## Chapter 1 **Port Dada Integration:** Opportunities for Optimization and Value Creation

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## ABSTRACT

The maritime supply chain is growing in complexity. Ports are at the crossroads of many activities, modes, and stakeholders, and are actively becoming digital hubs. Today, digital and physical connectivity go hand in hand. The port could benefit from taping the opportunities arising from digitalization and data integration since it helps to leverage external knowledge, engage stakeholders, create new decisionmaking anchors, lower the risk of certain investments, boost productivity and cut costs, and accelerate greening and digital transition, generating possibilities for just-in-time operations and optimizations. The chapter aims to apprehend the use of data science in the port sector. The state of the art in Brazil and Portugal are different. Even inside Brazil, there is no homogeneity of ports in the usage of digital infrastructure, cloud computing, or artificial intelligence. The existing inequalities hinder general cooperation between nations but, at the same time, reveal opportunities to approach specific nodes in the international supply chain.

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### INTRODUCTION

The present work is an exploratory study that aims to understand the application of data science in the port sector. The purpose, at first, is to provide information about the state of the art in two selected countries and then is to inform how it is possible to integrate data between ports from different nations to fill existing knowledge gaps. Information is currently generated in distinct regions or points in the supply chain, and it is necessary to identify a way to connect it systematically.

Another goal is to gather information about what would be the gains from these processes. Initially, the automation of routines with the integration of different systems is envisaged, which would result in resource savings, aid to decision-making processes, reduction of waiting time in ports, and the decrease of processes and goods costs. What other port challenges can be faced via data integration? Cooperation with other stakeholders will also be crucial to find workable solutions for issues like greening the shipping sector or the digitalization of the port ecosystem. According to European Sea Ports Organisation (ESPO), by teaming up, ports can leverage external knowledge or lower the risk of particular investments (Deloitte & ESPO, 2021). The study intends to trace a path that, later, can be followed.

After analyzing the trends on supply chains and the uses of machine learning in maritime logistics (which encompass Digital Supply Chain, Digital Ship, and Digital Prots), this chapter describes the current scenario in Brazil and Portugal. Survey the types of information produced by their ports and study the possibility of data exchange between them to identify the potential gains and challenges faced with data science.

This chapter aims to make an important locus in the global supply chain visible: the harbor. Several players operate in it, and it is hard to define, among the myriad of data produced, which ones can be made available and can optimize the system or bring tangible benefits to commercial exchanges. The scope of the present work is, therefore, bold. It is intended, in the end, to name the obstacles, assess their impact on the exchange of goods, and outline strategies to overcome them.

In summary, the authors seek to translate the complex reality of the sector into words and identify possible improvements resulting from data exchange in a systematic way. As a case study, the possibility of integration between selected Portuguese and Brazilian ports will be explored. Subsequently, future challenges in this context and possible lines of research will be outlined.

### Background

There are more than 7500 ports worldwide that together accommodate the vast majority of world trade volumes. According to the United Nations Conference on Trade and Development (UNCTAD), maritime transport is the backbone of the global supply chain since the international shipping industry is responsible for the carriage of around 90% of world trade (UNCTAD, 2020). Shipping is a global service industry that, by general recognition, provides the lifeline of international trade. Suffice it to say that, due to the morphology of our planet, most international trade takes place by sea (Haralambides, 2019; Langen, 2020). However, essential to note that UNCTAD estimates that the operation of merchant ships itself contributes about US\$380 billion in freight rates within the global economy, equivalent to about 5% of total world trade.

In this context, seaports are an essential spot in the global supply chain. Seaports are economic assets and value-adding logistics nodes with complex activity, comprising transactions related to cargo movement, whether in the transport or loading and unloading of vessels and which, if not responsibly 20 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:

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