



RESILIENCE STRATEGIES AS A PARAMETER OF COMPETITIVENESS IN MARITIME TRANSPORT

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ABSTRACT

The focus of this study is maritime transport, with an emphasis on shipping companies and ports as the main players in the execution of marine transportation services. Since the industry is constantly facing waves and extreme volatility influenced by many factors of its internal and external environment, the aim of this work is to provide a clear insight into maritime transport players' ideology concerning the overcoming of this instability and unpredictability by establishing resilience strategies which help not only in the survival of the companies but also in enhancing of their competitiveness. Therefore, in the first stage, some groundings are set regarding the maritime industry to better understand the field. Moreover, the current market is examined through the prism of recent global events such as the Covid-19 pandemic and the War in Ukraine, which affected the global economy and, consequently, the shipping industry. The reactions of the shipping companies and the ports are described through a literature review on various resilience strategies attempting to achieve a competitive advantage in the market. The paper concludes with thoughts for further research and proposals for increasing resilience, thus, effectiveness in the shipping industry.

Keywords: Resilience, Shipping, Ports, COVID-19, Efficiency

1. INTRODUCTION

It is well known that more than 80% of international trade is carried out by sea (Michail & Melas, 2020; Sun & Zhang, 2022), as shipping is the most cost-efficient mean of transport per unit of cargo. In 2021 the total seaborne trade was about 11 billion tons (UNCTAD, 2022a). It is important to mention that sea transport services cover derived and not direct demand (Stopford, 2009). The external environment and the exogenous factors that affect shipping companies are forcing them to take measures and adopt several strategies. The environmental impact of shipping, with emphasis on sea pollution and the Green House Gas Emissions (Schermerhorn, 2010; Kavussanos & Moysiadou, 2021; Theotokas, 2018), has resulted in the development of several environmental-related regulations. Seasonality must also be considered a major element of the industry's performance. Furthermore, the



internal environment of a shipping company affects its strategies, which include several players such as clients, suppliers, bankers, insurers, classification societies, executive bodies, employees, etc. (Schermerhorn, 2010; Theotokas, 2018).

Since all these factors, and many more, including those which are unpredictable such as a pandemic, an environmental disaster, a war, or a terrorist attack, have a great influence on shipping transportation, the companies need to build and constantly update their resilience strategy, becoming more flexible and always prepared for any circumstances. In general, a strategy can be examined in 3 levels: (a) the corporate strategy, which has to do with the purpose of the company and the choice of the activities to be developed (b) the competitive or business strategy, which focuses on the competitive advantage towards the competitors and (c) the functional strategy which concentration is the various functions of the company to contribute to the previously mentioned two strategy levels (Theotokas, 2018).

Having set the background, the following sections get into more detail depicting the recent events which affected the whole global economy, creating challenges and opportunities, resulting in tremendous modifications of maritime transport, and the actual shipping practices adopted by shipping companies and ports as the main actors of the sea transportation. The reflex mechanism of the market is described along with the adaptability of the organizations in practice by developing various strategies during the demanding times, followed by conclusions, recommendations for further research, and policy proposals.

2. LITERATURE REVIEW

Sea transport and ports can be affected in multiple ways with the most recent example being the covid-19 pandemic, which caused shocks and stresses in the marine sector, such as sudden changes in volume of transported goods, lack of human resources to ports and the seafarer crisis. Moreover, ports have to handle a constant changing environment, i.e., becoming carbon free and smart mobility hubs. In every term of these transformations' new technological pathways, new business models and new human skills creating opportunities for updating and upgrading ports to the race of survival in a competitive market. At the same time, these agendas can lead in a more fragile and vulnerable sea transport and port system affecting critical functions, if not treated holistically and structured in a resilience way.

Resilience has many different concepts, and it is depending on the scientific field examined. For instance, sociology uses the term resilience to identify what makes different social networks strong throughout disaster and recovery (Aldrich and Meyer 2015), engineering identifies the resilience of built infrastructure (Bruneau et al. 2003), and economics supplies information on the resilience of local business sectors (Rose and Wei 2013). The term resilience often associated with the ability of an entity or a system to recover from a disturbance or disruption. According to McAllister (2016), the concept of resilience has evolved beyond the performance and recovery to include theories like



risk-informed management, standardized assessments and mitigation methods, and technological approaches leading to an improved performance against future disasters. Therefore, the following definition is used: **Resilience** is the ability to predict, prepare for, and adapt to altering conditions and endure, respond to, and recover rapidly from disturbances while maintaining operational activities. Four key concepts in a cycle of continuous evolution can summarize this definition: prepare, resist, recover, and adapt.

Different types of infrastructures, i.e. hub or gateway port, have dissimilar vulnerabilities regarding maritime networks and its implications. Disturbances at a hub will affect greatly the maritime shipping network, while disturbances at a gateway port will mostly impact hinterland. As shipping and ports can be exposed to a variety of disruptions, it is essential for new systems to be more resilience over three core ideas:

- **Absorptive capacity** – the ability of a node or a terminal to maintain a level of its operational activities while a disruption is in progress.
- **Adaptive capacity** – the ability to route the cargo flows through alternatives nodes during a disruption so as to maintain a level of service.
- **Restorative capacity** – the ability to recover at the same or even higher level of service, in comparison with the era prior the disruption.

Shipping and port industry have to withstand and adapt to the changing environment, and to recover positively from shocks and stresses. The resilience concept is often associated with concepts like **agility, flexibility, and lean**. The term **agility** describes the time of the adaption process, making fast and unhindered changes when faced with disruptions. Immediate response, automated processes and built-in policies minimizing the adaption time leading to an agile supply chain. Such an entity utilizes new technologies, methods and information systems in order to structure an organization based on constant exchange of information between different departments and a strong relationship among its customers and suppliers. **Flexibility** is the ability to use innovative solutions as an answer to a transforming environment. As far as ports considers, this attribute allows the port or the port company to alter with smoothness so as to operate under new, different, or changing requirements in a cost-effective manner. **Lean** can be described as the continuous improvement of processes that eliminating waste or non-value stops across the supply chain. A lean supply chain leads to prime financial performance for all parties involved while reducing redundancy.

2.1 The impact of recent events on maritime transport

The Covid-19 pandemic and the War in Ukraine are the most recent events that have brought a global crisis with countries still struggling to cope. The main characteristics of the present global crisis

are the higher shipping cost (see Figure 1), great inflation pressure, shortages of food, higher energy price, and disturbances in the global supply chains (UNCTAD, 2022b).

During the pandemic, the international trade decreased as several countries went into continuous lockdowns. The pandemic has severely impacted the shipping industry with a decrease in freight rates in some shipping markets, which in turn damaged the cash flows of the shipping companies (Michail & Melas, 2020), along with several other operational issues related to pilotage, ports closure and problems (Sun & Zhang, 2022) and crew change processes (Iakovou et al., 2022). Especially the cruise lines faced the worst period in their history, halting operations, causing the global economy an approximate cost of 77 billion dollars until 2021 (Walters, Magor, Kelly & Wallin, 2022).

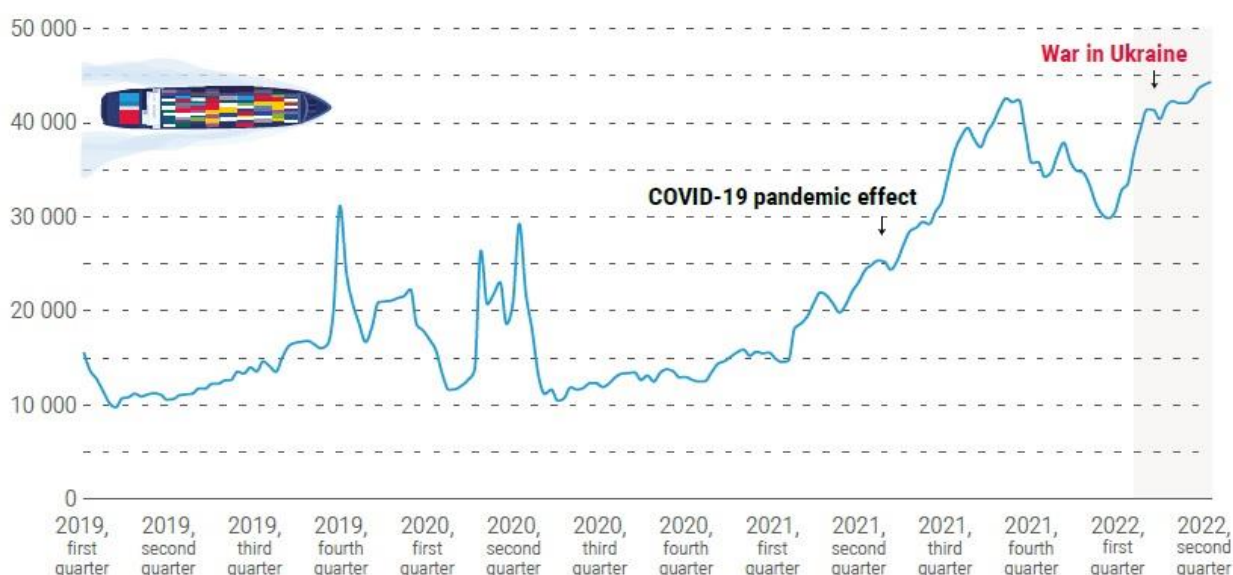


Figure 1: Clarksea Index in \$/day

Source: (UNCTAD, 2022b), based on data provided by Clarksons Research Shipping Intelligence Network.

Note: The series tracks average vessel earnings across the major shipping sectors, including tankers, bulkers, containerships, and gas carriers, weighted by the number of ships in each segment.

Russia invasion in Ukraine, causing a huge impact on international trade. Ukraine is one of the most important exporters of grains, seeds, and vegetable oils, and before the war, Ukraine exported more than 90% of its agricultural products via the Black Sea. On the other hand, the Russian Federation was the leading supplier of oil and gas to Europe until recently. The war in Ukraine, however, brought sanctions and restrictions imposed by the European Union towards Russia, which led to the use of alternative shipping routes in order to facilitate the related trade. Besides food insecurity, huge problems were raised regarding energy sources, which is also one of the main factors of the global economic crisis. Consequently, the increase in energy costs led to higher bunker prices,



and the vessels' calling at Ukraine's ports had a huge impact on the booming shipping cost, as shown in Figure 1. The higher transportation cost means that consumers face increasing prices eroding the purchasing power of both consumers and businesses, resulting in increasing inflation (UNCTAD, 2022c; OECD, 2022).

As regards shipping, the tanker market freight rate in the last five years faced two huge spikes, based on data from Baltic Exchange (2022). The first one started at the end of 2019 lasting until mid-2020 because of the pandemic and the emergence of Covid-19. Although the virus spread and the world's lockdown started in 2019, the oil-producing countries delayed cutting the output (Engebretsen, 2020). As a result, oil prices decreased significantly, and demand for vessels emerged to transport the oil to the shore tanks globally. When the shore tanks filled up, tankers, used as storage facilities, resulted in additional vessel shortages (Wallace & Faucon, 2020), driving the freight rates up. In 2022, another huge spike occurred due to the Russian invasion of Ukraine. European Union imposed sanctions on Russia, which resulted in a re-arrangement of shipping routes, increasing the ton-miles and, therefore, the demand for ships, especially for Aframax, resulting in increased freight rates. Also, given full sanctions to come, Russian oil companies provided big discounts to sell oil the soonest as possible and due to the partial suspension of Russian pipelines for supplying the EU (Capolongo, Köhl, & Skovorodov, 2022), led to excess demand of tankers.

The combination of the lockdowns, the slowing of global trade, and the oversupply of ships resulted in fierce competition in the market that pushed the freight rates to very low levels. In contrast with the tanker market, the pandemic had a negative effect on dry bulk shipping. The conflict in Ukraine also affected the trade routes and raised insurance costs for shipping companies, affecting freight rates (UNCTAD, 2022c). Overall, the dry bulk shipping market has been affected significantly by the pandemic and the war, with the freight rates mainly fluctuating on the lower levels.

Finally, in the container shipping freight market, the rapid spread of the coronavirus led to effective drop-in freight rates until 2020. The main reasons are the ports closure, crew shortage, quarantines, and other covid-19 restrictions, making the shipping companies struggle to stay profitable. From early 2020, the market started gradually to recover until 2021, with a significant increase in the freight rates. However, along with the high rates, serious problems were created in the shipping transport, as the ports faced huge congestion, with hotspots being the United States, Europe, and China (UNCTAD, 2022b). The delivery schedules were delayed a lot, and there was a shortage of equipment, workforce, and storage facilities. The situation was enhanced as the shipping companies applied Black Sailings to minimize delays. By 2022 onwards, the freight rates started to fall again. The war hampered Black Sea container lines, especially those connecting Ukraine and Russia, which resulted in delays and higher shipping costs.

3. RESILIENCE STRATEGIES

Every transaction in a shipping company must be planned with great precision and consider all the possible factors that may affect it and the objectives it seeks to achieve because the capital involved is



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enormous. It is widely known that the shipping market is volatile, and risk is a daily occurrence. Disruptions can be triggered from multiple sources either predictable or not. An internal disruption is related with shipping operations, such as breakage of equipment or a breach in security. The external factors are related with elements that the shipping company can't control, such as a hurricane, an economic crisis, or a pandemic. Having explained thoroughly the concept of resilience, as long as the risks that ports may face the questions that rises is “how these challenges can be dealt with?”. Forecasting, Project, and Modeling tools can provide a set of actions in order to survive and thrive in the race of resilience.

- The main Forecasting tools to deal with uncertainty are the Scenario analysis and PRIMA (van Asselt, 2000) (Pluralistic Framework of Integrated uncertainty Management and risk Analysis). Scenario analysis examines different alternative futures in order to create a variety of development paths, risks, opportunities, and possibilities for policies and decision making. The most used scenario analysis methods are the scenario writing, providing qualitative scenarios, or the basic policy exercises and modeling analysis, providing quantitative scenarios. PRIMA is a tool helping in developing a structure focused on uncertainty management. PRIMA is the only approach that advances and provides structure to the systematic use of multiple values, paradigms, perceptions, judgments, in assessment processes.
- The main Project tools to deal with uncertainty are the SWOT analysis and Diagramming Techniques. SWOT are the initials of strengths, weaknesses, opportunities, and threats and a SWOT analysis is a familiarize process for a port or a port related organization to identify internal its strengths and weaknesses and examine external opportunities and threats. Diagramming Techniques represent graphically variables and outcomes of certain decisions or risks with the use of techniques, methods, and tools.
- Some of the most well-known Modeling tools in order to deal with uncertainty are the Sensitivity analysis, the Error propagation equations and Monte Carlo simulation. Sensitive analysis is a technique that aims to understand the quantitative sources of uncertainty and identify the sources providing the greatest uncertainty. Error propagation equations is a method aiming to assess how quantified uncertainties inserted in a propagate model produce an uncertainty range in a given model outcome of interest. Monte Carlo simulation is limited to quantified and expressed as probabilities uncertainties that aims to trace the structure of model output that results from uncertainty of model inputs.

There is a necessity to capture and quantify resilience value in a system. Tools and frameworks can be “recruited” in order to structure a shipping transformation plan and implementation that focus on shipping resilience.



3.1. Resilience strategies in ports

Across the world, ports are considered critical infrastructure. The impact of ports on the economy is critical. They serve as regional centers of employment, offering jobs to over 10-20% of the employed population in the surrounding communities; they create assets, facilities, networks, and processes. (Lengnick-Hall et al. 2011). Ports' operational and business continuity concern governments, businesses, and communities worldwide. The social and economic impact would be enormous in the case of port failure, disruption, or total shutdown. Threats to ports are implemented both by exogenous and external environmental factors and by industry actors. These threats are the trends and changes that ultimately shape world trade. (Notteboom & Haralambides, 2020). Ports must become resilient to survive environmental, geopolitical, and technological crises. A resilient port "can maintain or minimize the impact of disruptions on its logistic, industrial, and economic functions in a dynamic environment and can recover quickly from those disruptions by effectively mobilizing the resources available within its ecosystem." (Vanlaeret al., 2022)

In order to find out what resilience strategies ports must undertake in order to cope with incidents, bounce back from them, and at the same time stay competitive, we must first define what the ecosystem of a port consists of and the potential threats deriving from it. We will divide the main actors into three domains: the policy, economic, and operational domains. The policy domain of a port consists of the relationships formed between policymakers in general. Such policymakers include national and local governments, NGOs, labor organizations, media, and industry. From this specific domain, decisions and social trends, such as regulations, policies, and legitimation, influence port functions to emerge. (Dowling & Pfeffer, 1975). The economic domain of a port ecosystem describes the commercial-driven activities and the relationships between shipping companies, agencies, terminals, service providers, and competing ports. The economic domain is heavily affected by economic shocks and financial decision-making processes. (Dooms et al., 2013). The third and final domain is the operational one. All the relationships and activities required to perform basic operational activities are included here. Such activities are cargo handling, nautical Management, and the delivery of services. Incidents and accidents directly threaten this domain. (Vanlaer, Albers, Guiette, van den Oord, & Marynissen, 2022). Of course, many other factors may cause port disruption. To name a few: natural disasters like tsunamis, earthquakes, typhoons, human factors, disruption in the financial flow, ship collision, technological and organizational factors, shipping route density, labor productivity, electric power, and gas supply, etc. (Vanlaer et al. 2022).

The process of making a port resilient has three stages. The first stage is to create anticipation capabilities. That means a port must be able to observe, identify and prepare. The port authority of each port must scan the entire ecosystem of the port for any changes and then interpret those changes into threats and opportunities. (Hollnagel, 2017) For that purpose, many lead ports use international information networks to understand the future needs of their port users so they can have a long-term plan concerning their strategic port capacity planning. (Meyer, 1982) An example of using the information network is what the port of Antwerp did. During the first wave of the Covid 19 pandemic,



through endless meetings and input from the Leadership Team members of the port, it was able to make strategic and tactical decisions. (van der Oord, et al., 2020) Information Management also extends to resource allocation, strengthening a port's predictive capability. (Meyer, 1982) Resource allocation planning covers the need for towage, planning of birth, locks and bridges and extends to navigational safety and port security, for example, the handling of hazardous cargo. (Bichou, 2009) Ports must also be prepared. That is ensured through business continuity management which provides a strategic framework that focuses on recovery speed. It reduces port vulnerabilities following national crisis management regulations and frameworks, incorporating them into the port authority's organization. (Herbane, Elliott, & Swartz, 2004)

The second step is the capability of a port to cope. That comes through two stages. First, the acceptance of a problem, then the development and implementation of possible solutions. (Duchek, 2020) In an unfortunate situation of disruption or change that directly affects the policy domain of a port, port authorities face an additional challenge. This is because some of the port's stakeholders may have conflicting interests. (de Langen, 2006). For this reason, port authorities need to strengthen cooperation between all stakeholders. Stakeholders must share information and be ready for possible negative effects to themselves but ultimately generally optimal solutions. (UNCTAD, 2022b) The flow of information in a port's ecosystem is crucial. In order to provide a solution to a disruptive event, first, a port must accept it, then make sense of it and finally communicate the appropriate actions. Stakeholders' cooperation is critical here as well, and that is because different stakeholders have different kinds of data regarding a disruptive situation. The role of port authorities here is vital. Through their relationship with all port actors, they can gather commercial, regulatory, and operational information and assemble them to develop a solution. (Vanlaer, et al. 2022).

The third and final step is a port's adaptive capability. That means that port authorities must improve their ability to learn from previous events and implement those lessons effectively. (Hollnagel, 2017) That can be achieved via both formal and informal incident management processes such as discussions and presentations. (Shaw, Achuthan, Sharma, & Grainger, 2019)

4. CONCLUSIONS

Shipping companies and ports follow several strategies in order to be resilient. These strategies can relate to the economic, operational, environmental, and other domains. All these aspects impact shipping companies and ports and may impose direct and indirect threats. There are several resilient strategies that can be applied to shipping companies and ports, by taking into account their peculiar characteristics in order to safeguard their operational continuity. This continuity of operation is vital and is a parameter of shipping companies and ports competitiveness. They must ensure their potential clients that they can carry out their services and be trusted. It is a fact that companies and ports with a strong brand name, which has been achieved through the successful delivery of services, are more competitive and have higher earnings. In other words, resilience strategies are a tool that shipping



companies and ports use to achieve their goal, being operational under any circumstances, being competitive, and profitable.

Further research is needed on shipping companies' and ports' risk management strategies. A more in-depth study in this area could include training personnel using scenarios to manage different types of crises, as well as the policy measures taken by companies and ports. Maintaining the resilience and competitiveness of shipping companies and ports is a multifactorial equation. The adoption of a holistic approach that will encompass all factors mentioned, is needed in order to develop effective crisis prevention tactics. These would eliminate the main problem, the time lag in making critical and uncritical decisions. Research that would lead to the proposal of real-life scenario-based drills and potential risk management strategies, in addition to their theoretical value, would be highly beneficial for shipping companies and ports.

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