NAVIGATING AI – IMPACT & TRANSFORMATION OF DRY CARGO SHIPBROKING

OTTO HILLERSTRÖM

SWEDEN

2025

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INTRODUCTION

This study will examine the impact of Artificial Intelligence (AI) on the dry-bulk shipbroking profession within the coaster sector, focusing on both opportunities and challenges during the next decade. AI has already begun influencing the shipping market through digital platforms, data analytics, and other AI-enhanced tools. AI is still in uncharted territory regarding the general technique, specifically for the market segment of coaster dry bulk shipping. In this sector, it remains uncertain if and how AI may enhance or transform the traditional role of market practitioners and the potential pitfalls that may arise as technology advances. Will the shipbrokers' role change significantly, or will it almost disappear? The future of AI in coaster dry-bulk shipbroking relies on various perspectives and its transformative potential. While some industry professionals believe AI will revolutionize shipbroking within the next decade, others emphasize the irreplaceable role of human expertise, intuition, and relationship management. Will this study conclude that AI will serve as a valuable tool in shipbroking rather than a replacement for brokers, enhancing operational efficiency while requiring human oversight to maintain industry standards and credibility? Could it mean spending more time on relationship building and customer care rather than purely administrative tasks? Some of these solutions are part of the broker's daily work today, just through other systems, and that could be more efficient and might not seem as dramatic as it can.

PROBLEM IDENTIFICATION

The goal and ambition of this paper is to understand how the current AI trend is affecting shipbrokers' daily work. Moreover, what are the potential risks and benefits of using AI applications, and what does the future have in store for shipping executives deciding to use and develop their business with artificial intelligence? To bridge the gap between the current and future AI-driven dry cargo shipping environment, AI's strengths and weaknesses need to be explored and evaluated. Four different hypothetical strategies can be developed to best serve the needs of dry cargo shipping executives. However, each logical chain starts with a clear objective that addresses the problem formulation.

OBJECTIVE

The objective of this paper is to analyse and evaluate how Artificial Intelligence, based on its strengths and weaknesses, may affect which strategy a shipping professional may choose to manage future opportunities and threats within the macro business environment.

Hence, the main objective of this paper is:

How may AI affect the business microenvironment within the dry-bulk coaster sector in the coming years, and what strategy may shipbrokers select to best take advantage of this application in the macro business environment?

To answer the main objective of this paper, the following two research questions will be addressed.

1. What is Artificial Intelligence, and to which areas of the dry-bulk shipping macro and microenvironment are presently applied?
2. Which strategies for AI implementation are available to shipbrokers within the dry-bulk coaster shipping segment?

Data for each research question and model have been collected, forming a valid research design. Each question is based on established literature and a survey sent to different market practitioners: 1) Charterers, 2) Shipbrokers, 3) Shipowners. The two research questions aim to understand the consulted shipping executives' AI macro and microenvironments. Additionally, what strengths and weaknesses does AI have in the dry cargo coaster shipping segment? This will help develop a viable strategy for dry cargo coaster shipping executives, addressing the paper's objective.

SCOPE AND LIMITATIONS

This paper is limited to the dry bulk short sea shipbroking segment and its associated fields of practice areas: relationships, negotiations, operations, and know-how. Due to the secretive nature of the business and unwillingness to give up business advantages, the questionnaire will only be general to establish how AI is evolving in the industry. It is believed that the accuracy of the survey results is significant concerning the specific objective and research questions addressed in this paper. In addition, the lack of previous studies on the topic makes it difficult to obtain comprehensive material. Therefore, the purpose of this paper is not an in-depth analysis of AI; instead, it will only serve as a study trying to understand how AI will impact the coaster dry bulk shipping sector.

STRUCTURE AND APPLIED METHODOLOGY

This paper consists of two parts: 1) SWOT analysis and 2) The Ansoff Matrix. The SWOT analysis constitutes the core part of this paper as it provides the foundation for the strategies and suggestions developed in the Ansoff matrix. The details from the “FONASBA” questionnaire and already published material on AI aim to identify common grounds and potential contradictions between the perspectives, enabling understanding of AI’s potential impact on the shipping sector (Fig. 1).

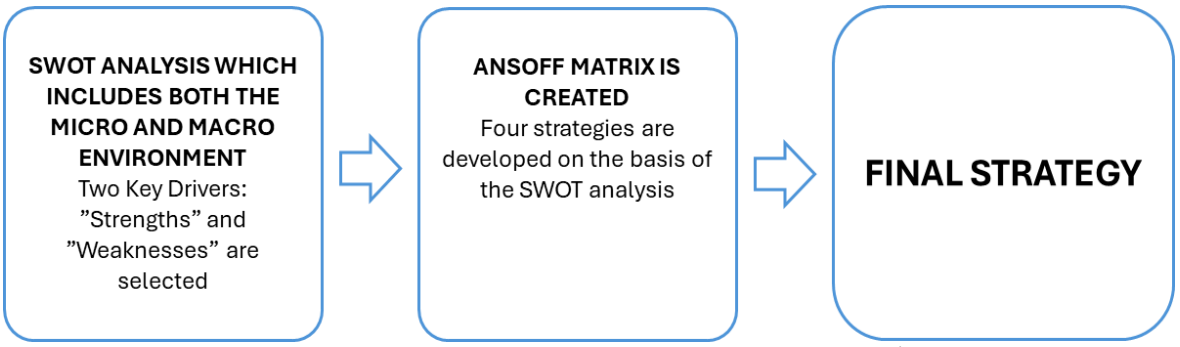

Figure 1 Showing paper structure and methodology Authors design 1st May 2025.

SWOT METHODOLOGY

The SWOT analysis aims to identify the Strengths, Weaknesses, Opportunities, and Threats related to AI applications in the dry cargo shipping micro and macroenvironment across the following segments: i) Shipbrokers, ii) Shipowners, and iii) Charterers. Gaining a deeper understanding of how the AI application works is advantageous when developing strategic planning and decision-making.

ANSOFF MATRIX METHODOLOGY

The Ansoff Matrix is a strategic planning tool for identifying and developing growth strategies. It has been adapted based on the findings in the SWOT analysis and to find out how AI can facilitate future business expansion in the three previously mentioned segments. Categorized into the following: 1. Market Penetration, 2. Market Development, 3. Product Development, and 4. Diversification. The four strategies are evaluated based on their risk and reward profiles. One is presented as the most suitable option and is believed to offer the most significant benefit to the dry cargo shipbroker.

PRIMARY AND SECONDARY DATA SOURCES

Primary data was collected by sending out a questionnaire (appendix 7) to ship owners, charterers, and shipbrokers in the dry cargo coaster shipping segment, with the specific purpose of answering the objective of this paper. Other sources of information are collected from web pages and online articles, such as the Harvard Business Review. They are considered secondary data that serve as a good complement to the research questions.

RELIABILITY AND VALIDITY OF DATA

The survey's reliability and validity depend on the data provided by interviewees. There is no reason to believe that the respondents have had any reason to withhold or distort the information given other than for the protection of business secrets. Therefore, the survey questions are general and formulated in multiple-choice form to avoid going into too much detail. Moreover, giving the interviewee full anonymity is believed to increase the reliability of their answers. Secondary data was compiled from reputable, trustworthy, and updated sources. When possible, primary and secondary data have been compared to verify the reliability and validity of the information. Finally, to ensure peer review of this paper, two market practitioners independent of each other, Mr. Martin Alm and Mr. Carl Hillerström, have examined this paper."

A BRIEF INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Artificial Intelligence (AI) refers to the capability of computer systems to perform tasks that require human intelligence. These tasks include learning from executing different tasks and improving their results. As well as analysing large data sets with algorithms to generate references and summaries of certain aspects in texts. (McKinsey & Company, 2024)

Different types of AI serve various purposes. Natural Language Processing (NLP) Example: Google Translate. Computer Vision Example: Facial recognition, medical image analysis. Generative AI Example: DALL-E (image generation), DeepSeek (text generation), ChatGPT. Autonomous AI Example: Self-driving cars (Waymo – self-driving taxi). (Stanford (HAI), 2025)

Both regulations and the underlying technology behind AI are continuously advancing. As a result, some aspects remain uncertain, particularly those related to data security and the deployment of autonomous systems. In its current state, AI often depends on human oversight in various forms, whether for understanding results, making key decisions, or grasping broader implications of its outputs. Many AI applications function as supportive tools that require human input and judgment rather than being fully autonomous agents. (NCSC - National Cyber Security UK, 2024)

Different challenges still impact AI implementation, particularly around integration. In practice, AI systems are only as effective as the data and programming behind them. If the foundation is weak, due to missing, outdated, or poorly structured information, the output will reflect those weaknesses. (Schmelzer, 2023)

Furthermore, energy consumption is a factor to consider regarding Artificial intelligence, and AI data centres consume up to 1% of global electricity, a figure expected to rise sharply with growing AI adoption. Hence, this means that AI applications are not environmentally friendly and underline the urgent need for energy-efficient hardware. (Zewe, 2025)

Within the shipping industry, AI can be applied to a wide range of applications, which include:

1) Market analysis and forecasting

2) The Negotiations process

3) Email automation

4) Voyage estimation

5) Accounting

6) Risk assessment

7) The automation of chartering processes.

It was further confirmed in the "FONASBA questionnaire" that question number one asked the interviewees which areas of the commercial dry-bulk shipping business they believed AI could be applied to, and their answers are shown in Figure 2.

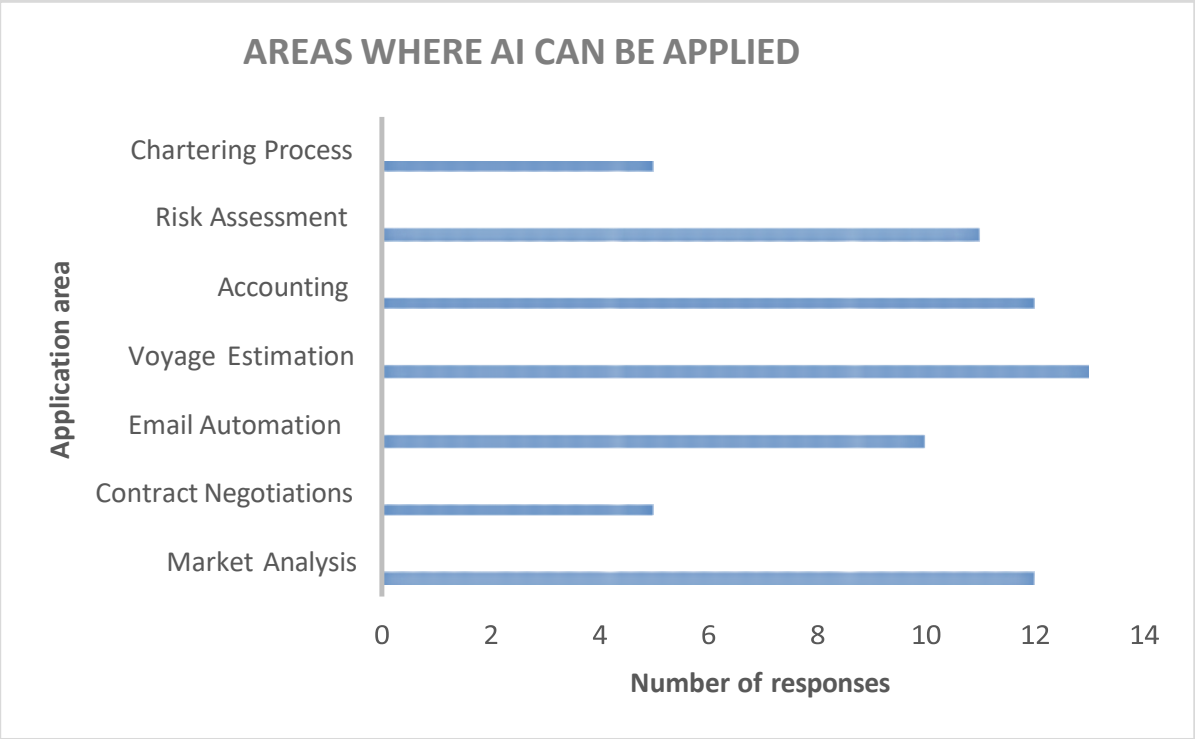

Figure 2 Showing interviewees' response to question number one in the questionnaire (Appendix 1). Authors design 1st May 2025. Source: FONASBA Questionnaire by Otto Hillerström

However, when asked, only 24 percent of the interviewees had to some degree implemented AI tools in their daily business activities; hence, AI is not yet a common trait within the shipping dry bulk coaster shipping segment (Fig. 3).

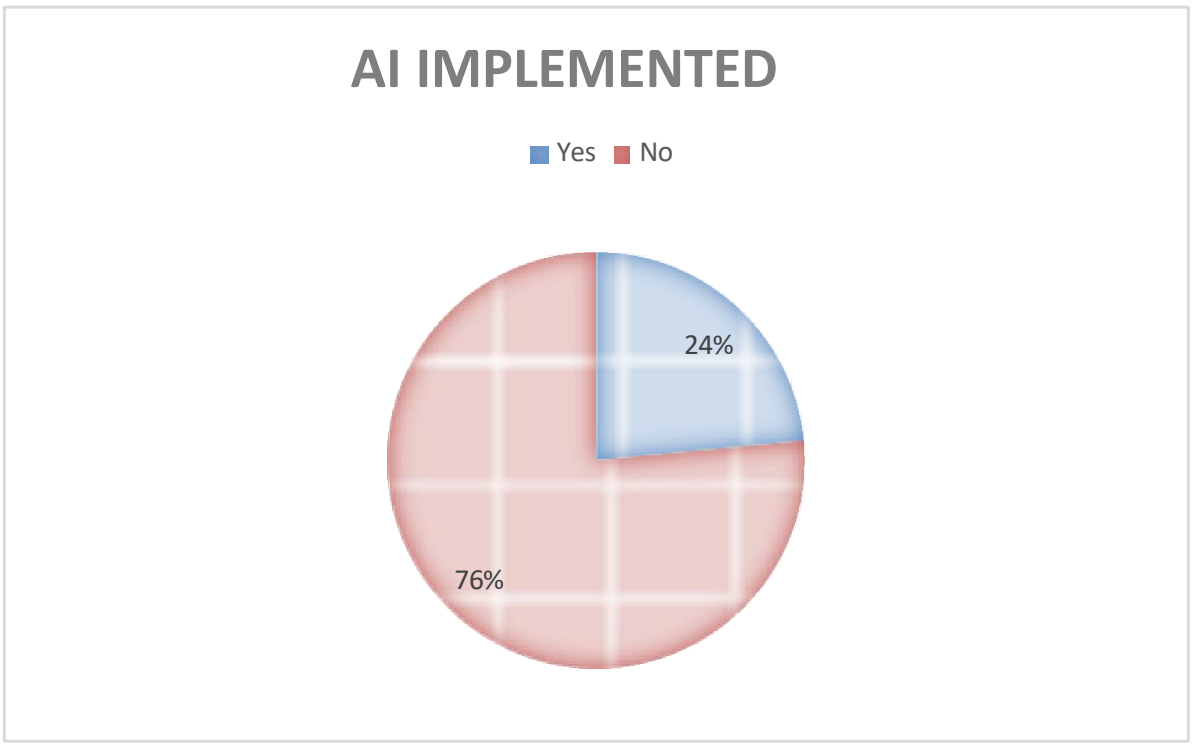

Figure 3 Showing how many of the interviewees have implemented AI in their daily business routines. (Appendix 1.) Authors design 1st May 2025. Source: FONASBA Questionnaire by Otto Hillerström, respondents were also asked:" To what extent is the belief that AI will revolutionize the shipbroking industry. Only received a mild optimism that it will revolutionize within the next decade (Fig. 4).

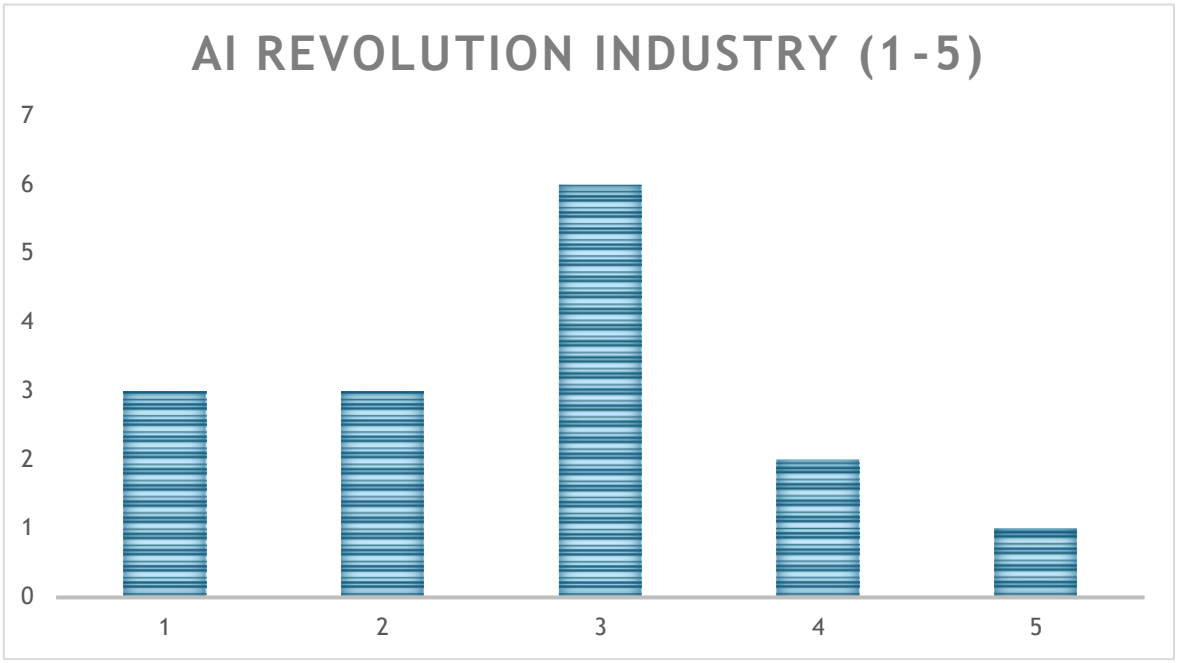

Figure 4 Indicates the belief in the AI revolution held by the interviewees. 1 Strongly Disagree to 2 Strongly Agree (Appendix 2). Authors design 1st May 2025. Source: FONASBA Questionnaire by Otto Hillerström

This chapter points out issues connected to question 1: what is artificial intelligence, and to which areas it can be applied.

MARKET ANALYSIS AND FORECASTING

Market analysis and forecasting are one of the areas where AI can provide substantial support. AI systems can process large volumes of market data to identify trends and generate forecasts related to freight rates, demand across specific trade routes, and commodity flow patterns. (Pansare, 2024)

However, it is important to emphasise that forecasts produced by AI still require validation through additional human resources and expertise. No prediction model is entirely self-sufficient, and relying solely on algorithmic outputs without cross-referencing may lead to incomplete interpretations. The Baltic Exchange notes that while AI can transform the transport sector by optimizing routing, reducing fuel consumption, and improving overall safety, it also introduces new risks. Concerning cybersecurity, data privacy, and the regulatory implications of rapidly evolving AI technologies, these factors continue to shape how quickly these systems can be adopted within the shipping industry. (Fields, 2024)

THE NEGOTIATION PROCESS

The heart of shipbroking rests on personal relationships and trust. The maritime industry is built upon long-standing networks and credibility between shipbrokers, shipowners, and charterers. Emotional intelligence, the art of negotiation, and the ability to manage nuanced interactions are qualities that artificial intelligence cannot currently copy. While AI can support operational efficiency and provide valuable insights, it cannot replace the trust brokers have built for years. Experts across the field continue to stress that technology may enhance the broker's toolkit, but it does not replace the need for authentic personal relationships. (Murphy, 2023) As an example, most interviewees think that AI will not replace human interaction (Fig. 5)

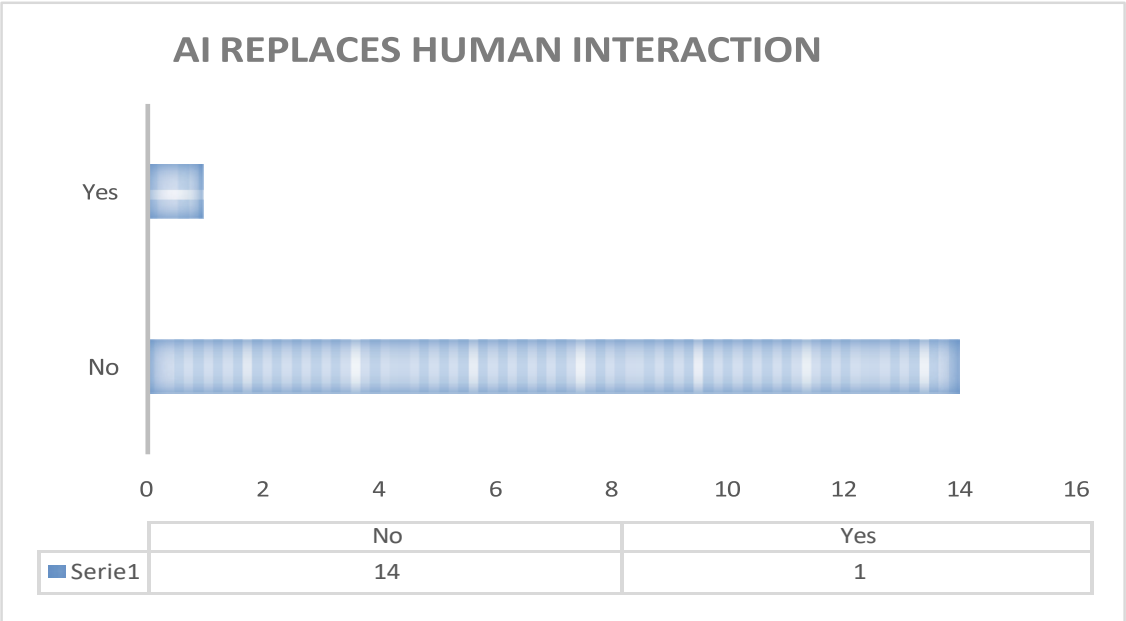

Figure 5 Illustrates that only one interviewee out of 15 participating in the survey thought that AI will replace human interaction (Appendix 2.). Authors design 1st May 2025. Source: FONASBA Questionnaire by Otto Hillerström

A recent industry debate similarly underscored that many shipowners are reluctant to share sensitive information with algorithms; “people, especially shipowners, will not reveal their secrets to a machine”, explained one senior broker, highlighting a continued preference for human brokers as trusted intermediaries. (Howard, 2024)

AI-powered networking tools, such as platforms that use algorithms to match cargoes with suitable vessels, can potentially connect parties who might not have encountered each other through traditional industry networks. This capability can expand a broker's reach, opening new business opportunities beyond their established client base. This view is also shared by interviewees in figure (fig 6)

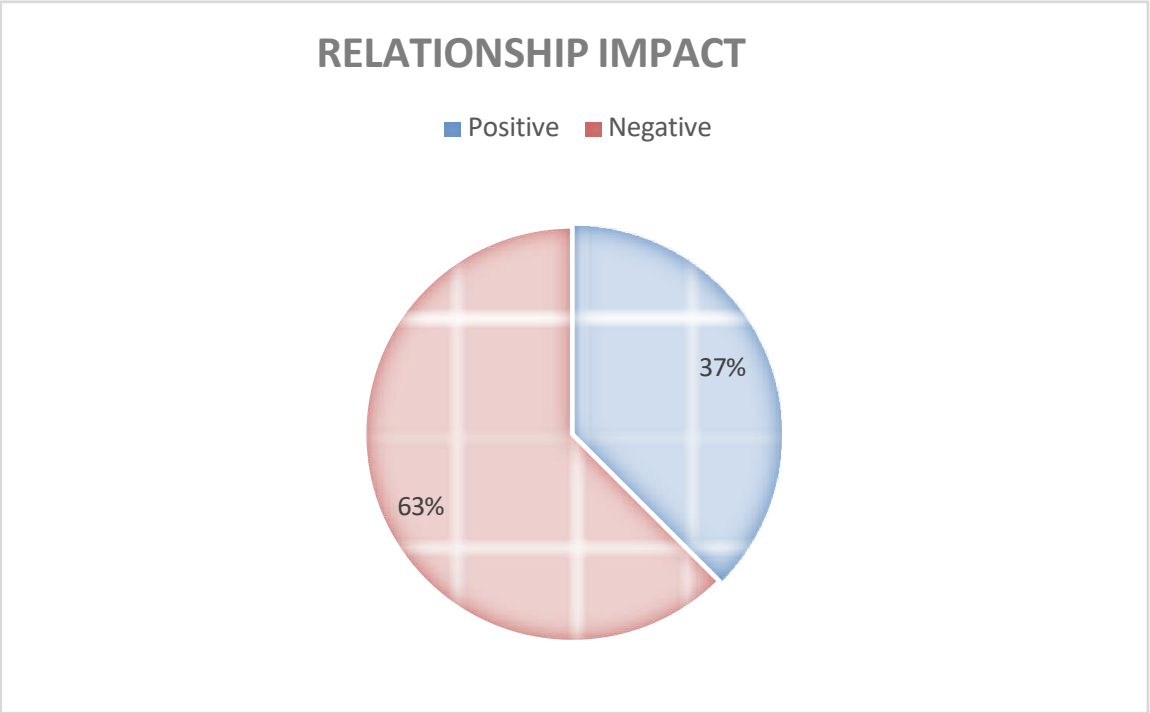

Figure 6 Shows how interviewees thought AI may impact personal relationships (Appendix 2.). Authors design 1st May 2025. Source: FONASBA Questionnaire by Otto Hillerström

There is concern that over-reliance on AI tools may erode the personal connection and loyalty that typically develop in long-term broker-client relationships. Research into maritime digitalization indicates that a fully developed global e-charting marketplace could indeed make shipping transactions more transparent and competitive, but it could also render them more impersonal and standardized, potentially diminishing the nuanced, trust-based interactions that have long defined the shipbroking profession (Evi Plomartiou, 2022). In the early 2000s, several e-chartering marketplaces attempted to automate the fixing process by enabling shipowners and charterers to complete deals through online bidding systems, aiming to eliminate the need for brokers. However, these initiatives largely failed. (Batrinca, 2007) Because machines and platforms lack the flexibility and emotional intelligence required to navigate the high-stakes negotiations (Mirra, 2025).

AI can support decision-making by offering data-driven insights and streamlining certain processes; however, it cannot replace the human intuition and trust required in closing fixtures successfully (Döhle, 2024). This distinction was reinforced in the interviews, where most respondents agreed that AI tends to reduce the intuition, as shown in Figure 7. The

responses suggest that while AI is a valuable tool, it may risk undermining the interpersonal aspects in shipbroking.

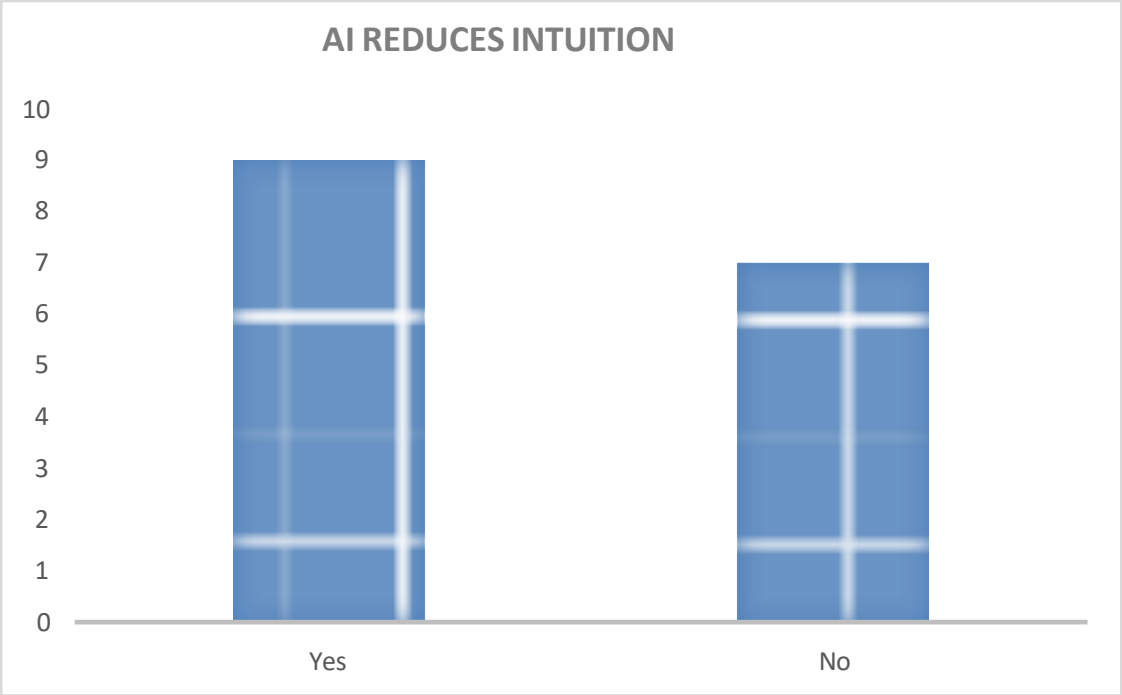

Figure 7 showing that a majority of the respondents of the survey were of the opinion that AI applications reduce human intuition (Appendix 3). Authors design 1st May 2025. Source: FONASBA Questionnaire by Otto Hillerström

EMAIL AUTOMATION

AI in communication has the capability of computer systems to specify unstructured communication data, identify critical information, and help to manage the flow of emails and market information that shipbrokers handle daily.

Despite these advances, AI implementation faces several challenges. Communications within the shipping sector often use a wide variety of templates, abbreviations, and language, complicating the training and reliability of AI systems. Models trained on a single company's data may struggle to generalize across different firms, requiring continuous data preparation and model adjustments. This makes it both time-consuming and costly, where human validation remains essential. (Irmina Durlik T. M., 2024) This is also verified in the survey, where most respondents thought AI optimization of email was valuable (Fig.8); however, only a few used this application (Fig.8).

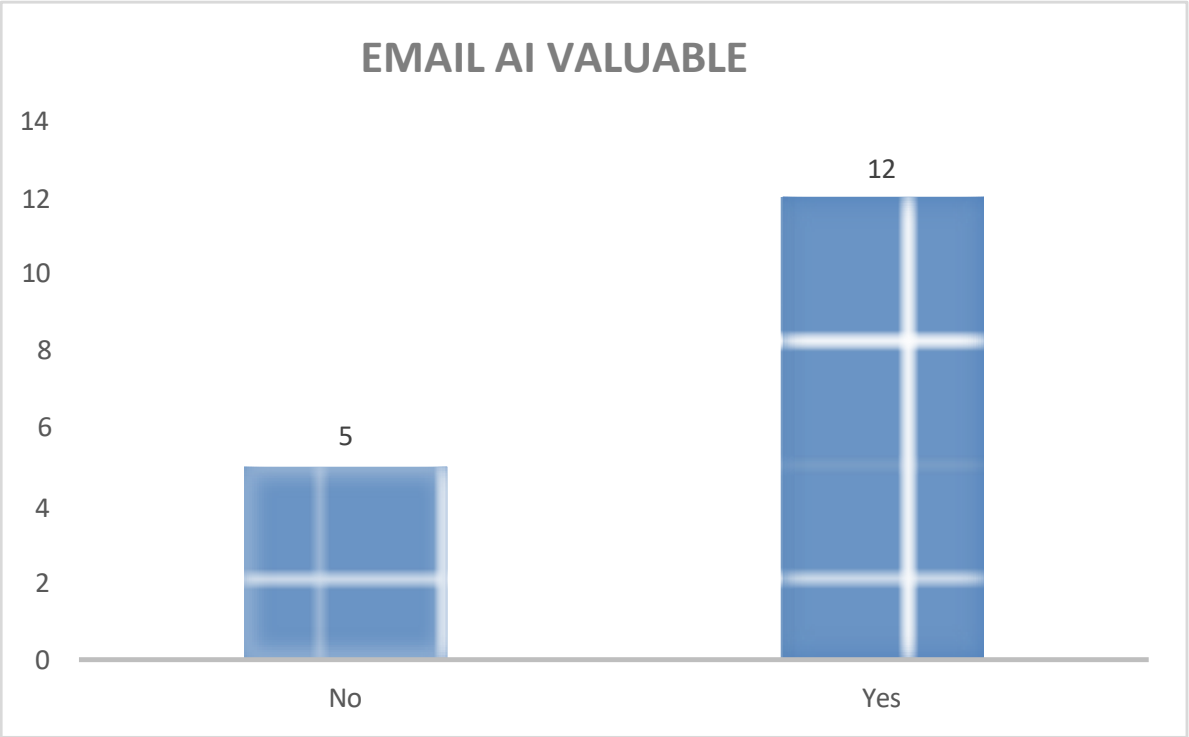

Figure 8 shows that the majority of the interviewees in the FONASBA questionnaire thought that AI optimization of email may be valuable (Appendix 3). Authors design 1st May 2025. Source: FONASBA Questionnaire by Otto Hillerström

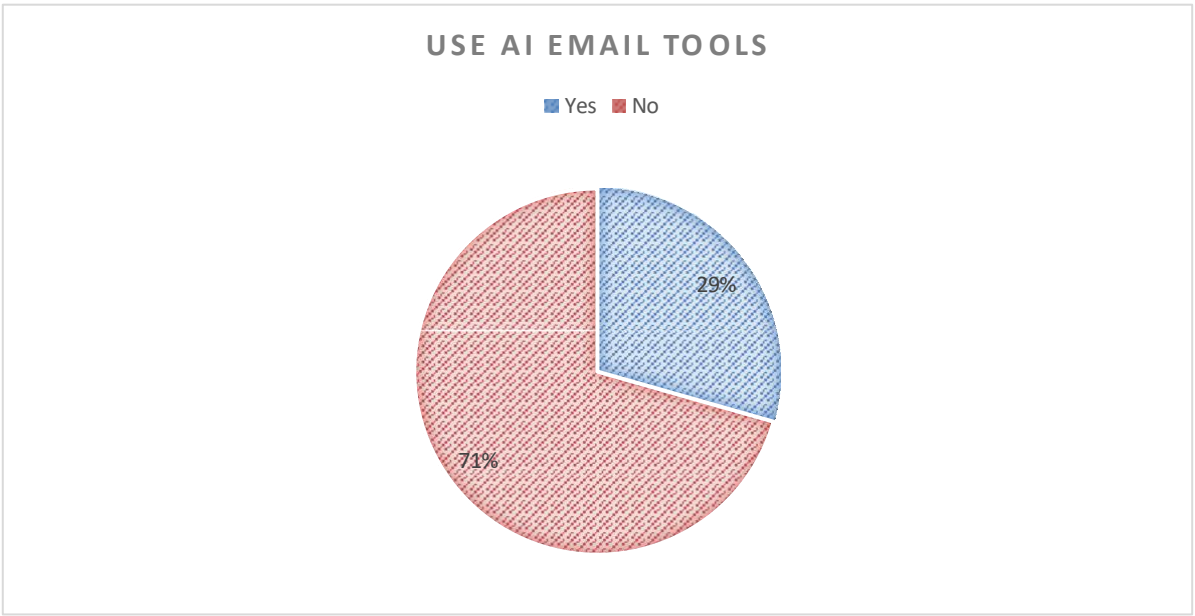

Figure 9 showing how many of the interviewees were using AI tools in their daily work environment (Appendix 3.). Authors design 1st May 2025. Source: FONASBA Questionnaire by Otto Hillerström

One example illustrating the benefits of AI-driven email automation comes from a business case between the email management platform Sedna and NORDEN, one of Denmark's oldest and largest shipping companies. NORDEN implemented an AI-based system capable of auto-categorizing and sorting emails in real time. The system utilized tagging mechanisms, shared inboxes, and search functions to ensure that high-priority messages. Integration with

NORDEN's VMS (Voyage Management System) further reduced manual sorting. This streamlined process enabled quicker access to critical information and reported a reduction in internal email traffic by approximately 50%. (Sedna, 2025)

VOYAGE ESTIMATION

AI applications used to support voyage estimation processes face challenges in consistency and integration. One of the most significant risks lies in the quality and accuracy of the master data. Any time saved through automation may be lost in verifying and correcting the outputs if the underlying data is incorrect or incomplete. (Schmelzer, 2023)

"About calculations," even if automated, caution is required. For example, port tariffs or agent fees are often only indicative and, in many regions, cannot be openly published. (Institute of Chartered Shipbrokers, 2020). This means that the final figures must still need to be confirmed manually despite the availability of automated tools to avoid discrepancies.

AI-driven calculations can offer valuable first approximations and be quite accurate under the right conditions. Still, if used without verification, they can lead to decisions based on flawed assumptions, resulting in deviations from original expectations or financial outcomes. On a more positive note, because many AI models learn and improve through repetition and continuous data input, their accuracy and reliability could increase over time, provided by consistent user engagement and data validation. (Irmina Durlik T. M., 2024)

ACCOUNTING

Different AI functions are being integrated in accounting, particularly in bookkeeping and financial forecasting. In bookkeeping, AI automates transaction classification, invoice matching, and account reconciliation tasks. By using machine learning, these systems categorize expenses and match payments automatically, boosting accuracy and efficiency. (Fadi Bou Reslan, 2024)

Moreover, AI tools can be applied to automate time tracking connected to ship calls at different ports, by automating laytime calculations and extracting data from Statements of Facts (SoF). Indicate inconsistencies and accelerate the preparation of claims. Furthermore, integration with voyage management (VMS) systems allows for precise cost tracking. (Burmester-Vogel, 2025)

In accounting, the authentication of certain decisions and records is often regulated by law or professional standards to ensure transparency, accountability, and legal validity. This is especially relevant when systems like AI make decisions, raising questions about responsibility, traceability, and compliance. Directive (2013/34/EU). With AI systems suggesting or executing accounting actions, such as auto-categorizing entries and initiating invoice payments, it's crucial that Human authorization and oversight are retained for critical decisions. Finally, decision logs are to be maintained that document: What the AI recommended, who approved or overrode it, and on what basis the decision was made. EU AI Act, still under draft but relevant in regulations to AI (including those used in finance), has

to maintain these matters. (European Commission, Directorate-General for Communications Networks, Content and Technology, 2021)

RISK ASSESSMENT

Risk assessment in dry bulk shipping shows potential in the ability of AI to recognize and act on patterns that would otherwise be difficult to detect. AI systems today can process historical voyage data, port call logs, incident reports, sanction lists, restrictions, and external factors like weather forecasts to provide real-time risk indicators. (Raiten, 2025)

Lloyd's List has a tool named "Seasearcher Trade Risk platform". This tool reflects the possibility of detecting trade finance fraud; it also now offers comprehensive voyage-level risk screening across bulk segments. Through continuous monitoring of vessels, ports, cargoes, and counterparties, platforms like these can highlight suspicious patterns. Including repeated cargo damage, high-risk berths, or contract disputes. (Lloyds intelligence, 2025)

In the scenario that AI detects a certain vessel or charterer consistently associated with delays or damage claims and commercial disputes, for example, many arbitrations. The system could issue alerts prompting decision-makers to consider alternatives to reduce exposure. Similarly, predictive weather-routing models can advise risk mitigation strategies by analysing historical storm patterns and linking them to prior cargo incidents. (Munoz, Barkley EDU, 2024)

AUTOMATION OF CHARTERING PROCESSES

Artificial Intelligence (AI) in the dry cargo chartering process can assist in streamlining the administrative side of fixture execution, such as email summary, recap generation, and data extraction from fixture-related correspondence. As earlier described under email automation, the NLP-driven systems can extract terms from emails to populate contract templates to reduce initial manual inputs. (Sedna, 2025)

Models rarely translate directly into commercial maritime practice. Relationship dynamics influence chartering negotiations, evolving market sentiment, and reputation; these factors are difficult to apply in machine-readable terms. Consequently, AI systems are unlikely to replace human negotiators, and their current role remains advisory at best. In practice, they may suggest standard responses or highlight market benchmarks, but the nuanced judgment required to conclude a successful fixture still lies with experienced practitioners. (Peacock, 2025)

Further limitation lies in the nature that many AI models (especially machine learning models) make decisions in ways that are not fully visible, understandable, or explainable to humans, which conflicts with the need for explainability and legal accountability in contract negotiations. (Chakravorti, 2024)

These technologies can take over routine and repetitive tasks such as document management, data entry, or email automation, freeing up time for shipbrokers to concentrate on more strategic aspects of their role. This opens the door for brokers to

provide more advisory services to their clients. However, as AI becomes more integrated into daily operations, there may also be an increased demand for strategic oversight, ensuring that automated suggestions align with commercial realities and client-specific needs. In this context, the broker's role evolves, but it remains essential. (Allison, 2024). The risk of job displacement in replacing some repetitive tasks, as technology becomes more established and accepted, is noted in a survey. (80%) (fig. 10)

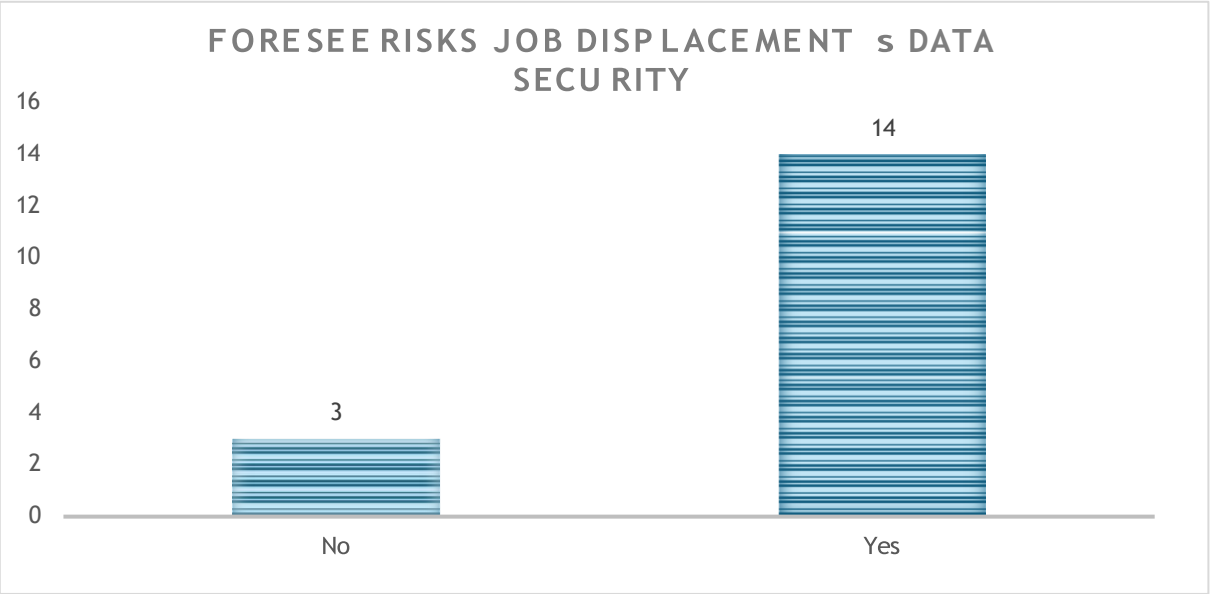

Figure 10 Showing how the survey respondents see the risk of job displacement & data security (Appendix 4) Authors designed 1st May 2025. Source: FONASBA Questionnaire by Otto Hillerström

It remains essential to confirm the intentions and to get approval from the principals involved to avoid breaching the terms of the warrant of authority. If incorrect information is processed or relied upon, it may lead to misrepresentation or legal and financial issues. (Munday, 2016)

RISKS RELATED TO ARTIFICIAL INTELLIGENCE

The increasing use of AI in shipping brings risks. Some risk factors include data quality, cybersecurity, explainability, accountability, regulatory compliance, and overreliance on AI at the expense of human judgment and interactions.

AI systems are sensitive to the quality of data they are trained on. In the maritime sector, data can be fragmented or error-prone, such as inconsistencies in market databases. Predictive models are only as good as the data on which they are based, and poor data quality or missing and biased information can lead to incorrect results. (Irmina Durlik T. M., 2024)

Email automation, predictive maintenance, or navigation assistance systems must interface with corporate networks and even vessel systems, presenting attractive targets for hackers. The maritime industry has seen a rise in cyber activity, making resilience against cyberattacks important. (Reberio, 2022) For instance, a compromised AI system could send falsified

communications (in a chartering negotiation context) or disrupt operations by feeding bad data to decision-makers.

The regulatory environment for AI is evolving, and handling it is complex. There is a concern that current laws and industry rules have not caught up with technologies, creating uncertainty about liability and acceptable use. AI integration faces regulatory issues and needs a framework to ensure safer implementation. (Irmina Durlik T. M., 2024)

Furthermore, belief in artificial intelligence will impact human expertise and intuition, which have long been central to the shipping industry. AI outputs without applying critical judgment, and AI can't capture the full context of complex shipping decisions. (Kendrick, 2022). Research on supply chain AI warns that over-reliance on algorithms can lead to human oversight, which is crucial in handling unforeseen events and complex decision-making. Scenarios that AI might not yet be fit to handle. (Ibal, 2023). In contrast, the interviewees believed that AI would enhance collaboration and efficiency of the supply chain (Fig. 11).

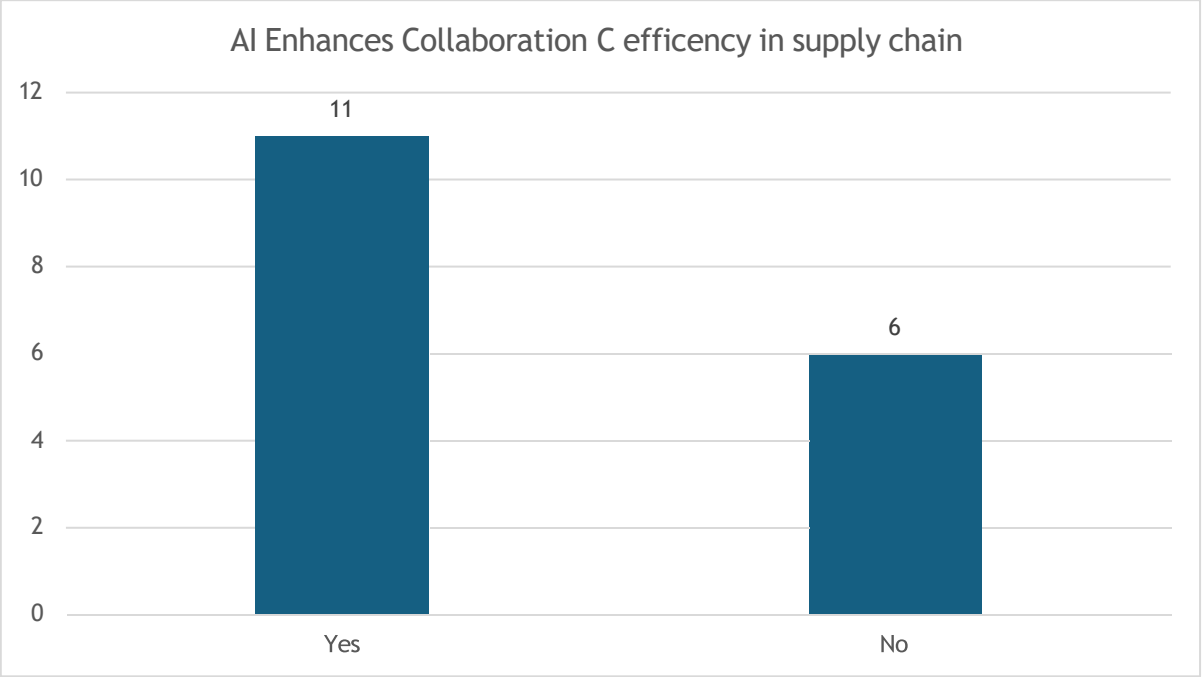

Figure 11 Showing how interviewees thought about AI enhancing the overall supply chain (Appendix 4). Authors design 1st May 2025. Source: FONASBA Questionnaire by Otto Hillerström

Data privacy regulations differ between the West (EU & USA) and other parts of the world. These differences impact how artificial intelligence (AI) is applied. The General Data Protection Regulation (GDPR) treats privacy as a fundamental right in the EU. It imposes strict consent rules and transparency requirements that slow rapid AI deployment, but protect individual liberties. (European Commission Data protection, 2024). The USA lacks a comprehensive privacy law but uses a patchwork of sector-specific regulations. (Decision Foundry, 2024). Both regions emphasize privacy and human oversight, which can limit how extensively AI is used for surveillance or data-sharing.

In contrast, others have fewer personal protection laws and permit widespread state surveillance. This structure enables tighter AI integration in shipping, as it could involve cargo scanning, facial recognition, and vessel tracking, without the same legal constraints. (Baptista, 2024)

Companies involved in shipping must handle this globally. Western companies face legal friction when deploying AI tools, especially when handling crew or customer data, while, for instance, certain countries may implement surveillance-backed AI systems with few restrictions. This will impact the way efficiency is achieved.

As UNCTAD and the IMO noted, global shipping must balance innovation with privacy and ethical oversight to maintain trust across jurisdictions. (Tejwani, 2024) Despite the previously mentioned risks, many interviewees believe that AI will improve the overall efficiency of the negotiation process in shipbroking (Fig. 12).

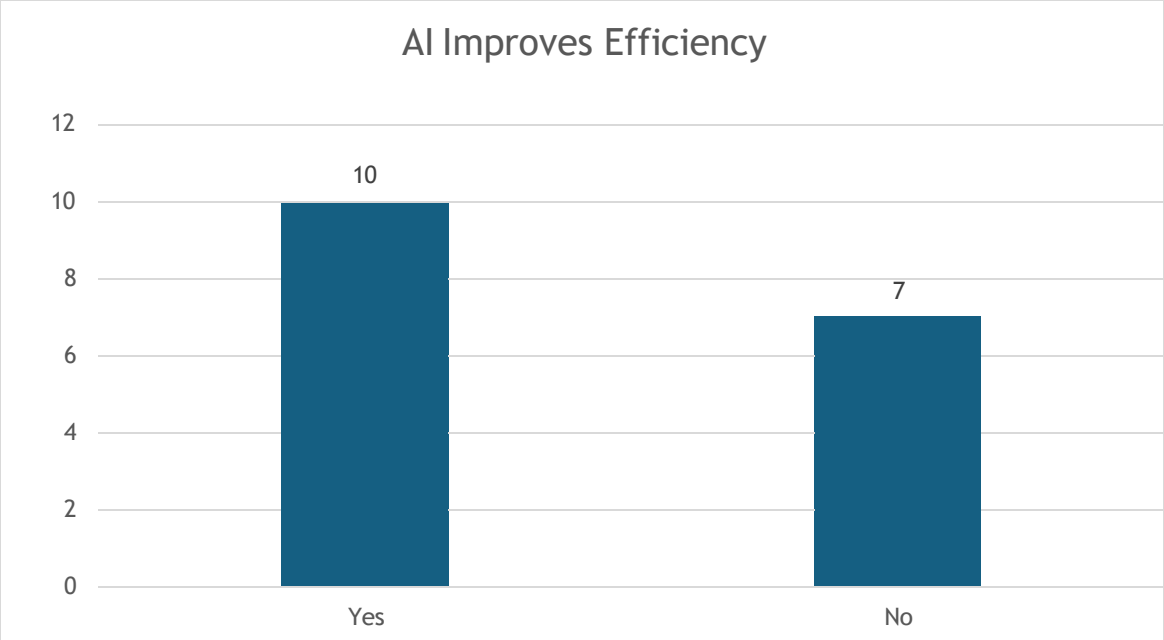

Figure 12 Showing whether respondents believe AI will improve efficiency of the negotiation process or not (Appendix 4). Authors design 1st May 2025. Source: FONASBA Questionnaire by Otto Hillerström

SWOT ANALYSIS

STRENGTHS

The survey identified several areas where AI offers benefits, which were backed up by already published information and verified sources. AI can be applied to well-structured and repetitive tasks, particularly email filtering as an example (NORDENS VMS auto sorting e-mail system) and document support, which were noted as effective ways to reduce manual workload. AI is a tool that can process large amounts of data, enhancing the accuracy and speed of the decision-making process and reducing time-consuming processes that can be

used to develop new business opportunities. Finally, AI may assess risks that are otherwise hard to detect.

WEAKNESSES

Despite its strengths in routine tasks, AI's limitations are evident in areas requiring human intuition. In the survey, respondents believed AI may negatively impact broker-client relationships and think AI reduces professional intuition. Another factor is reluctance to share sensitive business data with AI systems, reflecting concerns over data security, misuse, and the impersonal nature of algorithmic decision-making. These factors together restrict AI's broader possibility for adoption in more strategic and relational functions. Moreover, the main weakness with AI applications lies in the quality and accuracy of master data input.

OPPORTUNITIES

Results from the survey show participants do not believe in a revolution within the next decade. However, there is a belief in AI applications that support and improve various tasks. Furthermore, respondents highlighted that AI may enhance collaboration and productivity by taking over routine tasks, allowing brokers to focus on other matters such as client relations. Automating document management, email categorization, and data handling was seen as a benefit. As AI tools become more refined and integrated, their role in supporting operational workflows is expected to increase. Technological advancement presents a valuable opportunity for the shipping sector to leverage AI for increased efficiency gains, resulting in better productivity.

THREATS

Specific threats are linked to AI adoption, and 82 % foresee risks related to data security, commercial fraud, and job displacement, emphasizing concerns about employment and commercial confidentiality. Moreover, AI-powered cargo matching systems could undermine the loyalty and trust built by shipbrokers. In addition, the inability of AI to replicate emotional intelligence and nuanced negotiation skills poses a challenge in maintaining service quality. These factors collectively represent significant barriers to AI's widespread adoption in the human-centric environment of shipbroking. In the long run, high energy consumption and future environmental legislations could lead to higher AI operational expenses.

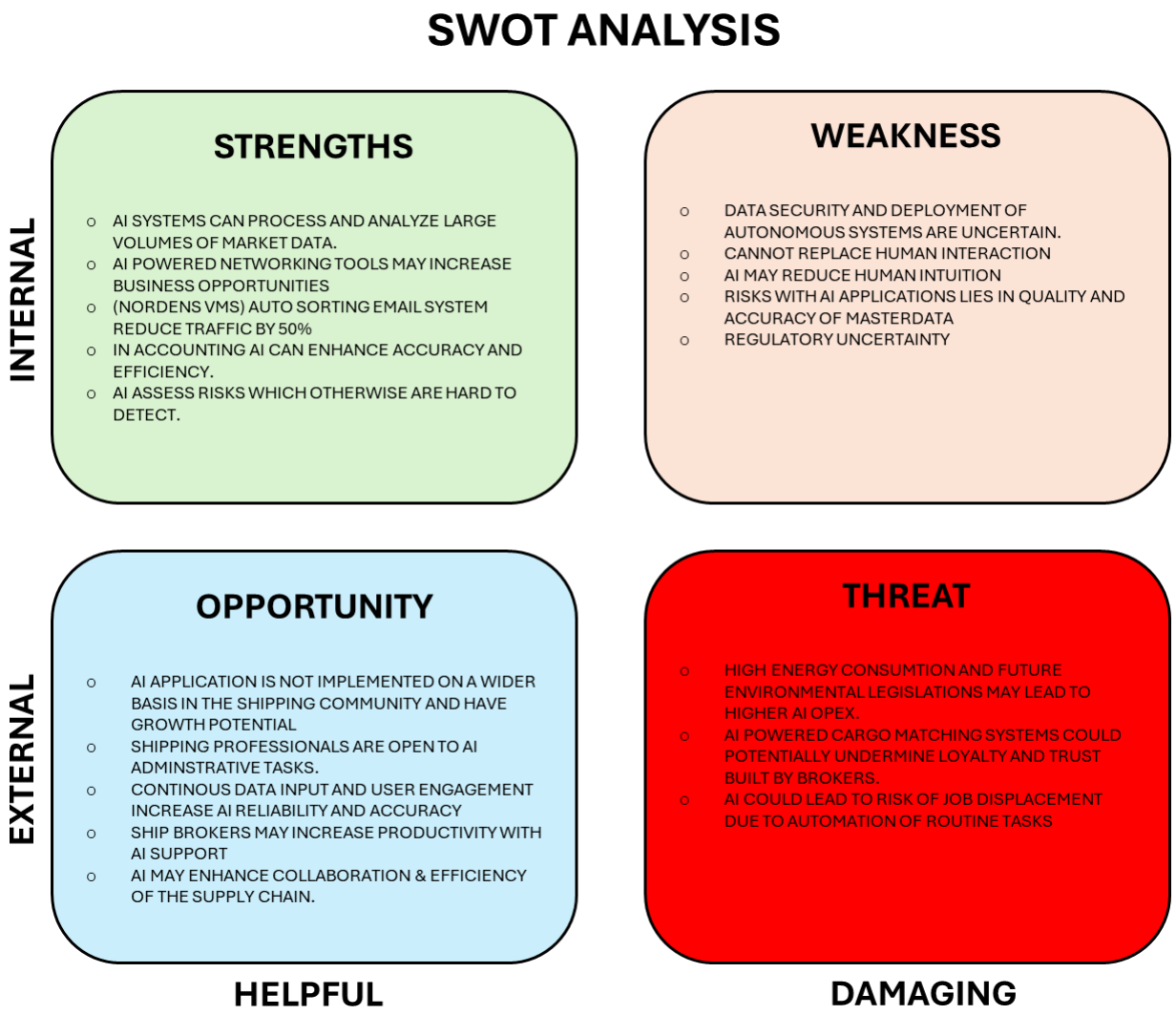

Figure 13 SWOT analysis showing AI applications; Strengths, Weaknesses, Opportunities & Threats. Authors design 1st May 2025

FORMULATING A VIABLE STRATEGY

This chapter points out issues connected to question 2: Which strategies for AI implementation are available to Shipping professionals within the dry-bulk coaster shipping segment?

It is essential to ask this question to develop and choose an effective strategy for AI implementation that can be applied to and influence the future of shipbrokers. The Ansoff market strategy has been used to define these: Market penetration, Market development, Product development, and Diversification.

MARKET PENETRATION STRATEGY

Efficiency increases by working with traditional shipbroking methods highlight that the broker's value lies in relationship management, emotional intuition, areas where AI is limited to impact.
The strategic Implication with this approach relies on refining existing workflows through process improvements rather than introducing AI. Example improved data handling or brokers may increase efficiency through standardized laytime calculations, risk profiling, or updated reporting structures. While it presents minimal risk and helps preserve trust and client relationships, it does not leverage AI's potential, offering limited innovation, which may serve the company; therefore, this strategy will not be further reviewed.

DIVERSIFICATION STRATEGY

This strategy is deemed high risk when entering a new market using AI and leveraging into the market. The SWOT analysis reveals limited support for applying AI in unfamiliar, relationship-based segments, particularly where trust, relationship building, and market knowledge are crucial. SWOT factors further highlight regulatory uncertainty.

-The Strategic Implication of this strategy is that each segment of Dry bulk is highly complex, and to then expand to enter the liquid bulk industry, for example, just by applying an unfamiliar AI seems unrealistic. The risk is overwhelming since market segments is quite different. Outcomes are difficult to predict, for instance, applying dry bulk centric AI models to tanker-specific practices as example fixtures with World scale against more individually negotiated freight rates as done in Dry bulk will make this too complex to overview just by applying AI tools. Due to the high risk, untested value, and weak survey support, this strategy is not considered for further review.

MARKET DEVELOPMENT STRATEGY

Market Development strategy is high reward, moderate risk. Findings from the SWOT analysis have resulted in this evaluation. The survey responses indicate that AI best supports voyage estimation, accounting, market analysis, email automation, and risk assessment. Tasks that are structured, repetitive, and are more administration heavy. However, legal and social factors suggest that adoption should be done gradually, with continued human oversight due to data privacy, trust, and accountability concerns. Furthermore, Email automation, for instance, can greatly reduce workload by classifying high volumes of incoming emails into predefined categories, flagging priorities, and generating summaries. The NORDEN case demonstrates a potential reduction in internal workload of up to 50%, though this depends on the specific systems and needs of the adopting company. The general results of applying this function are not statistically secure.

Moreover, when combined with risk assessment, voyage estimation can automate the comparison of routing and cost alternatives. This enables quicker decision-making and improves visibility on options that might otherwise be less prioritized due to time constraints.

Accounting tasks can also be semi-automated, improving accuracy and reducing manual effort. At the same time, market analysis tools can process large volumes of structured and unstructured data to deliver broad market overviews and segment-specific insights for short-sea shipping. Although service providers exist, such as Veson Nautical and Voyage X AI, these functions and their reliability need to be evaluated.
The strategic Implications of this strategy show that brokers can serve more clients without sacrificing quality, leveraging AI to enhance operations and assist in decision-making. As identified in the SWOT analysis, the strategy may differ depending on the stakeholder if it is a charterer, shipbroker, or shipowner, the size of the organization, and the current IT infrastructure. The survey shows that charterers are generally more open to AI tools, though all categories expressed certain initial interest, although they have limited current use and experience with this technology. Moreover, a step-by-step approach is advisable. It could be, for instance, to start with implementing basic email automation focused on categorization and summarization. Avoid fully autonomous tools like chatbots in early phases to remain in human control.

Voyage estimation and risk assessment are particularly useful for charterers and shipowners when making fixture decisions. This would also help validate master data before integration with systems like VMS (Voyage Management Systems), which would be a logical next step if the organization later aspires to go into more of a Product development strategy.

The main drawback of this approach is that it does not exploit AI's full potential. However, this ensures that brokers remain in control. Technology support, as mentioned earlier, will not replace human roles. AI is carefully reviewed before any broader adaptation. Given the predictable ROI (return on investment), lower implementation risk, and compatibility with current workflows.

Job displacement is not expected in the near term if the strategy focuses on support functions rather than relational or strategic roles.

PRODUCT DEVELOPMENT STRATEGY

From the Ansoff perspective, the product development strategy has a higher risk and could impact trust-based, intuition-driven tasks. The potential gains from such initiatives remain uncertain due to the limited use and knowledge of AI technologies adapted specifically for the short sea market, and the lack of clear political frameworks or regulatory alignment, as highlighted in the SWOT analysis. This means additional risk, particularly regarding data sharing with AI systems, which may be especially problematic in sensitive areas such as contract negotiation automation and chartering negotiations. Adopting this strategy may be more appropriate for companies with higher digital readiness and system integration. For instance, shipowners like NORDEN, who have already integrated AI with their Voyage Management Systems (VMS), could benefit more from adapting this strategy.

Energy consumption concerns and potential risks linked to fewer regulations in countries like China need to be considered. Companies may need to invest in greater data capacity, and the sustainability perspective should also be evaluated, particularly about whether such

developments align with the company's broader CSR (corporate social responsibility) strategy.

As the survey results show, most shipowners, brokers, and charterers are not yet at this stage to pursue this strategy, and therefore, this is not the recommended option. However, depending on how the market and technology develop, it could be an option to adopt this strategy in a few years.

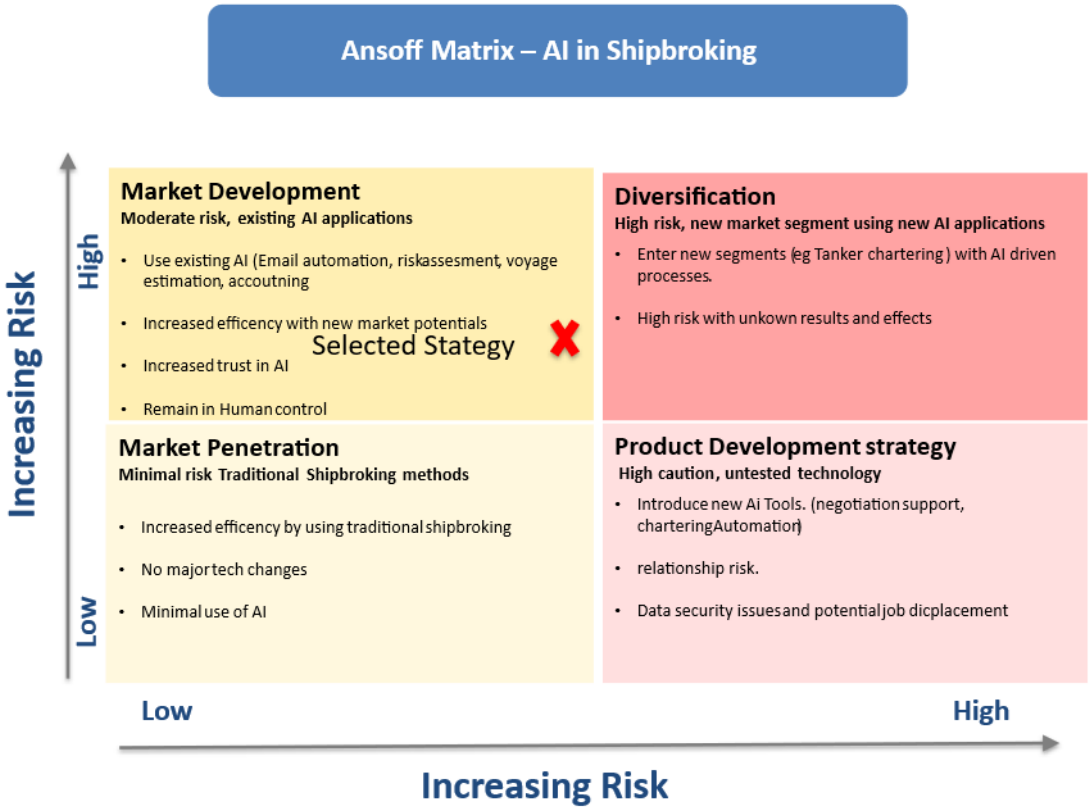

Figure 14 The Ansoff Matrix showing the strategies; Market penetration, Diversification, Market development & Product development strategies. Authors design 1st of May 2025

Finally, due to its flexibility and moderate risk, the "Market Development strategy" is believed to be the most practical and sustainable strategy of the four created in the "Ansoff Matrix" and, therefore, the best option.

CONCLUSION

In conclusion, the main objective of the paper, “How may AI affect the business microenvironment within the dry-bulk coaster sector in the coming years, and what strategy may shipbrokers select to best take advantage of this application in the macro business environment?”

AI refers to technologies capable of performing tasks that require human-like intelligence. In coaster dry-bulk shipping, AI is currently used in repetitive, data-driven areas such as voyage planning, forecasting, accounting, and email/document processing. Moreover, the survey results indicate that AI adoption remains limited. While interest grows, current usage is experimental primarily or focused on administrative support functions.

Out of the four strategies (Market penetration, Market development, Product development, and Diversification), the ***“****Market development****”*** is believed to be the best strategy in general for shipbrokers to adopt in the near future and gives a balance between risk and gains. Also dependent on the size of the corporation.

Further analysis could be done on the mapping of current AI usage within the dry cargo shipping sector to understand how technological maturity varies among brokers, shipowners, and charterers, and could provide valuable input for more tailored digital strategies. Additionally, tracking technological and regulatory progress, as well as industry market developments, needs to continue over time to determine whether higher-risk strategies, such as “product development,” may become more viable.

REFERENCES

1. *European Commission, Directorate-General for Communications Networks, Content and Technology. (2021). Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL LAYING DOWN HARMONISED RULES ON ARTIFICIAL INTELLIGENCE (ARTIFICIAL INTELLIGENCE ACT) AND AMENDING CERTAIN UNION LEGISLATIVE ACTS. Brussels,Belgium: European Comission.*
2. *(CREA), C. f. (2024). Financing Putin's War: Shadow Fleet Exports of Russian Oil. CREA.*
3. *(IMO), I. M. (2022). Global Maritime Security: Threats and Challenges. IMO. Retrieved from https://www.imo.org/en/OurWork/MaritimeSecurity/Pages/Threats-and-Challenges.aspx*
4. *(IMO), I. M. (2024). Maritime Security and Piracy Reports 2023. International Maritime Organization (IMO).*
5. *(OECD), O. f.-o. (2023). Sanctions and the Global Shipping Industry: Impact of Russia's War in Ukraine. OECD. Retrieved from https://www.oecd.org/en/topics/economic-outlook.html*
6. *(UNCTAD), U. N. (2024). Review of Maritime Transport. United Nations Conference on Trade and Development (UNCTAD). Retrieved from https://unctad.org/webflyer/review-maritime-transport-2022*
7. *Adland, R. C.-C. (2020). Optimal Ship Speed and the Cubic Law Revisited: Empirical Evidence from an Oil Tanker Fleet. Transportation Research Part E: Logistics and Transportation Review. Retrieved from https://doi.org/10.1016/j.tre.2020.101972*
8. *Agency, E. M. (2021). EMSA Outlook 2021: Maritime Safety and Security Improvements. European Maritime Safety Agency. Retrieved from The EMSA Outlook 2021 document is a report published by the European Maritime Safety Agency (EMSA). It falls under the category of institutional reports, rather than an academic journal or news article.*
9. *Allison, M. (2024, October 31). robotics and automation news. Retrieved March 31, 2025, from https://roboticsandautomationnews.com/2024/10/31/the-future-of-ship-broking-in-a-world-of-ai/84145/*
10. *altexsoft. (2021). altexsoft.com. Retrieved April 14, 2025, from https://www.altexsoft.com/blog/maritime-chartering-software/*
11. *Androjna, A. P. (2024). AIS Data Manipulation in the Illicit Global Oil Trade.*
12. *Androjna, A. P. (2024, January). AIS Data Manipulation in the Illicit Global Oil Trade. Retrieved from https://www.mdpi.com/2077-1312/12/1/6*
13. *Ballinger, O. (2024). Automatic Detection of Dark Ship-To-Ship Transfers Using Deep Learning and Satellite Imagery. arXiv.*
14. *Baptista, J. S. (2024). Reuters. Retrieved May 11, 2025, from https://www.reuters.com/world/china/off-grid-chinese-data-law-adds-global-shipping-disruption-2021-11-17/*
15. *Batrinca, G. (2007, January 1). Research Gate. Retrieved 04 8, 2025, from https://www.researchgate.net/publication/263506746_E-Chartering_Web_Based_Platforms_Between_Success_and_Failure*
16. *Bockmann, M. W. (2023). Abuse of IMO vessel-numbering scheme and falsely flagged ships continues, committee hears. Lloyd's List Intelligence. Retrieved from https://www.lloydslist.com/LL1144513/Abuse-of-IMO-vesselnumbering-scheme-and-falsely-flagged-ships-continues-committee-hears?utm*
17. *Bockmann, M. W. (2023). Shifty Shades of Grey: the different risk profiles of the dark fleet explained. Lloyds List Intelligence.*
18. *Bockmann, M. W. (2024, November 18). Spoofing tanker completes Russia cargo STS with sanctions-linked suezmaxes. Retrieved from lloydslistintelligence.com: https://www.lloydslist.com/LL1151476/Spoofing-tanker-completes-Russia-cargo-STS-with-sanctions-linked-suezmaxes*

19. *Bockmannci, M. W. (2024). Evolving geopoliticalrisk, sanctions, the 'dark' fleet, and deceptive shipping practices. Lloyd's List Intelligence.*

20. *Burmester-Vogel. (2025). burmester-vogel.com. Retrieved April 2, 2025, from https://burmester-vogel.com/copilot-demurrage-platform*

21. *Chakravorti, B. (2024). Harvard business review . Retrieved April 3, 2025, from https://hbr.org/2024/05/ais-trust-problem?*

22. *Council, A. (2023). Russia's growing dark fleet: Risks for the global maritime order. Atlantic Counci. Retrieved from https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/russias-growing-dark-fleet-risks-for-the-global-maritime-order/*

23. *Decision Foundry. (2024). Decision Foundry.com. Retrieved May 11, 2025, from https://www.decisionfoundry.com/data/articles/complete-guide-us-data-protection-laws/*

24. *Dixon, G. (2023, October 03). Dark fleet tankers 'spill 5,400 barrels during Middle East oil transfer. Retrieved from TradeWinds is part of DN Media Group: https://www.tradewindsnews.com/tankers/dark-fleet-tankers-spill-5-400-barrels-during-middle-east-oil-transfer/2-1-1719478*

25. *Döhle, P. (2024). Medium.com. Retrieved April 14, 2025, from https://medium.com/carriers-of-tomorrow-updates-on-shipping-4-0/melf-br%C3%BCnn-human-interaction-cannot-be-replaced-by-technology-91f35e6d4b80*

26. *European Commission. (2024). Commission Europe. Retrieved April 11, 2025, from https://commission.europa.eu/law/law-topic/data-protection_en*

27. *European Commission Data protection. (2024). European Commission Data protection. Retrieved May 11, 2025, from https://commission.europa.eu/law/law-topic/data-protection_en*

28. *Evi Plomartiou, S. J. (2022, December 19). Pub Med Central - National Library of Medicine. Retrieved April 14, 2025, from https://pmc.ncbi.nlm.nih.gov/articles/PMC9760532/*

29. *Executive, T. M. (2022, January 18). Record Seizures of Drugs and Weapons in the Arabian Sea and the Gulf of Oman. Retrieved from The Maritime Executive, LLC: https://maritime-executive.com/article/record-seizures-of-drugs-and-weapons-in-arabian-sea-and-gulf-of-oman*

30. *Fadi Bou Reslan, N. J. (2024). Assessing the Transformative Impact of AI Adoption on Efficiency, Fraud Detection, and Skill Dynamics in Accounting Practices. Beirut, Lebanon: Journal of Risk and Financial Management (JRFM).*

31. *Fields, C. (2024, October 9). www.balticexchange.com. Retrieved April 12, 2025, from https://www.balticexchange.com/en/news-and-events/news/baltic-magazine/2024/Double-edged-sword-of-AI-in-shipping.html*

32. *Howard, G. (2024). Seatrade Martime. Retrieved April 14, 2025, from https://www.seatrade-maritime.com/maritime-technology/the-rise-of-ai-shipowners-will-not-reveal-their-secrets-to-machines-*

33. *Ibal, R. (2023). Bulitin.com. Retrieved April 2, 2025, from https://builtin.com/articles/artificial-intelligence-supply-chain*

34. *Institute of Chartered Shipbrokers. (2020). Shipping business. In P. N. William Simper (Ed.), Shipping business (p. 102). London: Institute of Chartered Shipbrokers.*

35. *Intelligence, L. L. (2023). Shifty Shades of Grey: The Different Risk Profiles of the Dark Fleet Explained. Lloyd's List Intelligence. Retrieved from https://www.lloydslistintelligence.com/*

36. *International Maritime Organization. (2024). Maritime Security and Piracy Reports 2023. International Maritime Organization (IMO).*

37. *Irmina Durlik, T. M. (2024, Augusti 22). MDPI. Retrieved April 14, 2025, from https://www.mdpi.com/2076-3417/14/18/8420?*

38. *Irmina Durlik, T. M. (2024, September 19). Multidisciplinary Digital Publishing Institute. Retrieved March 31, 2025, from https://www.mdpi.com/2076-3417/14/18/8420?*

39. *Julien Bouissou, A. M. (2024, October 30). Le Monde. Retrieved from Russia's ghost fleets, a strategic asset for selling sanctioned oil: https://www.lemonde.fr/en/les-decodeurs/article/2024/10/30/russia-s-ghost-fleets-a-strategic-asset-for-selling-sanctioned-oil_6731039_8.html*

40. *Jungman, C. (2023). Blacklisted Russian and Iranian ships: trading patterns and partners revealed. Seasearcher / Lloyd's List Intelligence.*

41. *Kendrick, J. M. (2022). Harvard Business Review. Retrieved April 4, 2025, from https://hbr.org/2022/09/ai-isnt-ready-to-make-unsupervised-decisions?*

42. *Krishnamoorthy, J. Y. (2023, September 18). How a burnt-out, abandoned ship reveals the secrets of a shadow tanker network. Retrieved from The Guardian: https://www.theguardian.com/business/2023/sep/18/how-a-burnt-out-abandoned-ship-reveals-the-secrets-of-a-shadow-tanker-network#:~:text=The%20Pablo%20was%20part%20of,Pablo%20remains%20where%20it%20is.*

43. *List, L. (2023). Dark fleet: Out of mind, but not out of sight. LIyods List. Retrieved from https://www.lloydslist.com/LL1144570/Dark-fleet-Out-of-mind-but-not-out-of-sight*

44. *Lloyd's List Intelligence. (2023). Shifty Shades of Grey: The Different Risk Profiles of the Dark Fleet Explained. Lloyd's List Intelligence. Retrieved from https://www.lloydslistintelligence.com/thought-leadership/reports-and-whitepapers*

45. *Lloyds intelligence. (2025). Lloyds intelligence. Retrieved May 8, 2025, from https://www.lloydslistintelligence.com/contact-us/press/announcements?*

46. *Mandra, J. O. (2023, May 8). Devastating Pablo tanker explosion exposes dangers of growing shadow fleet. Retrieved from Offshore Energy Magazine: https://www.offshore-energy.biz/pablo-tanker-explosion-exposes-dangers-of-growing-shadow-fleet/*

47. *McKinsey & Company. (2024). McKinsey & Company. Retrieved April 1, 2025, from https://www.mckinsey.com/featured-insights/mckinsey-explainers/what-is-ai*

48. *Mirra, M. (2025). Aligned. Retrieved April 14, 2025, from https://www.alignednegotiation.com/insights/what-ai-can-and-cant-do-for-negotiation?*

49. *Munday, R. (2016). Agency: Law and principles (3rd Edition). In P. D. DeMott (Ed.), Agency: Law and principles (3rd Edition) (pp. 147-164). Oxford: Oxford University Press (OUP).*

50. *Munoz, R. P. (2024). Barkley EDU. Retrieved May 8, 2025, from https://cmr.berkeley.edu/2024/12/utilizing-ai-for-maritime-transport-optimization/*

51. *Munoz, R. P. (2024). Bekley EDU. Retrieved May 8, 2025, from https://cmr.berkeley.edu/2024/12/utilizing-ai-for-maritime-transport-optimization/*

52. *Murphy, G. (2023). Safety 4 sea. Retrieved April 14, 2025, from https://safety4sea.com/why-professional-shipbroking-standards-matter-more-than-ever-before/*

53. *Nangoy, S. S. (2023, July 12). Reuters. Retrieved from Reuters: https://www.reuters.com/world/indonesia-seizes-iranian-flagged-tanker-suspected-illegal-transshipment-oil-2023-07-11/*

54. *NCSC - National Cyber Security UK. (2024). NCSC.gov.uk. Retrieved April 2, 2025, from https://www.ncsc.gov.uk/guidance/ai-and-cyber-security-what-you-need-to-know?*

55. *Netsuite. (2025). netsuite.com. Retrieved April 5, 2025, from https://www.netsuite.com/portal/resource/articles/financial-management/financial-forecast-ai.shtml*

56. *OECD. (2021). MISUSE OF CONTAINERIZED MARITIME SHIPPING IN THE GLOBAL TRADE OF COUNTERFEITS. Retrieved from https://www.oecd.org/en/publications/misuse-of-containerized-maritime-shipping-in-the-global-trade-of-counterfeits_e39d8939-en.html*

57. *Pansare, S. (2024). Globaltrademag.com. Retrieved April 2, 2025, from https://www.globaltrademag.com/predictive-analytics-in-global-trade-forecasting-market-trends-with-ai/*

58. *Peacock, J. (2025). Splash247. Retrieved April 14, 2025, from https://splash247.com/is-ai-about-to-replace-charterers/*

59. *Pedrozo, P. P. (2025, April 27). Guest Post: Prof Pete Pedrozo on "Russia's Shadow Fleet". Retrieved May 4, 2025, from https://sites.duke.edu/lawfire/2025/04/27/guest-post-prof-pete-pedrozo-on-russias-shadow-fleet/*

60. *Raiten, K. (2025). Orca AI. Retrieved May 8, 2025, from https://www.orca-ai.io/blog/transforming-maritime-operations-with-data-analytics/*

61. *Reberio, A. (2022). Industrialcyber. Retrieved April 2, 2025, from https://industrialcyber.co/regulation-standards-and-compliance/uk-rolls-out-its-national-strategy-for-maritime-security-to-target-physical-and-cyber-threats/*

62. *S&P Global Market Intelligence. (2023). Russia's Shadow Fleet – Understanding Its Size, Activity, and Relationships. S&P Global Market Intelligence. Retrieved from https://www.spglobal.com/marketintelligence*

63. *Schmelzer, R. (2023). Forbes.com. Retrieved April 2, 2025, from https://www.forbes.com/sites/cognitiveworld/2023/08/11/the-hidden-challenges-in-integrating-data-for-ai-systems/*

64. *Sedna. (2025). Sedna.com. Retrieved April 2, 2025, from https://sedna.com/case-studies/norden-optimised-communication-to-drive-focus-and-profitability*

65. *Sedna Ai mail. (2023). sedna.com. Retrieved April 14, 2025, from https://sedna.com/resources/how-the-maritime-industry-leverages-ai-for-email-management?*

66. *Shipuniverse. (2025). Shipuniverse.com. Retrieved April 15, 2025*

67. *Singapore, M. a. (2021). Dltledgers' Tech Creates Digital Bill of Lading to Link Ports of Singapore and Rotterdam. Asia Biz Today. Retrieved from https://www.asiabiztoday.com/2021/05/03/dltledgers-tech-digital-bill-of-lading-singapore-rotterdam/*

68. *Smooth Sea 22 was not the ship it claimed to be. (2023, January 27). Retrieved from International Institute of Marine Surveying 2025.: https://www.iims.org.uk/smooth-sea-22-was-not-the-ship-it-claimed-to-be/*

69. *Soldatkin, V. (2024). Russia faces higher costs on sea-borne oil exports due to new US sanctions. REUTERS. Retrieved from https://www.reuters.com/business/energy/russia-faces-higher-costs-sea-borne-oil-exports-due-new-us-sanctions-2025-01-13/?utm_source*

70. *Stanford (HAI). (2025). The 2025 AI Index Report. Stanford: Stanford Institute for Human-Centered Artificial Intelligence.*

71. *State, U. D. (2020). Sanctions Advisory for the Maritime Industry, Energy and Metals Sectors, and Related Communities. U.S. Department of State, U.S. Department of the Treasury, and U.S. Coast Guard. Retrieved from https://home.treasury.gov*

72. *State, U. D. (2020). Sanctions Advisory for the Maritime Industry, Energy and Metals Sectors, and Related Communities. U.S. Department of State, U.S. Department of the Treasury, and U.S. Coast Guard. Retrieved from https://home.treasury.gov*

73. *Tannenbaum, D. (2024, December 2). Toxic Tonnage: How the Dark Fleet puts the world at environmental & economic risk. Retrieved May 4, 2025, from https://www.doccredit.world/dark-fleet-environmental-and-economic-risks/*

74. *Tejwani, D. (2024). UNCTAD Transport and Trade Facilitation Newsletter. Retrieved May 11, 2025, from https://etradeforall.org/news/navigating-future-how-ai-big-data-and-autonomous-systems-are-reshaping-maritime-transport*

75. *Triebert, C. M. (2023). Fake Signals and American Insurance: How a Dark Fleet Moves Russian Oil. The New York Times. Retrieved from https://www.nytimes.com/interactive/2023/04/10/world/europe/russia-oil-dark-fleet.html*

76. *U.S. Department of State. (2020). Sanctions Advisory for the Maritime Industry, Energy and Metals Sectors, and Related Communities. U.S. Department of State, U.S. Department of the Treasury, and U.S. Coast Guard. Retrieved from https://home.treasury.gov*

77. *United Nations Office on Drugs and Crime, UNODC. (2024). Transnational Organized Crime Threat Assessment. UNODC. Retrieved from https://www.unodc.org/unodc/data-and-analysis/TOC-threat-assessments.html*

78. *Zewe, A. (2025). Massachusetts Institute of Technology. Retrieved Ma 11, 2025, from https://news.mit.edu/2025/explained-generative-ai-environmental-impact-0117*

APPENDIX 1

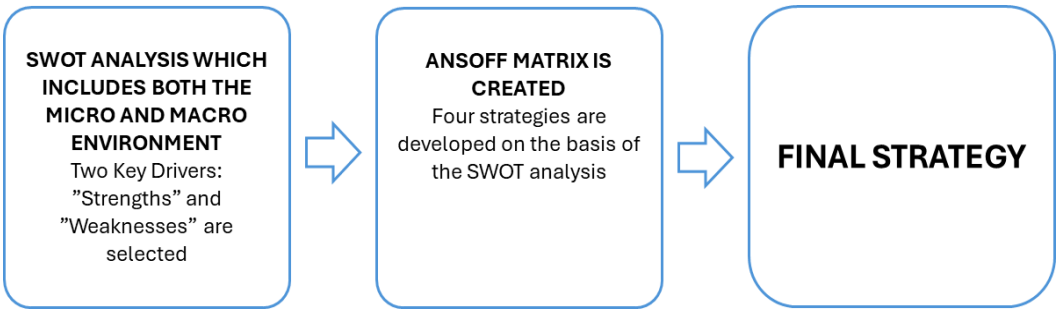

Figure 1: Showing paper structure and methodology. Authors design 1st May 2025

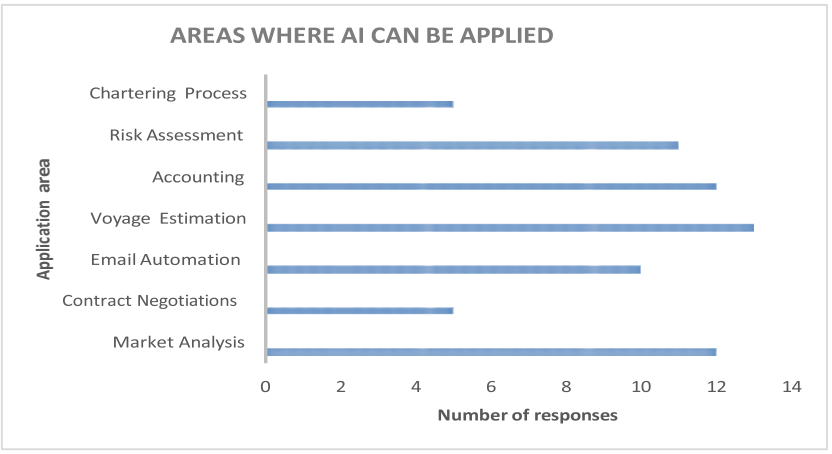

Figure 2 shows interviewees response to question number one in the questionnaire. Authors design 1st May 2025. Source: FONASBA Questionnaire by Otto Hillerström

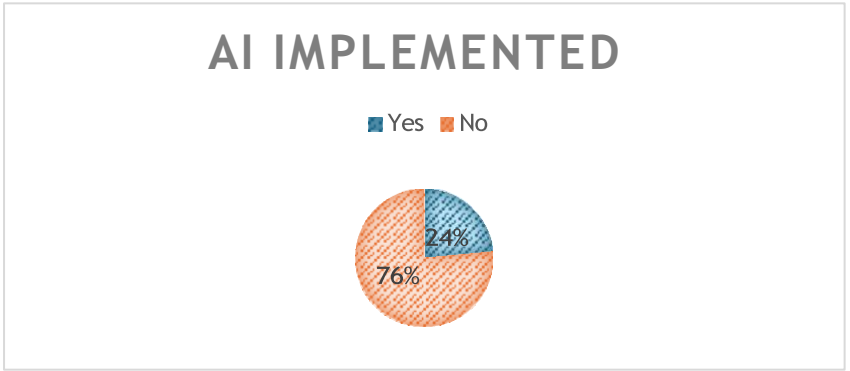

Figure 3 shows how many of the interviewees have implemented AI in their daily business routines. Authors design 1st May 2025. Source: FONASBA Questionnaire by Otto Hillerström

APPENDIX 2

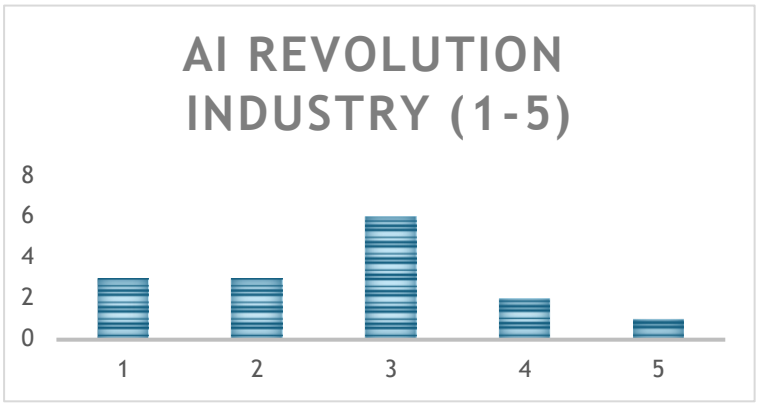

Figure 4 indicates the belief in the AI revolution held by the interviewees. 1 Strongly Disagree to 2 Strongly Agree) Authors design 1st May 2025. Source: FONASBA Questionnaire by Otto Hillerström

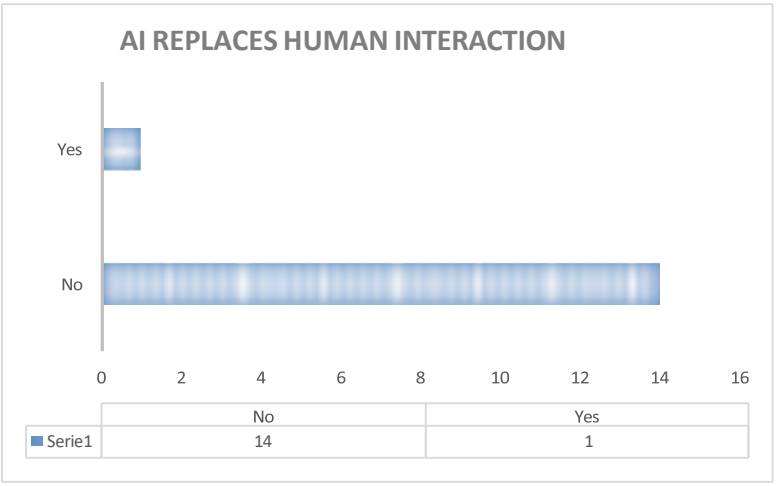

Figure 5 illustrates that only one interviewee out of 15 participating in the survey thought that AI would replace human interaction. Authors design 1st May 2025. Source: FONASBA Questionnaire by Otto Hillerström

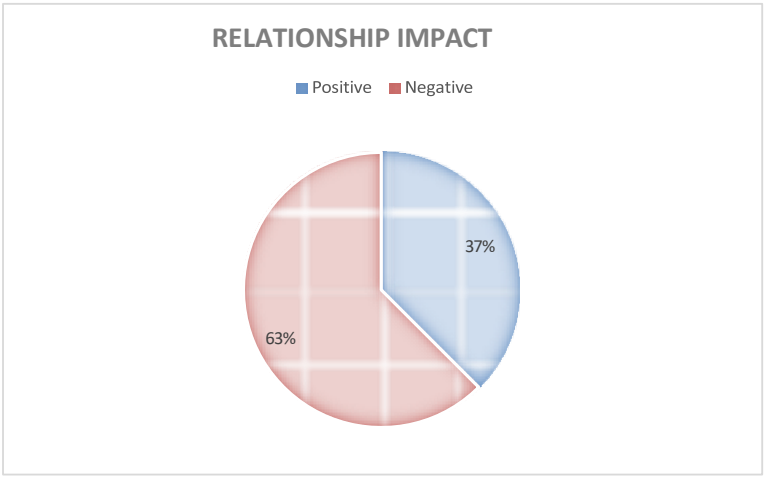

Figure 6 shows how interviewees thought AI may impact personal relationships. Authors design 1st May 2025. Source: FONASBA Questionnaire by Otto Hillerström

APPENDIX 3

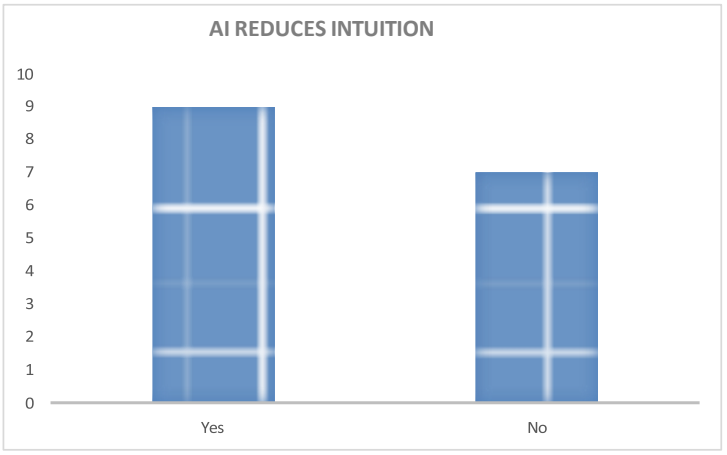

Figure 7 shows that a majority of the respondents of the survey were of the opinion that AI applications reduce human intuition. Authors design 1st May 2025. Source: FONASBA Questionnaire by Otto Hillerström

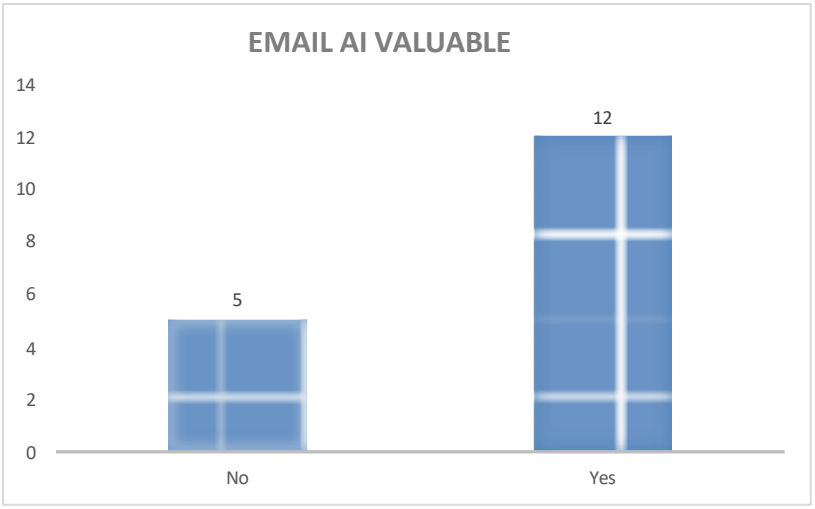

Figure 8 shows that the majority of the interviewees in the FONASBA questionnaire thought that AI optimization of email may be valuable. Authors design 1st May 2025. Source: FONASBA Questionnaire by Otto Hillerström

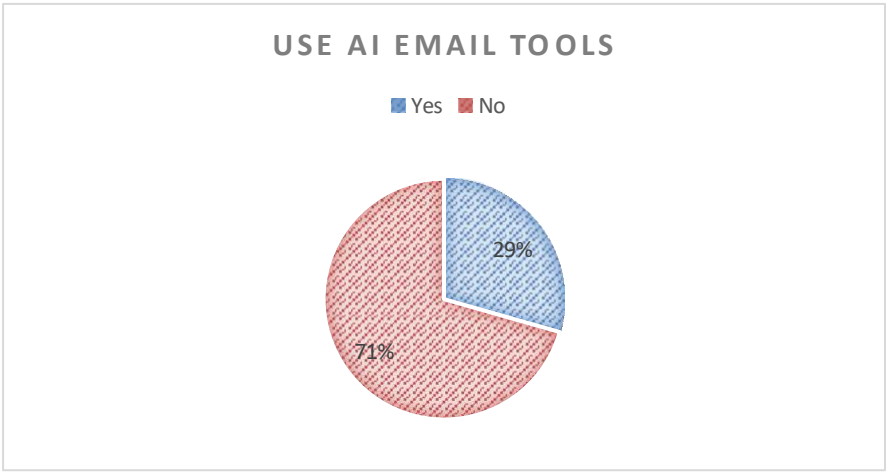

Figure 9 shows how many of the interviewees were using AI tools in their daily work environment. Authors design 1st May 2025. Source: FONASBA Questionnaire by Otto Hillerström

APPENDIX 4

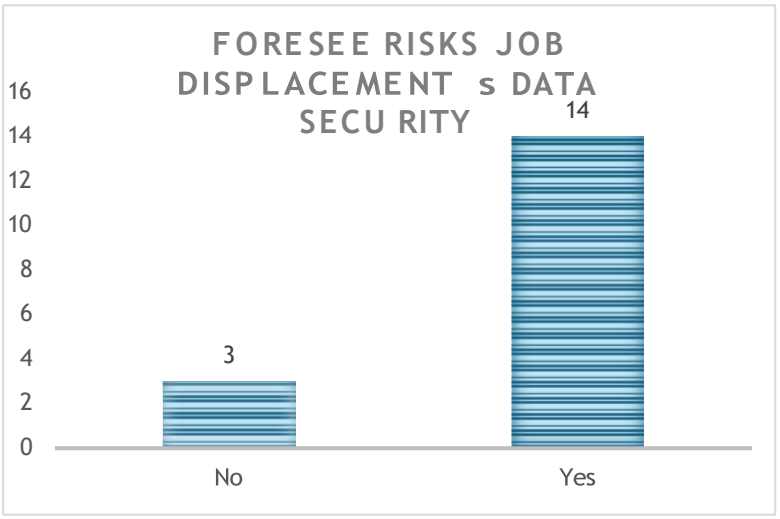

Figure 10: Showing how the survey respondents see the risk of job displacement & data security. Authors design 1st May 2025. Source: FONASBA Questionnaire by Otto Hillerström

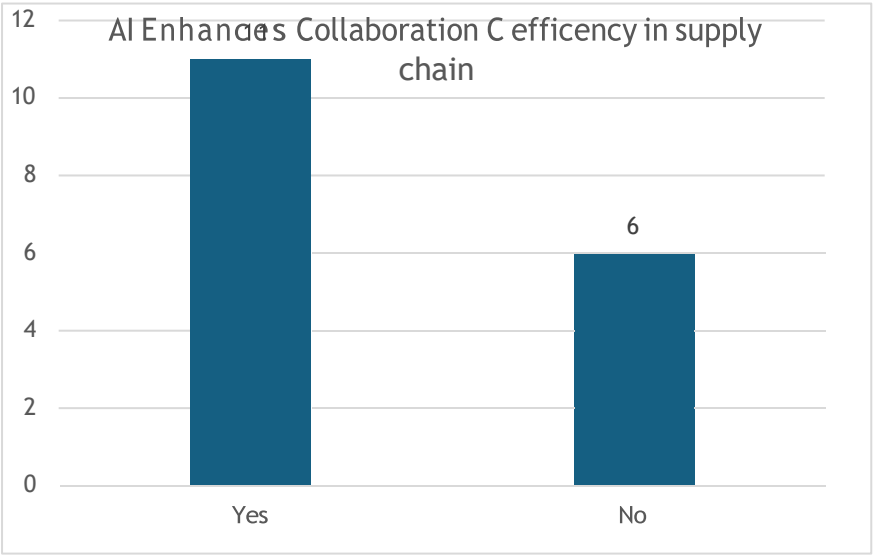

Figure 11 shows how interviewees thought about AI enhancing the overall supply chain. Authors design 1st May, 2025. Source: FONASBA Questionnaire by Otto Hillerstr

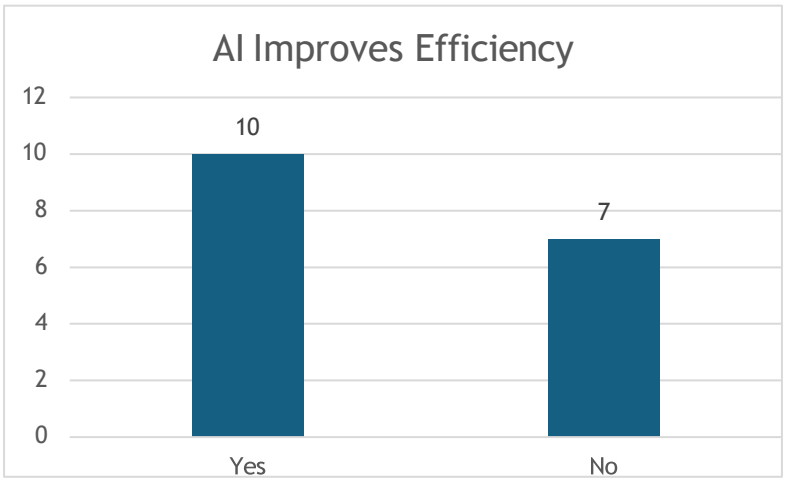

Figure 12 shows whether respondents believe AI will improve the efficiency of the negotiation process or not. Authors design 1st May 2025. Source: FONASBA Questionnaire by Otto Hillerström

APPENDIX 5

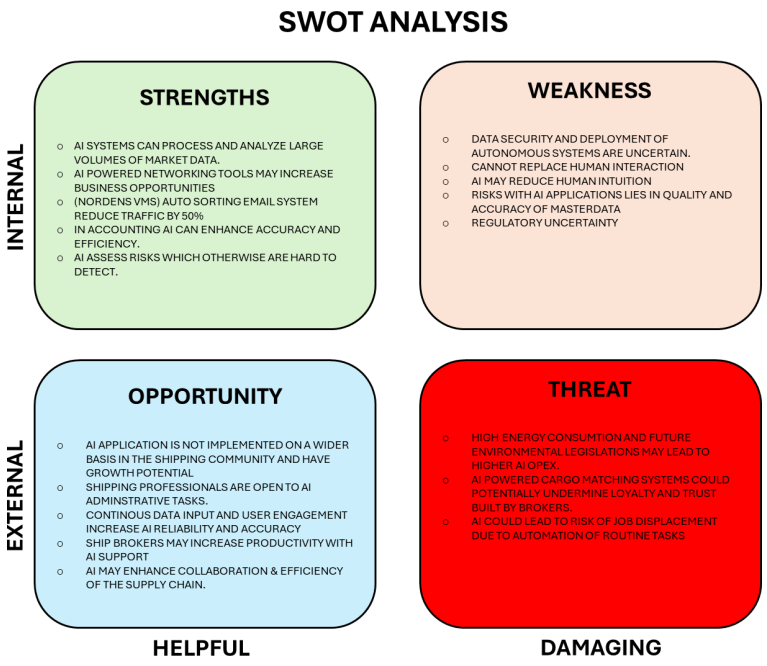

Figure 13 SWOT analysis showing AI applications: Strengths, Weaknesses, Opportunities & Threats. Authors design 1st May 2025

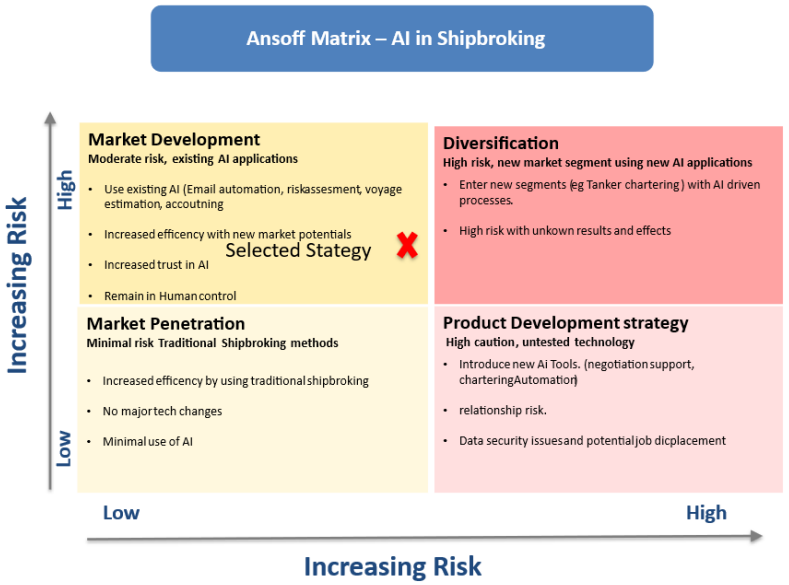

Figure 14 The Ansoff Matrix showing the strategies: Market penetration, Diversification, Market development & Product development strategies. Authors design 1st of May 2025

APPENDIX 6

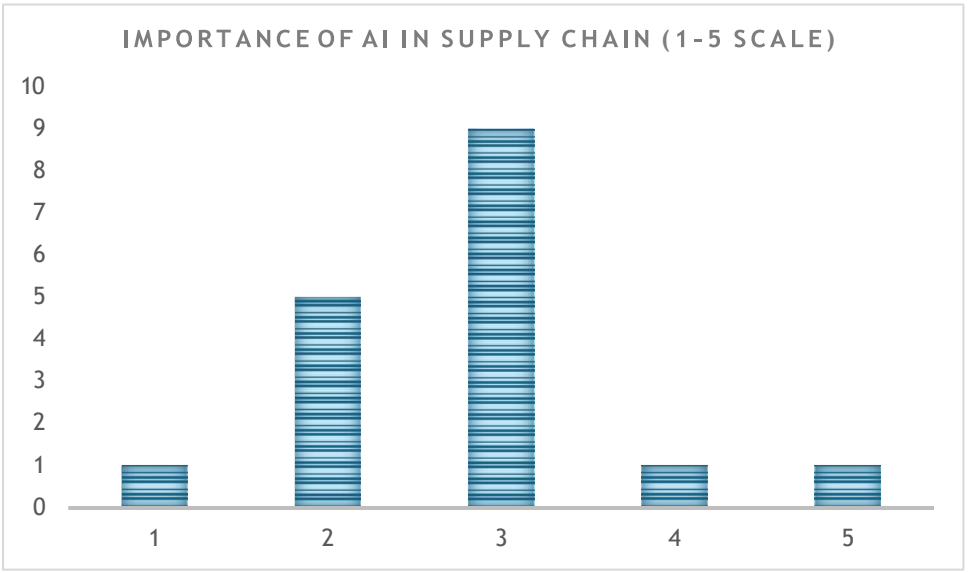

Figure 15 showing the importance of AI improvement in supply chain. Scale of (1 to 5) for the supply chain involving Shipbrokers, Shipowners & Charterers (1 being not at all, 5 being extensive); From Authors design 1st May 2025. Source: FONASBA Questionnaire by Otto Hillerström. Not part of paper.

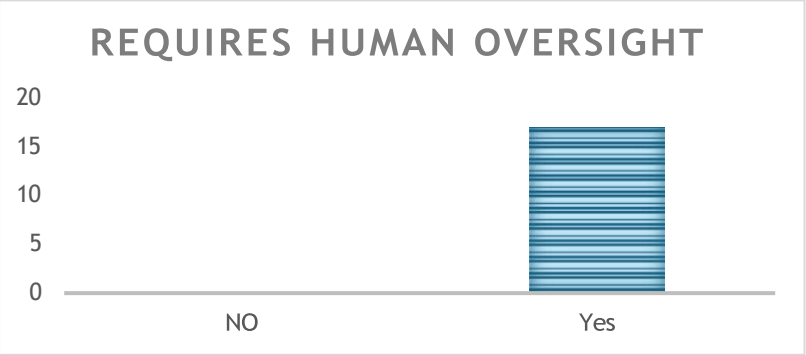

Figure 16. AI requires human oversight; From the Authors design 1st May 2025. Source: FONASBA Questionnaire by Otto Hillerström. Not part of the paper.

APPENDIX 7

Questionnaire

Artificial Intelligence (AI) refers to the capability of computer systems to perform tasks that typically require human intelligence. These tasks include learning from executing different task and improving its results. Analysing vast amount of data using algorithms to generate references and summary

1: Familiarity and Usage of AI

1. In which of the below areas of the commercial dry-bulk shipping business do you think AI can be applied?

☐Market analysis and forecasting
☐Contract negotiations[1]
☐Email automation [2]
☐Voyage estimation[3]
☐Accounting[4]
☐Risk assessment[5]
☐Chartering process automation[6]
☐Other (please specify) _____

2. Have you or your company implemented AI-driven tools in your daily operations?
   ☐Yes
   ☐No
   IF yes please advice if any of above _____

2: AI and the negotiation & operational process

1. In the future commercial coaster dry bulk shipping segment, how important do you think AI-analytics and predictive models will be on a scale of (1 to 5) for the supply chain involving Shipbrokers, Shipowners & Charterers (1 being not at all, 5 being extensively);

   ☐1
   ☐2
   ☐3
   ☐4
   ☐5

2. Do you believe AI systems should require human oversight at various stages of decision-making?
   ☐Yes
   ☐No

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[1] *such as avoiding and repeating past mistakes from previous COA negotiations*
[2] *Email sorting, automated responses etc. in Microsoft Outlook or similar platforms*
[3] *Such as integrating realtime data (ship to office), scenario planning, applying historical data for better decision making etc. into the voyage estimate.*
[4] *Such as automatic filing of recaps and charterparties which subsequently are used for invoicing purposes and finally passed on to auditing and book-keeping.*
[5] *Such as finding right cargo description and C/P clauses when transporting dangerous goods, evaluating war risk zones etc.*
[6] *Such as linking all "SMS", "Whatsup", documentation and email traffic to the final recap, thereby reducing the risk of human error.*

3: AI´s Role in personal relations & experience

1. Since AI 's role is basically to reduce human error, improve time management, and refine the overall fixture process, in this respect, what impact do you think it will have on personal relationships between brokers, charterers, and shipowners?
   ☐Positive
   ☐Negative
   Personal comments _____

2. Could AI potentially reduce human intuition during negotiations and thereby making the commercial player more indifferent to the outcome of the process?
   ☐Yes
   ☐No

3. In an industry which highly rely on trust and personal relationships, do you think that AI can replace this element of human interaction?
   ☐Yes
   ☐No
   Personal comments _____

4: AI Optimization of Email Platforms

1. Would you consider AI-driven email optimization a valuable tool for managing communication in your daily shipping activities?
   ☐Yes
   ☐No
2. Do you currently use email functions with AI-features (email sorting, automated responses etc.) in Microsoft Outlook or similar platforms?
   ☐Yes
   ☐No

5: Future of AI in Dry Bulk Shipbroking

1. Do you foresee any risks such as job displacement and data security issues in implementing AI in commercial shipping business?
   ☐Yes
   ☐No
   Personal comments _____

2. To what extent do you agree with the statement: "AI will revolutionize the shipbroking industry within the next decade"? (1- Strongly Disagree, 5 - Strongly Agree)

   ☐1
   ☐2
   ☐3
   ☐4
   ☐5

3. Do you think AI can enhance collaboration and efficiency in the supply chain between Shipbrokers, Charterers, and Owners?
   ☐Yes
   ☐No
   Personal comments _____

Section 6: In summary

1. Taking the abovementioned into account do you believe AI will improve the overall efficiency of the negotiation process in shipbroking?
   ☐Yes
   ☐No
   Personal comments _____

Thank you for completing this survey. Please note you will remain anonymous

With kind regards: Otto Hillerström