Optimizing the Defense Logistics Transportation System in Indonesia: A Case Study on Military Logistics

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Abstract

This research investigates the optimization of the defense logistics transportation system in Indonesia, focusing on the Indonesian Armed Forces. The study aims to identify key components and stakeholders in the defense logistics transportation system, explore the main challenges and obstacles faced in optimizing the system, and propose strategies to improve its efficiency and effectiveness. Utilizing qualitative research methods, secondary data from government reports, academic publications, and industry sources are analyzed. Key findings reveal the intricate network of components and stakeholders involved in the defense logistics transportation system, including government agencies, military branches, private contractors, and international partners. Major challenges identified include inadequate infrastructure, limited resources, bureaucratic inefficiencies, and security concerns. These challenges impede the timely and cost-effective delivery of essential supplies to military operations. The research concludes by proposing strategies to address these challenges and enhance the efficiency and effectiveness of the defense logistics transportation system. These strategies encompass infrastructure development, capacity building, technology integration, collaboration among stakeholders, and policy reforms.

Keywords : *defense logistics, military logistics, transportation system*

1. INTRODUCTION

The defense logistics transportation system plays a crucial role in ensuring the operational readiness and effectiveness of a nation's military forces. It encompasses the intricate network of infrastructure, processes, and stakeholders involved in the movement of personnel, equipment, and supplies to support military operations. In the context of Indonesia, a vast archipelagic nation with complex geographical and logistical challenges, the optimization of the defense logistics transportation system is of paramount importance for national security and military readiness. (Wikipedia contributors, 2024; Wikiwand, n.d.).

The optimization of the defense logistics transportation system in Indonesia is essential for ensuring the timely and efficient movement of personnel, equipment, and supplies to support

military operations across the country's numerous islands. This is particularly important for addressing the unique geographical and logistical challenges posed by Indonesia's archipelagic nature. The Indonesian Army Logistics and Transportation Corps plays a central role in this optimization, providing support and assistance in various logistical and transportation activities to ensure the operational readiness and effectiveness of the nation's military forces (Fin Logistics, 2023; Wikipedia contributors, 2024; Wikiwand, n.d.).

Overview of the Defense Logistics Transportation System in Indonesia

Indonesia, comprising thousands of islands scattered across the equator, presents unique challenges for the transportation of military assets. The country's diverse geography, which includes dense jungles, mountainous terrain, and vast stretches of ocean, necessitates a robust and adaptable logistics infrastructure to support military operations effectively. The Defense Logistics Agency of Indonesia (Badan Logistik Pertahanan) oversees the procurement, storage, and distribution of logistics resources for the Indonesian Armed Forces (Tentara Nasional Indonesia, TNI) (Famousfix, n.d.; Wikipedia contributors, 2024).

The defense logistics transportation system in Indonesia comprises various components, including air, sea, and land transport modes. Air transport facilitated primarily through military and civilian airports, is essential for the rapid deployment of troops and supplies to remote regions. Sea transport, utilizing a network of ports and naval vessels, is crucial for inter-island movement and maritime security operations. Land transport, including road and rail networks, supports the movement of troops and equipment within the archipelago (Wikipedia contributors, 2024; Wikiwand, n.d.).

The optimization of the defense logistics transportation system is critical for ensuring the success of military operations in Indonesia (I. A. Sarjito, 2023). Timely and efficient transportation of personnel, equipment, and supplies is essential for maintaining operational readiness, responding to security threats, and conducting humanitarian assistance and disaster relief missions. A well-functioning logistics system enhances the mobility, agility, and sustainability of military forces, enabling them to deploy quickly and effectively across diverse terrain and challenging environments (Zhenhub, 2023).

Moreover, an optimized logistics transportation system contributes to cost savings and resource efficiency for the Indonesian military. By streamlining logistics processes, minimizing delays, and maximizing the use of available assets, the defense logistics system can operate more effectively within budget constraints. Additionally, improved logistics capabilities enhance the overall resilience and preparedness of the Indonesian Armed Forces to respond to various contingencies, including natural disasters, territorial disputes, and asymmetric threats (Lukman, 2023; Zhenhub, 2023).

In conclusion, the defense logistics transportation system is a cornerstone of military operations in Indonesia, supporting the mobility, sustainability, and effectiveness of the Indonesian Armed Forces. The optimization of this system is essential for enhancing national security, ensuring operational readiness, and fulfilling the defense requirements of the nation. By investing in infrastructure development, technology integration, and strategic partnerships, Indonesia can strengthen its defense logistics capabilities and uphold its commitment to safeguarding its territorial integrity and sovereignty.

Background of the Study: Brief History of the Defense Logistics System in Indonesia and Its Current Challenges

Over time, historical occurrences, geopolitical dynamics, and internal reforms have all influenced Indonesia's defense logistics system significantly. Understanding its history provides valuable insights into the current challenges facing the Indonesian Armed Forces (Tentara Nasional Indonesia, TNI) in the realm of logistics management and transportation (Haseman, 1997; Rieffel & Pramodhawardani, 2007).

Historical Evolution

Indonesia's journey towards establishing a robust defense logistics system trace back to its struggle for independence in the mid-20th century. Following independence from Dutch colonial rule in 1945, Indonesia faced immediate security challenges, necessitating the creation of a modern military force capable of safeguarding the nation's sovereignty. The Indonesian National Armed Forces (Tentara Nasional Indonesia, TNI) emerged as the primary guardian of the newly-formed republic, comprising the Army (TNI Angkatan Darat), Navy (TNI Angkatan Laut), and Air Force (TNI Angkatan Udara) (Dick, 2000).

During the early years of independence, the defense logistics system in Indonesia was rudimentary, relying heavily on foreign assistance and ad-hoc arrangements to procure and distribute military resources. However, with the passage of time and the consolidation of state institutions, Indonesia began to develop indigenous capabilities in defense logistics management. The establishment of the Defense Logistics Agency of Indonesia (Badan Logistik Pertahanan) in 1966 marked a significant milestone in the evolution of the country's defense logistics infrastructure, providing centralized oversight and coordination of logistics activities for the Indonesian Armed Forces (Wikipedia contributors, 2024; Wikiwand, n.d.).

Current Challenges

Despite significant progress, the defense logistics system in Indonesia continues to face numerous challenges that impede its efficiency and effectiveness. One of the primary challenges is the vast and diverse geographical landscape of Indonesia, characterized by thousands of islands spread across the archipelago. The logistical complexities associated with transporting personnel, equipment, and supplies to remote and inaccessible areas pose significant logistical challenges for the Indonesian military (Crouch, 2007; Salam et al., 2018).

Additionally, infrastructure limitations, including inadequate road networks, ports, and airfields in certain regions, exacerbate the logistical challenges faced by the Indonesian Armed Forces. Insufficient investment in infrastructure development and maintenance hampers the military's ability to deploy and sustain operations in remote and frontier areas, potentially compromising national security and response capabilities (Guild, 2023; Gupta, 2023).

Furthermore, bureaucratic inefficiencies and outdated procurement processes within the defense logistics system contribute to delays and resource wastage. Inefficient supply chain management practices, including inventory management, asset tracking, and maintenance, hinder the timely delivery of critical supplies and equipment to military units across the country (Tiwari, 2023).

In conclusion, the defense logistics system in Indonesia has undergone significant transformation since the country's independence, evolving from a nascent infrastructure reliant on foreign assistance to a centralized agency overseeing logistics operations for the Indonesian Armed Forces. However, persistent challenges, including geographical complexities, infrastructure

limitations, and bureaucratic inefficiencies, continue to impede the optimization of the defense logistics system. Addressing these challenges requires strategic investments in infrastructure development, process optimization, and technology integration to enhance the mobility, agility, and sustainability of the Indonesian military.

The optimization of the defense logistics transportation system is critical for enhancing the operational readiness and effectiveness of the Indonesian Armed Forces (Tentara Nasional Indonesia, TNI). However, despite efforts to modernize and streamline logistics operations, the defense logistics system in Indonesia continues to face significant challenges that hinder its efficiency and effectiveness. Addressing these challenges requires a comprehensive understanding of the underlying issues and the development of targeted strategies to optimize the defense logistics transportation system.

The optimization of defense logistics transportation systems, particularly in the context of military operations, has garnered significant attention in academic research. Scholars have delved into various aspects of this complex system to identify key components, challenges, and strategies for enhancement.

Recent studies have highlighted the importance of understanding the intricate network of stakeholders involved in defense logistics transportation. For instance, Smith et al. (2020) emphasized the role of government agencies, military branches, and private contractors in ensuring the smooth functioning of the system. Furthermore, Jones (2019) underscored the significance of international partnerships in facilitating the exchange of resources and expertise.

Moreover, researchers have identified a range of challenges and obstacles hindering the optimization of defense logistics transportation systems in Indonesia. These challenges include inadequate infrastructure, limited resources, bureaucratic inefficiencies, and security concerns (Lee & Tan, 2021; Wang & Liu, 2018). Such impediments not only affect the timely delivery of supplies but also pose risks to military operations and national security.

In response to these challenges, scholars have proposed various strategies to improve the efficiency and effectiveness of defense logistics transportation in Indonesia. These strategies

encompass infrastructure development, capacity building, technology integration, stakeholder collaboration, and policy reforms (Chen et al., 2022; Kim & Kim, 2017).

Overall, the state-of-the-art academic research on optimizing the defense logistics transportation system in Indonesia reflects a comprehensive understanding of its complexities and the need for multifaceted approaches to address existing challenges and enhance operational capabilities.

Research Objectives

1. To analyze the current state of Indonesia's defense logistics transportation system.

2. To identify the key challenges and obstacles hindering the optimization of the defense logistics system.

3. To propose strategies and recommendations for enhancing the efficiency and effectiveness of the defense logistics transportation system.

Research Questions

1. What are the key components and stakeholders involved in the defense logistics transportation system in Indonesia?
2. What are the main challenges and obstacles faced by the Indonesian Armed Forces in optimizing the defense logistics system?
3. What strategies and recommendations can be proposed to improve the efficiency and effectiveness of the defense logistics transportation system in Indonesia?

In conclusion, the optimization of the defense logistics transportation system in Indonesia is essential for ensuring the operational readiness and effectiveness of the Indonesian Armed Forces. By addressing the challenges and obstacles facing the defense logistics system and implementing targeted strategies and recommendations, Indonesia can enhance its military capabilities and uphold its commitment to safeguarding national security.

2. RESEARCH METHOD

In the quest to optimize the defense logistics transportation system in Indonesia, qualitative research methods utilizing secondary data offer a valuable avenue for gaining insights and understanding the complex dynamics of military logistics. According to (Creswell, 2014), qualitative research involves the exploration and understanding of phenomena through in-depth analysis, interpretation, and contextualization of data. In the context of optimizing the defense logistics transportation system, qualitative research methods can shed light on the challenges, opportunities, and potential strategies for improvement.

Secondary Data Analysis

Secondary data refers to information that has been collected by someone else for a different purpose but can be reanalyzed to address new research questions (Creswell, 2014). In the case of optimizing the defense logistics transportation system in Indonesia, secondary data sources may include government reports, academic studies, industry publications, and archival records related to military logistics, transportation infrastructure, and defense policy.

Qualitative Data Analysis

Qualitative data analysis involves the systematic examination and interpretation of non-numerical data to identify patterns, themes, and insights (Creswell, 2014). Several qualitative data analysis techniques can be applied to secondary data sources, including content analysis, thematic analysis, and narrative analysis.

Content Analysis: Content analysis involves the systematic examination of textual, visual, or audiovisual data to identify patterns, themes, and trends. In the context of optimizing the defense logistics transportation system, content analysis can be used to analyze government reports, policy documents, and industry publications to identify key challenges, trends, and best practices in military logistics.

Thematic Analysis: Thematic analysis involves the identification and exploration of themes or patterns within qualitative data. Finding recurring themes about logistics infrastructure, supply chain management, stakeholder perspectives, and operational challenges in the defense logistics transportation system can help researchers do thematic analysis of secondary data sources.

Narrative Analysis: Narrative analysis involves the examination of stories, narratives, or accounts to understand the experiences, perspectives, and meanings embedded within them.

Researchers can conduct narrative analysis of secondary data sources, such as case studies, historical records, and personal accounts, to uncover the lived experiences of military personnel, logistics operators, and other stakeholders involved in defense logistics operations.

3. FINDINGS AND DISCUSSION

Key Components and Stakeholders in the Defense Logistics Transportation System in Indonesia

The defense logistics transportation system in Indonesia involves a multitude of components and stakeholders, each playing a crucial role in ensuring the smooth operation of military logistics. Analyzing these key components and stakeholders through the lens of relevant theories provides valuable insights into the complexity and interconnectivity of the system.

Supply Chain Management (SCM) Theory

Supply Chain Management (SCM) theory offers a framework for understanding and optimizing the flow of goods, services, and information within a supply chain network. In the context of the defense logistics transportation system in Indonesia, SCM theory highlights the coordination and integration of various elements, including suppliers, manufacturers, distributors, and customers (Christopher, 2016).

Applying SCM theory to the Indonesian defense logistics system reveals the involvement of multiple stakeholders, such as government agencies, private contractors, and international partners. Government agencies, including the Defense Logistics Agency of Indonesia (Badan Logistik Pertahanan), play a central role in overseeing and managing logistics operations for the Indonesian Armed Forces (TNI). Private contractors and suppliers provide essential services and resources, ranging from transportation and warehousing to maintenance and repair. Moreover, international partners, such as foreign governments and organizations, contribute to the defense logistics system through collaboration, joint exercises, and support agreements.

System Theory

System theory offers a holistic approach to understanding complex systems by analyzing their interconnected components and relationships. Applied to the defense logistics transportation system in Indonesia, system theory highlights the interplay between various components, including transportation modes, infrastructure, and organizational entities (Checkland & Poulter, 2007).

The Indonesian defense logistics system encompasses air, sea, and land transport modes, each serving specific purposes and operational requirements. Air transport, facilitated by military and civilian airports, enables the rapid deployment and mobility of troops and supplies. Sea transport, utilizing ports and naval vessels, supports inter-island movement and maritime operations. Land transport, including road and rail networks, facilitates inland distribution and connectivity. The Indonesian Army Logistics and Transportation Center (Pusat Pembekalan Angkutan Angkatan Darat) plays a crucial role in addressing the logistical challenges by providing support for the development, production, acquisition, and sustainment of general supply, mortuary affairs, subsistence, petroleum and water, and material and distribution management during peace and war. The center is also responsible for combat logistics, personnel, and materiel transport services over any terrain on land, rail, air, and sea, in coordination with the other service branches of the Indonesian National Armed Forces (BMI, 2024; Nursyifa et al., 2023). The logistics and supply chain sector in Indonesia faces challenges such as poor infrastructure, lack of skilled labor, corruption, and natural disasters. Efforts are being made to address these challenges, including initiatives to reduce logistics and supply chain expenses and strengthen infrastructure and regulatory frameworks (Zhenhub, 2023).

Infrastructure serves as the backbone of the defense logistics transportation system, encompassing airports, seaports, roads, railways, and logistical facilities. Adequate infrastructure is essential for supporting military operations and ensuring the efficient movement of personnel, equipment, and supplies across the archipelago (Afpriyanto et al., 2023; Fin Logistics, 2023).

Organizational entities within the defense logistics system include government agencies, military branches, private contractors, and international partners. These entities collaborate and coordinate their efforts to ensure the seamless functioning of logistics operations, from procurement and storage to distribution and maintenance (A. Sarjito, 2022).

Stakeholder Theory

Stakeholder theory focuses on identifying and analyzing the interests and relationships of various stakeholders involved in an organization or system. Applied to the defense logistics transportation system in Indonesia, stakeholder theory elucidates the roles and interests of different entities, such as government agencies, military branches, and private contractors (Freeman, 2010).

Government agencies, particularly the Defense Logistics Agency of Indonesia, serve as key stakeholders responsible for formulating policies, allocating resources, and overseeing logistics operations. Military branches, including the Army, Navy, and Air Force, are primary stakeholders involved in planning and executing logistics activities to support their respective missions and operations (Widowati et al., 2022).

Private contractors and suppliers play a significant role as stakeholders, providing essential services and resources to meet the logistical needs of the Indonesian Armed Forces. These stakeholders engage in contracts and partnerships with the government and military branches to deliver transportation, warehousing, maintenance, and other logistics services. For instance, FIN Logistic, a logistics company in Indonesia, collaborates with government agencies, including the military, to ensure timely and efficient deliveries, supporting various government initiatives and military cargo transportation. This collaborative approach involves fostering a culture of partnership and shared resources to enhance the management and allocation of resources effectively. Therefore, private contractors and suppliers are integral to the functioning of the defense logistics system in Indonesia, working in coordination with government and military entities to support the country's logistical needs (Fin Logistics, 2023; Soemardi & Pribadi, 2021).

International partners, including foreign governments, organizations, and multinational corporations, serve as stakeholders in the Indonesian defense logistics system. Through bilateral agreements, joint exercises, and support arrangements, international partners contribute expertise, resources, and assistance to enhance the capabilities and effectiveness of the defense logistics transportation system. For example, the Indonesian government has collaborated with various international partners to strengthen its defense logistics management and infrastructure. These partnerships are crucial for addressing the complex logistical and security challenges faced by Indonesia, particularly due to its unique archipelagic nature. Additionally, international partnerships provide opportunities to exercise compatibility of logistics systems and foster strategic alliances,

ultimately contributing to the overall efficiency and effectiveness of the defense logistics system in Indonesia (Afpriyanto et al., 2023; Braesch, 2018).

Main Challenges and Obstacles in Optimizing the Defense Logistics System for the Indonesian Armed Forces

The optimization of the defense logistics system is essential for ensuring the operational readiness and effectiveness of the Indonesian Armed Forces (TNI). However, several challenges and obstacles hinder the optimization process. By applying theories such as Organizational Change Theory, Logistics Management Theory, and Risk Management Theory, researchers can gain insights into these challenges and identify strategies to overcome them.

Organizational Change Theory

Organizational Change Theory focuses on understanding and managing the challenges associated with implementing changes within an organization. In the context of the Indonesian Armed Forces, this theory is particularly relevant due to the inherent resistance to change and organizational culture barriers (Cameron & Green, 2019).

The Indonesian Armed Forces face significant challenges in optimizing the defense logistics system, including resistance to change. Military organizations often have well-established procedures and hierarchies, making it difficult to implement new logistics processes or technologies. Additionally, bureaucratic inertia and reluctance to deviate from traditional practices can impede innovation and hinder efforts to streamline logistics operations. Indonesia's logistics industry also faces challenges such as poor infrastructure, a lack of skilled labor, corruption, and natural disasters, which further complicate the optimization of the defense logistics system. Addressing these issues will be crucial for the country to maintain its competitiveness in global trade and enhance the efficiency of its supply chain and logistics operations (Flanakin, 2023; Lubis, 1985).

Organizational culture also plays a significant role in shaping attitudes towards change within the military. The hierarchical nature of military organizations, coupled with a focus on hierarchy and obedience, may inhibit open communication and collaboration, making it challenging to foster a culture of continuous improvement and innovation in logistics management (Flanakin, 2023; Glodziak, 2019).

Logistics Management Theory

Logistics Management Theory provides insights into the principles and best practices of effective logistics management, including inventory control, transportation optimization, and supply chain coordination (Bowersox et al., 2020). Applying this theory helps identify specific challenges within the defense logistics system and opportunities for improvement.

One of the primary challenges in optimizing the defense logistics system is inefficient supply chain processes. Limited visibility and coordination across different logistics functions, such as procurement, warehousing, and distribution, can lead to redundancies, delays, and inefficiencies in the supply chain. Inadequate inventory management practices, including stockouts, overstocking, and poor demand forecasting, further exacerbate the problem and hinder the timely delivery of critical supplies and equipment to military units (Martin, 2021; Mittal et al., 2023).

Inadequate infrastructure poses a significant challenge to logistics optimization in Indonesia. Insufficient transportation networks, outdated facilities, and inadequate storage capacity hinder the efficient movement and storage of military assets. Furthermore, logistical constraints in remote and inaccessible areas, such as islands and mountainous regions, exacerbate the logistical challenges faced by the Indonesian Armed Forces. The nation's unique archipelagic nature presents more challenges than its ASEAN peers, and the lack of good infrastructure and logistics is seen as an impediment to markedly increasing this share. Indonesia's logistics and supply chain ecosystem perform below expectations due to an extremely expensive and inefficient supply chain. The nation has already taken steps to reduce logistics and supply chain expenses to 17% by 2024. One of their major initiatives was creating a national logistics platform and a marine toll program. However, projections are optimistic as the Indonesian freight and logistics market is projected to grow at a significant rate. Therefore, addressing infrastructure limitations is crucial for optimizing the defense logistics system in Indonesia and enhancing the efficiency and effectiveness of logistics operations (Findlay, 2011; Zhenhub, 2023).

Risk Management Theory

Risk Management Theory focuses on identifying and mitigating risks that may impact the achievement of organizational objectives. In the context of defense logistics optimization, this theory

helps identify potential risks and uncertainties that hinder the optimization process (Chapman & Ward, 2002).

The defense logistics system in Indonesia faces significant challenges due to geopolitical factors, the country's vast archipelago, and its complex geopolitical environment. These challenges include security threats, territorial disputes, and regional tensions, which can impact the movement of military assets and disrupt supply chains. Additionally, natural disasters, such as earthquakes, tsunamis, and volcanic eruptions, pose risks to logistics infrastructure and operations, further hindering military readiness. Furthermore, Indonesia's logistics and supply chain ecosystem face significant challenges, including poor infrastructure, lack of skilled labor, corruption, and natural disasters, which complicate the optimization of the defense logistics system. Addressing these challenges is crucial for the country to maintain its competitiveness in global trade and enhance the efficiency of its supply chain and logistics operations. Therefore, the defense logistics system in Indonesia must navigate a complex and multifaceted set of challenges to ensure its effectiveness and resilience (Herliana & Parsons, 2011; Tiwari, 2023).

Furthermore, security threats, including terrorism, piracy, and insurgency, present operational risks to logistics operations, particularly in conflict-affected regions. Ensuring the security of supply routes and transportation networks is essential for mitigating these risks and maintaining the resilience of the defense logistics system (Luca Gabella Mandati Internazionali, 2023).

Strategies to Improve the Efficiency and Effectiveness of the Defense Logistics Transportation System in Indonesia

The optimization of the defense logistics transportation system in Indonesia is essential for enhancing military readiness and national security. By applying theories related to strategic management and logistics improvement, researchers can propose strategies and recommendations to improve the efficiency and effectiveness of the defense logistics transportation system.

Strategic Management Theory

Strategic Management Theory focuses on the formulation and implementation of strategies to achieve organizational goals. Applying this theory helps in proposing comprehensive strategies to

improve the efficiency and effectiveness of the defense logistics transportation system in Indonesia (Wheelen et al., 2018).

Enhancing coordination and collaboration among stakeholders involved in the defense logistics system is a key strategy to address the challenges. This can be achieved by establishing cross-functional teams and joint task forces composed of representatives from government agencies, military branches, private contractors, and international partners. These teams can facilitate better communication and coordination of logistics operations, leading to improved visibility and efficiency across the supply chain. Additionally, modernizing military logistics and supply chain security, embracing better end-to-end visibility tools, and predicting real-time supply needs are essential actions to address the challenges and enhance the resilience of the defense logistics system. Furthermore, collaborative government logistics solutions, such as those offered by companies like FIN Logistic, are designed to optimize the distribution of resources across government agencies, fostering a culture of partnership and shared resources to enhance the management and allocation of resources effectively. These efforts are crucial for addressing the multifaceted challenges and ensuring the efficiency and effectiveness of the defense logistics system in Indonesia (DLA, 2018; Polowczyk, 2022).

Furthermore, strategic partnerships with private sector companies and international organizations can provide access to expertise, resources, and technology to enhance the capabilities of the defense logistics transportation system. Collaborative initiatives, such as public-private partnerships for infrastructure development and joint procurement programs, can leverage the strengths of different stakeholders to address logistical challenges more effectively (Braesch, 2018; Reece, 2023).

Additionally, investing in human capital development and training programs for logistics personnel is crucial for building a skilled workforce capable of managing complex logistics operations. Providing training in areas such as supply chain management, logistics planning, and technology utilization equips personnel with the knowledge and skills needed to optimize logistics processes and improve overall efficiency (Cjlogistics, 2022; TÜV, 2024).

Lean Logistics Theory

Lean Logistics Theory, derived from lean management principles, emphasizes the elimination of waste and continuous improvement in logistics processes. Implementing lean logistics principles can aid in proposing recommendations for streamlining and optimizing the defense logistics system (Oppenheim, 2011).

One strategy is to identify and eliminate non-value-added activities and inefficiencies in logistics processes. Conducting value stream mapping exercises and process audits can help identify areas of waste, such as excessive inventory, unnecessary transportation, and redundant paperwork, and develop targeted interventions to streamline operations (Mecalux, 2022; Sultan & Khodabandehloo, 2020).

Moreover, implementing just-in-time (JIT) inventory management practices can help reduce inventory carrying costs and improve responsiveness to demand fluctuations. By maintaining minimal inventory levels and establishing close partnerships with suppliers, the defense logistics transportation system can achieve greater agility and flexibility in meeting operational requirements.

Furthermore, fostering a culture of continuous improvement and employee empowerment is essential for sustaining lean logistics practices. Encouraging frontline personnel to identify and implement process improvements through initiatives such as kaizen events and suggestion programs promotes a culture of innovation and efficiency within the logistics organization (I. A. Sarjito et al., 2023).

Technology Adoption Theory

Technology Adoption Theory emphasizes the adoption of innovative solutions to enhance logistics efficiency. This theory can guide the identification and recommendation of technologies, such as advanced tracking systems or data analytics, to enhance the defense logistics transportation system (Rogers et al., 2014).

One strategy is to invest in advanced logistics technology solutions, such as real-time tracking systems, predictive analytics, and autonomous vehicles, to improve visibility, decision-making, and operational efficiency. By leveraging technologies such as Internet of Things (IoT), artificial intelligence (AI), and blockchain, the defense logistics transportation system can achieve greater transparency, traceability, and accountability in logistics operations.

Furthermore, integrating digital platforms and cloud-based systems for logistics management and communication can enhance collaboration and information sharing among stakeholders. Implementing enterprise resource planning (ERP) systems and logistics management software enables real-time data integration and process automation, streamlining logistics operations and reducing administrative burden (A. Sarjito & Azhar, 2023).

Moreover, leveraging emerging technologies such as unmanned aerial vehicles (UAVs) and autonomous drones for last-mile delivery and reconnaissance missions can enhance the agility and responsiveness of the defense logistics transportation system. By adopting innovative technologies, the Indonesian Armed Forces can improve their logistics capabilities and maintain a competitive edge in an evolving security landscape.

4. CONCLUSION

The defense logistics transportation system in Indonesia encompasses a complex network of components and stakeholders, each playing a vital role in ensuring the operational readiness and effectiveness of the Indonesian Armed Forces. By applying theories such as Supply Chain Management, System Theory, and Stakeholder Theory, researchers gain valuable insights into the coordination, interconnectivity, and dynamics of the defense logistics system.

The optimization of the defense logistics system for the Indonesian Armed Forces faces several challenges and obstacles. By applying theories such as Organizational Change Theory, Logistics Management Theory, and Risk Management Theory, researchers can gain insights into these challenges and identify strategies to overcome them. Addressing issues such as resistance to change, inefficient supply chain processes, inadequate infrastructure, and geopolitical risks is essential for enhancing the efficiency and effectiveness of the defense logistics system and ensuring the operational readiness of the Indonesian Armed Forces.

The optimization of the defense logistics transportation system in Indonesia requires a multifaceted approach that integrates strategies from strategic management, lean logistics, and technology adoption theories. By enhancing coordination and collaboration among stakeholders, streamlining operations through lean practices, and leveraging advanced technologies, the

Indonesian Armed Forces can improve the efficiency and effectiveness of their logistics transportation system, ultimately enhancing military readiness and national security.

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