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Master Data Management Maturity Model (MD3M) Assessment: Case Study of PT Graha Segara

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ABSTRACT

This study focuses on assessing the maturity level of Master Data Management (MDM) implementation at PT Graha Segara, a service provider in the logistics industry, with a particular focus on data inconsistencies resulting from manual container data management. MDM plays a critical role in ensuring data consistency, quality, and integrity, which are essential for efficient operations. The study utilizes the Master Data Management Maturity Model (MD3M) to evaluate the current state of MDM practices within the company and identifies key challenges, including the impact of data inconsistencies on billing processes and the obstacles to effective data integration at container terminals. The results of the research highlight how manual data entry errors create inefficiencies, disrupt business processes, and delay critical operations. By assessing the company's current MDM maturity, this study aims to provide a comprehensive understanding of the issues at hand and offers strategic recommendations to improve the implementation of MDM. These recommendations are designed to enhance the quality and consistency of data, streamline operations, and improve overall operational efficiency. Ultimately, this research will contribute to the development of a more reliable data management system, enabling PT Graha Segara to optimize its business processes and better support the company's growth and customer satisfaction.

Keywords: Master Data Management, MDM, Data Inconsistencies, Maturity Model, MD3M, Data Integration

INTRODUCTION

Information technology (IT) has become a major catalyst in digital transformation in various industrial sectors, including the port ecosystem. In the era of industry 4.0, the concept of smart ports prioritizes the use of data-driven technology to improve operational efficiency and services to customers. According to research from Gartner, modern ports are increasingly adopting technologies such as the Internet of Things (IoT), artificial intelligence (AI), and blockchain to support process automation, improve data security, and ensure better system integration (Ko, Adywiratama, & Hidayanto, 2021). Another study by UNCTAD shows that the use of a data-driven approach in ports has helped reduce ship waiting times by up to 20% and significantly improve logistics productivity (Asymala & Hidayanto, 2024).

However, the adoption of this technology is often hampered by challenges in inconsistent data management, especially in companies that do not yet have an integrated data management system. In Indonesia, ports as the main node in the national logistics supply chain face major challenges in realizing full digitalization due to problems such as reliance on manual input and the absence of standardized data management between stakeholders. This causes operational inefficiencies that can affect the overall competitiveness of the port (Mardiyana et al., 2023).

In the context of PT Graha Segara, a behandle service provider company operating in the port ecosystem, inconsistent container data management is one of the main challenges.

The reliance on manual data entry not only increases the risk of human error, but also hinders the integration of the system with external partners such as container terminals. The impact is delays in the billing process and disruptions in the container logistics process (Apriliani, 2024).

Inconsistent and poorly integrated data has the potential to cause significant losses to companies and customers. Therefore, this study aims to assess the maturity level of data management at PT Graha Segara using the Master Data Management Maturity Model (MD3M) approach. Thus, this study not only provides an evaluation of current conditions, but also strategic recommendations to improve the efficiency of enterprise data management (Pada, Apriliani, & Ruldeviyani, 2020).

Master Data Management (MDM) has become an essential component in modern business operations, particularly for organizations that deal with large volumes of data across various departments and systems. As companies expand their operations and integrate with external partners, ensuring consistency and accuracy in data becomes a critical factor for achieving operational efficiency. MDM helps to centralize and standardize data management practices, reducing data duplication, errors, and inconsistencies. In the logistics industry, where timely and accurate information is vital for smooth operations, implementing a robust MDM system can greatly improve performance and customer satisfaction (Nusantara, 2018).

One of the primary challenges in MDM implementation is the risk of data inconsistencies, which often arise from manual data entry or updates. In industries like logistics and port services, where data such as container information is frequently updated, the potential for errors increases (Pansara, 2021). PT Graha Segara, a service provider in this sector, faces significant challenges in managing its master data due to the reliance on manual processes for container data management. These data inconsistencies not only affect the accuracy of billing but also hinder the smooth integration of data across systems and external stakeholders, such as container terminals (Karami, 2018).

Data inconsistencies caused by manual processes in container management create barriers to operational efficiency. For instance, incorrect or outdated information about containers can result in delayed billing cycles, missed shipments, and inefficient resource allocation (Hikmawati, Santosa, & Hidayah, 2021). As a result, addressing these issues requires a comprehensive approach to improving the company's MDM maturity. This involves assessing current practices, identifying gaps in data management, and proposing solutions that integrate automation and improve data governance. In this context, this study aims to evaluate PT Graha Segara’s MDM maturity level using the Master Data Management Maturity Model (MD3M) (Pansara, 2021).

The MD3M framework provides a structured approach to assess the maturity of MDM systems by examining several key dimensions, such as data quality, governance, and integration with other systems. By using this model, the study will help PT Graha Segara identify the specific areas where its MDM processes are underdeveloped and recommend strategies to advance its maturity (Spruit & Pietzka, 2015). This approach is essential for understanding how improvements in data management can address operational inefficiencies and enhance overall business performance. Additionally, the research will explore the impact of data inconsistencies on billing processes and container terminal integrations, providing a comprehensive analysis of the challenges faced by the company (Kumar Das & Mishra, 2011).

Previous studies have explored various aspects of MDM and its application in different industries. According to Inmon and Linstedt (2019), MDM plays a critical role in ensuring data consistency and accuracy across business systems, which is essential for decision-making and operational efficiency. Their work highlights the importance of implementing data governance frameworks to ensure that data is properly managed, reducing errors and increasing reliability. Similarly, Otto (2012) emphasizes the role of MDM in maintaining data

integrity and minimizing inefficiencies that arise from inconsistent data practices. Otto's research focuses on how organizations can streamline their data management processes and improve decision-making through better data governance.

Despite the growing recognition of the importance of MDM, there is limited research focusing specifically on the challenges faced by service-oriented companies like PT Graha Segara, particularly in terms of manual data entry and the integration of data with external stakeholders. Much of the existing literature on MDM tends to focus on large-scale industries or technology-driven sectors, leaving a gap in understanding how MDM can be applied effectively in logistics and port services. This research seeks to fill this gap by assessing PT Graha Segara's current MDM maturity and providing insights into how the company can improve its practices to support smoother operations and better integration with external systems, such as container terminals.

According to Inmon and Linstedt (2010), effective Master Data Management (MDM) systems ensure that an organization's data is consistent, accurate, and accessible, which is critical for decision-making and operational efficiency. They emphasize that implementing MDM can help companies reduce errors, improve data integration, and ensure data governance across departments. Similarly, Otto (2011) discusses the role of MDM in maintaining data integrity and preventing inefficiencies that arise from inconsistent data practices, especially in organizations that rely on manual data inputs and siloed systems.

The urgency of this research lies in the critical need for businesses, especially those in logistics and port services like PT Graha Segara, to improve their data management systems to stay competitive in an increasingly digitalized market. Inconsistent data, particularly from manual entry processes, causes significant delays in billing and disrupts operational workflows, leading to financial and logistical inefficiencies. As the company seeks to streamline its operations and meet the demands of a rapidly evolving market, understanding and improving the maturity of its Master Data Management (MDM) system is essential for enhancing efficiency, reducing errors, and achieving smoother integration with external systems such as container terminals.

While research on MDM systems and their implementation has been abundant, there is limited research focused on the practical application of MDM maturity models, especially in the context of manual data input and its impact on operational processes in service-oriented companies. Additionally, there is a lack of studies focusing on the implementation of MDM maturity models specifically in port-related logistics companies, particularly those facing the challenge of data integration with external stakeholders. This study aims to bridge this gap by assessing the MDM maturity level at PT Graha Segara and providing actionable recommendations.

This research introduces a novel approach by focusing on the specific challenges faced by PT Graha Segara, a service provider in the port logistics industry, regarding data inconsistencies due to manual input processes. By applying the Master Data Management Maturity Model (MD3M), this study offers a structured evaluation of the company's data management practices and identifies targeted strategies for improvement. The novelty of this research lies in its focus on the port sector, where logistics operations and data integration are vital, and where MDM practices are often underdeveloped or improperly implemented.

The primary objective of this research is to assess the current MDM maturity level at PT Graha Segara using the MD3M framework, identifying key areas for improvement in data management practices, particularly regarding the manual container data management process. The study aims to provide recommendations that will help the company enhance data quality, improve operational efficiency, and streamline data integration with external systems like container terminals. The benefits of this research include providing PT Graha Segara with a roadmap for improving its data management processes, which will lead to faster, more

accurate billing, improved logistics coordination, and better decision-making. Moreover, the findings will contribute to the broader understanding of how MDM maturity models can be applied in logistics and port services to improve overall operational performance.

METHOD

This study uses a case study approach with a focus on PT Graha Segara. The assessment of the level of MDM maturity in this company was carried out using the Master Data Management Maturity Model (MD3M). This approach makes it possible to assess the data management process at PT Graha Segara, identify data inconsistency issues, and provide relevant recommendations.

a. Data Collection

Data was obtained through interviews with IT managers, IT Helpdesk staff, IT Database staff, field operator staff, Billing staff. In addition, observation of business processes that involve manual data input is also carried out, such as the process of changing the status of containers.

b. MD3M Assessment

The MD3M assessment process is carried out by measuring the extent to which the company has implemented MDM standards in master data management, especially in terms of container data input that affects data integration and billing.

c. Identify the Impact of Data Inconsistencies

The impact of the identified data inconsistencies included inhibitions in the billing process and data integration issues with container terminals. This study analyzes how data inaccuracies affect the smooth operation and provides recommendations for improvement.

RESULTS AND DISCUSSION

1. MDM Maturity Level at PT Graha Segara

Based on the assessment using MD3M, PT Graha Segara is at the Managed maturity level (Level 2). Although the company has implemented several structured processes for data management, a lot of data is still managed manually, especially in container data management which involves manual input by staff.

2. Impact of Data Inconsistencies

   a. Billing Process Bottlenecks

Errors in container data input cause inaccuracies in the information on fees to be paid by customers. This results in delays in the billing process and slower decision-making regarding customer billing.

   b. Obstacles to Data Integration to Terminals.

Data inconsistencies lead to discrepancies in the shipping information received by the terminal. As a result, there are delays in container delivery, which has an impact on costs.

3. Gap Analysis.

The results of the analysis show that there is a gap between the current conditions and best practices in MDM implementation. Although PT Graha Segara has started to implement a data management structure through the use of certain systems, the reliance on manual input remains a major weakness. This is due to several factors, including a lack of integration between systems, the absence of automation tools, and non-standardized data management procedures across all departments.

This analysis reveals that most of the data management process is still done manually, especially in terms of updating container data involving many parties. As a result, there are often errors or delays in data recording, which directly impacts two important operational aspects:

a. Process Billing.

The mismatch of container data leads to the inability of the system to generate invoices automatically and on time. This slows down cash flow and creates challenges in the company's financial management.

b. Data Integration to Terminal.

Container terminals require accurate and up-to-date data to process container shipments. Data inconsistencies complicate this process, increasing the risk of shipping errors or operational delays.

4. Identify the Causes of Data Inconsistencies.

Based on interviews and observations, some of the main causes of data inconsistencies at PT Graha Segara include:

a. Process Manual.

Reliance on manual data entry increases the risk of human error.

b. Lack of Staff Training.

Staff who don't have an adequate understanding of the importance of accurate data often overlook data validation before input.

c. No Data Monitoring Mechanism.

The absence of tools that automatically monitor and detect data inconsistencies makes data errors often missed.

CONCLUSION

This study reveals that data inconsistency due to manual input is a significant challenge that hinders operational efficiency at PT Graha Segara. The impact includes inhibitions in the billing process and obstacles in data integration with container terminals. With the implementation of automation systems, process standardization, staff training, and end-to-end system integration, companies can significantly reduce data inconsistencies.

The assessment of MDM's maturity level using MD3M shows that PT Graha Segara is at the Managed maturity level. To achieve a higher level of maturity, companies must focus on improving automation and integrated data management. Thus, companies can improve data quality, operational efficiency, and data-driven decision-making.

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