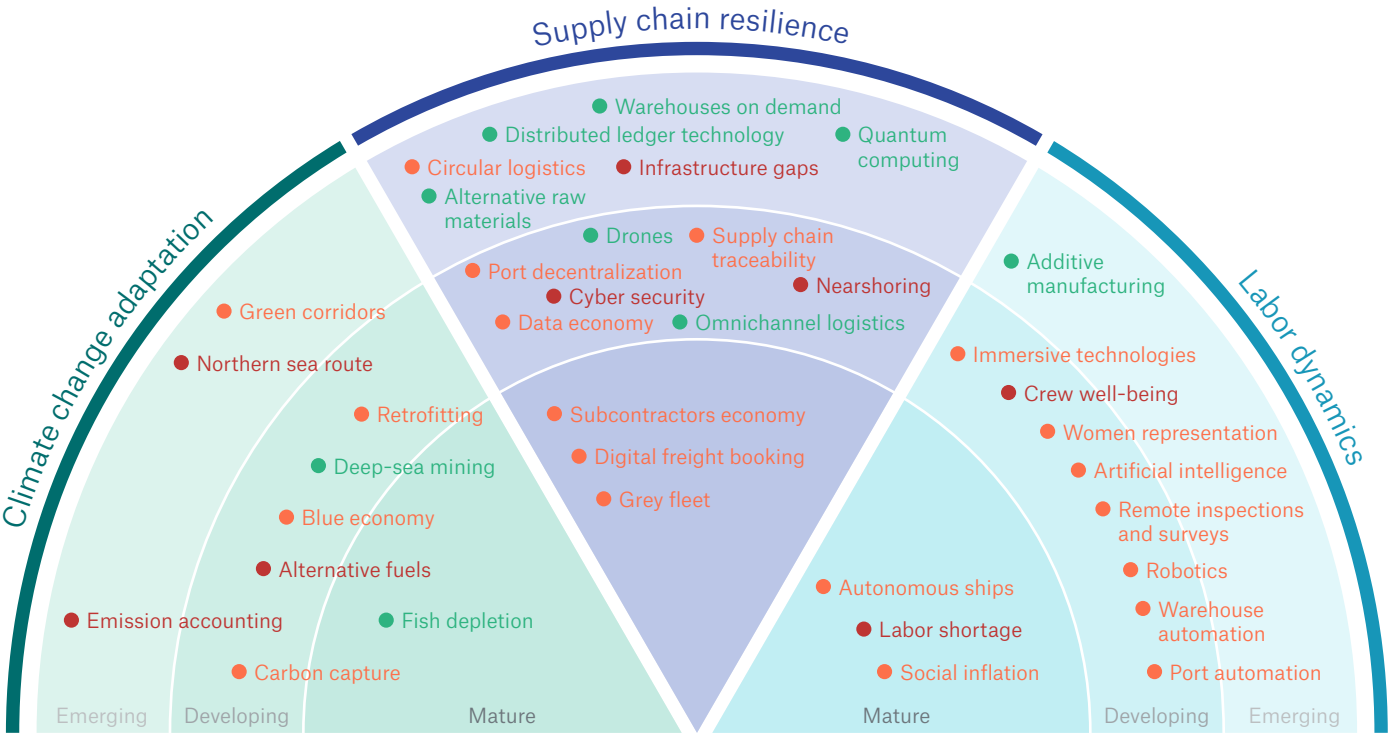
Marine Trend Radar 2023

Trend overview

The Marine Trend Radar 2023 provides a comprehensive overview of **37 key trends** shaping the maritime industry and logistics. They affect all dominant lines of marine business: cargo, hull, energy, and general marine, including liability.

The trends are divided into three main clusters: **climate change adaptation, supply chain resilience and labor dynamics.**

In addition, all trends are categorized according to their **impact** on the industry (low, medium, high) and their **maturity level** (emerging, developing, mature).



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Impact: High Medium Low
Maturity level: Mature, Developing, Emerging

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1. Climate change adaptation

1.1 Alternative fuels

General definition
Any materials or substances that can be used as fuels, other than conventional, e.g., bio-diesel, bio-alcohol (methanol, ethanol, butane), refuse-derived fuel, hydrogen, non-fossil methane, non-fossil natural gas, vegetable oil, propane and other biomass sources.

Context in the maritime industry and logistics
It is clear that alternative fuels are here to stay. The real question is rather "which one?". Retrofits propose already a realistic option for ship owners and practically all new vessels run on at least two types of fuels. Nonetheless, it is still unclear wether the next mainstream will be hydrogen, ammonia, methanol, or biofuels. It will most probably vary across regions depending on local resources and technologies. On the other hand, electric engines are also positioning themselves for short-distance voyages. Overall, alternative fuel prices are predicted to fall but will take time to become competitive.

Opportunities
– Emissions reduction.
– Autonomy from conventional fuels and their volatile price.
– Thought leadership within the industry.

Risks
- All fuel alternatives have lower energy densities than conventional fuels, leading to less cargo capacity.
- Inadequate or insufficient infrastructure.
- More complexity in fuel storage and processing which also require crew familiarity with chemical properties of new fuels.

1.2 Blue economy

General definition
Economy that comprises a range of economic sectors and related policies that together determine whether the use of ocean resources is sustainable.

Context in the maritime industry and logistics
The blue economy comprehends not only crucial industries such as food, energy, and transport, but recreational sectors like tourism, and complex industries, such as biotechnology and carbon storage. However, for this economic model to prosper, capacity building and the participation of the financial sector are key components.

Moreover, as the ocean is the largest common resource in the world, effective coordination among different sectors, stakeholders, and governance levels is fundamental to ensure the development of a sustainable, inclusive, and equitable blue economy.

Opportunities
- Emerging offshore industries could increase job opportunities and profit pools.
- Improve climate change adaptation through the valuation of aquatic ecosystems and offshore carbon capture technology.
- Opportunity for insurers to decarbonize their portfolio through offshore renewable energy.

Risks
- The ocean is still highly unknown compared to terrestrial ecosystems.
- Reputational risks for unsustainable and extractive economic activities, such as deep-sea mining.
- Geopolitical risks arising from the use of international waters with little or no regulations.

1.3 Carbon capture

General definition
The storage of carbon dioxide that is intended to help protect the climate.

Context in the maritime industry and logistics
Emissions associated with the maritime sector are predicted to increase by 250% between 2014 and 2050 if abatement tactics are not implemented (IMO, 2015). There are three options to avoid this. First, energy efficiency strategies, such as route optimization, second, replacing fossil with alternative fuels, and third, carbon storage to reduce emissions from existing fossil-fueled vessels. This last option might seem just a bridging technology, but in the long term, it can provide innovative solutions, such as capturing and reusing green carbon dioxide (CO_2) as part of the methanization cycle.

Opportunities
- Decarbonization of the shipping sector. Hence, decarbonization of marine insurers' portfolios
- Additional source of income by selling emissions reduction certificates / credits.
- Creation of a new shipping segment focused on CO_2 transport thanks to the increasing demand for CO_2 storage and associated CO_2 transport.

Risks
– Increasing energy demand to use carbon capture technology.
– Risk of cargo capacity loss when integrating carbon capture in the vessel due to the high volume and weight of the capture and storage system.
– Additional onboard management, maintenance, safety, and handling requirement.

1.4 Deep-sea mining

General definition
Exploration, development, and extraction of mineral resources on and under the seabed.

Context in the maritime industry and logistics
While deep-sea mining offers the potential for economic growth and access to important resources, it also poses significant environmental and social risks.

Currently, there are only a few companies engaged in deep-sea mining exploration and testing, with no active large-scale commercial mining operations. However, there is growing interest and investment in the sector, with several countries and companies securing exploration licenses and conducting feasibility studies.

Opportunities
– The ocean floor contains a variety of valuable metals and minerals that are increasingly in demand for use in technologies such as smartphones and electric cars.
– Deep sea mining has the potential to drive economic growth and create jobs in areas where traditional industries may be in decline.
– The exploration and study of the deep sea environment have the potential to yield new scientific discoveries and insights into our planet's history and evolution.

Risks
– Deep sea mining has the potential to cause significant damage to fragile marine ecosystems and biodiversity, including disrupting food chains and habitats.
– Mining operations may result in the release of toxic chemicals and pollutants into the ocean, which can harm marine life and ecosystems.
– Further concerns associated with deep-sea mining are the displacement of indigenous communities and potential violations of human rights.
– The harsh and extreme conditions of the deep sea environment pose significant technological challenges for mining operations.

1.5 Emission accounting

General definition
Creating an inventory for, and calculation of, an organization's scope 1, 2, and 3 greenhouse gas emissions.

Context in the maritime industry and logistics
The maritime industry is responsible for around 3% of global emissions, and with the growth in global trade and shipping, this figure is expected to increase in the coming years. Emission accounting can help the industry to identify areas where emissions can be reduced, such as improving vessel efficiency, using cleaner fuels, and optimizing shipping routes to reduce fuel consumption.

Similarly, logistics and transportation are responsible for a significant amount of emissions, particularly in the road transport sector. By accurately measuring and reporting emissions, logistics companies can identify ways to reduce their carbon footprint, e.g. by investing in electric vehicles or using more efficient logistics operations.

Overall, emission accounting has important implications for the maritime industry and logistics, as it can help drive greater sustainability and reduce the impact of these industries on the environment. By taking proactive measures to reduce emissions, these industries can help mitigate the effects of climate change and create a more sustainable future.

Opportunities
- Companies that adopt sustainable practices and reduce their carbon footprint can gain a competitive advantage. Customers and investors are increasingly interested in supporting companies that are environmentally responsible, which can help businesses to attract new customers and increase revenue.
- Many countries are implementing regulations aimed at reducing emissions from the maritime industry and logistics. By adopting emission accounting practices, companies can ensure compliance with these regulations and avoid potential penalties.

Risks
- While reducing emissions can lead to cost savings in the long term, there may be initial costs associated with adopting new technologies and practices. For example, investing in electric vehicles or developing new logistics operations can be expensive.
- Reducing emissions may require changes to logistics operations, which could cause disruptions to supply chains and shipping routes. This could result in delays, lost revenue, and damage to the company's reputation.
- Despite the potential benefits of emission accounting, some companies may be slow to adopt these practices due to a lack of awareness, resources, or interest. This could lead to missed opportunities for reducing emissions and improving sustainability.

1.6 Fish depletion

General definition
Reduction, through overfishing, in the level of abundance of the exploitable segment of a stock that prevents the realization of the maximum productive capacity.

Context in the maritime industry and logistics
Overfishing and other unsustainable fishing practices have led to the depletion of fish stocks in many fish banks, with some species at risk of extinction. To date, 90% of the world's fisheries are classified as fully exploited or overexploited. At the same time, one in every five fish caught at sea was either illegal, unreported, or unregulated, generating an illicit profit of US$ 15.5 to US$ 36.4 billion yearly. Overall, the state of the fish banks worldwide is a critical issue that has significant implications for the global economy. It is important for all stakeholders, including governments, the fishing industry, and consumers, to take proactive steps to promote sustainable fishing practices and protect fish stocks for future generations. By doing so, we can ensure the long-term viability of the fishing industry and preserve the health and well-being of our oceans.

Opportunities
- By adopting sustainable fishing practices, such as setting catch limits and using selective fishing gear, fish stocks can be maintained and even restored. This can help ensure the long-term viability of the fishing industry and support the livelihoods of those who depend on it.
- Consumers are becoming more aware of the impact their food choices have on the environment and are increasingly looking for sustainable seafood options. Companies that can provide sustainable seafood can tap into this growing market and gain a competitive advantage.
- Many organizations are working to conserve and protect fish stocks, including through the creation of marine protected areas and the restoration of fish habitats. By supporting these efforts, companies can demonstrate their commitment to sustainability and help preserve fish stocks for future generations.

Risks
- Overfishing and depletion of fish stocks can have significant economic impacts, such as loss of jobs and reduced revenue for fishing communities. It can also lead to food insecurity and affect the availability of fish products for consumers.
- Fish depletion can have broader environmental impacts, including the loss of biodiversity and the disruption of marine ecosystems. This can affect the health and well-being of other marine species, as well as the ocean's ability to provide ecosystem services, such as carbon sequestration and nutrient cycling.
- Illegal, unreported, and unregulated fishing can exacerbate fish depletion and lead to further environmental and economic impacts. This type of fishing can be difficult to regulate and monitor, which makes it challenging to address. It also creates unfair competition for those who are fishing sustainably and legally. This issue is especially relevant for insurers: insuring fishing vessels related to IUU fishing increases the likelihood of claims due to "low quality" flag or classification as well as due to absence or non-proper use of AIS vessel tracking (48% of sunken ships due to collisions are fishing vessels).

1.7 Green corridors

General definition
Green corridors are Emission Controlled Areas (ECAs).
ECAs are sea areas in which stricter controls were established to minimize airborne emissions from ships as defined by the International Maritime Organization (IMO).

Context in the maritime industry and logistics
Emission control areas (ECAs) are designated areas in the maritime world where ships are required to reduce their emissions of harmful pollutants, such as sulfur oxide, nitrogen oxide and particulate matter. The goal of ECAs is to reduce the negative impact on the environment of the shipping industry and improve air and water quality in coastal regions.

Currently, there are several ECAs in operation, including the Baltic Sea, North Sea, and the North American coastline. These areas have strict emission standards, requiring ships to use low-sulfur fuels or install scrubbers to reduce their emissions.

In addition to existing ECAs, there is growing interest in and support for expanding its application to other regions around the world. The International Maritime Organization (IMO) has been working to establish more ECAs, e.g. in the Mediterranean and Caribbean seas.

Opportunities
- The implementation of ECAs will probably lead to significant improvements in air quality, particularly in coastal regions where emissions from shipping can have a significant impact on public health.
- The adoption of ECAs is driving innovation and the development of new technologies and fuels for the maritime industry. This has the potential to create new economic opportunities.
- The establishment of ECAs demonstrates a commitment to environmental stewardship by states and the responsible management of marine resources, which can enhance the reputation of the industry and support sustainable development.
- The development of ECAs requires collaboration and partnerships between industry, government, and civil society. This can build trust and promote cooperation on other environmental and social issues in the maritime sector.

Risks
- Compliance with ECAs requirements results in increased costs for shipowners, including the need to invest in new technologies and fuels.
- The establishment of new ECAs or changes to existing ones may result in disruptions to established shipping routes. This can impact the efficiency and profitability of the industry.
- The lack of consistent and comprehensive global regulation for emission control areas can create inconsistencies and challenges for the maritime industry.

– Ensuring compliance with ECAs can be challenging, particularly in areas with limited monitoring and enforcement capabilities.

1.8 Northern sea route

General definition
Shipping lane between the Atlantic Ocean and the Pacific Ocean specifically running along the Russian Arctic coast from Murmansk on the Barents Sea, along Siberia, to the Bering Strait and Far East.

Context in the maritime industry and logistics
The Northern Sea Route (NSR) has been increasingly utilized in recent years, as melting sea ice in the Arctic has made the route more accessible for longer periods of time.

A study predicted that climate change will likely enable new routes through international waters by 2065 unless warming is constrained to 1.5°C. This would increase the probability of having a navigable season outside Russian waters by almost 30% with a 99% confidence.

The use of the NSR offers several potential benefits, including shorter transit times and lower fuel costs compared to traditional shipping routes through the Suez Canal or around the Cape of Good Hope. However, this could also have major implications for world trade and global politics, especially in light of Russia's war on Ukraine.

Opportunities
– The NSR offers a shorter shipping route between Europe and Asia, which can reduce transit times and fuel costs, and consequently lower emissions per unit transported.
– Increased use of the NSR can generate economic benefits for countries in the Arctic region, including new trade opportunities and increased investment in infrastructure.
– The unique challenges of shipping in the Arctic are driving innovation and the development of new technologies and practices that have the potential to benefit the maritime industry more broadly.
– Careful regulation and management of shipping activities in the Arctic can promote environmental stewardship and the responsible management of marine resources in the region.

Risks
– The extreme cold, storms, and ice in the Arctic can make navigation difficult and increase the risk of accidents.
– The lack of supporting infrastructure, such as ports and emergency response capabilities in the Arctic region can create challenges for safe and efficient shipping.
– Increased shipping in the Arctic has the potential to cause disruptions to fragile marine ecosystems and contribute to the further melting of sea ice, exacerbating the impacts of climate change.
– The NSR passes through waters that are claimed by multiple countries, which can lead to political tensions and potential disputes over territorial rights.
– Draft restriction 12,5 m.

1.9 Retrofitting

General definition
To put a new piece of equipment into a machine that did not have it when it was built; to provide a machine with a new part, etc.

Context in the maritime industry and logistics
Vessel retrofitting has emerged as an important trend in the maritime industry, as companies seek to improve the efficiency, safety, and environmental performance of their vessels. Retro-

fitting involves making modifications to an existing vessel to upgrade its systems, equipment, and technology, rather than building a new vessel from scratch.

Vessel retrofitting can involve a range of modifications, including installing new propellor design, upgrading navigation and communication systems, improving hull design, and adding new equipment such as ballast water treatment systems. Retrofitting can also involve the installation of new technology, such as automation systems and digital solutions, which can improve vessel performance and efficiency.

Opportunities
- Improving the vessel's safety by upgrading its navigation and communication systems, fire suppression systems, and life-saving equipment.
- Increasing the vessel's efficiency by improving its propulsion systems, reducing fuel consumption, and lowering emissions.
- Strengthening the vessel's marketability by enhancing its operational capabilities and compliance with environmental regulations, making it more attractive to potential customers.
- Providing a competitive advantage by meeting the changing needs of the marketfor eco-friendly vessels or vessels with enhanced safety features.

Risks
- Cost overruns risk. Retrofitting can be an expensive process. There is always a risk of exceeding the budget due to unforeseen challenges or delays.
- Retrofitting requires the vessel to be taken out of service, which can result in lost revenue and increased operating costs.
- Risk of technological obsolescence. Retrofitting a vessel with outdated technology can quickly become obsolete, resulting in a significant waste of time and resources.
- Retrofitting must comply with regulatory requirements, and failure to do so can result in fines and penalties.

2. Supply chain resilience

2.1 Alternative raw materials

General definition
Materials derived through chemical processes meant to substitute costly or polluting raw materials.

Context in the maritime industry and logistics
As population and consumption grow, the pressure on natural capital is showing its effects. Resources are scarce and global geopolitical tensions are increasing the competition for raw materials. In turn, developed economies are looking for substitutes in alternative places, such as outside the earth or in the deep sea. The discovery of these alternative raw materials offers opportunities to make supply chains more resilient but also poses unprecedented risks.

Opportunities
- More resilience in the supply chain when conventional raw materials are scarce or not available.
- Additional supply of raw materials can lead to a decrease in commodity prices.

Risks
- The consequences of extracting alternative raw materials are still unknown. There are risks of pollution and biodiversity threats.
- Reliability of their quality is still to be proven.

2.2 Circular logistics

General definition
Alternative to linear logistics, where raw materials used are recycled back into the manufacturing operation with the purpose to produce another product.

Context in the maritime industry and logistics
Supply chains are usually understood as a linear sequence of processes undertaken for the production and distribution of a good or service. However, the end of life of those commodities is usually not included, even though this would involve a more efficient and sustainable use of resources. However, due to current shortages of certain materials and public awareness, some industries are moving towards circular logistics. Circularity includes all processes after the use of a product and aims to recycle or reuse the resources available. This shift from linearity towards circularity will put more complexity and thereforepressure on the logistic sector. Insurers can seize this opportunity to reduce uncertainty and help build resilience in the supply chain.

Opportunities
– More efficient use of resources.
– Pollution reduction.
– Additional jobs in the logistics sector.
– Contribution to supply chain resilience.

Risks
– Increase in labor demand in an industry that already faces labor shortage.
– More complex processes.

2.3 Cyber security

General definition
IT systems may be altered and data could be stolen or deleted.

Context in the maritime industry and logistics
Cybersecurity in the maritime industry and logistics is becoming an increasingly important issue as more and more operations move online. The industry is becoming heavily reliant on technology for managing supply chains, tracking shipments, and communicating with partners, which opens up vulnerabilities to cyber-attacks.

Recent years have seen a growing number of cyber-attacks targeting the maritime industry and logistics. These attacks can range from phishing scams and malware infections to more sophisticated hacking attempts aimed at stealing sensitive data or disrupting operations.

One major challenge facing the industry is the lack of cybersecurity awareness and training among staff. Many employees may not fully understand the risks associated with using online systems or may not be familiar with digital best practices. This can leave organizations vulnerable to attacks that exploit human error.

The complexity of the supply chain can make it difficult to trace the source of a cyber-attack or identify vulnerabilities. The global nature of the industry also means that different countries may have varying levels of cybersecurity regulations, which can make it difficult to establish consistent standards across the board.

To address these challenges, organizations in the maritime industry and logistics must take a proactive approach to cybersecurity. This includes investing in staff training and education, regularly auditing systems and processes for vulnerabilities, and collaborating with industry partners and government agencies to share information and establish common standards. By prioritizing cybersecurity, the industry can help protect against potential threats and ensure the safe and efficient movement of goods around the world.

Opportunities
- Cybersecurity measures can help protect sensitive data such as shipping manifests, cargo information, and customer information from unauthorized access and theft.
- A company with strong cybersecurity measures in place can build a reputation for reliability and trustworthiness. This can help attract and retain customers and partners.
- As the maritime industry and logistics continue to digitalize, opportunities arise to develop new business models that leverage cybersecurity technologies and services.
- With the increasing number of cyber threats in the maritime industry and logistics, there is a growing need for insurance coverage for cyber incidents. Insurers can offer specialized policies that cover losses related to data breaches, ransomware attacks, and other cyber threats. This can provide a new revenue stream for insurers and help organizations in the industry manage their risks.
- Insurers can leverage their expertise in risk assessment to provide guidance and recommendations to organizations in the maritime industry and logistics. By assessing the cyber risks associated with a company's operations and providing tailored recommendations, insurers can help prevent cyber incidents before they occur.
- Insurers can use data analytics to gain insights into the cybersecurity risks and vulnerabilities in the maritime industry and logistics. By analyzing data from cyber incidents, insurers can identify trends and patterns that can help organizations better protect themselves from cyber threats.

Risks
- Maritime industry and logistics are vulnerable to cyber-attacks, which can result in the loss or theft of valuable data, disruption of operations, and financial losses.
- Human error can pose a significant risk to cybersecurity, with staff inadvertently clicking on malicious links or failing to follow proper security protocols.
- Organizations in the maritime industry and logistics must comply with a range of cybersecurity regulations, which can be complex and time-consuming to navigate. Failure to comply with these regulations can result in fines, legal issues, and reputational damage.
- Cybersecurity incidents can be costly, both in terms of financial losses and reputational damage. Insurers may face significant payouts for claims related to cyber incidents, which can impact their profitability.
- The maritime industry and logistics may not have a thorough understanding of the cyber risks they face. Therefore, it can be difficult for insurers to accurately assess risk and provide adequate coverage.
- Cyber risks can be difficult to quantify. As a result, it can be challenging for insurers to accurately price cybersecurity policies. The lack of historical data on cyber incidents in the maritime industry and logistics can further complicate risk assessment.

2.4 Data economy

General definition
Global digital ecosystem in which data is collected, organized, and exchanged by a network of providers to derive value from the information they collect.

Context in the maritime industry and logistics
Supply chains and the maritime industry will become highly data-driven to improve efficiency, save costs and build resilience. Therefore, integrating crucial technologies in the maritime industry is only a matter of time. IoT, for instance, allows vessels' constant and holistic tracking and monitoring to reduce risks and is already playing an important role in the supply chains. Moreover, these technologies go hand in hand with others, e.g. big data and analytics. They are key partners to process and generate insights from IoT devices. High-speed satellite data connection optimizes the communication between them ensuring a network system that handles a high volume of data. All of this makes the data economy an important part of the maritime world and thereforeshould be secured from cyber threats.

Opportunities
– Complete monitoring through IoT.
– Better energy, route, and process optimization.
– Optimized modelling for risk assessment using digital twins.
– Improved access to the internet while at sea through improved satellite connections and 5G.

Risks
– Data protection risks.
– Cyber security threats.
– Data manipulation.
– So far, cellular network is only available in coastal waters. This limits real time communication and hence further development of the data economy at sea.

2.5 Digital freight booking

General definition
Use of online platforms for freight forwarding.

Context in the maritime industry and logistics
Digital freight booking is a growing trend in the maritime industry, with significant implications for the industry's efficiency and competitiveness. It involves using online platforms and technologies to streamline the process of booking cargo shipments and managing logistics operations. For the maritime industry, this means increased efficiency of logistic operations. Digital freight booking can help streamline the process of booking cargo shipments, thus reducing the time and costs associated with traditional manual booking methods.

By adopting digital freight booking platforms and technologies, shippers and carriers can also improve accessibility and transparency. Digital freight booking platforms can make it easier for small and medium-sized shippers to access shipping services and lowers the barriers to entry for these businesses. This can help promote competition in the industry, driving down costs and improving the quality of services offered to customers. At the same time, digital freight booking platforms generate large amounts of data on logistics operations that can be used to identify trends and patterns in shipping behavior. This can help improve decision-making and drive improvements in logistics operations, leading to greater efficiency and cost savings.

Opportunities
– Increased efficiency by reducing time and costs associated with traditional manual booking methods.
– Improved transparency by real-time tracking of cargo.
– Better visibility of smaller shippers and carriers, which improves competition and drives down shipping prices.
– Increased data analysis for better decision-making and optimization of logistic operations.
– Potential for digital insurance and parametric solutions.

Risks
– Digital freight booking platforms are vulnerable to cyber threats such as hacking, data breaches, and malware attacks. This can compromise the security of sensitive information such as cargo and customer data.
– Platforms require reliable and stable technology infrastructure to function effectively. Technical glitches, system failures, and other disruptions can cause security issues.

2.6 Distributed ledger technology

General definition
A blockchain is a shared, non-manipulable registry that facilitates the process of recording transactions and tracking assets.

Context in the maritime industry and logistics
An important topic in logistics is transparency – and blockchain is a key technology in this area. This decentralized data storage ensures that information is not manipulated, while transactional and financial data is made available to everyone.

Opportunities
– Automated electronic documentation.
– Payment processing systems.
– Smart contracts.
– Traceability and authenticity in the supply chain.
– Potential for digital insurance and parametric solutions.

Risks
– Cyber security threats.
– Missing or unclear regulations.

2.7 Drones

General definition
Aircraft that does not have a pilot but is controlled by someone on the ground or autonomously.

Context in the maritime industry and logistics
Drones have become a game-changer in the maritime industry and logistics. They are increasingly used in the sector for various purposes such as surveillance, inspection, delivery, and search and rescue operations.

In the maritime industry, drones equipped with high-definition cameras and sensors can be used for monitoring and inspecting ships, ports, and offshore structures. This can help detect potential hazards and prevent accidents, leading to safer and more efficient operations. Drones can also be used for environmental monitoring and research, such as tracking marine life, oil spills, and water quality.

In logistics, drones are used for last-mile delivery, especially in remote areas or places with difficult access. They can deliver packages and goods quickly and efficiently, reducing delivery times and costs. Drones can also be used for inventory management and warehouse inspections, improving supply chain management and reducing human error.

However, the use of drones in the maritime industry and logistics is not without challenges. These include regulatory and legal issues, as well as concerns around privacy, security, and safety. Moreover, drones require skilled operators and sophisticated technology, which can be expensive and require significant investments.

Opportunities
– Drones can help businesses in the maritime industry and logistics operate more efficiently by reducing delivery times and costs, improving inventory management, and enhancing safety and security.
– The use of drones in these sectors represents a significant technological advancement, allowing companies to explore new ways of operating and delivering value to customers.
– Increased accessibility: drones can be used to deliver goods and services to remote or hard-to-reach areas, providing new opportunities for businesses to expand their reach.
– Drones can help reduce the environmental impact of logistics and transportation by reducing fuel consumption and emissions.

Risks
– Drones can pose a safety risk if they collide with other aircraft or objects, or if they malfunction and crash.
– There is a risk of drones being hacked or used for malicious purposes, such as smuggling contraband or conducting surveillance.

– Privacy issues: drones equipped with cameras can infringe on people's privacy and lead to concerns about surveillance and data protection.
– Regulatory challenges are associated with the use of drones, such as obtaining licenses and complying with safety regulations.

2.8 Grey fleet

General definition
Sanctioned states are assembling hull fleets with the primary purpose of exporting their commodities to the major world markets. This is not a new topic, but due to increased geopolitical tensions, it is currently taking on a new dimension and could increase further in the near future. These fleets often consist of old ships that were supposed to be scrapped. They are owned by offshore entities, which makes it difficult to trace the true owner and thus allows them to escape sanctions.

Context in the maritime industry and logistics
A grey fleet might not be (properly) insured. Ships that are not insured against oil spills or collisions will not be allowed to dock in EU ports. This is also valid with other ports across the globe.

Opportunities
– From an insurer's point of view, this type of risk is to be avoided.
– Insurers could seize the opportunity to conduct, as far as feasible, a thorough compliance check about the hull fleets to be insured.

Risks
– Insuring or trading with sanctioned entities can have severe consequences.
– Unclear owner structure is a problem for subrogation.
– Furthermore, grey fleets consist of old vessels, which runs counter to climate change adaptation and carbon capture. For companies willing to comply with ESG rules, this can be a negative factor.

2.9 Infrastructure gaps

General definition
Mismatch of infrastructure compared to technology development and industry demand.

Context in the maritime industry and logistics
Infrastructure gaps include inadequate port facilities, congested waterways, inadequate road and rail networks, and a lack of intermodal connectivity. They are a crucial trend since they result in delays, increased costs, and reduced competitiveness for companies operating in the maritime industry.

The state of infrastructure gaps in the maritime industry and logistics varies depending on the region and country. For example, some countries and regions have made significant investments in port infrastructure and intermodal connectivity, while others continue to face significant challenges in these areas.

The COVID-19 pandemic has also highlighted infrastructure gaps in the industry, particularly in the areas of digitalization and supply chain resilience. The pandemic has exposed vulnerabilities in global supply chains and underscored the importance of robust and resilient infrastructure to support the movement of goods and facilitate international trade.

Climate change puts significant pressure on infrastructure as extreme weather events appear more frequently. For ports, sea level rise is a major problem. First, because it is still unclear how much sea level will rise. And second, because coping with this issue would be very expensive. For instance, elevating the infrastructure of the 100 biggest ports in the U.S. by two meters would costs US$ 69 to US$ 103 billion.

To address infrastructure gaps in the maritime industry and logistics, governments and industry stakeholders are investing in new infrastructure projects, such as port expansions and upgrades, road and rail network improvements, and digitalization initiatives.

Opportunities
- Development of new business opportunities and services through innovation and collaboration in the infrastructure and logistics sectors.
- Insurers can develop and offer risk management solutions to address the risks associated with infrastructure gaps, such as delays, supply chain disruptions, and cargo damage or loss.
- Insurers can develop specialized insurance products that cater to the unique risks of infrastructure development and management, such as construction, operation, and maintenance risks.

Risks
- High costs and funding challenges for infrastructure development and upgrades.
- Lack of political will or cooperation among stakeholders to invest in infrastructure improvements.
- Environmental and social impacts of infrastructure development, such as habitat destruction and displacement of communities.
- Potential for regulatory and legal challenges related to infrastructure development and management.
- Cybersecurity risks associated with increased digitalization and connectivity of supply chains.

2.10 Nearshoring

General definition
The practice of transferring a business operation to a nearby country, especially in preference to a more distant one often located on another continent.

Context in the maritime industry and logistics
Nearshoring is a response to the challenges and disruptions caused by the COVID-19 pandemic and the current geopolitical situation in Ukraine, as companies seek to reduce supply chain risks and increase resilience. Nearshoring has become an attractive option for companies that seek to reduce their dependence on distant suppliers and improve their agility in responding to market changes.

In particular, the pandemic has exposed vulnerabilities in global supply chains, such as the reliance on a few key suppliers, long lead times, and disruptions to transportation and logistics. Nearshoring reduces these risks by moving production closer to the end markets, thereby reducing lead times and transportation costs, and improving responsiveness to customer needs.

The trend towards nearshoring is evident across various industries, including manufacturing, automotive, and technology. For example, many automotive manufacturers are now investing in local production facilities to meet demand for electric vehicles and reduce dependence on foreign suppliers. Similarly, technology companies are increasingly moving production closer to their customers to reduce lead times and improve responsiveness.

Opportunities
- By moving production facilities closer to end markets, companies can reduce supply chain risks associated with long-distance supply chains, such as disruptions in transportation, customs clearance, and other logistical challenges.

– Nearshoring can help companies respond more quickly to changes in demand and market trends by shortening lead times and reducing time to market.
– Companiescan improve their sustainability performance by reducing the distance that goods need to travel, thereby lowering carbon emissions and other environmental impacts associated with long-distance supply chains.
– Enables companies to provide better customer service by reducing the time to market and improving responsiveness to customer needs.

Risks
– Nearshoring may result in higher labor costs if higher wages are paid in the country to which production is relocated. This could cause higher manufacturing costs, which may have to be passed on to customers.
– Companies may struggle to find skilled labor in the new location, which could result in delays in production and increased costs associated with training new workers.
– Companies may face political or societal risks in the new location. This could lead to disruptions in supply chains, higher costs, and increased uncertainty.
– High demand for production and warehouse real estates that is not always available. Additional loss of biodiversity through large scale construction.
– New value concentrations and accumulations.

2.11 Omnichannel logistics

General definition
Supply chain strategy, in which all sales channels and customer contact points used by the organization are networked with each other, with the customer always being at the center.

Context in the maritime industry and logistics
Omnichannel logistics is a strategy that involves integrating different sales channels, such as brick-and-mortar stores, e-commerce websites, and mobile applications, into a single seamless experience for the customer. This approach aims to provide customers with a consistent and personalized experience, regardless of the channel they use to make a purchase.

With last mile deliveries projected to increase by 78% throughout 2030, this trend has several implications. First, it requires increased coordination and collaboration among different supply chain partners, such as manufacturers, distributors, and retailers. This ensures that products are available across all channels and that customer orders can be fulfilled efficiently.

Second, omnichannel logistics often requires companies to rethink their inventory management strategies. Instead of maintaining separate inventories for each sales channel, companies may need to adopt more flexible inventory management systems that allow them to fulfill orders from different channels using a single inventory pool.

Third, omnichannel logistics can create new logistical challenges, such as faster and more flexible delivery options, and managing returns and exchanges across different channels.

Hence, to successfully implement an omnichannel logistics strategy, companies will need to invest in new technologies and data management systems, as well as build strong partnerships with other supply chain partners.

Opportunities
– By offering a seamless and personalized shopping experience, companies can attract more customers and increase sales.
– By providing a consistent experience across all channels, companies can improve customer satisfaction and build brand loyalty.
– By adopting flexible inventory management systems and streamlining logistics processes, companies can improve operational efficiency and reduce costs.
– By offering an omnichannel experience, companies can differentiate themselves from competitors and gain a competitive advantage.

Risks
- Omnichannel logistics requires increased coordination and collaboration among supply chain partners, which can create new logistical challenges and increase complexity.
- Implementing an omnichannel strategy may require companies to invest in new technologies and infrastructure, which can be expensive.
- Omnichannel logistics involves the use of digital technologies and data management systems. This can create new cybersecurity risks.
- Any disruptions in the supply chain can have a ripple effect across all channels, potentially impacting customer satisfaction and brand reputation.

2.12 Port decentralization

General definition
Use of many small instead of a few large ports to avoid port congestion.

Context in the maritime industry and logistics
The decentralization of ports refers to the trend of shifting from centralized, large-scale ports to a more distributed network of smaller, more specialized port facilities. This trend has been reinforce by a variety of factors, including changing trade patterns, advances in technology, and the increasing focus on sustainability and resilience in the maritime industry. However, the main driver for this trend is the increasing accumulation of ports during the last three years.

Opportunities
- Smaller, more specialized port facilities can be more adaptable to changing trade patterns and customer needs, allowing for greater flexibility and responsiveness.
- Decentralized ports can help reduce congestion and delays at major port facilities, improving efficiency and reducing costs for shippers.
- A more distributed network of ports can help improve the resilience of the maritime industry by reducing the vulnerability of supply chains to disruptions at any single location.

Risks
- Smaller, more specialized port facilities may not benefit from the economies of scale that larger port facilities can achieve, leading to higher costs for shippers.
- A more distributed network of ports can create coordination challenges for stakeholders, including shippers, carriers, and port authorities.
- Decentralization may require significant investment in infrastructure and facilities to support the development of new port facilities.
- Decentralization can create both competition and collaboration among port facilities, as well as between port facilities and other transportation modes. This requires careful management to ensure a level playing field and effective coordination.

2.13 Quantum computing

General definition
Computing that makes use of the quantum states of subatomic particles to store information.

Context in the maritime industry and logistics
Quantum computing is an emerging technology that has the potential to transform many sectors, including the maritime industry. While quantum computers are not yet widely available, recent advances in research and development have led to increased interest and investment in the field.

In the maritime industry, quantum computing could have significant implications for areas such as logistics optimization, route planning, and risk management. For example, quantum computing could enable shipping companies to optimize their fleet routing and scheduling in real-time, taking into account a wide range of variables such as weather conditions, port congestion, and cargo volumes.

Similarly, quantum computing could be used to improve risk management by enabling more accurate and sophisticated modeling of complex risks, such as supply chain disruptions, cyber-attacks, and natural disasters. This could help shipping companies to better anticipate and mitigate risks, and improve overall business resilience.

Opportunities
- Optimization of logistics and route planning, which could lead to cost savings and improved efficiency.
- Enhanced risk management through more accurate modeling and simulation of complex systems, which could help companies to better anticipate and mitigate risks.
- Improved sustainability and reduced carbon footprint through more efficient operations and logistics planning.
- Development of new business models and services enabled by quantum computing, such as predictive maintenance and personalized shipping services.
- Competitive advantage through early adoption of quantum computing technology.

Risks
- High cost of quantum computing hardware and expertise, which may make it difficult for smaller companies to adopt the technology.
- Complexity and uncertainty in developing and implementing quantum algorithms for real-world applications.
- Security risks associated with the potential of quantum computers to break existing encryption systems and compromise sensitive data.
- Legal and ethical concerns regarding the use of quantum computing, such as the potential for algorithmic bias and unintended consequences.
- Need for specialized skills and expertise in quantum computing, which may be in short supply in the early stages of adoption.

2.14 Subcontractors economy

General definition
Business models that are based on assigning, or outsourcing, part of the obligations and tasks under a contract to another party known as a subcontractor.

Context in the maritime industry and logistics
The subcontractors economy is a trend in which companies outsource certain functions and activities to third-party contractors or service providers. This trend has significant implications for supply chains, which rely on a network of interconnected businesses and service providers to move goods from producers to consumers.

One of the primary implications of the subcontractors economy for supply chains is increased complexity. As companies rely on more subcontractors to provide services and support, the supply chain becomes more fragmented and difficult to manage effectively. This can lead to delays, increased costs, and reduced efficiency, as experienced during the COVID-19 pandemic and given the current geopolitical situation in Ukraine.

Opportunities
- By outsourcing certain functions to specialized contractors, companies can more easily adapt to changes in demand or market conditions, without the need for significant investments in new infrastructure or capabilities.
- Helps improve the overall quality of the supply chain by leveraging the expertise and experience of specialized service providers.

– Outsourcing certain functions can help reduce costs, particularly for activities that are not core competencies of the company.
– Increased innovation: working with specialized contractors can help foster innovation, by exposing companies to new ideas and approaches.

Risks
– Managing quality across a fragmented supply chain can be challenging, particularly if multiple subcontractors are involved in the production and distribution process.
– Coordinating the activities of multiple subcontractors can be difficult, especially in complex supply chains with multiple tiers of subcontractors.
– Maintaining transparency and traceability across the supply chain can be challenging if multiple subcontractors are involved in the production and distribution process.
– Risks related to cybersecurity, data privacy, and supply chain resilience.

2.15 Supply chain traceability

General definition
Process of tracking the provenance and journey of products and their inputs, from the very start of the supply chain through to end-use.

Context in the maritime industry and logistics
Supply chain traceability has become an increasingly important issue in recent years as consumers and regulators have become more concerned about issues such as product safety, sustainability, and ethical sourcing.

This trend is particularly relevant for developed economies. The German Supply Chain Act, for instance, was adopted in 2021 and came into effect in 2023. It requires companies with more than 3,000 employees to perform due diligence on their supply chains to identify and address human rights and environmental risks. At the same time, the Corporate Sustainability Due Diligence Directive (CSDDD) in the EU is currently under development. It is a proposed EU-wide directive that would require companies with more than 500 employees to conduct due diligence on their supply chains to identify and address risks related to human rights, child labor, and environmental sustainability.

On the other hand, the Slave-Free Business Certification Act was introduced in the US Senate in 2022. It would require companies with annual revenues of more than US$ 500 million to obtain certification from the Department of Labor stating that their supply chains are free from forced labor and child labor. The law would also require companies to submit annual reports detailing their due diligence efforts and compliance with the law.

Opportunities
– Traceability is seen as a key tool for addressing ESG concerns by providing greater transparency and accountability across the supply chain.
– Supply chain traceability could create opportunities for insurers to offer new products and services, such as supply chain risk management solutions, cyber risk insurance, and product recall insurance.
– Greater visibility across the supply chain can help insurers better assess and manage risks associated with specific products or suppliers. This could enable them to develop more effective risk mitigation strategies.
– Supply chain traceability can improve insurers' understanding of the risks and liabilities associated with different products and supply chain actors, which could help them price insurance policies more accurately and reduce losses from claims.

Risks
– Achieving full supply chain traceability can be a complex and challenging process. Many different actors are involved in the production and distribution of goods, each with their own data systems and processes. Achieving full visibility across the entire supply chain requires close collaboration and coordination between all these stakeholders.

- Insurers rely on accurate and reliable data to assess risk and set insurance rates. Supply chain traceability initiatives can involve large amounts of data, some of which may be inaccurate or incomplete. This could make it difficult to accurately assess risk and price policies.
- Some suppliers may be reluctant to share information about their operations or supply chain partners, which could limit the effectiveness of traceability initiatives and make it difficult for insurers to assess risk.
- Collecting and sharing supply chain data could create new cybersecurity risks for insurers, particularly if the data is stored or transmitted through insecure systems.
- Supply chain disruptions, such as product recalls or transportation delays, could result in significant losses for insurers. While traceability initiatives may help insurers better understand and manage these risks, they cannot eliminate them completely.

2.16 Warehouses on demand

General definition
Digital marketplace that allows customers to access shared warehousing and logistics services on a pay-per-use basis.

Context in the maritime industry and logistics
Warehouses on demand is a relatively new concept in the logistics industry, which involves the use of shared, flexible warehouse spaces that can be rented on a short-term basis. These warehouses are designed to meet the growing demand for more flexible and scalable storage solutions, particularly among small and medium-sized businesses.

Currently, innovation in this area is rapidly evolving, with several startups and established companies investing in developing new technologies and business models to support the growth of warehouses on demand.

Some of the key innovations in this area include the use of artificial intelligence and machine learning to optimize warehouse space and operations, the development of new software platforms and marketplaces to connect businesses with available warehouse space, and the use of automation technologies such as robotics and drones to streamline warehouse operations.

In addition, there is a growing focus on sustainability and energy efficiency in the design and operation of warehouses on demand, with many companies exploring the use of renewable energy sources and green building practices.

Opportunities
Warehouses on demand provide businesses with more flexibility in terms of storage space, allowing them to scale their operations up or down as needed.
Renting warehouse space on demand can be more cost-effective than traditional warehousing solutions, particularly for small and medium-sized businesses.
Warehouses on demand can be optimized using artificial intelligence and automation technologies, resulting in improved operational efficiency and faster order fulfillment.
Warehouses on demand present new opportunities for startups and logistics providers to develop innovative technologies and business models that support the growth of this industry.

Risks
- Warehouses on demand rely heavily on digital technologies and data management systems, creating potential cybersecurity and data privacy risks.
- Warehouses on demand may need to comply with a range of regulations and standards, including those related to safety, environmental impact, and data privacy.
- With multiple businesses sharing the same warehouse space, there is a risk of quality control issues, particularly in terms of product handling and storage.
- For insurers, many storing parties and various contractual relationships add complexity for possible liability claims in case of damage.
- Added complexity for accumulation control, especially if stored values are highly volatile due to changes in demand.

3. Labor dynamics

3.1 Social inflation

General definition
The upward movement in insurance costs as a consequence of more frequent litigation, judgements in favor of the victims, and larger settlements amounts awarded by the courts.

Context in the maritime industry and logistics
So far, social inflation is more relevant for the casualty business than the marine industry. However, this might change in the future regarding injury and pollution.

Opportunities
– At the present early stage, opportunities for marine insurers are not clear.

Risks
– Possible negative claim developments for marine liability insurers.
– Insufficient or incorrect pricing of social inflation in insurance products.
– Possible increase in premium levels for policyholders to cover this trend.

3.2 Remote inspections and surveys

General definition
Decentralized and real-time inspections and surveys conducted with accessible technology such as smartphones, tablets or drones.

Context in the maritime industry and logistics
Remote inspections and surveys offer a number of benefits over traditional in-person inspections, including reduced costs and increased efficiency.

In addition, remote inspections and surveys can enhance safety by reducing the need for surveyors to physically access hazardous or hard-to-reach areas of a ship or maritime asset. They also offer increased flexibility, allowing inspections and surveys to be carried out more easily across different time zones and locations.

However, there are challenges to consider with remote inspections and surveys. These include the need for robust and reliable technology infrastructure, as well as skilled technicians to operate and maintain the technology.

Overall, the current state of remote inspections and surveys in the maritime industry is one of growth and innovation, with increasing adoption of advanced technology to improve efficiency and reduce costs. As the technology continues to evolve and mature, it is likely that remote inspections and surveys will become an increasingly important tool for surveyors and other stakeholders in the maritime industry.

Opportunities
- Reduced costs and increased efficiencyas remote inspections and surveys can be carried out without the need for surveyors to travel to physical locations.
- Increased flexibilityas remote inspections and surveys can be conducted across different time zones and locations.
- Improved safety by reducing the need for surveyors to access hazardous or hard-to-reach areas of a ship or maritime asset.
- Improved accuracy and consistency in inspections and surveysas remote tools can provide real-time access to data and video footage, reducing the potential for errors and discrepancies.
- Increased availability of data and insights that can be used to improve decision-making and overall operational performance.
- Creation of new jobs with changed profiles.

Risks
- Technical challenges associated with the adoption of new technology, such as connectivity issues and compatibility with existing systems.
- Cybersecurity risks related to the use of remote tools and digital systems that could be vulnerable to hacking and other security breaches.
- Concerns regarding data privacy and protection, particularly as sensitive data is transmitted across remote systems.
- Challenges in maintaining quality standards for remote inspections and surveys, as well as ensuring compliance with regulatory requirements.
- Potential job displacement as automation and remote tools replace some traditional manual tasks in inspection and surveying.

3.3 Port automation

General definition
The use of integrated technology to develop intelligent solutions for efficient control of traffic and trade flows on the port thereby increasing capacity and port efficiency.

Context in the maritime industry and logistics
The current state of port automation is characterized by the increasing adoption of advanced technologies, such as autonomous cranes, automated guided vehicles (AGVs), and container terminal operating systems (TOS).

Automated container terminals use advanced technology to optimize operations, such as automated cranes for container handling and AGVs for cargo transport within the terminal. These systems can help reduce labor costs, improve efficiency, and enhance safety by minimizing the need for human intervention in dangerous areas.

Terminal operating systems (TOS) are increasingly used to manage container handling and logistics operations in ports. TOS can help optimize vessel planning, yard operations, and equipment allocation, improving terminal productivity and reducing wait times for vessels.

Port automation can also include the use of advanced data analytics and Internet of Things (IoT) sensors to monitor cargo movements, port operations, and supply chain performance in real-time. This data can be used to improve efficiency, optimize processes, and enhance security.

Improvement of vessel scheduling, including arrivals, departures and berthing operations. Improved planning for port resources like pilots, tugs, linesmen.

Opportunities
- Increased efficiency and productivity in port operations, resulting in reduced costs and improved competitiveness.
- Enhanced safety and security through the use of automation systems, which can reduce the risk of accidents and improve cargo tracking and monitoring.
- Improved customer service through faster and more reliable cargo handling and reduced wait times for vessels.
- Enhanced accountability and safety by weighing containers at various points of operation to ascertain the correct weight as per the Bill of lading (B/L) without losing time.
- Creation of new jobs in technical and specialized roles, such as software engineers and data analysts.
- Improved sustainability and reduced environmental impact through the use of electric and autonomous vehicles.

Risks
- Significant upfront costs associated with the adoption of port automation, including infrastructure upgrades and technology investments.
- Potential job displacement as automation replaces some traditional manual tasks in port operations.
- Technical challenges associated with integrating automation systems with existing port infrastructure and legacy systems.
- Cybersecurity risks associated with the use of IoT sensors and digital systems, which could be vulnerable to hacking and other security breaches.
- Challenges in managing and optimizing complex systems, including the need for skilled technicians and IT professionals.

3.4 Warehouse automation

General definition
Process of automating the movement of inventory into, within, and out of warehouses to customers with minimal human assistance.

Context in the maritime industry and logistics
Warehouse automation is transforming the logistics and supply chain industry, driven by the need for greater efficiency, accuracy, and speed in handling and processing goods. The current state of warehouse automation is characterized by a range of advanced technologies that are being developed and adopted at an unprecedented pace.

Automated storage and retrieval systems (ASRS) are one of the most common forms of warehouse automation, with technologies such as automated conveyors, carousels, and shuttle systems being used to move goods around warehouses and distribution centers. These systems offer benefits such as increased throughput, reduced labor costs, and improved inventory accuracy.

Robotics is another key area of warehouse automation, with autonomous mobile robots (AMRs) being used to perform a range of tasks such as picking and packing, inventory management, and transportation. These technologies offer benefits such as improved efficiency, flexibility, and safety, and can be integrated with other warehouse automation systems to create a fully automated warehouse.

Opportunities
- Warehouse automation can help improve efficiency, productivity, and accuracy in the logistics and supply chain industry, leading to cost savings and enhanced competitiveness.
- Adoption of automation can help address workforce shortages in the industry by reducing the reliance on manual labor and creating new job opportunities in technical and specialized roles.
- Automation can help improve safety in the warehouse industry by reducing the potential for accidents and injuries.
- Automation can enable new business models and services, such as same-day or next-day delivery, which is revolutionizing the industry.

Risks
- Initial investment costs associated with the adoption of warehouse automation can be significant, and there may be challenges in securing financing for these projects.
- Job displacement as automation and robotics replace some traditional manual tasks in the warehouse industry, which could have negative social and economic consequences.
- There may be technical challenges with integrating automation and robotics into existing systems, which could lead to downtime and operational disruptions.
- There may be regulatory and legal challenges associated with the adoption of warehouse automation, particularly with regards to safety and liability issues.

3.5 Robotics

General definition
Science of making and using robots, i.e.machines controlled by computers that are used to perform jobs automatically.

Context in the maritime industry and logistics
Robotics is increasingly adopted in the maritime industry and logistics to automate and optimize a range of processes, from cargo handling to vessel operations and maintenance. The current state of robotics in the maritime industry and logistics is characterized by rapid technological advancements and growing interest and investment from industry stakeholders.

In port operations, robotics is used to automate cargo handling and transportation, with autonomous cranes, trucks, and other equipment being developed and deployed in several ports around the world. These technologies offer benefits such as improved efficiency, reduced labor costs, and increased safety.

In vessel operations and maintenance, robotics is used to improve the safety and reliability of vessels, with technologies such as drones, autonomous underwater vehicles, and robotic arms used to perform inspections, maintenance, and repairs. These technologies can help reduce downtime and maintenance costs and improve vessel performance and safety.

Opportunities
- Robotics and automation can help improve efficiency, productivity, and safety in the maritime industry and logistics, leading to cost savings and enhanced competitiveness.
- Adoption of robotics can help address workforce shortages in the industry by reducing the reliance on manual labor and creating new job opportunities in technical and specialized roles.
- Robotics can enable new business models and services, such as autonomous shipping, which could revolutionize the industry.

Risks
- Initial investment costs associated with the adoption of robotics in the maritime industry and logistics can be significant. Securing funding for these projects might prove difficult.
- There is a potential for job displacement as automation and robotics replace some traditional manual tasks in the industry, which could have negative social and economic consequences.
- There may be regulatory and legal challenges associated with the adoption of robotics in the maritime industry and logistics, particularly with regards to safety and liability issues.
- There may be technical challenges with integrating robotics and automation into existing systems, which could lead to downtime and operational disruptions.

3.6 Labor shortage

General definition
Imbalance in the maritime labor market, where demand exceeds the supply of workers.

Context in the maritime industry and logistics
Worker strikes have been a big issue in 2022, and the situation in 2023 does not look promising. Inflation is predicted to put pressure on workers' income, leading to labor dissatisfaction, particularly in key areas such as seafaring, shipbuilding, and port operations. Labor shortage is due to a range of factors, including demographic shifts, changing job preferences among younger workers, and the impact of the COVID-19 pandemic on labor markets.

There is a growing shortage of qualified crew members in the seafaring sector, particularly among officers and engineers. This shortage is driven by an ageing workforce, the closure of maritime training institutions, and a lack of opportunities for career advancement and professional development.

Shipbuilding and repair also lack skilled workers, such as welders, electricians, and mechanics. This shortage is partly due to competition from other industries and the offshoring of manufacturing jobs.

Port operations experience a shortage of workers in key roles such as crane operators, truck drivers, and cargo handlers. This is due to a range of factors, including competition for workers from other sectors, increasing automation of port operations, and the impact of the COVID-19 pandemic on labor supply chains.

Labor shortage in the maritime industry poses challenges for companies operating in the sector, including increased costs, reduced productivity, and difficulty in meeting customer demands. To address this shortage, companies are taking a range of measures, such as investing in training and development programs, increasing wages and benefits, and leveraging technology and automation to improve efficiency.

Opportunities
- Investment in training and development programs to build a skilled and resilient workforce.
- Adoption of new technologies and automation to improve efficiency and reduce the reliance on manual labor.
- Collaboration with industry stakeholders, such as labor unions and governments, to address workforce challenges and develop solutions like fair working conditions and adequate salary.

– Increased investment in workforce diversity and inclusion to attract and retain a broader range of talent.
– Development of new business opportunities and services through innovation and collaboration in the workforce and labor management sectors.
– Integration of career planning into company policies to manage training of junior ranks and better availability of senior ranks.

Risks
– Reduced productivity and increased costs due to labor shortages, which can affect the competitiveness of companies operating in the maritime industry.
– Safety risks due to a shortage of qualified crew members and workers in key roles. This can increase the likelihood of accidents and incidents.
– Difficulty in meeting customer demands and fulfilling contracts due to a lack of available labor, which can result in reputational damage and loss of business.
– Potential for regulatory and legal challenges related to the shortage of qualified workers in the maritime industry.

3.7 Women representation

General definition
Equalitarian participation of women in a certain organization, industry, or population.

Context in the maritime industry and logistics
Women make up half of the world's population, but only 1.2% of the global seafarer workforce (BIMCO/ICS 2021). Although this percentage might sound alarming, women's representation in the maritime industry has increased by over 45% since 2015. The participation of women in this industry goes beyond the fact that gender equality translates into progress overall, as increasing the number of female seafarers can be crucial to closing the labor market gap. However, measures against gender-based discrimination, harassment, and intimidation in the workplace must be ensured.

Opportunities
– Improved social fabric and environment on the ships.
– Closing the labor shortage gap.
– Positioning as ESG leader.
– Breaking with stereotypes.
– Crew and staff diversity.

Risks
– Unequal treatment can cause friction between teams leading to performance issues.
– Increase of harassment cases at the workplace.

3.8 Artificial intelligence

General definition
Theory and development of computer systems able to perform tasks normally requiring human intelligence, such as demand forecasting, supply planning and warehouse automation.

Context in the maritime industry and logistics
AI is already an essential part of several industries, and maritime is no exception. From route optimization to predictive maintenance, AI has a vast variety of applications at sea and land that can easily facilitate and optimize processes.

Opportunities
- Predicting ship speed over the ground: AI can be used to analyze historical data on ship speed and weather patterns to create predictive models that help operators optimize routes and fuel consumption.
- Vessel traffic and route planning: AI can help analyze real-time and historical vessel data to optimize traffic flow and route planning, reducing congestion and improving safety.
- Shipping demand forecasting: AI can be used to predict changes in shipping demand by analyzing data on economic indicators, trade volumes, and other factors, allowing shipping companies to adjust their operations accordingly.
- Shipping container recognition: AI can help automate the process of container recognition, improving accuracy and reducing the need for manual inspection.
- Container throughput forecasting: AI can be used to forecast container throughput by analyzing data on cargo volumes, weather patterns, and other factors, allowing port operators to optimize resource allocation and reduce congestion.
- Maritime anomaly detection: AI can help detect anomalies in maritime data, such as abnormal vessel behavior or equipment malfunctions, allowing operators to quickly take corrective action.
- Predictive maintenance: AI can be used to analyze real-time and historical data on vessel and equipment performance, predicting when maintenance is needed and reducing downtime.
- Ship berth allocation: AI can help optimize ship berth allocation by analyzing real-time and historical data on vessel traffic and berth availability, improving efficiency and reducing waiting times.
- Ship collision risk assessment: AI can help assess collision risk by analyzing vessel data and environmental factors, providing operators with real-time alerts and recommendations to reduce the risk of collisions.
- Maritime energy-efficiency optimization: AI can be used to analyze vessel data and identify areas for improving energy efficiency, such as optimizing vessel speed, reducing idle time, and improving maintenance practices.

Risks
- Data quality and reliability: AI systems rely heavily on high-quality and reliable data, and errors or biases in the data can lead to inaccurate or unreliable results.
- Cybersecurity and data privacy: The increased use of AI systems in the maritime industry may create new cybersecurity risks and data privacy concerns, particularly as more sensitive data is collected and analyzed.
- Technical failures: AI systems are complex and can be prone to technical failures or malfunctions, which can lead to operational disruptions or safety risks.
- Lack of transparency: AI systems can be opaque and difficult to understand, particularly when using advanced machine learning techniques. This can make it difficult to identify and correct errors or biases.
- Human-machine interaction: As AI systems become more sophisticated, it can be difficult for human operators to understand and control them, leading to potential safety risks.
- Legal and regulatory challenges: The use of AI in the maritime industry may raise legal and regulatory challenges, particularly with respect to issues such as liability and responsibility for AI-related accidents or failures.
- Loss of traditional jobs.

3.9 Autonomous ships

General definition
Uncrewed vessels that transport goods or people with little or no human interaction over navigable waters.

Context in the maritime industry and logistics
Maritime Autonomous Surface Ships (MASS) have been a trending topic for a while and are here to stay. The global market for autonomous ships is estimated to reach a size of US$ 11.4 billion by 2027 (Research and Markets, 2022). Their establishment in the shipping industry will be faster than anticipated, according to our experts. In fact, already more than 1,000 MASS are

operated by 53 organizations (Autonomous Ship Technology Symposium 2021), and regulations are catching up to ensure safety and accountability (IMO, 2022).

Opportunities
– More efficiency in voyage availability.
– Helping close the labor shortage gap.
– Potential reduction of (collision) claims due to human error or fatigue.

Risks
– Missing regulations.
– Liability allocation.
– In case of AI failure, it is unclear how ships will be retrieved.

3.10 Immersive technologies

General definition
User can immerse themselves in virtual environments with the help of technology.

Context in the maritime industry and logistics
Immersive technologies have the potential to address two crucial issues regarding labor shortage in the maritime industry. First, it enables remote maintenance, inspection, and troubleshooting, which usually have to take place in person. This allows specialists and engineers to work more efficiently and from anywhere in the world, increasing availability and saving costs. Second, immersive technologies create realistic training environments and simulate real-life situations enabling a larger supply of training exercises and skills development for future and current seafarers.

Opportunities
– Closing the labor shortage gap by providing better and more accessible training for future seafarers.
– Improving crew well-being through mobile healthcare.
– Improving ship maintenance though remote inspections.
– Providing better connectivity for seafarers to interact with their family.
– Opportunity for onboard management to interact with shore management.

Risks
– Cyber security threats.
– Missing or incomplete regulations.

3.11 Crew well-being

General definition
Physical and mental health related to the working conditions of seafarers.

Context in the maritime industry and logistics
When bad working conditions in the maritime sector were exposed during the COVID-19 pandemic, numerous seafarers chose or were forced to change career paths, leading to a decline in labor supply at sea. As a response, seafarers are demanding better working conditions and stakeholders have started to listen. However, crew well-being does not only involve basic topics such as human rights or internet access , but also mental health, enhanced financial resilience, or improved social justice. Further steps include providing counselor support, de-criminalizing seafarers and evaluating and training onboard management. Thus, stakeholders will have to adapt to seafarers' demands and contribute to their well-being if labor at sea is to be ensured.

Opportunities
– Closing the labor shortage gap by making the maritime industry a more attractive place to work and ensuring fair working conditions.
– Mobile and remote healthcare.
– Decrease in liability risks.

Risks
– Complexity due to different legislations in various countries.

3.12 Additive manufacturing

General definition
Widely referred to as 3D printing, additive manufacturing is an emerging and innovative manufacturing process where components are built up layer by layer.

Context in the maritime industry and logistics
The ocean's harsh conditions have made it difficult for this trend to establish itself in the maritime world. Conventional 3D printing does not meet the requirements, but other technologies have been developed, such as Wire Arc and Powder Bed Fusion. They can produce larger components thanks to high-rate deposition and unlimited build size. Establishing these building techniques would alleviate pressure on shipyard workers.

Opportunities
– Lower claims costs.
– More flexible and faster repairs and shipbuilding.
– Use of alternative and more sustainable materials.
– Optimizing the availability of the printer saves time no matter where the ship is located.

Risks
– Uncertainty with new technology.

Contact our experts

Interested in more insights? We are happy to explain trends and developments, assess risks and potentials, and identify new business opportunities for your company. In co-creation formats, we develop customized solutions that meet your individual needs. We look forward to connecting with you!

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