

IMPLEMENTATION OF DIGITALIZATION OF PLANNING AND CONTROL IN PT IPC TERMINAL PETIKEMAS AREA PONTIANAK

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ABSTRACT

Technological developments are driving digital transformation in the maritime industry to improve efficiency and competitiveness. PT IPC Terminal Petikemas Area Pontianak implemented the Terminal Operating System (TOS) Nusantara as a solution. Therefore, this study analyzes the implementation of digital planning and control, its benefits, and obstacles. The implementation of TOS Nusantara was carried out in three stages: planning, training, and testing. The results show significant benefits, including increased operational efficiency through increased ship loading and unloading productivity (Box Ship Hour/BSH), data accuracy for real-time decision-making, and quality customer service through transparent container tracking. Key obstacles include technical challenges such as dependence on internet connection and server performance, as well as employee adaptation. Solutions involve improving IT infrastructure, providing guidance, and intensive training. This study emphasizes the importance of technology and human resource investment for successful digitalization in the maritime sector.

Keywords: Implementation of Digitalization, TOS Nusantara, Container Terminal

A. INTRODUCTION

The rapid technological developments of the Industrial Revolution 4.0 era have driven digitalization across various sectors of life. This revolution has brought fundamental changes to the way humans process resources and produce goods through automation, artificial intelligence, and the massive use of data. This transformation not only increases productivity but also strengthens competitiveness in various fields, including the services, logistics, and public services sectors. One sector experiencing significant change is the maritime industry, where digital systems are now used to accelerate data exchange and transactions. This digitalization evolution has been gradual, starting with port-terminal connections, port-city integration, and

finally, comprehensive integration within the Global Supply Chain (GSC).

PT IPC Terminal Petikemas Area Pontianak (TPK Pontianak), as a subsidiary of PT Pelabuhan Indonesia (PELINDO), acts as a container terminal operator that manages core activities such as dock operations (loading and unloading ships using PDA Tally), field operations (container stacking using VMT and pagers), and gate operations (receiving/delivery using Handheld). Prior to the implementation of the Nusantara Terminal Operating System (TOS) in September 2023, operational activities were still semi-manual and ran separately between units. This condition caused various problems such as delays, the risk of data errors, and a lack of information integration between divisions.

The implementation of TOS Nusantara is a strategic step in the digitalization of terminal operations. This system is based on the principles of real-time planning, organization, control, and reporting, integrating all operational activities to improve efficiency and data accuracy. Through this system, TPK Pontianak is expected to improve service quality and accelerate logistics processes. However, on the other hand, digitalization implementation also presents several challenges, such as infrastructure costs, system maintenance, and human resource training to adapt to new technologies.

A gap analysis revealed a discrepancy between *das sollen*—the principles of global logistics digitalization that demand real-time data integration, high accuracy, and operational efficiency as stipulated in international standards such as ISO 28000—and *das sein*, the semi-manual practices that persisted at TPK Pontianak prior to the implementation of TOS Nusantara. This gap highlights the need for comprehensive digital transformation to increase productivity and reduce operational risk. Furthermore, technical and organizational barriers are key factors that need to be addressed for the digitalization process to be effective.

The theoretical framework of this research is based on the concept of the Industrial Revolution 4.0, which emphasizes the integration of digital technology, automation, the Internet of Things (IoT), and big data into operational processes (Schwab, 2017). Furthermore, the maritime logistics digitalization theory explained by Notteboom and Rodrigue (2020) emphasizes

the importance of integrating port, terminal, and city systems in supporting global supply chain efficiency. To understand the internal challenges in adopting new technologies, this research also refers to the Technology Acceptance Model (TAM) by Davis (1989), which highlights employee resistance factors and training needs in the digital system implementation process.

Furthermore, program implementation theory is also used to strengthen the analysis of TOS Nusantara implementation in TPK Pontianak. Based on policy implementation theory, a program can be said to be successful if it includes three main components, namely: (a) the availability of a program designed and implemented according to the needs of the organization; (b) the existence of clear targets regarding the parties or units that will receive benefits from the program; and (c) implementation carried out by organizations or individuals who have the responsibility and competence in implementing it. In the context of this research, the first component is reflected in the availability of the TOS Nusantara system as a form of structured digitalization program. The second component is seen in the target beneficiaries, namely all operational units in TPK Pontianak that are directly affected by increasing work efficiency. Meanwhile, the third component includes implementation by the management and employees of TPK Pontianak who are responsible for the operation of the system.

The integration of Industrial Revolution 4.0 theory, maritime logistics digitalization theory, the Technology Acceptance Model (TAM), and

program implementation theory provides a comprehensive analytical framework. This framework allows the study to assess not only the extent to which digitalization through TOS Nusantara improves efficiency and data accuracy, but also the readiness of organizations and implementers to adopt technological changes. Therefore, this study is expected to produce relevant and applicable empirical findings to support digital transformation in the maritime logistics sector, particularly at regional container terminals in Indonesia.

B. METHODS

This research uses qualitative descriptive approach which aims to describe in depth the implementation *Terminal Operating System*(TOS) Nusantara at PT IPC Terminal Petikemas Area Pontianak. This approach was used because it can explain social phenomena naturally based on the meaning, experience, and perspectives of informants regarding the implementation of digital systems in terminal operational activities.

This type of research is descriptive, with a focus on presenting facts and characteristics of the research object as they are without variable manipulation. Informants are determined through purposive sampling technique, selected based on direct involvement and more than five years of work experience in terminal operations. The informants consisted of five people: the Assistant Manager of Operations Planning and Control, the Group C Operations Supervisor, the Support Supervisor, the Planning & Control Group B Coordinator, and the Operations Staff who also

served as members of the TOS Nusantara Project Team.

Data collection techniques include semi-structured interviews, direct observation, And documentation study. Interviews were conducted to obtain in-depth information about the system implementation, observations were conducted frankly to observe operational activities, while documentation was used to collect supporting evidence in the form of archives, reports, and screenshots of TOS features. Data validity was guaranteed through triangulation of methods and sources, namely by comparing the results of interviews, observations, and documents from various informant positions.

Data analysis is carried out interactively using models Miles and Huberman, which includes three main stages: data reduction, data presentation, as well as drawing and verifying conclusions. These three processes are carried out continuously from data collection to the final interpretation stage to obtain valid and comprehensive results.

C. DISCUSSION

Implementation of digitalization of planning and control through Terminal Operating System (TOS) Nusantara The system at PT IPC Terminal Petikemas Area Pontianak is a strategic step to improve the efficiency and effectiveness of port operations. The system was implemented in March 2023 and officially launched in September 2023, following the planning, training, and trial stages. Training is conducted in stages, starting with *Super User Training, End User Training, Mini Lab*, until *User Acceptance Test (UAT)*, to ensure

all staff are prepared and competent. Research findings indicate that all operational activities, from loading and unloading ships, container arrangement, heavy equipment movement, to performance reporting, have been digitally integrated through the menu. *Vessel, Yard, Truck, Equipment, Human Resources, Monitoring, And Dashboard & Report*. This aligns with the theories of Wibowo et al. (2023) and Riant Nugroho (2003), who emphasize digitalization to optimize work processes.

The implementation of TOS Nusantara provides significant benefits, including increased efficiency and workflow, data accuracy, rapid decision-making, and productivity and service quality. Ship loading and unloading productivity increased by approximately 50% (Box Ship Hour), operators received digital commands directly, and operational reports were available in real time. These results support the theory of Upwork (2023) in Afnarius et al. (2024) and previous research by Hidayat et al. (2023), Gultom et al. (2024), and Safuan (2022) which showed that digitalization improves efficiency, accuracy, and service quality.

However, system implementation also faced technical and organizational challenges. Dependence on internet networks and server performance were major obstacles, while staff adaptation to the shift from manual to digital work culture took time. Mitigation strategies included backup procedures in the event of system disruptions and tiered training supported by a *Super User*. This approach aligns with the theories of Permana et al. (2023) and Teichert (2019) regarding the importance of a stable

network and human resource readiness for successful digital transformation.

Critically, the success of digitalization at PT IPC Terminal Peti kemas depends not only on technology but also on organizational and human resource readiness. The combination of adequate infrastructure, continuous training, and an adaptive work culture enables the company to build a modern, efficient, and competitive work system. The implementation of TOS Nusantara is clear evidence that digital transformation in the port sector can improve operational effectiveness, transparency, and national logistics competitiveness in the Industry 4.0 era.

D. CONCLUSION

The implementation of digital planning and control through TOS Nusantara at PT IPC Terminal Petikemas Pontianak Area has been carried out systematically and structured. The implementation process included planning, multi-level training (Super User and End User), exercises with simulated data, and real-world testing (User Acceptance Test). All key system features, including work planning, real-time activity monitoring, and automated reporting, have been effectively utilized in daily operations.

The implementation of digitalization offers significant benefits for companies. Time and labor efficiency increase due to more organized workflows and automated reporting. Data accuracy is higher, enabling faster and more accurate decision-making. Furthermore, the quality of customer service improves because container positions can be tracked in real time.

However, the system implementation faced several obstacles. Technical challenges, such as reliance on internet connections and sometimes slow servers, were addressed through regular network infrastructure maintenance and repairs. Organizational and cultural challenges arose from the need for staff to adapt to the new system. These challenges were successfully addressed through tiered training and intensive mentoring, enabling staff to adapt without significant resistance.

Overall, the implementation of TOS Nusantara has proven to improve operational effectiveness, data accuracy, and service quality at ports. This success underscores the importance of combining technical and human resource readiness in supporting sustainable digital transformation.

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