematic textual analysis, it can be said that a vessel is described as a means of 'transportation' on water. This is a fundamental attribute of a vessel and therefore, this term can be extended to cover several types of vessels, as this definition is too broad. Added to this, this definition does not provide certain legal requirements to limit the scope of this legal text. However, Rule 3(b) of the same Regulations has to be taken into consideration when defining a vessel. This Rule provides that "… the term "power-driven vessel" means any vessel propelled by machinery." It is not clear whether or not autonomous system vessels, as self-propelled vessels, can fall within the scope of the 'power-driven vessel and 'vessel propelled by machinery'.[261] Therefore, there is a need for illustrating the boundaries of the above mentioned definition.

3.2.1.2. National Definitions

3.2.1.2.1 Article 1(5) of Saudi CML

As previously mentioned, warships and governmental vessels are not required to register in the national public record. Therefore, they fall out of the scope of Saudi Commercial Maritime Law. This law applies only to the Saudi and foreign vessels that anchor at Saudi ports or maritime areas.[262] For this purpose, Article 1(5) defines the ship as " … *any floating craft normally*

[260] COLREGs, Rule 3(a).
[261] Toshiyuki Miyoshi, Shoji Fujimoto, Matthew Rooks, 'Tsukasa Konishi, and Rika Suzuki, Rules Required for Operating Maritime Autonomous Surface Ships form the viewpoint of Seafarers' (2022) 75(2) The Journal of Navigation 384.
[262] The 2018 Saudi Commercial Maritime Law, Art (2).

designed to operate in maritime navigation, even if it is not for profit, including vessel appurtenances which are necessary for its operation …".[263] This definition is the standpoint of the rule of the law. However, the definition laid down in the above Article is not strictly clear in regards to whether or not the autonomous vessels are included. The definition is formulated too broadly and thus could be subjected to interpretation activities that would reveal the intent of policymakers. Through a process of deconstructive reading, three elements that structure Article 1(5) will be illustrated. The first element is that a ship is a ' *floating craft'*. However, this element seems to be as broad as the term ship itself. It does not fix the lack of clarity in relation to the definition of the term 'ship' within a very clear normative basis and framework. The second element of Article 1(5) is the '*navigation'*. It provides a restriction with regard to the first element. Therefore, a *floating craft* has to be operated in maritime *navigation* to be considered as a ship. A *contra* reading is that a *floating craft* that has not been made for *navigation* is not considered a ship. The third element is that the *navigation* of *floating craft* has to be on a *routine basis*. Therefore, it could be said that the fundamental elements of Article 1(5) give signs to the statutory textual meaning of the term 'ship'. However, these signs seem to be too broad, and this could possibly lead to disagreement over the ordinary meaning of the term 'ship'.

In this regard, the pertinent question is whether or not autonomous vessels could fit under Article 1(5)? This is a question that has not a definitive answer yet. It could be argued that the formulation of the Article assigned semantic contents to express the meaning of a ship. These semantic contents could cover the autonomous vessels as it is broad enough. This argument is based on the literal approach that is considered as a primary rule to explore the plain, ordinary, or

[263] The 2018 Saudi Commercial Maritime Law, Art (1)5.

literal meaning of the legal words to the case. However, a counter-argument may rely on the historical approach. This argument presents the notion of autonomous vessels which was not in existence at the time of enactment, therefore, it was not in the intent of the policymakers. Nevertheless, this argument could be evaluated as invalid for a reason. The concept of autonomous vessels does not conflict with the elements of the definition despite the date of enactment. This conclusion could be supported by the application of a purposive approach to interpreting the above Article. This approach, as it is well known, relies on three main criteria namely, the language of the legal text, the context, and the purpose of the legal text to the case. Therefore, the purposive approach does not only consider the ordinary words of the legislation, as it is the case in a literal approach, but also considers its 'general legislative purpose'. This is a traditional judicial approach to give effect to the true purpose of the legislation. The conclusion that could be drawn from this, is that the definition laid down under the said Article could cover the concept of autonomous vessels if it is not excluded or included by any new provisions.

3.2.1.2.2 Article 11(1) of the United Arab Emirates CML

The definition of a ship is primarily set out in Article 11(1) of the Federal Law No. 26 of 1981 on the Commercial Maritime Law. This Article establishes that " … a vessel shall mean *any* structure normally operating, *or* made for the purpose of operating, in navigations by sea, *without* regard to its power, tonnage or the purpose for which it sails …".[264] On this basis, there could be a good reason to argue that the definition mentioned above could cover the new concept of the ship. Notably, it can be observed that Article 11(2) is structured on the basis of three

[264] The United Arab Emirates Federal Law No. 26 of 1981, Article 11(1).

elements. These are that the structure has to be '*normally operated*' or '*made to operate*' for the '*navigation*'. These are pragmatic functions to differentiate the ships from other structures in the sea. Similarly, the above mentioned Article shares the same semantics with Article 1(5) of Saudi Commercial Maritime Law. However, Article 11(2) of the United Arab Emirates Commercial Maritime Law went further to establish that "… in applying the provisions of the Law, *hovercraft* used for commercial or non-commercial purposes shall be deemed to as ships".[265] Therefore, it can be said that it is clear autonomous vessels are neither excluded nor included in the above definition. In addition, said vessels are not regulated by a particular law yet. Therefore, so long as a *hovercraft* is regarded as a ship under the above Article, *a fortiori*, autonomous ship could be regarded as a ship as well.

3.2.1.2.3 Article 1 of Qatari Maritime Law

The definition of a ship is laid down under Article 1 of the Maritime Law.[266] It provides that the ship "… is a *seaworthy craft* that routinely operates in the *navigation* or made for this purpose …".[267] This Article shares the same language with the ship definitions under the other Gulf States' national maritime laws. It describes a ship as a *craft* that is made for *navigation* on a *routine basis*. These are the three norms to differentiate a ship from other crafts. These norms could be taken as semantic signs to give a visualization of a ship. Distinctively, Article 1 of Qatari Maritime Law added a restriction upon the definition. This restriction is that a *craft* has to be '*seaworthy'* to be regarded as a ship. It refers, therefore, to the meaning of the seaworthiness legal requirements that are far beyond the definition itself. This is a direct link to clarify the

[265] The United Arab Emirates Federal Law No. 26 of 1981, Article 11(2).
[266] Qatari Maritime Law No. 15 of 1980, Article 1.
[267] Ibid.

statutory meaning. However, the issue that may arise here is that the ordinary meaning of a ship may conflict with the statutory meaning. The question here is to what extent autonomous vessels could be covered by Article 1 of said Law. Indeed, it might be difficult to estimate the answer *ex ante.* However, the definition of a ship is linked with the vessel's seaworthiness. This could lead to the conclusion that autonomous vessels are not considered as ships under Article 1 of Qatari Maritime Law for several reasons that will be discussed in the second subchapter.

3.2.1.2.4 Article 313(1) of the UK MSA

Under English law, it might be acceptable to state that the Merchant Shipping Act does not provide a precise legal definition for a ship. As evidence, Section 313(1)(c) of said Act provides that " a ship includes every description of vessel used in navigation".[268] This is considered a general legal definition of a ship but is not precise. It is not a clear legal term because the limitation of this definition in the legislation is not always fully understandable. Instead, looking beyond the legislation, it is important to appreciate that there is a significant volume of case law to interpret this provision of the 1995 Act.

In both the legislation and the case law, it can be said that the key element of this definition to understand what constitutes a ship for the above mentioned Section purposes is the phrase 'used in navigation'. In English common law, however, the reliance on the phrase 'used in navigation' to define a ship has been beset by problems.[269] At many times, English courts have tended to examine whether not a ship in question was being 'used in navigation' during the operation that

[268] British Merchant Shipping Act 1995, Section 313(1)(a).
[269] GM Gauci, 'Is it a vessel, a ship or a boat, is it just a craft, or is it merely a contrivance?' (2016) 47(4) Journal of Maritime Law and Commerce, 479.

gave a rise to litigation.[270] Take the case of *Curtis v. Wild* as an example, in this case, the judge used familiar reasoning to clarify that movement on water does not constitute navigation.[271] Therefore, it could be said that, said phrase implicitly refers to the seaworthiness of a vessel. Therefore, based on the above mentioned article and the absence of an authoritative definition, it is reasonable to say that the legal definition of a ship is broad. Consequently, this definition can be extended to cover autonomous systems vessels provided that said vessels are not excluded by specific laws or regulations.

Therefore, this subchapter examined what could constitute a ship under the UNCLOS and several national States regulations. In relation to the UNCLOS, it sets a definition for the warship, but it does not provide an accurate definition of the commercial ship. It is, therefore, logical to conclude that whether or not the UNCLOS provides what constitutes a meaning of ship, it is a controversial point. There are three different vital views in this regard. The argument presented in favor of autonomous vessels is that the lack of the ship definition under the UNCLOS does not exclude the autonomous vessels from the UNCLOS. On this basis, the meaning of the term ship and or vessel shall expand to include autonomous vessels. A counter-argument is that the UNCLOS is irrelevant to the definition of a ship. The definition of a ship and or a vessel is related to national State regulations. The third argument opposes both of the mentioned above arguments. It presents that the autonomous vessel falls out of the scope of the term ship and or vessel in the sense of the UNCLOS, and this is because it was not in the

[270] GM Gauci, 'Is it a vessel, a ship or a boat, is it just a craft, or is it merely a contrivance?' (2016) 47(4) Journal of Maritime Law and Commerce, 479.
[271] [1991] 4 All ER 172. See also *Steadman v Scofield* [1992] 2 Lloyds Rep 163, R v. Goodwin [2005] EWCA Crim3184 and The Sea Eagle [2012] 2 Lloyds Rep 37, which came to the same conclusion.

policymakers' minds when they drafted the said convention. The requirements of the master and crew are evidence to prove that the manned vessel is the object. These arguments are opposed to each other. However, the author of this chapter would suggest if autonomous vessels do not fit under Article 94 of UNCLOS in conjunction with national regulations, then it would not be considered a ship in sense of the UNCLOS.

Concerning national laws, several national flag States laws demonstrated to reveal whether or not the autonomous vessels could fit under the current definitions of a ship. Throughout this subchapter, the definition of a ship under four different jurisdictions, namely Saudi Arabia, the United Arab of Emirates, Qatar, and the United Kingdom has been examined. This was enough to conclude that the autonomous vessels could arguably fit under the definition of ships under the definition of a ship under Saudi Arabia, United Arab of Emirates, and the United Kingdom laws. Provided that autonomous system vessel meet the required elements of the definitions. This is because of that the elements of the definitions of a ship under the three different regulations are broad such as that the vessel has to be made for the ‘navigation’ on ‘a routine basis’. However, Qatar law requires a vessel to be seaworthy in order to qualify as a vessel. This measure extend further to the registration regime that will be demonstrated in the following subchapter.

3.3 REGISTRATION REGIME

As already stated, what constitutes the meaning of a vessel under the UNCLOS is debatable. This debate may lead to the necessity of this research to extend further to flag State's obligations under Article 94 of the UNCLOS. Exploring this Article is imperative, and it could be the most effective way to build a solid understanding in relation to the correct meaning of a ship under the UNCLOS. Broadly, it could be argued that autonomous vessels fall out of the scope of the meaning of ship and or vessel in the sense of the UNCLOS. This is because the safety requirements under Article 94 of UNCLOS pose legal barriers in front of the operation of autonomous vessels. This assumption is mainly based on the principle of non-contradiction. A proposition cannot be 'to be' and 'not to be' at the same time.[272] This is a classical logic that has an intimate relation between logic and law, with no doubt.[273] Take as an example an expression that people usually hear is that "the lawyer for the defense gave a very logical argument to the jury", or " the plaintiff's attorney introduced his evidence in a logical manner."[274] This means logic is viewed as a principle of correct thinking that aims to secure the efficient application of legal principles.[275] This is the connection between logic and law. Therefore, it could be mistaken to argue that the autonomous vessels could fit under the meaning of a 'ship' and or 'vessel' under the current provisions because this argument will violate the law of non-contradiction. Therefore, this chapter argues that Article 94 of UNCLOS and its implementation under the IMO's regulations would hinder the operation of autonomous vessels, and therefore it should be amended.

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[272] Henry W. Johnstone Jr, 'The Law of Non-Contradiction' (1960) Vol 3(9) Peeters Publishers 3.
[273] Nicholas F. Lucas, 'Logic and Law' (1919) Vol 3(4) Marquette Law Review 203.
[274] Ibid.
[275] Ibid.

At the national level, the selected flag States' national regulations provide definitions for a ship. Linguistically, these definitions are broad enough to cover the various types of ships. However, from a legal perspective, these definitions do not cover autonomous vessels because these vessels fall out of the scope of the registration regime. Logically, it cannot be said that the autonomous vessels fall under the meaning of the ships' definitions under the above-mentioned regulations, but they are excluded by the registration regime of the same regulations. This perception could be a mistake and would create a contradiction in a flag State's national law that would lead to uncertainty in the maritime legal framework accordingly.

Hence, this subchapter will provide a broad overview of the concept of registration. In addition, the duties of the State Parties under the UNCLOS will be explored, as it is set out several requirements associated with the registration regime. Then, it will provide a historical review about the State Parties discretion to set the registration requirements. Finally, the registration requirements under flag States national laws will be demonstrated.

3.4 The Concept of Ships Registration

The registration of ships is not a new phenomenon. Not only this, but it could also be said that it is as old as the ship itself. The origin of ship registration, as cited by Nigel P. Ready, goes back to the laws of imperial Rome before widespread in the City-States of medieval Italy.[276] Therefore, the 'registration' in this context is considered a term that is generally used to mean

[276] Nigel P. Ready, *Ship Registration* (2nd edn, Lloyd's London Press, 1994) 2.

entering the vessel in the public record.[277] In other words, it is an administrative procedure to grant nationality to a ship that is considered a public law function.[278] The functions of this law, *inter alia*, link the vessel and its subjection to one jurisdiction; to grant the vessel the right to fly the national flag and the right to engage in particular activities within the territorial waters of the flag State and between the ports of flag States; and the right to diplomatic protection by the flag State.[279] The public international law and the plurality of international conventions on the law of the sea are also concerned with these functions.[280] Furthermore, registration seems to be a precondition for the protection of the title of the registered owner and the preservation of the priorities between the person holding a security interest over the ship such as mortgages.[281] It is with these functions private law is concerned. Therefore, it could be said that registration is a procedure comprised of public and private laws functions. These functions aim to protect shipowner rights under national and international laws, and also ensure that the shipowner adherence to the said laws through flag States.

3.5 Duties of Flag States

It is understandable that the activities of ships at sea cannot be left entirely unregulated.[282] This is the main driver behind the duties of flag States to address some of the safety and environmental issues resulting from vessels' activities. Thus, the basis of those duties is laid down under Article 94 of the UNCLOS. However, the full extent of Article 94 of the UNCLOS is only perceivable in

[277] Rhea Rogers, 'Ship registration: A Critical Analysis' (Master Dissertation, World Maritime University, 2010) 7.
[278] Nigel P. Ready, *Ship Registration* (2nd edn, Lloyd's London Press, 1994) 2.
[279] Ibid 6 - 7.
[280] Ibid.
[281] Ibid.
[282] Tamo Zwinge, 'Duties of Flag States to Implement and Enforce International Standards and Regulations – And Measures to Counter Their Failure to DO SO' (2011) Vol 10(2) Journal of International Business and Law 297.

connection with further international conventions and agreements,[283] such as the 1966 International Convention on Load Lines, the 1969 International Convention on Tonnage Measurement, the 1972 Convention on the International Regulations for Preventing Collision at Sea, the 1972 International Convention for Safe Containers, the 1974 International Convention for the Safety of Life at Sea and 1988 Protocol, the 1978 International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (revised 1995), the 1979 International Convention on Maritime Search and Rescue, the 1989 International Convention on Salvage.[284] These measures must be met by each ship prior to the registration.[285] Therefore, whether or not autonomous vessels could meet Article 94 of UNCLOS and its implementation under other international conventions is the focus of the following section.

3.5.1 Maintain Registration

Essentially, ship registration is one of the flag States obligations. This obligation is laid down under Article 94(1) of UNCLOS which states that every flag State "… shall effectively exercise its jurisdiction and control in administrative, technical and social matters over ships flying its flag."[286] This paragraph, as critiqued by Hosanee, is based on the closing provision of Article 5(1) of the 1958 Convention on the High Sea (HSC).[287] The purpose of this paragraph is to impose general duties on flag States in relation to the indicated matters. This legal text could be

[283] Tamo Zwinge, 'Duties of Flag States to Implement and Enforce International Standards and Regulations – And Measures to Counter Their Failure to DO SO' (2011) Vol 10(2) Journal of International Business and Law 297.
[284] Richard A Barnes, 'Flag States' in Donald R Rothwell, Alex G Oude Elferink, Karen N Scott, and Tim Stephens (eds), *The Oxford Handbook of The Law of The Sea* (1st edn, Oxford University Press, 2015) 315.
[285] UNCLOS, Art 94(4)(a).
[286] UNCLOS, Art 94(1).
[287] Nivedita M. Hosanee, 'A Critical Analysis Of Flag State Duties As Laid Down Under Article 94 Of The 1983 United Nations Convention On The Law Of The Sea' (The United Nations -Nippon Foundation Fellowship Programme – Research Paper, University of Milan, 2009) 21.

taken to mean that every individual flag State is responsible to ensure protection to human rights on the board of vessels and also to prevent crime and illegal activities that may occur. Therefore, it is concerned with the ship activities rather than the ship itself. In addition, it has been said that Article 94(1) could also be read as a complement of paragraph 1 of Article 92 of UNCLOS.[288] This paragraph requires that "… ships shall sail under the *flag* of one State only and, save in exceptional cases expressly provided for in international treaties or in this Convention, shall be subject to its *exclusive jurisdiction* on the high seas. A ship may not change its flag during a voyage or while in a port of call, save in the case of a real transfer of ownership or change of registry …".[289] This Paragraph provides two obligations that must be exercised by flag States. First, a ship 'shall sail under the flag of one State' which means that there must be a 'genuine link' between a vessel and flag State to effectively exercise its jurisdiction over the matters expressed under Article 94(1).

Notably, the 'genuine link' between a state of registration and a vessel is considered the main element of the principle of freedom of navigation.[290] However, there is a lack of a precise legal definition of what is meant by 'genuine link' in the Conventions of 1982 and 1958.[291] Therefore, the meaning of 'genuine link' is controversial. The scope of this controversy widened when said principle adopted as a test for effective flag state jurisdictional control over vessels flying its

[288] Nivedita M. Hosanee, 'A Critical Analysis Of Flag State Duties As Laid Down Under Article 94 Of The 1983 United Nations Convention On The Law Of The Sea' (The United Nations - Nippon Foundation Fellowship Programme – Research Paper, University of Milan, 2009) 23.
[289] UNCLOS, Art 92(1).
[290] Serhii Kuznietsov, 'The "Genunie Link" Concept: Is It Possible to Enhance the Strength?' (2021) 7(6) Lex Portus, 65.
[291] Ibid. See also H. E. Anderson III, 'The Nationality of Ships and Flags of Convenience: Economics, Politics and Alternatives' (1996) 21 Tulane Maritime Law Journal 139 and M. L. McConnell, '"Darkening Confusion Mounted upon Darkening Confusion": The Search for the Elusive Genuine Link' (1985) 16 Journal of Maritime Law and Commerce 365

flag.[292] This test is translated into a legal principle with political consequences.[293] According to Simon Tache, 'genuine link' can be defined as the legal and functional responsibilities the flag state assumes when a flag state gives its national character upon a vessel.[294] The registration of a ship into one or another state implies the 'genuine link' between a state and a ship.[295] Despite the controversial meaning of the 'genuine link', flying the national flag is visual evidence of a ship's nationality,[296] and registration. Second, Paragraph 1 of Article 92 emphasizes that the flag State must exercise its *exclusive jurisdiction* over the ship on the high seas. The reason behind such obligation may aim to bridge the gap in international law in respect to the sovereignty on the high sea that is addressed by flag State public law.[297] A further explanation for this point could be found in the Award of International Tribunal for the Law of the Sea (ITLOS), the case of '*M/V Saiga' (No 2),*[298] which ruled that;

> [T]he LOSC considers a ship as a unit … Thus the ship, everything on it, and every person involved or interested in its operations are treated as an entity linked to the flag State. The nationalities of these persons are not relevant.[299]

Therefore, the registration of a ship is an imperative procedure to establish a 'genuine link' between a ship and the flag State, as a 'genuine link' is an obligation imposed by Article 91(1) of

[292] Simon W. Tache, 'The Nationality of Ships: The Definitional Controversy and Enforcement of Genuine Linke' (1982) 16(2) International Lawyer, 301.
[293] Ibid.
[294] Ibid.
[295] Serhii Kuznietsov, 'The "Genunie Link" Concept: Is It Possible to Enhance the Strength?' (2021) 7(6) Lex Portus, 65.
[296] Nigel P. Ready, *Ship Registration* (2nd ed, Lloyd's London Press, 1994) 6.
[297] Douglas Gulifoyle, 'The High Seas' in Donlad R Rothwell, Alex G Oude Elferink, Karen N Scott, and Tim Stephens (eds), *The Oxford Handbook of The Law of The Sea* (1st edn, Oxford University Press, 2015) 209.
[298] *Saint Vincent and the Grenadines v Guinea*, Order, Request for Provisional Measures, ITLOS Case No 2, ICGJ 335 (ITLOS 1998)
[299] Gulifoyle (n 297) 209.

UNCLOS. This Article provides that " … there must exist a genuine link between the State and the ship".[300] This norm enables a state to effectively exercise its jurisdiction over the ship. However, the issue is how would the flag State effectively exercises its jurisdiction over autonomous vessels? There is still some ambiguity regarding such issues.

In addition, Article 94(2)(a) of UNCLOS provides more specifications in relation to the duty of the flag State. It is set out that every flag State shall " … maintain a register of ships containing the names and particulars of ships flying its flag, except those which are excluded from generally accepted international regulations on account of their small size …".[301] This subparagraph requires a flag State has to ensure its ships are in compliance with the generally applicable and accepted international regulations, as the registration of ships is determinative for its nationality and for its activity subsequently. However, a flag State's jurisdiction over the ship, shipmaster, officers, and crew in relation to administrative, technical, and social matters has to be exercised according to flag State national law.[302] The primary barrier to the operation of autonomous vessels is the 'generally accepted international regulations. As will be examined in the following paragraphs, the autonomous vessels may fall out of the scope of those regulations, and it might be difficult for flag States to fulfill maintain register obligation in this regard.

3.5.2 Construction, Equipment, and Seaworthiness of Ships

Paragraph 3 of Article 94 lays down vessels' safety measures that must be taken into consideration by the flag State. This paragraph requires that "… [e]very State shall take such

[300] UNCLOS, Art 91(1).
[301] UNCLOS, Art 94(2)(a).
[302] UNCLOS, Art 94(2)(b).

measures for ships flying its flag as are necessary to ensure safety at sea …".[303] This includes the construction, equipment, and seaworthiness of ships,[304] taking into consideration the applicable international instruments. The issue is that neither Article 94(3) nor Article 219 defines the term 'seaworthiness' as they are only Articles in the UNCLOS that contains such a phrase.[305] The term 'seaworthiness' under this Article should be read in the context of the construction and equipment of ships in order to ensure the safety of navigation at sea.[306] However, a flag State obligation under Article 94(3)(a) is too broad. This subparagraph does not provide more details in relation to the construction, equipment, and seaworthiness standards. The standards and details of this obligation have been left to be agreed upon between State Parties in different conventions.

In this regard, a comprehensive volume of standards for the ship's construction and subsequent maintenance sets out in the detailed technical annex chapters to the 1974 International Convention for the Safety of Life at Sea and the 1988 Protocol (SOLAS).[307] Regulation 1(a), for example, states that "… cargo ships of less than 500 tons gross tonnage …" would fall out of the scope of SOLAS,[308] which applies only to the ships that aim to engage in the international voyage.[309] Several authors, such as Robert Veal, argue that the current category of unmanned

[303] UNCLOS, Art 94(3).
[304] UNCLOS, Art 94(3)(a).
[305] Ling Zhu and Richard W.W Xing, 'Developments of Unmanned Autonomous Merchant Ships: Legality under the UNCLOS' In Keyuan Zou and Anastasia Telesetsky (eds), *Marine Scientific Research, New Marine Technologies and the Law of the Sea* (1st edn, Brill, 2021) 123.
[306] Ibid.
[307] Robert Veal, Michael Tsimplis, and Andrew Serdy, 'The Legal Status and Operation of Unmanned Maritime Vehicles' (2019) 50(1), Ocean Development & International Law, 35.
[308] SOLAS, Regulation 3(a)(ii).
[309] SOLAS, Regulation 1(a).

vessels is not of sufficient tonnage to be subject to SOLAS.[310] Those vessels are much smaller than what is required by Regulation 1(a) and most of the autonomous vessels do not exceed 20 meters in length.[311] Even if the autonomous vessels met Regulation 1(a), these vessels do not meet some of the other Regulations of SOLAS. For example, SOLAS sets out several provisions related to seafarers' accommodations on board. In particular, Paragraph 2.3.1 of Regulation II-2/9 which provides 'methods of protection in accommodation area' shall be adopted,[312] and Paragraph 2.3.2 of the same Regulation that requires 'Bulkhead within accommodation area'.[313] In addition to Paragraph 2.3.4 which provides 'protection of stairways and lift trunk in accommodation spaces, service spaces, and control stations'.[314] These Paragraphs provide methods and descriptions for the containment of a fire in seafarers' accommodation. However, autonomous vessels are crewless which means that these would be designed without crew accommodation. In this case, the mentioned-above requirements could be seen as legal barriers. This could also mean that it is a flag State's responsibility to prevent the operation of autonomous vessels in the high sea as long as it does not meet the flag State obligation under Article 94(3)(a), otherwise, this Article would be breached.

[310] Robert Veal, Michael Tsimplis, and Andrew Serdy, 'The Legal Status and Operation of Unmanned Maritime Vehicles' (2019) 50(1), Ocean Development & International Law, 35.
[311] Youri Van Longchem, 'International Law of the Sea and Autonomous Cargo Vessels' In Baris Soyer and Andrew Tettenborn (eds), Artificial Intelligence and Autonomous Shipping: Developing the International Legal Framework (1st edn, Bloomsbury Publishing, 2021) 30.
[312] SOLAS, Regulation 9(2.3.1).
[313] SOLAS, Regulation 9(2.3.2).
[314] SOLAS, Reguation 9(2.3.4).

3.5.3 Manning of Vessels

Ensuring vessels are manned is viewed as one of flag state obligations. This obligation is laid down in Article 94(3)(b) of UNCLOS and it aims to ensure safety at sea. As evidence, this Article provides that a flag State must ensure " … the manning of ships, labour conditions, and the training of crews, taking into account the applicable international instruments …".[315] However, this Article does not go further to provide more details in this regard. Thus, it can be said that the safe manning obligation has to be read with the safe manning principle in Chapter V Regulation 14(1) of SOLAS for a better and proper understanding. To clarify, Paragraph (1) of Regulation V/14 stresses that every contracting government has to maintain that "… all ships shall be sufficiently and efficiently manned …" for the purpose of ensuring the safety of life at sea.[316] In addition, it requires a State Party to ensure that every "… ship shall be provided with an appropriate minimum safe manning document or equivalent issued by the Administration as evidence of the minimum safe manning considered necessary to comply with the provisions of paragraph (1) …".[317] Thus, what might be understood is that vessels must hold a 'safe manning' in order to be considered safe at sea. The number of seafarers that may constitute a 'safe manning' is not determined in the above provisions. Probably, this task was left to be decided on the basis of the shipowners and flag States' discretion.[318] However, the discretion of Administrations and companies is not absolute.[319] In 2011, the IMO's Resolution A.1047(27)[320]

[315] UNCLOS, Art 94(3)(b).
[316] SOLAS, Regulation V/14(1).
[317] SOLAS, Regulation V/14(2).
[318] Paolo Zampella, 'Maritime and Air Law Facing Unmanned Vehicle Technology' (Ph.D. Thesis, University of Cagliari, 2018) 126.
[319] Ibid.
[320] General Assembly Resolution A.1047(27), *Principles of Minimum Safe Manning*, A 27/Res. 1047, (20 December 2011) available from https://wwwcdn.imo.org/localresources/en/OurWork/HumanElement/Documents/1047(27).pdf

developed a framework to assist Administrations and companies in the Application of the Principle of Minimum Safe Manning;[321] Guidelines for Determination of Minimum Safe Manning;[322] Responsibilities in the Application of Principles of Minimum Safe Manning;[323] Guidance on Contents and Model Form of Minimum Safe Manning Document;[324] Model Form of Minimum Safe Manning Document;[325] and Framework for Determining Minimum Safe Manning.[326] The objective of this Resolution, *inter alia*, is to " … ensure that a ship is sufficiently, and efficiently manned to provide safety and security of the ship, safe navigation and operations at sea …" that can be achieved through the adoption of a goal-based approach, standard procedures for effective implementation, and effective enforcement.[327] Therefore, the level of safe manning will be determined on the basis of the said Resolution. Especially, Annex 4 establishes that the Administration should specify the minimum safe manning by " … a table showing the number, grades and or capacities of the personnel required to be carried, together with any special conditions or other remarks …".[328] Additionally, Annex 5 which requires a " … submission of a proposal from the company for minimum safe manning defining the nature of the operation of the ship …"[329] On this basis, it could be said that the exact number of minimum safe manning is not available in UNCLOS, SOLAS, and IMO's Resolution provisions. This would lead to a view that the final decision to determine the number of safe manning will be left to Administrations and companies. At a national level, the Saudi Transport General Authority

[321] Annex 1, Resolution A.1047(27).
[322] Annex 2, Resolution A.1047(27).
[323] Annex 3, Resolution A.1047(27).
[324] Annex 4, Resolution A.1047(27).
[325] APPENDIX, Resolution A.1047(27).
[326] Annex 5, Resolution A.1047(27).
[327] Annex 1(2), Resolution A.1047(27).
[328] Annex 4(1)(2), Resolution A.1047(27).
[329] Annex 5(1)(1), Resolution A.1047(27).

produced the Regulation of Minimum Safe Manning under the provision of regulation V/14 of the International Convention for the Safety of Life at Sea, 1974. According to Article 3 of the Code of the Minimum Safe Manning, this Code will be applied to all vessels flying the Saudi flag[330] except, *inter alia*, warships and non-commercial vessels,[331] small fishing vessels,[332] tourism vessels,[333] and sea research vessels.[334] In addition, this Code will be applied to foreign vessels licensed to work in Saudi Maritime Zones.[335] The minimum safe manning is determined by Article 9 of said Code. For example, the minimum safe manning for vessels between 500 and 3000 tonnage is (1) Master, (1) Chief Officer, (2) Second Officers, (2) Deck Watch Rating, and (1) Able Seafarer Deck. Breaching this Article will bear the owner of such vessel (30,000) Saudi Ryals as a fine. On this basis, it can be said that autonomous intelligent system vessels will not meet the requirements of the minimum safe manning. Therefore, said vessels are not eligible to exercise the navigation in the above mentioned state maritime zones.

It is not clear whether or not the shipowner in other countries can write a zero number of manning down in the submission proposal or the application for minimum safe manning document. It is expected that the shipowner annotates the said application with zero so long as the new technology will replace the onboard master and crew. However, it has been argued that the IMO's will never permit a ship to sail without an officer on board.[336] Veal *et al.*, in this

[330] Code of the Minimum Safe Manning, Art 3(1).
[331] Ibid, Art 3(1)(a).
[332] Ibid, Art 3(1)(d).
[333] Ibid, Art 3(1)(e).
[334] Ibid, Art 3(1)(g).
[335] Ibid, Art 3(2).
[336] Jeremia Humolong Prasetya, 'The Operation of Unmanned Vessel in Light of Article 94 of the Law of the Sea Convention: Seamnning Requirement' (2020) Vol 18(1) Indonesian Journal of International Law 115.

context, argue that it would be a matter of discretion if a national administration allows the operation of autonomous vessels.[337] The matter lies in the absence of uniform international standards for unmanned vessels' communication technology and practices.[338] Therefore, it could be concluded that the operation of 'autonomous' or 'unmanned' vessels is questionable due to Article 94(3)(b) of UNCLOS and the Code of the Minimum Safe Manning. Even if the 'autonomous' or 'unmanned' vessels have met the safety requirements, the 'literal meaning' of 'safe manning' under the said provision is literally in contrast to the term 'unmanned' vessels. This is the interpretation that may draw the line between safe manning and unsafe.

3.5.4 The Prevention of Collisions

Flag States are legally obliged to create safety measures in order to prevent a collision at sea. This obligation is laid down under Article 94(3)(c) of UNCLOS which states, in particular, "… the use of signals, the maintenance of communications, and the prevention of collisions …" are textual obligations imposed on the flag State.[339] The language of this subparagraph specifies that 'the maintenance of communications' during a voyage is considered one of the necessary means to achieve safety at sea. This obligation has been addressed by several conventions under the umbrella of IMO, such as the Global Maritime Distress and Safety System (GMDSS) as part of the SOLAS in addition to the 1972 Convention on the International Regulations for Preventing Collisions at Sea (COLREGs) which will be the focus hereafter. This convention applies to " … all vessels upon the high seas and in all waters connected therewith navigable by seagoing

[337] Robert Veal, Michael Tsimplis, and Andrew Serdy, 'The Legal Status and Operation of Unmanned Maritime Vehicles' (2019) Vol 50(1) Ocean Development & International Law 37.
[338] Ibid.
[339] UNCLOS, Art 94(3)(c).

vessels …".[340] It sets out the various rules for the safety of navigation to prevent collision between vessels.[341] For instance, this convention provides the rules of steering and sailing,[342] lights and shapes,[343] and sound and light signals.[344] It covers, *inter alia*, navigation tasks on board and operational decision-making concerning collision avoidance, priorities, and speed.[345] Therefore, these rules must be implemented by flag States and shipowners before registering the vessels for the purpose of the safety of the sea. Traditionally, these navigational rules were performed physically on board by seafarers. However, the seafarers would be replaced by remote control operators and the algorithm control in the autonomous vessels. It could be, therefore, doubtful to consider that the new technological development would effectively meet COLRGs. Rules (2) and (5) of COLREGs may be the most proper and important rules of the COLREGs in this regard.[346] Therefore, these rules will be examined further, as follows.

3.5.4.1 Collision Avoidance

It is worth noting that the COLREGs provide some guidance to avoid collision between two vessels at the sea. For example, Rule 13 of COLREGs provides how the vessels should be overtaking other vessels,[347] and Rule 14 governs meeting or head-on situations.[348] However,

[340] COLREGs, Rule 1.
[341] Shinji Iwanga, 'Legal Issues Relating to the Maritime autonomous Surface Ships Development and Introduction to Services' (Master Dissertation, World Maritime University, 2019) 38.
[342] COLREGs, Part B.
[343] COLREGs, Part C.
[344] COLREGs, Part D.
[345] Erica Yvonn Jungblut, 'The First Step in Regulating Autonomous Ships: An Assessment on the Interim Guidelines for Maritime Autonomous Surface Ships Trials and its Legal Significance in the International Regulatory Landscape' (Master thesis, The Arctic University of Norway, 2020) 38 – 39.
[346] Robert Veal, Michael Tsimplis, and Andrew Serdy, 'The Legal Status and Operation of Unmanned Maritime Vehicles' (2019) 50(1) Ocean Development & International Law, 23 – 38.
[347] COLREGs, Rule 13.
[348] COLREGs, Rule 14.

these Rules might not pose fundamental legal problems in conjunction with the operation of autonomous vessels in comparison to Rule 2 of the same Convention. This Rule is a general provision and the autonomous vessels must comply with it to avoid the collision at sea.[349] For example, Paragraph (a) of Rule 2, which merits full citation, provides that " … nothing in these Rules shall exonerate any vessel, or the owner, master or crew thereof, from the consequences of any neglect to comply with these Rules or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case ...".[350] This Paragraph contains some crucial elements in relation to liabilities and when departure from COLREGs should be taken.[351] The effect of this Paragraph is that the seafarers have to take into consideration the principle of 'ordinary practice of seamen' or 'good seamanship'.[352] The view on the juridical basis of good seamanship is identified to mean that it is the foundation of all COLREGs rules.[353] It is explained further, by Shinji Iwanaga, to mean the expertise and skills pertaining to the operation, navigation, management, safety, and maintenance of ships.[354] It is, therefore, not clear how this principle would be fulfilled in relation to autonomous vessels.

Even if the principle of good seamanship could be codified in the autonomous system and this system would effectively act accordingly, Paragraph (b) of Rule 2 has the potential to be viewed as another legal barrier. This Paragraph establishes that " … in construing and complying with

[349] Shinji Iwanaga, 'Legal Issues Relating to the Maritime Autonomous Surface Ships' Development and Introduction to Services' (Master Dissertation, World Maritime University, 2019) 38.
[350] COLREGs, Rule 1(a).
[351] Phillip Belcher, 'Rule Following Behaviour in Collision Avoidance: A Study of Navigational Practices in the Dover Strait' (Ph.D Thesis, Cardiff University, 2007) 87.
[352] Ibid.
[353] Robert Veal and Michael Tsimplis, ' The Integration of Unmanned Ships into the Lex Maritima' (2017) 2 LMCLQ 303, 324.
[354] Iwanaga (n 349) 39.

these Rules due regard shall be had to all dangers of navigation and collision and to any special circumstances, including the limitations of the vessels involved, which may make a departure from these Rules necessary to avoid immediate danger ...".[355] This Paragraph illustrates a discretion of the authority to the seafarers that would enable the seafarers to temporarily deviate from the COLREGs provisions to avoid the immediate danger that is expected. This action is based on the realization and visualization of seafarers which is impossible to be done by algorithm control. Therefore, it could be concluded that 'ordinary practice of seamen' or 'good seamanship' is a principle that could be implemented by seafarers only, and a flag State obligation under Article 94(3)(c) of UNCLOS must ensure seafarers on the board of the ship for this purpose. Otherwise, flag States would be seen to be in breach of this obligation if it were to give permission to autonomous vessels to sail on the high sea.

3.5.4.2 Human Look-Out

A human lookout is a traditional obligation of high importance, to ensure the safety of vessels. This obligation is established in Rule 5 of COLREGs which provides that " … every vessel shall at all times maintain a proper look-out by sight and hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision …".[356] Conventionally, a proper look-out obligation is fulfilled by a bridge team who are physically present on board. They are assisted by radar, e-navigation, and echo sounders.[357] The received information would be processed urgently by the seafarers on board to envisage the possible situation that would lead to assessing the danger

[355] COLREGs, Rule 1(b).
[356] COLREGs, Rule 5.
[357] Robert Veal and Michael Tsimplis, ' The Integration of Unmanned Ships into the Lex Maritima' (2017) 2 LMCLQ 303, 326.

accordingly.[358] However, as previously mentioned, technology has been developed significantly to replace human activity onboard ships. For example, autonomous and remote control vessels would be equipped with, *inter alia*, 360-degree cameras and radar equipment that transmit a very accurate view of the vessel's vicinity.[359] This development poses a possible challenge to the obligation under Rule 5. For example, Rule 5 states that the proper look-out has to be performed through 'sight' and 'hearing' that requires the exercise of human perception.[360] Therefore, fully autonomous vessels rely solely on the algorithmic collision avoidance technology and this technology would not be able to maintain a look-out by 'sight' and 'hearing'.[361] Added to this point is that "… human input in surveying and assessing the situation and collision risk …" is required legally.[362] This view would put forward an argument that technology would not replace humans in such a particular thing. From a very technical point of view, the AAWA Position Paper points out that it is possibly feasible to create algorithms that would very diligently comply with the general rules of steering and sailing under the COLREGs, exempt Rule 2.[363] Tied to this point is that it is very difficult to incorporate the principle of 'good seamanship' into any automated navigation program.[364] To conclude this paragraph, it might be reasonable to state that the purpose of flag State and shipowner obligation could be met by the new technology in relation to remote control vessels, Level Three of Autonomous Ships, but not fully autonomous vessels and Article 94(3)(c) of UNCLOS accordingly.

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[358] Robert Veal and Michael Tsimplis, ' The Integration of Unmanned Ships into the Lex Maritima' (2017) 2 LMCLQ 303, 326.
[359] Ibid.
[360] Ibid.
[361] Ibid; Robert Veal, Michael Tsimplis, and Andrew Serdy, 'The Legal Status and Operation of Unmanned Maritime Vehicles' (2019) 50(1) Ocean Development & International Law, 23 – 39.
[362] Oda Loe Fastvold, 'Legal Challenges for Unmanned Ships in International Law of the Sea' (Master Thesis, The University of Norway, 2018) 40.
[363] Ibid.
[364] Ibid 41.

3.5.5 Master

According to Barbara Stepien, a master of a vessel traditionally represents all the responsibilities and obligations associated with the operation of a vessel.[365] According to Article 1 of the Code of the Minimum Safe Manning, the word master refers to a person who is qualified to command and supervise a vessel.[366] This is a simple legal definition laid down in said Code. According to Barbara Stepien, both the customary and conventional laws determined 'the master position as the core of the maritime legal order' and these laws presume the presence of a master onboard, even if these laws do not explicitly state that.[367] For example, Article 94(4)(b) of the UNCLOS establishes that " … each ship is 'in the charge' of a master and officers who possess appropriate qualifications, in particular in seamanship, navigation, communications and marine engineering, and that the crew is appropriate in qualification and numbers for the type, size, machinery and equipment of the ship …".[368] Simply, this subparagraph requires that a flag State must take necessary measures to ensure each ship is in charge of the master and officers to achieve safety at sea. According to Article III of the 1978 International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, " the Convention shall apply to seafarers serving on board seagoing ships entitled to fly the flag of a Party except to those serving on board,[369] namely, warship and governmental non-commercial ships,[370] fishing vessels,[371] pleasure yachts not engaged in trade,[372] wooden ships of primitive build."[373] Therefore, it can be said that

[365] Barbara Stepien, 'Can a Ship be its Own Captain? Safe Manning of Autonomous and Uncrewed Vessels' (2023) Vol 148 Marine Policy 1.
[366] The Code of the Minimum Safe Manning, Art 1.
[367] Stepien (n 365).
[368] UNCLOS, Art 94(4)(b).
[369] The 1978 International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, Art III.
[370] Ibid, Art III(a).
[371] Ibid, Art III(b).
[372] Ibid, Art III(c).

boarding a vessel is a prerequisite for master and seafarer.[374] It also means that a strict interpretation of the term 'on board' could support the argument that autonomous vessels would fall out of the scope of the STCW Convention.[375]

According to Regulation VIII/2(2)(1) of the STCW Convention, "administrations shall require the master of every ship to ensure that watch–keeping arrangements are adequate for maintaining a safe watch or watches, taking into account the prevailing circumstances and conditions and that, under master's general direction: (1) officers in charge of the navigational watch or watches are responsible for navigating the ship safely during their periods of duty, when they shall be physically present on the navigating bridge control room at all time. On this basis, it can be said that the bridge of a vessel is a place where navigational instruments are provided and also where a navigational watch can be performed.[376] However, the onboard master and crew will be replaced by remote control operators and autonomous systems in the autonomous intelligent system vessels. It is suggested that navigational functions would be implemented through the programmer of the software for the ship's autonomous operation on the voyage, and the remote control center would monitor the vessel's progress and navigation by remote control.[377] This means that the new technological development will challenge the above-mentioned Articles. Therefore, there is a need to modify the above mentioned Articles in order to accommodate the

[373] The 1978 International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, Art III(d).
[374] Michol Ji, 'A Study on the Legal Status and Responsibilities of the Master in Autonomous Vessels: The Case of General Remote Operators' (Master Thesis, World Maritime University, 2022) 15.
[375] Oda Loe Fastvold, 'Legal Challenges for Unmanned Ships in International Law of the Sea' (Master Thesis, The University of Norway, 2018) 19.
[376] Ji (n 374) 16.
[377] Simon Baughen and Andrew Tettenborn, 'International Regulation of Shipping and Unmanned Vessels' in Baris and Andrew (eds), *Artificial Intelligence and Autonomous Shipping: Developing the International Legal Framework* (1st edn, Bloomsbury Publishing, 2021) 12.

new technology. For example, there is a scope to redefine master duties and responsibilities to be performed from a remote control center. In addition, it could be possible to expand the concept of a vessel master to cover the remote control operator.

3.6 Freedom Of States To Fix Conditions

The decision to grant nationality to vessels is generally subject to the sovereignty of a flag State.[378] This is a classic statement that could be proof that every State has an individual and unilateral right to fix the conditions for the grant of nationality.[379] The principle of freedom to fix registration conditions was made in the case of *Great Britain v France* (*Muscat Dhows*).[380] This case received significant attention from academic commentators.[381] Not only this, the Award of the said case has proved to be highly influenced upon subsequent legislation, providing the legal basis for the first sentence of Paragraph 1 of Article 91 of UNCLOS, Article 99, and Article 110 of the same Convention.[382] Therefore, it is an important source for the international law of the sea studies and it is worth discussing. The scope of the discussion will be focused on the registration issues. Thus, the facts of such a case are the starting point.

In April 1893, British officers on *Zanzibar* had spotted a dhow, a native vessel sailing in the Indian Ocean and Arabic Gulf that utilized a lateen sail, sailing out of the harbor under the

[378] Nigel P. Ready, *Ship Registration* (2nd ed, Lloyd's London Press, 1994) 9.
[379] Ibid.
[380] Muscat Dhows Case, *France v Great Britain*, Award, (1961) XI RIAA 83, ICGJ 406 (PCA 1905), 8th August 1905, Permanent Court of Arbitration [PCA].
[381] Fahad Ahmad Bishara, 'No Country but the Ocean: Reading International Law from Deck of an Indian Ocean Dhow, ca.1900' (2018) 60(2) Cambridge Core 338, 366.
[382] Jean Allain, *Slavery in International Law of Human Exploitation and Trafficking* (1st edn, Martinus Nijhoff Publishers, 2013) 75.

French flag.[383] A British naval officer was dispatched by the authorities, who found more than fifty slaves tucked away in a hatch.[384] The owners of this vessel were subjects of the Sultan of Muscat.[385] However, they fly the French flag and hold official registration papers. The argument presented by the French Consul in Muscat was that the jurisdiction over the *Dhow* is exclusively subject to French authorities and the vessel and seafarers must be released.[386] The release had happened on the condition that France had to arbitrate several matters.[387] At the heart of the case, the question was whether or not the Consul of France in Muscat had the right to grant flags and navigation passes to *Dhows*?[388] This is where the conflict of views lies. The argument brought by the French representative was that the status of subjects of the Sultan of Muscat had been deemed *protégé* by France, according to the French-Muscat Treaty of the 17th November, 1844.[389] This Treaty gave the right to the Consul of France in Muscat to grant the nationality and navigation passes to the subjects of the Sultan of Muscat for trading purposes in Muscat territorial waters, the Red Sea, the Indian Ocean, and the Arabic Gulf.[390] In addition, the immunity from search was included in the Treaty.[391] These were the legal basis for the French representative's argument.

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[383] Fahad Ahmad Bishara, 'No Country but the Ocean: Reading International Law from Deck of an Indian Ocean Dhow, ca.1900' (2018) 60(2) Cambridge Core 338, 366.
[384] Ibid.
[385] Nigel P. Ready, *Ship Registration* (2nd ed, Lloyd's London Press, 1994) 11.
[386] Louis B. Sohn, John E. Noyes, Erik Franckx, and Kristen G. Juras, *Cases and Materials on the Law of the Sea* (2nd edn, BRILL, 2014) 113.
[387] Ibid.
[388] Bishara (383).
[389] Jean Allain, *Slavery in International Law of Human Exploitation and Trafficking* (1st edn, Martinus Nijhoff Publishers, 2013) 75.
[390] Renate O'Connell, *The International Law Of The Sea* (1st edn, Oxford University Press, 1984) 753.
[391] Ibid.

However, the counter-argument that was presented by British representatives, in this case, was that the said Treaty was modified by the Declaration of March 10, 1862.[392] Such a Declaration between Great Britain and France required parties in the dispute "… to engage reciprocally to respect the independence …" of the Sultan of Muscat and *Zanzibar*.[393] The reason behind this amendment was due to, *inter alia*, the misuse of the French flag which was being used as protection for slave trading by *Dhows*.[394] This behavior disabled the Sultan of Muscat from taking action against those vessels to suppress the slave trade, and it constituted an infringement of the declaration mentioned above that was made by the French and British.[395] In addition, the French-Muscat Treaty of 1844 was limited by Article 32 of the 1890 General Act of the Brussels Conference.[396] This Article stated that;

> Authority to fly the flag of one of the said Powers shall in future only be granted to such native vessels as shall satisfy all the three following conditions:
>
> 1. Their fitters-out or owners must be either subjects of or persons protected by [*protégés* of][397] the Power whose flag they claim to fly.
>
> 2. They must furnish proof that they possess real estate situated in the district of the authority to whom their application is addressed, or to supply a solvent security as a guarantee for any fines to which they may eventually become liable.
>
> 3. Such fitter-out or owners, as well as the captain of the vessel, must furnish proof that they enjoy a good reputation, and especially that they have never been condemned for acts of Slave Trade.[398]

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[392] Renate O'Connell, *The International Law Of The Sea* (1st edn, Oxford University Press, 1984) 753.
[393] Louis B. Sohn, John E. Noyes, Erik Franckx, and Kristen G. Juras, *Cases and Materials on the Law of the Sea* (2nd edn, BRILL, 2014) 113.
[394] O'Connell (392).
[395] Ibid.
[396] Sohn, Noyes, Franckx, and Juras (n 393) 114.
[397] Ibid.
[398] General Act Of The Brussels Conference Relative To The African Slave Trade 1890, Art 32.

In its Award, the Panel of the Permanent Court of Arbitration ruled that the ship registration "… belongs to every Sovereignty to decide to whom he will accord the right to fly his flag and to prescribe the ruled governing such grants, and whereas therefore the granting of the French flag to subjects of His Highness the Sultan of Muscat in itself constitutes no attack on the independence of Sultan …".[399] Furthermore, it was also pointed to the mentioned-above Article which set out the requirements under which 'native vessels' had to be granted authority to fly a flag.[400] Therefore, after France had ratified the General Act of the Brussels Conference, it had no authority to " … authorize vessels belonging to subjects of His Highness the Sultan of Muscat to fly the French flag, except on conditions that their owners or fitters-out had established that they had been considered and treated by France as her *protégés* before the year 1863 …".[401] To conclude, with respect to this paragraph, this case is considered to be the leading precedent that is frequently cited to support international law in relation to the freedom of the State to decide what registration requirements would be imposed on vessels to fly a State flag.[402] Therefore, a flag State has the freedom to set registration requirements. This has been clearly enshrined in the modern provisions of UNCLOS.

3.7 National Laws and Vessels Registration

An individual State is legally obligated to register a vessel in its territorial waters. This is a clear obligation as previously mentioned. It is also discussed that the registration requirements are

[399] Louis B. Sohn, John E. Noyes, Erik Franckx, and Kristen G. Juras, *Cases and Materials on the Law of the Sea* (2nd edn, BRILL, 2014) 113.
[400] Jean Allain, *Slavery in International Law of Human Exploitation and Trafficking* (1st edn, Martinus Nijhoff Publishers, 2013) 75.
[401] Jean Allain, *The Law and Slavery: Prohibiting Human Exploitation* (Brill, 2015) 99.
[402] Z. Oya Ozcayir, *Port State Control* (1st edn, Lloyd's London Press, 2001) 11.

subject to flag State discretion. However, the exercise of State discretion is not absolute, it is restricted by several provisions in the UNCLOS that provide the rule that a State shall not go below the minimum international standards. Article 94(5), for example, sets out that "… each State is required to conform to generally accepted international regulations, procedures and practices …".[403] On this legal basis, it could be said that a flag State is obliged to comply with general regulations, procedures, and practices to fulfill its obligations under Article 94 of UNCLOS, regardless of other flag State national law requirements.[404] To what extent State Parties to UNCLOS may register autonomous vessels under the current legal framework is the central question that needs to be addressed. Arguably, the possibility of registering the said vessels is questionable. This is due to the fact that one of the registration purposes is to establish jurisdiction over the vessels on the high seas. These vessels on the high seas are considered an entity linked to the flag State by international law. Therefore, a flag State's textual obligations must be implemented prior, during, and after the registration. In this regard, the question that may arise here is; How are these obligations implemented under flag State laws? This will be explored further, as follows;

3.7.1 Ship Registration Under Law of Saudi Arabia

According to paragraph 1 of Article 7 of Commercial Maritime Law, "… no self-propelled vessel sail under the flag of the Kingdom unless it is registered in accordance with the provisions of this Law. The regulations shall specify the registration requirements and procedures as well as the

[403] UNCLOS, Art 94(5).
[404] Jeremia Humolong Prasetya, 'The Operation of Unmanned Vessel in Light of Article 94 of the Law of the Sea Convention: Sea manning Requirement' (2020) 18(1) Indonesian Journal of International Law, 111.

issuance of the certificate …".[405] This paragraph provides that the registration of the ship is compulsory. However, Article 2 of the same Law stated that " … the provisions of this Law shall apply to Saudi vessels and foreign vessels that anchor at the Kingdom's ports or maritime areas, with the *exception* of warships, public service vessels for non-commercial purposes, and vessels subject to a special provision, except for cases relating to collision, rescue, and general average."[406] It is, therefore, clear that warships, public service vessels for non-commercial purposes, and vessels subject to a special provision are exempt from the registration. Further, Article 7(2) of the same law set out marine units and vessels that shall be exempt from registration, as follows; "… (a) Vessels of less than 24 meters in length; (b) Fishing vessels of a tonnage not exceeding 30 tons, and a length not exceeding 20 meters; (c) Pleasure and diving vessels of a tonnage not exceeding 10 tons, and a length not exceeding 11 meters which are not permitted to sail outside the Kingdom's territorial sea; (d) Vessels of primitive construction, sailing vessels, non-self-propelled units, lighters and barges, and other floating crafts usually operating within the port."[407] Therefore, it is clear that Articles 2 and 7(2) of such law set out the eligibility criteria for the ship that has to be registered.

However, the legal requirements of ship registration could be seen as a legal barrier to the operation of autonomous vessels. For example, Article 6(G) of the Executive Regulation for the Registration of Ships and the Registration of Marine Units provides that " … a ship registration will be based on an application order submitted to Marine Authority by the shipowner or one on his behave …" and this application should include " … ship classification and safety *certificates*

[405] The 2018 Commercial Maritime Law, Art 7(1).
[406] Ibid, Art 2.
[407] Ibid, Art 7(2).

have to be issued by a classification society that recognized by the Kingdom of Saudi Arabia …".[408] Such legal requirements, as it exist under the Article mentioned above, are considered ship classification and safety certificates as an essential part of the application documents. It indicates that the failure of a shipowner to provide the required certificates would lead to an unsuccessful application. According to Article 7 of the same Regulation, the ship and its certificates must be in compliance with SOLAS and other relevant international regulations.[409] The issue here is the autonomous vessels do not meet the safety requirements under IMO's regulations such as SOLAS and COLREGs, and they would not be certified accordingly. These common issues have been discussed previously at length. Consequently, it is sufficient to state that the autonomous vessels are not eligible to be registered under the current regime of registration due to the requirements of ship classification and safety *certificates* under IMO's regulations.

3.7.2 Ship Registration Under Laws of the United Arab Emirates

Examining whether or not the United Arab Maritime Legal Framework could accommodate autonomous vessels, Article 14(1) of the United Arab Federal Law is the starting point. This Article is the gateway to the vessel's registration procedure. It states that " … a vessel needs to be registered to one of the United Arab Emirates ports to acquire the nationality …".[410] This registration is a compulsory precondition to grant nationality. A registration application has to be submitted by the shipowner to one of UAE's registration offices, in one of UAE ports, including,

[408] Executive Regulation for the Registration of Ships and the Registration of Marine Units No. 2/2019/4/26 and Date 08/09/2019, Art 6(G).
[409] Ibid, Art 7.
[410] The United Arab Emirates Federal Law No. 26 of 1981, Article 14(1).

inter alia, the name of the shipmaster and qualifications.[411] The requirements here constitute a challenge on the face of unmanned vessels that are conceptually made to operate without a master crew. Specifically, these challenges, *inter alia,* are associated with the physical absence of human activity on board the ship. Even if the definition of master expands to include remote-control operators, another legal issue would arise in relation to the required training and qualifications certificates.

Furthermore, even if the ship is registered, this does not mean a ship has the right to sail before obtaining a navigation license from the port authority.[412] However, a navigation license would not be granted if the vessels do not meet the internationally accepted standards in relation to safety and classifications. As evidence, Article 52(1) states that "… a navigation license must be issued if the international regulations and conventions requirements have been met …".[413] This condition could be considered as another legal impediment. It requires that the ship meet the IMO's regulation in order to grant the license for the navigation. However, autonomous vessels do not meet many of IMO's regulation requirements and therefore would not be certified accordingly. Therefore, the registration of autonomous vessels under the current regulation is questionable.

3.7.3 Registration Under Qatari Law

The ships registration regime in Qatar is not dramatically different from other flag States. It shares a common basis of international rules that regulate a registration legal system. This means

[411]The United Arab Emirates Federal Law No. 26 of 1981, Article 27(z).
[412] Ibid, Article 50(1).
[413] Ibid, Article 52(1).

that it also shares the same legal barriers with other countries that restrict autonomous vessels. Article 1 of Qatar Amiri Decree No. 18 of 1980, for example, requires a ship to register under the Qatari flag in order to fly the flag.[414] This condition is compulsory to grant nationality to a ship. Furthermore, Article 4 of the same Decree provides that, *inter alia*, " … ship's master name and qualifications …" are required to issue the certificate of registration.[415] This is an administrative requirement to enter a vessel in the public record. However, the condition under Article 4 is difficult to achieve. This is because unmanned vessels are unmanned, there are no master and crew. In addition, even if the remote control operator could be considered as a master, the training and qualifications certificates would be granted to the remote control operator and algorithms control as they fall out of the scope of the STCW Convention. Moreover, Article 19 of the said Amiri Decree required that a registered ship " … shall not sail in the territorial or international waters unless if it acquires a navigation license …" in addition to "… a ship and its equipment safety certificates …".[416] These certificates have to comply with the International Convention for the Safety of Life at Sea (SOLAS) and the International Convention on Load Lines.[417] Therefore, it is axiomatic to conclude that the navigation license will not be issued because the existing form of instruments and standards are not appropriate for autonomous ships.

3.7.4 Registration Under Laws of the United Kingdom

According to Section 2(1)(a) of Merchant Shipping (Registration) Act 1993, a ship is entitled to be registered if – (a) it is owned, to the prescribed extent, by persons qualified to own British

[414] Qatar Amiri Decree No. 18 of 1980, Article 1.
[415] Ibid, Article 2.
[416] Ibid, Article 19.
[417] Ibid, Article 25.

ships …". However, the United Kingdom gave effect to the International Regulations such as International Regulations for Preventing Collision at Sea 1972 according to the Merchant Shipping (Distress Signals and Prevention of Collision) Regulations 1983 and the International Convention for the Safety of Life at Sea Convention according to the Marchant Shipping (Control of Pollution) (SOLAS) Order 1998. These Regulations impose some requirements that will be challenged by the development of new technology, as discussed above.

In this context, the Department for Transport, the United Kingdom, published the 'Future of Transport Regulation Review Consultation: Marine Autonomy and Remote Operations' in September 2021. The purpose of this Consultation is to ensure that the United Kingdom laws keep pace to ensure the 'safe, secure, and environmentally sound of remotely operated and autonomous vessels.' For example, this Consultation highlighted a number of issues and areas for clarification in the Merchant Shipping Act 1995 that should be addressed in order to pave the way for remote control and autonomous vessels for the operation. It proposed that there is a need to define and clarify remote control and autonomous vessels in primary and secondary legislation. This definition of and clarification includes vessel degree or types and also the requirements for such vessels to have an entity and to be registered in public records. The Consultation also proposed a similar arrangement for the person having command of the remote control vessels. As the master plays an important role and bears overall responsibility for the vessel, crew, cargo, and regulatory compliance, in the current regulations. The roles and responsibilities of the remote control vessel master and remote control operators should be clarified. Connected to this, the legislation should ensure that such legal responsibilities are

enforceable. For example, there should be a focus on new principles and rules of certification and training requirements for a Remote Control Operator in the legislation.

Therefore, it can be said that there is a regulatory gap between the Shipping Merchant Act 1995 and remote control or autonomous vessels. This means that there is a need to regulate said vessels. However, said Consultation paper proposes that developing a domestic legal framework now could diverge from international standards as they will be agreed in the future under the IMO regulations, for instance, when defining the remote control and autonomous vessels. This is because of that there is no current consensus on what these terms should be under the international legal framework, as they are under review. Thus, it might be better to wait for the IMO to produce new regulations for remote control and autonomous vessels. Otherwise, it is possible to utilize the exception that is available through the Merchant Shipping Act to allow remote control and autonomous vessels under 24 meters in length to operate within the United Kingdom waters under the United Kingdom Flage. For this purpose, there is a need to address the regulatory gap with new legal rules and continue to be obligated to comply with the Merchant Shipping Act and all other applicable regulations.

Therefore, it can be argued that the operation of autonomous vessels under the current legal framework is debatable. This is due to flag State obligations under the UNCLOS and its implementation regulations. Article 94(4)(b), for example, requires that the flag State must ensure that every ship is in charge of master and officer. This requirement aims to ensure safety at sea. Therefore, it could be taken to mean that autonomous vessels are not safe. This view is from a legal perspective, despite the technical stance that argues otherwise. Flag State would be

liable if the autonomous vessels engaged in the activities out of a State's territorial water as long as this Article is not amended. To solve such a matter, there is the suggestion that the definition of master should be expanded to include remote control operators. However, this suggestion only covers remotely control vessels not fully autonomous one that is controlled by algorithms. Therefore, if the definition of master expanded to cover remote control operators, the purpose of Article 94(4)(b) would be achieved. Nevertheless, this requires certifying the remote-control operators in the first stance which would not have happened under the current regulations due to Article 3 of the STCW Convention which presumes the presence of seafarers on board.

This subchapter also examined the selected national regulations in relation to registration requirements. In general, it could be said that these regulations share the same common requirements such as classification society, safety, and master certificates. These are preconditions to register a ship under flag State which also lays down under IMO’s regulations, such as SOLAS and STCW. As already stated, autonomous vessels fall out of the scope of these regulations which makes the registration of autonomous vessels under the current legal framework is questionable.

3.8 In Conclusion

This chapter attempts to explore whether or not autonomous system vessels could fit within the scope of the registration regime in the Kingdom of Saudi Arabia. It went further to analyze the registration regime of the selected flag states. However, this chapter necessitates an exploration of whether or not said vessels can fit within the scope of a vessel's legal definition under the legal frameworks of the selected flag states. In addition, it went further to explore what is meant by a vessel in the sense of the COLREGs and the UNCLOS, as the relationship between these Conventions and maritime legal framework in many states is active and clarified. Therefore, discussion about the meaning of a vessel in the sense of the said Convention continues to engage international views. For this purpose, this chapter is divided into two subchapters. The first one is to examine the definition of ships under the UNCLOS, COLREGs, and the selected national laws. The result was that the UNCLOS did not define a commercial ship or even lay down its characters. It can be said that this task was left to national states and IMO's regulations. Rule 3(a) of the COLREGs, for example, defines the vessel as " … every description of water craft, including non-displacement craft, WIG craft and seaplanes, used or capable of being used as a means of transportation on water …". This definition is introduced in a broad language. Therefore, it might be expanded to include autonomous intelligent system vessels, provided that such vessels are in compliance with other provisions of this Convention. At a national level, Article 1(5) of Saudi Commercial Maritime Law defines the ship as " … *any floating craft normally designed to operate in maritime navigation, even if it is not for profit, including vessel appurtenances which are necessary for its operation* …". This Article defined a ship in broad language. In other words, the application of a literal approach to interpreting this Article would lead to the conclusion that autonomous intelligent system vessels are neither included nor

excluded in this definition. In other words, said vessels were not in the minds of policymakers when they drafted this definition. This conclusion is also in compliance with an interpretation historical approach. However, the above mentioned Article provides several elements to define a vessel, such as the following elements, the vessel has to be made for the 'navigation' on 'a routine basis'. Probably, these elements mean that the *floating craft* has to meet the seaworthiness requirement to be considered as a vessel. On this basis, it can be argued that determining whether or not said vessels can meet the elements of vessel definition requires analyzing the regime of registration. This chapter compared the above mentioned Article with Article 11(1) of the United Arab Emirates Commercial Maritime Law, Article 1 of Qatari Maritime Law, and Article 313(1) of the United Kingdom Merchant Shipping Act. This chapter found that these Articles use the same approach to define a vessel and there is not much difference between said Articles. Both of these Articles are formulated in broad language and give an indication that *floating craft* has to be seaworthy or meet the navigation requirements. Generally, it can be said that autonomous intelligent system vessels could fit under the scope of the above mentioned definitions if it is not excluded by specific laws. However, it might be better to make up a legal definition for autonomous intelligent system vessels that would be used in a state's internal and territorial waters. Connected to this, waiting for the International Maritime Organization to produce a definition for said vessels that would be used for navigation beyond the state territorial waters. This might be a good approach to define said vessels in compliance with international regulations.

The second subchapter attempts to explore whether or not autonomous intelligent system vessels can be registered under the current legal framework. To this end, this subchapter gave an

overview of the concept of the registration, duties of flag states under the UNCLOS, flag States' freedom to set registration requirements, and also the registration requirements under the selected flag states' national regulations. At an international level, Article 94(2)(a) of the UNCLOS provides that "… every state shall maintain a register of ships containing the names and particulars of ships flying its flag, except those which are excluded from generally accepted international regulations on account of their small size …". This is a duty of the flag state to register a vessel into the public record. However, this Article gives an indication that such a vessel is meant to be registered and fulfill 'generally accepted international regulations'. In other words, a vessel has to meet 'the generally accepted international standards' in order to be registered. Article 94(3) of the UNCLOS provides more information in this regard. This Article provides that every flag state shall take such measures, generally accepted international regulations, for ships flying its flag as are necessary to ensure safety at sea with regard, inter alia, to "… (a) the construction, equipment and seaworthiness of ships; (b) the manning of ships, labour conditions and the training of crews, taking into account the applicable international instruments; (c) the use of signals, the maintenance of communications and the prevention of collisions …". In relation to Paragraph (a) of this Article, the 1974 International Convention for Safety of life at Sea and the 1988 Protocol (SOLAS) developed comprehensive standards for ship construction and subsequent maintenance. For example, Paragraph 2.3.1 of Regulation II-2/9 of the SOLAS provides 'methods of protection in accommodation area' to be adopted. In addition, Paragraph 2.3.2 of the same Regulation required ' Bulkhead within accommodation area'. Paragraph 2.3.4 of the same Regulation also requires 'protection of stairways and lift trunk in accommodation spaces, services spaces, and control stations'. Indeed, these requirements hold a vital position within the international law of the sea. A failure of the state to meet its

international obligations means that such a state will be responsible provided that the violation is attributable to the state concerned. When it comes to autonomous vessels, these vessels will be less than 500 tonnages, therefore, it will fall out of the scope of the SOLAS according to Regulation 1(a). Even if this Regulation is amended, autonomous vessels will be crewless, and this means said vessels will be designed without accommodation. Consequently, it is expected that the above mentioned Articles will be challenged.

When it comes to the obligation of the flag state to maintain a vessel is manned according to Article 93(3)(b) of the UNCLOS, this is another legal challenge. This Article should be read in conjunction with Paragraph 1 of Regulation V/14 of the SOLAS which requires that every contracting government has to maintain " … all ships shall be sufficiently and efficiently manned …" in order to ensure safety at sea. Tied to this, Paragraph 2 of Regulation V/14 of the same Convention requires that every state party should ensure "… ship shall be provided with an appropriate minimum safe manning document or equivalent issued by the Administration as evidence of the minimum safe manning considered necessary to comply with the provisions of paragraph (1) …". In addition, Article 94(4)(b) of the UNCLOS provides that every state shall take such measures for ships flying its flag as are necessary to ensure safety at sea with regard, *inter alia*; "that each ship is in the charge of a master and officers who possess appropriate qualifications, in particular in seamanship, navigation, communications and marine engineering, and that the crew is appropriate in qualification and numbers for the type, size, machinery and equipment of the ship." Therefore, it can be said that it is not clear how flag state will meet this obligation with regard to autonomous intelligent system vessels, because they will be unmanned. An argument that might arise here is that some autonomous system vessels will be controlled by

remote control operators. Somehow, it can be said that such vessels will be manned remotely, and the above mentioned Article did not determine the location of the crew. However, a contra argument is even if the above mentioned Article did not specify the location of crews, such crews have to be trained and certified according to the 1978 International Convention on Standards of Training, Certification and Watchkeeping for Seafarers. Article III of this Convention, for example, provides that " the Convention shall apply to seafarers servicing on board ships entitled to fly the flag of a Party except to those serving on board (a) warships and or ships owned or operated by a state and engaged only on governmental non-commercial service; (b) fishing vessels; (c) pleasure yachts not engaged in trade; or (d) wooden ships of primitive build. On this basis, it can be said that remote control operators will fall out of the scope of this Convention. Therefore, this is a challenge to the operation of autonomous intelligent system vessels. To address this issue, the concept of master and crew can be expanded to cover remote control operators and amend the above mentioned Articles, or there is a need to develop new regulations to accommodate the said vessels.

At the national level, an individual state is obligated to register a vessel flying such a state flag into the public record. The registration requirements are subject to the discretion of the flag state. However, the exercise of flag-state discretion is not absolute. It is restricted by the UNCLOS provisions. For example, Article 94(5) of the UNCLOS provides that " in taking the measures called for in paragraphs 3 and 4 each State is required to conform to generally accepted international regulations, procedures and practices and to take any steps which may be necessary to secure their observance". This means that the requirements of vessel registration in an individual state should conform to generally accepted international regulations. To this end,

Article 6(G) of the Implementation Regulations for the Registration of Ships and the Registration of Marine Units provides that " … a ship registration will be based on an application order submitted to Marine Authority by the shipowner or one on his behave …" and this application should include "… ship classification and safety certificates issued by a classification society that is recognized by the United Kingdom of Saudi Arabia …". In addition, Article 7 of the same Implementation Regulations requires that a ship and its certificates must be in compliance with SOLAS and others relevant international regulations. The phrase 'others relevant international regulations' could be taken to mean regulations under the umbral of the International Maritime Organization. In addition, Saudi Transport General Authority established the Regulation of Minimum Safe Manning according to the provision of regulation V/14 of the International Convention for the Safety of Life at Sea, 1974. This Code will not allow the vessel to depart the internal or territorial waters without a master and crew. On this basis, it can be said that the root of the legal barrier in front of the registration of autonomous intelligent system vessels under a flag state extends to the UNCLOS and other international regulations. This makes registration difficult or impossible according to the current legal framework. Probably, this barrier will be achieved if the International Maritime Organization produced new regulations for said vessels.

However, national states have sovereignty under the internal and territorial waters. This means such states have a right to register vessels whether they are manned or unmanned to work in said maritime zones. The notion is that vessels that are intended to operate only in the internal and territorial waters of a particular state are exempted from international regulations. Mostly, these vessels are less than 24 meters in length. Therefore, this chapter suggests that a state may wait

for the International Maritime Organization to develop technical requirements for autonomous intelligent system vessels that aim to sail beyond state jurisdiction, and thereafter adopt these requirements into national legislation. This approach is similar to many states, or at least - it is not that much different from the United Kingdom Department of Transportation approach, as it is clarified in the paper titled ‘‘Future of Transport Regulation Review Consultation: Marne Autonomy and Remote Operations’ and published in September 2021. When it comes to vessels that aim to operate in internal and territorial waters or vessels less than 24 meters in length, it might be acceptable to recommend that an individual state has an opportunity to develop technical and legal requirements for the operations of these vessels, as the operation of these vessels will be limited to such state jurisdiction zones. Another legal challenge that is expected to face the operation of said vessels is the regime of transit, innocent passage, and also port access. Even if the above mentioned legal barriers have been solved, it is not clear how said vessels will enjoy the right of innocent passage under the current legal framework. It is expected that the introduction of autonomous intelligent system vessels will challenge the regime of innocent passage. This challenge is the main feature of the following chapter.

CHAPTER FOUR

NAVIGATIONAL RIGHTS

4.1 Introduction

Theoretically, it can be argued that the impact of unmanned vessels on the current national and international regulations is feasible. Specifically, these implications would be on the registration requirements, navigational requirements, and also the elements of the legal definition of a vessel under some flag State regulations. These points have been discussed at length, in the previous chapter. Further, it can be said that UNCLOS is considered the starting point for establishing State rights and duties in relation to achieving maritime safety and security. However, this Convention did not set out a definition of a ship either in a broad or narrow context. Irrespective of whether or not the lack of definition in this regard can be considered a good legislative approach to accommodate several types of vessels, this absence has generated a very wide debate in relation to whether or not unmanned vessels can be regarded as vessels under the UNCLOS. From one perspective, some law scholars argue that the UNCLOS has to be interpreted in a broad way to cover unmanned vessels. From another perspective, other law scholars rightly argue that unmanned vessels would not fall within the scope of the legal meaning of a vessel or a ship under the UNCLOS. Simply, unmanned vessels would meet several of the UNCLOS's provisions, such as Article 94(4)(b) which requires a flag State to ensure that every ship and or vessel is in charge of a master and officer. This is an obligation of a flag State under the UNCLOS. Thus, unmanned vessels would fit within the meaning of a 'vessel' or a 'ship' in the UNCLOS, if such vessels would not meet said Convention provisions. Arguing otherwise would lead one to conclude that the provisions of the UNCLOS contradict each other.

This chapter attempts to bring unmanned vessels under the UNCLOS and the Kingdom of Saudi Arabia regulations. It will go further and demonstrate whether or not unmanned vessels can enjoy traditional navigational rights. Initially, it can be said that the navigational rights of vessels whether or not it is unmanned, depend on the geographical location of such vessels. Further, it has been said that the right of navigation is subject to a 'complex mixture of international and municipal laws'.[418] Therefore, this chapter argues that the navigation of unmanned vessels in internal and territorial waters of a flag State depends on such State discretion and domestic regulations. However, it would challenge flag States' obligations in other maritime zones. In addition, it could be argued that the introduction of unmanned vessels would have implications on the regime of coastal State enforcement. These points will be explained further, and this chapter will be divided into four subchapters. First, it will attempt to examine the regime of internal waters and reach the conclusion that coastal States have sovereignty over such zones of water, and the operation of said vessels depends on the coastal States' discretion and domestic regulations. It also will illustrate that the coastal States have a right to deny foreign vessels access. Second, subchapter two will examine the regime of the territorial sea. It will illustrate that the sovereignty of coastal States extends to such States' territorial seas. However, the sovereignty of coastal States over the territorial seas is restricted by the principle of innocent passage, it is not absolute. Nevertheless, foreign vessels have to be in compliance with the regime of innocent passage, otherwise, coastal States will intervene to enforce their jurisdiction if the passage is non-innocent. An argument can be made by coastal States that new technological development would render a passage to be non-innocent. This is because unmanned vessels did

[418] Craig H. Allen, 'The Salish Sea Boundary Straits: "Historic Internal Waters" of Territorial Seas?' (2017) Ocean Development & International Law, 48(2), 85.

not meet the internationally agreed standards. Third, it will also examine the regime of an exclusive economic zone. Through the discussion, it will become evident that the operation of unmanned vessels in such a zone of water will challenge flag State obligations under the UNCLOS. In addition, it attempts to clarify that foreign unmanned vessels' navigation in coastal States' exclusive economic zone might be clanged by such States on the basis of safety, security, and environmental matters. Finally, this chapter found that unmanned vessels would challenge coastal States' enforcement jurisdiction. It is unclear how coastal States would enforce its jurisdictions on such types of vessels.

4.2 Internal Waters

4.2.1 Introduction

Internal waters are a term used in national and international laws indicating a particular maritime zone.[419] Such a particular maritime zone was not clear enough before the recognition of the legitimacy of straight baselines.[420] Kaare Bangert provides a very good description of this zone of water, and to quote such author's words, the zone of internal waters is a zone that is positioned within the inner limit of the territorial sea.[421] Article 8 of the UNCLOS introduced a legal description of said waters, it provides that the internal waters are " … waters on the landward side of the baseline of the territorial sea form …".[422] It also includes " … the low-water mark along the coast of the state …",[423] ports and harbours,[424] estuaries,[425] and waters enclosed by the straight baselines.[426] At a national level, Article 2 of the Statute of Maritime Delimitation of the Kingdom of Saudi Arabia provides that the "… internal waters of the Kingdom are those on the landward side of the baseline of the territorial sea".[427] This Article shares the same concept of internal waters with Article 8 of UNCLOS. Both said provisions rely on the baseline method to delimit the zone of internal waters. In short, it can be said that the zone of internal waters is considered as regions of the sea the most intimate with the land territory of the state.[428]

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[419] Marcelo G. Kohen, 'Is the Internal Waters Regime Excluded from the United Nations Convention on the Law of the Sea?' In Lilian del Castillo (eds), *Law of the Sea, Fromm Grotius to the International Tribunal for the Law of the Sea* (Brill, 2015) 110 .
[420] Donald R Rothwell and Tim Stephens, *The International Law of the Sea* (2nd edn, Oxford and Portland, 2016) 53.
[421] Kaare Bangert, 'Internal Waters: Customary Rules of the Extension of Internal Waters' (1992 - 1993) 61 Nordic J Int'l L 44.
[422] UNCLOS, Art 8(1).
[423] UNCLOS, Art 5.
[424] Yoshifumi Tanaka, *The International Law of the Sea*, (3rd edn, Cambridge University Press, 2019) 95.
[425] Ibid.
[426] Ibid.
[427] Statute of Maritime Delimitation of Kingdom of Saudi Arabia (Royal Decree No.6 of 2011), Article 2.
[428] Brian D. Smith, *State Responsibility and the Marine Environment: The Rules of Decision* (1st edn, Oxford University Press, 1988) 167.

This subchapter attempts to answer the following question; To what extent unmanned vessels can navigate and operate in internal waters? The author of the chapter argues that the internal waters are subject to the principle of sovereignty of coastal States. This principle is rooted in public international law. Therefore, it can be said that the navigation of vessels whether or not they are unmanned is left to the sole discretion of the coastal State. In chapter three, it has been proved that unmanned vessels would fall out of the scope of the registration regime. The author of this chapter argues that unmanned vessels would not fit under the regime of internal waters.. However, coastal States can exclude unmanned vessels from the current registration requirements temporarily, based on such States' sovereignty over the said zone. This will be illustrated further in the below paragraphs.

4.2.2 The Legal Status of Internal Waters

As mentioned above, the internal waters are subject to the principle of sovereignty. At an international level, Article 2(1) of UNCLOS provides that " … the sovereignty of a coastal State extends, beyond its land territory and internal waters …".[429] Clearly, this Article establishes the notion that the geographical scope of a coastal State's sovereignty covers such State land territory and internal waters. However, this Article does not go further to determine the extent of such sovereignty. For this reason, the language of the above-mentioned paragraph is criticized widely. Specifically, the limitation of a coastal state's sovereignty is ambiguous, and it cannot be assumed, and this is the center of a legal issue. Kaare Bangert presents a very strong argument in this regard. This argument suggests that the regime of internal waters is a customary law

[429] UNCLOS, Art 2(1).

regime.[430] This argument denies the application of UNCLOS to the internal waters. A further argument is that the internal waters and the customary law are excluded deliberately from both the UN Convention on the Territorial Sea and the Contiguous Zone and the UNCLOS.[431] Conversely, Marcelo G. Kohen argues that the above-mentioned argument is clearly contradicted by a number of provisions recognizing rights and obligations for the sovereign state.[432] This argument suggests that the internal waters regime regulated by the UNCLOS and what has not been regulated by said Convention fall within the realm of the sovereign decision of the coastal State.[433] Nevertheless, the author of this chapter found that both of the above–mentioned authors have discussed the regime of internal waters from a different angle. The UNCLOS provides some provisions to delimit the internal waters zone, but it does regulate such zone of water. This zone of maritime waters is fully subject to coastal State legislative, judicial, and jurisdictional powers of coastal States in relation to illicit acts committed on the board of vessels.[434] As evidence, the principle of innocent passage is not provided in the internal waters, except in internal waters areas which had not previously been considered as such, according to Article 8(2) of UNCLOS.[435] Understanding the concept of the sovereignty of a State would address the legal issue of whether or not the application of UNCLOS provisions extends to the internal waters. Much will be said below.

[430] Kaare Bangert, 'Internal Waters: Customary Rules of the Extension of Internal Waters' (1992-1993) 61 Nordic J Int'l L 43, 45
[431] Ibid.
[432] Marcelo G. Kohen, 'Is the Internal Waters Regime Excluded from the United Nations Convention on the Law of the Sea?' In Lilian del Castillo (eds), *Law of the Sea, Fromm Grotius to the International Tribunal for the Law of the Sea* (Brill, 2015) 123.
[433] Ibid.
[434] Anne Bardin, 'Coastal State's Jurisdiction Over Foreign Vessels' (2002) 14(1) Pace Int'l L. Rev 2, 4.
[435] UNCLOS, Art 8(2).

A test case that is brought to test the principle of coastal state sovereignty was the case of *Argentina v Ghana* (The *ARA Libertad*).[436] This case is a very complicated one because both of the case parties relied on two different main principles in the UNCLOS to support their arguments. The above-mentioned case was about the detention of an Argentina warship in the port of Tema (Republic of Ghana). The background of the case is that the governments of Argentina and Ghana signed an agreement, on 4 June 2012, to authorize the Frigate *ARA Libertad* to visit the port of Tema on 1 October 2012, and such Frigate arrived on the scheduled day.[437] Surprisingly, on the following day, an official of the Judicial Service of the Superior Court of Judicature of Ghana delivered an official letter from the court requiring that Frigate to remain at the Tema Port.[438] This is an order issued by Judge Richard Adjei-Frimpong, from the above-mentioned court commercial division, in the context of a claim made in New York by NML Capital Limited, a 'vulture' private corporate fund that was registered in the Cayman Island against Argentina.[439] NML's New York judgment is established on its ownership of defaulted Argentine Republic debt.[440] Several unfruitful contacts have been made between the parties of the disputes which finally led Argentina to establish proceedings against Ghana before an arbitral tribunal.

[436] 'ARA Libertad' Case, Argentina v Ghana, Order, provisional measures, ITLOS Case No 20, [2012] ITLOS Rep 21, ICGJ 454 (ITLOS 2012), 15th December 2012, International Tribunal for the Law of the Sea [ITLOS].
[437] Marcelo G. Kohen, 'Is the Internal Waters Regime Excluded from the United Nations Convention on the Law of the Sea?' In Lilian del Castillo (eds), *Law of the Sea, Fromm Grotius to the International Tribunal for the Law of the Sea* (Brill, 2015) 111.
[438] Ibid.
[439] Susana Ruiz-Cerutti, 'The UNCLOS and the Settlement of Disputes: The ARA Libertad Case', In Lilian Del Castillo (ed), *Law of the Sea From Grotius to the International Tribunal for the Law of the Sea* (BRILL, 2015) 714.
[440] Ibid.

Argentina instituted the statement of the case under Paragraph 5 of Article 290 of UNCLOS.[441] In this case, Ghana was demanded to adopt a provisional unconditional measure to enable the Argentine warship to leave the jurisdictional waters of Ghana.[442] The government of Argentina, in its written statement, argued that the measures that were taken against the *ARA Libertad* breached international law, specifically, the principle of immunity of warships.[443] This argument demonstrate *arguendo* believe that the UNCLOS application extended to cover the internal waters of the coastal State. However, a counter-argument presented by the Counsel acting for Ghana was that:

> [a]t each stage it was understood that the regime of ports and internal waters was excluded from the relevant instrument and the 1982 Convention, on the basis, as one member of the international law Commission put it in 1954, that it was 'universally agreed' that the regime of ports and internal waters was 'different from that of the territorial sea'.[444]

Through the above-mentioned quote, one can understand that the Counsel acting for Ghana denied the application of UNCLOS to the internal waters. This argument was a very strong start and a preliminary defense to challenge the jurisdiction of an arbitral tribunal. In addition, it challenged the immunity of warships in internal waters.[445] This argument seems valid, and it has all true premises. As evidence, Article 95 of the UNCLOS provides that "warships on the high

[441] Frigate ARA Libertad Case (Argentina v Ghana) (Request For The Prescription Of Provisional Measures Under Article 290, Paragraph 5, Of The United Nations Convention On The Law Of The Sea) [2012] ITLOS < https://www.itlos.org/fileadmin/itlos/documents/cases/case_no.20/C20_Request_Argentina.pdf > accessed 24 November 2022, page [6], para [1].
[442] Ibid, page [8], para [7].
[443] Ibid, page [8].
[444] Marcelo G. Kohen, 'Is the Internal Waters Regime Excluded from the United Nations Convention on the Law of the Sea?' In Lilian del Castillo (eds), *Law of the Sea, Fromm Grotius to the International Tribunal for the Law of the Sea* (Brill, 2015) 111.
[445] Ibid.

seas have complete immunity from the jurisdiction of any state other than the flag state".[446] The ordinary meaning of this provision is that the warships have complete immunity on the high seas, but not in the internal waters. The phrase 'on the high sea' is clearly meant to be the geographical scope of the application of the said provision. Ghana representatives went further to argue that:

> [i]nternal waters are an integral part of a coastal state and therefore not the subject of detailed regulation by the Convention. The coastal state enjoys full territorial sovereignty over internal waters, and any foreign vessel that is located in internal waters is subject to the legislative, administrative, judicial, and jurisdictional powers of the coastal State.[447]

In this quotation, Ghana representatives deny the application of the UNCLOS on the internal waters based on the sovereignty of a coastal State. They went further to argue that international customary law and state practices are the regimes that govern the internal waters. The phrase 'subject to' in the above-mentioned quote could mean that the coastal state has full sovereignty over any vessels in internal waters. This sovereignty is not restricted by the UNCLOS according to the above-mentioned quotation. In addition, such a quote demonstrates what Ghana's representatives believe when it comes to the meaning of the sovereignty of the coastal State. According to the above quotation, sovereignty means unlimited 'legislative, administrative, judicial, and jurisdictional powers of the coastal State'.

[446] UNCLOS, Art 95.
[447] Marcelo G. Kohen, 'Is the Internal Waters Regime Excluded from the United Nations Convention on the Law of the Sea?' In Lilian del Castillo (eds), *Law of the Sea, Fromm Grotius to the International Tribunal for the Law of the Sea* (Brill, 2015) 111.

However, Argentina, to win the case, attempted to rebut the above quote by arguing that "… the Annex VII arbitral tribunal would have *prima facie* jurisdiction over the dispute …".[448] This argument relied on Article 32 of the UNCLOS, and Argentina claimed that it breached by the detention of said warship.[449] Article 32 of the UNCLOS establishes that " … nothing in this Convention affects the immunities of warships and other government ships operated for non-commercial purposes …".[450] However, this provision has been widely criticized concerning the scope of its application. Argentina representatives argued that the geographical scope of Article 32 is not limited and therefore, such an Article would be applicable to all maritime zones.[451] However, this argument is not valid. This is because Articles 32 and 95 of the UNCLOS have to be read together carefully to reach a proper conclusion. Two members of the ITLOS have rightly agreed with the defendant in relation to the idea that " … none of the provisions of the Convention provide for the immunity of warships in the internal waters of a foreign State …".[452] This quote is quite enough to close the paragraph in relation to whether or not the immunity of foreign warships extends to the internal water of coastal States.

When it comes to the question raised in this contribution, whether or not the UNCLOS governs the internal waters, Marcelo G. Kohen discussed the same question and suggests that a joint

[448] Marcelo G. Kohen, 'Is the Internal Waters Regime Excluded from the United Nations Convention on the Law of the Sea?' In Lilian del Castillo (eds), *Law of the Sea, Fromm Grotius to the International Tribunal for the Law of the Sea* (Brill, 2015) 112 .
[449] Ibid.
[450] UNCLOS, Art 32.
[451] Kohen (n 448).
[452] Ibid.

separate opinion of Judges Cot and Wolfrum would be worth being quoted in order to answer such a question.[453] According to these Judges,

> there are certain provisions in the Convention have a bearing on the legal regime governing the internal waters; these are Article 2, paragraph 1, article 7, paragraph 3, article 8, paragraph 4, article 18, paragraph 1, article 25, paragraph 2, article 27, paragraph 2, article 28, paragraph 3, article 35(a), article 50, article 218, paragraph 3, and article 218 of the Convention. But even a cursory assessment of these provisions clearly indicates their limited scope. They only deal with the status of internal waters, equating that area with the land territory, the access thereto, their delimitation vis-à-vis territorial sea, the rights of coastal States exercising their jurisdiction vis-à-vis vessels having left internal waters, and the rights of coastal States to prevent the entry of vessels into their internal waters. However, all these provisions taken together do not constitute a comprehensive legal regime comparable to the one on the territorial sea.[454]

The language of the above quote refers to several provisions of the UNCLOS that deal with internal waters. However, according to Marcelo G. Kohen, these provisions are not exhaustive because there are many other significant provisions that similarly indicate the conduct of coastal states in the internal waters and ports.[455] A joint separate opinion that indicates that the UNCLOS does not govern the internal waters is that " … the principle governing internal waters is the sovereignty of the coastal State concerned …".[456] This joint separate opinion strived to establish the notion that even if the UNCLOS extends to deal with the internal waters, the provisions of such a Convention would not prevail on the sovereignty of the coastal state.

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[453] Marcelo G. Kohen, 'Is the Internal Waters Regime Excluded from the United Nations Convention on the Law of the Sea?' In Lilian del Castillo (eds), *Law of the Sea, Fromm Grotius to the International Tribunal for the Law of the Sea* (Brill, 2015) 112 .
[454] Ibid, 112 - 113.
[455] Ibid, 113.
[456] Ibid.

It is worth noting that the sovereignty of the coastal state is codified in domestic regulations. For example, Article 4 of the Statute of Maritime Delimitation of the Kingdom of Saudi Arabia provides that "the jurisdiction of the Kingdom extends beyond its land territory and internal waters to its territorial sea, the air space over the territorial sea as well as to its seabed and subsoil. The Kingdom exercises sovereignty over the territorial waters in accordance with the provisions of the Convention and other rules of international law."[457] The language of this article clearly indicates that internal waters are subject only to the sovereignty of a state. Tied to this point, the movement of vessels in the internal waters of the Kingdom of Saudi Arabia is subject to its domestic regulations according to Article 3 of the Statute of Maritime Delimitation of the Kingdom of Saudi Arabia.[458] The language used in these Articles is in context with author Brian D. Smith's point of view that, the internal waters are the waters that are subject to the highest prescriptive legal authority held by the state.[459] Connected to this, the conduct within said maritime zone might be prohibited or permitted at the discretion of the coastal state only.[460] This is a territorial jurisdiction that, for example, will support policymakers in a state to establish any appropriate rules or standards to regulate the conduct within the internal waters and to protect the environment.[461] These are coastal States' practices in the internal waters that are considered customary law. Therefore, the UNCLOS would not be in force according to Article 306 of such

[457] Statute of Maritime Delimitation of Kingdom of Saudi Arabia (Royal Decree No.6 of 2011), Article 4.
[458] Ibid, Article 3.
[459] Brian D. Smith, *State Responsibility, and the Marine Environment: The Rule of Decision* (1st edn, Oxford University Press, 1988) 167.
[460] Ibid.
[461] Ibid 168.

Convention, if it is inconsistent with the customary law of coastal States.[462] Succinctly, the internal waters are subject to the highest sovereignty of a coastal State. Therefore, the navigation and operation of autonomous vessels in the internal waters of coastal States would be permitted or prohibited at the sole discretion of such States. Yet, there is a lack of domestic legislation dealing specifically with such vessels. A close look at the regime of ports will explore the regulatory gap.

4.2.3 Ports

4.2.3.1 Introduction

Ports can be viewed as the main gate of international trade. These means are very close to lawyers' and entrepreneurs' hearts more than to policymakers'. However, according to Kaare Bangert, ports do not have a legal definition in public international law.[463] The UNCLOS will be the start point, as it is considered the constitution of the law of the sea. Article 11 of such Convention provides that " for the purpose of delimiting the territorial sea, the outermost permanent harbour works which form an integral part of the harbour system are regarded as forming part of the coast. Off-shore installations and artificial islands shall not be considered as permanent harbour works ...".[464] A critic of this provision states that the first sentence of this Article is taken from Article 8 of the Geneva Convention on the Territorial Sea and the Contiguous Zone (TSC), while the second one was newly added.[465] However, the definition of

[462] Kaare Bangert, 'Internal Waters: Customary Rules of the Extension of Internal Waters' (1992-1993) 61 Nordic J Int'l L 43.
[463] Ibid.
[464] UNCLOS, Art 11.
[465] Yoshifumi Tanaka, *The International Law of the Sea* (3rd edn, Cambridge University Press, 2019) 73.

the term 'harbour works' is missing. This term is neither defined in the TSC nor the UNCLOS.[466] Therefore, the meaning of the term 'harbour works' is subject to interpretation. In the case of the *Black Sea,*[467] the International Court of Justice interpreted said term as " … generally installations which allow ships to be harboured, maintained or repaired and which permit or facilitate the embarkation and disembarkation of passengers and the loading or unloading of goods …".[468] This judicial definition of the phrase 'harbour works' is quite enough to move on and examine whether or not foreign vessels have a right to access a coastal state port.

4.2.3.2 Right of Access to Ports

The right access to ports is a controversial topic among international law scholars,[469] and this is due to the fact that the UNCLOS is silent in relation to whether or not foreign vessels have the right access to a coastal state port.[470] From one perspective, it has been argued that foreign vessels have a right to access ports.[471] The advocate of this argument relied on customary international law as a source of law.[472] Conversely, there is an argument implying that foreign vessels do not have the right access to ports.[473] Put simply, this is because of that the coastal State enjoys its full territorial sovereignty over its ports.[474] This view was explicitly stated, in the

[466] Maritime Delimitation in the Black Sea (*Rom. v. Ukr.*), 2009 I.C.J. (Feb.3), para 133.
[467] Ibid.
[468] Ibid.
[469] Abdulkadir O. Abdulrazaq and Sharifah Zubaidah Syed Abdul Kader, 'Right of Ship Access to Port State Under International Law: All Bark with No Bite' (2012) 6(11) Australian Journal of Basic and Applied Sciences 214.
[470] Donald R Rothwell and Tim Stephens, *The International Law of the Sea* (1st edn, Hart Publishing, 2016) 57.
[471] Abdulrazaq and Abdul Kader (n 469).
[472] Ibid.
[473] Ibid.
[474] Yoshifumi Tanaka, *The International Law of the Sea* (3rd edn, Cambridge University Press, 2019) 98.

case of *Nicaragua v USA*, by the International Court of Justice (ICJ).[475] The ICJ stated that it is " … by virtue of its sovereignty, that the coastal State may regulate access to its ports …".[476] However, Anthony P. Morrison stated that the above-mentioned case did not examine a general right to enter foreign ports, or even any general right for a coastal State to deny entry of foreign vessels. [477] However, such a case relied on the sovereignty of a costal State that might implicitly govern raised points. In the case of *Patterson v. Bark Eudora*,[478] the US Supreme Court made it clear that "… the implied consent to enter our harbour may be withdrawn, and if this consent may be fully withdrawn, it may be extended upon such term conditions as the government sees fit to impose …".[479] These quotes can lead to that port State has an extensive discretion to exercise territorial jurisdiction over its ports.[480] Thus, this reading would convincingly rebut the presumption that foreign vessels' right to access state ports is granted under customary international law.

In addition, the 1958 *Saudi Arabia Government v the Arab American Oil Company* (Aramco)[481] is viewed as one of the prominent cases in this particular topic. The facts of the above-mentioned case were that the founder of the kingdom of Saudi Arabia, on 29 May 1933, concluded a Concession Agreement with the Standard Oil Company of California (SOCAL).[482] Article 1 of

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[475] Erik J Molenaar, 'Port and Coastal States', in Donald R Rothwell, Alex G Oude Elferink, Karen N Scott, and Tim Stephens (eds), *The Oxford Handbook of The Law Of The Sea* (1st edn, Oxford University Press, 2015) 283.
[476] Ibid 283 - 284.
[477] Anthony P. Morrison, *Places Of Refuge For Ships In Distress: Problems And Methods Of Resolution* (Martinus Nijhoff Publishers, 2012) 64.
[478] *Patterson v. Bark Eudora*, (1903), 178.
[479] Robin Churchill, Vaughan Lowe, and Amy Sander, *The Law of the Sea* (4th edn, Manchester University Press, 2022) 114.
[480] Molenaar (n 475).
[481] Donald R Rothwell and Tim Stephens, *The International Law Of The Sea* (2nd edn, Hart Publishing, 2017) 57; *Saudi Arabia v the Arab American Oil Company* (Aramco) (1963) 27 ILR 117.
[482] Khaled Mohammed Al-Jumah, 'Arab State Contract Disputes: Lessons From The Past' (2002) 17(3) JSTOR 215, 221.

such Agreement stated that "the exclusive right, for a period of sixty years … , to explore, prospect, drill for, extract, treat, manufacture, deal with, carry away and export petroleum."[483] Later, the Standard Oil Company of California (SOCAL), under the name of the California-Arabian Standard Oil Company (Casoc), organized a corporation exclusively for the purpose of enterprise and appointed 'to its rights and obligations under the Concession Agreement'.[484] This cooperation was ratified by the government of Saudi Arabia and the name of the California-Arabian Standard Oil Company (Casoc) changed to the Arabian American Oil Company (ARAMCO).[485] On a contractual basis, ARAMCO started its operation to explore and drill, when the oil was explored in large amounts and the local market was dull, ARAMCO started to export such oil abroad.[486] Accordingly, ARAMCO concluded an agreement for the sale of crude oil and for the sale of refined products. In addition, ARAMCO held a Concession Agreement and Supplemental Agreements in which such company claimed these agreements granted it the right to, *inter alia*, to the means of transportation necessary for the petroleum it produced, including transporting such petroleum overseas.[487] At that time, ARAMCO did not own or charter tankers, preferring to conclude appropriate contracts for carriage instead and, usually, these contracts were on a shipment term 'Free Of Board' (FOB).[488]

In 1954, the authority of Saudi Arabia concluded an agreement with Mr. A. S. Onassis, and this agreement granted Mr. A. S. Onassis permission to establish a fleet of tankers under the name of

[483] A. V. Lowe, 'The Right of Entry Into Maritime Ports In International Law' (1977) 14(3) San Diego Law Review 597, 598.
[484] Khaled Mohammed Al-Jumah, 'Arab State Contract Disputes: Lessons From The Past' (2002) 17(3) JSTOR 215, 221.
[485] Ibid.
[486] Ibid.
[487] Ibid.
[488] Ibid.

the Saudi Arabian Maritime Tankers Company Ltd (SATCO) and a right of priority for the transport of oil for a 30-year period.[489] Additionally, the agreement between said parties included that oil companies in the Kingdom of Saudi Arabia that needed to transport oil outside the territory of Saudi Arabia had to transport it through the Saudi Arabian Maritime Tankers Company Ltd.[490] This agreement raised the dispute between ARAMCO and the authority of Saudi Arabia. ARAMCO argued that the priority right given to Saudi Arabia Maritime Tanker Company Ltd violated Article 1 of the 1933 Concession Agreement that gave ARAMCO the "exclusive right to carry away and export petroleum."[491] A counter-argument was that the exclusive rights of ARAMCO were limited by the 1933 Concession Agreement which did not extend beyond the territory of Saudi Arabia.[492] The Tribunal held that the 1933 Concession Agreement between the government of Saudi Arabia and Aramco applied to the distribution of oil within and without the Concession area.[493] Therefore, the enforcement of Saudi Arabia Maritime Tanker Company Ltd "priority right to transport" under the 1954 Agreement amounted to a violation of the 1933 Concession Agreement for which the Saudi Arabian government was liable.[494] This conclusion was all that was an essential resolution of the dispute between case parties.[495] However, the Tribunal went further to comment upon the right of entry into ports in customary international law.[496] The arbitrators held that;

[489] Khaled Mohammed Al-Jumah, 'Arab State Contract Disputes: Lessons From The Past' (2002) 17(3) JSTOR 215, 221.
[490] A. V. Lowe, 'The Right of Entry Into Maritime Ports In International Law' (1977) 14(3) San Diego Law Review 597, 598.
[491] Ibid.
[492] Ibid.
[493] Ibid.
[494] Ibid.
[495] Ibid 599.
[496] Ibid.

> [T]he territorial sovereignty of the State over its means of maritime communication is not unrestricted. It can only be exercised within the limits of customary international law, of the treaties the State has concluded and of the particular undertaking it has assumed. According to a great principle of public international law, the ports of every State must be open to foreign merchant vessels and can only be closed when the vital interests of the State so require.[497]

The above-mentioned quote, as a part of the outcome of litigation, demonstrates the Tribunal's belief in relation to the right of access to the foreign port. According to Anthony P. Morrison, the arbitrators used the 1923 Geneva Convention and Statute and other older authorities to reach the above-mentioned judicial view.[498] However, the mainstream of commentators refuse these views,[499] and they extremely criticized the above-mentioned quote because of that what the Tribunal's believes added a limit to the principle of coastal state sovereignty over its internal waters that is absolute in its nature. A. V. Lowe, for example, argues that the Tribunal was mistaken in advancing this proposition of law because vessel passage cannot be regarded as authority for a right of entry.[500] The general view is that the intent and effect of the 1923 Geneva Convention and Statute was not to grant vessels general access to foreign ports but to grant such vessels access on the basis of reciprocity.[501] Such granted right could be suspended where reciprocity is not given by another State or where on the basis of national interests.[502] This view

[497] A. V. Lowe, 'The Right of Entry Into Maritime Ports In International Law' (1977) 14(3) San Diego Law Review 597, 600.
[498] Anthony P. Morrison, *Places Of Refuge For Ships In Distress: Problems And Methods Of Resolution* (Martinus Nijhoff Publishers, 2012) 60.
[499] Ibid.
[500] Lowe (n 497) 598.
[501] Morrison (n 498).
[502] Ibid.

has been supported by the United Nations Conference on Trade and Development (UNCTAD), in a report in 1975, which stated;[503]

> It would appear that the 1923 Ports Convention does not state unequivocally (i) that a right of access exists for all merchant vessels that come to a port with a lawful purpose, regardless of their nationality or ownership and prior or subsequent port of call; (ii) the type of ports for which access is granted; (iii) the type of vessels for which access is granted; (iv) the circumstance in which access can be denied; and (v) the procedures governing access.

To date, the acceptance of the 1923 Geneva Convention and Statute is limited with only forty-three current signatories, European States are the majority that ratified this Convention within the first ten years.[504] Importantly, the mentioned Convention is not ratified by all flag States, there are a number of major maritime States that have not acceded to such Convention, such as the United States, the Russian Federation, and China.[505] This means that there has not been much support for the above-mentioned Convention and Statute which would indicate that there are an insufficient number of State practices to argue that the said Convention and Statute represents customary international law.[506] The general right of access, therefore, would be binding only upon parties to the Convention, but it would not bind to non-signatories.[507] To conclude, the right of foreign vessels to access ports does not exist in customary international law, however, such right might be provided by applicable a bilateral port access agreement or treaty, such as the

[503] Anthony P. Morrison, *Places Of Refuge For Ships In Distress: Problems And Methods Of Resolution* (Martinus Nijhoff Publishers, 2012) 61.
[504] Ibid.
[505] Ibid.
[506] Ibid.
[507] A. V. Lowe, 'The Right of Entry Into Maritime Ports In International Law' (1977) 14(3) San Diego Law Review 597, 605.

Maritime Ports Convention[508] and the 1994 General Agreement on Tariffs and Trade (GATT 1994).[509] The right of access to coastal State ports, in addition, would be based on such State national laws. This point will be expanded below.

4.1.3 Legislative Jurisdiction

As has been discussed, ports are considered part of the internal waters and, therefore, this zone of waters is mainly subject to the sovereignty of the coastal State. In principle, a coastal State has full legislative jurisdiction to enact laws and regulations within said body of water.[510] Accurately, such States have extensive discretion to impose conditions for the access of foreign vessels to port and also can deny foreign vessels access as well.[511] A coastal State can, for instance, charge foreign vessels port dues, require such vessels to comply with its customs and immigration regulations, regulate pollution from foreign vessels, and extend its criminal laws to govern all those on board of foreign vessels in ports and internal waters.[512] However, such jurisdiction is subject to any restrictions made under treaties concerning the right of foreign vessels to access State ports, for example, a prohibition on discrimination between or against foreign vessels that is imposed by Article V(2) of the GATT.[513] It is worth noting that discrimination between foreign vessels in relation to the conditions attached to passage through internal waters and other certain matters is forbidden by the UNCLOS, but such Convention does not forbid discrimination

[508] Erik J Molenaar, 'Port and Coastal States', in Donald R Rothwell, Alex G Oude Elferink, Karen N Scott, and Tim Stephens (eds), *The Oxford Handbook of The Law Of The Sea* (1st edn, Oxford University Press, 2015) 285.
[509] Robin Churchill, Vaughan Lowe, and Amy Sander, *The Law of the Sea* (4th edn, Manchester University Press, 2022) 117.
[510] Ibid, 119.
[511] Erica Yvonn Jungblut, The First Step in Regulating Autonomous Ships: An Assessment on the Interim Guidelines for Maritime Autonomous Surface Ships Trials and Its Legal Significance in the International Regulatory Landscape (Master Thesis, The Artic University of Norway, 2020) 31.
[512] Churchill, Lowe, and Sander (n 509).
[513] Ibid.

between foreign vessels when it comes to those vessels' admission to ports or and the exercise of coastal State jurisdiction over such vessels in ports.[514] However, the UNCLOS does impose specific procedural requirements concerning States exercising legislative jurisdiction.[515]

Article 211(3) of the UNCLOS, for example, provides that " the coastal State has a right to establish particular requirements for the prevention, reduction, and control of pollution of the marine environment as a condition for the entry of foreign vessels into the coastal State ports or internal waters or for a call at their off-shore terminals shall give due publicity to those requirements and shall communicate such requirements to the competent international organization …".[516] The international obligation of a coastal State, if this interpretation is correct, is that a coastal State should publicize such requirements and communicate with the International Maritime Organization, before such requirements are enforced.[517] In addition, these requirements should have "… the same effect as that of generally accepted international rules and standards established through the competent international organization or general diplomatic conference ...", at least.[518] Connected to this, Article 211(3) also provides that " … every State shall require the master of a vessel flying its flag or of its registry, when navigating within the territorial sea of a State participating in such cooperative arrangements, to furnish, upon the request of that State, information as to whether it is proceeding to a State of the same region participating in such cooperative arrangements and, if so, to indicate whether it complies with the

[514] Robin Churchill, Vaughan Lowe, and Amy Sander, *The Law of the Sea* (Fourth Edition, Manchester University Press, 2022) 119.
[515] Ibid.
[516] UNCLOS, Art 211(3).
[517] Churchill, Lowe, and Sander (n 514).
[518] UNCLOS, Art 211(2).

port entry requirements of that State."[519] Clearly, this paragraph requires a master to be in charge of a vessel. Another requirement is that foreign vessels have to be in compliance with port State regulations. The notion is, if such vessels did not meet port States' requirements, those States have a right to deny such vessels to its ports and internal waters. A significant question regarding unmanned vessels is whether or not such vessels meet port regulations. At an international level, the above-meantime Article clearly requires a master when a vessel navigates in other State territorial waters. According to Danish Maritime Authority, Articles 22, 25(2), and 211(3) will present a general barrier to autonomous vessels.[520] This jurisdictional issue is required the international community to develop regulatory requirements to accommodate said vessels.

At a national level, the Kingdom of Saudi Arabia has enacted little legislation dealing with access to ports. This legislation clearly deals with conditions of entry to ports and also the denial of access to such ports. This means, vessels do not have a general right of access to Saudi Arabia ports. Entering such ports requires consent from the port State, otherwise, it is a *prima face* breach of Saudi's national laws.[521] The harbour master has been given the power to accept and or deny the entry of the port under Article 9(2)(1) of the 2023 Executive Regulation for Port Operation.[522] According to Article 208 of said Executive Regulation, every ship requesting permission in order to enter Saudi port must comply with the International Ship and Port Facility (ISPS) Code.[523] Such a Code is designed to prevent vessels from being utilized as weapons by

[519] UNCLOS, Art 211(3).
[520] Danish Maritime Authority, Analysis of Regulatory Barriers to the Use of Autonomous Ships (Final Report, 2017) 16.
[521] The 2023 Executive Regulation for Port Operation, Art 9(2)(3).
[522] This Executive Regulation is quite new. It is publicized by Saudi Ports Authority Decision No. 1(2023), Outgoing No. 1 / 31/ 70 / 18063 Dated on 05/ 02/ 2023 | 14 / 07/ 1444 H.
[523] The 2023 Executive Regulation for Port Operation, Art 208.

terrorists.[524] It aims to identify security threats, implement security measures, and also create commitments for governments, administrations, and vessels on a national and international level.[525] Therefore, the ISPS Code requires that a shipping company has to designate a Company Security Officer and Ship Security officer onboard nominated by the ship operator.[526] Moreover, a ship must have a Security Plan after having a Ship Security Assessment, it should obtain a vessel International Ship Security Certificate accordingly.[527] Such requirements are made to be applied on conventional ships from ports.[528] However, it has been argued that it is difficult to apply the above-mentioned security requirements codified in an annex to chapter XI-2 of SOLAS on autonomous vessels.[529] This means said vessels would not fulfill the ISPS Code and Saudi's port regulations accordingly. As a result, it can be said that foreign autonomous vessels would not be legally eligible to enter Saudi ports under the current regulations. It is recommended that there is a need to amend the ISPS Code, in the future, to accommodate the new development and strength of maritime security in light of the absence of a security officer. This suggestion is in line with the RSE conclusion which suggests that several IMO instruments need to be addressed, especially SOLAS Chapter XI-2.[530]

[524] Aditya Pratap Singh, Study on the Implications of Autonomous Ships on Maritime Security and Law Enforcement by Reviewing Maritime Security Incidents (Master Dissertation, World Maritime University, 2021) 15.
[525] Ibid.
[526] Muhammad Adil Bajwa, 'Threats and Challenges to Maritime Autonomous Surface Ships (MASS): Role of Law Enforcement Agencies' (Master Dissertation, The World Maritime University, 2022) 23.
[527] Ibid.
[528] Ibid, 23 – 24.
[529] Ibid.
[530] Singh (n 524) 15.

4.3 Territorial Sea

4.3.1 Introduction

Historically, the international law of the sea was dominated by two contrasted theories namely, *mare liberum* and *mare clausum*.[531] The use of these important theories continued in the international law of the sea till the codification of such laws was made through various Conferences.[532] The codification, therefore, could be the right solution to developing the law of the sea and strike the balance between the application of those theories. It is worth noting that the doctrine of *mare liberum* is one of the foundations of contemporary maritime legal doctrine, and such doctrine means the 'freedom of the seas'.[533] In 1609, Hugo Grotius, the father of international law of the seas,[534] wrote that the seas had already been a *de facto* synonym for freedom of navigation and utilization for many centuries.[535] The idea of the above-mentioned principle was that the sea is common to all, and it cannot be a possession of anyone because it is limitless, and because it is adapted for the use of all, whether such use is for navigation or fisheries.[536] Grotius mentioned that "the sea is called indifferently the property of no one (*res nullius*), or public property (*res publica*), or a common possession (*res communis*).[537] Conversely, John Selden wrote the theory of *mare clausum* which claimed sovereignty over

[531] William K. Agyebeng, 'Theory in Search of Practice: The Right of Innocent Passage in the Territorial Sea' (2006) Vol 39(2) Cornell International Law Journal 371.
[532] Donald R Rothwell and Tim Stephens, *The International Law of the Sea* (2nd edn, Hart Publishing, 2016) 60.
[533] Arianna Broggiato, Thomas Vanagt, Laura E. Lallier, 'Mare Geneticum: Balancing Governance of Marine Genetic Resources in International Waters' (2018) 33(1) The International Journal Of Marine And Coastal Law 3 - 4.
[534] Francis Nagantcha, *The Right of innocent Passage and the Evolution of the International Law of the Sea* (1st edn, the University of Geneva , 1990) 11.
[535] Broggiato, Vanagt, and Lallier (n 533).
[536] Douglas Guilfoyle, 'The High Seas', In Donald R Rothwell, Alex G Oude Elferink, Karen N Scott, and Tim Stephens (eds), *The Oxford Handbook of The Law Of The Sea* (1st edn, Oxford University Press, 2015) 203.
[537] Ibid.

coastal seas for States interest.[538] The notion of this theory was not only a legal concept, but it was a very much geographical one also.[539] Eventually, such a theory led to the introduction of territorial waters to be one of the recognized maritime zones. The concept of such a maritime zone is built on the notion that the coastal State has a sovereignty that could be exercised beyond its territory in the adjacent sea.[540] The actions of states, in such zone, would be based on the principle of sovereignty.

This subchapter will examine the legal regime of the territorial seas, first. It then turns to investigate the legal and regulatory challenges connected with the development of autonomous vessels. This subchapter will also demonstrate how the extent the legal regime of territorial waters may pose legal barriers and regulatory challenges to said vessels. Arguably, it can be said that there is a lack of an explicit legal framework to regulate autonomous vessels. Coastal States can adopt legal regimes to govern said vessels in such States' territorial seas based on the principle of territorial sovereignty, however, such vessels would not enjoy the right of innocent passage. This subchapter will be structured in a very logical way to rationalize the above statement. First, the subchapter will examine the legal status of the territorial seas. Second, the principle of territorial sovereignty will be demonstrated. Finally, the anchor point is the principle of innocent passage.

[538] Yoshifumi Tanaka, *The International Law of the Sea* (3rd edn, Cambridge University Press, 2019) 23.
[539] Bo Johnson Theubtenberg, 'Mare Clausum et Mare Liberum' (1984) 37(4) Arctic Institute of North America 482.
[540] Francis Nagantcha, *The Right of innocent Passage and the Evolution of the International Law of the Sea* (1st edn, the University of Geneva , 1990) 10.

4.3.2 The Legal Status

The legal status of the territorial seas is determined by the UNCLOS. It is evident that the territorial sea, air space over the territorial sea, and its bed and subsoil are subject to the sovereignty of a coastal State.[541] Such a principle, however, will be discussed in a separate section. Here, the limit of the territorial sea will be examined. Prior to UNCLOS, the measurement of this zone has historically generated controversy,[542] and it was difficult to identify the applicable law to maritime delimitation.[543] Various methods were developed and used in the context of international customary law, state practice, and legal theory.[544] Many States had used theories of the 'cannon shot' or 'line of sight' rule to measure the breadth of the territorial sea.[545] This can indicate that international maritime law is influenced by state practices, theories, and doctrine as well.[546] It can also be interpreted as an issue that challenged the effective governance of the use of the sea. However, this issue has been solved by Article 3 of UNCLOS, which embodies the baseline system as a method of measuring the territorial water width. This Article provides that " … every State has the right to establish the breadth of its territorial sea up to a limit not exceeding 12 nautical miles, measured from baselines determined in accordance with this Convention …".[547] A close reading of such legal text shows that the coastal states have a right to establish a territorial sea, this right is broad and can be extended to a

[541] UNCLOS, Art 2(1) and (2).
[542] Brian D. Smith, *State Responsibility and the Marine Environment: The Rule of Decision* (1st edn, Oxford University Press, 1988) 188.
[543] Anshory Ilyas, Mustafa Bola, and Judhariksawan, 'Measurement of the Territorial Sea of the Kingdom of Gowa, Indonesia: Comparative Study in International Maritime Law' (4th International Symposium on Marine Science and Fisheries, University of Hasanuddin – Indonesia, 2021) < https://iopscience.iop.org/article/10.1088/1755-1315/860/1/012094/pdf > accessed 10 December 2022.
[544] Ibid.
[545] John E Noyes, 'The Territorial Sea and Contiguous Zone', in Donald R Rothwell, Alex G Oude Elferink, Karen N Scott, and Tim Stephens (eds), *The Oxford Handbook of The Law Of The Sea* (1st edn, Oxford University Press, 2015) 92 - 93.
[546] Ilyas, Bola, and Judhariksawan (n 543).
[547] UNCLOS, Art 3.

maximum of 12 nautical miles. However, the minimum limit of such a sea is absent in the above-mentioned legal text. The lack of minimum limit of the territorial sea in Article 3 of UNCLOS might be due to the fact that much of coastal States that are opposite to each other have less than 24 nautical miles of a territorial sea boundary. Thus, it might be said that said Article formulated with a lack of minimum limit intentionally in order to cover all situations. More importantly, the above-mentioned article provides that the baseline is the landward limit of the territorial sea.[548] Added to that, a combination of methods for determining baselines would be used to measure the territorial sea,[549] if the shape of the coast is varied such as the method of normal and straight lines.[550]

It can be assumed that Article 3 of the UNCLOS had put an end to the debate regarding the breadth of the territorial sea. Some States, however, addressed the potential challenges to the 12 nautical miles and the limitation of the regime of territorial sea in the declarations made upon their signature and or ratification of the UNCLOS.[551] For instance, Belgium indicated in its 1984 Declaration that "… the limitation of the breadth of the territorial sea, as established by Article 3 of the Convention, confirms and codifies a widely observed customary practice which it is incumbent on every State to respect, as it is only one admitted by international law …".[552] This state, also, stated that it would not recognize a territorial waters claim that extends beyond 12

[548] Yoshifumi Tanaka, *The International Law of the Sea* (3rd edn, Cambridge University Press, 2019) 102.
[549] UNCLOS, Art 14.
[550] Anshory Ilyas, Mustafa Bola, and Judhariksawan, 'Measurement of the Territorial Sea of the Kingdom of Gowa, Indonesia: Comparative Study in International Maritime Law' (4th International Symposium on Marine Science and Fisheries, University of Hasanuddin – Indonesia, 2021) < https://iopscience.iop.org/article/10.1088/1755-1315/860/1/012094/pdf > accessed date 10 December 2022.
[551] Donald R Rothwell and Tim Stephens, *The International Law Of The Sea* (2nd edn, Hart Publishing, 2017) 73.
[552] Ibid, 73 - 74.

nautical miles.[553] This does not mean that all states have reached a unanimous agreement on this limit of the territorial sea, there were others claiming a territorial sea with more than 24 nautical miles, such as the United States, however, this claim had been subject to protest by several States.[554] In 2012, Roath and Smith asserted that " the state practice of territorial sea claims has become, by a large measure, stable and in line with the customary international law" shown in the UNCLOS.[555]

When it comes to States practice, the Kingdom of Saudi Arabia clearly defined its territorial sea as embracing both inland waters and the coastal sea by Royal Decree No. 6/4/5/311 of May 23, 1949.[556] This might be the first Decree in this regard, and it is definitely before the enactment of the 1982 UNCLOS. Such Decree determined the breadth of territorial waters as six nautical miles beyond its inland waters as well as it identified the right of the Kingdom of Saudi Arabia to exercise its maritime surveillance in relation to navigation, security, and fishery matters in a contiguous zone extending six nautical miles beyond the territorial sea.[557] However, the contents of the above-mentioned Decree language have been re-worded into the 2011 Statute of Maritime Delimitation of the Kingdom of Saudi Arabia. Article 5(1) of such statute provides that " the territorial sea of the kingdom extends 12 nautical miles, measured from the baselines ."[558] Clearly, this Article consists of two elements. Firstly, the Kingdom of Saudi Arabia's territorial sea is 12 nautical miles. Secondly, such a sea will be measured from the baselines. Therefore, it

[553] Donald R Rothwell and Tim Stephens, *The International Law Of The Sea* (2nd edn, Hart Publishing, 2017) 74.
[554] Ibid.
[555] Ibid.
[556] Omar Abou Baker Bakhahab, 'The Legal Regime of Saudi Arabia Territorial Sea' (1988) Vol 1 King Abdul Aziz University 1, 14 < https://www.kau.edu.sa/Files/320/Researches/51489_21624.pdf > accessed 11 December 2022.
[557] Ibid.
[558] The 2011 Statute of Maritime Delimitation of Kingdom of Saudi Arabia, Article 5(1).

can be said that the aforementioned Article is in line with the customary international law that is reflected in Article 3 of UNCLOS. Put Simply, the territorial sea is legally described as a narrow belt of water that extends seaward from the baselines of coastal States.[559] Again, this body of water is governed by the principle of coastal State sovereignty which will be discussed further below.

4.3.3 The Sovereignty of Coastal States

Sovereignty is an expression in legal and political philosophy.[560] It is frequently used to describe the position of a State.[561] The origin of the term, as it has been said, is deeply rooted in Latin legal terms, *sui juris, esse suae potestatis, superanus or summa potestas*, which means " … a supreme and independent authority, and no obligation can be forced upon a sovereign state either by the international community or by international law …".[562] As the supreme authority, the concept of sovereignty has three separate aspects namely, independence, personal supremacy, and territorial supremacy.[563] Territorial supremacy, therefore, is the appropriate point to begin a discussion. According to Article 2(1) of the UNCLOS, " … the sovereignty of a coastal State extends, beyond its land territory and internal waters and, in the case of an archipelagic State, its archipelagic waters, to an adjacent belt of sea, described as the territorial sea …".[564] This Article,

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[559] John E Noyes, 'The Territorial Sea and Contiguous Zone', in Donald R Rothwell, Alex G Oude Elferink, Karen N Scott, and Tim Stephens (eds), *The Oxford Handbook of The Law Of The Sea* (1st edn, Oxford University Press, 2015) 91.

[560] Melissa Anne North Higgs, 'Perforated Sovereignty: The Geopolitical Dilemma of Aegean Hydrocarbons' (Master Thesis, University of Missouri-Columbia, 2018) 131.

[561] Brian D. Smith, *State Responsibility and the Marine Environment: The Rules of Decision* (1st edn, Oxford University Press, 1988) 68.

[562] Stephen Kong, ' The Right of Innocent Passage: A Case Study on Two Koreas' (2002) Vol 202(11) Minnesota Journal of International Law 377.

[563] Arie Afriansyah, Dila Paruna , and Rania Andiani , '(Un)Blurred Concept of Sovereign Rights at Sea : Implementation Context' (2020) Vol 16(1) LAW REFORM 129 – 130.

[564] UNCLOS, Art 2(1).

clearly, affirms that the territorial seas of a coastal State are dominated by such State sovereignty. However, the language of this article has received much criticism. Neither said Article nor others in the UNCLOS defined the meaning of the sovereignty of the coastal State.[565] A close reading of some of the provisions of the UNCLOS might be a very good jurisprudential approach in order to deduce the correct meaning of the sovereignty of coastal States. Article 212 of the UNCLOS, for example, requires coastal States to adopt laws and regulations in order to "… prevent, reduce, and control pollution of the marine environment from or through the atmosphere, applicable to the air space under their sovereignty and to vessels flying their flag or vessels or aircraft of their registry, taking into account internationally agreed rules, standards, and recommended practices …".[566] In addition, Article 212(2) of UNCLOS, provides that States have the right to take other measures that may be necessary to prevent such pollution.[567] Furthermore, Article 245 of the UNCLOS states that " … coastal States, in the exercise of their sovereignty, have the exclusive right to regulate, authorize and conduct marine scientific research in their territorial sea …".[568] Through these provisions, it may seem obvious that the notion of territorial sovereignty refers to the final authority in all legal and political matters.

As far as territorial sovereignty is concerned, the Government of Saudi Arabia issued the 1958 Royal Decree that extended the kingdom's sovereignty to the air space above the soil and sub-soil beneath the territorial sea.[569] This Decree was reworded in Article 4 of the Statute of

[565] Arie Afriansyah, Dila Paruna , and Rania Andiani , '(Un)Blurred Concept of Sovereign Rights at Sea : Implementation Context' (2020) Vol 16(1) LAW REFORM 129 – 130.
[566] UNCLOS, Art 212(1).
[567] UNCLOS, Art 212(2).
[568] UNCLOS, Art 245.
[569] Omar Abou Baker Bakhashab, 'The Legal Regime of Saudi Arabia Territorial Sea' (1988) Vol 1 King Abdul Aziz University 1, 14.

Maritime Delimitation of the Kingdom of Saudi Arabia which provides " the jurisdiction of the kingdom extends beyond its land territory its internal waters and territorial sea, the air space over the territorial sea as well as to the seabed and subsoil. The kingdom exercises sovereignty in accordance with the provisions of the Convention and other rules of international law."[570] This article provides that a Saudi's territorial sea is subject to the territorial sovereignty of its state, but neither this article nor other provisions in the Statute of Maritime Delimitation of the Kingdom of Saudi Arabia defined the meaning of sovereignty. Howbeit, such an article made this clear that territorial sovereignty would be exercised in compliance with UNCLOS and international law. This is a clear reference that could be taken to mean that the legal meaning of the coastal state territorial sovereignty is similar to the meaning of the territorial sovereignty that is established under the UNCLOS and customary international law. The question that arises here is; Does territorial sovereignty absolute? In essence, the sovereignty of a State is absolute in its nature. However, territorial sovereignty is not extensive as same as the sovereignty that governs the land territory. As evidence, Article 2(3) of the UNCLOS provides that " … the sovereignty over the territorial sea is exercised subject to this Convention and to other rules of international law ...".[571] According to John E Noyes, the sovereignty over the territorial sea is limited according to rights and duties international law elucidates to independent States,[572] such as the right of innocent

[570] The 2011 Statute of Maritime Delimitation of Kingdom of Saudi Arabia, Article 4.
[571] UNCLOS, Art 2(3)
[572] John E Noyes, 'The Territorial Sea and Contiguous Zone', in Donald R Rothwell, Alex G Oude Elferink, Karen N Scott, and Tim Stephens (eds), *The Oxford Handbook of The Law Of The Sea* (1st edn, Oxford University Press, 2015) 97.

passage.[573] This right is the most prominent restriction on coastal States' competence in territorial water,[574] to which this paragraph now turns.

4.3.4 The Right of Innocent Passage

The right of innocent passage through territorial seas was introduced for foreign vessels. This principle was instituted in the middle of the nineteenth century,[575] based on the principle of freedom of navigation,[576] which dominated the international law of the sea for centuries.[577] The principle of innocent passage, might be, a political solution to strike a balance of interests between coastal States and flag States. It has been said that said principle was made as a result of the contradiction between theories of *mare liberum* and *mare clausum*,[578] as a compromise between said theories.[579] The doctrine of innocent passage is firmly recognized in international customary law, and it is codified currently in the UNCLOS.[580] This academic contribution aims to examine the regime of innocent passage. The examination aims to explore whether or not unmanned vessels can enjoy the above-mentioned principle.

Therefore, Article 17 of the UNCLOS is the starting point. This Article provides that " … subject to this Convention, ships of all States, whether coastal or land-locked, enjoy the right of

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[573] Yoshifumi Tanaka, *The International Law of the Sea* (3rd edn, Cambridge University Press, 2019) 104.
[574] John E Noyes, 'The Territorial Sea and Contiguous Zone', in Donald R Rothwell, Alex G Oude Elferink, Karen N Scott, and Tim Stephens (eds), *The Oxford Handbook of The Law Of The Sea* (1st edn, Oxford University Press, 2015) 98; UNCLOS, Art 97.
[575] Tanaka (n 573).
[576] Ibid.
[577] Pierandrea Leucci, 'Innocent Passage in the Territorial Sea Within the Framework of the Law of the sea Convention' (2018) 10 (1) International Journal of Maritime Affairs and Fisheries 1.
[578] Donald R Rothwell and Tim Stephens, *The International Law Of The Sea* (2nd edn, Hart Publishing, 2017) 60.
[579] William K. Agyebeng, 'Theory in Search of Practice: The Right of Innocent Passage in the Territorial Sea' (2006) Vol 39(2) Cornell International Law Journal, 372.
[580] Robin Churchill, Vaughan Lowe, and Amy Sander, *The Law of the Sea* (4th edn, Manchester University Press, 2022) 142.

innocent passage through the territorial sea …".[581] This Article, according to the textualist method of interpretation, commences with an affirmative statement indicating the right of foreign vessels to enjoy said principle, however, such an Article does not provide a legal definition of 'innocent passage'. Breaking the phrase 'innocent passage' down might be a suitable approach to understanding this principle in its proper context.

4.3.4.1 The Meaning of the Term 'Passage'

From the point of view of Robin Churchill et al, the definition of the term passage is not a difficult matter.[582] Article 18 of UNCLOS, for example, provides that the meaning of the term 'passage' as traversing in the territorial sea "… without entering internal waters or even calling at a roadstead or port facility outside internal waters …"[583] or "… proceeding to or from internal waters or a call at such roadstead or port facility ...".[584] Further, the passage of vessels has to be 'continuous and expeditious',[585] for the purpose of entering or leaving internal waters, or passing through the territorial sea.[586] It also means that vessels have to maintain a regular speed, taking into account safety and other relevant factors.[587] The act of hovering, by foreign ships, does not fit into the legal meaning of 'passage' under Article 18 of UNCLOS.[588] In addition, vessels during navigation have to avoid any unnecessary delay in the passage,[589] however, vessels

[581] UNCLOS, Art 17.
[582] Robin Churchill, Vaughan Lowe, and Amy Sander, *The Law of the Sea* (4th edn, Manchester University Press, 2022) 142.
[583] UNCLOS, Art 18(1)(a).
[584] UNCLOS, Art 18(1)(b).
[585] UNCLOS, Art 18(2).
[586] Simon McKenzie, When Is A Ship A Ship? Use By State Forces Of Un-crewed Maritime Vehicles And The United Nations Convention On The Law Of The Sea' (2020) Vol 21(2) Melbourne Journal of International Law 1.
[587] Yoshifumi Tanaka, *The International Law of the Sea* (3rd edn, Cambridge University Press, 2019) 105.
[588] Ibid.
[589] Pierandrea Leucci, 'Innocent Passage in the Territorial Sea Within the Framework of the Law of the sea Convention' (2018) 10 (1) International Journal of Maritime Affairs and Fisheries 1.

stopping or anchoring due to incidental ordinary navigation, *force majeure*, or distress would be viewed as rendered necessary.[590] These conventional definitions are in compliance with 'a long and consistent general practice among States'. [591] Furthermore, Article 20 of the UNCLOS provides that vessels "… in the territorial sea, submarines and other underwater vehicles are required to navigate on the surface and to show their flag ...".[592] This Article follows essentially from Article 14(6) of the TSC.[593] A reverse meaning of this Article is that vessels that navigate underwater would fall out of the meaning of a passage articulated in Article 18(1) of UNCLOS. In this regard, the question arises as to whether a breach of the requirement to navigate on the surface will justify the use of force against the submarine. According to Tanaka, such a violation would not instantly justify the use of force against the submarine, most importantly, every measure should be taken short of armed force to require the foreign submarine to leave the territorial sea.[594]

4.3.4.2 The Meaning of the Term 'Innocence'

It has been said that the meaning of the term 'innocence' is debatable. According to Churchill et al, the criterion of 'innocence', in the 1982 UNCLOS, lacked any clear definition and almost certainly any clear meaning as well.[595] Stephen Kong, in addition, in views of that international law scholars have different views in this regard.[596] While coastal States define the meaning of

[590] UNCLOS, Art 18(2).
[591] Robin Churchill, Vaughan Lowe, and Amy Sander, *The Law of the Sea* (4th edn, Manchester University Press, 2022) 142.
[592] UNCLOS, Art 20.
[593] Yoshifumi Tanaka, *The International Law of the Sea* (3rd edn, Cambridge University Press, 2019) 105.
[594] Ibid.
[595] Churchill, Lowe, and Sander (n 591) 143.
[596] Stephen Kong, ' The Right of Innocent Passage: A Case Study on Two Koreas' (2002) Vol 11 Minnesota Journal of International Law, 378.

innocent by subjective interpretation, objective manner by scholars also define such a term.[597] The basic structure of Article 19, stipulated some of the 'activities' that would render the passage of foreign vessels to be not innocent. In detail, such an Article provides that the passage cannot be considered innocent if it is "… prejudicial to the peace, good order, or security of the coastal State …".[598] However, the language of this Article is open to subjective interpretation,[599] and it is susceptible of being implemented in an arbitrary manner by the coastal State.[600] The language of this paragraph is very broad, and it did not determine the activities that amount to the above-mentioned terms. However, to achieve the objectivity of said paragraph, foreign vessels enjoying the right of innocent passage have to fall out of the scope of any of the activities that are determined in Article 19(2) of UNCLOS.

Paragraph 2 of Article 19 of the UNCLOS provides some of the activities that would render the passage to be non-innocent if such activities are exercised by foreign vessels. These activities are; (a) any threat or use of force against the coastal State sovereignty;[601] (b) any exercise with weapons of any kind;[602] (c) collecting information to the prejudice of the security or defence of the coastal State;[603] (d) any act of propaganda to affect the defence or security of the coastal State;[604] (e) the launching, landing, or taking on board of any aircraft;[605] (f) the launching,

[597] Stephen Kong, ' The Right of Innocent Passage: A Case Study on Two Koreas' (2002) Vol 11 Minnesota Journal of International Law, 378.
[598] UNCLOS, Art 19(1).
[599] Kong (n 597) 379.
[600] Gamaliel Rodriguez Ballester, 'The Right of Innocent Passage of Warships: A Debated Issue' (2014) 54 Rev Der PR 87, 92.
[601] UNCLOS, Art 19(2)(a).
[602] UNCLOS, Art 19(2)(b).
[603] UNCLOS, Art 19(2)(c).
[604] UNCLOS, Art 19(2)(d).
[605] UNCLOS, Art 19(2)(e).

landing, or taking on board of any military device;[606] (g) the loading or unloading of any commodity, currency or person contrary of the customs, fiscal, immigration or sanitary laws and regulations of the coastal State;[607] (h) any act of willful and serious pollution;[608] (i) fishing activities; [609] (j) research or survey activities; [610] (k) interference with any system of communication or any other facilities or installations of the coastal State;[611] and (I) any other activities not having a direct bearing on passage. [612] However, a textualism reading and interpretation of the above-mentioned Article indicates that the above-listed activities are not exhaustive. This means, there are some activities that can render the passage to be non-innocent, however, these activities are not written yet. Tanaka is of the view that the word 'activities' in Article 19(2) of UNCLOS seems to suggest that the prejudicial nature of an innocent passage is judged based on how the passage is carried out, and it does not judge based on the type of the ship.[613] This is an effective approach that can be used to decide whether or not the passage is innocent. This approach, also, has been taken by the International Court of Justice (ICJ) in the 1949 *Corfu Channel* case, when such Court relied fundamentally on the criterion of "… whether the *manner* in which the passage was carried out was consistent with the principle of innocent passage ...'.[614] However, several subparagraphs of Article 19(2) of UNCLOS seem unclear and received many criticisms in this regard. These will be discussed below.

[606] UNCLOS, Art 19(2)(f).
[607] UNCLOS, Art 19(2)(g).
[608] UNCLOS, Art 19(2)(h).
[609] UNCLOS, Art 19(2)(i).
[610] UNCLOS, Art 19(2)(j).
[611] UNCLOS, Art 19(2)(i).
[612] UNCLOS, Art 19(2).
[613] Yoshifumi Tanaka, 'Navigational Rights and Freedoms', in Donald R Rothwell, Alex G Oude Elferink, Karen N Scott, and Tim Stephens (eds), *The Oxford Handbook of The Law Of The Sea* (1st edn, Oxford University Press, 2015) 542.
[614] Ibid.

According to Tanaka, the language of Article 19(2)(a), (c), and (j) are widely drafted, and this language may lead to international disputes in relation to its interpretation.[615] Tanaka went further to suggest that 'a coastal state which questions whether the particular passage of a ship through its territorial sea is innocent shall inform the ship of the reason why it questions the innocent passage, and provide the ship an opportunity to clarify its intentions or correct its conduct in a reasonable short period of time.'[616] This is a procedural suggestion to implement the above-mentioned subparagraphs. Another criticism of Article 19(2) of UNCLOS centers around its meaning. It is not clear whether or not paragraph (2) is meant to be an illustrative list of Paragraph (1) of the same Article. In addition, it is unclear whether or not the coastal state can evaluate innocence on the basis of paragraph (1) of article 19 of UNCLOS only.[617] An ambiguity in this paragraph may lead to an interpretive issue and one, by necessity, should consider the entire context of Article 19 to determine which one of the plausible readings is in accordance with the intentions of the statute. Tanaka's argument, in this regard, is that Paragraph (1) of Article 19 is not limited to Paragraph (2) of the same provision, and if Paragraph (2) is an illustrative list of Paragraph (1), Paragraph (1) therefore may seem to be superfluous.[618] This critic, after giving the text a close reading, has rightly suggested that the coastal state can consider a certain passage of a vessel as non-innocent on the basis of Paragraph (1) of Article 19, even if the activities involved during the passage do not fall within the scope of Paragraph (2) of

[615] Yoshifumi Tanaka, 'Navigational Rights and Freedoms', in Donald R Rothwell, Alex G Oude Elferink, Karen N Scott, and Tim Stephens (eds), *The Oxford Handbook of The Law Of The Sea* (1st edn, Oxford University Press, 2015) 542.
[616] Ibid.
[617] Ibid.
[618] Ibid.

Article 19.[619] This critical statement is literally in compliance with Article 19(2)(I) of UNCLOS. On the basis of this interpretation, the government of Japan, as an example, is in view of the passage of a foreign warship that carries nuclear weapons through its territorial waters as non-innocent, while the government of Japan generally recognizes the right of innocent passage of foreign warships.[620] Generally, it can be said that Paragraph (2) is not an illustrative list of Paragraph (1) of Article 19 of UNCLOS and the passage would be non-innocent if it fall within the scope of Article 19(1) of UNCLOS.

Theoretically, it can be said that the right of innocent passage has automatically become a part of national laws of State Parties to the UNCLOS. Article 6 of the modern Statute of Maritime Delimitation of the Kingdom of Saudi Arabia, for example, states that ships of all states enjoy the right of innocent passage through the territorial sea of the kingdom, taking into consideration the laws and regulations of the kingdom.[621] The contextual meaning of Article 6 is that foreign vessels have the right to enjoy the principle of 'innocent passage' in Saudi Arabia's territorial sea. The fundamental question to be asked is; To what extent the autonomous vessels can enjoy the right of innocent passage? Arguably, it can be said that unmanned vessels would not enjoy the right of innocent passage under the current legal regime. As evidence, Paragraph 3 of Article 9 of the Statute of Maritime Delimitation of the Kingdom of Saudi Arabia provides that " all ships … which exercise their right of innocent passage in the territorial sea of the Kingdom shall adhere to laws and regulations of the Kingdom and conform to all international regulations to

[619] Yoshifumi Tanaka, 'Navigational Rights and Freedoms', in Donald R Rothwell, Alex G Oude Elferink, Karen N Scott, and Tim Stephens (eds), *The Oxford Handbook of The Law Of The Sea* (1st edn, Oxford University Press, 2015) 542.
[620] Ibid.
[621] The Statute of Maritime Delimitation of the Kingdom of Saudi Arabia 2011, Art 6.

avoid collision with other ships".[622] This Article is in compliance with Paragraph 4 of Article 21 of the UNCLOS which provides that "… foreign ships exercising the right of innocent passage through the territorial sea shall comply with all such laws and regulations and *all generally accepted international regulations* relating to the prevention of collisions at sea …".[623] The 1972 Convention on the International Regulation for Preventing Collision at the Sea can be viewed as one of the most important regulations, in this regard.[624] As has been discussed previously, unmanned vessels would not meet rules (2) and (5) of COLREGs.

[622] The Statute of Maritime Delimitation of the Kingdom of Saudi Arabia 2011, Art 9(3).
[623] UNCLOS, Art 21(4).
[624] Yoshifumi Tanaka, 'Navigational Rights and Freedoms', in Donald R Rothwell, Alex G Oude Elferink, Karen N Scott, and Tim Stephens (eds), *The Oxford Handbook of The Law Of The Sea* (1st edn, Oxford University Press, 2015) 541.

4.4 The Exclusive Economic Zone

4.4.1 Introduction

An exclusive economic zone, as it has been said, is a comparatively recent innovative one in the law of the sea.[625] The role of this zone has been examined by many scholars, and most of the aspects of this zone concept have been explored, comprising its legal, political, economic, and social implications.[626] However, all of these aspects generate a series of ambiguities in relation to the interpretation and application of existing provisions, which destines environmental concerns and the improvement of new technologies.[627] It is worth saying that the exclusive economic zone is considered a fundamental subject in the international law of the sea, and this importance is due to the wide extension and proximity of the exclusive economic zone to the coasts.[628] The sovereign rights of exploring and exploiting, conserving and managing, the living and non-living resources to a distance of 200 nm" is granted for coastal states.[629] The main driver behind such a regime is the ambition of some states to obtain a fair share of coastal marine resources and also to address the unregulated exploitation of marine living resources.[630] Arguably, new innovations in technologies would have an impact on the exclusive economic zone regime, in particular, the provisions of maritime security. To prove this view, this section aims to analyses the legal regime that is applicable to the exclusive economic zone, and then illustrate and determine the rules that might be impacted by the operation of autonomous vessels.

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[625] Donald R Rothwell and Tim Stephens, *The International Law of the Sea* (2nd edn, Hart Publishing , 2016) 85.
[626] Gemma Andreone, The Exclusive Economic Zone, in Donald R Rothwell, Alex G Oude Elferink, Karen N Scott, and Tim Stephens (eds), *The Oxford Handbook of The Law of The Sea* (1st edn, Oxford University Press, 2015) 159.
[627] Ibid.
[628] Ibid, 160.
[629] Rothwell and Stephens (625).
[630] Ibid.

4.4.2 The Legal Status

It is understood that the exclusive economic is a maritime zone established by the UNCLOS, as a claimable maritime zone.[631] This maritime zone is subject to specific legal regime.[632] Specifically, Article 55 of the aforementioned Convention described the exclusive economic zone as " … an area beyond and adjacent to the territorial sea, subject to the specific legal regime established in this Part, under which the rights and jurisdiction of the coastal State and the rights and freedoms of other States are governed by the relevant provisions of this Convention."[633] This Article is considered a legal basis for the said zone in international law of the sea. Breadth of such zone clarified under Article 57 of the same Convention. This Article provides that " the exclusive economic zone shall not extend beyond 200 nautical miles from the baselines from which the breadth of the territorial sea is measured."[634] That is to say, coastal States have a right to claim an exclusive economic zone up to 200 nautical miles from the baseline, and such zone is constituted by a band of waters, seabed, and subsoil which effectively reach 188 nautical miles in breadth, taking into account territorial sea which is 12 nautical miles in breadth.[635] Therefore, it is clear that a coastal state cannot claim more than 200 nautical miles, however, coastal States can claim an exclusive economic zone lesser breadth than 200 nautical miles.[636] In practice, most States have claimed an exclusive economic zone up to 200 nautical miles in breadth and those countries also have introduced national legislations for the purpose of governing such maritime

[631] Donald R Rothwell and Tim Stephens, *The International Law of the Sea* (2nd edn, Hart Publishing , 2016) 88.
[632] Robin Churchill, Vaughan Lowe, and Amy Sander, *The Law of the Sea* (4th edn, Manchester University Press, 2022) 262.
[633] UNCLOS, Art 55.
[634] UNCLOS, Art 57.
[635] Rothwell and Stephens (n 631)
[636] Ibid.

zone and implementing, in this regard, Part V of UNCLOS.[637] The Kingdom of Saudi Arabia, for example, Article 12 of the Statute of Maritime Delimitation provides that " … the Kingdom has an exclusive economic zone located beyond and adjacent to the territorial sea, and extends to the maritime borders with the neighboring states or opposite it.".[638] This Article does not fix the minimum of nautical miles for an exclusive economic zone, but it states that such a maritime zone extends to the maritime borders with the neighboring states or opposite it. This is because the distance between Saudi maritime borders and its opposite States is less than 400 nautical miles.

Generally, it can be said that the right of an exclusive economic zone is very well articulated, in Article 55 of the UNCLOS. This Article fixed the maximum of nautical miles a coastal state can claim as an exclusive economic zone, but it does not fix the minimum of nautical miles for a reason. The reason behind that is the 200 nautical miles maximum would not be reached in some places, such as adjacent States and opposite coastal States, if the distance between these States is less than 400 nautical miles.[639] In this case, Article 74 of the UNCLOS has to be given effect in order to delimit the maritime boundary. Paragraph 1 of such Article provides that " the delimitation of the exclusive economic zone between States with opposite or adjacent coasts shall be effected by agreement on the basis of international law, as referred to in Article 38 of the Statute of the International Court of Justice, in order to achieve an equitable solution."[640] Therefore, it is evident that entering into an agreement is a principle set out by Article 74. The

[637] Donald R Rothwell and Tim Stephens, *The International Law of the Sea* (2nd edn, Hart Publishing , 2016) 88.
[638] The Statute of Maritime Delimitation of the Kingdom of Saudi Arabia 2011, Art 6.
[639] Rothwell and Stephens (n 637).
[640] UNCLOS, 74(1).

aim of such an agreement is to reach an equitable solution between States with opposite or adjacent coasts. Thus, according to Paragraph 4 of the same article, " … questions relating to the delimitation of the exclusive economic zone shall be determined in accordance with the provisions of that agreement."[641] The rights and obligations of States Parties to the UNCLOS, in the exclusive economic zone, will be discussed below.

4.4.3 States' Rights and Obligations

In the exclusive economic zone, the rights and obligations of coastal States have been drawn in Part V of the UNCLOS.[642] Precisely, Article 56 can be seen as a key provision in Part V. Such Article grants the coastal State " … sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living, of the waters superjacent to the seabed and of the seabed and its subsoil, and with regard to other activities for the economic exploitation and exploration of the zone, such as the production of energy from the water, currents and winds."[643] Based upon this provision, the nature and the scope of the sovereign rights, if this interpretation is correct, is only to explore, exploit, conserve, and mange living and none-living resources. However, these sovereign rights do not extend to the freedom of the navigation of foreign vessels. As evidence, Article 58(1) of UNCLOS provides that " … all States, whether coastal or land-locked, enjoy, subject to the relevant provisions of this Convention, the 'freedoms referred to in article 87 of navigation and overflight' and of the laying of submarine cables and pipelines, and 'other internationally lawful uses of the sea related to these freedoms', such as those associated with the operation of ships, aircraft and submarine

[641] UNCLOS, 74(4).
[642] Donald R Rothwell and Tim Stephens, *The International Law of the Sea* (2nd edn, Hart Publishing , 2016) 90.
[643] UNCLOS, Art 56(1)(a).

cables and pipelines, and 'compatible with the other provisions' of this Convention."[644] This Article, clearly, emphasizes the right of a ship, whether it is national or foreign, to enjoy the principle of freedom of navigation beyond the territorial sea of a coastal state. A very important question arises in this section is whether autonomous vessels can enjoy the freedom of navigation in the exclusive economic zone? Initially, it can be said that the principle of freedom of navigation is unrestricted in the high sea and coastal States do not have jurisdiction over foreign vessels. However, it can also be argued that the freedom of navigation in the exclusive economic zone is not absolute, it is subject to some legal restrictions.[645] As evidence, the above-mentioned Article state that enjoying the right of freedom of navigation has to be 'compatible with the other provisions of this Convention'. Although the scope of this legal text is not altogether clear,[646] however, it indicates that the exercise of the right of freedom of navigation has to be in compliance with the UNCLOS and domestic laws and regulations. This requirement can be viewed as a legal barrier in front of unmanned vessels.

In connection with the above, Rothwell and Stephens argue that the coastal States' regulation of exclusive economic zone fisheries could impose some restrictions on the freedom of navigation by merchant's vessels, owing to sensitive marine environments that are crucial for the health of fisheries, such as coral reefs.[647] In Part V of UNCLOS, there is no provision providing this point clearly, but this is possible.[648] A clear example of this possibility can be deduced from the language of Article 60(7) of UNCLOS. This Article states that " artificial islands, installations,

[644] UNCLOS, Art 58(1).
[645] Donald R Rothwell and Tim Stephens, *The International Law of the Sea* (2nd edn, Hart Publishing , 2016) 98.
[646] Robin Churchill, Vaughan Lowe, and Amy Sander, *The Law of the Sea* (4th edn, Manchester University Press, 2022) 276.
[647] Rothwell and Stephens (n 645).
[648] Ibid.

structures, and safety zones around them may not be established where interference may be caused to the use of recognized sea lanes essential to international navigation."[649] According to Rothwell and Stephens, such an Article seeks to limit the impact of coastal states' jurisdiction in relation to the navigational rights of the exclusive economic zone,[650] however, it has been argued that such an Article leaves room for uncertain and conflicting interpretation.[651] This uncertainty may lead the coastal states to intervene in the navigation of foreign vessels and aircraft. In 2001, for example, a United States Navy EP-3 aircraft collided with a Chinese F-8 fighter aircraft in a Chinese-exclusive economic zone.[652] As a result, the Chinese aircraft crashed into the sea and its pilot died.[653] The United States Navy EP-3 reconnaissance aircraft managed to make a distress landing at a Chinese military base on Hainan.[654] The EP-3 aircraft and its crew were detained by the Chinese government on the grounds of that the United States abused the rights of overflight in the exclusive economic zone and filed to have 'due regard' to the rights and duties of China as the coastal state, as required by Article 58(3) of UNCLOS.[655] This Article provides that "… States shall have 'due regard' to the rights and duties of the coastal State and shall comply with laws and regulations adopted by the coastal State in accordance with the provisions of this Convention and rules of international law in so far as they are not incompatible with this Part …".[656] Chines asserted a right to interfere with exclusive economic zone overflight by foreign

[649] UNCLOS, Art 60(7).
[650] Donald R Rothwell and Tim Stephens, *The International Law of the Sea* (2nd edn, Hart Publishing , 2016) 98.
[651] Gemma Andreone, The Exclusive Economic Zone, in Donland R Rothwell, Alex G Oude Elferink, Karen N Scott, and Tim Stephens (eds), *The Oxford Handbook of The Law of The Sea* (1st edn, Oxford University Press, 2015) 167.
[652] Rothwell and Stephens (n 650) 100.
[653] Ibid.
[654] Ibid.
[655] Ibid.
[656] UNCLOS, Art 58(3).

aircraft that pose a threat to natural security.[657] However, this incident raised the matter as to the effect of provision 58 which applies the navigational and overflight rights in the exclusive economic zone.[658] Similarly, coastal States may use the same argument to challenge the navigation of autonomous vessels in such a State's economic exclusive zone.

The use of autonomous vessels to commit crimes at sea is possible. These vessels may open new avenues for perpetrators to use autonomous vessels as versatile tools to commit crimes offenses at sea, such as arms, drug trafficking,[659] smuggling,[660] and terrorist acts. Said vessels are capable of carrying explosive payloads which could cause full or partial damage to ships, port infrastructure, and offshore installations.[661] In early 2017, as evidence, Houthi rebels implemented several attacks against commercial vessels, warships, and installations in the Red Sea by remote control explosive-laden boats.[662] The small size of these vessels, in the future, might be developed further to transport and disperse chemical, biological, or radiological material. This scenario is expected and therefore, it could be said that it is quite enough to cause havoc at sea. Coastal States and International Communities have come a long way to develop different laws and approaches to suppress criminality at sea and the assumption is that a human being presents on board ships to commit the *actus reus* of the respective offense.[663] However,

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[657] Donald R Rothwell and Tim Stephens, *The International Law of the Sea* (2nd edn, Hart Publishing , 2016) 100.
[658] Ibid.
[659] Aditya Pratap Singh, Study on the Implications of Autonomous Ships on Maritime Security and Law Enforcement by Reviewing Maritime Security Incidents (Master Dissertation, World Maritime University, 2021) 17.
[660] Anna Petrig, The Commission of Maritime Crimes with Unmanned Systems: An Interpretive Challenge for the United Nations Convention on the Law of the Sea, in Malcolm D. Evans, Sofia Galani (eds), *Maritime security and the Law of the Sea – Help or Hindrance?* (1st edn, Edward Elgar Publishing Ltd, 2020) 109.
[661] Ibid, 108.
[662] Anna Petrig, Autonomous Offender Ships and International Maritime Security Law, in Henrik Rinbom, Erik Rosag, and Trond Solvange, *Autonomous Ships and the Law* (1st edn, Routledge, 2021) 23.
[663] Petrig (660) 112.

when it comes to autonomous and remote-control vessels, these vessels unmanned, and therefore, some of the traditional approaches might be do not fit for the purpose which requires coastal states to develop legal requirements to maintain safety and security at sea. Take the crime of piracy as a direct example. Arguably, the new development of technologies would have an impact on the legal constructions of said crime, and more will be said on this below.

4.4.4 Piracy

Piracy is a universal crime, and it is not a new phenomenon. As evidence, the term of said crime has been used in Classical Greco-Roman writings which extend back to 400 BC, at least.[664] Therefore, it is enough to say the regime of piracy crime is rooted in international customary law and this regime, currently, is codified in the UNCLOS. According to authors Douglas Guilfoyle and Rob McLaughlin, the codification of the piracy regime positively led to settling the legal meaning of such crime relatively.[665] Contrary to popular belief, the introduction of autonomous vessels would lead to new types of crimes. Criminals would rely on cyber-piracy instead of human presence on board vessels. Thus, the term 'cyber-piracy' needs to be demonstrated to reach its proper meaning. Linguistically, the word Cyber is an English one derived from the term 'cybernetics' that has its root in the Greek words 'kubernētēs'.[666] In other words, 'cyber' means 'to guide or control the movement of something'.[667] Connected to this, the word 'pirate' is an

[664] Douglas Guilfoyle and Rob McLaughlin, 'The Crime of Piracy', in Charles C. Jalloh, Kamarie M. Clarke and Vincent O. Nmethielle (eds), *The African Court of Justice and Human and Peoples' Rights in Context* (Cambridge University Press, 2019) 386.
[665] Ibid.
[666] Emily Lewis, Unmanned and Autonomous Ships and Cyber Piracy: An Analysis of International and National Regulatory Measures (Master Thesis, University of KwaZulu-Natal, 2021) 28.
[667] Ibid.

English one that is derived from the Latin word 'pirata'.[668] This term is also rooted in the Greek word 'peiratēs' which means in the English language a person who attacks someone or something, and the word piracy indicates the attack itself.[669] Together, the phrase 'cyber piracy' can be understood as an attack that strives to lead or control the movement of someone or something.[670] Such crimes are highly expected to happen with the introduction of autonomous vessels. Consequently, the question that arises in this section is whether or not cyber piracy can fall within the scope of Article 101 of UNCLOS. Arguably, autonomous vessels would introduce new types of crimes, such as the new version of piracy crime. Such types of crime are not regulated yet. Through the internet, criminals can commit crimes across multiple borders and change the direction of a vessel from one way to another. Said crime to be committed, does not require a person to be on board vessels. Therefore, it can be said that cyber-piracy would not fulfill the criteria of the legal concept of piracy settled by Article 101 of UNCLOS. To prove this statement, much will be said in below paragraphs.

In general, piracy is a group that has been established on the criminal phenomenon.[671] The contemporary crime of piracy can be perceived in one of two forms namely, hijacking vessels and crew or the commission of property offences.[672] The primary legal framework to counter piracy is set out by Articles 100 to 110 of UNCLOS,[673] which means such a Convention played

[668] Emily Lewis, Unmanned and Autonomous Ships and Cyber Piracy: An Analysis of International and National Regulatory Measures (Master Thesis, University of KwaZulu-Natal, 2021) 28.
[669] Ibid.
[670] Ibid.
[671] Anna Petrig, 'Piracy' in Donald R Rothwell, Alex G Oude Elferink, Karen N Scott, and Tim Stephens (eds), *The Oxford Handbook of the Law of the Sea* (1st edn, Oxford University Press, 2015) 844.
[672] Ibid.
[673] Ibid.

an important role in suppressing piracy. However, it can be argued that, in some countries, there is a legislative gap between national and international laws on the concept of piracy. In this context, Tanaka argues that some domestic regulations regard some acts as piracy crimes, whereas such acts are not regarded as 'piracy' in international law.[674] Partially, the difference between these laws over the concept of piracy has left room for ambiguity.[675] Tanaka's argument is valid, and it reflects that the harmonization of domestic legislation with, legal norms of, the UNCLOS about the concept of piracy is not at a very good standard. The concept of piracy is laid down in Article 101(a) of the UNCLOS. This article provides that piracy consists of " … any of illegal acts of violence or detention, or any act of depredation, committed for private ends by the crew or passengers of a private ship or a private ship or a private aircraft …" on the high sea against ship, persons, or property.[676] This Article is descriptive. It describes any act amounting to piracy in the international law of the sea. However, the language of such a paragraph is criticized widely. O'Connell, for example, is of the view of that the above-mentioned legal text is both tautologous and imprecise – tautologous because it does not define and it offers no guidance as to what types of violence constitute piracy.[677] Through a deconstructive reading, the elements of the concept of piracy crime will be examined, as follows;

First, the act has to be 'illegal acts of violence', 'illegal detention', and or 'illegal depredation' in order to be qualified as an act of piracy.[678] However, the language of this requirement is broad,

[674] Yoshifumi Tanaka, *The International Law of the Sea* (3rd edn, Cambridge University Press, 2019) 452.
[675] Ibid.
[676] UNCLOS, Art 1(a)(i) – (ii).
[677] Michal Wallner and Artur Kokoszkiewicz, 'Maritime Piracy and Limitation of the International Law of the Sea' (2019) Vol 28(35)/2019 Historia i Polityka 25, 29.
[678] UNCLOS, Art 101(a).

and the definition of such terms is absent in the UNCLOS.[679] It is not an exaggeration to say that these terms have been subjected to thorough scrutiny to be more understandable. As evidence, Anna Petrig has criticized the language of the above terms. Such criticism indicates that there is ambiguity in relation to the exact meaning of the aforementioned requirement. Petrig argues that the meaning of the phrase 'illegal acts of violence or detention' is unclear.[680] Specifically, the term 'illegal' could indicate the absence of grounds negating criminal liability, such as the use of violence as self-defence, and or exceptional situations that may justify the private detention.[681] However, Anete Logina suggests an alternative interpretation, that the term 'illegal violence' can be generally understood as violence that is not authorized by the State.[682] In other words, military forces and other government forces are authorized by domestic regulations to use violence in some situations.[683] Therefore, this act would not fall within the scope of the requirement 'illegal act'. In addition, it has been argued that self-defense is permitted by law, however, this permission is not absolute, it is limited by State regulations.[684] Thus, self-defence is a legitimate right, and it falls out of the meaning of the term 'illegal acts of violence'. However, self-defence or private detention has to be proportionate to the character of the attack, otherwise, the defending person may be accused of committing an offense.[685] When it comes to the assessment of proportionate acts of self-defence, it is different from one State's regulations to another. Generally, it can be said that the meaning of the phrase of 'illegal acts of violence or detention' is

[679] Emily Lewis, 'Unmanned and Autonomous Ships and Cyber Piracy: An Analysis of International and National Regulatory Measures' (Master Thesis, University of Kwazuz-Natal , 2021) 31.
[680] Anna Petrig, 'Piracy' in Donald R Rothwell, Alex G Oude Elferink, Karen N Scott, and Tim Stephens (eds), *The Oxford Handbook of the Law of the Sea* (1st edn, Oxford University Press, 2015) 846.
[681] Ibid.
[682] Anete Logina, The Internatioal Law Related to Maritime Security: An analysis of its Effectiveness in Combating Piracy and Armed Robbery Against Ships' (Master Dissertation, World Maritime University, 2009) 8.
[683] Ibid.
[684] Ibid.
[685] Ibid.

controversial, and the article does not provide further perception in relation to the type of violence against persons or property on board that constitutes piracy. Nevertheless, it could be said that a reasonable approach to put an end to such legal controversy is to rely on the element of '*actus reus non facit reum nisi mens sit rea*'. The meaning of this element in the English language is 'an act does not render the perpetrator culpable unless there is a criminal intention'.[686] As a general rule, a person who acted without 'mental fault' would not be liable in criminal law. Therefore, the element of 'mental fault' may also be an appropriate approach to determine whether or not the requirement of 'illegal acts of violence', 'illegal detention', and 'illegal depredation' has been met. Another major criticism of such a requirement is that it does not clarify whether or not the term 'acts of violence or detention' necessitates a plurality of acts.[687] A comparison with the second part of subparagraph (a) of Article 101 of UNCLOS in addition to subparagraphs (b) and (c) of the same Article and Convention, where a single act is used, these provisions clearly suggested that a single act of violence or detention will be sufficient to qualify the act as a crime of piracy.[688] From a purely legal point of view, illegal acts of violence are not included in the language of Article 101 of UNCLOS. In general, it could be said that the language of Article 101 demonstrates the perception of the UNCLOS drafters in relation to there are the variety of criminal activities that are considered illegal acts of violence, which cannot be limited. The assessment of such acts of violence is subject to municipal laws. However, unmanned vessels, according to such vessels' names, do not have a crew on board. The question that may arise here is; to what extent does the cyber piracy attack against autonomous

[686] Johan Van der Vyver, 'The International Criminal Court and the Concept of Mens Rea in International Criminal Law' (2012) Vol 12 University of Miami International & Comparative Law Review 57.
[687] Anna Petrig, 'Piracy' in Donald R Rothwell, Alex G Oude Elferink, Karen N Scott, and Tim Stephens (eds), *The Oxford Handbook of the Law of the Sea* (1st edn, Oxford University Press, 2015) 846.
[688] Ibid.

and or unmanned vessels fall within the scope of the term 'illegal acts of violence' laid down in article 101 of UNCLOS? Arguably, cyber piracy attacks would not fall within the scope of the above-mentioned Article. This is because of that, according to the Cambridge Dictionary, the meaning of the word 'violence' is 'actions or words that are intended to hurt people'.[689] It is taken from the Latin word '*violentia'* which is interpreted as an exercise of 'a physical pirate attack' against a person.[690] When it comes to cyber piracy, the situation is different. Such a crime requires a laptop or computer desk in addition to an internet connection to be committed, only. Therefore, it is not considered an act of violence; however, it can be described as an unauthorized act or illegal influence initiated through cyberspace using a computer or any other electronic device.[691] These attacks would be directed at the Remote Control Centre or the unmanned vessels, not at the person. This might be enough to say electronic attacks against autonomous vessels would not fall within the first requirement of piracy.

Second, Article 101(a) of UNCLOS requires that the illegal act has to be committed for 'private ends'. This is another implied condition to qualify whether or not an illegal committed act is piracy. However, the meaning of the phrase 'private ends' is a very controversial topic,[692] due to the uncertainty.[693] According to Helene Viksas, it seems that there is no one who can conclude

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[689] 'Violence, n' (*Cambridge Dictionary Online,* CUP) < https://dictionary.cambridge.org/dictionary/english/violence > accessed 30 April 2024.

[690] Raimundas Jurka, Jolanta Zajanckauskiene, Renata Marcinauskaiti and Jolita Sukyte, 'The Concept of Violence and Its Expression in Criminal Law' (2020) Vol 9 International Journal of Criminology and Sociology 1481. < DOI:10.6000/1929-4409.2020.09.168> accessed date 30 April 2024.

[691] Emily Lewis, 'Unmanned and Autonomous Ships and Cyber Piracy: An Analysis of International and National Regulatory Measures' (Master Thesis, University of Kwazulu-Natal, 2021) 96.

[692] Helene Viksas, What is the Correct Interpretation of the Criterion 'for Private Ends' in LOSC Art. 101? (Master Thesis, The Arctic University of Norway , 2020) 20.

[693] Anna Petrig, 'Piracy' in Donald R Rothwell, Alex G Oude Elferink, Karen N Scott, and Tim Stephens (eds), *The Oxford Handbook of the Law of the Sea* (1st edn, Oxford University Press, 2015) 846.

authoritatively.[694] In addition, Viksas argues that theories are divided into two schools of thought.[695] From one point of view, the term 'private ends' excludes any act that is ideologically or politically 'motivated' from piracy, such as terrorism and environmental activism.[696] Following this view, 'terrorism and violent ecological activism at sea' are excluded from the concept of piracy because they are politically motivated.[697] This simply means, the illegal act of violence will be tested on the base of the offender's motivation.[698] From another point of view, an act of violence that is not authorized by a state is considered private. Connected to this point, such an act may constitute a piracy crime, if the other requirements are met.[699] This view is suggested by much of legal scholars and gains support from the *Lotus case*.[700] Under a textual reading, Article 31(1) of the Vienna Convention of the Law of Treaties will be applied. This Article states that " … [a] treaty shall be interpreted in good faith in accordance with *the ordinary meaning* to be given to the terms of the treaty in their context and in the light of its object and purpose."[701] Hence, when it comes to the term 'private', linguistically this term can be read to give an opposite meaning to the term 'public'. The meaning of 'private' is focused on the motives for the act and this is a legal test that is beyond whether or not the act is authorized by a state.[702] Together with the word 'ends', it indicates to the psychological attitude of a person who

[694] Helene Viksas, What is the Correct Interpretation of the Criterion 'for Private Ends' in LOSC Art. 101? (Master Thesis, The Arctic University of Norway , 2020) 8.
[695] Ibid.
[696] Ibid 9.
[697] Anna Petrig, 'Piracy' in Donald R Rothwell, Alex G Oude Elferink, Karen N Scott, and Tim Stephens (eds), *The Oxford Handbook of the Law of the Sea* (1st edn, Oxford University Press, 2015) 846.
[698] Yoshifumi Tanaka, *The International Law of the Sea* (3rd edn, Cambridge University Press, 2019) 453.
[699] Viksas (n 694) 9.
[700] Ibid.
[701] VCLT 1969, Art 31(1).
[702] Viksas (n 694) 13.

implements the act.[703] Broadly speaking, the use of the term 'private ends' can indicate the lack of State sponsorship.[704] This reading can fit best in conjunction with Article 102 of UNCLOS which provides that " the acts of piracy … committed by a warship, government ship or government aircraft whose crew has mutinied and taken control of the ship or aircraft are assimilated to acts committed by a private ship or aircraft …". [705] This article, if this interpretation is correct, covers the legal gap in Article 101(a) of UNCLOS. It indicates that the act committed by warships and or government vessels to control other vessels' are assimilated into acts of piracy. Therefore, the ordinary meaning of the phrase 'private ends' excludes any action committed by public authorization.[706] To conclude this paragraph, cyber piracy may fall within the scope of the private ends requirement and fall within the scope of the piracy's definition accordingly. However, this fulfillment is meaningless if the other elements of the definition are not met.

Third, the illegal acts of violence or detention committed for private ends by a private ship's crew or passengers has to be directed against another ship according to Article 101(a)(i) of the UNCLOS.[707] This element is called the two-ship rule. In accordance with this requirement, an internal hijacking that happens on the high sea by a ship's crew or passenger is not considered a piratical act.[708] The case of *Achille Lauro* can be taken as a good example. On October 7, 1985,

[703] Anete Logina, 'The International Law Related to Maritime Security: An analysis of its Effectiveness in Combating Piracy and Armed Robbery Against Ships' (Master Dissertation, World Maritime University, 2009) 16.
[704] Mazyar Ahmad, 'Maritime Piracy Operations: Some Legal Issues' (2020) Vol 4(3) Journal of International Maritime Safety, Environmental Affairs, and Shipping, 63.
[705] UNCLOS, Art 102.
[706] Helene Viksas, What is the Correct Interpretation of the Criterion 'for Private Ends' in LOSC Art. 101? (Master Thesis, The Arctic University of Norway , 2020) 8.
[707] UNCLOS, Art 101(a)(i).
[708] Yoshifumi Tanaka, *The International Law of the Sea* (3rd edn, Cambridge University Press, 2019) 455.

an Italian-flag cruise vessel, the *Achille Lauro*, was seized while it was sailing on its way from Alexandria to Port Said.[709] The hijackers had boarded the above-mentioned ship in Genoa posing as tourists, whereas they were members of the Palestine Liberation Front at that time.[710] Later, the hijackers held the crew and passengers as hostages, and they threatened to kill the passengers if Israel did not release 50 Palestinian from the prison.[711] In addition, they also threatened to blow up the vessel if any rescue mission was attempted.[712] By the following afternoon, when their demands had not been met, they shot Leon Klinghoffer, a United States citizen, and threw the body of the victim overboard.[713] The United States considered the act of seizure of the *Achille Lauro* as a crime of piracy, this is a position that has been corroborated by many commentators and opposed by others.[714] In this case, it is evident that there was not a second ship involved in this crime which means, from one perspective, it would not constitute piracy under Article 101 of UNCLOS.[715] It is reasonable to have in mind that a vessel in the high sea is subject to the exclusive jurisdiction of the flag State according to Article 92 of UNCLOS. Therefore, any illegal act that is committed on board the vessel, in the high sea, would be qualified in accordance with a flag State domestic regulation.[716] This is, indeed, a very serious argument that indicates that the one-ship situation was not in the mind during *travaux*

[709] Malvina Halberstam, Terrorism on the High Sea: The Achille Lauro, Piracy and IMO Convention on Maritime Safety (1988) 82(2) ASIL 269.
[710] Anete Logina, The International Law Related to Maritime Security: An analysis of its Effectiveness in Combating Piracy and Armed Robbery Against Ships' (Master Dissertation, World Maritime University, 2009) 26.
[711] Ibid.
[712] Ibid.
[713] Halberstam (n 709).
[714] Ibid.
[715] Mazyar Ahmad, 'Maritime Piracy Operations: Some Legal Issues' (2020) Vol 4(3) Journal of International Maritime Safety, Environmental Affairs, and Shipping, 63.
[716] Michal Wallner and Artur Kokoszkiewicz, 'Maritime Piracy and Limitation of the International Law of the Sea' (2019) Vol 28(35)/2019 Historia i Polityka 25, 32.

préparatoires.[717] The statement that backs up said argument is that the inherent flaw in the definition of piracy led the IMO to adopt the Convention for the Suppression of the Unlawful Acts against the Safety of Maritime Navigation (SUA).[718] A counter-argument, however, is that the two-ship rule is not necessary to qualify the act as a crime of piracy. Commentators went further to support the said argument by using Article 101(a)(ii) of UNCLOS as evidence. This Article defined a crime of piracy as any illegal act of violence or detention, or any act of depredation "against a ship, aircraft, persons or property in a place outside the jurisdiction of any State".[719] A literal meaning of this subparagraph is clear, it is regarded as an act of violence against a ship itself or its crew or passenger as an act of piracy. It does not require another ship and there is no reference to 'another ship' in this subparagraph. However, it can be said that subparagraph 101(a)(ii) is complementary to the notion of subparagraph 101(a)(i). In other words, subparagraph 101(a)(ii) of UNCLOS was introduced to draw the geographical scope of the application of the regime of piracy. Saying otherwise would lead one to argue that subparagraph 101(a)(i) is meaningless because it is replicated by subparagraph 101(a)(ii). To conclude this paragraph, the cyber-attack may be implemented against 'another vessel' or 'crew' outside the jurisdiction of any State. However, such an attack against other vessels outside the jurisdiction of any coastal State would not fit within the scope of the illegal acts of violence laid down in Article 101(a) of UNCLOS.

[717] Michal Wallner and Artur Kokoszkiewicz, 'Maritime Piracy and Limitation of the International Law of the Sea' (2019) Vol 28(35)/2019 Historia i Polityka 25, 32.
[718] Mazyar Ahmad, 'Maritime Piracy Operations: Some Legal Issues' (2020) Vol 4(3) Journal of International Maritime Safety, Environmental Affairs, and Shipping, 63.
[719] UNCLOS, Art (a)(ii).

Fourth, the illegal act, in order to be considered a crime of piracy, has to be committed on the high seas or outside the jurisdiction of any state.[720] This requirement is regarded as a geographical limitation concerning illegal acts of piracy. This geographical limitation is inherent in the legal definition of piracy. Conversely, any illegal acts committed in the internal and territorial waters will be excluded from the definition of piracy. It can be said that the illegal acts committed in said waters will be regarded as 'armed robbery', according to the IMO Code of Practice for the Investigation of the Crimes of Piracy and Armed Robbery against ships.[721] In addition, it can be said that illegal act of violence committed in the exclusive economic zone seems to be regarded as piracy.[722] As evidence, Article 85(2) of UNCLOS sets that " … articles 88 to 115 and other pertinent rules of international law apply to the exclusive economic zone in so far as they are not incompatible with this Part …".[723] Clearly, this paragraph indicates that the regime of piracy will be expanded to cover the exclusive economic zone. According to author Emily Lewis, illegal act of cyber piracy may meet the high sea element if it is committed outside the coastal state jurisdiction.[724] However, it has been said that the onboard Information and Communication Technology system of the ship at sea might be targeted from the land or coastal State territorial waters, and this action is highly expected. If this happened, this illegal act would not meet the element of piracy definition because the attack does not take place on the high seas.[725] This action would be regarded as a cybercrime, not a piracy. Additionally, the issue would be more complicated if a state did not cooperate in applying efficient and effective

[720] UNCLOS, Art 101(a)(i).
[721] Yoshifumi Tanaka, *The International Law of the Sea* (3rd edn, Cambridge University Press, 2019) 455.
[722] Ibid.
[723] UNCLOS, Art 58(2).
[724] Emily Lewis, 'Unmanned and Autonomous Ships and Cyber Piracy: An Analysis of International and National Regulatory Measures' (Master Dissertation, University of Kwazulu-Naal, 2021) 33.
[725] Ibid.

measures to prevent cyber-attacks. To conclude, four elements of the definition of piracy have to be met, in order to consider the illegal acts as a crime of piracy, otherwise, the attack would not fit within the scope of a piracy crime. Based on the above discussion, the element of illegal acts of violence and high sea would not be met through cyber-attacks. This assessment might be enough to determine that there is a regulatory gap with regard to a cyber-attack that might be directed against autonomous vessels in the exclusive economic zone.

4.5 Enforcement Jurisdiction

As has been discussed above, coastal States have legislative jurisdiction over internal, territorial, and exclusive economic zone waters as well. Logically, it can be said that where States enact domestic laws and ratify international laws, these laws are meant to be enforced by such States. It is the responsibility of coastal States to maintain law enforcement and maritime security in its territorial seas.[726] Therefore, the concept of enforcement jurisdiction is the jurisdiction of coastal States in enforcing laws through judicial or non-judicial actions. Engaging in enforcement activities is based on coastal States' exercise of sovereignty, sovereign rights, or jurisdiction over its maritime zones. Article 219 of UNCLOS, for example, granted port States the right of enforcement over foreign vessels. This Article provides that " a state can take administrative measures to prevent the vessels from sailing …".[727] This provision clearly ascertained the right of coastal States in reaction to the violation of the seaworthiness of vessels within the port. In addition, Article 220(2) of UNCLOS provides that a state " … may undertake physical inspection of the vessel …" if " … there are clear grounds for believing that a vessel navigating

[726] Aditya Pratap Singh, 'Study on the Implications of Autonomous Ships on Maritime Security and Law Enforcement by Reviewing Maritime Security Incidents' (Master Dissertation, World Maritime University, 2021) 6.
[727] UNCLOS, Art 219.

in the territorial sea of a state violated laws and regulations of the state adopted in accordance with this Convention or applicable international rules and standards for the prevention, reduction and control of pollution from vessels …".[728] Furthermore, a coastal State may also require a vessel to give information concerning to its identity and port of registry in addition to other relevant information to establish whether a violation has occurred.[729] What is more, Article 110 recognizes the coastal state's rights to visit a vessel, in five situations, where there is reasonable ground for suspecting that (1) the ship is engaged in piracy;[730] (2) slave trade;[731] (3) unauthorized broadcasting and the flag State of the warship has jurisdiction under Article 109;[732] (4) the ship is without nationality;[733] and (5) though flying a foreign flag or refusing to show its flag, the ship is, in reality, of the same nationality as the warship.[734] These provisions gave coastal states enforcement rights over foreign vessels within ports and internal waters. Similarly, coastal states have a right to institute proceedings including the detention of the vessel if there are clear grounds for believing that a vessel navigating in the territorial waters of such State violated laws and regulations of the State adopted in compliance with Articles 19 and 21 of UNCLOS or applicable international rules and standards for the prevention, reduction and control of pollution.[735] This is stipulated, also, under Article 25(1) of UNCLOS which states that the coastal states have enforcement right to " … take necessary steps in its territorial sea to prevent passage which is not innocent".[736] Such enforcement right extends to an exclusive economic zone

[728] UNCLOS, Art 220(2).
[729] UNCLOS, Art 220(3).
[730] UNCLOS, Art 110(1).
[731] UNCLOS, Art 110(2).
[732] UNCLOS, Art 110(3).
[733] UNCLOS, Art 110(4).
[734] UNCLOS, Art 110(5).
[735] UNCLOS, Art 220(2).
[736] UNCLOS, Art 25(1).

according to Articles 220(3), 220(5), and 220(6) of UNCLOS. The question arises; how would coastal states exercise its enforcement rights over autonomous vessels? This question is still open. Arguably, it is clear that the introduction of unmanned vessels would challenge the enforcement of coastal States' laws. This means, there is a need to develop an approach to deal with such vessels when they violated coastal States' regulations.

4.6 In Conclusion

This chapter aims to explore whether or not autonomous vessels would have enjoyed navigational rights through the internal, territorial, and exclusive economic zones. This chapter has examined the regime of such zones that govern the navigation of foreign vessels. It has been found that the internal waters are governed by the principle of sovereignty. On this basis, it can be said that entering internal waters from the high seas is based on the discretion of a coastal State. However, it can be said that Article 211 of UNCLOS reaffirms coastal States' rights to establish requirements for the entry of foreign vessels into such State internal waters. Such an Article provides that coastal States' regulations shall have the same effect as that of generally accepted rules and standards established through the competent international organization or diplomatic conference. In addition, Article 208 of the 2023 Exclusive Regulation for Port Operation requires that foreign vessels have to be in compliance with the ISPS Code before requesting permission to enter the internal waters of the Kingdom of Saudi Arabia. However, this chapter and the one before found that autonomous vessels would not meet the generally accepted rules and standards, such as the ISPS Code and COLREG. Therefore, it is evident that autonomous vessels would face legal barriers that need to be amended, for accommodating said vessels. When it comes to the right of innocent passage of foreign vessels through internal waters

is not available, it is available through the territorial sea. However, this right is not absolute, it is subject to the UNCLOS and coastal States regulations. Article 19 of the UNCLOS stipulated that some of the activities that would render the passage of vessels to be non-innocent, if such passage is prejudicial to the peace, good order, or security of coastal States. In addition, Article 9(3) of the Statute of Maritime Delimitation of the Kingdom of Saudi Arabia provides that all ships exercising the right of innocent passage in the territorial sea of the Kingdom of Saudi Arabia shall adhere to the laws and regulations of the kingdom and conform to all international regulations to avoid collision with other ships. However, throughout the previous discussion, it is clear that the autonomous vessels would not meet Rules 2 and 5 of COLERGs. Therefore, these rules would be legal barriers in front of autonomous vessels. There is a need to develop a new law to govern the safety of navigation of autonomous vessels.

In addition, coastal States have legislative jurisdiction over an exclusive economic zone. Article 58(3) of UNCLOS, for example, provides that foreign vessels shall have 'due regard' to coastal States and also shall comply with laws and regulations adopted by coastal States in compliance with international law. This provision covers the navigation of vessels. Arguably, coastal States may challenge the navigation of foreign autonomous vessels because it is expected that said vessels would be used to commit crimes at sea. In 2017, for example, explosive-laden boats were implemented by Houthi rebels in the Red Sea. Such a small boat might be developed in the future to transport and disperse chemical, biological, or radiological material. Yet, there is no legal framework governing such types of vessels in the exclusive economic zone. There is a need to develop an approach to deal with the risks of foreign autonomous vessels. More importantly, it is not clear how would coastal States enforce its laws against autonomous vessels through

judicial or non-judicial actions. This also means there is a need to develop an approach dealing with autonomous vessels in relation to the enforcement jurisdiction of coastal States. This development may also touch flag States' jurisdiction in order to give coastal States room to control foreign autonomous vessels.

CHAPTER FIVE

The Regime of Vicarious Liability and Data Protection

5.1 Introduction

The notion of autonomous systems is not new. However, it has been developed further in recent times, as a result of new technological development. This development has been described repeatedly as a disruptive technology. Connected to this, this innovation may change the face of the current practices and regulations. For this reason, this thesis attempts to define the regulatory gaps in the current legal framework. Previous chapters have shown that the notion of autonomous intelligent system vessels is expected to challenge the current regulations. Specifically, certificates of classification society, safety, vessel master, and crew are part of the registration and navigation requirements. However, the said vessels would not meet generally accepted international standards to be certified. In addition, previous chapters of this thesis found that said vessels are expected to challenge the regime of a right of innocent passage. According to Article 94 of UNCLOS, a flag state is obligated to make sure a vessel is in charge of a master. However, fully autonomous systems and remote-control systems will be used to replace the onboard master and crew. This can show how this Article will be challenged. Therefore, this result could lead one to logically propose that there is a need to address these legal challenges either by amending determined Artiles or by introducing new regulations to govern the new technological developments.

Yet, the story is not complete. Replacing human beings with autonomous systems is also expected to challenge the liability rules. Specifically, the introduction of autonomous systems

vessels is expected to create gaps in the current duties of care and legal liability. For example, the liability of collision is a fault-based liability. A master will be liable for a collision or damage to others caused by such master. On this basis, a shipowner will be vicariously liable for a master's fault. For the application of vicarious liability, a claimant should prove the fault of the defendant and a tortious act accordingly. Connected to this, a claimant must prove that a tort is a direct consequence of the fault of the defendant. These are very essential requirements to seek compensation and they must be satisfied before starting the claim proceedings in front of the court.[737] This is also how the court reviews the liability case in many national legislations. In general, it can be said that this regime of vicarious liability is directed to an employer and or a company for negligence that might be committed by an employee.

However, with the development of technology, it is expected that the regime of vicarious liability will be challenged by the introduction of said systems. It is not an exaggeration to say that disputes between case parties would be more complicated. The legal issue is that a transformation to autonomous systems instead of master and crew onboard the vessel disrupts the grounds of current legal liability, specifically, non-contractual liability. The vicarious liability regime aims to cover risks caused by an employee and an autonomous system is not considered an employee according to the current regulations. In addition, it is expected that algorithmic tort will be incapable of being traced, and this is because algorithmic processes are unintelligible, self-modifying, and also unpredictable.[738] Therefore, a failure of liability mechanisms to achieve

[737] Civil Law, Art 120.
[738] Pinches Huberman, 'A Theory of Vicarious Liability for Autonomous-Machine-Caused Harm' (2021) 58(2) Osgood Hall Law Journal, 233.

justice would lead faultless victims to disproportionately bear the accident costs of autonomous systems, and this is definitely an unfair and objectionable outcome.[739]

In addition, autonomous intelligent systems vessels rely on cameras and sensors for navigation. The data on where autonomous intelligent systems often go, day or night, will be collected through cameras and processed. For instance, arrays of multiple Cameras will be used for 360-degree lookout around the vessels to fulfill the visual lookout obligation.[740] While the crew of conventional vessels uses binoculars for long-range lookout, in autonomous intelligent systems vessels, these tasks can be implemented using Pan-Tilt-Zoom (PTZ) cameras.[741] The systems of said cameras might operate "… either in visual light or in infrared or near-infrared frequency ranges …" to effectively enable "… imaging in low light or in the presence of atmospheric conditions reducing visibility …".[742] However, this operational approach may raise a very serious privacy issue. For example, the cameras of said systems may capture passengers and persons in ports or in the areas near the vessels without getting the consent of the data subject. Further, it has been said that the extent of these cameras could reach some of the vessels with sleeping capacity, hotels, and corridors of residential buildings and the private yards of the residents.[743] However, maritime law did not regulate this issue, and this might be a regulatory gap in the current legal framework. Nevertheless, it can be said that personal data is regulated by

[739] Pinches Huberman, 'A Theory of Vicarious Liability for Autonomous-Machine-Caused Harm' (2021) 58(2) Osgood Hall Law Journal, 233.
[740] Henrik Ringbom, Mika Viljanen, Jussi Poikonen, and Saara Ilvessalo, *Charting Regulatory Frameworks for Maritime Autonomous Surface Ship Testing, Pilots, and Commercial Deployments* (Ministry of the Transport and Communications - Helsinki, 2020) 27.
[741] Ibid.
[742] Ibid.
[743] Ibid 198.

the Personal Data Protection Law, and breaching this law will incur the owner of the vessel fine that may reach (five million) Riyals according to Article 36 of said law. Therefore, several principles of said will be applied before collecting data, such as the principle of data subject 'consent' and the principle of 'legitimate interest'. Therefore, it can be argued that it is not clear how said systems will comply with the Personal Data Protection Law of Saudi Arabia. In other words, this law is expected to challenge the operation of autonomous system vessels. For this reason, the relation between this law and said vessels will be explored.

The purpose of this chapter is to examine the challenge that autonomous systems create for the application of the current vicarious liability legal framework in addition to the right of a person to privacy under the laws of Saudi Arabia. For this reason, this chapter will be divided into two subchapters. The first subchapter will examine the vicarious liability of ship owners. This subchapter will be divided into four sections. Section One will examine the legal basis of vicarious liability. As will be shown, the regime of vicarious liability is established by Article 92 of the Commercial Maritime Law and Article 129 of the Civil Law in the laws of Saudi Arabia. These Articles provide a solid legal basis for said liability. An argument that can be made under these Articles is that vicarious liability, in its essence, is based on an employment relationship and a tortious act. However, the jurisprudential basis of such liability is unclear, at least, for the author of this thesis. Section Two of this chapter went further to explore the jurisprudence of vicarious liability. This study is beyond written legal texts to understand the meaning of vicarious liability in a proper sense. This Section found that the theory of vicarious liability is a worldwide and common concept. In legal literature, four doctrines have been put forward in order to reason the notion of vicarious liability. These are the doctrines of presumed fault, agency or principal,

risk-bearing, and guarantee. Therefore, it can be said that the jurisprudence basis of vicarious liability, if this expression is correct, is a mixture of several doctrines. This Section also will attempt to provide reasonable explanations for these doctrines. Section three of this chapter will attempt to contribute to filling the knowledge gap in whether or not the risks of autonomous systems can fit under the scope of the regime of vicarious liability. It also will examine whether or not the autonomous system will be considered a person under the current legal framework.

The second subchapter will deal with the gap in maritime law in relation to data protection. It went further to explore whether or not this gap is addressed by another law. This subchapter is divided into three sections. It will deal with the scope of the Personal Data Protection Law. Then, it will move to the data subject's consent and the requirements of this principle. After that, it will examine the principle of legitimate interest. This subchapter found that the operation of autonomous systems in public areas might be challenged by several of said law principles. Therefore, there is a need to deal with this legal issue. Much will be said below.

5.2 The Legal Basis of Vicarious Liability

The legal basis is the justifiable ground to bring legal action. This means that a cause of action without a legal basis will be rejected based on the fact that it has no legal basis. Therefore, the legal basis is a very important part of making sure whether or not an action is brought in a lawful way. In maritime law, the legal basis of vicarious liability is laid down in Article 92. This Article, if a translation is accurate, provides that “ a shipowner or a charter party will be civilly liable for a harmful act of a master, crew, pilot, or others who are in service of a vessel. Provided that, said employees have committed a harmful act within the period of duty, and this harmful act caused a

tort to others ...".[744] However, it can be said that the phrase 'others who are in service of a vessel' is broad. It is not clear who will fall within or fall out of the scope of this phrase. Therefore, the meaning of said phrase may be subject to interpretive issues, especially with the development of technology. An author's viewpoint is that the understanding of the above-mentioned Article would not be completed without reading Article 129(2) of Civil Law. Article 92 should be read in conjunction with Article 129(2). This is because of that the origin of vicarious liability can be traced back to Civil Law, which contains basic principles that regulate civil liability. Thus, Article 129(2) provides that "a superior (an employer) will be vicariously liable for the fault of a subordinate (an employee), if this fault occurred within the duty of work and caused the harmful act to others. Provided that an employer has actual authority to control and supervise such employee. An employer will also be civilly liable for a tort to others caused by the activity itself."[745] It can be said that this Article put some teeth into Article 92 and the regime of vicarious liability stands on two general elements namely, the relationship of subordination and the harmful act.

Similarly, vicarious liability has long been recognized in English Law. In such a legal system, the principle of vicarious liability is considered a secondary liability, not a primary (or personal) liability. The term vicarious liability refers to the situation where a person is liable for torts of another.[746] The point is that, in many cases, said liability will be the legal basis on which the defendant was sued.[747] According to Baris Soyer and Andrew Tettenborn, the liability regime for

[744] Commercial Maritime Law, Art 92.
[745] Civil Law, Art 129(2).
[746] Andrew Evans, *Liability, Risk and the Law* (1st edn, Witherby Publishers, 2000) 63.
[747] Jenny Steel, *Tort Law: Text, Cases, and Materials* (4th edn, Oxford University Press, 2017) 576.

negligent navigation is established on the ordinary law of tort.[748] This liability relies on two Latin maxims, namely '*respondeat superior'* (the superior shall be answerable) and '*qui facit per alium facit per se'* "(who brings something about through another does it himself)".[749] By way of explanation, the latter doctrine invokes the theory of identification as the fault of the servant is attributed to the master, whereas the former doctrine does no more than present the doctrine.[750] Other views emerge, such as Lord Brougham, provides that the reason that a superior is responsible is this, by employing a servant, a superior sets the complete thing in motion; and what does, being done for a superior benefit and under the superior direction, such a superior will be liable for the impacts of doing it.[751] Therefore, it can be said that vicarious liability works most often in the employment context provided the core feature of the employment relationship is present.[752]

5.3 The Requirements for Vicarious Liability Application

This section will critically demonstrate and discuss the requirements for vicarious liability laid down in Article 92 of Commercial Maritime Law and Article 129(2) of Civil Law. These requirements are the subordination and the tortious act. This section will be divided as follows.

[748] Baris Soyer and Andrew Tettenborn, *Artificial Intelligence and Autonomous Shipping: Developing the International Legal Framework* (1st edn, Hart Publishing, 2021) 64 : Luci Carey, Contractual and Tortious Maritime Liability Regimes and the Interodcuion of Autonomus Vessels ()18. https://law.nus.edu.sg/wp-content/uploads/2023/03/CML-WPS-2303.pdf
[749] Paula Giliker, *Vicarious Liability in Tort: A Comparative Perspective* (1st edn, Cambridge University Press, 2010) 228.
[750] Ibid.
[751] Ibid.
[752] Jenny Steel, *Tort Law: Text, Cases, and Materials* (4th edn, Oxford University Press, 2017) 575.

5.3.1 The Subordination

Subordination is one of the main requirements for the application of vicarious liability. This requirement is common in many legal systems to identify dependent employment and the boundaries of this relationship. It is a key element used by a court to examine a claim when it is filed on the grounds of the regime of vicarious liability. However, it is not easy sometimes to define who can fit under the scope of this requirement. Article 92 of Commercial Maritime Law, for example, provides that the subordination can be fulfilled by a contract between the shipowner and a master, crew, pilot, and also with others who are in the service of a vessel. Nevertheless, the language of this legal text is not clear particularly when it comes to the word ‘others’. A relationship between an employer and an employee can exist in many forms. For example, such a relationship can be long-term or short-term, with a promise to pay money or without money. Therefore, it is not clear that ‘who is can’ and ‘who is cannot’ fit under the scope of said term. This point, from different perspectives, could be problematic. However, it can be argued that Article 129 of Civil Law can serve to remove some of the ambiguities in Article 92 or, at least, it can reduce the degree of uncertainty.

As a general rule, Article 129 of Civil Law codified the regime of vicarious liability recently. It also provides some legal requirements that must be fulfilled for a proper application of vicarious liability. A close reading of Article 129(2) shows that it contains two norms to determine the relationships between said parties. The first norm is that there must be ‘actual authority’ in the relationship between an employer and an employee. This means that the norm of subordination

grants an employer actual authority to control and direct an employee.[753] The origin of the norm of actual authority will be based on an employment contract between parties, this is because of that the relationship of subordination between an employee and employer is an essential element in the employment contract.[754] This contract can be used to identify and prove the relationship between said parties. This relationship can be based upon a paid or unpaid contract, and it might be a long-term contract or a short-term one.[755] On this basis, it can be said that employees are expected to be subject to accountability if they break the rules in the workplace or fail to meet the expected standards.[756]

Notably, the absence of a written employment contract does not negate the relationship between said parties. The link of the relationship of subordination between said parties will exist even if there is not an employment contract.[757] This is because of that actual authority is also an obligation of law. Therefore, it can be said that the absence of a written employment contract between parties would not be a valid legal basis to negate the vicarious liability if an employee caused a tort to others.[758] Another point that needs to be addressed here is that, often, the link of subordination is based on the employer's freedom to choose an employee.[759] However, this relationship would exist even if the employer was not free to choose the employee, according to Article 129(2) of Civil Law.[760] This condition, it may be said, refers to the economic norm, even

[753] Khaled Al-Sayed Muhammad Abdel Majeed Musa, *Sources of commitment in Islamic jurisprudence and Saudi regulations: Theories of General Obligations* (2nd edn, Dar Al Ketab, 2022) 282.
[754] Ibid.
[755] Omar bin Al-Zubair, 'Towards Objective Civil Liability' (Ph.D Thesis, The University of Algiers 1, 2017) 293.
[756] Ibid.
[757] Musa (n 753).
[758] Ibid.
[759] Al-Zubair (n 755).
[760] The 2023 Civil Law, Art 129(2).

if it is not clearly described under the above-mentioned Article. The 'economic norm' is a logical extension of the norm of 'actual authority'. The norm of economics, in the subordination, is understood as that an employee works for the benefit of the employer.[761] Therefore, it can be said that both of the norms actual authority and economic play important roles in identifying the subordination between an employer and an employee.

Therefore, it can be said that the element of relationship of subordination is required for the application of vicarious liability. This is a clear indication in Articles 92 and 129(2) of the above-mentioned laws. Article 92 of Commercial Maritime Law clearly determined the parties of the relationship of subordination as a shipowner and a master, crew, pilot, or 'others' in the service of the vessel. However, the concept of the term 'others' is broad and therefore, this uncertainty may cause interpretive issues. Article 129(2) provides a norm of 'actual authority' to define the subordination and this norm is a very effective one. The notion of this norm is to demonstrate an employer's power to direct and supervise employees, as these are the elements of actual authority. Thus, it is presumed that a fault of an employee that causes tort to others indicates the fault of the employer to direct and supervise employees. Another requirement of the application of vicarious liability is a tortious act.

As mentioned previously, the relationship between the defendant and the tortfeasor is similarly capable of giving rise to vicarious liability, in English Law. Take the case of the *Catholic Child*

[761] Omar bin Al-Zubair, 'Towards Objective Civil Liability' (Ph.D Thesis, The University of Algiers 1, 2017) 290.

Welfare Society v Institute of the Brothers of the Christian Schools as an example.[762] In this case, Lord Phillips indicated that the first stage is to ask whether or not the relationship between the defendant and the tortfeasor is "one that is capable of giving rise to vicarious liability".[763] The most common instance, and the paradigm case, is an employment relationship.[764] This means that said liability requires the tortfeasor to be an employee of the defendant and the vicarious liability will never arise where the tortfeasor is an independent contractor, this is a fundamental principle of this area of the law.[765] Therefore, the employment relationship is required in the above-mentioned legal jurisdictions to raise vicarious liability.

5.3.2 The Tortious Act

A harmful act is another legal requirement for the application of vicarious liability. This requirement is laid down under the above-mentioned Articles, specifically Articles 92 and 129. In Jurisprudence, jurists have said that a harmful act could happen directly or indirectly to others.[766] To be precise, the requirement of directness in torts to the person means that a defendant by himself caused a harmful act, and this act caused tort to others.[767] This tort can occur by trespass or deviation.[768] The defendant therefore will bear a burden of liability of a tort, even if a defendant was not intended to hurt or cause damage to others.[769] In addition, a tort

[762] The *Catholic Child Welfare Society v Institute of the Brothers of the Christian Schools* (2012) UKSC 56; James Goudkamp and Donal Nolan, Winfield & Jolowicz on Tort (20th edn, Thomson Reuters, 2020) 600.
[763] James Goudkamp and Donal Nolan, *Winfield & Jolowicz on Tort* (20th edn, Thomson Reuters, 2020) 600.
[764] Ibid.
[765] Ibid.
[766] Ahmed Al-Saeed Al-Zaqrad, *Explaining Saudi Civil Law: Sources of Obligation* (2nd edn, Al-Roshed, 2015) 340.
[767] Ibid.
[768] Ibid.
[769] Ibid.

could happen indirectly to others as a consequence of a person's action.[770] Therefore, a person suffering loss or harm because of a tortious act of a tortfeasor will not be left without compensation, according to the jurisprudential rule in a customary law stating 'harm should be made good'. In this regard, this section will examine the concept of a tort, tort of employee, and tort of employment.

5.1.1.2.1 The Concept of Tort

A tort is a civil wrong and it is undeniably an essential element of contractual and non-contractual liability. It is a consequence of fault that unfairly caused loss or suffering to another person, and it is common in all legal systems and traditions. In common parlance, a physical or material tort can be defined as a wrongful act that causes legally cognizable damage or injury to another person or property,[771] rather than just breaking laws or contract conditions. It is referred to as trespassing on a claimant's right that is protected by laws. In other words, it can be said that tort is the origin of liability.[772] This is because of that a liability cannot be established without tort.[773] This feature is considered a distinction between civil liability and criminal liability.[774] Civil liability stands on tort, whereas as a criminal one stands on criminal conduct only even if this conduct did not cause a tort to others.[775] A claimant who brings a compensation suit against a defendant must prove a tort to win a court case, whether this tort is direct or

[770] Ahmed Al-Saeed Al-Zaqrad, *Explaining Saudi Civil Law: Sources of Obligation* (2nd edn, Al-Roshed, 2015) 341.
[771] Ali Alkafif, *Guarantee in Islamic Jurisprudence* (1st edn, Dar AlFiker AlArabi, 2015) 38.
[772] Al-Zaqrad (n 770) 243.
[773] Ibid.
[774] Ibid.
[775] Ibid.

indirect. In addition, other certain statutory tests must be satisfied in compliance with Articles 92 and 129. These points will be discussed separately into two sections, as follows.

5.3.2.2 Torts of Employees

A harmful act conducted by employees is considered one of the requirements for the application of vicarious liability. To be precise, this tort is presumed to be a direct consequence of an employee's fault. Conversely, it cannot be legally acceptable to attribute a cause of tort to an employee without a fault. Therefore, it can be said that the element of fault lies at the heart of the requirement of a tort caused by an employee. This notion leads to examining the general element of a fault under the scope of the liability. According to Article 120 of Civil law, a person is liable for a fault caused tort to others.[776] This is a general legal rule. However, the definition of the term fault is absent in law texts, and the Article mentioned above can be taken as an example. This raises the question of what the meaning of the term fault under the scope of the regime of liability is. In the legal literature, the concept of fault is a conduct that causes a breach of trust or laws.[777] It is a deviation from the reasonable behavior of a person, with a realization of this conduct.[778] This is a jurisprudential definition of a fault, and it might be broad enough to cover all the aspects of a torts scenario. Therefore, it will be used as a basic understanding of said term for the purpose of examining the requirement of torts caused by employees. On this basis, it can be said that the concept of the term fault stands on two main elements. These elements are a

[776] The 2023 Civil Law, Art 120.
[777] Izz al-Din al-Danasouri and Abdul Hamid Al-Shawarbi, *Civil Liability in Light of Jurisprudence and Judiciary* (1st edn, *Monshaat Al-Maarif* – Alexandria, 2004) 70; Shawakh Muhammad Al-Ahmad, *General Theory of Obligation: Sources of Obligation* (1st edn, King Fahad Library, 2019) 341.
[778] Al-Ahmad (n 777) 342.

deviation from the reasonable conduct of a person and realization. In the paragraphs below, much will be said in this regard.

5.3.2.2.1 The Norm Of Deviation

The deviation from the conduct of the reasonable person's behavior is a material element of a fault that triggers a liability.[779] This is a general standard to determine the fault of a person, in the form of negligence. The question that emerges here is how the conduct of a reasonable person will be evaluated. The answer to this question is debatable. There are two competing prominent schools of thought proposing two views for evaluation of the conduct of a reasonable person. From one point of view, there is a need to differentiate between intentional and unintended acts.[780] This means that there will be two different standards accordingly. For example, if a person has caused a tort to the claimant intentionally, such as an act of stealing or trespassing, the norm of subjective state of mind (*mens rea*) should be applied to qualify whether or not that conduct is a deviation in behavior.[781] This is a mental state of mind that is legally required to convict a specific defendant of a certain crime. Therefore, the advocates of this view suggest that a court should examine the fault of the wrongdoer based on the conduct and perspective of the wrongdoer himself, as long as this wrongdoer made a fault intentionally.[782]

[779] Izz al-Din al-Danasouri and Abdul Hamid Al-Shawarbi, *Civil Liability in Light of Jurisprudence and Judiciary* (1st edn, *Monshaat Al-Maarif* – Alexandria, 2004) 70
[780] Ibid.
[781] Ibid.
[782] Ibid.

Connected to this, there is a different degree of vigilance between employees during the time of work.[783] It is expected from an employee with a high degree of vigilance to maintain sustained concentration over periods of work,[784] and therefore the percentage of faults of these employees will be very low if it is not zero percent. A fault of such employees, if it occurs, is considered a deviation from the conduct of an employee himself, and it is also trespassing on the other's rights. This notion will also lead to that the fault of an employee with a high degree of vigilance cannot be compared to an employee with a low degree of vigilance.[785] A fault of an employee with a low degree of vigilance should be assessed on the basis of a deviation from the conduct of the reasonable person, and the behavior of the reasonable person is usually assessed on the basis of custom.[786] A court, in addition, should consider the moral reason for the tortious act when assessing this act.[787] In the case of unintended acts, this school of thought favors the usage of the objective standard of a man of ordinary prudence to assess whether or not the unintended act of a defendant was negligent.[788] Therefore, it can be said that this school of thought applies the standard of subjective over the intended acts and the objective standard over unintended acts, depending on circumstances present at the time of the delict or tort. However, it can be said the above-mentioned classification complicates the understanding of the tortious acts and makes the application of proposed standards difficult. According to Izz al-Din Al-Shawarbi and others, the norm of subjective is not an appropriate one to assess whether or not an employee's act is a

[783] Izz al-Din al-Danasouri and Abdul Hamid Al-Shawarbi, *Civil Liability in Light of Jurisprudence and Judiciary* (1st edn, *Monshaat Al-Maarif* – Alexandria, 2004) 70
[784] Ibid.
[785] Ibid.
[786] Ibid, 70 - 71.
[787] Ibid.
[788] Ibid.

fault.[789] The subjective standard of fault is the appropriate one for criminal liability, and it is not appropriate for civil liability.[790]

However, another school of thought rightly favors the usage of objective fault standards to assess whether or not an employee's act falls within the scope of the concept of fault.[791] This norm, as already discussed, compares a particular act of a defendant with the act of a reasonable person.[792] On this basis, it can be said that a court can test the act of a person and judge whether this act is a fault or not. If an act of a defendant is assessed as a fault, this defendant will bear the burden of civil liability accordingly. To conclude this paragraph, it can be said that the norm of deviation from the conduct of a reasonable person is considered a material element of the concept of fault. As might have been expected, the standard of the reasonable person is an appropriate norm to assess whether or not the act of an employee falls within the scope of fault. This norm is used in many different jurisdictions to determine whether or not the act is of fault in the form on negligence.

5.3.2.2.2 The Norm Of Realization

As discussed above, the norm of a deviation from the conduct of a reasonable person is a material element of the concept of a fault. A defendant's realization of such deviation is another element of the concept of fault. Therefore, it can be said that the legal meaning of a fault would

[789] Izz al-Din al-Danasouri and Abdul Hamid Al-Shawarbi, *Civil Liability in Light of Jurisprudence and Judiciary* (1st edn, *Monshaat Al-Maarif* – Alexandria, 2004) 70 - 71.
[790] Khaled Al-Sayed Muhammad Abdel Majeed Musa, *Sources of commitment in Islamic jurisprudence and Saudi regulations: Theories of General Obligations* (2nd edn, Dar Al Ketab,2022) 243.
[791] Al-Danasouri and Al-Shawarbi (n 789) 70.
[792] Ibid.

not be completed without the element of the mental state of the person or a mental property.[793] This element demonstrates the state of mind of a person in order to establish whether or not a defendant is at fault. Article 122(1) of Civil Law, as evidence, provides that a person will be liable for a tortious act if a person realizes when committing such act.[794] As a legal norm, it means that a defendant was realizing the consequence of the harmful act at the time of committing the tortious act is, however, a defendant did not take all the necessary steps to prevent damage to others, according to a defendant's duty of care obligations.[795] On this basis, it can be said that the lack of discernment falls out of the scope of liability because the second element of the concept of a fault, which is the realization, is not satisfied.

Therefore, it can be said that the requirement of tortious acts is essential for the application of vicarious liability. Provided that a tortious act has been committed by the fault of an employee. On the basis of the above discussion, it is clear that the fault of the defendant stands on two elements namely, a deviation from the conduct of a reasonable person and a realization of this deviation at the time of committing the act. Broadly speaking, the fault of a defendant lies in breach of legal obligations, such as a duty of care. This is considered negligence of a person that leads to causes tort others. However, a fault of an employee that caused harm to others is not the only requirement for the application of vicarious liability. This liability can arise if a tort to others has been caused by a performed work. This requirement will be discussed as follows.

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[793] Khaled Al-Sayed Muhammad Abdel Majeed Musa, *Sources of Commitment in Islamic Jurisprudence and Saudi Regulations: Theories of General Obligations* (2nd edn, Dar Al Ketab, 2022) 238.
[794] Civil Law, Art 122(1).
[795] Musa (n 793).

5.3.2.3 Torts of the Activities

As discussed above, an employer will be vicariously liable for a fault of an employee that causes a tort to others, provided that this fault falls within the scope of an employee's work. The damage, in this regard, should have been a direct and foreseeable consequence of the employee's negligent behavior. In addition, the employer will be vicariously liable if damage to others is the result of an activity that originates from employment itself. The notion of this requirement is that damage does not arise from the fault of the employee at all, it is a direct consequence of the activity, and an employee may need to prove that to defend himself from any expected causes.[796] Therefore, it can be said that there must be a strong link between damage and employment to fall within the scope of the requirement of vicarious liability.[797] Damage, in this regard, can happen in so many different scenarios. For example, the activity itself causes damage to the ecosystem or human beings. To close this paragraph, it can be said that damage caused by the employment itself, or if an employee used the employment and caused damage to others, will fit within the scope of the requirements of harmful acts that arise vicarious liability.[798]

As discussed above, vicarious liability is a legal concept and stands on two main elements namely, the subordination and the harmful act. These are legal justifications for the application of said liability. On this basis, it can be said that if the case is taken to court for a compensation claim and fulfilled the above-mentioned requirements, the case is expected to be successful. A defendant can return to get compensation from an employee who caused a loss or damage to

[796] Shawakh Muhammad Al-Ahmad, *General Theory of Obligation: Sources of Obligation* (1st edn, King Fahad Library, 2019) 397.
[797] Ibid.
[798] Ibid.

others if the basis of the case was an employee's fault.[799] However, it can be argued that the above-mentioned articles failed to provide a 'comprehensive jurisprudential basis' for the regime of vicarious liability. With the development of technology and the modern working environment, the absence of a 'comprehensive jurisprudential basis' could place a court in a difficult position when it comes to litigation on the grounds of said liability. It is expected that some cases may arise to push the boundaries of the jurisprudence of such liability. For a proper understanding of the theory of vicarious liability, this subchapter will contribute to attempting to prominent this jurisprudential basis. This point will be discussed in detail, in the following section.

5.4 Theories of Vicarious Liability

As has been discussed, the above-mentioned articles established the doctrine of vicarious liability and the requirements. However, it can be argued that the language of Articles 92 and 129 did not have the jurisprudential basis of vicarious liability. This basis is unclear and therefore, said Articles might be subject to interpretive issues because they did not maintain the vitality of such jurisprudence. In comparison with other jurisdictions, nevertheless, this issue seems vital in different legal jurisdictions such as France, Egypt, and Algeria, according to Omar.[800] In legal literature, many doctrines have been put forward as justification for the regime of vicarious liability, and favor of these justifications are different from one legal jurisdiction to another. These justifications are the doctrine of presumed fault, risk-bearing, agency or principal, and guarantee. The aim of said theoretical justifications is to illustrate the correlation between the

[799] Civil Law, Art 129(3).
[800] Omar bin Al-Zubair, 'Towards Objective Civil Liability' (Ph.D Thesis, The University of Algiers 1, 2017) 302.

work of a subordinate (an employee) and the action that gives rise to injury or harm to others.[801] Therefore, examining the basis of the theory of vicarious liability gives a broad and thorough understanding of what is meant by vicarious liability in the legal texts. This will be conducted as follows.

5.4.1 The Doctrine of Presumed Fault

The notion of a presumed fault is considered one of the earliest propositions that have been introduced to justify the theory of vicarious liability.[802] Simply, a general idea of this doctrine is that the fault of a superior is presumed when the action of a subordinate within the scope of work caused a tort to others.[803] A plaintiff, in this case, is not required to prove the fault of a subordinate to succeed in a lawsuit against a supervisory party, where the burden of proof is shifted from a plaintiff to the defendant, as a result of such principle.[804] A plaintiff, in this regard, is required to prove the causal relationship between the harmful acts and the responsibility of the owner of the activity. However, the advocates of such a notion are divided into two different perspectives in relation to the type of presumed fault that would lead to vicarious liability. For example, there is a view that suggests that a fault of the owner of the activity (an employer) lies in negligence or a fault in choosing a subordinate (an employee).[805] This view reflects that the owner of the activity has trusted and hired a person to bear the

[801] Izz al-Din al-Danasouri and Abdul Hamid Al-Shawarbi, *Civil Liability in Light of Jurisprudence and Judiciary* (1st edn, *Monshaat Al-Maarif* – Alexandria, 2004) 352.
[802] Omar bin Al-Zubair, Towards Objective Civil Liability (Ph.D Thesis, The University of Algiers 1, 2017) 303.
[803] Ibid.
[804] Ibid.
[805] Ibid.

responsibility of specific work, and such a person was not at a certain level of trust.[806] This is an old view, and it provides a justification for the theory of vicarious liability. Nevertheless, this view has been rightly criticized widely, that is because it is not at a certain level of logic to convince the majority of academic and professional scholars.

A notion of vicarious liability is that the owner of the activity will be responsible for an employee's fault that caused a tort to others even if an employee is compulsory and the owner of the activity was not free to choose an employee, according to article 129 of civil law. Take a pilot of a vessel as an example. A pilot is compulsory when a vessel approaches internal waters, this is legal requirement in many national regulations. Therefore, said view is inappropriate to be a logical and jurisprudential basis for the theory of vicarious liability. In addition, some jurists are of the view that a presumed fault of a superior is based on the notion of a fault in control and supervision.[807] This view suggests that the owner of the activity has actual authority to evaluate an employee's performance and to take control.[808] If a tort was caused by a subordinate (an employee) to others, this means that a superior (the owner of the activity) has failed to exercise its authority to direct and control.[809] This is a notion of presumed fault that justifies vicarious liability.

However, it can be argued that such a view might be flawed because there are two different explanations narrated by the advocates of this doctrine. In addition, it can be said that a

[806] Omar bin Al-Zubair, 'Towards Objective Civil Liability' (Ph.D Thesis, The University of Algiers 1, 2017) 304.
[807] Ibid, 303.
[808] Izz al-Din al-Danasouri and Abdul Hamid Al-Shawarbi, *Civil Liability in Light of Jurisprudence and Judiciary* (1st edn, *Monshaat Al-Maarif* – Alexandria, 2004) 353.
[809] Ibid.

technician and or specialist knows more about their work than a company or the owner of the activity nowadays. For example, it is expected that a master of a vessel is knowledgeable and qualified more than the owner of a vessel. A master does not need guidance from the owner of the vessel in relation to the operation of a vessel and or navigation. A certificate of a master in this regard can be used to show that the master is qualified enough to perform a job. Therefore, the owner of the activity could negate a lack of direction and control in this regard, according to Article 129(2).[810] However, it can be said that the employer can exercise its authority to direct and control employee as administrator, not from a technical perspective. Therefore, it can be said that the doctrine of presumed fault did not leave a space for the owner of the activity to negate a liability, it regards the owner of the activity as liable merely a tort happened to others.[811] To conclude this paragraph, a presumed fault could be a jurisprudential basis for vicarious liability.

5.4.2 The Doctrine of Agency or Principal

A doctrine of agency or principal is another justification for the theory of vicarious liability. An agency and or principal have been used interchangeably in the legal literature. The concept of this doctrine, according to a group of jurists, is that a subordinate (an employee) is considered an extension of the legal status of a superior (the owner of the activity).[812] It is a legal representative of the superior to perform a certain work.[813] On this basis, a superior will be vicariously liable for harmful acts that were committed by a subordinate in a duty of work, and a claimant has to prove

[810] Civil Law, Art 129(2).
[811] Omar bin Al-Zubair, 'Towards Objective Civil Liability' (Ph.D Thesis, The University of Algiers 1, 2017) 304.
[812] Ibid 5.
[813] Ibid.

the fault of an employee.[814] However, this doctrine has been criticized widely in relation to its appropriateness to be a justification for the vicarious. It has been argued that such a doctrine does not cover all the aspects of the theory of vicarious liability.[815] According to a group of specialist jurists, the scope of vicarious liability should remain in the realms of physical actions and conduct between principal and agent via the law of agency.[816] It should not however cross into areas in which legal action takes place such as between principal and lawyer.[817] This disconnection between such competing theories of vicarious liability has not resolved the matter of whether legal action extends to the law of agency within such matters. Further, it has been argued that if an employee is considered an extension to an employer to perform work, this means an employer cannot go back to an employee to get compensation.[818] Conversely, this doctrine does not provide an interpretation of a situation when an employer has a right to get compensation back from a wrongdoer,[819] as this right is laid down under Article 129(3) of civil law.[820] Therefore, it is best to quote Omar's words which provide that it is not an exaggeration to say that a doctrine of agency and or principal is inappropriate to be a jurisprudential basis for a vicarious liability.[821]

[814] Omar bin Al-Zubair, 'Towards Objective Civil Liability' (Ph.D Thesis, The University of Algiers 1, 2017) 306.
[815] Ibid.
[816] Ibid, 307.
[817] Ibid.
[818] Ibid.
[819] Ibid.
[820] Civil Law, Art 129(3).
[821] Al-Zubair (n 814).

5.4.3 The Doctrine of Risk-Bearing

It is not an exaggeration to say that a doctrine of risk-bearing is as old as a vicarious liability itself. It is a common universal doctrine, and it is incorporated in many legal systems. This doctrine is established based on the notion of risk.[822] Specifically, the advocates of this doctrine rely on the element of created risk as a justification for a vicarious liability. It is interpreted that the owner of the activity will create a risk to a society by an employee who performs the activity and by the activity itself, this will increase the risks in the society.[823] In addition, it is expected that the activity and an employee would economically benefit the owner of such activity, therefore, the owner of the activity should be liable for a risk of the activity and a fault of an employee in this regard.[824] This notion is in compliance with an old doctrine of '*Al-ghunm bi al-ghurm*'.[825] Simply, the meaning of this doctrine is that the owner of the activity is liable for a risk or cost that results from the activity.[826] This is a very well-known doctrine and many judicial judgments have built on it. For example, in case number 12313 dated in (1437 H), a claimant, as a partner in a joint-stock company, filed a case against another partner who was working as a general manager of such company. The claim was that the loss of a company had reached SAR (54,641,777) because of mismanagement. A claimant requested the court to shift legal responsibility to a general manager only. However, a court, after many hearings, found that a claimant was the vice president of a company and signed many documents that also led to a loss

[822] Omar bin Al-Zubair, 'Towards Objective Civil Liability' (Ph.D Thesis, The University of Algiers 1, 2017) 307.
[823] Ibid.
[824] Ibid.
[825] Abu Al- Kalam Shafiq Al- Qasimi, 'An explanation of A Doctrine Of *Al-ghunm bi al-ghurm*' (English Alukah, 2015) < https://www.alukah.net/sharia/0/90889/%D8%B4%D8%B1%D8%AD-%D9%82%D8%A7%D8%B9%D8%AF%D8%A9-%D8%A7%D9%84%D8%BA%D8%B1%D9%85-%D8%A8%D8%A7%D9%84%D8%BA%D9%86%D9%85/ > Accessed Date 11 November 2023.
[826] Ibid.

of partnership capital of the company. On this basis, a court held that both the claimant and defendant were legally liable for a loss and had to share a legal liability for a loss based on a sharing laid out in the partnership agreement, according to a doctrine of '*Al-ghunm bi al-ghurm*'. Therefore, it can be said that said doctrine and also a doctrine of risk-bearing share the same concept, and they might be a proper jurisprudential basis for vicarious liability.

5.4.4 Doctrine of Guarantee (*Dhaman*)

A doctrine of guarantee is a secondary obligation from a superior (an employer) to others. It means that the owner of the activity will be vicariously liable for compensating an injured party due to a tort caused by a fault of a subordinate (an employee) within a duty.[827] This is another sold jurisprudential justification for vicarious liability. According to author Omar, the notion of a guarantee came from that an employee may have not enough money to compensate for damages, injury, or another incurred loss to an injured party, and therefore, an employer has to guarantee that.[828] this doctrine is widely considered to be one of the fundamental justifications for vicarious liability and it is in compliance with the doctrine of '*Al-Kharaj Bal Daman*'. This doctrine is rooted in customary laws, and it means that "any profit goes to the one who bears responsibility." It also leads to a situation in which the owner of the activity any gain or profit realized is based on the risk created by the activity – a situation that is in compliance with the concept of the doctrines of '*Al-ghunm bi al-ghurm*' and risk- bearing. Therefore, it can be said that the doctrines of Guarantee and *Dhaman* can also be a proper jurisprudential basis for vicarious liability.

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[827] Ahmed Al-Sayed Al-Bahi Al-Shoubri, *Civil Liability for Technological Risk and Insurance* (1st edn, New University House – Egypt, 2016) 171.
[828] Ibid; Omar bin Al-Zubair, 'Towards Objective Civil Liability' (Ph.D Thesis, The University of Algiers 1, 2017) 309 - 310.

To conclude, it can be said that vicarious liability is a common theory. it is incorporated in many legal systems. However, its jurisprudential basis is debatable, and this is also common. Article 92 of Commercial Maritime Law, for example, introduced this theory without giving enough information in relation to the application and the jurisprudential basis of this theory. Article 129 of Civil Law, which did not exist before starting to write this thesis, provides the elements of vicarious liability but it also does not provide the jurisprudential basis of this theory to understand it in a proper sense. Thus, it can be said that the jurisprudential basis of the said theory is derived from many doctrines, they may be doctrines of risk-bearing and guarantee. These doctrines are in compliance with two fundamental doctrines in customary law namely, '*Al-ghunm bi al-ghurm*' and '*Al-Kharaj Bal Daman*'. These doctrines lead to the notion that the owner of the activity that gains a profit will bear the responsibility for risks. A question that may arise here is, to what extent does the owner of the autonomous systems incur the risks of this system based on the regime of vicarious liability? This question will be discussed at length, below.

5.5 The Regime of Vicarious Liability and Autonomous Systems

5.5.1 Introduction

In the near future, the interaction between humans and autonomous systems is expected to increase. However, autonomous systems are expected to present novel accidental harm to society. These systems may disrupt the current structure of torts of law. A question is who will be liable when things go wrong? This is a very important question that needs to be answered. From one perspective, it could be said that the regime of vicarious liability can cover the risks of autonomous systems if said systems are granted a personality. From another perspective, it can be said that autonomous systems are not ineligible to be granted a personality based on the current requirements of personhood. Accordingly, it can be said that vicarious liability would not be an appropriate regime to cover the expected risks of intelligent autonomous systems. This section looks at existing vicarious liability rules and explains how the risks of autonomous systems may challenge the currently applicable rules. The regime of vicarious liability, laid down in Articles 92 and 129(2), is designed to cover the faults of humans, it is not designed for the risks of systems. To narrow this down, said articles require 'an actual authority' of the owner of the activity and a 'subordinate-supervisor relationship'. Theoretically, these requirements will be challenged. This section will be divided as follows.

5.5.2 Norm of Actual Authority

The norm of 'actual authority' is a very important one to justify the application of vicarious liability. This norm lies at the heart of said liability regime, and it is used to demonstrate the relationship between a superior (an employer) and a subordinate (an employee). An employer has actual authority to request employees adhere to the work procedures and 'supervise' their tasks.

In addition, an employer has actual authority to 'control' an employee in relation to implementing those instructions and administering consequences accordingly.[829] However, it is not required that the employer has to 'supervise' and 'control' an employee from a technical perspective, but an administrative does.[830] This is because it is expected that an employee knows more than what employer in this regard,[831] and the master of a ship and the shipowner can be taken as an example in this regard. More specifically, Article 92 of Commercial Maritime Law illustrated who will be under the actual authority of the shipowner. They are the master, pilot, crew, and others who work in service of the vessel.[832] This article is directed to the behavior of employees in service of a vessel, and it is conditional upon negligence on the part of said employees. This means the shipowner will be vicariously liable for employees defined in said article if other requirements of the regime of vicarious liability are met. However, the situation will be different with the development of technology. A vessel will be operated remotely from a remote control center or will operate in a fully autonomous mode. In remote control vessels, it has been said that such vessels will be controlled by operators from remote control centers. Under this logic, a remote crew would make decisions from a remote control locations instead of on board the vessels.[833] In this regard, it can be said the operators in the said center will be in charge of the operation of the vessel and will be under the administrative 'supervise' and 'control' of the shipowner. In this regard, it can be argued that the remote control center

[829] Civil Law, Art 129(2); Omar bin Al-Zubair, 'Towards Objective Civil Liability' (Ph.D Thesis, The University of Algiers 1, 2017) 293 ; Shawakh Muhammad Al-Ahmad, *General Theory of Obligation: Sources of Obligation* (1st edn, King Fahad Library, 2019) 395.
[830] Al-Ahmad (n 829) 395.
[831] Ibid.
[832] Commercial Maritime Law, Art 92.
[833] Henrik Ringbom, Erik Røsæg, and Trond Solvang, *Autonomous Ship and Law* (1st edn, Routledge, 2021) 89.

operators can fit under the scope of the word 'others' stated in Article 92 of Commercial Maritime Law, provided that operators fulfill all requirements and are certified for this work.

However, blaming remote control operators is not always possible, particularly, when the remote connection is lost.[834] It is evident that remote control operators will remain in charge to the extent that the remote connection is functioning.[835] This means that adequate quality data should be available during the operation of autonomous systems to enable remote control operators to make decisions, and said systems have to be in good condition and capable of following the orders being given by the remote control operators.[836] Precisely, autonomous systems utilize various types of physical sensors to gather data and create a significantly comprehensive image of the vessel's surroundings, such as Global Positioning System (GPS), Radio Detection and Ranging (RADAR), Cameras, and Light Detection and Ranging (LIDARs).[837] This data enables the remote control operators to make decisions. The issue will be particularly clear when the data seems to be correct but is not, and there is no way to find its incorrectness.[838] Therefore, the application of vicarious liability over such cases is problematic.

The situation will be more complicated when it comes to the operation of fully autonomous systems. These systems will be governed by decisions through pre-programmed algorithms,

[834] Henrik Ringbom, Erik Røsæg, and Trond Solvang, *Autonomous Ship and Law* (1st edn, Routledge, 2021) 89.
[835] Ibid.
[836] Ibid.
[837] Ibid.
[838] Ibid 90.

computers, sensors, and cameras, for example.[839] It is not clear how the owner can control and supervise these systems, as it is required for the application of vicarious liability. Therefore, it can be said that holding the owner of autonomous systems liable for the fault of autonomous systems is non-compliance with the regime of vicarious liability. This is because said systems will not be under the control of the shipowner. This legal issue is not limited to the above mentioned jurisdiction. It also existed in many legal systems that consider the norm of actual authority or control test as a justification for the application of the doctrine of vicarious liability.

In English Law, for example, an employee is defined as any person employed by another for working and subject to the 'control' in addition to the directions of the employer, in respect of the conduct in which that work is to be done.[840] The term 'control', in this regard, means that the employer has the right to control the activities of the employee instead of exercising actual control.[841] Therefore, the control test is a decisive factor in establishing the relationship between the employee and employer, as expressed by courts.[842] It has in any case been said that professionally trained persons such as the master of a ship, a hospital consultant, and the pilot of an aircraft are all employees for whose torts their employers are liable.[843] Therefore, it has been admitted that "the significance of control today is that the employer can direct what the

[839] A.v.raghav Sharma, 'Maritime Autonomous Surface Ships: Caught Between the Devil's Advocate and the Deep Bule Sea' (Master Thesis, World Maritime University, 2019) 30.
[840] Andrew Evans, *Liability, Risk and the Law* (1st edn, Withherby, 2000) 64.
[841] Ibid.
[842] Ibid.
[843] James Goudkamp and Donal Nolan, *Winfield & Jolowicz on Tort* (20th edn, Thomson Reuters, 2020) 602.

employee does, not how he does it".[844] It is not clear how this test will be satisfied when it comes to autonomous system vessels guided by artificial intelligence. Another legal issue centered around the application of vicarious liability is that autonomous systems lack legal personhood. These systems are not considered legal persons according to many state laws, and much will be said below.

5.5.3 Personhood

As has been discussed, the relationship of subordination between 'employees' and 'employers' has to exist. This is a legal requirement to impose a vicarious liability on the shoulders of employers, provided that the fault of the employee has been proved. For instance, the owner of a vessel will be vicariously liable for the negligent acts of a master, crew, polite, and others in the service of a vessel.[845] This is a literal meaning of a legal text laid down in Article 92 of Commercial Maritime Law. However, it might be accepted to say that subordination would not exist without a person. As a general rule, a personality is understood as 'the bearer of legal rights and obligations' When it comes to Remote Control Centre Operators they may fall within the scope of the word 'others' under the above-mentioned Article provided that others relevant provisions have been met. The situation is unclear when it comes to the legal position of independent contractors. Remote control vessels will be navigated and managed by remote control center. This center is expected to be managed and controlled by independent contractors. However, the above-mentioned Article provides that " the owner of a ship or a charterparty will be liable for a master … fault …". This is because of that a master the only person that can

[844] James Goudkamp and Donal Nolan, *Winfield & Jolowicz on Tort* (20th edn, Thomson Reuters, 2020) 602.
[845] Commercial Maritime Law, Art 92.

navigate and control the vessel according to Article 101(1) of the above-mentioned Law and works on behaving the owner of a ship or the charterparty according to Article 107(1) of same law. In addition, a master shall be appointed by the owner of a ship or the charterparty according to Article 100 of said Law. The word 'appoint' can be interpreted to mean that a master has to work as an employee not an independent contractor. Therefore, it can be said that the legal position of independent contractors is unclear.

The situation will be clearer when it comes to artificial intelligence system, that will navigate and control Level Four of Autonomous Vessels. It can be said that autonomous systems do not have the capability to bear legal rights and obligations. This is because of that said system neither a person nor a legal person at the current time. With this as a background, a question emerges as to whether or not the regime of vicarious liability covers the risks of autonomous systems. The answer to this question could be debatable. However, the author of this thesis argues that the current regime of vicarious liability would not cover the expected risks of autonomous systems. This is because said systems are not granted the legal personality yet and therefore the relationship of subordination would not exist. This is a legal barrier that would make it difficult for the application of vicarious liability. To prove this point, this section will attempt to explain what is meant by personality under relevant law. On this basis, this section will be divided into two sections namely, natural person and artificial person, this will be as follows.

5.5.3.1 Natural Person

In jurisprudence, a natural person is a title indicated to a person or individual and it is used to identify a human being. According to Article 3(1) of the Civil Law, a living human being

acquires a natural personality without express consent and this personality starts from the birth to death.[846] This personality is distinguished from the category of an artificial or legal person, and its legal rights and obligations are granted by state laws. In the context of the Commercial Maritime Law, this person can be either a master, crew, pilot, or others in the service of a vessel.[847] These job titles are literally mentioned in the above mentioned law. The notion of autonomous systems will operate, navigate, and make a decision instead of a master and crew. However, this system is not included in the above mentioned Article and therefore, it goes without saying that autonomous systems would fall out of the scope of Article 92 of Commercial Maritime Law. Although regulating said systems in Article 92 is possible and this is because of that a state has authority and absolute discretion for regulation, however, regulating autonomous systems under the umbrella of the said article will be difficult without good reasoning. The legal issue is, at its core, an autonomous system is not a person in the current legal framework in order to bear master and or crew obligations and therefore it will not be considered as an employee accordingly. A question that may arise here is, to what extent an autonomous system can be considered as a 'person'? This is a philosophical question that will take a reader to another level of the discussion. The answer to this question could be debatable. However, it can be argued that it seems difficult to grant autonomous systems personhood under the above-mentioned Article. This is due to the fact that there is a key practical distinction between a person and an autonomous system.

[846] Civil Law, Art 3(1).
[847] Commercial Maritime Law, Art 92.

In ethics and the philosophy of morals and justice, for example, it has been said that there are specific approaches that have to be used for granting personhood, and these approaches differ between different theoretical frameworks.[848] However, examining what constitutes a person and what is not, would not be completed without examining the relevant philosophical worldviews, as Gerhard Wagner suggests.[849] In a deontological theory like Kant's, for example, it has been said that the ability to act as an autonomous subject is considered the essential feature of personhood.[850] It follows easily that, personhood, in Kant's philosophy, is closely connected with moral agency in the sense of the ability of a subject to choose moral laws, and this choice might be exercised as a member of a group or society at large or as the subject itself.[851] This can be taken to mean that a person is also known as one who can be held liable for committed actions by him, and also a person is different from things by virtue of the unity of consciousness throughout all the changes that happen to such person.[852]

The alternative theory to the deontological theories of law and personhood is consequentialist.[853] This theory focuses on the outcomes that the action achieves in the real world, not on the principle on which an action was based.[854] Utilitarianism, for example, is the leading consequentialist theory, this theory relies on the ability to actually feel pleasure and pain as a norm to recognize a personality in the moral universe.[855] On this basis, it can be said that a

[848] Gerhard Wagner, 'Robot, Inc.: Personhood for Autonomous Systems?' (2019) Vol 88(2) Fordham Law Review, 595.
[849] Ibid.
[850] Ibid 595 - 596.
[851] Ibid.
[852] Ibid, 596.
[853] Ibid 595.
[854] Ibid.
[855] Ibid.

person is considered entity status reserved for human beings and excluding others from this description. In this regard, it can be said that Autonomous systems would not be counted in the overall utilitarian calculus as long as these systems cannot experience pain and pleasure.[856] The capacity of the said systems to act as a person remains clearly circular as such capacity relies on the recognition as a legal subject.[857] To close this paragraph, autonomous systems would not be considered a person from ethics and the philosophy of morals and justice perspectives. This is due to the fact that autonomous systems lack experience of pain and pleasure, in addition to that these systems lack the ability to choose moral laws. Accordingly, it can be said that this system will not also be considered as an employee. However, autonomous systems can be qualified as a legal person if these systems granted this personality by specific law.

In English law, artificial intelligence cannot be named a natural person. The case of *Thaler v Comptroller-General of Patents, Designs and Trade Marks* can be taken as an example.[858] The Supreme Court, in this case, unanimously decided that an artificial intelligence system can not be named as the inventor for the United Kingdom patent application.[859] The ground for this decision was that the definition of the term 'inventor' under the Patents Act 1977 requires the inventor of a patent to be a natural person.[860] This is also the case in current employment law. For example, the relationship between employee and employer involves a mutual contract in which the

[856] Gerhard Wagner, 'Robot, Inc.: Personhood for Autonomous Systems?' (2019) Vol 88(2) Fordham Law Review, 595
[857] Ibid.
[858] *Thaler v Comptroller-General of Patents, Designs and Trade Marks* [2023] UKSC 49.
[859] Carlton Daniel, Paul Jinks and David Naylor, 'UK Supreme Court Rules on AI and Patent Applications' (Global IP & Technology Law Blog, 3 January 2024) < https://www.iptechblog.com/2024/01/uk-supreme-court-rules-on-ai-and-patent-applications/ > accessed data 27 May 2024.
[860] Ibid.

employer promises to pay the employee dependent on the employee's promise to work.[861] However, this mutuality of obligation will be challenged by the increasing use of artificial intelligence when a case requires employers to illustrate that their decisions have been taken in good faith.[862] Connected to this, the doctrine of personal service indicates the obligation of the employee to provide personal skill, effort, and expertise in their role.[863] Without this obligation, it can be said that the relationship between said parties is not an employment relationship, instead, it might be another commercial relationship.[864] Accordingly, it might be said that the application of vicarious liability might be not an appropriate basis for artificial intelligence systems risk.

5.5.3.2 Artificial Person

An artificial person is an entity that is identified by law as a legal person. The legal requirements of this personality, rights, and obligations are determined by state laws. For example, civil law describes a legal person as a public body and institution,[865] endowments,[866] and companies.[867] It is clear that an autonomous system is not included in the above mentioned article. Therefore, it can be said that said systems are not considered artificial persons under the current legal framework. However, the question that may arise here is, whether or not the concept of an artificial person can be extended to cover autonomous systems. Arguably, it can be said that civil

[861] Patrick Brione and Sam Day, 'Artificial Intelligence and Employment Law' (Briefing Paper No CBP 9817, House of Commons Library, 11 August 2023) < https://researchbriefings.files.parliament.uk/documents/CBP-9817/CBP-9817.pdf > accessed date 27 May 2024.
[862] Ibid.
[863] Ibid.
[864] Ibid.
[865] Civil Law, Art 17(B).
[866] Civil Law, Art 17(C).
[867] Civil Law, Art 17(D).

law is flexible, and it can accommodate autonomous systems provided that these systems are incorporated by specific law. As evidence, Paragraph (W) of Article 17 of Civil Law provides that 'any legal person that might be created by a special law' will be considered as a legal person.[868] However, it can be said that the meaning of this paragraph would not be complete without reading Article 18 of the same law. This article provides certain requirements that must be fulfilled before granting legal personhood. For example, a legal person must have a separate financial entity,[869] capacity,[870] rights to litigation,[871] independent home,[872] nationality,[873] and representative.[874] Therefore, it can be said that the lack of fulfilling these requirements will directly lead to exclude the autonomous systems of qualifying as a legal person.[875]

5.6 Shift to Strict Liability

As discussed above, the vicarious liability of the shipowner (employer) is based on the master, crew, pilot, and others who are in service of a vessel (employees) fault. The most conspicuous example can be a liability for damage and collisions at sea. In this regard, it is better to quote Robert Veal's words that collision liability is based to a large extent on negligence, albeit with some of its particularities.[876] This liability will be divided based on the degree of fault between the collided vessels. The origin of said liability is a breach of legal obligations. To narrow this

[868] Civil Law, Art 17(W).
[869] Civil Law, Art 18(2)(A).
[870] Civil Law, Art 18(2)(B).
[871] Civil Law, Art 18(2)(C).
[872] Civil Law, Art 18(2)(D).
[873] Civil Law, Art 18(2)(H).
[874] Civil Law, Art 18(3).
[875] Medjdoub Nawal, *Challenges of Legal Liability that Arises from the Application of Artificial Intelligence* (1st edn, Scientific Group, 2022) 72.
[876] Robert Veal, 'Regulation and Liability in Autonomous Shipping: A Panoptic View' (2020) 45 Tul Mar LJ 101.

point down, mariners are required to exercise the doctrine of good seamanship. In legal literature, the term 'seamanship' is understood as the standard of care that is required of mariners.[877] It means that mariners are required to effectively take reasonable care and also use reasonable skills and knowledge based on the circumstances of the case.[878] The standard of care is set out in the COLREGs.

For non-contractual liabilities, it can be said that the tort of negligence is the most common basis for bringing a claim under Saudi's Law. This is also the case under English law.[879] However, Rule 2 of the Convention on the International Regulations for Preventing Collisions at Sea, for example, states that nothing in this Convention Rules shall exonerate "… master or crew thereof, from the consequences of any neglect to comply with …" with this Convention Rules "… or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case."[880] This Rule indicates to ultimate liability of a master or crew to apply the standard of good seamanship.[881] This Rule also gives a master and or crew permission to depart from the Rules of COLREGs, if need be, to avoid immediate danger.[882] The duty of seamanship means that a master and or crew are expected to demonstrate ordinary skill and intelligence in the exercise of the said duty as measured against the relevant

[877] Frank Stevens, Seaworthiness and Good Seamanship in the Age of Autonomous Vessels, In Henrik Ringbom, Erik Rosage, and Trond Solvang (eds), *Autonomous Ships and the Law* (1st edn, Routledge, 2021) 252.
[878] Ibid.
[879] Baris Soyer and Andrew Tettenborn, *New Technologies, Artificial Intelligence and Shipping Law in the 21st Century* (1st edn, Informa Law, 2019) 76.
[880] The 1972 Convention on the International Regulations for Preventing Collisions at Sea, Rule 2(a).
[881] Robert Veal, 'Regulation and Liability in Autonomous Shipping: A Panoptic View' (2020) 45 Tul Mar LJ 101.
[882] The 1972 Convention on the International Regulations for Preventing Collisions at Sea, Rule 2(b).

circumstances.[883] At least, it refers to 'human judgment' that is based on hardware systems inputs.[884] In the Saudi legal system, the above mentioned Convention is given effect according to Public Transport Authority Resolution No. 07182-40-001 dated 02 October 2018 (22/01/1440 AH).

However, with the absence of an onboard crew, a question that has been put forward is who will be responsible for exercising the obligation of good seamanship?[885] This is an obligation placed on the shoulders of the master and crew to avoid expected collisions at sea. Initially, it could be argued that the obligation of good seamanship can be shifted to the remote control operators. This is possible, provided that, the remote control operators are certified as a master and crew. The legal issue here is who and how said obligation can be implemented with the introduction of autonomous systems, it is not from where this obligation can be implemented. As previously discussed, the remote control operators will fall out of the scope of the current STCW Convention, as they will not be onboard the vessel. Even if remote control operators are certified, professional skills and knowledge are needed for technical and legal requirements clarifying the scope of the standard of good seamanship. The importance of these requirements is to determine whether or not remote control operators breached the standards of duty of care. Therefore, considering remote control operators in breach of the obligation of the duty of good seamanship requires said people to have needed professional skills and knowledge in how to navigate remote control vessels and apply the required standards of safety. It is not clear how would remote

[883] Michel Farach, 'A Sea Trolley Problem: An Exploration of the Impact of Unmanned Vessels in Maritime Law' (Master Thesis, The City Law School – University of London, 2020) 33.
[884] Ibid.
[885] Ibid 32.

control operators fulfill the duty of good seamanship similar to the standard of safety of onboard master and crew. This uncertainty will have an impact on the regime of vicarious liability.

In addition, it is clear that remote control operators would rely on hardware systems, such as cameras and sensors. These systems would play an important role in master and crew operational decisions. However, it can be argued that the hardware systems may have an impact on the efficiency of the duty of remote control operators in some situations. This could happen when a system does not send the collected data at the right time to remote control operators, or the information that has been received seems to be accurate, but it is not. In this regard, it might also be difficult to prove a collision was due to the breach of said obligation or due to hardware systems. On this basis, *inter alia*, the regime of liability would be challenged. In addition, a master and crew who are involved in exercising duty of care obligations on board a vessel will not exist when it comes to fully autonomous system vessels. Tasks of said human beings will be shifted to autonomous systems. A question that might be raised here is how the obligation of seamanship would be exercised in a fully autonomous system vessel. This question is still open to debate. The author of this argues that an autonomous system would not exercise the duty of seamanship as same as a master or crew. This is because of autonomous systems' lack of 'human judgment', and this point is discussed at length previously. Therefore, it might be accepted to say that Rule 2 of COLERG would not be satisfied by autonomous systems vessels.

In addition, Rule 5 of the COLREGs provides that every vessel shall maintain a proper look-out by sight and hearing at all times to make a full appraisal of the situation and of the risk of

collision.[886] Clearly, this Rule requires a duty of care of the controller of the vessel, and this duty is to maintain proper situational awareness in order to make informed decisions.[887] This duty requires sight and hearing by humans on the board of vessels which is expected to be replaced by camera and audio transmissions that would be considered as 'all available means'.[888] However, it has been said that many of the case laws do not suggest a visual and hearing lookout can be replaced by other equipment, whereas the use of RADAR does not remove the need for a visual lookout.[889] Indeed, the impact of the notion of an autonomous system on Rule 5 is undeniable. In the context of remote control vessels, it can be said that camera and audio communication could enable remote control operators to exercise a duty of care, such as a proper lookout. Rule 5 of COLERG can be interpreted in a very broad way to accommodate this 'technical means'.

However, a logical question remains, to what extent remote control operators can maintain a proper lookout by said technical means in the event of a complete loss of data transmission?[890] The answer to this question suggests that a vessel could be given the status of not being under the command or restricted ability to maneuver.[891] However, this suggestion seems to be difficult and needs clarification as the current proposed technical solutions require amendments to the existing legal framework.[892] When it comes to fully autonomous system vessels, these vessels would face the same legal issues as they lack human judgment. This means that fully autonomous system

[886] The 1972 Convention on the International Regulations for Preventing Collisions at Sea, Rule 5.
[887] Michel Farach, 'A Sea Trolley Problem: An Exploration of the Impact of Unmanned Vessels in Maritime Law' (Master Thesis, The City Law School – University of London, 2020) 35.
[888] Ibid.
[889] Ibid.
[890] Ibid.
[891] Ibid
[892] Ibid.

vessels would not meet the requirement under Rule 5 of COLERG. Consequently, it can be argued that the notion of autonomous systems would challenge the current duty of care rules and the regime of liability accordingly. Therefore, it can be said that strict liability might be appropriate for the risks of autonomous system vessels.

Strict liability is a form of civil liability, and it is a common worldwide concept. This liability is unlike a fault-based regime, and it derives from different places. The notion of this liability is that a defendant will be held liable for the consequence of the harmful act even if the defendant was not at fault. As a general rule, exercising the right in a public area is closely connected with the safety of others, and therefore, whoever uses a right in a public area and causes harm to others will be liable for that harm.[893] With an extremely broad brush, it can be said that strict liability is imposed on the ship owner by many international conventions. The most conspicuous example is IMO's regulations,[894] such as the 1969 International Convention on Civil Liability for Oil Pollution Damage,[895] the 2001 International Convention on Civil Liability for Bunker Oil Pollution Damage,[896] the 1996 International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea,[897] and the 2007 Nairobi International Convention on the Removal of wrecks.[898] Therefore, it can be said that strict liability has its legal basis in national and international regulations and it might also be an appropriate regime to govern the risks of autonomous systems.

[893] Civil Law, Art 135.
[894] Robert Veal, 'Regulation and Liability in Autonomous Shipping: A Panoptic View' (2020) 45 Tul Mar LJ 101.
[895] The 1969 International Convention on Civil Liability for Oil Pollution Damage.
[896] The 2001 International Convention on Civil Liability for Bunker Oil Pollution Damage.
[897] The 1996 International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea.
[898] The 2007 Nairobi International Convention on the Removal of Wrecks.

5.7 Autonomous Systems and Data Protection

5.7.1 Introduction

Autonomous intelligent system vessels are expected to be in service, in the near future. These systems, as has been discussed, go through the use of a significant amount of data for navigation. This data will be collected through various cameras and sensors for the purpose of processing. These cameras and sensors will take an image and video of passengers of autonomous systems vessels, other vessels, and or people near these vessels when the vessel is in the mode of operation. This is a breach of personal privacy. However, it can be argued that maritime legal framework does not regulate this legal issue. This is a legal gap in the current regulation, or it might be regulated by another law. Therefore, this subchapter attempts to contribute and fill this lacuna.

According to Article 1(5) of the Personal Data Protection Law, personal data can be processed by any means "… whether manual or automated, including collecting recording, saving, indexing, organizing, formatting, storing, modifying, updating, consolidating, retrieving, using, disclosing, transmitting, publishing, sharing, linking, blocking, erasing and destroying data."[899] With the development of technology, there are, and there will be, various automated means capable of processing personal data such as autonomous intelligent systems vessels. The lack of a legal definition of the term 'automated means' may cause ambiguity in the above mentioned legal text. This ambiguity may reasonably lead to more than one interpretation. However, it can be said that the above mentioned Article should be in conjunction with Article 1(18) of the same law. This

[899] Personal Data Protection Law, Art 1(5).

Article provides a definition for the controller that is responsible for data collection. It stipulates that the controller is any public entity, natural person, or private legal person that specifies the purpose and manner of processing persona data, whether the data is processed by that controller or by the processor,[900] that is processing such data for the benefit and on behalf of the controller.[901] Based on this Article, it can be said that autonomous intelligent systems vessels will fall out of the scope of the term controller, and this law accordingly. This is because these systems are not considered legal person yet. A constructive argument that can be made here is that autonomous intelligent systems will be owned by a natural person or artificial person (company), and this means that the controller will be one of these persons not said systems if these vessels are not excluded by a specific law.

However, it is not clear how would the owner of the autonomous systems vessels comply with the Personal Data Protection Law as it will be part of the operation and navigation requirements. From a legal perspective, personal data can be collected on the grounds of one of two legal principles namely, either the principle of data subject 'consent' or the principle of 'legitimate interest'. Breaching these principles will lead the owner of these systems to be subject to a warning or a fine not exceeding Five Million Saudi Riyals and this fine penalty may be doubled in the event of a repeat violation, according to Article 36 of said law. This subchapter argues that the notion of autonomous intelligent systems will challenge the said principles. This point will be discussed at length in the below paragraphs.

[900] Personal Data Protection Law, Art 1(18).
[901] Ibid, Art 1(19).

5.7.2 The Scope of Personal Data Protection Law

Personal Data Protection Law applies to all companies located in the Kingdom of Saudi Arabia, according to Article 2(1).[902] Therefore, actors of autonomous intelligent systems vessels are not excluded from this law, especially when it comes to collecting, transferring, and also processing such data.[903] This data can be, *inter alia*, a photo, video, name, identification number, and property of a person that leads to recognize such a person.[904] Therefore, several provisions of the above mentioned law will be relevant to decisions taken by autonomous intelligent systems. Connected to this, non-personal data is excluded from the application of this law.

5.7.3 Consent

One of the lawful grounds for processing data is the consent of data subjects. This is a legal principle in data protection law.[905] The controller party must obtain valid consent from a data subject in any appropriate form or means, including written or verbal consent or by using electronic methods.[906] This consent shall be 'given freely',[907] by a person who has full legal capacity.[908] This is a requirement for the application of the principle of data subject consent. The core of the phrase 'given freely' may emphasize that the data subject has to be in a position to make a 'real choice'. If there is a clear imbalance between the data subject and controller, this could be understood as that consent was not given freely. An example of this situation appears in the case of autonomous system vessels, data will be collected without a choice of data subject.

[902] Personal Data Protection Law, Art 2(1).
[903] Ibid, Art 1(5).
[904] Ibid, Art 1(4).
[905] The Implementing Regulation of the Personal Data Protection Law, Art 11(1).
[906] Ibid, Art 11(1).
[907] Ibid, Art 11(1)(a).
[908] Ibid, Art 11(1)(c).

Another example, which is justified by law, is that public authorities shall not be subject to consent if the processing is required for security purposes or to satisfy judicial requirements.[909]

Another requirement for the application of data subject consent is that the processing purpose shall be clear, specific and shall be explained and clarified to the data subject before or at any time of requesting consent.[910] This means that the consent should describe what the consent relates to. In addition, the controller is obliged to give adequate information about the reason for data subject consent. At least, the data subject should be informed about the type of data that will be collected, the identity of the controller, and the purpose of processing. Otherwise, collecting and or processing of data could be judged to be unlawful. It is not clear how autonomous systems will meet the above-mentioned consent requirements.

5.7.4 Legitimate Interest

The lawfulness of processing personal data is based on the consent of data subjects and the legitimate interest. For example, Article 10(7) the controller party should collect personal data directly from data subjects and it can be collected from a source other than the data subjects for which they have been collected in the situation that "personal data collection is necessary to achieve legitimate interests of the Controller, without prejudice to the rights and interests of the data subject, and provided that no sensitive data is to be processed".[911] Therefore, it can be these that this Article is the legal foundation for a legitimate interest that must be taken into account

[909] Personal Data Protection Law, Art 6(3).
[910] The Implementing Regulation of the Personal Data Protection Law, Art 11(1)(b).
[911] Personal Data Protection Law, Art 10(7).

when a collector party collecting personal data. However, this principle might be used as an open door to process all personal data that does not fit well within the scope of others' lawful processing basis. This could be the risk of this principle, and it could happen in some situations either intentionally or without intention.

Nevertheless, it can be said that the policy makers have been careful to limit the scope of the principle of legitimate interest and did not leave a controller or third party to define this principle and use it against the data subject. According to Article 1(6) of said law, the concept of the legitimate interest " refers to any necessary interest of the Controller that requires the Processing of Personal Data for a specific purpose, provided it does not adversely affect the rights and interests of the data subject".[912] Based on this sentence, it can be said that there are three cumulative conditions that must be fulfilled when relying on the legitimate interest ground namely, (i) the pursuit of a legitimate interest, (ii) the necessity to collect and process personal data, and (iii) balancing the rights between the controller and the data subjects. This section will be divided as follows.

5.7.4.1 Specific Purpose Test

One of the conditions for the application of legitimate interest is the criteria of a specific purpose. The purpose of collecting and processing data must be clear and specific.[913] This purpose for which Personal Data is collected has to be directly related to the purposes of the

[912] The Implementing Regulation of the Personal Data Protection Law, Art 1(6).
[913] Personal Data Protection Law, Art 12.

controller party and shall not contravene any legal provisions.[914] Therefore, it can be said that specific purpose is a fundamental principle in the Personal Data Protection Law, and it is a legal justification for data collection. Therefore, it can be said that a specific purpose is meant to be a specific reason for processing personal data. Similarly, this principle is regulated in the UK's General Data Protection Regulations. As evidence, Article 5(1)(b) of the General Data Protection Regulation provides that personal data shall be "collected for specified, explicit and legitimate purposes and not further processed in a manner that is incompatible with those purposes …".[915] This Article is clear and formulated in a very good language. According to the Data Protection Working Party established by Article 29 of Directive 95/46/EC 'Article 29 WP', the term 'purpose' is meant to be the specific reason for data processing, whereas 'interest' is meant to be broader stake or the benefit the controller and or the society may have from the processing.[916] It is also better to borrow Gabbi Meskenaite words in order to describe the above-mentioned principle. According to Meskenaite, consent for a specific purpose is a safeguard against the controller abusing required consent and using this consent for widened and blurred interpretations.[917] Thus, it can be said that the principle of specific purpose, in both legislation systems, also aims to demonstrate whether or not that collection is proportionate to both the controller and data subject's purpose and interest. Connected to this, vague purposes do not fulfill the criteria of specific consent and also the consent for general use is not legally possible.

[914] Personal Data Protection Law, Art 11(1).
[915] GDPR, Art 5(1)(b).
[916] Ann Kristin Glenster, 'The Commodification of Personal Data: Individuals' Control Through the European Union's General Data Protection Regulation' (PhD Thesis, University of Cambridge, 2021) 112 - 113.
[917] Gabbi Meskenaite, 'An Examination of the Criteria for Valid Consent Under the GDPR in the light of the Rational and Technological Neutrality' (Master Thesis, Lund University, 2022) 30.

The legal issue that needs to be discussed here is whether or not autonomous intelligent systems can pass the test of a 'specific purpose'. Generally, it can be said that this point is controversial. In principle, said systems could pass this test if the purpose of collecting data is proportionate to both parties. However, it is not clear whether or not the purpose of collecting data through autonomous intelligent systems cameras and sensors would be appropriate for the data subject. According to Article 16(3)(b) of Implementing Regulation of the Personal Data Protection, the controller party shall conduct and document an assessment of the proposed processing and its impact on the rights and interests of data subjects before processing personal data for legitimate interests, and this assessment shall include "… evaluation of the purpose to ensure that it is legitimate and compliant with the laws in the Kingdom".[918] The purpose of autonomous intelligent systems to process data might be clear, it could be safe navigation. This can be used as a justification for data collection. However, Data subject consent is legally required to achieve this purpose.[919] Therefore, it can be said that the operation of such systems will challenge the above-mentioned principle in addition to other rules, such as appropriate measures to inform the data subject that should be taken according to Article 13 of said law,[920] within Personal Data Protection Law. Therefore, it can be said that it is not clear how autonomous intelligent systems would pass the test for a specific purpose. This point needs to be evaluated officially in order to make it clear when it comes to the operation of autonomous intelligent system vessels. However, passing the above mentioned test does mean that the autonomous intelligent system vessels would be eligible to collect data, there is a need to pass the test of necessity as well. This test will be demonstrated below.

[918] The Implementing Regulation of the Personal Data Protection Law, Art 16(3)(b).
[919] Personal Data Protection Law, Art 5(1).
[920] Ibid, Art 13.

5.7.4.2 Necessity Test

In general, it can be said that the requirement of necessity is fundamental to protect personal data. This requirement lies at the heart of many provisions of the Personal Data Protection Law. For example, Article 15(1)(a) of the Implementing Regulation of the Personal Data Protection Law provides that "processing data shall be necessary and proportionate to the specified purpose".[921] This means that processing unnecessary data is unjustified according to this Article. The aim of the necessity test is to protect the rights and freedoms of data subjects. Although the idea of necessity is fundamental in the Personal Data Protection Law, this law and its Implementing Regulations did not define the concept of necessity. Arguably, the term 'necessity' seems to be rather vague, and it is not clear. Next to this, authoritative or court interpretation of what the term 'necessity' means, does not exist. However, the term 'necessary' can be understood as a reflection of what is essential or indispensable to perform the purpose for which personal data is collected. It must be exercised for an objective of general legitimate interest. However, assessing the necessity of the processing of personal data is not an easy task, and the controller party should apply data minimization principles to achieve the specific purpose according to Article 19 of the Implementing Regulation of the Personal Data Protection Law.[922]

To put this test into the General Data Protection Regulation (GDPR) which is more familiar to British legal professionals, Article 5(1)(c) of said law provides that personal data shall be "… adequate, relevant and limited to what is necessary in relation to the purposes for which they are

[921] The Implementing Regulation of the Personal Data Protection Law, Art 15(1)(a).
[922] Ibid, Art 19.

processed ('data minimisation') …".[923] This principle of 'data minimization' can be viewed as a security against expected risks, and it is considered one of the significant responsibilities of the controller party according to Article 24(1) of GDPR.[924] This principle aims to minimize the collected data to the lowest level and to a level adequate for the purpose of processing. Emmanual Salami notes that two important steps have been identified in order to ensure compliance with said principle, these steps are 'ascertaining the relevant purpose of processing activity' in addition to 'ensuring collected data are necessary to achieve the relevant purpose'.[925] This can lead to that unnecessary data should not be collected.

Therefore, it can be said that processing data has to be necessary for a specific purpose and both the legal systems share the same concept. When it comes to autonomous systems, the owner of these systems may argue that collecting personal data is necessary for the safe operation and navigation of said systems in order to pass the test of necessity. However, passing this test is not the final end to process personal data. Further, the balancing test must be achieved, and this test will be examined below.

5.7.4.3 Balancing Test

Balancing tests play an important role in the Personal Data Protection Law. The term balance is not legally defined in the said law, in order to make what is meant by balance is clear. However, it can be said that the meaning of balancing is implied in several concepts, such as fairness and

[923] GDPR, Art 5(1)(c).
[924] Oda Josefine Børke Selle, 'The Data Breach Notification Obligation in the GDPR: Assessing the Interpretative and Practical Problems Posed by the Obligation' (Master Thesis, University of Oslo, 2020) 20.
[925] Emmanuel Salami, 'Autonomous Transport Vehicles vs The Principle of Data Protection Law: Is Compatibility Really an Impossibility?' (2020) Vol 10(4) International Data Privacy Law 330, 338.

proportionality, that permeate the said Law. It could also mean that a controller and or third party must give due regard and weight to the fundamental rights and freedom when processing personal data. The legal basis of this test can be found in According to Article 6(4) of the Personal Data Protection Law. This Article stated that processing of personal data shall not be subject to the consent referred to in Article 5(1) herein " … if the processing is necessary for the purpose of the legitimate interest of the controller, without prejudice to the rights and interests of the data subject, and provided that no sensitive data is to be processed. Related provisions and controls are set out in the Regulations."[926] The centerpiece of the balancing test within Personal Data Protection Law can be found in 'without prejudice to the rights and interests of the data subject', as illustrated in the above mentioned Article. This test is compulsory, and it should be carefully evaluated. The term 'without prejudice' is a legal mechanism that can be used to limit the impact on personal legal rights and interests. The notion of balancing tests is great, as it aims to balance the rights and interests between the controller party and the data subject.

However, it can be argued that the legal disputes dependent on this test may put the court in a difficult situation. This is because of that striking a balance between the controller rights of interest and data subject rights is difficult and also challenging. In addition, it is not clear how the systemic balancing will be conducted. Therefore, it can be said that this test is formulated in an unclear language. In this context, there is a need to develop guidelines on how to perform balancing tests and also clarify what are the interests that need to be balanced.

[926] Personal Data Protection Law issued pursuant to Royal Decree No. (M/19) dated 16/09/2021, Art 6(4).

Similarly, the balancing tests are regulated by the GDPR. However, it can be said that this test is presented in clear language. The balancing test is introduced in the last part of the GDPR Article 6(1)(f) which provides that " … except where such interests are overridden by the interests or fundamental rights and freedoms of the data subject which require protection of personal data …".[927] According to Ellinor Serine Bryntesen Høgberg, this quote can be interpreted to mean that the controller and or third party must perform a balancing test by taking the principle of proportionality into consideration.[928] The principle of proportionality, in the European Court of Human Rights' words, is inherent in a "... fair balance between the demands of the general interests of the community and the requirements of the protection of the individual's fundamental rights ...".[929] On this basis, it can be said that a fair balance is achieved through the application of the principle of proportionality.[930] According to Article 29 Data Protection Working Party, the balancing test has to be a genuine one and it should not be weighted in favour of the controller or the data subject.[931] Added to this, the word 'genuine' must be understood as a 'reasonable and fair assessment where there is no partiality to either side'.[932] A claim based on the balancing test breached should be assessed on a case-by-case basis to demonstrate whether or not the controller or third party interests are overridden the fundamental rights and freedoms of the data subject.

[927] GDPR, Art 6(1)(f).
[928] Ellinor Serine Bryntesen Høgberg, 'The Balancing of Interests: A Legal Analysis of the Balancing Tests Under Article 6(1)(f) and Article 21 of the GDPR in Relation to Processing of Personal Data Through Video Devices' (Master Thesis, University of Oslo, 2021) 17 – 18.
[929] Martin Curtice, Fareed Bashir, Sanjay Khurmi, Juli Crocombe, Tim Hawkins and Tim Exworthy, 'The Proportionality Principle and what it Means in Practice' (2018) Vol 35(3) Cambridge University Press, 111.
[930] Ibid.
[931] Høgberg (n 928) 18.
[932] Ibid.

However, it might not be easy to assess the balance of interest. This is because of that the interests of the controller and or third party could range from insignificant to compelling, and vice-versa for the data subject.[933] Nevertheless, it has been said that four general assessments should be conducted as a starting point, when carrying out the balancing tests. These assessments aim to assess the controller and or third-party legitimate interest, assessing the impact on the data subjects, assessing the provisional balance, and additional safeguards applied by the controller and or third party in order to prevent any undue impact on the data subjects.[934] When it comes to assessing the impact of processing on the data subject, the controller and or those of the third party should consider to what extent the processing affects the interests, fundamental rights, and freedoms of data subjects in addition to whether or not this processing would cause violations or negative consequences in relation to data subjects rights.[935] The risks of the intrusion of the data subjects' rights have to be evaluated by the controller, and the decisive criterion here is the intensity of intervention for the rights and freedom of the data subjects.[936] The intensity can be defined, *inter alia*, by the types of information that is collected, the scope (information density, spatial, and geographical extent), the number of data subjects concerned, the situation in question, the actual interests of the group of data subjects, alternative means in addition to the nature and scope of the data assessment.[937]

[933] Ellinor Serine Bryntesen Høgberg, 'The Balancing of Interests: A Legal Analysis of the Balancing Tests Under Article 6(1)(f) and Article 21 of the GDPR in Relation to Processing of Personal Data Through Video Devices' (Master Thesis, University of Oslo, 2021) 18.
[934] Ibid.
[935] European Data Protection Board (2019B), Guidelines 3/2019 (10 July 2019), p.11.
[936] Ibid, 12.
[937] Ibid.

In addition, the reasonable expectations of the data subject in the context of the processing of its personal data have to be assessed.[938] The relationship between the data subject and controller and those of third party, concerning systematic monitoring, is vary significantly and could affect what reasonable expectations the data subject may have.[939] The interpretation of the notion of reasonable expectations is not only based on the subjective expectations in question, but rather it can be based on an objective third party if this party could reasonably expect to be subject to monitoring in this certain position.[940] For example, a person in a private garden, living areas, or in examination and treatment rooms is not expecting to be monitored. In the same context, it is not reasonable to expect monitoring in some areas such as sanitary or sauna facilities – monitoring such areas is considered an intense intrusion into the rights of the data subjects.[941] The interests or rights and freedoms of the data subjects will, in most cases likely, override the controller and or those of third-party legitimate interest. In this regard, it can be said that the reasonable expectations of data subjects are that there will be no video surveillance in those areas.[942] These reasonable expectations are in contrast to the reasonable expectations of a customer of a bank that is expected to be monitored inside the bank or by the ATM.[943]

The balancing of rights between data subjects and controller party has to be decided on a case-by-case basis.[944] It is not insufficient referencing abstract situations or even comparing one case

[938] European Data Protection Board (2019B), Guidelines 3/2019 (10 July 2019), p.12.
[939] Ibid.
[940] Ibid.
[941] Ibid, 13.
[942] Ibid.
[943] Ibid.
[944] Ibid ; GDPR, Art 6(1)(f).

to another,[945] assuming that every case is different from the others and also the invasiveness of privacy may differ.[946] While assessing the balancing test is expected to be challenging in some cases, assessing this test will be easy sometimes. For example, filming a person is not legally accepted in principle. However, private car parking utilizes video surveillance at day and night to prevent expected crime, and many people use that parking with no objection.[947] People using that parking may also feel these cameras increase the level of safety and security.[948] Therefore, video surveillance in the car parking might be in the interest of customers for safety and security reasons.

Therefore, it can be said that the balancing test is one of the criteria to establish a legitimate interest. A controller party must pass this test to establish a justifiable legitimate interest in processing data. The hypothetical purpose under consideration, which is safe navigation, may fail against the rights of a person to privacy and data protection. This is because of that the purpose that is intended to be achieved may not necessarily be the same as the rights and freedoms of data subjects. Connected to this, the application of the tree-step test could lead to that the principle of legitimate interest will not be a justifiable legal ground for processing personal data in autonomous intelligent systems through cameras and sensors that are capable of identifying people overboard the autonomous vessels, people on other vessels, or people offshore

[945] EDPB 2019B, Guidelines 3/2019 (10 July 2019), p.12
[946] Ellinor Serine Bryntesen Høgberg, 'The Balancing of Interests: A Legal Analysis of the Balancing Tests Under Article 6(1)(f) and Article 21 of the GDPR in Relation to Processing of Personal Data Through Video Devices' (Master Thesis, University of Oslo, 2021) 19.
[947] Ibid.
[948] Ibid.

(depending on the closeness of said autonomous systems). Thus, it is safe to say that collecting personal data without the knowledge of the data subjects is a challenge to data protection law.

5.8 In Conclusion

The notion of autonomous systems leads to several questions on civil liability and people privacy. With regards to shipowners' liability, these questions center around the liability of collision and damage caused by said systems. Therefore, it should be on the agenda of the specialists of law to clarify who will be liable for collision or damage caused by autonomous systems. This chapter attempts to contribute and examine the regime of vicarious liability, and whether or not this regime covers the risks of autonomous systems. To this end, this chapter started with the legal basis of vicarious liability. It has been found that Article 92 of Commercial Maritime Law is the doctrine of vicarious liability and a legal basis for claim compensation. This Article provides that a shipowner will be vicariously liable for a harmful act of the master, pilot, crew, and others who work in the service of a vessel. Provided that, such a harmful act is a direct consequence of a fault of determined employees within the scope and duties of work. Applying literal and purposive rules of legal text interpretation leads one to conclude that autonomous systems are out of the scope of this Article, without any doubt.

This chapter also finds that Article 92 may be subject to interpretive issues with the development of new technology. The phrase ‘and others who are in service a vessel’ is one of the components of said Article, however, the meaning of this phrase is broad and not clear enough. Arguably, remote control operators can fit under the scope of the meaning of this legal text because they will work in the service of a vessel. This is because of that they work in the service of the vessel.

Therefore, it can be said that the regime of vicarious liability can cover the expected risks of remote control systems. However, an expected issue is how remote control operators' faults would be proven in the event of a collision. It is not clear how to prove the fault of the operators in this regard. It has been said that proof of fault of remote control operators seems to be difficult in some events, and liability for collision is based on fault-based liability that has to be proved. Accordingly, this issue may challenge the application of vicarious liability. Another future issue that has to be addressed is how to evaluate the duty of care of remote control operators. A comment that may be made here is that the doctrine of seamanship cannot be exercised in a very effective way due to expected hardware and or software issues. These issues would be barriers in front of the application of said duty. Therefore, there is a need to develop clear and reachable standards.

When it comes to fully autonomous systems, it is evident that these systems would challenge the regime of vicarious liability. The notion of vicarious liability is that it is a rule of law that imposes liability on employers for the wrongdoing of the employees. In very simple words, an autonomous system is neither a natural person nor a legal person at the current time, according to Articles 3 and 18 of Civil Law. Therefore, the relationship of subordination, which is one of the vicarious liability requirements, does not exist. Connected to this, it can be said that even if intelligent autonomous systems granted personality by specific laws, the test of actual authority is also a very important one justifying the application of vicarious liability. As has been discussed, fully autonomous systems vessels are under the control of an autonomous system, these vessels are not controlled by human beings. Therefore, the requirement of actual authority would not be achieved. On this basis, it can be said that vicarious liability would not be a proper

basis for the intelligent autonomous system vessels' risks due to the lack of subordination and actual authority. An autonomous system could be recognized as a person by a specific law, and this is the discretion of a state. However, a proper basis for covering the expected risks of autonomous system vessels could be a strict liability as long as the regime of vicarious liability is not.

In addition, this chapter found that data protection is not regulated by maritime law while the introduction of autonomous intelligent system vessels may require that. This chapter attempts to bridge this legal gap and argues that the Personal Data Protection Law can be the answer. However, the operation of autonomous intelligent system vessels may challenge several principles of the above mentioned law. For example, said systems rely on cameras and sensors for the operation. These cameras will collect data close to the vessels on shore side or offshore and process it. This collection will be based on no legal grounds if the owner of autonomous intelligent system vessels does not rely on the principle of data subject consent or the principle of legitimate interest. However, it is difficult to get consent from the data subject. It is also difficult to rely on the principle of legitimate interest as a legal basis. This is because of that the controller would not meet the requirements of a doctrine of consent such as a balancing test. This issue needs to be resolved. There might be a need to develop new rules to govern this issue. Alternatively, this issue might be solved if public authority creates mapping and imaging data platforms and allows such companies to subscribe for the purpose of navigation provided that collected data is removed before existing the territorial waters.

CHAPTER SIX

6.0 IN CONCLUSION

This thesis started by observing that the applications of artificial intelligence have been increasing. Autonomous systems vessels, as one of the artificial intelligence applications, might be used in commercial service. This was merely a visionary prediction for the future. The advocates for autonomous system vessels are based on two arguments. The advocates of said vessels argue that autonomous system vessels are, at least, as safe as manned vessels and it will decrease vessels' operational costs. However, these arguments are rooted in technical and economic perspectives, which means that the assessment of these arguments is beyond the scope of this thesis. To clarify, the purpose of presenting the above-mentioned agreements, in this thesis, is to illustrate that there is ongoing debate regarding the introduction of autonomous system vessels in commercial service, from different perspectives. At the beginning of this course, very few studies were available regarding autonomous systems vessels at the international level, and still, there are none discussing the impact of said vessels on Saudi Laws. For this reason, the above-mentioned arguments were used as a pavement or a platform to discuss the notion of autonomous system vessels from a legal perspective. The main question of this thesis is to explore the impact of said vessels on the current regulations. This topic is significant enough, and it can also be said that it is also expansive enough. The significance of this topic lies in its new topic. This chapter will summarize the main expected legal issues that have been explored, discussed, and analyzed in this thesis, as follows.

Chapter One provided a complete roadmap of this research. For example, it introduced the reader to the research issue that has been explored and gave an overview of the research topic, as stated

above. For a justification of this research problem, IMO engagement has been clarified in this regard. The IMO engagement is the primary evidence for this research issue, and it can be said that it is the best available evidence. At its meeting sessions, the IMO took a step to understand the magnitude of the issues that required to be addressed. This is through reviewing regulations under the IMO umbrella and suggesting amendments. The IMO team meetings, in this regard, are still going on. The objective of this research is defined as whether or not autonomous system vessels govern by any legal framework in addition to what extent the current legal framework would constitute legal barriers to the implementation of said vessels and what are the legal gaps. In doing so, this thesis was guided by several questions and these questions will be discussed in the following chapters.

Chapter Two, therefore, attempted to answer the first question that has been put forward by this thesis. This chapter explored the concept of autonomous system vessels and how do these vessels work. The purpose of this question was to generate knowledge about said vessels and to explore how these vessels are different from conventional vessels. This approach is very significant in order to build the legal discussion on a very solid base. Thus, this chapter found that the concept of autonomous system vessels is considered new in the maritime industry, and said vessels are considered one type of artificial intelligence applications. In addition, this chapter found that said vessels are named differently in many different national jurisdictions, such as unmanned vessels, uncrewed surface vessels, self-navigating vessels, intelligent smart marine autonomous surface ships, autonomous system vessels, and also autonomous intelligent system vessels. At an international level, however, the IMO attempted to unify the concept of said vessels. As evidence, the Maritime Safety Committee (MSC) of the International Maritime Organization

(IMO), at MSC 98 in June 2017, described said vessels as Maritime Autonomous Surface Ships (MASS) and defined this concept as " a ship which, to a varying degree, can operate independently of human interaction". Additionally, IMO has determined four degrees of autonomy, as follows:

1. Ship with automated processes and decision support: Seafarers are on board to operate and control shipboard systems and functions. Some operations may be automated.
2. Remotely controlled ship with seafarers on board: The ship is controlled and operated from another location, but seafarers are on board.
3. Remotely controlled ship without seafarers on board: The ship is controlled and operated from another location. There are no seafarers on board.
4. Fully autonomous ship: The operating system of the ship is able to make decisions and determine actions by itself.

The above-mentioned definition is made to facilitate the progress of the purpose of the regulatory scoping exercise. This regulatory scoping exercise was conducted to present the *status quo* (the current state) of the regulatory framework in European inland shipping with regard to autonomous system vessels. In addition, to assess whether or not the identified provisions in an agreed list of the IMO instruments are applicable to said vessels.

The notion of the said vessels, as it has been said, is to reduce operational costs and collisions at sea. This will be done through replacing the on-board human tasks with several on-board systems, artificial intelligent systems, and remote control operators. For example, situational awareness duties will be shifted from onboard crew to proposed situational awareness systems, for safe navigation. To be precise, environmental situation awareness will be gathered through several sensors. These sensors will be used for Radar, Electronic Chart Display and Information, System Automated Identification System, Video and Infrared (IR) Cameras, and also Laser

Imaging Detection and Ranging (LiDAR). These environmental data will be collected and processed by artificial intelligence systems and then, will be sent to remote control operators or onboard autonomous systems to navigate the vessels from one port to another. These data will be sent to remote control operators in remote control centers, if the vessels are in remote control mode, through one or more of the communication capabilities, such as Medium and High Frequency Radio, Cellular Communication, Satellite Communication, and Microwave Communication.

Moreover, it can be said that the remote-control center will lie at the heart of the operation of said vessels. The concept of this center is new in the maritime industry. Its functions are that remote operators located in said center will take vessel management, supervision, and monitoring due to transforming full or part of authority from the shipboard to the said center. Depending on the level of autonomy, said vessels are either controlled by remote control operators or by artificial intelligence. Several projects have been conducted to test the notion of said vessels, such as Maritime Unmanned Navigation through Intelligence in Networks (MUNIN), The Advanced Autonomous Waterborne Applications (AAWA), and *YARA Birkeland.* These projects present the possibility of the operation.

Therefore, it can be said that replacing on-board master and crew with artificial intelligence requires regulatory intervention. Arguably, it can be said that artificial intelligence systems are not governed by one specific law yet, in the Kingdom of Saudi Arabia. However, many private and public sectors have started to invest in and employ artificial intelligence systems. In addition, there is a little news regarding Saudi's experts meetings at national and international level for

regulating artificial intelligence systems, at the current time. This could mean that regulating artificial intelligence systems is expected to be soon, and this is the time to regulate said systems as some countries already established govern the use of the artificial intelligence systems. For example, in March 2024, the European Union Artificial Intelligence Act was established. The purpose of this Act, according to its Article 1(1), is "… to improve the functioning of the internal market and promote the uptake of human-centric and trustworthy artificial intelligence (AI), while ensuring a high level of protection of health, safety, fundamental rights enshrined in the Charter of Fundamental Rights, including democracy, the rule of law and environmental protection, against the harmful effects of artificial intelligence systems (AI systems) in the Union, and to support innovation." Therefore, is an expected opportunity to develop law for artificial intelligence systems in order to govern the use of said vessels and reduce the level of said systems impact.

When it comes to remote control centers, remote control operators, and remote masters, these are new concepts. These concepts were also identified by the IMO teams to be addressed. Therefore, there is a need to bridge the regulatory gaps and regulate the above-mentioned concepts. For example, there is a need for remote master legal definition, legal requirements such master qualifications should be established, in addition to the roles and responsibilities of said master. Remote control centers functions, manning, and technical requirements should be identified. Operating autonomous system vessels without taking identified issues into consideration may lead to uncertainty in the current legal framework.

Chapter Three of this thesis attempted to find whether or not the concept of autonomous system vessels can fit within the scope of the legal definition of a vessel and register into public record accordingly. In other words, whether or not the current legal framework can accommodate said vessels. Therefore, the legal definition of a vessel was the starting point. At international level, an attempt has been made to explore the legal meaning of a 'vessel' in terms of the UNCLOS. The reason is that said Convention is commonly referred to as the 'constitution of the ocean'. It is considered a basic law governing the use of oceans and seas in addition to their resources. This function, therefore, may reflect the importance of said Convention.

However, this research found that the UNCLOS referred to a 'vessel' and a 'ship' interchangeably, but these terms are not defined in this Convention. This Convention defined the warship only. As evidence, Article 29, provides that "… warship means a ship belonging to the armed forces of a state bearing the external marks distinguishing such ships of its nationality, under the command of an officer duly commissioned by the government of the state and whose name appears in the appropriate service list or its equivalent, and manned by crew which under regular armed forces." According to Bernard H. Oxman, the importance of this Article lies in the distinction between applicable rules to warships and those rules that apply to commercial vessels. In other words, the purpose of the abovementioned Article is to differentiate between commercial and non-commercial vessels. Therefore, the meaning of a vessel under the UNCLOS is debatable due to the lack of definition. This required an authoritative interpretation of whether or not autonomous system vessels could fit under the scope of a ship or a vessel in the UNCLOS.

In addition, an attempt has been made to explore the definition of a vessel in the 1972 COLREGs. Exploring the meaning of a vessel in said regulations is important. This is because said regulations are designed to prevent collisions from occurring and therefore, these regulations play an important role in the safety of all vessels by providing international rules and regulations. According to Rule 3(a) of said Regulations, " … the word vessel includes every description of water craft, including non-displacement craft, WIG craft and seaplanes, used or capable of being used as a means of transportation on water …". On this basis, it can be said that the ordinary meaning of a vessel suggests that a vessel is every description 'capable of being as a means of transportation on water'. A reasonable interpretation of this Article is that said Article does not literally include autonomous system vessels and it does not exclude it. However, it requires a vessel to be 'capable of being as a means of transportation on water'. This might be a norm that would determine whether or not an autonomous system vessel falls within the scope of the above mentioned definition. Thus, determining whether or not said vessels are capable of being a means of transportation may be subject to evaluation from technical and legal perspectives for the purpose of safe navigation. For example, it might not be reasonable to consider an autonomous system vessel as a vessel and it falls out of the scope of the legal requirements. In addition, Rule 3(b) of the same Regulations has to be taken into consideration when defining a vessel. This Rule provides that "… the term "power-driven vessel" means any vessel propelled by machinery." According to Toshiyuki Miyoshi, It is not clear whether or not autonomous system vessels can fall within the scope of the 'power-driven vessel and 'vessel propelled by machinery'. Therefore, there is a need for illustrating the boundaries of the above mentioned definition.

At a national level, the legal definition of a vessel under Article 1(5) of Saudi's Commercial Maritime Law has been examined. This Article defined a vessel as " … *any floating craft normally designed to operate in maritime navigation, even if it is not for profit, including vessel appurtenances which are necessary for its operation* …". It might be accepted to say that this definition is formulated too broadly. Thus, it might be subjected to interpretation activities in relation to whether or not autonomous system vessels fit under the scope of this definition. However, it can be said that three elements of vessels definition are structured in Article 1(5). These elements are that a vessel has to be a 'floating craft', and it has to be made for 'navigation' on a 'routine basis'. Nevertheless, these elements are broad enough and said elements might be met by autonomous system vessels if these vessels are not excluded by a special law. Similarly, this thesis found Article 11(1) of the Federal Law, No 26 of 1981 on the Commercial Maritime Law sharing the same approach in defining a vessel. This Article provides that " … a vessel shall mean any structure normally operating, or made for the purpose of operating, in navigation by sea, without regard to its power, tonnage or the purpose for which it sails …". In addition, Section 313(1)(c) of the United Kingdom Merchant Shipping Act defines a vessel as " … every description of vessel used in navigation". Arguably, the aforementioned legal definitions are broad enough. These definitions can be stretched to cover autonomous system vessels if said vessels are not excluded by a special law. However, Article 1 of the Qatari Law took a slightly different approach to defining a vessel. This Article defines a vessel as a "… seaworthy craft that routinely operates in the navigation or made for this purpose …". This Article provides that the vessel has to be made for navigation on a routine basis, and also it must be seaworthy. This means that a vessel must meet seaworthiness requirements to fall within the scope of the legal definition of a vessel. These requirements are rooted in the regime of vessel registration.

When it comes to the registration requirements, Article 94 of UNCLOS was the starting point. This Article laid down some duties that are only perceivable in connection with other international regulations such as the 1966 International Convention on Load Lines, the 1969 International Convention on Tonnage Measurement, the 1972 Convention on the International Regulations for Preventing Collision at Sea, the 1972 International Convention for Safe Containers, the 1974 International Convention for the Safety of Life at Sea and 1988 Protocol, the 1978 International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (revised 1995), the 1979 International Convention on Maritime Search and Rescue, the 1989 International Convention on Salvage. Measures provided in the above-mentioned Regulations have to be met by a vessel.

As evidence, Article 94(1) of the UNCLOS provides that every flag state "… shall effectively exercise its jurisdiction and control in administrative, technical and social matters over flying its flag." For a better understanding, this Article should be read in conjunction with Article 92(1) of the same Convention. Article 92(1) requires that "… ships shall sail under the *flag* of one State only and, save in exceptional cases expressly provided for in international treaties or in this Convention, shall be subject to its *exclusive jurisdiction* on the high seas. A ship may not change its flag during a voyage or while in a port of call, save in the case of a real transfer of ownership or change of registry …". Therefore, it can be said that the above-mentioned Articles provide two obligations. First, a 'vessel should sail under one flag state'. this is because flying a national flag is considered visual evidence of a vessel's nationality and it means that a vessel is registered accordingly. Second, with such a flag a state exercises its exclusive jurisdiction over a vessel on

the high sea. The reason behind this obligation might be to bridge the gap in international law with respect to the sovereignty on the High Sea. Therefore, registering vessels and exercising exclusive jurisdiction is an obligation upon a state. This obligation has been given effect by Article 7(1) of Saudi's Commercial Maritime Law. This Article provides that "… self-propelled vessel must be registered in accordance with the provisions of this Law in order to sail under the flag of the Kingdom. The regulations shall specify the registration requirements and procedures as well as the issuance of the certificate …". Therefore, vessel registration is compulsory according to the above-mentioned Article and the owner of such vessel has to satisfy registration requirements for the purpose of registration.

This thesis also found that flag a state should not go below the minimum international standards for registering a vessel. As evidence, Article 94(5) of the UNCLOS provides that " … each State is required to conform to generally accepted international regulations, procedures and practices …". The reference to 'generally accepted international regulations, procedures, and practices' means the existence of legal rules and principles that should be followed by each flag state. The above-mentioned regulations have been included in many national legislations. For example, Article 7 of the Saudi's Exclusive Regulation for Registration of Vessels and Marine Units provides that a vessel and its registration certificates must be in compliance with the SOLAS and other relevant international regulations. In addition, Article 52(1) of the United Arab Emirates Federal Law and Article 25 of the 1980 Qatari's Amiri Decree No 18 require a vessel to be certified according to the SOLAS and other relevant international regulations for the purpose of registration. Therefore, it can be said that the notion of autonomous system vessels will challenge

many national and international provisions. The operation of said vessels requires amendments to be made on determined provisions or developing a new law for said vessels.

This thesis found also that human look-out on board a vessel will be replaced by new technologies. The notion is that autonomous system vessels will be equipped with 360-degree cameras, among others. These cameras will gather data around a vessel, this data will be processed by artificial intelligence, and then it will be sent to remote control operators through communication tools. However, this development may pose a legal challenge to Rule 5 of COLREGs. This Rule provides that "… every vessel shall at all times maintain a proper look-out by sight and hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision …". Based on this Rule, a proper look-out will be through 'sight' and 'hearing'. It is not clear whether or not this task can be done through technology, Level Three of Autonomous Ships, but it will not be satisfied by autonomous systems vessels. This development challenges the above-mentioned Rule.

In addition, Rule 2(b) has the potential to be viewed as another legal barrier. This Rule provides that "… in construing and complying with these Rules due regard shall be had to all dangers of navigation and collision and to any special circumstances, including the limitations of the vessels involved, which may make a departure from these Rules necessary to avoid immediate danger …". This Rule grants the seafarers a discretion to temporarily deviate from the COGREGs Rules to the expected immediate danger. This action will be based on the realization and visualization of seafarers which might be impossible to be done through algorithm control or acritical

intelligence. Therefore, this Rule may require an amendment because it might be not possible to meet such obligation by autonomous system vessels that will be driven by artificial intelligence.

This thesis found that a vessel has to be manned According to Article 94(3)(b) of the UNCLOS. This Article provides that a flag State must ensure " … the manning of ships, labour conditions, and the training of crews, taking into account the applicable international instruments ...". The plain meaning rule, or the ordinary meaning of this Article language, indicates that a vessel has to be manned. This is an obligation upon the flag state. The aim of this obligation might be to ensure safety at sea. Reading this Article with other applicable international instruments, such as Chapter V of SOLAS, may provide a proper understanding of Article 94(3)(b) of the UNCLOS. For example, Paragraph 1 of Regulation V/14 of the SOLAS provides that every contracting government has to maintain that " … all ships shall be sufficiently and efficiently manned …" in order to ensure the safety of life at sea. In addition, Paragraph 2 of V/14 of SOLAS requires that "… ship shall be provided with an appropriate minimum safe manning document or equivalent issued by the Administration as evidence of the minimum safe manning considered necessary to comply with the provisions of paragraph (1) …". Therefore, this principle of minimum safe manning has to be implemented by a state party.

The above-mentioned obligations have been adopted into many national legislations. For example, Saudi's Code of the Minimum Safe Manning, a vessel has to be manned. Article 9 of this Code, for example, requires that the minimum safe manning for vessels between 500 and 3000 tonnage is (1) Master, (1) Chief Officer, (2) Second Officers, (2) Deck Watch Rating, and

(1) Able Seafarer Deck. Breaching this Code means that the owner of such vessel will incur (30,000) Saudi Riyals as a fine. Therefore, a vessel sailing without the Minimum Safe Manning means that the above mentioned law is breached. It also means that the legality of autonomous system vessels operation is questionable. In this regard, it might be acceptable to recommend an amendment for Article 94(3)(b) of the UNCLOS and Paragraph 2 of V/14 of SOLAS, the Code of Minimum Safe Manning to address the operation of said vessels.

This thesis also found that a vessel has to be in charge of a master. As evidence, Article 94(4)(b) of the UNCLOS provides that " … each ship is 'in the charge' of a master and officers who possess appropriate qualifications, in particular in seamanship, navigation, communications and marine engineering, and that the crew is appropriate in qualification and numbers for the type, size, machinery and equipment of the ship …". This Article requires a flag state to ensure that a vessel is in charge of a master, officer, and crew who possess appropriate qualifications. To address the operation of autonomous system vessels, a vessel master will implement its tasks remotely, and it is suggested to be named a 'remote master'. However, the issue is when a vessel is a fully autonomous system and controlled by artificial intelligence systems, these systems may not fit under the scope of the term of a master. In addition, remote masters may face a legal challenge when it comes to qualifications. Article III of the 1978 International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, for example, provides that " the Convention shall apply to seafarers serving on board seagoing ships entitled to fly the flag of a Party except to those serving on board, namely warship and governmental ono-commercial ships, fishing vessels, pleasure yachts not engaged in trade, wooden ships of primitive build." Therefore, remote masters would fall out of the scope of this Article. On this basis, it might be

acceptable to recommend that there is a need to amend this Article for the operation of autonomous system vessels.

As pointed out above, there are many provisions in national and international laws that may challenge the registration and operation of said vessels. On other words, the abovementioned provisions are considered barriers in front the operation of said vessels. Therefore, there is a need for addressing international regulations by competent authority, the IMO, or developing new instruments for said vessels. Noting, the IMO team identified some rules that may restrict the operation of autonomous vessels and working to address the issue. A state could wait to IMO draft its amendment on the current international regulations and employ it in the national regulations accordingly. Alternatively, each flag state can operate said vessels within the internal waters, and these water rules are subject to a coastal state's discretion. Therefore, it can be said that, if there is a political will to operate said vessels, states can shape the legislation for said vessels to operate in said maritime zone.

Chapter Four of this thesis attempted to explore whether or not autonomous system vessels could enjoy navigational rights. On this basis, this study has examined the internal waters, territorial waters, and also economic exclusive zone regimes. It found that every maritime zone is regulated by specific provisions. Therefore, the operation of said vessels depends on relevant provisions. For example, the internal waters are subject to the principle of sovereignty of a coastal state. As evidence, Article 2(1) of UNCLOS provides that "… the sovereignty of a coastal state extends, beyond its land territory and internal waters …". This is a doctrine in international law illustrating the legal status of internal waters. At a national level, Article 3 of the Statute of

Maritime Delimitation of the Kingdom of Saudi Arabia " the laws and regulations of the kingdom, regulate the movement of ships in its internal waters". Therefore, it can be said that the language used in the above-mentioned Articles indicates that the internal waters are subject to the highest prescriptive legal authority held by a state. This means that entering internal waters from ports or from high seas is subject to coastal state regulations and such a state's discretion. However, a vessel registration certificate is compulsory for a vessel before starts sailing, according to Article 23(1) of implementing Saudi's Exclusive Regulation for Registration of Vessels and Marine Units. To link this paragraph with the previous chapter, one of the registration legal requirements is that a vessel owner has to submit a classification and other registration certificates with a registration application, according to Article 7 of the Saudi's Exclusive Regulation for Registration. These certificates have to be in compliance with the SOLAS and other relevant international regulations. Therefore, it can be said that autonomous system vessels may fail to satisfy the registration requirements. Accordingly, this failure would prevent such a vessel from navigating in internal waters. A recommendation to solve this legal challenge is that there is an opportunity to develop specific legal and technical requirements for the operation of said vessels in Saudi internal waters till the IMO addresses the legal issues under international regulations.

When it comes to territorial waters, this maritime zone is governed by the sovereignty of a coastal state. As evidence, Article 2(1) of the UNCLOS, " … the sovereignty of a coastal State extends, beyond its land territory and internal waters and, in the case of an archipelagic State, its archipelagic waters, to an adjacent belt of sea, described as the territorial sea …". On the basis of this Article, it can be also said that the territorial sea is dominated by the sovereignty of such a

state. However, the extent of a coastal state's sovereignty over the territorial waters is debatable. This is because neither the above mentioned Article nor others in the UNCLOS defined the sovereignty of coastal states. Nevertheless, John E Noyes rightly argues that coastal state sovereignty is limited due to such a state's rights and duties under international law. To be precise, the principle of innocent passage is viewed as one of the restrictions on the sovereignty of a coastal state. However, it is expected that this principle will be challenged with the development of artificial intelligence systems.

To clarify, Article 17 of the UNCLOS provides that " … subject to this Convention, ships of all States, whether coastal or land-locked, enjoy the right of innocent passage through the territorial sea …". The ordinary meaning of this Article is that foreign vessels have a right to enjoy the principle of the right of navigation based on the UNCLOS provisions. However, the principle of innocent passage is not defined in this Convention. Robin Churchill *et al* went further to argue that the UNCLOS lacked any clear meaning of said principle. Nevertheless, Article 19(1) of said Convention illustrates that " passage is innocent so long as it is not prejudicial to the peace, good order, or security of the coastal State …". In addition, Article (19)2 of said Convention determined some of the activities that would render the passage to be non-innocent if these activities are exercised by foreign vessels. These activities are: (a) any threat or use of force against the coastal sovereignty; (b) any exercise with weapons of any kind; (c) collecting information to the prejudice of the security or defence of the coastal state; (d) any act of propaganda to affect the defence or security of the coastal state; (e) the launching, landing, or taking on board of any aircraft; (f) the launching, landing, or taking on board of any military device; (g) the loading or unloading of any commodity, currency or person contrary of the

customs, fiscal, immigration or sanitary laws and regulations of the coastal state; (h) any act of willful and serious pollution; (i) fishing activities; (j) research or survey activities; (k) interference with any system of communication or any other facilities or installations of coastal state; and (l) any other activities not having a direct bearing on passage. A textualism reading of the above mentioned Article indicates that these activities are not exhaustive, which means there are many activities that can render a passage to be non-innocent. On the base of one or more of the above-mentioned Paragraphs, a coastal state may regard the passage of autonomous system vessels as non-innocent. This legal issue requires to be addressed at an international level, by a competent authority.

Additionally, a state that is not in favor of said vessels may also rely on Article 21(4) of the UNCLOS to prevent the passage of said vessels. This Article provides that " … foreign ships exercising the right of innocent passage through the territorial sea shall comply with all such laws and regulations and *all generally accepted international regulations* relating to the prevention of collisions at sea …". In this regard, the 1972 Convention on the International Regulation for Preventing Collision at the Sea can be viewed as one of the most important regulations. As has been discussed previously, human look-out and collision avoidance are required according to Rules 2 and 5 of said Convention. However, these functions will be replaced by new technology and this development will challenge the above-mentioned Rules. On this basis, the principle of the innocent passage will also be challenged.

This thesis also found an exclusive economic zone a claimable maritime zone. This zone is established by the UNCLOS. Specifically, Article 55 of said Convention describes the exclusive

economic zone as " … an area beyond and adjacent to the territorial sea, subject to the specific legal regime established in this Part, under which the rights and jurisdiction of the coastal State and the rights and freedoms of other States are governed by the relevant provisions of this Convention …". In addition, Article 57 of the same Convention provide that the breadth of such zone "… shall not extend beyond 200 nautical miles from the baseline from which the breadth of the territorial sea is measured …". With regard to opposite or adjacent coast states, Article 74(1) of the UNCLOS provides that "… the delimitation of the exclusive economic zone between States with opposite or adjacent coasts shall be effected by agreement on the basis of international law, as referred to in Article 38 of the Statute of the International Court of Justice, in order to achieve an equitable solution …". However, the sovereign rights of coastal states over exclusive economic zones are for "… the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living, of the waters superjacent to the seabed and of the seabed and its subsoil, and with regard to other activities for the economic exploitation and exploration of the zone, such as the production of energy from the water, currents and winds …", and this according to Article 56 of the UNCLOS. Therefore, it can be said that foreign vessels will exercise navigation over said maritime zone on the base of the principle of navigation, and it is not on the basis of the principle of innocent passage.

As evidence, Article 58(1) of the UNCLOS provides that "… all States, whether coastal or land-locked, enjoy, subject to the relevant provisions of this Convention, the 'freedoms referred to in article 87 of navigation and overflight' and of the laying of submarine cables and pipelines, and 'other internationally lawful uses of the sea related to these freedoms', such as those associated with the operation of ships, aircraft and submarine cables and pipelines, and 'compatible with the

other provisions of this Convention …". Nevertheless, this Article clearly indicate that the operation of a vessel in the said zone has to be in 'compatible with the other provisions of this Convention'. This means that the principle of the right of navigation is not left without restrictions. The above mentioned Article requires a vessel to be compatible with other provisions of UNCLOS. Article 211(5), as one of these provisions, provides that "coastal States, for the purpose of enforcement as provided for in section 6, may in respect of their exclusive economic zones adopt laws and regulations for the prevention, reduction and control of pollution from vessels conforming to and giving effect to generally accepted international rules and standards established through the competent international organization or general diplomatic conference …". Therefore, as long as the autonomous system vessels may fall out of the 'generally accepted international rules and standards', it is expected that a coastal state will intervene to prevent the passage of said vessels.

Chapter Five of this thesis attempted to examine the potential impact of artificial intelligence systems on the current liabilities regime. This chapter started with the legal basis of vicarious liability and the discussion was widened after that. Theories of vicarious liability, beyond the legal texts, have been touched. The notion is that humans in many private and public sectors will be replaced by artificial intelligence systems. The functions of humans in said sectors will be shifted to said system. However, this shift is expected to have an impact on the current regulations. For example, Article 92 of Commercial Maritime Law provides that the shipowner will be vicariously liable for a harmful act committed by a 'master', 'crew', 'pilot', or 'others' who are in service of a vessel. Provided that, said employees have committed said act within the

period of duty, and this act caused a tort to others. Literally, this Article did not mention artificial intelligence systems.

This research found that ‘remote master’ and or ‘remote control operators’ could fit under the scope of the term ‘others’ in the above mentioned Article. This is because of that the concept of the term ‘others’ is broad enough and it can be expanded by inclusive reading to include remote masters and operators. It can also cover anyone in the service of a vessel. Provided that a tortious act has been committed by a shipowner’s employee, this requirement is one of the application requirements of a shipowner's vicarious liability. Another requirement is that an employee's fault was committed when an employee was on duty. This means that an employee's fault must be proved. The case will be complicated when a collision is not a direct result of an employee's fault. The notion is that remote control masters and operators rely on environmental situation awareness systems and other technologies that may be a reason behind a collision or damage. Proving software or hardware system faults is not easy. Therefore, this research recommends that the above mentioned point needs to be examined in future research.

This research also found that the issue will be more complicated when it comes to fully autonomous system vessels. These types of vessels will be driven and controlled by artificial intelligence. As this thesis argues, artificial intelligence risks would not be covered by shipowner vicarious liability. According to Article 92 of Commercial Maritime Law, shipowner vicarious liability aims to cover ‘master’, ‘crew’, ‘pilot’, and ‘other’ in service of a vessel negligence or civil wrong. Artificial intelligence, for sure, is not one of the above-mentioned people. An argument that may arise here is that artificial intelligence can fit within the scope of the word

‘others’. Put simply, artificial intelligence will also work in service of a vessel. However, a counter argument is vicarious liability is designed to impose civil liability on a person or entity for employee negligence or faults. The application of this liability requires the element of subordination to be met. As a general rule, subordination assumes the employee or worker performs the work under ‘the authority of the employer’. The norm of ‘actual authority’ is also a very important element to demonstrate the relationship between the employer and the employee.

To clarify, vicarious liability is directed to the behavior of employees, and it arises from the negligence of such employees. Therefore, the artificial intelligence systems will fall out of the scope of the above-mentioned Article, as these systems are not controlled by the employer. Another legal issue is that artificial intelligence system lacks personality. Artificial intelligence is neither a natural person nor a legal person. Although granting an artificial intelligence system a legal personality is possible, it can be argued that the regime of vicarious liability will be not an appropriate legal basis for covering the artificial intelligence expected risks, and this is a legal gap in the current liability regime. This thesis, therefore, recommends that strict liability would be an appropriate legal source to cover the expected risks of artificial intelligence systems.

Moreover, this thesis also found that maritime law does not regulate data protection. This legal gap should be bridged before the operation of said vessels. Arguably, personal data, in the maritime field, is regulated by the 2023 Personal Data Protection Law. According to Article 2(1) of Personal Data Protection Law, this Law will be applied to “ … any Processing of Personal Data related to individuals that takes place in the Kingdom by any means, including the Processing of Personal Data related to individuals residing in the Kingdom by any means from

any party outside the Kingdom …". In addition, Article 1(4) of the same Law described personal data as "… any data, regardless of its source or form, that may lead to identifying an individual specifically, or that may directly or indirectly make it possible to identify an individual, including name, personal identification number, addresses, contact numbers, records, photos, and videos of an individual, and any other data of personal nature …". What is more, Article 11(1) of the Implementing Regulation of the Personal Data Protection Law provides that "… the Controller shall obtain the Data Subject's consent for Processing their Data in any appropriate form or means, including written or verbal consent or by using electronic methods, …". When bringing the case of autonomous system vessels under this Article, the operation of said vessels might be legally problematic. It is not clear how said vessels would comply with the above-mentioned Articles. The notion is that the onboard master and crew will be replaced cameras for environmental situation awareness. These cameras will collect data around the vessel and send it to onboard systems and or remote control operators. Some of this data might belong to the subject and it might be collected without consent from the data subject. This is a legal issue. Collecting and processing data without consent from the data subject can be judged to be unlawful. This issue needs to be addressed before the operation of said vessels. Therefore, it can be said that this thesis highlights a number of expected legal issues that need to be addressed, and these legal issues can be a very legislative priority in the future.

Therefore, it is recommended that a comprehensive legal framework needs to be developed to govern the development of artificial intelligence. It is also recommended that the autonomous system vessels need to be governed by a specific legal framework. This legal framework

includes, for example, the concept of a vessel, safety and security legal requirements. Also, this framework may contain the concept of remote control center, its functions and roles. Remote masters and operators definitions, roles and responsibilities need to be addressed. It might also suitable to wait for the IMO Code of autonomous system vessels that is expected to be published next month. In addition, the issue regarding the strict liability is recommended to address the expected risks.

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