

# BEYOND THE HORIZON

Opportunities and Obstacles  
in the Maritime AI Boom

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# FOREWORD

In an era where technology is reshaping industries at an unprecedented pace, the maritime sector stands on the brink of a transformative revolution. The integration of Artificial Intelligence (AI) into maritime operations is not just a trend; it is a paradigm shift that promises to redefine the future of shipping, logistics, and global trade. This report, commissioned by Lloyd's Register and crafted by Thetius, delves into the dynamic and rapidly evolving landscape of operational AI in the maritime industry.



**MARK WARNER**

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The maritime sector, often perceived as traditional and resistant to change, is now embracing AI with remarkable enthusiasm. This shift is driven by the need for greater operational efficiency, enhanced safety, and a commitment to sustainability. AI technologies are being harnessed to optimise voyages, predict maintenance needs, enhance navigational safety, and manage energy consumption more effectively. The potential benefits are immense, from reducing fuel consumption and emissions to improving the reliability and safety of maritime operations.

One of the most compelling aspects of AI in maritime is its ability to learn and adapt. Unlike traditional technologies that require extensive programming and rigid instructions, AI systems can analyse vast amounts of data, identify patterns, and make informed decisions in real-time. This capability is revolutionising how ships are operated, maintained, and navigated.

However, the journey towards fully realising the potential of AI in maritime is not without challenges. Issues such as data quality, regulatory compliance, and ethical considerations must be addressed to ensure the responsible and effective deployment of AI technologies. This report provides a comprehensive overview of these challenges and offers strategic recommendations for overcoming them.

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As we navigate through this exciting era of technological advancement, it is crucial to foster a culture of collaboration and innovation. The successful integration of AI into maritime operations requires not only cutting-edge technology but also a strategic approach that includes assurance and verification processes to help ensure the reliability and ethical use of AI systems.

This report is a testament to the collaborative efforts of industry stakeholders, researchers, and AI experts who are dedicated to driving the maritime industry towards a smarter, safer, and more sustainable future. It is an invitation to embrace the possibilities that AI offers and to embark on a journey of continuous improvement and innovation.

# INTRODUCTION

In the heart of South Carolina lies BMW's Spartanburg manufacturing plant. Each day 11,000 workers assemble 1,500 vehicles, with the majority exported to 120 countries worldwide. But the plant has a problem. It's a problem that exists across the USA in a range of industries including manufacturing, logistics, and retail.

There are 10 million unfilled jobs in the USA. 70% of them are for essential roles in manufacturing, logistics and retail where staff attrition is high. Recruiting, training and retaining skilled workers at the scale required to maintain production at the Spartanburg plant is a constant battle.

To combat this, BMW has a new worker on probation. They are 5'6" tall, weigh 60KG and can carry 20KG without difficulty. The worker walks

*While robots have existed in the automotive production line for decades, they have always been programmed to do a specific task repetitively to a very high standard.*

at just under 3 mph and can do a full five-hour shift without a break.

The worker is Figure 01. It is a humanoid robot that can walk, talk, carry out tasks and understand the environment around it. It can talk, reason, follow instructions, and critically evaluate its own performance. At the moment, Figure 01 is learning sections of the BMW production line to find out where it can be of most help.

The critical word here is learning. While robots have existed in the automotive production line for decades, they have always been programmed to do a specific task repetitively to a very high standard. It would take many months and sometimes years of R&D to programme the robot to perform the task. It would then be capable of performing only that task.

Figure 01 is different. It is not programmed by humans. It learns. It uses an end-to-end neural network that makes it capable of learning complex tasks. Compared to a human, it's a slow learner. It took Figure 01 about a year to learn to walk. But it can walk. The robot spent around ten hours watching humans and practising to learn how to use an espresso machine. It can now make flawless espressos repeatedly.

At the Spartanburg BMW plant, Figure 01 has learned how to pick car parts out of storage and place them perfectly into the production line. It is a dull, repetitive, but necessary job and based on the current trajectory one that could be replaced by robotics very quickly.

Through our partnership with LR, Thetius has been publishing freely available research on AI in maritime for three years. During this time, the AI maritime market has consistently been fast-moving. But in the last 12 months something has changed.





In step with the rest of the world, the adoption of AI in maritime has gone from fast to supersonic, tripling in a single year.

Thirteen years ago leading venture investor Marc Andreessen coined the phrase “software is eating the world”. That has been proven true, everything from books and music to finance and retail are now driven by software. Today it is becoming increasingly clear that AI is eating software. It is already revolutionising the maritime industry and bringing greater operational efficiency, safety, and more sustainable shipping.

However, the successful integration of AI into maritime operations requires careful planning and consideration. AI technologies must be scalable, flexible, and help rather than hinder people’s skills. AI is a valuable tool, but overreliance on it could limit skill development.

Realising the full potential of AI requires more than just technology: it demands a strategic approach that includes assurance and verification processes to ensure the reliability and ethical use of AI systems.

This report, commissioned by Lloyd's Register (LR) and written by Thetius, explores the current state of operational AI in the shipping industry. It examines the latest trends and developments in AI applications, provides case studies showcasing successful implementations, and discusses critical considerations for achieving a successful return on investment (ROI).

Including the opinions of various industry stakeholders and AI experts, this report aims to answer the following questions:

- ▶ What does AI mean for the maritime industry today?
- ▶ What is the current size and state of the AI operational technology market?
- ▶ What are the emerging trends in the application of AI for ship operations?
- ▶ What are the current challenges and opportunities with AI implementation?
- ▶ How can the industry assure and verify AI for operational use?



# UNPICKING AI

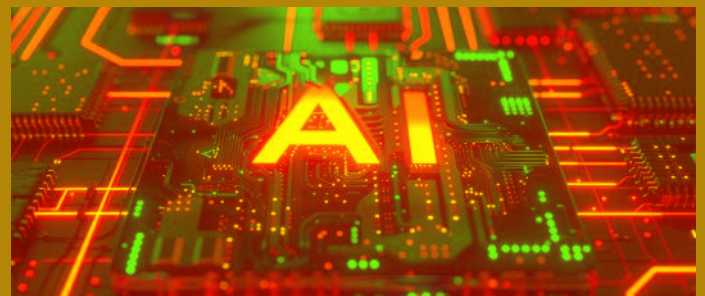
The definition of AI has evolved significantly since the concept was first brought to light in the 1950s when mathematician and computer scientist Alan Turing questioned whether machines could be intelligent.<sup>1</sup>

Since then, there has been widespread discussion and debate on the meaning of AI. In late 2023, the OECD updated its definition to help governments align on the term and ensure they have a foundation for legislating and regulating the use of AI, which in turn allows for interoperability across jurisdictions. According to OECD, AI refers to machine-based systems that are designed to make predictions, recommendations, or decisions for specific human-defined objectives, integrating both human and machine inputs to influence real or virtual environments.<sup>2</sup>

## NARROW AI VS GENERAL AI

AI can be categorised into two types: **Narrow AI** and **General AI**. Narrow AI (also known as Weak AI) is designed and trained to complete a specific task without human interference. This means that knowledge gained from performing that task will not automatically be applied to other tasks.<sup>3</sup> Apple's Siri and Amazon's Alexa are two of the most well-known Narrow AI systems.

General AI (also known as Strong AI) refers to AI that is designed to understand, learn, and apply knowledge and intelligence to a range of tasks in a similar way that a human being would do. General AI is a theoretical concept. It would require machines to possess the cognitive abilities that rival those of a human being.<sup>4</sup>



## GENERATIVE AI

Generative AI refers to deep-learning models that are capable of learning and generating statistically probable outputs from raw data.<sup>5</sup> According to IBM, generative AI models have been used for many years in statistics but in the last few years advances in deep learning have made it possible for generative AI to analyse images, speech, and other data. Today, generative AI learns from existing data and creates new content based on what it has learned.

One example is Copilot by Microsoft. The generative AI chatbot is hailed as 'your everyday AI companion' by Microsoft and helps users to analyse data, automate repetitive tasks, summarise meeting discussions, generate content and emails or other documents, and has many other features.

Shipping company Wallenius Wilhelmsen recently implemented Copilot to help streamline processes, empower decision making, and cultivate a culture of innovation and inclusion by promoting learning and monitoring progress within the organisation.<sup>6</sup>

1 Harvard University (Aug, 2017) [The history of artificial intelligence](#)

2 OECD (Nov, 2023) [Updates to the OECD's definition of an AI system explained](#)

3 Techopedia (Oct, 2023) [Narrow artificial intelligence](#)

4 McKinsey & Company (Mar, 2024) [What is artificial general intelligence \(AGI\)?](#)

5 IBM (accessed Jul, 2024) [What is generative AI?](#)

6 Microsoft (Jul, 2024) [AI at the helm: How Wallenius Wilhelmsen's adoption of Viva and Copilot is shaping its future](#)

*Artificial intelligence is a broad term and at large it is used to describe the interaction of a range of technologies that enable a computer system to learn like a human.*

## LARGE LANGUAGE MODELS

One subset of AI that has received widespread attention within the last few years is the large language model (LLM). LLMs describe specific applications within the broader field of AI. They make use of deep learning techniques to process and generate language and represent advancements in Natural Language Processing (NLP), a crucial branch of AI dedicated to the interaction between computers and human language.

LLMs can be trained to understand the fine details of huge data sets. In shipping, this means that they can be deployed to navigate complex documents and extract critical details to optimise deliveries, reducing manual labour and the risk of human error.

One of the most well-known LLMs is ChatGPT. The platform first launched in November 2022 but has advanced. The latest version is ChatGPT 4.0, which is capable of analysing large sets of data and creating new content, including audio, video, and images.

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In May 2024, OpenAI, the developer behind ChatGPT, went one step further. In a series of videos posted by OpenAI, ChatGPT is shown to act as a real-time translator,<sup>7</sup> solve complex maths problems,<sup>8</sup> and even helps someone prepare for an interview.<sup>9</sup> In another video, two GPTs were video interacting and singing to one another.<sup>10</sup>

In the last few years, it's clear to see that the shipping industry is exploring the use of LLMs to optimise operations. K Line is one example. The shipping company is one of many using ChatGPT to streamline employee operations and encourage the utilisation of new technologies among its staff. Another example is Maersk. The container giant is using AI-enabled robotics in its UK warehouse to triple sorting speed and increase inventory pickup efficiency by a reported 33%.<sup>11</sup>

7 OpenAI (May, 2024) [Real-time translation with GPT-4o](#)

8 OpenAI (May, 2024) [Maths problems with GPT-4o](#)

9 OpenAI (May, 2024) [OpenAI GPT-4o - Interview preparation](#)

10 OpenAI (May, 2024) [Two GPT-4os interacting and singing](#)

11 AI Expert Network (Aug, 2023) [Case Study: Maersk's innovative use of AI in global shipping](#)

# THE AI BOOM AND THE TRIPLING TECH MARKET

In the last few years the AI market has boomed, which owes its legacy to the gaming industry.

To support increasingly complex and realistic graphics, chip designers created the graphics processing unit (GPU). These chips were capable of carrying out a huge number of calculations in parallel, making it possible to power consoles like Xbox and Playstation. In the early 2020s, when AI researchers were looking for viable ways to replicate the power of the human brain, they started using these gaming chips. Nvidia, the most prominent GPU chip manufacturer, had a market cap of \$150bn at the beginning of 2020. Today, driven by demand for AI applications, Nvidia's market cap hovers around \$3 trillion and it is one of the world's most valuable companies.<sup>12</sup>

The integration of AI into the maritime market has also witnessed impressive growth. Thetius data suggests that in the last 12 months alone, the maritime AI technology market has nearly tripled.

2024 research estimates that the AI market is worth a staggering US \$4.13 billion with a 5-year Compound Annual Growth Rate (CAGR) of 23%.<sup>13</sup> Compared with Thetius' research from 2023, which estimated it to be worth US \$1.47 billion with a 5-year CAGR of 22%,<sup>14</sup> it's clear to see that the value of the maritime AI technology market is rapidly rising.

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This data was produced by Thetius IQ, a database that tracks the movement of more than 4,000 maritime organisations.

Through 604 market updates logged by Thetius IQ within the last 12 months,<sup>15</sup> 420 organisations have been involved in developing, selling, buying, or investing in AI technologies within the maritime industry. In 2023, Thetius IQ tracked only 276 organisations, suggesting a growth in AI-based solutions from maritime stakeholders.

It's also worth pointing to a 2020 paper<sup>16</sup> on AI that shows a sharp increase in studies relating to big data and AI in the maritime industry. The bibliometric review found that since 2014, there has been a rapid rise in maritime AI research and an exponential growth of publications around these topics, pointing to a growing interest in these domains.

<sup>12</sup> Financial Times (Jul, 2024) [Nvidia could reach \\$50tn market cap in a decade, says top tech investor](#)

<sup>13</sup> Thetius IQ

<sup>14</sup> Thetius and LR (Apr, 2023) [Out of the Box](#)

<sup>15</sup> Between July 2023 and June 2024

<sup>16</sup> Munim, Z H et al. (Jul, 2020) [Big data and artificial intelligence in the maritime industry: a bibliometric review and future research directions](#)

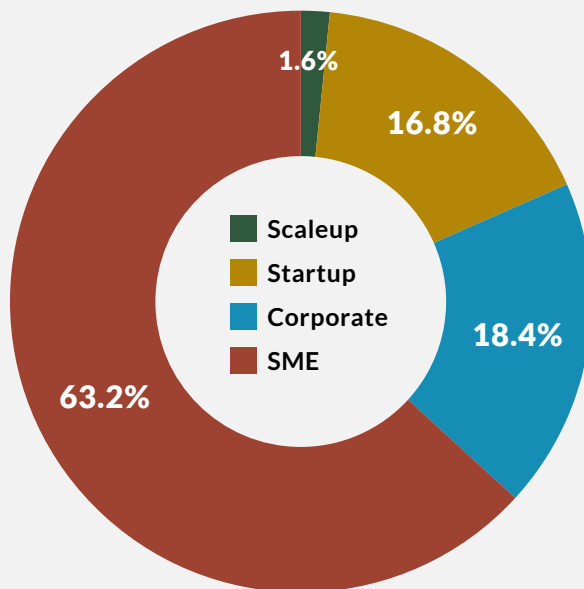


# MARKET OVERVIEW: WHO'S DOING WHAT?

## BUYERS AND SUPPLIERS

Thetius IQ<sup>17</sup> has captured 125 companies involved in supplying AI technologies within the last 12 months and 36 shipping companies that have announced the purchase or plans to deploy AI-enabled technologies.

AI Suppliers by Type



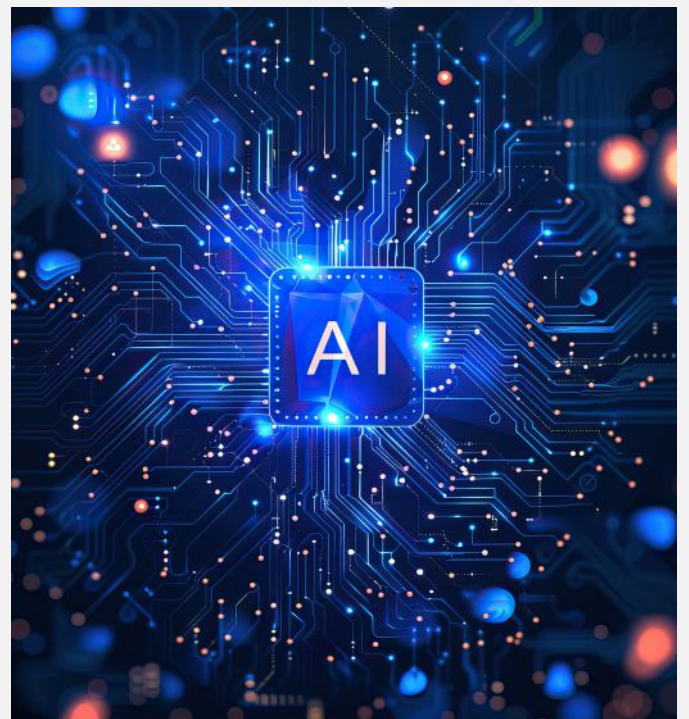
Thetius IQ data suggests that 63% of organisations recorded in our database that are supplying AI technologies are SMEs, while 18% are corporates and nearly 17% are startups.

Compared to Thetius' data from 2022-2023, the percentage of startups in the AI tech sector has increased by 5%,<sup>18</sup> indicating a slight growth in the number of new companies entering this field. The percentage of SMEs has grown 2% since our 2022-2023 research.

The growth in SMEs and startups supplying AI technologies since the 2022-2023

research is unsurprising. This rise aligns with the industry's increasing demand for energy-efficient and safe operations. Regulatory pressure and the desire from shipping lines to reduce their emissions and maintain competitive advantage present a huge opportunity for startups and SME technology providers to bring new and innovative solutions to the market.

Several factors contribute to the small rise in SMEs. Thanks to their size, SMEs are often agile and able to adapt in line with changing market conditions. Warwick Business School suggests that SMEs are not large enough to be impacted by corporate bureaucracy but possess the resources to innovate quickly.<sup>19</sup> Moreover, SMEs often specialise in niche markets or applications of AI, allowing them to offer tailored and customised solutions to meet specific needs. For example, Dutch company AI in Motion has developed AI-enabled solutions that help OEMs build mobile robotics. It's a unique company,



<sup>17</sup> Please note that this data includes records captured by the Thetius IQ database. There may be other shipping companies that have not announced AI technology purchases and therefore will not be included within this data set.

<sup>18</sup> Based on [Out of the Box](#) data, a previous report produced by Thetius and LR which showed that startups accounted for 12% of the companies supplying AI technologies.

<sup>19</sup> Warwick Business School (Oct, 2023) [How can an SME out-innovate bigger companies?](#)



offering solutions that target the specific issue of human detection and collision avoidance.

SMEs also tend to partner with larger organisations or research institutions to grow and develop their solutions with sufficient financial backing and advice from experts in the field.

Interestingly, Thetius IQ data shows more technology companies pursuing AI than end users. This could indicate that while there is a generous hype for AI, the appetite from buyers has not yet peaked. Furthermore, a recent poll undertaken by Thetius involving several key shipping companies<sup>20</sup> on the understanding and engagement of new technologies showed that AI was not a top priority for many. Instead, there was a greater focus on vessel performance software, technical management software, and the Internet of Things, while cyber security, vessel performance software, safety technology, process automation, and alternative fuels were identified as top priorities for engagement.

This suggests that shipping companies are less engaged with AI compared to technology stakeholders.

## INVESTMENT AND FUNDING

Thetius data shows that in the last year, funding and investment from venture capital firms have been high. Startups and SMEs with fewer resources and a lower budget to develop their technologies tend to benefit heavily from such investment. For example, Israeli SME Orca AI secured US \$23 million in May 2024 following a collaboration with North Standard to further enhance its AI platform that improves voyage safety and efficiency.<sup>21</sup> To date, the solution has reportedly achieved fuel savings of around 3-5% per year and a reduction of over 170,000 tonnes of CO2 emissions.

Outside of startups and SMEs, there have been some major investment rounds secured for solution providers looking to expand their AI reach. One example is the GASS project led by Navtor. At the start of this year, the company secured 44 Million NOK to Propel Sustainable Shipping. Currently, there is a lack of systematic, data-driven solutions to improve energy efficiency onboard ships. This is largely due to the complexity of ship operations and the challenges of processing data, like AIS data, which is often incomplete and unreliable.<sup>22</sup>

<sup>20</sup> The names of the shipping companies have been kept anonymous to ensure confidentiality

<sup>21</sup> FinTech Global (May, 2024) [Orca AI secures \\$23m investment boost after North Standard collaboration](#)

<sup>22</sup> Navtor (Jan, 2024) [AI-project secures 44 Million NOK to propel sustainable shipping](#)



These investments indicate that venture firms are keen to explore the explosion of AI. In fact, a 2024 report by PwC *Sizing the Prize*, predicts that by 2030 AI could contribute \$15.7 trillion to the global economy.<sup>23</sup> VCs can't afford to ignore this opportunity; they must take advantage of the opportunities AI presents.

Interestingly, like last year, government bodies continue to play a minor role in funding AI activities.<sup>24</sup> Other than the UK government's £8 million in funding<sup>25</sup> that will be used to

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support feasibility studies for technologies including self-driving boats and automated systems, we've seen little other funding announcements from governments.

In some cases, governments lack the funding required to support AI initiatives. Moreover, the investment governments make is often simply not enough to enact real change. Governments inject what they feel is a substantial amount of capital into a technology project, but it is unfortunately inadequate to achieve the desired outcome. According to Air Street Press, a venture capital firm investing in AI-first companies, this leads to a funding death zone, where projects receive enough funding to seem expensive, but rarely enough to ensure successful delivery.<sup>26</sup>

In addition, private investors are often driven by the high return on investment (ROI) potential in AI technologies, leading to substantial private-sector funding compared to government funding.

## APPLICATIONS OF AI: USE CASES

In the last 12 months, the maritime media headlines regarding AI point to six key applications. This section explores some of the recent headlines and how AI is being used to optimise ship operations in the following areas:

- ▶ Voyage optimisation
- ▶ Data-driven Condition Based Maintenance (CMB)
- ▶ Autonomous navigation
- ▶ Safety and compliance
- ▶ Energy management
- ▶ Port management

### VOYAGE OPTIMISATION

One example of AI being used to optimise voyages is Ardmore Shipping's deployment of DeepSea Technologies' solution. Following extensive trials in 2023, Ardmore Shipping partnered with DeepSea Technologies in early 2024 to implement Pythia, the company's voyage optimisation tool, across its fleet. According to Ardmore's commercial project manager Ha Eun Ruppelt, the shipping company has been optimising voyages manually for over 10 years, but it was consuming a substantial amount of man hours. "With the advancement of sensors, AI and enhanced onboard internet, we thought there must be a better way to do this."

One major challenge Ardmore faced was the lack of access to real-time performance data for both ships and shore operations. "Data

<sup>23</sup> PwC (Feb, 2024) [Sizing the prize: Global artificial intelligence study: exploiting the AI revolution](#)

<sup>24</sup> Thetius and LR (Apr, 2023) [Out of the Box](#)

<sup>25</sup> UK Government (Apr, 2024) [£8 million funding boost for AI to make boats smarter](#)

<sup>26</sup> Air Street Press (Nov, 2023) [Why does so much government tech investment deliver so little?](#)

that's even an hour old can quickly become irrelevant, making it difficult to assess how current conditions are affecting our voyages. We needed more accurate predictive tools, driven by live data, to improve efficiency and evaluate the profitability of a voyage with both ship and shore teams working together. While certain adjustments might seem profitable, the unpredictable nature of shipping means that any deviation from expectations can significantly impact our bottom line—positively or negatively. This is why real-time feedback is crucial; it allows us to adjust our assumptions as needed and see immediate results, enabling us to fine-tune our voyages more effectively," Ruppelt explained.

The partners have already completed a year-long full-scale trial of the technology on Ardmore vessels, during which time DeepSea and Ardmore worked together to refine a series of algorithms powered by AI-generated vessel behaviour models leveraging Ardmore's historical data to allow an AI approach to be deployed within the context of tramp trade.

According to Ruppelt, it took the company an additional year of market research to determine which vendor to go with for their voyage optimisation. "DeepSea understood our ultimate goal in the voyage optimisation space. Everyone has a different definition of what optimisation looks like but their organisation truly understands where we were headed both in the short term and the long term," Ruppelt told Thetius. "DeepSea took the crucial step of cleaning Ardmore's data before feeding into the system, which was an important part of identifying irregularities and ensuring that the live data being used to optimise voyages was accurate."

Within the last 12 months, German shipping company Hapag Lloyd also launched its own AI-powered Fleet Deployment Optimiser in partnership with Bearing AI with the aim to help customers simulate future emissions and

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instantly compare the efficiency of different vessels across potential schedules.<sup>27</sup>

Eastern Pacific Shipping (EPS) also announced a fleet-wide deployment of DeepSea's "Cassandra Performance Monitoring" platform<sup>28</sup> to monitor its fleet in real-time through AI-generated digital twins of vessel machinery. The ultimate goal is to improve decision-making and reduce fuel consumption.

27 Port Technology International (Oct. 2023) [Bearing AI, Hapag-Lloyd launch AI-powered vessel emissions tracker](#)

28 Smart Maritime Network (May, 2024) [Eastern Pacific Shipping to roll-out DeepSea Technologies platform fleetwide](#)



Other headlines showcasing the interest in AI-powered ship operations include K Line's deployment of ChatGPT<sup>29</sup> and HD Hyundai's launch of the first merchant ship with AI-enabled machinery monitoring and safety systems.<sup>30</sup>

An interesting point to note is that Greek tech company DeepSea is behind many of these partnerships. The firm offers vessel monitoring powered by AI and has more than 300 vessels signed up to one of its platforms.<sup>31</sup> In the last 12 months alone, the firm has secured at least 4 deals with shipping companies and investors.

### The importance of data in AI-based voyage optimisation

Optimising a vessel's voyage based on anticipated weather and sea state conditions can help reduce fuel consumption and emissions.

But one of the biggest challenges shipping companies still face today in voyage optimisation is getting good quality data from the vessel. This is essential to feed accurate AI models.

Daniel Jacobsen, Vice President of Artificial Intelligence at Lloyd's Register OneOcean, explained that AI models can be improved by enhancing the quality of the data that is fed into the model. He believes that companies should spend as much as 80% of their efforts on obtaining better-quality data if they wish to improve their AI model.

One factor that affects voyage optimisation is ocean currents. Determining the currents at each point of the vessel's voyage is important for understanding their impact on vessel speed and therefore fuel consumption and emissions. The challenge at the moment is that AI models are working with noisy data. This means that while the perfect model of the vessel's performance could exist, if it is fed with noisy speed-through-water data, it becomes very difficult to get valuable insight.



One way to mitigate this issue is to increase the quantity of data over time and across vessels to provide higher-resolution data. The other approach is to use more advanced AI models that may show the impact of the current, even if they cannot show the current itself. But building AI models that predict future currents to optimise voyages is very difficult and is an issue that stretches beyond the maritime industry due to the size and expense of the advanced computers that are required.

Another issue Jacobsen pointed to is that some prefer to rely on existing data and are hesitant to enroll a machine learning algorithm or AI to help with the work. The problem with this approach is that a complex issue that plays out in many dimensions will be too difficult for the human brain to work out and make a correct decision. This can become quite dangerous as people make decisions based on inaccurate information. "If you have a really advanced model but it gets bad data because something happened with the sensor, it can give you really bad advice. And if you trust that data, you're making a mistake. People who develop these AI models have to be really skilled and able to build

29 Smart Maritime Network (Oct, 2023) ['K LINE automates laytime statements with AI-powered OCR](#)

30 The Maritime Executive (Aug, 2023) [HD Hyundai delivers bulker designed to operate "without engineer"](#)

31 About DeepSea (accessed Jun, 2024) [Making waves](#)

into the model a system that provides an alert or guardrails to prevent poor quality data being turned into bad advice,” Jacobsen explained.

He suggests that high-quality sensors and a sceptical view of the data are essential. Challenging the data will help to identify inaccuracies, while transparency and honest communication are necessary to avoid making bad decisions based on the assumption that the AI model is always correct.

## DATA-DRIVEN CONDITION BASED MAINTENANCE

AI is commonly used in condition-based maintenance and remote diagnostics. Advanced algorithms analyse data from onboard sensors and predict equipment failures before they occur. In turn, this allows maintenance to be scheduled before the machinery malfunctions, prolonging equipment lifespan and ensuring crew safety. Data-driven condition based maintenance can help to customise maintenance schedules, optimise resource utilisation and reduce operational disruptions.

In June 2024, LR, Nippon Yusen Kabushiki Kaisha (NYK Line) and MTI identified during their joint research that the adoption of data – driven condition based maintenance (DCBM) can significantly impact vessel efficiency and reliability. The study showed that ships that deployed CBM processes saved millions of dollars across various services. For instance, employing CBM to lubrication services resulted in a US \$1 million saving for vessels in service for 10 years. A US \$2 million saving for repairs and another 2 million for docking services were also achieved by vessels using CBM. For vessels that had been in service for 20 years, the OPEX for repair services dropped from US \$10 million to 5 million, showing a substantial long-term financial benefit as a direct result of deploying CBM services.<sup>32</sup>

Another example that highlights the importance of CBM is the application of Kaiko Systems’ vessel

*The collected data is analysed using AI algorithms to identify patterns, predict maintenance needs, and detect potential issues before they escalate.*

condition monitoring software across 18 F. Laeisz vessels. Kaiko Systems has an app-based tool that is used for ship inspections. It uses AI to structure and analyse data collected on board by the crew. This provides insights into the condition of the fleet and identifies potential risks in near real-time. The collected data is analysed using AI algorithms to identify patterns, predict maintenance needs, and detect potential issues before they escalate.

F. Laeisz was looking to improve its maintenance processes. The Kaiko system aims to boost collaboration between teams on land and onboard, ensuring continuous monitoring of the vessels from shore, compared with the previous process of carrying out two to three ship visits per year.

Harald Schlotfeldt, Technical Director at F. Laeisz said in a recent press release that they have high expectations for the new system. “The software must, of course, be state-of-the-art. It must be easy and quick to implement so that the changeover is as simple and convenient as possible for our teams on board and ashore. And it must help us to continuously optimise the condition of our fleet and thus prevent unpleasant surprises during maintenance procedures.”<sup>33</sup>



32 Lloyd’s Register, NYK Line, The Monohakobi Technology Institute (2024) [The benefits and opportunities of data-driven condition-based maintenance](#)

33 Smart Maritime Network (Feb, 2024) [F. Laeisz to deploy Kaiko Systems to improve vessel condition monitoring](#)



## AUTONOMOUS NAVIGATION

AI is commonly used to help support decision-making when it comes to autonomous navigation.

Israeli startup Orca AI applies AI to improve situational awareness and enhance navigation safety. One of its offerings is a fully automated watchkeeper that processes multiple sources of visual information during navigation at sea. It mimics and supports human watchkeeping in real-time. The company has worked with shipping lines MSC, NYK, Maersk, and Seaspans and has cited a 33% reduction in close encounters and 40% reduction in crossing events across 15 million nautical miles thanks to its technology.<sup>34</sup>

The company has already secured significant funding to develop its technologies. In May 2024, it announced an additional \$23 million, led by OCV Partners and Mizmaa Ventures, bringing its total to nearly \$40 million.

## ENERGY MANAGEMENT

AI is being increasingly applied to ship operations to target fuel savings. Fuel consumption can be reduced by making minor changes in the operation of the vessel, but you need the data and the insight to know when and what to do. AI can help. One example is MMSL, the shipowning arm of Marubeni, which saved a reported \$86,000 in fuel in a single year on just one vessel by giving watchkeepers a tool to help identify approaching vessels sooner.<sup>35</sup> According to an article by TradeWinds, the Managing Director of MMSL admitted that the company has been slow to adopt digitalisation and decarbonisation tools, but, since being pushed to invest in modern technologies, it has seen some positive results.

## SAFETY & COMPLIANCE

AI can be used to make decisions that help ensure safe and compliant operation of the vessel. One example is Berlin-based startup Sealenic, which is bringing an exciting new concept



to the industry. The company has developed a maritime AI decision-support platform that quickly answers questions a seafarer or ashore team member might have, eliminating the need for them to search through documents to find the right answer. The tool prioritises all data and information specific to that company, as well as public knowledge (such as BIMCO, IMO, EU and State law data) and generates quick, reliable and compliant answers to questions, helping crew make efficient data-based decisions.

The assistant cuts out the noise and large volumes of data and provides concise and targeted information that the user is looking for. For example, a seafarer may wish to find out how often and how they should calibrate the gas analysers. Instead of searching through documents and trying to find the answer, the user can simply ask the assistant. The tool will provide the answer and the source of the information, (for example, 'Company Manual, Chapter 4, Paragraph 14) allowing the seafarer to rapidly find the original source for further information.

Paramvir Singh, Co-founder and MD of Sealenic explained to Thetius that the idea for the solution arose after seeing how difficult it was for seafarers to make sense of the enormous quantity of data,

34 Orca AI (May, 2024) [Orca AI raises \\$23 million to propel autonomous shipping](#)

35 TradeWinds (Apr, 2024) [Slow to digitalise, quick to save \\$86,000: Why Marubeni has an eye for fleet digitalisation](#)

documents and ever-changing regulations they have to deal with. “Crew members and technical teams have a huge amount of information presented in various ways and they have to search through all of this to find the answer to a specific question. You cannot really process this data in the time you need to.” Sealenic is a tool that consolidates a knowledge layer of the company, allowing the end user to ask any question that relates to their company.

Singh explained that there is a robust verification system built into the system. Answers are always provided with references, enabling the user to visit the original source to ensure accuracy, as well as a confidence score and quick email feature to double check an answer with your superior. “This means that even if we can’t give a seafarer the exact answer they are looking for, we can still give them the correct document,” Singh confirmed. As a result, the time a seafarer spends searching for the correct document is reduced from hours to minutes.

Billel Ridelle, Sealenic Co-Founder added that the more often the solution is used, the more it learns. “It’s been developed in a way that captures and generates knowledge through

*The AI decision-support platform cuts out the noise and large volumes of data and provides concise and targeted information that the user is looking for.*

usage. As soon as you start asking questions, it starts developing more tags and more algorithms around how it should answer or present the data. It becomes increasingly tailored to your needs as an employee and as a company to the point where it’s capable of bringing a huge amount of value.”

The startup was launched earlier this year by Berlin-based venture studio Flagship Founders. It has already secured the support of four shipping companies, including: Reederei F. Laeisz, Fairplay Towage Group, Harren Ship Management, and one undisclosed company. The AI decision-support platform is currently being trialled by these shipping lines and is due for commercial launch in summer 2024.

## PORT MANAGEMENT

Efficient cargo handling in ports is crucial to the seamless transfer of goods, allowing vessels to arrive and depart ports in a timely manner. A survey conducted by Navis in 2021 found that 76% of terminal operators were keen to reduce waiting times for trucks and vessels in port to reduce fuel consumption and emissions. 61% were keen to prioritise the efficiency of container handling in the yard.<sup>36</sup>

Three years later and it’s clear that ports are still facing operational delays and increased maintenance costs<sup>37</sup> as a result of unexpected equipment failures. Even a minor disruption to one part of the supply chain can have a huge knock-on effect. While port workers may be aware of delays, they often lack the time or information to address them. By providing this information to an AI platform, supply chain adjustments can be made to mitigate disruptions.<sup>38</sup>

SparkCognition, a Californian analytics software company, uses AI and machine learning to integrate data from various sources and provide ‘what-if’ scenarios. Manually processing this data would take hours and lead to inaccuracies, making it difficult to determine the best option. The software predicts the logistical and financial impact of various scenarios, such as rerouting a vessel or docking at an unscheduled port, and allows end users to rapidly respond to changing operational conditions and optimise fleet schedules.

Another example is the Port of Rotterdam. The port has deployed PortXchange’s Synchronizer platform, which uses AI and machine learning

<sup>36</sup> Port Technology International (Nov, 2021) [Navis finds terminals are prioritising sustainability initiatives](#)

<sup>37</sup> Thetius (May, 2024) [Gateways of Tomorrow](#)

<sup>38</sup> Bouari, M (2018) [Automation and AI: Ports of the future](#)



to predict potential bottlenecks or port call delays. It connects shipping companies, agents, terminals, and other service providers by facilitating real-time data exchange concerning port calls, providing the opportunity for all involved to plan around the changes.

A pilot programme of the tool resulted in a 20% reduction in waiting times, reducing vessel idle

time and facilitating a faster turnaround for optimal port infrastructure and resource allocation.<sup>39</sup>

In another example, the CommTrac bulk terminal operating system from the TBA Group was recently integrated with Awake. AI's predictive vessel ETA technology to help port operators reduce vessel waiting times and optimise turnaround.<sup>40</sup>

## CASE STUDY: A pilot to optimise port visits for ships

Safetytech Accelerator, in collaboration with Algeciras Bay Port Authority (APBA), conducted a pilot project using Awake.AI's predictive technology to address significant inefficiencies in port operations. This was part of its Waypoint programme, which has been launched to help maritime operators solve pressing safety, risk and efficiency challenges with cutting edge technologies.

The pilot focused on addressing inefficiencies in the current Estimated Time of Arrival (ETA) prediction processes. Inaccurate ETAs can lead to prolonged waiting times for ships, which not only disrupts port operations but also results in higher fuel consumption and increased CO2 emissions. The challenge was to create a system that could offer more accurate and timely predictions, thereby optimising the entire port call process.

To achieve this, Awake.AI's platform was integrated with APBA's existing systems. The platform utilised AI and machine learning algorithms to analyse a variety of data sources, including real-time weather updates, vessel movement data, and port operational metrics. This integration provided enhanced situational awareness and allowed for better coordination among the various stakeholders involved in port operations.

The results of the pilot were promising. The 7% improved accuracy of ETA predictions achieved led to more efficient port operations, reducing the idle time of vessels. This optimisation not only helped in minimising operational delays but also contributed to reducing fuel consumption and lowering emissions—a crucial step towards more sustainable port operations.

This pilot demonstrated the potential benefits of leveraging advanced data analytics and AI to drive improvements in maritime logistics, which can lead to significant operational and environmental benefits.<sup>42</sup>

39 Port of Rotterdam (accessed Jul, 2024) [PortXchange Synchronizer](#)

40 Smart Maritime Network (Jun, 2024) [Awake.AI integrated into CommTrac bulk terminal operating system](#)

41 Safetytech Accelerator (Jun, 2024) [Case study: A pilot to optimise port visits for ships](#)

# CHALLENGES AND OPPORTUNITIES

AI has the potential to deliver significant benefits to the maritime industry, but several challenges must be overcome to fully unlock its capabilities.

- ▶ Data suitability and maturity
- ▶ Data consent
- ▶ Trust, transparency, and user acceptance
- ▶ Regulation
- ▶ Ethical concerns

## DATA SUITABILITY AND MATURITY

Data is fuel for AI algorithms. Without access high-quality and mature data, AI systems cannot learn, adapt, provide insights, and make decisions. But one of the biggest challenges for AI platforms is the lack of suitable data to train the systems.<sup>42</sup>

Consider autonomous driving as an example. If the data available to an AI model is not of high quality, the model may struggle to distinguish between similar objects, such as trees and people.

According to Dr. Hideyuki Ando, Director of MTI Co. Ltd, accurate and reliable data is critical for autonomous operations.

"Autonomous vessels are complex human-machine systems consisting of advanced automatic control systems, crews, and shore-based operators. It is extremely important to ensure the safety of the system during the design, development, construction, and operation of autonomous ships," he noted.

*If the data available to the AI model is not of a high enough quality, the model may be unable to learn and determine the difference between similar objects, such as trees and people.*

"Data quality control is extremely important. We have implemented DQMS (Data Quality Management System) in the use of ship IoT data for engine system anomaly detection and CBM, and we believe that utilising the knowledge gained so far will be extremely important in the future implementation of autonomous ships," he added.

This means that data must be optimised as well as the neural networks that are used to detect and identify objects.<sup>43</sup> With autonomous cars, this is crucial in preventing collisions with all objects, especially pedestrians.

According to Shogo Yamada, Chief Engineer and Deputy General Manager of the Marine Group at NYK Line, data maturity in the context of autonomous shipping can be assessed through two key indicators. "First, the ability to consistently acquire clean, timely, and granular data without gaps, delays, or sensor anomalies.

<sup>42</sup> Gauerhof, L (Apr, 2021) [Assuring safety of artificial intelligence](#)

<sup>43</sup> Gauerhof, L (Apr, 2021) [Assuring safety of artificial intelligence](#)



Second, the strategic investment in collecting data that has long been recognised as valuable but was previously unattainable due to cost constraints."

He says that this involves investing in the necessary sensors and infrastructure to capture that data. "When these foundational elements are in place, the benefits are twofold. End-users can reliably monitor vessel performance using high-quality data, ensuring safer and more efficient operations. Simultaneously, developers can leverage this robust data to create more sophisticated monitoring algorithms, driving advancements in autonomous technology."

Yamada explained that in this regard, data quality becomes the cornerstone of the entire data utilisation process. Without it, the potential of autonomous systems cannot be fully realised.

"High-quality, reliable data not only supports the present operational needs but also enables the future development of more advanced autonomous systems. As the industry progresses, investing in data quality will be a decisive factor in achieving true autonomy in shipping," Yamada noted.

The other issue tied to data suitability is the lack of standardisation. In other industries there is access to large quantities of standardised data sets, enabling stakeholders to work with huge volumes of data. But in the maritime sector there is some concern that the capability of machine learning will be limited without standardised data sets.

## THE DATA CONSENT CRISIS

General-purpose and multi-modal AI systems are built on large quantities of public data, but today there is an emerging crisis in data consent. This means that there is a growing risk that AI platforms will face restrictions in getting access to the data they require to learn, develop, and make increasingly advanced decisions.

A recent study by MIT, which looked at 14,000 web domains, found that online platform owners are taking steps to prevent their data from being used by others.<sup>44</sup> Across three common data sets, C4, RefinedWeb, and Dolma, 5% of all the data and 25% of data from critical domains has been restricted.

Companies like OpenAI and Microsoft are now facing legal ramifications for copyright infringement. Twitter and at least eight US newspapers have announced plans to sue OpenAI and Microsoft for taking content from their news articles without permission or payment in order to train their AI chatbots.<sup>45</sup>

The other concern for those that develop or own large datasets and share with third parties, is the risk of their data being used to train a model their competitor might have access to. This could increase the importance of exclusively licensed datasets and proprietary data.<sup>46,47</sup>

In the shipping industry, data lakes are increasingly being used by owners and operators to manage and increase the value of their data. A data lake houses clean and verified historical and live data, which can be accessed by algorithms running prediction programmes.<sup>48</sup> This allows shipping companies to store, explore and search their data for insights.

However, what happens when a large ship owner allows an AI model access to its data lake and this same model is used by a competitor? The AI

44 Longpre, S et al., (Jul, 2024) [Consent in crisis: The rapid decline of the AI data commons](#)

45 The Guardian (Apr, 2024) [Eight US newspapers sue OpenAI and Microsoft for copyright infringement](#)

46 Martens, B (Apr, 2024) [Economic arguments in favour of reducing copyright protection for generative AI inputs and outputs](#), working paper, 09/2024, Bruegel

47 OECD (May, 2024) [Artificial intelligence, data and competition](#), OECD artificial intelligence papers

48 Riviera (Jun, 2022) [Exploiting the 'data lake' of shipping intelligence](#)

model could have taken information from the data lake, used it to learn and develop, and provided even better outputs to another shipowner. A data lake could cost thousands or even millions, depending on its features and complexity.<sup>49</sup> Securing data lakes and implementing safeguards to manage data securely, efficiently, and in compliance with regulations are crucial to prevent a shipowner from losing their competitive edge.

## TRUST, TRANSPARENCY, AND USER ACCEPTANCE

No matter how intelligent a technology is, would you trust it to perform a critical procedure without having some insight into its decision-making process?

The perception of advanced digital technologies such as AI plays a crucial role in their acceptance and adoption. A 2023 paper that reviewed 60 studies on user acceptance of AI found that trust in AI was one of several factors affecting user acceptance.<sup>50</sup> Another study in 2022 showed that transparency around the performance of a technology is closely linked to user trust, which in turn is a hindrance to the delegation of tasks or decisions to an intelligent system.<sup>51</sup>

For a technology that is capable of replacing some human tasks, users must be able to understand its decision-making process. One of the barriers to AI's further growth and adoption is the lack of trust in it.

One train of thought by founder and director of the Oxford University Centre for Corporate Reputation Rupert Younger believes that while AI is a technology, it should also be viewed as a stakeholder<sup>52</sup> to help foster transparency and trust between humans and machines. After all, it is capable of creating content and making decisions just as a human does, so why not engage with it in the same way? In a



recent article by Younger, he explained that stakeholders using AI should collaborate with AI algorithm developers to understand and help shape the work the algorithm is doing. This means that users of AI will benefit from greater transparency on the AI's decision-making, while retaining some agency over the technology and therefore be able to place greater trust in it in the long run.

Thetius spoke with Stena Line's digital engineering manager Michael Ljunge about the interaction between humans and machines after it was revealed in the media that one of the biggest challenges they faced when implementing AI was "ensuring that everyone on board understands how the system works." The company rolled out its in-house voyage optimisation tool under the initial name Captain's AI but soon changed it to avoid misconceptions that AI would replace human decision-making. "AI is so hyped and

49 Cloudwick (Nov, 2022) [How much does it cost to build and manage a data lake?](#)

50 Kelly, S et al. (Feb, 2023) [What factors contribute to the acceptance of artificial intelligence? A systematic review](#), *Telematics and Informatics*, Vol 77, 101925

51 Wanner A et al. (Oct, 2022) [The effect of transparency and trust on intelligent system acceptance: Evidence from a user-based study](#), Vol 32, p.2079-2102

52 Younger, R (Apr, 2024) [AI is not just a technology, it has become a stakeholder](#)



a lot of people don't actually know what it means and immediately worry it's going to replace their jobs," Ljunge told us. "Instead, the technology is now presented as an intelligent assistant that supports the captain's and crew's decisions, which has helped to integrate the AI system in a more natural way and as a tool that complements human expertise and experience."<sup>53</sup>

*One of the greatest values of AI is that it can identify patterns and trends not visible to the human eye and make predictions based on this data.*

## ETHICAL CONSIDERATIONS

Many of us are now accustomed to signing GDPR forms and consenting to the sharing of our data, but AI introduces new privacy concerns. Current regulations around AI still have gaps, and AI systems may perform activities that legislators have not yet addressed. AI developers must proactively assess the ethical implications of their systems and take steps to mitigate potential risks.

One of the greatest values of AI is that it can identify patterns and trends not visible to the human eye and make predictions based on this data. Fitness trackers are a good example. They take personal information from an individual and create a fitness summary based on these data. This information is now available and could be shared or used elsewhere. According to the Office of the Victorian Information Commissioner, this means that information used by AI may "extend beyond what was originally knowingly disclosed by an individual."<sup>54</sup> As more and more data becomes available and the technology for processing it increases, it may become ever more difficult to determine whether this data is personal or confidential.<sup>55</sup>

## REGULATORY UNCERTAINTY

Regulation on AI is evolving unpredictably and not uniformly across jurisdictions.

According to Daniel Jacobsen, Vice President of Artificial Intelligence, Lloyd's Register OneOcean, this makes it harder to develop solutions, especially for smaller organisations as these are less well equipped to deal with the legal complexities.

In December last year, the European Parliament and European Council reached a provisional agreement on an EU Artificial Intelligence Act (AI Act). It is believed to be the world's first-ever comprehensive legal framework on AI.<sup>56</sup> This is an important move as the regulation will prohibit AI systems that pose an "unacceptable risk" from being deployed in the EU. It also might lead to the categorisation of AI systems as "high risk" or "limited risk". The idea is to reduce the risk of AI technologies being used unethically or with malicious intent. High-risk systems could include critical infrastructure, which may bring additional requirements for suppliers of maritime technology. They will need to ensure they have the necessary technical documentation to provide users with clear instructions on the use of the AI system.<sup>57</sup>

<sup>53</sup> Marine Log (Jun, 2024) [Stena Line implements AI for voyage optimisation](#)

<sup>54</sup> Office of the Victorian Information Commissioner (Aug, 2018) [Artificial Intelligence and privacy – issues and challenges](#)

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<sup>56</sup> Mayer Brown (Dec, 2023) [EU AI Act: European Parliament and council reach agreement](#)

<sup>57</sup> Reed Smith (Oct, 2022) [Transparency in shipping – Is artificial intelligence the future for the shipping industry?](#)

# ASSURING AI

## WHAT IS ASSURANCE?

The global flow of goods and materials is made possible by the trillion dollar shipping industry. With 11 billion tons of cargo transported by ship each year,<sup>58</sup> responsible, safe, and reliable practices are essential. Assurance is necessary to reduce risk and ensure shipping companies operate safe, reliable, and compliant vessels.

*In the shipping sector, one example is the manipulation of Automatic Identification System (AIS) data, which is heavily used for maritime situational awareness.*

## WHY DO WE NEED TO ASSURE AND VERIFY AI?

With the increasing efforts around autonomous operations, the assurance of AI systems is critical. An AI system may deviate from its intended functionality due to unpredictable environmental conditions, or because the machine learning that is used to understand the autonomous vehicles environment has been unable to make sense of the data. Assurance is fundamental in providing clarity and confidence for end users when

navigating new technologies that have little user experience. This is ultimately crucial for their broader adoption.

Another aspect around AI is how we can ensure its ethical use as it becomes increasingly integrated into everyday life.

There is a growing number of cyber criminals at play that use AI to manipulate and falsify data. In shipping, AI-generated content poses a risk of being used to create forged documents, such as cargo manifests, certificates of origin, or safety inspection reports. Another example is the manipulation of sensor data that can be used to tamper with ship systems. Generative AI could be exploited to alter sensor data transmitted by ship systems, enabling attackers to falsify or manipulate readings related to navigation, weather conditions, or cargo status. This could mislead ship operators or automated systems, potentially resulting in incorrect decisions or unsafe navigation.<sup>59</sup>

For example, in December 2019, a spoofing event between the Italian island Elba and the French island Corsica proved how easy it was to fake maritime AIS data and generate incorrect position information.<sup>60</sup> Thousands of AIS streams were received and assumed to be Dutch-flagged naval units. But closer investigation revealed the signals were fake. This type of incident poses a severe threat to the safety of navigation as other vessels may change course to avoid collision with non-existent hazards.

This type of incident highlights how relatively simple it is for maritime AIS to be hacked and inaccurate position information to be generated as a result.

58 ICS (accessed Jun, 2024) [Shipping and world trade: driving prosperity](#)

59 Cydome (accessed Sep, 2024) [Generative AI Impact on Cybersecurity @Sea](#)

60 Androjna, A et al. (2021) [AIS data vulnerability indicated by a spoofing case-study](#), Application of Surveying and Navigation Systems to Increase the Safety and Robustness of Maritime Operations, 11, 5015



## HOW DO WE ASSURE AI?

It's evident that AI requires assurance, but how does that look? If a piece of software is using AI, how do we know that the software is safe and is capable of making decisions that do not endanger human lives?

The first step is to determine what safe behaviour means and then to ensure that the AI system is capable of behaving safely in all conditions it may encounter.

Classification societies like Lloyd's Register (LR) play a key part. They provide confirmation and confidence to end users that ships are built to the applicable safety standards and in compliance with classification rules and regulations.

With the emergence of new technologies, solutions, and practices in the industry, class societies must adapt and evolve their assurance processes to help ensure safe and successful integration while effectively managing associated risks.

In 2018, LR created an assurance framework, which has been applied to AI applications. It takes a four-phase verification and validation process that examines a company's readiness to be a technology provider, the technology and product itself, testing of the technologies involved, and the validation of the product in service.

In a recent event hosted by The Centre for Assuring Autonomy, a partnership between Lloyd's Register Foundation and the University of York, found that demonstrating safety assurance is closely linked to the business case for autonomy. Professor John McDermid, Director of the Centre, explained, "We understand that in order to fully realise the opportunities of autonomy maritime organisations from across the world require

confidence, use cases, and methods by which they can safely assure a whole range of different maritime systems and operations."<sup>61</sup>

The purpose of the £10 million Centre for Assuring Autonomy is to provide a facility to test autonomous systems, and simultaneously encourage greater partnerships with industry members to research current issues around autonomy in maritime.

LR is also part of the Maritime Autonomy Assurance Testbed (MAAT) initiative. This is a partnership led by LR and the National Physical Laboratory (NPL), focussed on building a test and certification programme to provide a pathway to safe adoption for autonomous ships. The purpose of MAAT is to deliver a reliable and accessible assurance framework, enabling validated testing across virtual and physical environments and operational assurance of uncrewed and remotely operated systems.<sup>62</sup>

This will ultimately enable the UK to shape future international standards and drive international trade opportunities.

LR is also working alongside Japanese stakeholders to accelerate maritime autonomy and build an assurance framework for the safe and reliable introduction of AI and autonomy in maritime. By 2026, Japan aims to have ships operating at the equivalent of LR's autonomy level 4 (AL4) within its waters with physical demonstrator ships sailing by the middle of 2025.<sup>63</sup> LR and NPL are now ramping up their efforts to verify and validate the development of technology necessary to deploy such ships, with a focus on collision avoidance, training and watchkeeping.

61 LR Foundation (Apr, 2024) [Confidence in autonomous systems key to wide-scale adoption in the maritime industry](#)

62 NPL (accessed Jul, 2024) [Maritime Autonomy Assurance Testbed](#)

63 LR (Apr, 2024) [UK and Japan align efforts to accelerate maritime autonomy](#)

# CONCLUSION AND RECOMMENDATIONS

Investment, growth, and deployment of AI solutions for ship operations continues to grow. In the last year, the industry has seen a wave of new AI technologies launched to improve energy efficiency, cut emissions and boost safety. The market is now worth a staggering US \$4.13 billion, according to Thetius data, but in order to make the most of this growing market, stakeholders must understand when, where, and why to invest in AI technologies.

*AI should be deployed with other technologies, not in isolation, to create the most value.*

## 01 START WITH A SPECIFIC PROBLEM AND IMPLEMENT IN ITERATIONS

When deploying AI technologies, it makes sense to do so in iterations to ensure best risk management. For example, start by using AI and ML to automate repetitive easy processes, giving people the opportunity to focus on more complex tasks. An easy example is email organisation. Streamline time-consuming processes, then move on to bigger tasks before tackling the seriously complex ones.

Implementing AI solutions incrementally allows for testing and optimisation at each stage. This approach helps to identify potential issues early and make necessary adjustments without disrupting operations.

It is important to recognise that AI is a suite of tools and not one specific tool in a toolbox. AI should not be deployed in isolation. It should be combined with other technologies to create the most value.





## 02 DON'T BE AFRAID TO EMBRACE AI

While it is essential to manage the risks and remain cautious of AI's capabilities, it is equally important to take the initiative. Do not wait for larger players to act first or delay until more advanced technology becomes available. Embrace the opportunity to be a first mover. Even if a more advanced solution emerges later, you will already have a foundation in place and can continue to build upon it.



## 03 CONSIDER AI AS A STAKEHOLDER TO FOSTER TRUST AND TRANSPARENCY

*Sharing knowledge and being transparent about successes and challenges can enhance the value of applying technologies like AI.*

One of the challenges with the further growth and adoption of AI is the lack of transparency and trust around its decision-making process. This can generate feelings of unease and limit trust in the technology. One train of thought echoed by AI academics and researchers is that by engaging with AI like a human stakeholder, barriers to transparency and trust in the technology can be minimised. This two-way interaction fosters a culture of collaboration and trust, pushing users to embrace the technology rather than disengage with it out of fear. Systems such as AI will only be effective in the long run if users are confident and willing to engage with them. Organisations can further enhance trust in AI by focussing on change management. Sharing knowledge and being transparent about successes and challenges can enhance the value of applying technologies like AI, especially in areas where caution and uncertainty remain.

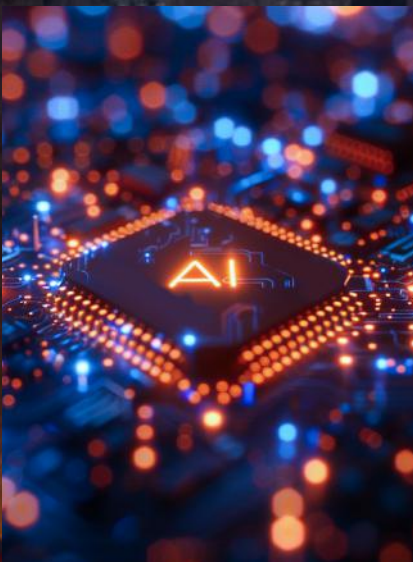
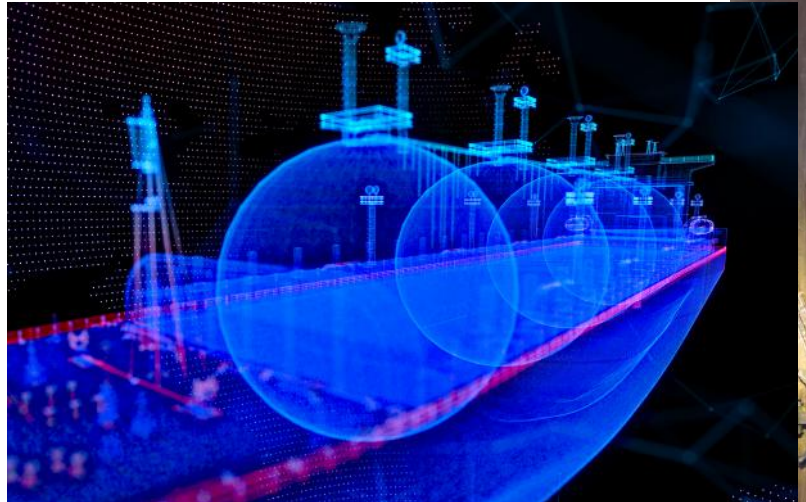




*AI must be able to rapidly troubleshoot problems.*

## 04 ENSURE YOUR AI CAN RAPIDLY TROUBLESHOOT PROBLEMS

AI must be able to rapidly troubleshoot problems to prevent minor issues from turning into significant failures. This is particularly important in remote operations where rapid detection of machinery issues is necessary to avoid costly vessel downtime. High-quality data is crucial for accurate detection and diagnosis, ensuring that repairs are targeted and effective.



## 05 DEPLOY BENEFIT TRACKING TO UNDERSTAND THE VALUE OF AI

AI solutions should incorporate benefit tracking to help users clearly identify the gains from deployment. Often, the advantages of implementing a particular solution aren't immediately obvious. Benefit tracking highlights progress and helps assess how and when previous losses occurred in the absence of AI.



# 06 CONSIDER REVENUE CREATION, NOT JUST COST

AI is often seen as a tool for cost reduction, but Daniel Jacobsen, Vice President of Artificial Intelligence at Lloyd's Register OneOcean, suggests it should chiefly be viewed as a means to generate revenue – something with no upper limit. AI can drive revenue growth in various ways, such as offering more accurate insurance models or very accurate predictive maintenance solutions.

*AI can drive revenue growth in various ways.*



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