

# DIGITAL TRANSFORMATION IN MARITIME TRANSPORT AND SEAPORTS

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**Abstract** The paper presents “PhD by Publication” steps, including the topic of digital transformation in maritime transport and seaports. Author plans to follow a “PhD by Publication” guidelines, in which the doctoral thesis is composed of published scientific papers during the PhD study. Author considers two approaches: including published papers and publishing new papers. Author is currently working on the paper “Digital transformation in maritime transport sector”, which will include drivers, success factors and barriers for digital transformation in maritime transport sector. It is a base for future research: case study with semi-structured interview.

**Keywords:**

PhD  
by  
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digital  
transformation,  
maritime  
transport  
sector,  
seaports,  
doctoral  
consortium.



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## 1 Introduction

Transport has always had an impact on economic growth, and ecological and social development (Jović, Kavran, Aksentijević, & Tijan, 2019). On the other hand, transport is one of the main causes of environmental pollution (Dimić, Pamučar, Ljubojević, & Dorović, 2016), (Tijan, Jović, & Karanikić, 2019).

Not all industries are equally developed and the maritime transport sector is among the slowest sectors regarding the digital transformation (World Maritime News, 2018). Only a small number of industry players in the maritime sector consider that digitalization has already changed their business significantly, whereas companies in high-tech and in public transport have already seen greater changes from the pressure of digitalization (Hamburgisches WeltWirtschafts & Institut, 2018).

Despite numerous advantages, enterprises are still facing the challenges of digital transformation in almost all industries, including seaports which are part of the maritime transport sector. Seaport is a nodal point between land and sea, or a modal interface between shipping or sea transportation system on the one side, and the land transport network on the other side (UNCTAD secretariat, 2004).

Author aims to identify (through comprehensive literature review) drivers of digital transformation, as well as success factors and barriers of digital transformation. Author plans to take advantages of the “PhD by Publication model, which is still very rare in Croatia. In this model, the doctoral thesis is composed of published scientific papers written as part of the research at the PhD study, published after the enrollment into the PhD program. These scientific papers are supplemented by a common introduction and joint conclusion (Faculty of Economics Rijeka, 2019).

Author is currently working on the paper which will be submitted to a top journal (Q1 journal indexed in the Web of Science database, following the “PhD by Publication” rules which are further explained in the Methodology section).

## **2 Problem definition**

The research problems stem from the lack of awareness of how digital trends affect business development, lack of managers and employees' involvement or desire to change current practices, insufficient budgets for digital initiatives, etc. in maritime transport sector. Furthermore, maritime transport is moving towards digitalization at different speeds in the different domains (Sanchez-Gonzalez, Díaz-Gutiérrez, Leo, & Núñez-Rivas, 2019).

## **3 Methodology**

According to the “PhD by Publication” guidelines, the doctoral thesis is composed of scientific papers written as part of the research at the PhD study, published after the enrollment into the PhD program. These scientific papers are supplemented by a common introduction and joint conclusion (Faculty of Economics Rijeka, 2019).

Each article can serve to qualify only one doctoral candidate, unless a special explanation is provided. The doctoral candidate needs to be a lead (first) author in at least three of the articles. The collected works need to present a new scholarly contribution relative to the individual articles.

Scientific papers must be published in journals with an impact factor according to the Journal Citation Report (JCR) in the year of publication. At least two papers must be published in journals with an impact factor higher than the median of the respective category and of these two papers at least one must be published in the first quartile (Q1) journal of the respective category.

The author will consider two approaches: including published papers through keywords and publishing new papers.

### 3.1 Including published papers

In order to prove a connection between papers, author must highlight the keywords as shown in the Table 1.

**Table 1: Author's published papers**

Author's published papers	Key words
An Overview of Security Challenges of Seaport IoT Systems (Jović, Tijan, Aksentijević, & Čišić, 2019)	Internet of Things, Seaports, Security systems
The Transition of Croatian Seaports into Smart Ports (Jović, Kavran, Aksentijević, & Tijan, 2019)	Smart ports, Smart technologies, Interconnected platforms, Croatian seaports
The role of Electronic Transportation Management Systems in Seaport Digitalization (Jović, Tijan, Aksentijević, & Sotošek, 2019)	Electronic Transportation Management Systems, Seaports, Digitalization, Business Processes
Economic and ecological aspects of electronic Transportation Management Systems in seaports (Tijan, Jović, & Karanikić, 2019)	Electronic Transportation Management Systems, Seaports, Economic aspects, Ecological aspects
Digital Transformation of Croatian Seaports (Consortium) (Marija Jović, 2019)	Digital transformation, Transportation companies, Maritime transportation, Seaports, Shipping companies
The Single Window concept in international trade, transport and seaports (Tijan, Jović, Jardas, & Gulić, 2019)	Electronic data exchange, Standardization, International trade, Transport, Seaports, Single Window
Maritime National Single Window — A Prerequisite for Sustainable Seaport Business (Q2) (Tijan,	Maritime national single window, Seaport business, Sustainability

Agatić, Jović, & Aksentijević, 2019)	
A review of blockchain technology implementation in shipping industry (Jović, Filipović, Tijan, & Jardas, 2019)	Blockchain technology, Shipping industry, Seaports
Big Data Management in Maritime Transport (Marx, Gebhard, Jović, & Tijan, 2019)	Big Data Management, Big Data Analysis, Maritime Transport, Shipping Safety, Energy Efficiency
SWOT analysis of selected digital technologies in transport economics (unpublished)	Digital technologies, Digital innovations, SWOT analysis, Transport economics
Optimization of cargo container loading on railway wagons (unpublished)	Railway, Wagons, Cargo, Intermodal, Liberalization

Source: author

In order to find the connection between the published papers, author has focused on the research keywords and has highlighted similar or identical keywords.

Currently, author considers including three published papers: *The Transition of Croatian Seaports into Smart Ports*, *An Overview of Security Challenges of Seaport IoT Systems* and *Maritime National Single Window — A Prerequisite for Sustainable Seaport Business* (belongs to a second quartile journal – Sustainability, published by MDPI). Along with that, author is working (in collaboration) on the paper regarding digital transformation (author plans to submit the paper to a first quartile journal) which will include drivers, success factors and barriers for digital transformation in maritime transport. At last, in the same paper, authors will analyze current initiatives and technologies and their role in successful digital transformation of maritime transport (Internet of Things, Blockchain, Big Data etc.). Furthermore, several examples in maritime transport sector will be demonstrated (port of Rotterdam, port of Koper, Maersk, CMA CGM, etc.), proving throughout the work that for successful digital transformation, it is not enough to focus only on technologies, but also on other identified factors, e.g. actively shaping future strategies, partner and employee engagement etc.). The aforementioned published papers are suitable for the “PhD by Publication” model as they include an analysis of smart technologies

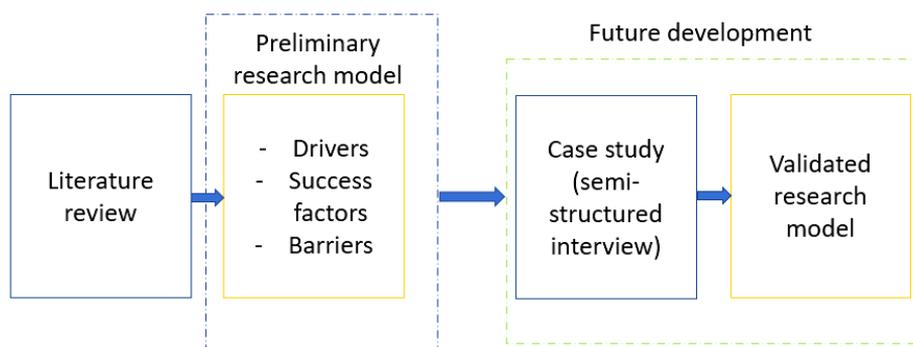
(from the perspective of less developed seaports – Croatia could serve as an example, and from the security perspective). Furthermore, *Maritime National Single Window — A Prerequisite for Sustainable Seaport Business* is a paper which researches the cases of MNSW (another widespread technology) implementation, both successful and less successful.

### **3.2 Publishing new papers**

Currently, author researches the drivers, success factors and barriers of digital transformation in maritime transport. While analyzing the published sources, author has realized that the literature review alone is not sufficient for the final research model. In this respect, author is going to publish a case study with a semi-structured interview. Semi-structured interview may be defined as “a list of themes and possibly some key questions to be covered [by the researcher], although their use may vary from interview to interview”. The goal is to enable the interviewees “to discuss topics they deemed relevant, to post follow-up questions and to generate new and additional insights.” (Arpe, 2019).

## **4 Preliminary/Expected results**

The drivers, success factors and barriers will be identified and possible positive impacts of digital transformation (if all success factors are considered) will be analysed, stemming from the lack of awareness among stakeholders of how digital trends affects business development, lack of managers and employees’ involvement or desire to change current practices, insufficient budgets for digital initiatives, etc. in maritime transport sector (Ultimate Software, n.d.). Figure 1 shows the research steps and expected outcomes.



**Figure 1: Research steps and outcomes**

Source: Author

A case study will provide a deeper insight of digital transformation in maritime transport. Case study will be further elaborated in the chapter “Future development”.

Furthermore, other published papers provides a deeper understanding of how certain technologies (Internet of Things, Maritime National Single Window) may affect a successful implementation if other successful factors are (not) considered. For example, one of the barriers for digital transformation is “decreased security of digital operations”. A published paper “An Overview of Security Challenges of Seaport IoT Systems” includes identified threats, measures for prevention of the IOT security threats, consequences of connecting the devices (IOT) at the seaports with emphasis on the security (providing cases such as Port of Rotterdam, Port of San Diego, Port of Antwerp etc.).

## 5 Future development

The comprehensive literature review is a basis for a future research (case study) regarding digital transformation in maritime transport sector. The goal of the further research is to gain a deeper understanding of how stakeholders cope with the market changes (changes in competitive landscape, costumer expectations etc.). Eventually, author will focus on the steps which companies in maritime transport sector should take, considering their current development, available resources, cultural readiness for changes etc. Author plans to partially follow up on the research results of two

papers “Digital transformation strategy making in pre-digital organizations: case of a financial services provider” (Chaniyas, Myers, & Hess, 2019) and “Patterns of Digitization, A Practical Guide to Digital Transformation” (Mugge, Abbu, Michaelis, Kwiatkowski, & Gudergan, 2020).

This paper could serve as an example to other PhD students in understanding the steps for “PhD by Publication”. Based on this work, other researchers will be able to upgrade the methodology, encouraging other students to embrace the “PhD by Publication” model.

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