

Chapter 100

Factors Influencing Port Terminal Automation in the Fourth Industrial Revolution: A Case Study of Durban

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ABSTRACT

Port terminals play an integral role in the transportation logistics chain by providing cargo handling, storage, and warehousing services to a range of shipping lines, freight forwarders, and cargo owners. This chapter reports on a case study aimed at determining the challenges and limitations experienced with the current information and communication technology used in port terminals in Durban and examines how technological, organizational, and environmental factors influence port automation. A quantitative approach was adopted, and a questionnaire was designed to collect data. The findings revealed that adequate technology needs to be acquired, and the compatibility and complexity of the technology have the biggest influence on the automation of terminal ports in Durban. Communication with stakeholders and IT skills retention were found to be the most important organizational factors and customer readiness emerged as an important environmental factor influencing the automation of port terminals in Durban.

INTRODUCTION

The global financial crisis of 2007–2008, which caused a decline in economic activity leading to the 2008–2012 global recession (Eaton, Kortum, Neiman & Romalis, 2010) has intensified competition between ports worldwide. This has led to the need for implementing performance improvement techniques and

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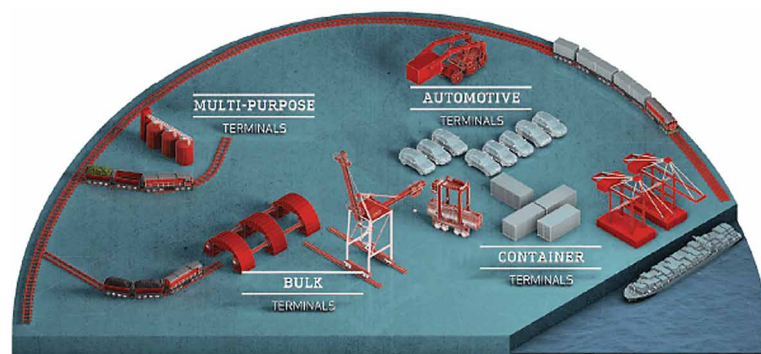
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effective cost reduction mechanisms in the operation of port terminals, to sustain development activities and improve their governance (Verhoeven, 2010). These factors have steered port terminals worldwide to implement the latest technology to increase productivity in their processes and grow their market share (Tongzon, 2001). The Fourth Industrial Revolution, sometimes called Industry 4.0 or 4IR, which embraces technologies such as artificial intelligence (AI), autonomous vehicles and drones, the internet of things (IoT), and advanced materials is set to have a major impact on automation of port terminal operations. This chapter aims at determining the challenges and limitations experienced with the current technology used for port terminal operations in the port of Durban and examines how technological, organizational and environmental factors influence the automation of port terminals.

BACKGROUND

A port terminal is a place on the edge of the earth called a coastline with seafronts deep enough for ships to dock, so that goods and people can enter into ships for transportation through the sea (Verhoeven, 2010). Port terminals have been used from many centuries back as the points of entry, mainly for goods meant for trading purposes from one continent to another (Roso, Woxenius & Lumsden, 2009). Port terminals play an integral role in the transportation logistics chain by providing cargo handling, storage and warehousing services to a wide range of shipping lines, freight forwarders and cargo owners (Pettit & Beresford, 2009). Port terminal operations are divided into four major business segments, namely containers, bulk, break-bulk (multi-purpose) and automotive as depicted in Figure 1.

Figure 1. Types of port terminals
(overendstudio, n.d.)



The operations of a port is a large process in which the final element is not a tangible product but rather a specified service (Homayouni & Tang, 2015). The service referred to is the handling and storage of the containerized merchandise for customers through the reception terminals (import and export) or transshipment terminals, where merchandises are transferred from one vessel to another. This service needs to be performed on the date agreed with the customer, and in accordance with the conditions that the seller, exporter and loader has contracted with the customer (Yu & Qi, 2013). The basic objective is to carry out the operations as rapidly as possible, to enable the vessel to spend the minimum time nec-

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