

Article

Ports Digitalization Level Evaluation

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Abstract: Currently, seaports are actively searching for methods and ways to improve their operational efficiency. Digitalization is considered as one of the main directions of current ports' development. Ports' digitalization levels are varied and may depend on different factors, including port size, traditions, turnover and handled cargo type, etc. Ports often face decision-making challenges related to assessment of their digitization level and choice of development directions. The article aims to develop a methodology to evaluate ports' digitalization level. A marketing research tool was used to collect the data needed for the analysis. A mathematical model allowing simulations is proposed and a case study of 30 ports located in the Baltic, North and Mediterranean Seas regions is explored. Based on conducted calculations, a ranking of analysed ports considering their digitalization level was created. The ports were compared within groups of small, medium-sized and large ports. It was estimated that the digitalization level in small and medium-sized ports is about 30% lower than the level of large seaports. The research results may be of interest to seaports striving to assess their level of digitalization and choose the best digital improvement solutions.

Keywords: seaport; digitalization; digitalization level; accuracy; maritime transport; digital index for ports

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1. Introduction

Nowadays, one of the essential directions of maritime transport and especially port development is digitalisation and IT systems implementation [1,2]. Different areas of ports' functioning are covered by digital transformation [3,4], such as port business, management and planning of activities, commercial and supporting services, contact with clients, navigation, etc. Implementation of digital solutions is essential and allows ports and other maritime sectors to increase their efficiency and sustainability, decrease costs and performance time of selected operations, improve information flow and decision-making, reduce paper documents in operational processes in relation to sustainability policy, increase safety, decrease the negative impact of maritime transport on the environment in ports and port areas, enhance innovation, etc. [5–7].

Seaports constitute the key nodes of the sea–land transport chains and closer integration into supply chains has a positive effect on their performance [8,9]. Therefore, the benefits of port digitalisation are also essential for the whole supply chain's performance improvement [10]. Different types of IT system are currently implemented in seaports, both individual solutions and those integrated into complex IT architecture [11].

However, it should be noticed that the digitalisation level of ports is different. Port efficiency measurement systems have been developed [12,13]. While planning further development, seaports are searching for practices already verified by other ports that could be implemented to improve ports' functioning and sea–land transport operation. Such