Thesis Summary

The shipping sector is the backbone of the worldwide trade, offering a smooth and economical transportation of goods, and is of perennial importance to the Greek economy. However, recently, it has been facing numerous crises and mounting pressure from regulators and is struggling to recoup its once robust financial prospects.

My thesis analysed how the sector is moving ahead into what it perceives as unchartered territory, aiming to combat multiple crises with technological advancements, increasing efficiency and streamlining the decision-making process. In that way, its struggling, vying members will be able to adjust in the modern era of razor thin profit margins and achieve a higher market share. In this endeavour, it has faced multiple problems, some being a result of its own operating culture. However, these are starting to subside, making room for true innovation. This comes in the form of data-related technologies and data.

The former were subsequently divided into four categories. First, the use of state-of-the-art data communication methods, which will allow the increasing collected data to move quickly and without interruptions; a difficult undertaking for a sector operating in the middle of the ocean. Second, its use of using modern cybersecurity protocols and practices, since the transferred data are invaluable for the business it belongs to and, thus, its security is of utmost importance. Third, the automation of the sector, which can be further subdivided into autonomous vessels (a milestone into safer operations and increased efficiency and predictability), and robotics (extremely useful in a sector operating with incredibly heavy loads). Last, the use of blockchain, which is expected to revolutionise the way certain data (e.g., contracts) are transferred, and streamline the current dallying bureaucracy—already effectually implemented in the TradeLens platform.

Regarding the data themselves, the thesis utilized the COSA data lifecycle framework to split the data into three main parts: sources, engineering, and applications. The main data sources presented include Internet of Things (coming from the vessels' sensors and systems, and the ports' sensors and status monitoring), weather (past, present, and future), and Automatic Identification System's data. Data engineering was defined as the practice of secure, efficient, instantly accessible, and reliable storing of properly cleaned, and reliable data, to ensure coherence, consistency, and quality.

Ultimately, my thesis examined how sector members improve efficiency and make more factually informed decisions, by using data applications. This is achieved through development of artificial intelligence applications, mainly in the areas of predictive maintenance, freight rate forecasting, and energy efficiency analysis. Overall, the results showed that it would be of utmost importance for the once traditional, laggard, and bureaucratic sector to become highly efficient and technologically advanced.

Lastly, my thesis provided a specific example of how such an application is developed, and the value it produces[1]. In the example, it is apparent that the data sources are critical in AI applications, and the data engineering part should not be overlooked since it provided the foundation upon which the subsequent model was developed. Additionally, the value of simple data analysis and visualisation tools was showcased, to allow the reader to realise that the AI applications might be the endgame of data analysis, but simple analyses should not be overlooked. Furthermore, it provided insight into the development of machine learning models, from basic linear regressions to complex ensemble models, and presented basic machine learning techniques, such as feature selection and hyperparameter tuning.

[1] Example can be accessed at: https://nbviewer.org/github/nantoniou/Fuel-Consumption-Forecasting-Noon-Reports/blob/main/Noon_Report_Analysis.ipynb