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Analyzing Operational Impacts on Prolonged Loading Duration at Cipta Krida Bahari using Structural Equation Modelling

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Abstract: The loading and unloading process is pivotal to the revenue cycle in the logistics industry. This study intensively observes anomalous phenomena at Cipta Krida Bahari characterized by prolonged loading and unloading process duration influenced by an unidentified factor, Focusing on four variables and an intermediary element inherent in understanding operational procedures. These variables encompass driver information, truck type, arrival time patterns, and commence time as well as completion time of the loading and unloading process. In contrast, the duration of the process loading & and unloading time is the dependent variable. By utilizing Structural Equation Modelling and using the method via SMART PLS 3, the author investigates interrelations and their potential influence on loading and unloading duration. This study highlights operational insights as the author gives a wide understanding of how to enhance efficiency through the operational view. The data for this study is extracted from the company's log from May to June 2023, encompassing 208 sample data.

Keywords: *Loading Duration, Structural Equation Modelling, Prolonged Duration, Driver, Truck Type, Arrival time patterns, Operational*

1. Introduction

In the logistics sector, the operational procedures related to loading and unloading activities are integral to the core business operations of Cipta Krida Bahari (CKB)(Bryson et al., 2020), an integrated logistics service provider established as a subsidiary of PT ABM Investama Tbk in 1997. With the increasing demand for logistics services, CKB has witnessed a corresponding surge in its logistics activities. Over time, these activities have significantly influenced CKB's operational efficiency. Within this context, we have uncovered an intriguing phenomenon related to extended loading times.

The significance of our research lies in its relevance to the logistics sector, where the efficient duration of loading and unloading processes is not just routine but a critical factor for operational efficiency, cost-effectiveness, customer satisfaction, and overall competitiveness (Rexdonald Gweko Ntuchu, 2019) However, the rise in logistical activities has also brought challenges, particularly concerning extended loading and unloading times.

To provide a comprehensive understanding, we present a comparison graph (Figure 1.1) that illustrates loading durations exceeding and falling below 4 hours. This visual analysis allows us to identify patterns and outliers related to prolonged loading durations. Notably, the graph reveals that extended loading durations are prevalent, demanding urgent solutions. Despite extensive data recording and discussions within CKB, root causes remain unresolved.

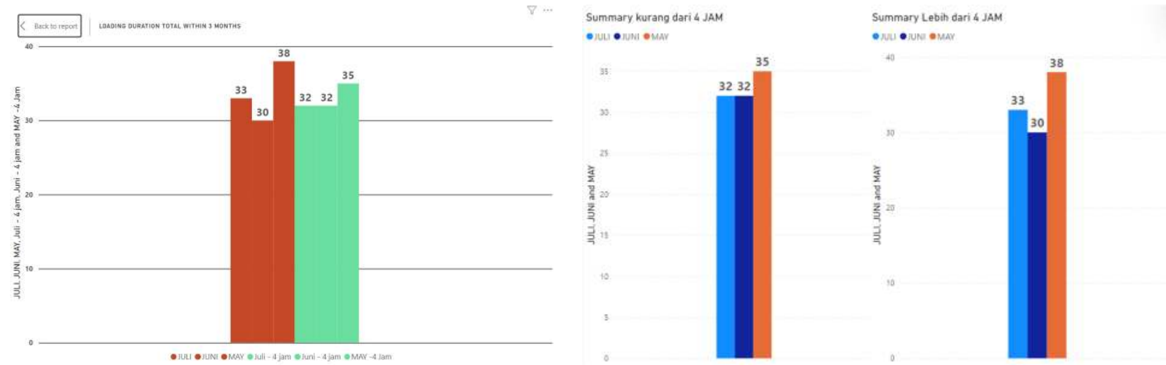

Figure 1.1. Comparative Analysis of Loading Duration

Source: Cipta Krida Bahari Historic Log Data, May 2023- July 2023

Additionally, we present a time series graph (Figure 1.2) depicting loading times from 00:00:00 to the maximum duration. This graph clearly shows a trend of loading times exceeding 18:00 hours, sometimes lasting overnight. This trend poses a pressing challenge that requires immediate resolution. Our primary objective as authors is to understand the underlying factors driving this issue, enabling us to formulate and implement effective solutions.

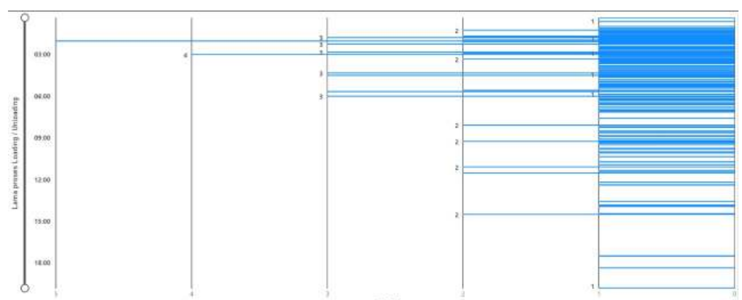

Figure 1.2. Temporal Trend of Time Frame

Source: Cipta Krida Bahari Historic Log Data, May 2023- July 2023

As evidenced by the graph, a clear trend emerges as loading times exceed 18:00 hours duration, potentially lasting overnight. This phenomenon presents a pressing challenge that demands immediate resolution. As authors, our foremost concern is to comprehend the underlying factors driving this issue before we can formulate and implement effective solutions.

2. Literature review

2.1 Prior Research

Variable	Operational definition	Source
Driver behavior	The analysis of driver behavior involves examining the performance of each driver responsible for daily loading and unloading activities	(Macadam, 2003)
Type Truck	Refers to the specific category or class of vehicles used for loading and unloading tasks, characterized by attributes like	(Suprata et al., 2020)

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	size, loading capacity, handling mechanisms, and technical specifications	
Commencement time of loading and unloading activity	Refers to the specific point when the process of loading and unloading cargo onto or from the vehicles begins	(Deo Leo Manalo, 2008)
Time Arrival Patterns	Refers to the temporal dynamic of truck arrivals including predictability, peak hours, and irregular patterns	(Chaudhari, 2022)
Completion time of loading and unloading activity	Refers to the specific moment when the process of loading and unloading cargo from trucks or delivery vehicles is successfully finished	(Deo Leo Manalo, 2008)

2.2 Loading & Unloading Processes in Logistics

According to (Wulan Ningrum, 2021), the unloading process is defined as the procedure of transferring goods from transportation which carries the goods to the destination and they are to be means loaded into a warehouse. In light of this, the last statement a definition of the loading process could be generalized, which loading process is characterized by an activity where the warehouse loads goods from a designated staging area to intended transportation such as truck, ships, or airplane whilst unloading process entails an activity where warehouse unload a good from transportation to the area of warehouse.

2.3 Logistics Efficiency

According to (Palmer & Torgerson, 1999) efficiency is closely linked to how resource inputs and to optimize expected outcomes. Further, it can be explained by simplifying it into two aspects which are (1) use outputs to measure resource effectiveness that can lead to optimizing chain of activity where it minimizes input and expected greater output in many terms such as quality, quantity, etc; (2) set standard of goals or output by possibly using an limited or minimum input resources. In the context of logistics, efficiency can be evaluated by measurement of essential assessments such as performance and competitiveness of the company. Efficiency can be used as an indicator to evaluate the performance of the organization and by measuring efficiency as well as separating the factor that affects activities environment, the factor can be analyzed to find which affects the most logistics efficiency(Sheng & Kim, 2021). Therefore identifying the cause of difference between variables that directly or indirectly impact operational procedure we can take a ratio measure of efficiency in logistics operational activities and strategize movement that can improve the performance of the company or in this case logistics activity.

Efficiency in logistics operations can be examined by the technical efficiency of trucks and found in substantial heterogeneity which is included in the study (Suprata et al., 2020) examined some trucks operating efficiently and others facing inefficiencies. This heterogeneity is akin to the variations we observe in logistics operations. The concept of technical efficiency is directly applicable to logistics operations, just as this study explored how different trucks demonstrated varying levels of efficiency, as operational management seeks to optimize these processes, and assessing technical efficiency is an important step toward achieving that goal. Furthermore, the study has found that inefficiencies in trucks varied across different categories such as labor cost, fuel cost, and other input factors creating multidimensional evaluations aligned with the complexity of the logistics operations, where various factors above need to be

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considered for improvement (Kim, 2010), this relates to optimizing operations on a broader scale, for this case various type truck which encompasses different challenge and distinct advantages

2.4 Driving Behavior

Referring to (Macadam, 2003) although there are many aspects to comprehending human drivers and their behavior, the emphasis here is on the control aspect of the human driver. They exhibit time delays in reacting to stimuli and sensed information (visual stimuli, motion cues, etc.) must also exceed certain thresholds before being detected. Other general limitations are required processing times for sensed information, information transmission time, cognitive requirements to anticipate or predict, and perceptions of higher derivative (or rate) information.

Defining how a driver steers while carrying out a controlled driving duty in a closed-loop system is a crucial part of the driver/vehicle model. The mathematical representation of the driver's behaviors must be streamlined to produce useful results given the complexity of human behavior and the variety of external cues encountered while driving. In this context, we hypothesized that a driver navigates a specified path by combining several straightforward judgments based on sensory and cognitive inputs to produce easy steering operations. (Sá da Costa, 1999)

According to (Weber et al., 2018)The world of driving is profoundly infused with emotions: encompassing the act of driving itself, the associated feelings and emotional states, the emotional values that a car represents, and the way drivers identify with their vehicles. The emotional aspects of the driving experience manifest through phrases like "thrill of driving", and "passion of the driver" and often involve expressions with a strong emotional value.

Negative emotions can significantly impact one's driving abilities and contribute to accidents and fatalities on the road. These emotional states encompass feelings of hostility and fury, exhaustion and drowsiness, tension, perplexity, jitters, and melancholy. Hostility and anger may lead to aggressive driving behavior, while fatigue and drowsiness can affect concentration, judgment, perception, and reaction time, potentially resulting in accidents. Driver stress is a common issue, often resulting in a noticeable decline in driving performance. Driver confusion can result in delayed reaction times and impaired decision-making abilities, especially among elderly drivers, and is expected to become a more significant concern with the growing complexity of digital technologies. Nervousness and sadness can also have adverse effects on driving performance, potentially leading to human errors and accidents. It's worth noting that human error remains the leading cause of accidents and road fatalities(Weber et al., 2018).

Those are the reasons why when driving, drivers need to maintain a good and focused emotional state. The following emotions and attitudes are ideal for safe and responsible driving: a) Alertness: Stay alert and attentive at all times, scanning the road and anticipating potential hazards. b) Patience**:** Be patient, especially in traffic or during congestion. Impatience can lead to aggressive driving and risky behavior. c) Calmness: Maintain a calm demeanor, even in frustrating situations. Road rage and anger can impair judgment and reaction times. d) Resilience: Be prepared to adapt to unexpected situations and road conditions. Resilience helps you remain calm in adverse circumstances. e) Responsibility: Take responsibility for your actions on the road, including obeying traffic laws, driving at safe speeds, and not driving under the influence. f) Focus: Maintain a high level of concentration and avoid distractions, such as texting or using a mobile phone while driving.

According to (Blander et al., 1993) driving behavior is made up of two different aspects: driving skills and driving style. Driving skill is concerned with performance standards for many aspects of the driving task. These include using the steering wheel to keep an eye on the road and the amount of time it takes to spot and react to risks. With training and practice, one can

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anticipate that driving ability will increase. Driving style refers to the way people choose to drive or the driving habits that have developed over time. It includes the choice of driving speed, the overtaking limit, the headway, and the inclination to break traffic laws. It is expected to be influenced by attitudes and beliefs relating to driving as well as more general

Adaptable driving skills are important because training cannot expose learners to the full range of situations that they are likely to encounter as licensed drivers. Drivers must be able to adapt their current abilities to a variety of scenarios and deal with new ones that may occur and fall outside of their experience. Adaptive competence is the ability to adapt a reaction to changing conditions or develop new strategies as needed (Ivancic & Hesketh, 2000).

2.5 Operations Management

According to (Rajesh Kumar R, 2019) an operational system can be described as a system in which multiple activities are carried out to convert a set of initial inputs into a valuable output through a process of transformation. These inputs and outputs can take concrete forms, such as raw materials and physical products, or they can be intangible, such as information and experiences. From this perspective, we can categorize both manufacturing and service systems as types of operational systems. The fundamental inputs in an operational system encompass labor, materials, and capital. The process of transformation involves a range of activities that the operational system performs to convert these raw materials into valuable products and services for customers.

Organizing work, choosing procedures, setting up layouts, finding facilities, designing jobs, evaluating performance, enforcing quality controls, creating work schedules, managing inventories, and scheduling production are all activities in operations management. Marketing, finance, operations, and human resources serve as the company's four main functional divisions. Operations are often the technical "hub" or "core" of the business, collaborating with suppliers and other functional areas to create products and deliver services to customers (Rajesh Kumar R, 2019)

2.6 Loading & Unloading Management

Loading and unloading systems are important components of the logistics systems for goods delivery. According to (Deo Leo Manalo, 2008), the loading and unloading system is made up of the loading and unloading activities, transportation, checking, and receiving, as well as the loading and unloading bays. Delivery vehicles unload their loads of cargo at loading and unloading facilities. The loading and unloading space is a section of the loading and unloading area that is used to load and unload cargo from trucks onto the ground(Dewy et al., n.d.). The transfer of items from the loading and unloading area to the receiving area of the retail store is referred to as conveyance activity. The path used for this movement is called the conveyance way.

The lead time, which is made up of multiple time values spanning between the supplier and the retail store, is the period between placing an order for a needed commodity and when it is expected to arrive. After receiving the order, the supplier produces, assembles, and packages the items according to the customer's specifications. Each of these processes takes time. However, in many instances, the requested items are already in stock and only need to be processed, loaded into trucks, and then delivered(Deo Leo Manalo, 2008).

Many truck drivers manually lift and handle multiple boxes, crates, sacks, bags, or other containers in some parts of the long-haul trucking sector. In some delivery arrangements, drivers frequently unload their vehicles at delivery locations, moving the goods to the back of the trailer setting it down on a warehouse dock, or the ground, or carrying it into a building. Some drivers use hand-towed electric pallet jacks to load and unload pallets of goods. Sometimes they use the forklifts or pallet lifts owned by the shipper or recipient to carry out these duties. (Krueger & Gerald P, 2001)

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2.7 Time Management

It's crucial to complete certain duties within a certain time frame. Efficient time management saves money, which is good for projects and operations. These are the fundamentals of time management: a) Effective planning is essential since everyone is busy, it's not necessary to finish the assignment in its entirety all at once. We occasionally give the assignment the preference. Things of greater importance should always take precedence over those of lesser importance. b) Setting concrete goals and objectives that must be adhered to. This is the key element of time management. If we have goals and objectives, all of our actions will be directed toward accomplishing them. c) Establishing deadlines, deadlines are required since they outline the number of times goals and objectives must be achieved. As a consequence, time management will be efficient. Time management will be at its best when people have objectives and deadlines for achieving those objectives. d) Prioritizing tasks, and setting priorities for tasks is challenging. It is important to understand the difference between important and urgent work. While dealing with urgent issues, we must also continue to give important issues top priority. (Chaudhari, 2022)

2.8 Performance Management

Performance management stands as a pivotal element in organizational dynamics, acting as a multifaceted approach to enhance employee performance, align organizational goals, and foster continuous improvement. As organizations continue to grapple with evolving challenges, the role of performance management remains paramount. Understanding the nuanced interactions between leadership training, coaching, competencies, and performance management is critical for fostering organizational resilience and success. Future research should delve deeper into these dynamics, exploring novel approaches to enhance performance management's effectiveness in the ever-changing organizational landscape(Primadi Candra Susanto et al., 2023).

3. Research method

We aim to employ a quantitative methodology to explore the relationship between an understanding of operational management and its influence on the execution of the loading process, which we hypothesize is interconnected. We opt for a quantitative approach, such as Structural Equation Modeling (SEM), to rigorously analyze this connection due to its suitability for examining complex relationships between variables. The quantitative approach provides a robust framework to scrutinize the intricate interplay between comprehension of operational management and its impact on loading procedures. We favor SEM over alternative methods because of its capability to model latent variables and measure their relationships accurately. This approach aligns seamlessly with our research objectives as it empowers us to precisely examine the proposed associations. By opting for SEM, we enhance the depth and precision of our analysis, contributing to a more thorough understanding of the interdependence between operational management comprehension and the execution of the loading process.

The data at our disposal comprises gathering log information recorded in Excel by the company data analyst at the time of the loading and unloading process. These entries are compiled based on the report submitted by the drivers who are on duty with delivery and tasks of supervising loading and unloading tasks carried by warehouse staff. The log data encompasses essential details such as time pattern of arrival, driver identification to analyze based on driver performance, truck categorization, the commencement time of loading/unloading procedures, and the finished time of the loading/ unloading process which serve as mediating agents that able to help influence dependent variables associated with the duration of loading/unloading process.

The data analysis to find a correlation between variables is a technique we are using called

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data modeling by utilizing the use of Smart Equation Model Partial Least Square, so the reader will able to have a visualization understanding of the data and also have statistical comprehension to conclude based data results. Besides the Smart Equation Model Partial Least Square, the Researcher utilizes Microsoft Excel 365 to preprocess data so it can be more understood in the aspect of statistics and able to support data reading of Smart Equation Model Partial Least Square.

This research was carried out starting in August 2023 at Cipta Krida Bahari Cakung specifically the loading zone. the studies were carried out by observing the operation process of both loading and unloading activity as well as the unit that carried delivery, We gathered a diverse range of sampling data to gain a thorough understanding by understanding determinant standard time to perform tasks by utilizing the time study measurement (Barnes, 1991), which can be readily applied in data modeling. Specifically, our data sampling focused on recording the time taken for various aspects of the loading process, including arrival times, start times, end times, and subsequently calculated process durations. This type of data sampling is instrumental for a comprehensive analysis of process efficiency and the optimization of logistics and operations research.

Revisit the previous statement relating to the variable dependent and independent, we can take the general formula to describe the duration of the loading process based on start times and end times, which is conceptually accurate, the formula is as below:

$$Y = \text{End Time of Loading (Z1)} - \text{Start Time of Loading (X4)}$$

In this formula, we refer to the following:
Y = Represents the calculated duration or loading process time
Z1 = Refers to the timestamp when the loading process is completed
X4 = Refers to the timestamp when the loading process is initiated

So for taken example calculation above, we take by first sample it goes below like this, before needed to be as calculated before, it should be converted like this

Numerical Convert = Time x 24 Hours

In the first sample, it goes

8.1 = 8:04 x 24:00

And then we can take to this calculation below

$$1.9(Y) = 10(\text{Z1}) - 8.1(\text{X4})$$

The conversion of time to a numerical format enabled us to perform calculations and statistical analyses, providing valuable insights into the temporal aspects of our research. With these methodological steps in place, we now have the function of numerical to delve into results and discussion.

4. Results and discussion

Validity test

R-Squared

To ensure the content validity of our measurement items, we reveal the extent to which the independent variables explain the variances in the dependent constructs. R-squared values are employed to assess the goodness of fit and the explanatory power of the model, as explained by (Ghozali, 2016), R-squared adjusted serves to address the issue of R-squared values continuously increasing when adding independent variables to the model, it measures the

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confidence in the precise addition of independent variables to enhance a model's predictive power. (Hair Jr et al., 2010) offer categorization which widely used method and traditionally R-squared values into three groups, Strong (0.75), moderate (0,50), and weak (0.25). these categories reflect the common understanding of the explanatory power of independent variables on the dependent variables, as suggested our results fall for completion time (0.167) and are weak as well for process loading (0.007) categorized into weak. However, based on the results from our study, the relationship between the combined independent variables and the intermediary element is found to be notably explained by the Y, with R^2 values of 0.167 which is 16.7%, signifying a substantial explanation of variance. This suggests that the combined effect of a variable on the intermediary element is weak to average in terms of its explanatory power.

	Original Sa...	Sample Me...	Standard D...	T Statistics (...	P Values
Completion...	0,167	0,184	0,053	3,154	0,002
Process Loa...	0,007	0,011	0,012	0,549	0,583

Figure 1.3. R-Squared values
Source: Smart PLS 3

an R^2 within the value of completion time is 0.167, revealing that approximately 16.7% variability in this construct is accounted for by the independent variables in the model. The associated p-value is 0.002, and the conventional threshold for statistical significance is typically set at 0.05, as about 5% of the normal distribution (Andrade, 2019). these statistics suggest a significant relationship between the independent variables' completion time. On the other hand, the influence of Z1 on the ultimate dependent variable (Y) shows a weaker level of explanation with R^2 values 0.007 which is 7%, while Z1 affects Y, it is essential to note that combined independent variables (X1, X2, X3, X4) exert a stronger influence on completion time (Z1).

Reliability Test
Cronbach's Alpha

In assessing the reliability of our research model, we employed Cronbach's alpha to evaluate the internal consistency of the scales or constructs utilized. Cronbach's alpha measures the extent to which the items within a scale are interrelated and consistently measures the intended construct. It is a crucial statistical tool that aids in determining the reliability of the measurement instrument used in our study. A high Cronbach's alpha value indicates strong internal consistency, suggesting that the items in our scales are measuring the construct effectively. In our case, we referred to the principles laid out by (Ghozali & Latan, 2014), who provide guidance on partial least square analysis and recommend that a Cronbach's alpha value exceeding 0.7 is desirable for reliable measurement instruments.

	Original Sample (O)	Sample Mean (M)	Standard Deviation (S...	T Statistics (...	P Values
Commence...	1,000	1,000			
Completion...	1,000	1,000			
Driver Name_	1,000	1,000			
Process Loa...	1,000	1,000			
Time Arrival...	1,000	1,000			
Type Truck_	1,000	1,000			

Figure 1.4. Cronbach's Alpha Value
Source: Smart PLS 3

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This implies that all items within this foundation are highly correlated and measure the same underlying dimension, these high values impact reliability, indicating that the items for each within consistent and reliable.

Hypothesis

Addressing the core problem of this study, we sought to uncover as well as analyze the underlying factors impacting the prolonged loading and unloading processes within Cipta Krida Bahari which later be a prime example for another logistics industry, According to (Ghozali, 2016), path coefficients in structural equation modeling indicate the strength and direction of a relationship between variables, mirroring the methodology described as well by (Ghozali, 2016). Path coefficients ranging from -1 to 1, serve as a valuable tool for determining whether the hypotheses have positive or negative directions, when a path coefficient falls within the range of 0 to 1, it signifies a value of a positive relationship, while values in the -1 to 0 range denote a negative relationship. For instance, we examine driver behavior statistically with P values of 0.015, as the path coefficient for this analysis was -0.868 which means -0.868 < P. 0.015 which means there is a statistically significant negative relationship between driver behavior as it is less than standard 0.05 p values and negative path coefficient indicates as driver behavior worsens, the process duration tends to increase or worsen as well, we present the outcomes of our research, delving into four variables and the intermediary element, These variables encompass driver information (X1), truck type (X2), arrival time patterns (X3), and the commencement (X4) and completion times (Z1) of the loading and unloading processes, with the dependent variable being the process duration (Y).

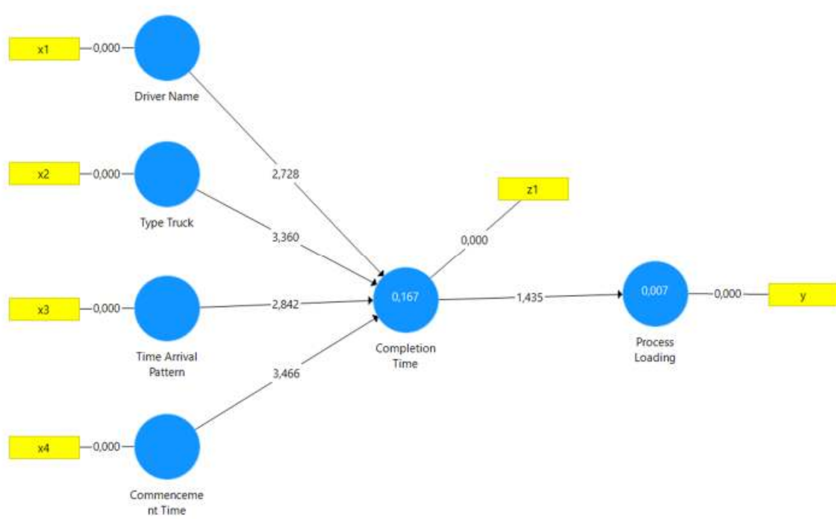

Figure 1.5. Data Modelling Interrelation Variables
Source: Smart PLS 3

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	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Commencement Time -> Completion Time_	0,270	0,269	0,078	3,466	0,001
Completion Time_ -> Process Loading	0,082	0,085	0,057	1,435	0,152
Driver Name_ -> Completion Time_	-0,868	-0,893	0,318	2,728	0,007
Time Arrival Pattern_ -> Completion Time_	0,211	0,216	0,074	2,842	0,005
Type Truck_ -> Completion Time_	1,013	1,041	0,301	3,360	0,001

Tables 1.1. Path Coefficients
Source: Smart PLS 3

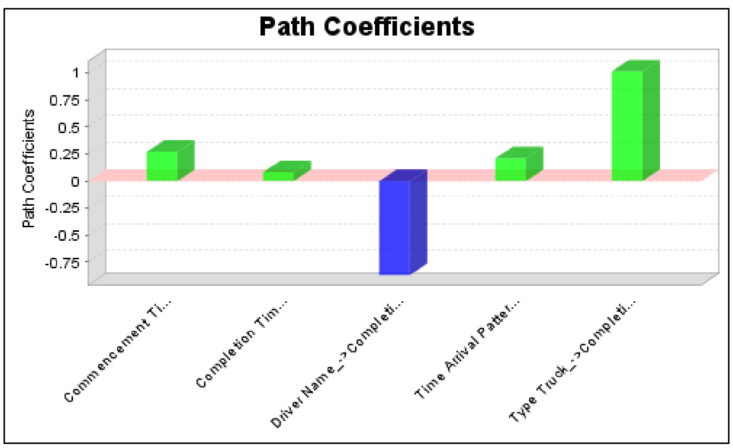

Figure 1.6. Path Coefficients Chart
Source: Smart PLS 3

Based on our evaluation and modeling data, we have identified several hypotheses related to the observed relationship by understanding through the built model data above, we explore the statistical significance and implications of these relationships. It is well-known tendencies of deficiencies in maritime logistics, operations, and infrastructure may result in poor logistics results, where applicable in any logistics operations. (Suprata et al., 2020)

H1: There is a significant effect of driver name (X1) on the loading process duration (Y)

The value of the path coefficient (-0.868, $p < 0.007$) shows that the driver's name (X1) has a significant influence on the loading process duration (Y). We hypothesize that variations in driver characteristics significantly impact the loading process's efficiency.

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H2: There is a moderate influence between variable type truck (X2) and driver name (X1) affecting loading process duration (Y)

The combination of the type of truck and driver information exerts a moderate effect on the loading process duration (Y), implying that as a type of truck changes favorably, the loading process tends to increase. (Path coefficient = 1.1013, $p < 0.152$).

H3: Time arrival pattern (X3) giving significant influence on determining loading process duration (Y)

Representing temporal dynamics movement of truck arrivals eventually plays a significant role in determining process loading (Y). we found that variations in time arrival patterns indicate loading efficiency and significantly impact the loading process duration. Suggesting that more efficient time arrival patterns result in shorter loading process durations. (Path coefficient 0.211, $p < 0.005$)

H4: Commencing time (X4) and completion time (Z1), together significantly impact process loading (Y)

The temporal markers of the loading process, together have a moderate impact on process loading. We suggest that temporal aspects of the loading process, from commencement to completion, influence the overall process duration. This means that when the commencing time and completion time are optimized, the loading process durations tend to be shorter. (Path coefficient = 0.270, $p < 0.001$)

H5: Arrival time pattern (X3) and commencing time (X4) significantly influence process loading (Y)

We posit that the interaction between temporal patterns of truck arrivals and the commencement time is integral to understanding variations in the loading process (Path coefficient, we observe a strong positive relationship, indicating that when efficient arrival time patterns align with favorable commencement times, the loading process duration tends to decrease. (0.270, $p < 0.001$)

H6: The collective impact of driver name (X1), type truck (X2), time arrival pattern (X3), commencing time (X4), and completion time (Z1) significantly influences process loading (Y)

Multiple factors impact process loading (Y). commencement time and completion time (0.270. $p < 0.001$) are strong contributors. Driver name (- 0.868, $p < 0.007$) has a significant negative effect, which emphasizes the importance of driver performance management while time arrival patterns (0.211, $p < 0.005$), and type of truck (1.1013, $p < 0.001$) positively influence loading efficiency, indicating the value of synchronized arrivals and strategic truck choice, these variables contribute to the process duration (Y).

5. Conclusion

In conclusion, our study has highlighted the critical matters that significantly impact the efficiency of loading and unloading processes. These variables include driver performance (X1), truck selection (X2), time pattern arrivals (X3), and loading initiation time (X4), with the loading process duration (Y) as dependent variables, our research emphasizes the following key points:

Driver Behavior (X1) Effective human resource management is crucial for driver behavior, as the driver behavior worsens that as well loading process tends to be longer. Communication and coordination between drivers and logistics personnel play a pivotal role in optimizing logistics activity, leading to reduced loading and unloading durations. (Vicrihadi et al., n.d.).

Truck Type Selection (X2) Understanding the attributes associated with various truck is essential as the truck get larger, and it tends to take a long time to process duration, this might be because larger trucks can hold more cargo, which requires more time to load. This knowledge enabled informed decisions about truck selection depending on the nature of the

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items transported and optimizing logistics operations. (Hayam et al., n.d.).

Time Pattern Arrivals (X3) synchronized truck arrivals with available resources are vital. Properly managing temporal patterns of truck arrivals can help reduce loading and unloading times.

Loading initiation time (X4) and Completion Time (Z1) the timing of loading commencement and the impact of completion time on downstream logistics activities are critical. Efficient time management during peak hours, irregular patterns, and empty queues can lead to shorter loading and unloading durations. (Irenita et al., n.d.).

Strategic management of these factors is key to enhancing operational performance within logistics companies. By focusing on optimizing driver behavior, truck type selection, time patterns, and efficient time management. Cipta Krida Bahari can achieve greater efficiency and effectiveness in its operations

6. Implications

The findings through this research hold several practical and theoretical framework implications for the logistics industry and related fields. These implications have the potential to influence various stakeholders. Here are the implications:

Enhanced driver training and management This paper suggests delving into driver information and performance which can lead to the management of human resources by utilizing knowledge of training and management practices, in short companies invest in better driver training, and management practices, to fulfill the need of a driver.

Optimal truck type selection understanding the significance of truck type variations allows companies to have information which later companies able to make decisions when choosing between different categories of vehicles depending on the goods they deliver.

Strategic and efficient time management result of this research highlights the importance of effective time management, particularly in synchronizing truck arrivals with available resources and staff allocations, thus implying that logistics companies should make more effective strategic scheduling and real-time monitoring of loading and unloading processes communication between warehouse and operational management which responsible for fleet unit

Control room as strategic downstream logistics optimization recognizing the impact of dynamics time changing, driver behavior, type truck, control rooms equipped with real-time monitoring and communication technologies can play a pivotal role in streamlining and coordinating logistics activities beyond the loading and unloading processes. The control room should be able to have connection communication interrelated between divisions for this case warehouse and fleet to have effective communication where it can line downstream logistics activities.

Data-driven decision-making This study find an implication collection and analysis of data from various point in the logistics process able to approach and enables informed decision-making helping to find underlying problems in the future so each division responsible for logistics activities is able to be proactive problem-solving

Theoretical contributions theoretical understanding of this research where the variables of human factors, time management, and operational variables interact to influence loading and unloading processes within the logistics sector. This can be a theoretical framework for future research and academics within these fields.

7. Research limitations

Our dataset is centered around Cipta Krida Bahari (CKB), a single logistics company. While our findings may not perfectly extend to the broader logistics sector due to variations in operational needs and practices among logistics companies, it's important to recognize that the unique insights gained from this specific case can still offer valuable lessons that apply to similar logistics firms. The data we collected dates back approximately four months, which means we may not fully capture potential changes over time, seasonal variations, or evolving industry norms. For future research, it would be beneficial to consider more extended data collection periods and investigate the influence of seasonal factors on loading and unloading processes. Additionally, we encountered constraints in data collection related to accessibility and data quality, which should be transparently acknowledged to assess the study's reliability. While our study highlights human factors, particularly driver performance, we did not delve deeply into behavioral aspects. Subsequent research can offer a more comprehensive understanding of how human behavior impacts the loading and unloading processes.

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