


Chapter 12

Digital Transformation in Port Management: Smart Ports

Murat Selçuk Solmaz

 <https://orcid.org/0000-0002-8528-2865>

Piri Reis University, Turkey

ABSTRACT

Like many other industries, the maritime industry has started to work on digital transformation due to its many benefits. Port management, which is one of the building blocks of the maritime industry, has also accelerated digital transformation efforts under the leadership of developed ports in the world. Today, conventional port managements are faced with many problems. The complex and dynamic nature of the port environment does not allow these problems to be solved by conventional methods. This chapter introduces how the smart port environment that can be achieved through digitalization efforts of ports can find solutions to existing and potential problems.

INTRODUCTION

In the days we live in the information age, digital transformation has become an indispensable target for all institutions. The reason for this is that institutions that fail to achieve digital transformation lose their competitive ability. Because compared to the institutions that have achieved digital transformation, they can do the work in a longer time, they need more employees and a larger office building, so their costs increase and profits decrease. In other words, digital transformation is also one of the most important instruments to ensure efficiency in institutions. Digital transformation brings about a corporate transformation. Digital transformation can be defined as organizational transformation in the digital age, where people's purchasing preferences are shaped by developments in information technologies (Tanniru, Xi, & Sandhu, 2020). With the effective use of digital technology in the institution, the operation of the institution also changes, and the institution undergoes a complete change. It is understood from this that digital transformation is a difficult, time-consuming, and painful process. However, the advantages to

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be gained when the transformation is achieved ensure the establishment of a sustainable system. With the awareness that organizations that cannot transform will be doomed to disappear, all organizations have started to take steps towards digitalization. With the encouragement of increasing competition in recent years, digital transformation efforts in the port sector have gained momentum.

Ports are complex structures where ships, cargoes and other transport modes meet at some point. At the same time, they integrate different actors and organizations that can be defined from various perspectives (Rajabi, Khodadad Saryazdi, Belfkih, & Duvallet, 2019). It is necessary to organize the works, actors and organizations in this complex structure very well. The operation inside the port can be compared to a mechanical machine consisting of many wheels. Just as the failure of one of these wheels prevents the operation of the machine, a disrupted job in the port prevents the work to be done after it and consequently disrupts the operation of the port. For this reason, all works in the port should be done in a very good planning and coordinated. Good planning increases the efficiency and profit of the port. It is also a necessity for the port operation that all operations in the port are coordinated with each other. For both planning and coordination, real-time data is needed at ports, with no doubt about its accuracy. In recent years, port managements have begun to use digital technologies to meet these needs and at the same time have started their digital transformation. With the COVID-19 epidemic, the need for digitalization has increased and the common use of digital technologies has brought maritime sector stakeholders closer (UNCTAD, 2020). With the use of many digital technologies such as the Internet of Things (IoT), blockchain, and digital twin, digital transformation has accelerated, and the foundations of smart ports have begun to be laid.

IoT technology enables all kinds of objects to be connected to the Internet, storing the information they produce, communicating objects with each other, and giving commands to objects remotely. Digital twin technology, on the other hand, is a technology that allows a device or system to be created in a virtual environment and constantly updated with information from its real twin. The transfer of information from the real twin is usually provided by IoT technology. Fed with up-to-date data, the digital twin reflects the life of the real twin. Thus, the virtual world of the real world is created on the computer. In this way, applications, changes, experiments planned to be made on real twin can be applied over the virtual twin, problems that may occur in the real twin can be detected and intervened in advance. Blockchain technology is a technology that prevents digital data from being damaged. It prevents accidental or intentional stealing, deletion, modification or corruption of digital data. In this technology, digital data is saved to all computers connected to each other in a decentralized structure through an encryption system that is very difficult to decipher. In this way, security concerns, one of the biggest threats of digital transformation, can be prevented. In smart ports that have achieved digital transformation, the uninterrupted and problem-free operation of digital technology depends on taking all measures related to cyber security. Blockchain technology is an assurance in terms of security for smart ports.

Today, many pilot projects are carried out in order to establish a sustainable, competitive and more profitable system, to benefit from digital transformation and ultimately to reach smart ports by finding the most suitable solutions within the complex structure of ports. With these projects, it is tried to find optimal sustainable solutions to the problems experienced in the ports. The research question in this study is, "How can smart port technology provide solutions to the problems faced by port management?" The study examines applications made with digital technology in port management. The aim of the section is to introduce the uses of digital technology in port management and to provide insight into how smart port technology can create opportunities to solve current and potential problems in ports.

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