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Chapter 12

Analysis of the Indonesian Port Readiness for Maritime Autonomous Surface Ship Operation.

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Abstract: Indonesia's maritime transport system is challenged by the development of autonomous vessels, even though it is meant to have a significant positive impact on the maritime sector. To meet these obstacles, West Sumatra's Port of Teluk Bayur needs to be ready. The ability of the port authority organization and its personnel to overcome this obstacle is one of the necessities. The purpose of this study was to assess the port authority organization's and its employees' preparedness to facilitate the operation of these self-governing vessels. This study was quantitatively carried out by assessing the capacity of port authority organizations and staff to determine the knowledge and skills of IT mastery and the degree of individual mental preparedness in the face of change. This study was carried out quantitatively by assessing the capacity of port authority organizations and staff. The findings included the degree of mental preparedness of each individual to deal with change, the degree of IT mastery knowledge and skills, and the degree of willingness of each individual to reach their full potential. From an organizational perspective, the port authority identified several areas that should be improved, including organizational management, human resource management, IT usability and utilization, information accessibility, facility and infrastructure availability, and financial aspects.

Keywords: individual readiness, organizational readiness, port

1. INTRODUCTION

Indonesia as an archipelago connected by water has many ports. Indonesia has 639 ports grouped into several criteria per the port service area. Organizing seaports in Indonesia is regulated in the Regulation of the Minister of Transportation of the Republic of Indonesia number PM 50 of 2021 concerning the Implementation of Sea Ports. This regulation regulates the national port order which contains the role, function, type, and hierarchy of ports in Indonesia, activities carried out at the port both government activities and business activities, determination of port locations, port master plans consisting of port and port support facilities, port development and development as well as working environment areas and port interest areas.

The development and application of Autonomous Vessels will affect the changes in port activities, both in terms of the construction and development of port infrastructure and services/activities that occur in the port. This will increase the role of ports in providing ship services and ports will face several challenges (Kurt & Aymelek, 2024). To ensure that ports can serve autonomous vessels, it is necessary to prepare human resources and port management organizations.

Readiness is one of the important factors in dealing with changes that will occur in the organization. Organizational efforts to reconfigure various aspects of the organization to improve efficiency and organizational service activities are organizational changes (Boohene & Williams, 2012). The readiness of individual resources to accept change is the first step for the organization to accept change. Individual readiness is an important aspect because, without the presence of individuals, the programs that have been prepared by the organization will not run successfully. This states that the readiness of individual

employees is an important aspect that must be considered by organizational leaders to deal with changes that will occur in the organization. Organizational change occurs in a positive direction, but employees often respond negatively to change and will react to hinder the change effort. One of the keys to success in dealing with change in the organization is the readiness of employees to face these changes.

The readiness of individual employees to face change can be seen in the belief that individuals can accept these changes (mental and behavioral) (Rafferty et al., 2013). In addition, individual efforts to increase personal knowledge and skills so that they are ready to face change provide positive confidence for the individual to successfully accept these changes (Samaranayake, 2017). Employees as agents of change must have the desire or willingness to increase their potential and change towards a positive direction can have a good impact on the readiness of the organization to change (Armenakis et al., 1993).

In addition to the human resources aspect in the form of employees, organizational readiness from various aspects also determines the success of the organization in facing change (Holt et al., 2007). The aspects of the organization that become the benchmark for dealing with change are the commitment of the organization to change with the readiness of the management of organizational management and the availability of human resources in the organization (Lehman et al., 2002). Human resources working at the port must have technical skills and the ability to adapt to changes in the organization due to the impact of the development of autonomous ships (Dybvik et al., 2020; Saha, 2021).

To ensure that the port can serve autonomous ships, it is necessary to prepare supporting infrastructure. One of the main infrastructures that must be prepared is infrastructure related to communication tools between ships and ports that must be integrated with Autonomous Ships (Theotokatos et al., 2023, Heffner & Rødseth, 2019; Kavallieratos et al., 2019; Komianos, 2018; Statheros et al., 2008). During the development of information and communication technology, the use of ICT is the basic capital for organizations to face change. By knowing the usefulness of each ICT development and knowing the method of operating the ICT, it is hoped that the organization can improve its performance effectively and efficiently in the face of the autonomous ship era which is conveyed that autonomous ships take advantage of ICT developments. The utilization of ICT must be supported by the existence of facilities and infrastructure. With the existence of these two aspects, the ease of obtaining information (information accessibility) is faster and can be seen at any time wherever the relevant parties are (Choi & Ruona, 2011). Another important thing that organizations must prepare to deal with change is the financing incurred to prepare the organization to restructure its organization. This financing aspect is also one of the main factors that must be addressed by the organization so that the organization has the capital to take corrective measures (Sari Savolainen, 2016). This means increasing efficiency and providing higher-quality services at a lower cost (Kasunic, 2001; Wegner, 1996).

Every port in Indonesia must be prepared to accept the changes brought about by the operation of these autonomous vessels. This will affect the port's performance in providing services. Therefore, it is necessary to assess the readiness of the port, especially in terms of human resources and the readiness of the port management organization to accept these changes. And determine the aspects of improvement that must be improved so that the quality of services provided is optimal.

2. PROBLEM STATEMENT

Every port has a port development plan that leads to improved services. One of the services that must be prepared is how the port can serve the operation of autonomous ships later. Therefore, to develop a suitable development plan, each port must first know the current port conditions. For this reason, it is necessary to assess how the readiness of human resources and the readiness of the organization itself in the ability to provide services.

3. OBJECTIVE

This study aims:

- a. To assess the level of readiness of port human resources in Indonesia to face the autonomous ship era. This research aims to identify the extent to which the competencies, skills and knowledge of existing human resources in Indonesian ports are facing the challenges of these new technologies so as to ensure they can adapt to the technological and port operational changes that occur due to the introduction of autonomous ships. The results of this study are expected to provide strategic recommendations for relevant parties to design effective and adequate HR development policies in facing the era of autonomous ships.
- b. To assess the level of port readiness in Indonesia to face the era of autonomous ships. This research aims to evaluate existing port infrastructure, regulations, and operational systems in order to deal with the changes brought about by the implementation of autonomous ship technology. It also seeks to identify the challenges and opportunities faced by Indonesian ports in adapting this technology, as well as assess the investment and development needs required. The results of this research are expected to provide recommendations for policy makers and related parties to prepare Indonesian ports to compete at the global level and support the smooth operation of autonomous ships in the future.
- c. To identify factors that must be improved by ports to face the era of autonomous ships. This research aims to evaluate the competencies of port human resources, such as technical skills and knowledge in autonomous vessel technology, and assess the readiness of port infrastructure in supporting autonomous vessel operations. In addition, the research will also identify aspects of regulation, port management systems, and technology that need to be updated or developed to ensure a smooth transition towards the use of autonomous vessels. The results of this research are expected to provide strategic recommendations for human resource development and port infrastructure improvements that are better prepared to face future technological challenges.

4. RELATED WORKS

4.1 Port Human Resource Readiness Assessment

Assessment of human resource readiness can be assessed from three aspects, namely the first aspect, the aspect of employee mental readiness by assessing the ability to adapt to changes that will occur, the ability to cooperate with internal and external parties, the ability to complete tasks and responsibilities, the ability to accept any changes that occur, the ability to encourage mental, creativity and innovation in developing abilities and self-potential in the face of change, emotional ability in dealing with work pressure and change, the ability to develop effective communication methods, the ability to deal with problems in the changes that occur.

The second is aspects of knowledge and skills related to the development of autonomous ships and the use of Information and communication technology by assessing knowledge of the benefits of autonomous ships for the world shipping industry, knowledge of digital systems in port services, Skills in operating digital systems in port service services, knowledge of port service communication systems, skills in operating communication systems in port services, knowledge of cybersecurity in port service systems, Ability to prevent cybercrime in port service systems, knowledge, and skills in managing change.

The third is aspects of the willingness to change and increase self-potential by assessing the willingness to take opportunities for self-development, the ability to consider the risks of all decisions and actions taken, the ability to improve oneself in learning to increase one's potential, activeness in training to increase one's potential, the ability to accept and overcome new changes that occur, the ability to increase one's potential through the method of learning to know new things, the ability to increase one's

potential through the method of learning to do new things, the ability to increase one's potential through the method of doing work in a team (learning to live together) to overcome changes due to new things.

4.2 Port Readiness Assessment

The port readiness assessment can be measured from seven aspects, namely the first aspect is the port management aspect which assesses the preparation of port management to serve the application of autonomous ships, implementation strategies to serve the application of autonomous ships in the form of rules, standard procedures and service indicators, innovation cooperation with external parties to improve service quality in serving the application of autonomous ships, development of digitization-based service business models. The second aspect is the aspect of human resource management that manages the port by assessing the adequacy of the number of human resources who have knowledge and skills (competencies) in the use of ICT, the adequacy of human resource capabilities in mastering ICT, data analysis and cyber security, the adequacy of training provided in mastering ICT, the adequacy of training materials for service improvement with ICT.

The third aspect assessed is the level of ICT usability at the port by considering the level of awareness of the importance of ICT in port services, especially for serving autonomous ships, the level of ICT usability in obtaining information on the status of cargo transportation, the level of timeliness of the ship information system, the level of port operational suitability in ensuring data security and ship communication. The fourth aspect relates to the level of ICT use by assessing the existence of ICT systems in ship guiding, the existence of ICT systems in berthing services, the existence of ICT systems in ship and port communication systems, the existence of ICT systems in maintenance and repair systems, the use of big data in managing data on ships, cargo, shipping routes and others, the existence of ICT / sensor systems in cargo handling, the use of communication satellites / remote sensor satellites in communication systems, the existence of ICT systems in cargo movement at ports, the existence of ICT systems in document management.

The fifth aspect, is determined by the accessibility aspect of service information by assessing access to port service information in real-time, access to tracking and tracing cargo in real-time, access to ship / cargo status information in real-time, accessible from various places and by various related parties. The sixth aspect, the facilities and infrastructure aspect is assessed from the port development plan and the ability of existing facilities and infrastructure for autonomous ship services. The last aspect, namely the seventh aspect seen from the financial side, is assessed by measuring the existence of a plan to improve autonomous ship services to be outlined in planning documents, port development planning documents have been oriented towards the ability to serve autonomous ships, availability of budgets to increase the competence of human resources capable of serving autonomous ships, availability of budgets to improve facilities and infrastructure to be able to serve autonomous ships. Write the related work here. Please indent the first line of the paragraph by 0.5". Continue the paragraph as usual when writing the subtopics.

5. CONCLUSION

The conclusion of this study shows that the readiness of port human resources (HR) and port organizations in Indonesia to face the era of autonomous ships still requires significant attention and improvement. In terms of human resources, although most port workers have adequate basic skills, there are still gaps in knowledge and technical skills related to autonomous ship technology. Therefore, continuous training and competency development programs are needed to improve the readiness of human resources in the face of rapid technological change.

On the port organization side, although some ports in Indonesia have made modernization efforts, infrastructure, and port operational systems in general still need to be strengthened to support the implementation of autonomous vessels. Readiness in terms of regulation, technology development, and

adaptation to automation systems are also important factors that need to be considered.

Overall, while there is potential to develop Indonesian ports for the era of autonomous vessels, it requires collaboration between the government, industry players, and academia to design policies and programs that can accelerate the transition process. The main recommendations of this research are the importance of human resource capacity building, strengthening port infrastructure, and updating regulations that support the development of autonomous ship technology in Indonesia. Write the conclusion of your paper here.

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9. CONFLICT OF INTEREST DECLARATION

I certify that the article is the Authors' and Co-Authors' original work. The article has not received prior publication and is not under consideration for publication elsewhere. This research/manuscript has not been submitted for publication nor has it been published in whole or in part elsewhere. We testify to the fact that all Authors have contributed significantly to the work, validity, and legitimacy of the data and its interpretation for submission to ICGSPB.

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