A THREAT OR AN OVERUSED BUZZWORD? HOW ARTIFICIAL INTELLIGENCE AND DIGITALISATION WILL SHAPE ONSHORE CAREERS IN COMMERCIAL SHIPPING

WILLIAM LOOSLEY

UNITED KINGDOM

2025

A THREAT OR AN OVERUSED BUZZWORD? HOW ARTIFICIAL INTELLIGENCE AND DIGITALISATION WILL SHAPE ONSHORE CAREERS IN COMMERCIAL SHIPPING.

WILLIAM LOOSLEY

UNITED KINGDOM

ABSTRACT

The threats to careers in shipping are well documented (Heilig, Schwarze and Voß, 2017). Both onshore and offshore careers are vulnerable to automation more recently, artificial intelligence has highlighted the potential threat to traditional maritime roles. How this will look in practice is still the subject of much debate in an industry traditionally conservative and slow to adopt new technologies. This innate cautiousness and skepticism are nothing new in commercial shipping (Pallis, Kladaki and Notteboom, 2024) – we are fortunate not to still be reliant on coal as the dominant method of propulsion as was the mid-20th century concern over having 'explosive' crude oil on board despite the higher energy efficiency and clear benefits of this 'new fuel'. Ultimately, shipowners and charterers are in business to make money and, if something can make a clear business case, change is inevitable.

This dissertation will explore the impact that Artificial Intelligence (AI) and digitalisation could have across shipping – with a specific focus on shipbrokers, ship agents, and trade documents such as bills of lading. By combining a dual-method approach using four interviews from across the author's network and the author's own machine learning model of the Baltic Exchange Index, this study will thoroughly explore the threat that AI poses. Within this dissertation, 'AI' may often be used as a catch all term for Artificial Intelligence and Machine Learning – both of which are being thoroughly explored throughout this dissertation.

The research will critically assess whether AI will pose an existential threat to shipping careers or, alternatively, can serve as a powerful tool that will enhance the efficiency of shipbrokers and ship agents. First, it will investigate the traditional paper-based practices of bills of lading and the campaign, led by the Future of International Trade (FIT) Alliance, to transition to electronic bills of lading while discussing the business cases and challenges in the adoption of these technologies based on firsthand experience and interviews. Next, this dissertation will explore AI in commercial shipping today to critically develop potential scenarios for the future of chartering and careers within chartering – it then considers these scenarios from the perspectives of shipbrokers as interviewed for this dissertation. Finally, this dissertation will present a technical case study using the author's own Baltic Exchange Index prediction model to examine the threat of the development of this technology to analysts and brokers, whose roles rely on capturing market sentiment.

DIGITAL TRANSFORMATION WITHIN SHIPPING

Shipping is an industry ripe for digitalisation. Commercial shipping in the 21st century is primarily made up of a mix of contracts from 1946, paper-based documents, archaic administrative systems, and only fifty years ago, Telex was phased out as the main form of communication. Since that time, the world has changed such that computerized administrative systems and smartphones run our lives to such an extent that 90% of the world's data – approximately 330 zettabytes (that's 33 followed by 22 zeros) – has been created in the past two years (Bartley, 2024). From a macro perspective, we have a rapidly digitalizing world with a slow and disorganized shipping industry falling behind. The very nature of shipping is driven by financial incentives and provided that shipping follows the principles of free market economics (Smith, 1776), digitalisation and optimization will occur if there is a business case and some form of coordinated effort towards change. From a more granular perspective and from the perspective of clients facing roles like shipbrokers, ship agents, and those involved in commercial shipping, the challenges to digitalisation arise in being the first movers to technology and the concern that by being the first to implement a technology you might lose clients and miss out on business.

There are examples of a coordinated effort towards digitalisation with a strong business case within shipping. A good example is the work of the FIT Alliance in pushing the industry to adopt electronic bills of lading (eBLs) – the digital version of a crucial trade document.

ELECTRONIC BILLS OF LADING AS A CASE STUDY FOR TRADE DIGITALISATION

The bill of lading is a paper-based document that facilitates the movement of goods as a 'document of title' which provides legal protection and acts as a proof of contract for shippers and receivers to discharge the cargo (CargoX, 2023). Bills of lading are similar to receipts in that they carry the seal of the shipper and proof of carriage, in fact, the very first bills of lading in medieval Europe were this simple and were used to discharge cargo and validate long distance trade (Encyclopaedia Britannica, 2025). Bills of lading were first established as a 'document of title' in Lickbarrow vs Mason (1794) which established the core principles of bills of lading as a legal document: their negotiability, document of title, and protection of the holders of these bills of lading providing purchasers were acting in good faith (Law Explorer, 2016). Later, through the 19th and early 20th centuries, international agreements like the Hague and later the Hague-Visby rules were developed to require carriers to issue bills of lading and standardize trade at sea. Since then, very little about the bill of lading has changed, a bill of lading is first issued at the load port to both shippers' and receivers' banks and finally for presentation at the discharge port before discharging can commence (see Figure 1). These bills of lading travel separately to the cargo using a network of couriers to arrive at the discharge port after having been processed by both banks before the cargo to commence discharging.

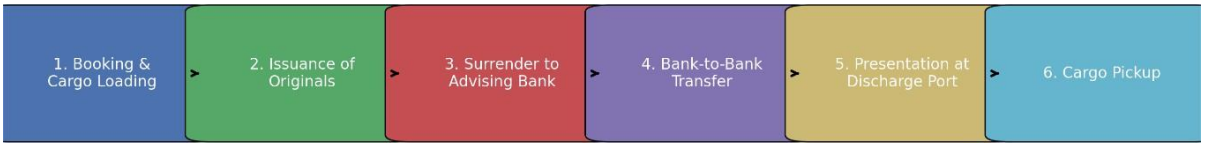

Figure 1 shows the processing of a bill of lading from load port to discharge port (Author's own)

This process in its entirety can often take weeks and, especially on shorter voyages and oil trades, the paper bill of lading might not arrive before the cargo, in which case, a letter of indemnity has to be issued in order to discharge the cargo. These letters of indemnity present a legal and financial risk for all parties and if the cargo is mis-delivered to someone not entitled under the original bill of lading, the carrier becomes liable for the full value of the cargo (Saftey4Sea, 2016).

This 'letter of indemnity problem' was one of the initial motivations behind the creation of the first electronic bill of lading platforms with the development of Bolero and essDOCS in the late 1990s and early 2000s. Since that time, there have been tens of other electronic bill of lading platforms all developed with the aim of providing a platform to pass eBLs between all parties efficiently and it is estimated that today approximately 5% of all bills of lading issued globally are electronic (DCSA, 2023). This already steady progress, combined with the Electronic Trade Documents Act 2023 being passed into English law, has meant that electronic bills of lading are now classed as a legal trade document with the same legal effects as paper trade documents – removing any legal implications for using an electronic bill of lading over a paper bill.

In addition to the 'letter of indemnity problem', the digitalisation of this crucial trade document has other benefits too. A McKinsey study cites that by converting to electronic bills of lading, the world economy could save up to $6.5 billion in direct costs as well as up to $40 billion in global trade per year (Casanova *et al.*, 2022). This clearly presents an overwhelming business case by reducing costs and time and resources taken to print, stamp, sign, and process each of these bills of lading - especially in the container trades where there can often be thousands of bills of lading on board for each voyage. This presents an opportunity for the container companies', says Grant Hunter, the Chief Digital Officer and director of products at BIMCO in an interview with the author (G. Hunter, interview by author, 2025). Who goes on to say that, traditionally, the processing of these bills of lading had been profit centres for them where they would charge shippers and receivers handsomely for the privilege of handling these bills of lading; with the threat of the digitalisation of this trade document, container companies will need to find new ways of generating profit (G. Hunter, interview by author, 2025).

THE ELECTRONIC BILL OF LADING REVOLUTION

It is clear that changes are needed for all of the approximately 105,000 commercial cargo ships around the world (UNCTAD, 2022) to adopt completely eBLs for each of their voyages. It is also clear that some sort of revolution needs to be led by the biggest companies and organisations to help encourage smaller companies to also invest in this technology. According to Grant Hunter (G. Hunter, interview by author, 2025), this change is already occurring with some of the

largest container shipping companies like Taiwanese shipping giant, Evergreen, reporting the use of between 40-50% electronic trade documents in their trades throughout 2024 with the aim of increasing this figure annually by encouraging shippers with larger trade volumes to process these eBLs through one of the eBL platforms. Of these eBL platforms, ten of them are approved by the international P&I clubs having full insurance coverage akin to a paper bill of lading.

As part of leading from the front and taking the initiative to encourage shipping to adopt electronic bills of lading, the FIT Allianc was formed in February 2022 by five leading membership organisations from across shipping (BIMCO, DCSA, FIATA, ICC, Swift) and serves as a clear example of NGOs taking action on digitalisation in shipping for the overall benefit of the industry. The FIT Alliance has one clear aim of achieving the '100% adoption of a standards-based eBL' (FIT Alliance, 2022) within which, it's membership organisations like BIMCO have set their own targets like '25 by 25' and '100% by 2030' from BIMCO in the dry bulk trades and by DCSA in the container shipping trades, respectively. According to BIMCO, their '25 by 25' campaign to get some of the world's biggest shippers to move 25% of one dry bulk commodity using an electronic bill of lading by 2025 was a great success with the final figure for eBL adoption across the four of the world's biggest shippers published at the end of 2024 being 25.1% (BIMCO, 2025).

As Hunter suggests (G. Hunter, interview by author, 2025), we are approaching a tipping point in digitalisation whereby shippers and receivers are now approaching shipping companies and saying they would prefer to use electronic bills of lading rather than the other way around. Once this point is reached by around 50% of shipping companies, Hunter (2025) believes it will soon become easier for companies to make use of these electronic bill of lading platforms rather than not. Despite this optimism from BIMCO and the FIT Alliance and the clear business case and incentives for containers and dry bulk, there is perhaps less of an impetus for eBLs from the tanker market where cargoes are often traded at sea with much less lead time. This highlights one of the pitfalls of using electronic bills of lading platforms, normally requiring each counter party to be set up on each of the platforms prior to the issuance of the bill of lading. This is a problem of interoperability. Some eBL platforms are incompatible with others making it a time-consuming process to sign up to each platform individually. The interoperability issue, however, is something that some of the largest eBL platforms are in collaboration with each other on to improve adoption of this technology. Grant Hunter (G. Hunter, interview by author, 2025) points this problem out in our interview, by suggesting that while we are seeing an impressive increase in the use of electronic bills of lading, the current adopters are the 'low hanging fruit', the big shippers trading internally or with a small number of different clients; full adoption of eBLs will require a greater industry buy in.

The FIT Alliance and the progress of the adoption of eBLs highlight a clear desire for digitalisation within shipping and provide a success story for the benefits and challenges associated with digitalisation. In many ways, the commitment by the FIT Alliance in support of a wider goal is exactly as required in order to improve digitalisation. While the continued success of eBLs and the ongoing digitalisation of this crucial trade document is a success, it also serves as a microcosm for the wider industry over the next decade with lessons learned from this process that can relate to future changes across shipping.

ARTIFICIAL INTELLIGENCE IN COMMERCIAL SHIPPING

Akin to digitalisation, Artificial intelligence (AI) has become a more relevant but still ubiquitous buzzword to signal future efficiency and innovation without any real scrutiny (Brynjolfsson and McAfee, 2014) and is fast becoming a crucial marketing tool for companies around the world. AI has been cited at an exponentially increasing rate with Semrush (2023) reporting that, following the release of ChatGPT, searches including the term 'AI' increased by over 800%. This is not isolated outside of shipping. Shipping has also seen a whole host of AI technology platforms that will 'streamline fixtures' and enhance 'workflow efficiency' - all claiming to make best use of this technology.

While the scale, efficacy, and integration of AI will only truly be known with time, based on current progress and trends, AI will impact every aspect of shipping and may replace human workers in both on-shore and off-shore careers. Whilst intensely interesting and of paramount importance to the world's 1.89 million seafarers (UNCTAD, 2021), the opportunity presented by autonomous ships is beyond the scope of this dissertation. Instead, this section will focus on providing a comprehensive overview of the potential impact and scenarios that AI will have on workflows, commercial management, and careers within the shipping industry. This dissertation will explore and analyse a range of potential scenarios including the full and partial replacement of humans in commercial shipping roles to better understand the impact that AI technology plays to onshore careers in shipping and the positive and negative impact it may have on the ability to move goods around the world.

CURRENT USE OF AI IN SHIPPING

Shipping is known for its' 'conservative nature' and 'long asset lifespans' which often makes for the adoption of new technologies a slow process (Howard, 2024). Despite this, times are changing, in February 2025, a collection of five of the largest shipbrokers (SSY, Arrow, Howe Robinson, Gibson Shipbrokers, and Ifchor Galbraiths) teamed up to create Ocean Recap, an AI-adjacent charter party management tool to help streamline the creation of recaps and to help 'challenge Clarksons' charter party management dominance' (TradeWinds, 2025). While only being announced in February 2025 and not necessarily the first platform to use AI in shipping, it certainly represents a significant step forward by being the first AI tool to be founded and publicly backed by five of the biggest shipbroking shops. An anonymous shipbroker from Howe Robinson (Anonymous Broker at Howe Robinson, 2025), shared that the Ocean Recap system is an AI tool 'designed to help brokers draw up charter parties and recaps after the deal has been concluded'. This perspective best describes the portion of the market that Ocean Recap will fall into: an AI tool to help brokers rather than replace brokers. This perspective is reiterated by other broking shops in the industry too. A Senior Director at SSY, Alexander Foster, believes that 'brokers will not disappear in the presence of AI, only there will be tools to make broking more efficient' (A. Foster in Interview by Author, 2025). It is likely that as AI becomes more capable, the role of a broker will become less admin based in drawing up Charter Parties and recaps and will increasingly be focused on building relationships and connecting clients around the world.

Perhaps then, the best and most comprehensive use of AI would be in voyage planning and risk management. Today, voyage planning in commercial shipping already relies on external

weather routing companies to provide forecasts that use complex numerical based weather prediction models (e.g. ECMWF GFS) to create optimal routes and meet safety criteria from which the Master has final say on which route the vessel takes (Song and Cao, 2024; Saftey4Sea, 2022). These external weather routing companies then use satellites to determine whether a vessel meets its performance guarantees or warranties, as stipulated by the head owner prior to a voyage or time charter. Further AI driven analysis integrated into these systems may be able to more accurately determine whether a ship is meeting its warranties as provided by the ship owner. A study by a shipping startup, Orca AI, estimates that if shipping were to use AI tools for sea navigation to reduce the number of sharp manoeuvres and route deviations, global commercial shipping could cut carbon emissions by up to 47 million tonnes per year – translating to an annual fuel saving per vessel of $86,000 (Orca AI, 2024).

The same principal of using AI as a prediction engine could be applied to vessel risk management too. The US based web-based ship management platform JiBe ERP has recently launched a tool that uses the CCTV cameras on board a ship to evaluate and predict where the biggest risks are on board a vessel and alert the master of vessel in real time to prevent accidents. If this technology is as effective as the marketing material suggests, a future update to the SOLAS convention could require ship management companies to use AI as a predictive engine to help prevent accidents across their operating fleets. From seafarers to stevedores, using this technology to improve safety at sea and port operations would improve the overall health of the industry and serves as an excellent example highlighting the potential benefits of partial AI integration in the industry.

HYPOTHETICAL SCENARIOS FOR SHIPBROKING

Today, the role of a shipbroker is to act as an intermediary to bring shipowners and charterers together and facilitate the negotiation and subsequent fixing of a vessel by providing market sentiment and insights to ensure both parties get as fair a deal as possible. The majority of these negotiations between owners and charterers use email to make a series of bids, offers, and counters before an agreement is reached. Once an agreement is reached, the broker is awarded a commission for the facilitation of the deal, which is their core revenue generation stream. Breaking down the role of a shipbroker even further, it is a people and relationship focused role with a number of core admin tasks that that could likely be completed faster and with more accuracy by an AI-bot – both desirable traits in a capital and time driven industry.

Thus far, this dissertation has explored the existing empirical evidence and tools developed to explore how AI might influence careers in shipping. The following section will be an analysis of some hypothetical scenarios for fixing vessels and will explore the opportunities and limits of AI based on the author's own reflections and prejudices. These potential scenarios range from the complete replacement of humans in shipbroking and commercial shipping to the partial replacement of humans and the use of AI-bots for certain tasks. The feasibility of each will be considered over differing temporal scales to gain ten, fifty, and one hundred year perspectives.

PARTIAL AI INTEGRATION USING A CHARTERING PLATFORM

The first of these potential scenarios is the partial replacement of humans in an owner-broker-charterer trade. At its very basic form, a shipbroker is the intermediary between the vessel owner and the charterer providing communication and to exchange offers and bids between the two (or more) parties. The question is, when AI is more capable and more powerful than it is today, could the role of a broker be automated and broking shops could just be technology platforms for charterers and owners to communicate, share bids and provide counters between each party? Any system would still require human shipbrokers to oversee the platform and to intervene if anything went wrong but would also require fewer shipbrokers than a traditional broking shop. This could mean that each broker or 'AI caretaker' would be responsible in supporting an AI-bot in as many as fifty different fixtures per day – clearly more profitable than a human broker, who may fix as many in a year. The role of a human broker in this scenario would be more being a marketer for the platform to owners and charterers - the platform would then connect the counterparties.

This hypothetical scenario is likely oversimplified and would almost certainly be ineffective in the short term. Although the underlying technology to build the platform is relatively straightforward, it would require long term investment and marketing from broking shops - challenges comparable to those faced by the FIT Alliance with eBLs, perhaps with stronger resistance. Progress in shipping is often slow with the 'first mover' paradox seemingly paralysing to a lot of companies, without a strong business case for change. This highlights the biggest problem with the partial AI integration hypothetical scenario being the lack of real benefit for the counterparties involved in the transaction aside from the shipbroking shop. The likelihood is that the only way to convince shipowners and charterers to move to this platform would be to provide some form of monetary incentive by reducing the standard commission for fixing a ship.

In research for this dissertation, many shipbrokers expressed their dislike for this scenario by often citing the importance of relationship building in the fixing of a ship and when concluding 'multi-million dollar transactions, building trust between counterparties is vital' (Broker A, Howe Robinson, Interview by Author, 2025). This is the essence of being a shipbroker and if that changed, the role of a shipbroker would become for similar to a marketing role where the value added would be in bringing people to use your platform.

FULL AI TAKEOVER OF FIXTURES

If you were to take this hypothetical scenario even further, then perhaps the logical solution is to replace all the links in the chain where each shipbroker, owner, and charterer have their own AI-powered bots to negotiate and fix ships either in a virtual shipbroking environment or via email. This system would require very little input from either party but would likely require a human to set a certain number of parameters and aims for the AI-bot to then negotiate on their behalf.

The principal benefit would be the much higher speed of evaluation of a vessel and or a market cargo, creating a faster and more competitive ship fixing environment. As a shipowner or operator, putting a vessel or cargo on the market would mean that within a few seconds there

would be five or ten potential offers from existing vessels or cargoes already on the market. This would place an even greater emphasis on speed and accuracy as within minutes of going on the market, a ship could be fixed subject to terms. This would create a more competitive market and in the short term would likely bring down Time Charter rates (TCE) by increasing the effective supply of vessels by reducing the time taken in matching vessels and cargoes. A TCE rate fall would likely level out at a new equilibrium that priced in the more efficient marketing and negotiation of contracts for vessels.

The problem then becomes technical. How does one negotiate with an AI-bot and how do they negotiate with one another? Would the AI-bots interact like humans but at a much faster rate? The best human negotiations are made up of a series of non-negotiable issues and concessions by both parties to create a mutually beneficial arrangement (Thuderoz, 2017). The art of a broker, therefore, is to make two people walk away from making a deal feeling like they have just made the deal of their life (Foster, interview by Author, 2025). How can you program an AI-bot to make a series of concessions and strategic decisions when negotiating with another AI? This is further complicated if two AI-bots are comparable in their setup and negotiation style – potentially leading to an impasse in negotiations where humans would have to get involved. By reintroducing humans into the loop, then you lose the benefit of speed in a negotiation and how much time would actually be saved?

MACHINE LEARNING CASE STUDY

Shipping freight markets became more like traditional financial commodity markets in May 1985, when the BIFFEX first launched a dry bulk futures contract that provided a centrally-cleared platform for trading futures contracts rather than the traditional 'paper' hedges of shipowners and charterers (Radopoulos, 2014). With time, the market then began trading Forward Freight Agreements (FFAs) and has now evolved to become more of a financial commodity market with growing participation from non-shipping speculators - although still being linked to the Baltic Exchange indices. The increase of non-shipping speculators has meant that these markets are now traded less as a way to hedge their gains and losses in physical markets but now is more of an extension of traditional mainstream finance. Despite this, both markets are good at signalling general industry sentiment and are challenging to predict due to the unforeseen nature of shipping that responds quickly to global crises and geopolitical change. Because freight markets are highly volatile, forecasting these markets has become a vibrant research stream (Katris and Kavussanos, 2021; Liu *et al.*, 2022) due to the potential financial incentives for accurate predictions.

This section of the dissertation will use machine learning to create a proprietary model that will attempt to predict the Baltic Exchange Dry Index (BDI) to explore some of the challenges in creating enhanced index forecasting using machine learning. This section will also explore the threat to the traditional roles of shipbrokers and market analysts that new forecasting technology plays to further gain essential insight into whether this is a genuine threat to careers or remains an ambiguous buzzword.

RIDGE REGRESSION MODEL TO PREDICT THE BDI

Machine learning is a branch of AI focused on the development of systems that uses data and complex algorithms to learn from data and perform tasks without being explicitly programmed. These algorithms can iteratively learn patterns and use data to make predictions from a new dataset and are used across science, business, and technology (Jordan and Mitchell, 2015). While there are many different machine learning algorithms that could be used to predict market trends, this case study uses one of the most common called 'Ridge Regression' due to its computational power and accuracy (Lee, 2025). By combining this algorithm with a separate linear regression model to account for residual corrections in the dataset, you are then able to create a model that predicts the BDI, as shown in Figure 2.

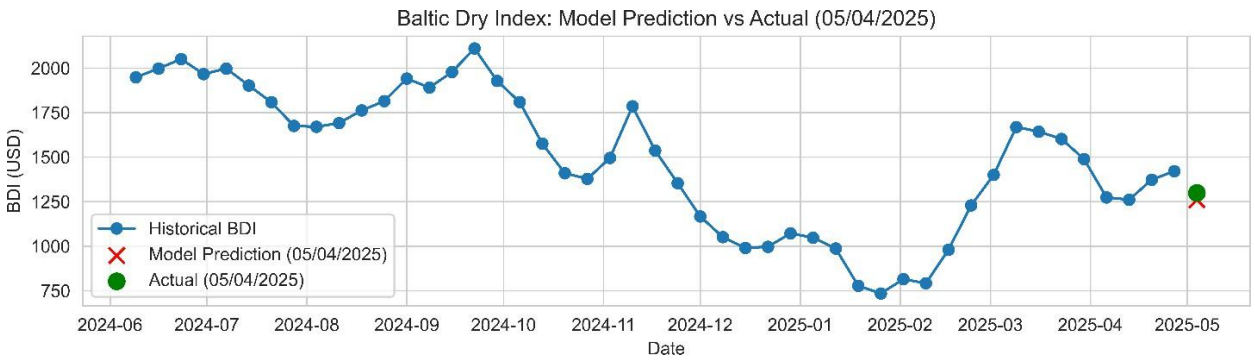

*Figure 2 shows BDI prediction from a Ridge Regression ML model (Source: Author's own) *Model code found in appendix**

Figure 2 is the output from the author's own machine learning model with the blue line highlighting the training dataset being the 51 preceding weeks to the 05/04/25 and the red 'X' being the models prediction with the green circle highlighting the actual BDI value for that day. Despite only using a year's worth of BDI index data, the machine learning algorithm was able to relatively accurately predict the market sentiment for the following week. Despite only being tested on a small dataset and sample size, this still highlights the potential for machine learning models in predicting shipping markets like the BDI. With more resources including more computational power, there is real potential for more accurate models that could be used over longer temporal scales and to predict changes in the BDI. While you cannot predict geopolitical events and the impact on the BDI or shipping, to improve the accuracy of these models you have to be able to price in some type of Geopolitical Risk Index that tracks a physical measure like the frequency of newspaper articles mentioning keywords as shown to spike during major crises (Caldara and Iacoviello, 2022).

With this type of technological improvement and the more accurate pricing in of geopolitical risks and volatility, there is potential for machine learning models to become more accurate than a star shipbroker or analyst. This has the potential to change existing roles that rely on sharing market information. The role of a shipbroker or analyst may become more of a strategic advisory position rather than one that is focused on digesting and disseminating market information. However, it is important to recognise the limits of these models of technical substitution. AI-driven models, although powerful, are constrained to using quantitative methods instead of shipbrokers who gather information qualitatively in conversations to formulate their opinions. Ultimately, while these models could appear to be a threat to data sharing roles, it is likely they will become useful tools rather than replacements for shipbrokers and analysts.

THE FUTURE THREAT TO CAREERS

The underlying discourse surrounding the threat of AI and digitalisation to careers is often polarised – and polarising. On one side, there are a those who are bullish about the future adoption of AI and the impact to careers in the latter half of the 21st century. This optimism likely coincides with their commercial interests to try to sell you their AI platform using the 'latest and greatest' technology and to discourage more cautious types to not get left behind. On the more conservative side, the empirical evidence for successful implementation of AI systems remains sparse in increasing profitability and efficiency even in shipbroking and ship agency roles. A recent Forbes study estimates that only around 25% of firms investing in AI has realised a tangible return on investment, due to the rapid development cycles and significant upfront costs associated with implementation (Forbes, 2025). The truth is: neither side is right. The true future of AI is more nuanced than we might already think (Crawford, 2021). AI powered tools are increasingly able and available to streamline administrative processes, improve the speed and accuracy of contract negotiations, and perform its own market analysis.

As is common with radically new technology or paradigm shifts, the question becomes one of trying to predict where we are on the Sigmoid curve of relative progress (Rogers, Singhal and Quinlan, 2014), see Figure 3. The Sigmoid curve shows an initially slow uptake of any new technology or social change followed by a rapid acceleration in progress and an ultimate plateau in progress nearer the end of a technology's life cycle or having reached market saturation (Rogers, Singhal and Quinlan, 2014). Figure 3 represents the author's best estimate as to where each of these technologies land in terms of progress. Digitalisation, having been around the longest and in this dissertation referring to the further adoption of electronic bills of lading, is nearing the plateau in terms of technological progress, while there is still a long way to go in terms of complete adoption – the biggest mining companies having just passed 25% (BIMCO, 2025) – the technological prowess has almost reached its natural limit. Meanwhile, concept of machine learning has been around for almost 75 years with the first recorded use of the term coming from Arthur Samuel's checker-playing program in 1959 (Samuel, 1959). As a result, machine learning is speculatively further down the Sigmoid curve than digitalisation as there is still vast technological progress to be made in this field. Even further down the Sigmoid curve is AI as it likely currently being used to a fraction of its potential use case. The term AI in this dissertation has, thus far, been used almost interchangeably with machine learning, this is likely a misnomer as AI is a slightly trendier buzzword and is an extension of machine learning. However, it is likely that AI is further still down the Sigmoid curve of progress as AI only really entering the popular conscience in late 2022 with the launch of ChatGPT, since which time there have been an explosion in generative AI based tools, in shipping and beyond (Chui *et al.*, 2023).

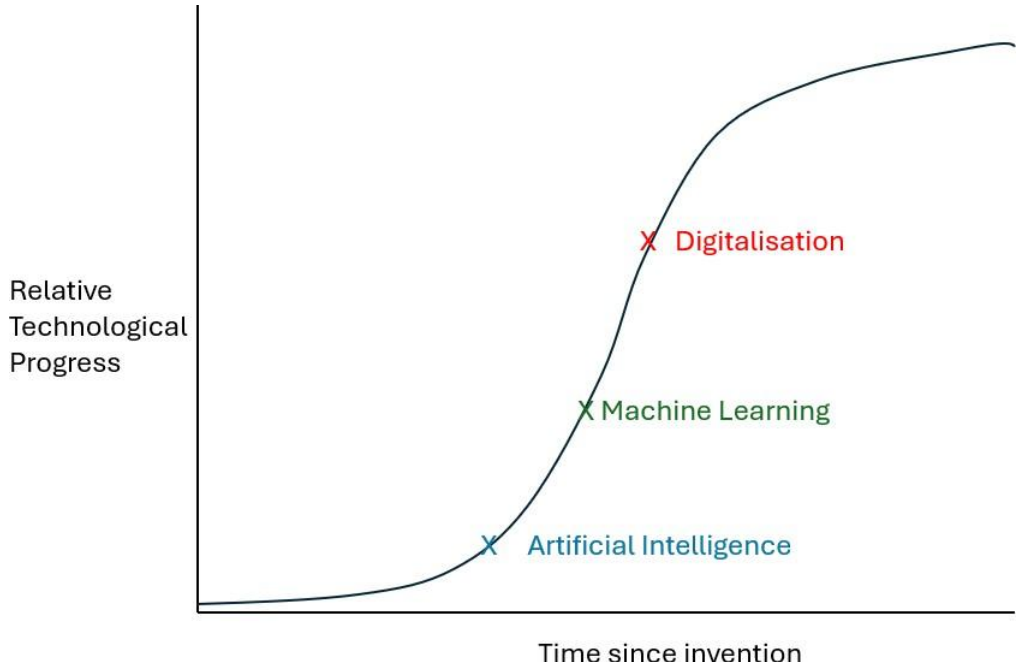

Figure 3 shows a Sigmoid curve of development in shipping (Source: Author's own)

The proliferation of AI tools in the industry could have some unintended consequences. In a scenario, where chartering marketplaces are common and often trades are done via virtual brokers, the market would become more consolidated to those brokerage shops that were able to share the best information and make use of the best AI tools, reducing the numbers of brokers in the market and meaning only the biggest shipbroking shops would survive.

Despite this, Professor Basak Akdemir - a prominent shipping AI researcher and Fellow of IMarEST - remains optimistic on traditional shipping roles in an interview with the Author. She argues that unlike other sectors, shipping is not as simple as a commodity based market and to be successful in shipping, you will always require human expertise (Akdemir, Interview by Author, 2025). She goes on to highlight the importance of upskilling people in traditional maritime roles to teach people how to use AI as a tool and suggests that rather than being a threat, it will bring efficiency gains among other benefits to the industry (ibid). She argues that although shipping is an industry reluctant to change, AI is not rocket science and if there is a business case for change, it will happen (ibid).

In summary, AI and digitalisation likely represent neither an existential threat nor an inconsequential buzzword to careers within shipping despite promising large-scale change. The tools being developed are effective and will likely change the role of a shipbroker and other shore-based careers over the next 50 years by further reinforcing the important of relationships.

CONCLUSION

Shipping will never become obsolete. As the backbone for global trade and responsible for transporting 90% global goods (Kaluza *et al.*, 2010), even the most protectionist and destructive international policy would struggle to completely displace shipping as a key facilitator of global trade. Nevertheless, the industry must not rest on its laurels, as digitalisation and AI is forcing change across all industries and will threaten traditional careers around the world. In shipping, these changes are particularly clear in three areas: digitalisation of trade documents; AI in chartering; and machine learning in market forecasting. This dissertation used empirical evidence, interviews, and a machine learning model to explore the opportunities and threats each of these changes may pose.

A continuous theme across each of these areas was the idea of a critical mass crucial for widespread adoption of any new technology to take place. By encouraging enough people to utilise a technology, suddenly it makes more sense to switch to a new technology rather than stick with the existing technology and process. This is most notable in the adoption of electronic bills of lading where once a critical mass of people start to these digital trade documents, it becomes easier to adopt them rather than resist. Any future research should examine this theme further, potentially with a focus on off-shore roles and the impact of autonomous vessels on maritime employment.

Through interviews conducted for this dissertation, a second continuous theme emerged. Shipping is poised for change. The threats posed by AI and digitalisation are restrained by the complexity of the industry such that humans are required to stay in the loop but perhaps with altered roles. Shipping is resilient and will continue to highly value interpersonal relationships as well as being driven by capital.

Shipping is neither under threat from AI and digitalisation, nor is shipping ignoring the technology. It presents a generational opportunity for those involved and will benefit the shipping industry for years to come.

REFERENCES

1. *A. Foster in Interview by Author (2025) 'Alexander Foster, Senior Director at SSY'.*
2. *Anonymous Broker at Howe Robinson (2025) Broker A'.*
3. *Bartley, K. (2024) 'Big data statistics: How much data is there in the world?', Rivery. Available at: https://rivery.io/blog/big-data-statistics-how-much-data-is-there-in-the-world/?utm_source=chatgpt.com.*
4. *BIMCO (2025) BIMCO's '25 by 25' campaign reaches 25.1% eBL adoption in first year. Available at: https://www.bimco.org/news-insights/bimco-news/2024/20240717-25-by-25-campaign-adoption-in-first-year/.*
5. *Brynjolfsson, E. and McAfee, A. (2014) The second machine age: Work, progress, and prosperity in a time of brilliant technologies. WW Norton & company.*
6. *Caldara, D. and Iacoviello, M. (2022) 'Measuring Geopolitical Risk', American Economic Review, 112(4), pp. 1194–1225. doi: 10.1257/aer.20191823.*
7. *CARGOX (2023) Bill of lading: meaning, types, example, and purpose, CARGOX. Available at: https://cargox.io/content-hub/bill-of-lading-meaning-types-example-and-purpose.*
8. *Casanova, D. et al. (2022) 'The multi-billion-dollar paper jam: Unlocking trade by digitalizing documentation', McKinsey's Travel, Logistics & Infrastructure Practice, pp. 1–8.*
9. *Chui, M. et al. (2023) 'The state of AI in 2023: Generative AI's breakout year'.*
10. *Citaristi, I. (2022) 'United nations conference on trade and', in The Europa Directory of International Organizations 2022. Routledge, pp. 177–181.*
11. *Crawford, K. (2021) The atlas of AI: Power, politics, and the planetary costs of artificial intelligence. Yale University Press.*
12. *DCSA (2023) 'DCSA's member carriers commit to a fully standardised, electronic bill of lading by 2030'.*
13. *Encyclopaedia Britannica (2025) Bill of Lading, Britannica Money. Available at: https://www.britannica.com/money/bill-of-lading (Accessed: 17 April 2025).*
14. *FIT Alliance (2022) The Electronic Bill of Lading Declaration. Available at: https://www.fit-alliance.org/.*
15. *Forbes (2025) Why 75% Of Businesses Aren't Seeing ROI From AI Yet. Available at: https://www.forbes.com/sites/cio/2025/01/30/why-75-of-businesses-arent-seeing-roi-from-ai-yet/.*
16. *Heilig, L., Schwarze, S. and Voß, S. (2017) 'An analysis of digital transformation in the history and future of modern ports'.*
17. *Howard, G. (2024) Iterative approach key to shipping's AI adoption, Seatrade Maritime. Available at: https://www.seatrade-maritime.com/maritime-technology/iterative-approach-key-to-shipping-s-ai-adoption.*
18. *Hunter, G. (2025) 'Author's Own Interview with Grant Hunter - BIMCO CDO & Director of Products'.*
19. *Jordan, M. I. and Mitchell, T. M. (2015) 'Machine learning: Trends, perspectives, and prospects', Science, 349(6245), pp. 255–260.*
20. *Kaluza, P. et al. (2010) 'The complex network of global cargo ship movement', Journal of the Royal Society, Interface / the Royal Society, 7, pp. 1093–1103. doi: 10.1098/rsif.2009.0495.*
21. *Katris, C. and Kavussanos, M. G. (2021) 'Time series forecasting methods for the Baltic dry index', Journal of Forecasting, 40(8), pp. 1540–1565. doi: https://doi.org/10.1002/for.2780.*
22. *Law Explorer (2016) A short history of the bill of lading. Available at: https://lawexplores.com/a-short-history-of-the-bill-of-lading/.*

23. *Lee, S. (2025) 7 Surprising Benefits of Ridge Regression in Modern Machine Learning, Number Analytics. Available at: https://www.numberanalytics.com/blog/ridge-regression-benefits-machine-learning.*

24. *Lickbarrow v Mason (1794) Lickbarrow v. Mason, 2 TR 63 - Supreme Court 1787.*

25. *Liu, M. et al. (2022) 'A Deep Learning Framework for Baltic Dry Index Forecasting', Procedia Computer Science, 199, pp. 821–828. doi: https://doi.org/10.1016/j.procs.2022.01.102.*

26. *Orca AI (2024) AI tools key to the 'urgent action' needed to meet IMO climate targets. Available at: https://www.orca-ai.io/resource/ai-tools-key-to-the-urgent-action-needed-to-meet-imo-climate-targets-2/.*

27. *Pallis, A. A., Kladaki, P. and Notteboom, T. (2024) 'Port economics, management and policy studies (2009–2020): a bibliometric analysis', WMU Journal of Maritime Affairs, 23(2), pp. 217–255.*

28. *Radopoulos, P. (2014) 'FFA-Forward Freight Agreements'. University of Piraeus (Greece).*

29. *Rogers, E. M., Singhal, A. and Quinlan, M. M. (2014) 'Diffusion of innovations', in An integrated approach to communication theory and research. Routledge, pp. 432–448.*

30. *Saftey4Sea (2016) Standard P&I Club warns of LOI dangers. Available at: https://safety4sea.com/standard-pi-club-warns-of-loi-dangers/.*

31. *Saftey4Sea (2022) AI powered voyage planner launched. Available at: https://safety4sea.com/ai-powered-voyage-planner-launched/.*

32. *Samuel, A. L. (1959) 'Some studies in machine learning using the game of checkers', IBM Journal of research and development, 3(3), pp. 210–229.*

33. *Semrush (2023) Online Search and Traffic Trends Answer Your ChatGPT and AI Questions, Semrush News. Available at: https://www.semrush.com/news/241364-online-search-and-traffic-trends-answer-your-chatgpt-and-ai-questions/.*

34. *Smith, A. (1776) 'An inquiry into the nature and causes of the wealth of nations: Volume One', in. London: printed for W. Strahan; and T. Cadell, 1776.*

35. *Song, Y. and Cao, X. (2024) 'Review of intelligent ship path planning algorithms', Frontiers in Management Science, 3(1), pp. 90–101.*

36. *Thuderoz, C. (2017) 'Why do we respond to a concession with another concession? Reciprocity and compromise', Negotiation Journal, 33(1), pp. 71–83.*

37. *TradeWinds (2025) Major brokers team up to challenge Clarksons' charterparty management dominance. Available at: https://www.tradewindsnews.com/shipbroking/major-brokers-team-up-to-challenge-clarksons-charterparty-management-dominance/2-1-1781351.*