ANALYSIS OF OPERATIONAL PROBLEMS IN A SHIPPING SERVICE COMPANY USING THE FAULT THREE ANALYSIS (FTA) METHOD
CASE STUDY: PT KERETA API LOGISTIK BANDUNG

Farrell Pratama Nugraha[2] Arida Murti Martikasari[2] Supono[3]
D4 E-Commerce Logistics Study Program
University Of Logistics & business International, Bandung, Indonesia[1,2,3]
arida@ulbi.ac.id, farrellpratama2@gmail.com, Supono@ulbi.ac.id

Abstract

This study aims to analyze operational problems at PT.KAI Logistik Bandung, the root causes were identified using the Fault Tree Analysis (FTA) method. Observations were conducted for two months with direct involvement in various operational functions, including customer service, administrative data management, goods condition inspection, loading and unloading activities, and the preparation of shipping documents Based on the results of observations and analysis, a number of problems were identified that affected operational effectiveness, including data input errors (human error), limited supporting facilities and infrastructure, suboptimal warehouse management, uneven human resource competency, and the use of a logistics system that was still manual. Through the FTA approach, the root causes of these problems were successfully mapped, resulting in recommendations for improvement, including increasing accuracy in administrative processes, providing more adequate facilities, optimizing warehouse governance, strengthening human resource capacity through training and certification, and developing an integrated digital-based e-logistics system. The implementation of these recommendations is expected to improve the efficiency, reliability, and competitiveness of PT KAI Logistik Bandung's operations in supporting the national logistics system based on rail transportation.

Keywords: *Logistics, Fault Three Analysis, PT KAI Logistik, Problem Analysis*

Abstrak

Studi ini bertujuan untuk menganalisis permasalahan operasional di PT.KAI Logistik Bandung,akar permasalahan diidentifikasi dengan menggunakan metode Fault Tree Analysis (FTA). Observasi dilaksanakan selama dua bulan dengan keterlibatan langsung pada berbagai fungsi operasional, meliputi pelayanan pelanggan, pengelolaan data administrasi, pemeriksaan kondisi barang, aktivitas bongkar muat, hingga penyusunan dokumen pengiriman. Berdasarkan hasil pengamatan dan analisis, teridentifikasi sejumlah permasalahan yang memengaruhi efektivitas operasional, antara lain kesalahan input data (human error), keterbatasan sarana dan prasarana pendukung, manajemen pergudangan yang kurang optimal, kompetensi sumber daya manusia yang belum merata, serta penggunaan sistem logistik yang masih bersifat manual. Melalui pendekatan FTA, akar penyebab dari permasalahan tersebut berhasil dipetakan sehingga menghasilkan rekomendasi perbaikan, meliputi peningkatan ketelitian dalam proses administrasi, penyediaan fasilitas yang lebih memadai, optimalisasi tata kelola gudang, penguatan kapasitas sumber daya manusia melalui pelatihan maupun sertifikasi, serta pengembangan sistem e-logistik berbasis digital yang terintegrasi. Implementasi dari rekomendasi ini diharapkan dapat meningkatkan efisiensi, keandalan, serta daya saing operasional PT KAI Logistik Bandung dalam mendukung sistem logistik nasional berbasis transportasi kereta api.

Kata Kunci: *Logistik, Fault Three Analysis, PT KAI Logistik, Analisis Permasalahan*

1. Introduction

PT Kereta Api Logistik (KALOG) is a subsidiary of PT Kereta Api Indonesia (Persero) that focuses on providing rail-based logistics services. A company that innovates in the integration of multimodal logistics services, KALOG not only carries out freight transportation functions, but also develops warehousing, courier services, and information technology-based logistics systems. This makes KALOG a strategic partner in supporting e-commerce logistics systems, especially in terms of efficient delivery of large quantities of goods over long distances. This mode has advantages in terms of large transport capacity, punctuality, and environmental friendliness. According to the Central Statistics Agency, freight transportation by rail reached 67.16 million tons in 2023, an 8% increase from 61.91 million tons in 2022. Meanwhile, domestic sea transportation reached 351.02 million tons, an increase from the previous year's 320.06 million tons. Through this study, the researcher had the opportunity to explore the logistics management system implemented by PT Kereta Api Logistik, from the goods distribution process and customer service to inter-division coordination. Furthermore, the hands-on experience allowed the researcher to apply the theory-based skills, such as the use of logistics information systems and data processing for shipping and receiving goods.

With this experience, the researcher is expected to develop broader insights, enhance professional skills, and prepare for the challenges of the increasingly competitive and technology-driven logistics industry. The research will describe the problems encountered at PT KAI Logistik Bandung and the activities undertaken during the study. This research was conducted to provide suggestions for companies to continue to improve operational performance.

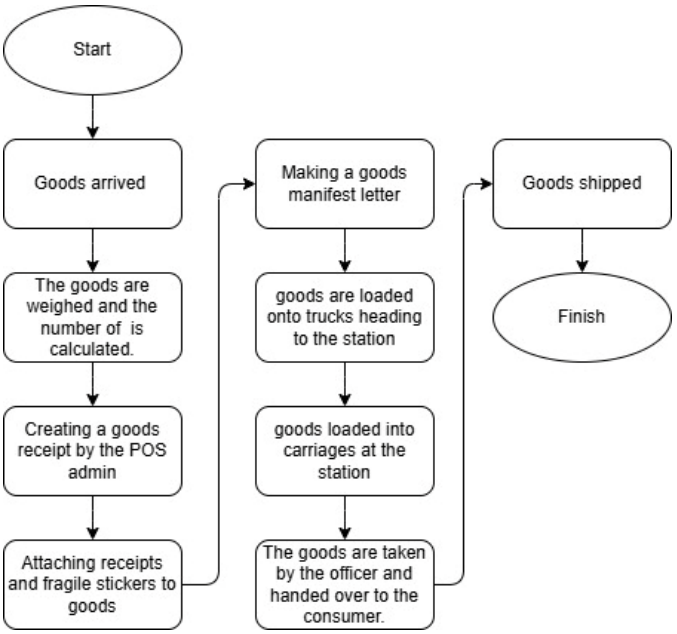
2. Method

The research at PT Kereta Api Logistik Bandung was carried out using the Block Release method Yunita (2006) block release method is a method that describes a situation or problem that occurs based on data and facts obtained during a certain period when the researcher carries out practical work. Block release here means the observation in a certain period and is carried out five days a week, during working hours according to the rules at PT KAI Logistik Bandung, namely, starting at 09.00 WIB - 17.00 WIB. Data collection was carried out through direct observation of operational activities, documentation in the form of administrative notes and photos of activities, as well as interviews with related employees to obtain in-depth information. Analysis of operational problems uses the Fault Tree Analysis (FTA) method, which maps the root causes of problems based on human, machine, method, and environmental factors. This approach allows the researcher to identify major obstacles and formulate improvement recommendations systematically.

3. Result and Discussion

The delivery process at PT Kereta Api Logistik Bandung begins when a customer hands their goods over to an officer at the front desk. At this stage, the officer will weigh the goods and record the number of packages received. The customer is then directed to the counter to complete the delivery transaction. The POS administrator will generate a delivery receipt using

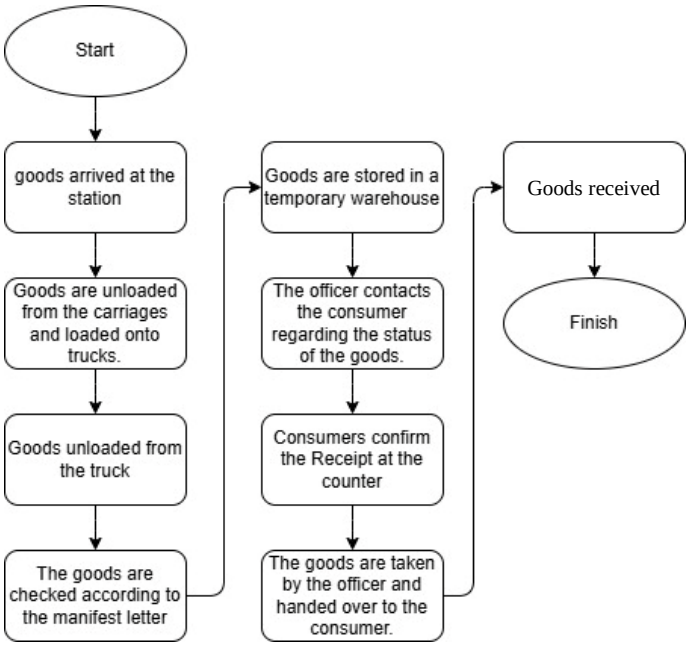
KAI Logistik's internal system. Once the transaction is complete, the printed receipt will be returned to the officer in the goods receiving area to be affixed to the goods to be shipped. If the goods require special handling, such as fragile or high-value items, additional stickers such as "fragile" will be affixed. The next step is for the officer to prepare a manifest. This letter contains information regarding the number of packages, the weight of the goods, and the destination station. Once all paperwork and marking are complete, the goods will be transported by truck to the departure station. At the station, the goods are loaded into train cars and arranged by officers based on the delivery route. This arrangement is crucial for efficient distribution at the destination station.



Source: PT KAI Logistik Bandung, 2025.

Picture 1. The goods delivery flow

For the goods-in-arrival process, the flow begins with the arrival of the goods at the destination station. Arriving goods are unloaded from the train cars by officers and then transported by truck to the retail outlet. Once the goods arrive at the location, the truck is unloaded and the goods are stored in a temporary warehouse. During this process, an officer will cross-check the physical condition of the goods against the contents of the manifest to ensure there are no discrepancies. Once the goods are safely stored, an officer will contact the customer to inform them that the goods are available for collection. The customer then comes to the outlet and shows the goods receipt to the officer at the counter. After verification by the officer, the goods are taken from the warehouse and handed over directly to the customer, completing the entire goods arrival process.

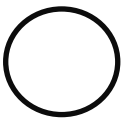


Source: PT KAI Logistik Bandung, 2025.

Picture 2. The goods arrival flow

There are problems that the researcher found during the analysis using the Fault Three Analysis (FTA) method. According to Windhi Y. Kartika, et al. (2016) Fault three analysis can be described as an analytical technique, analyzing the environment and operations to find a way / solution to the problems that arise. FTA is a graphical model of parallel variations and combinations of errors that arise as a result of defining existing problems. FTA shows the logical relationship of the basic causes that are the cause of the problem which is the main cause above (Fault Tree Handbook, 1981; IV-1)

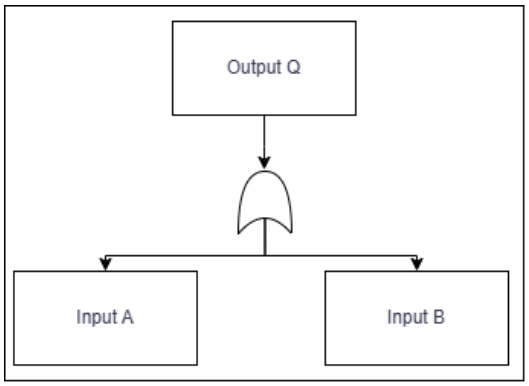
Table 1. Symbols in FTA

No	Symbol	Information
1		Basic Event The basis of the error initiation does not require further development.
2		Conditioning Event The basis of the error initiation does not require further development.
3		Undevelopment Event an event that cannot be developed further because information is not available

No	Symbol	Information
4		Extenal Event expected events occur
5		Gate AND Errors that arise due to all the input problems that occur
6		Gate OR Errors that arise due to one of the input problems that occur

Source: Fault Tree Handbook,*1981; IV-1*

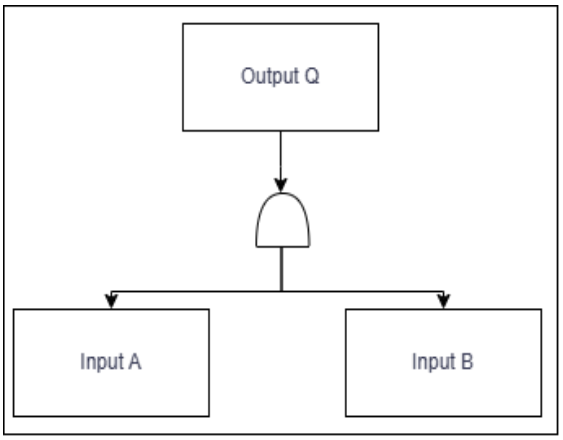
There are two gates in FTA construction: the "AND" gate and the "OR" gate. The OR gate is used to indicate that an output event will occur if one or more input events occur. There are multiple input events in an OR gate.



Source: Fault Tree Handbook,1981; IV-1

Picture 3. Gate OR

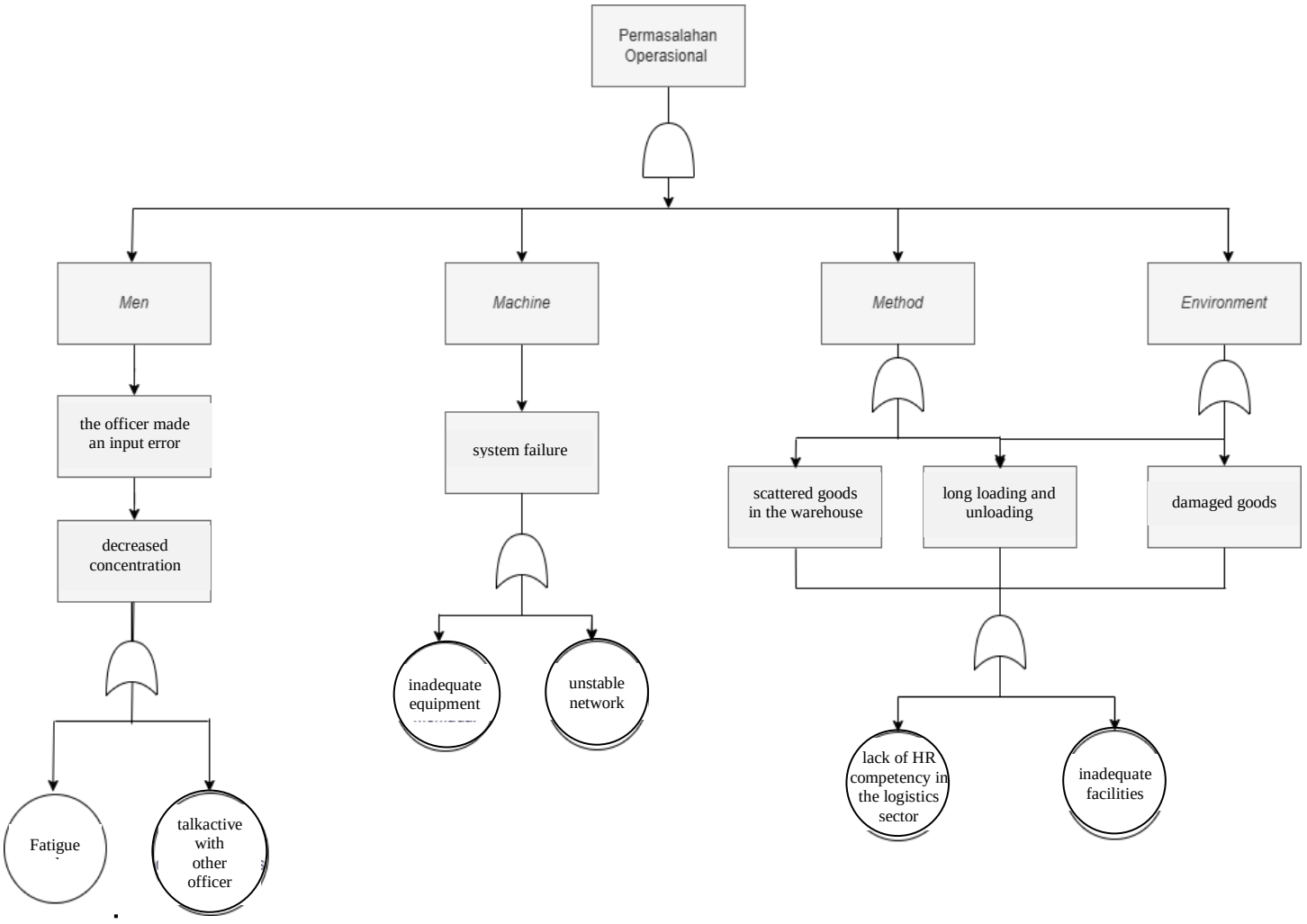
The image above shows two input events on an OR gate: input events A and B, and output Q. Output Q occurs if either input A or B occurs, or both occur. The AND gate is then used to indicate that the output will occur if all inputs occur. Multiple inputs may occur on an AND gate.



Source: Fault Tree Handbook,1981; IV-1

Picture 4. Gate AND

The image above shows two events, namely input event A and input event B and output event Q. Output Q will occur if both input event A and input event B occur. Next, after finding the root of the problem from several factors such as Men, Machine, Method, and Environment, use the FTA method which can be seen in the following image :



Source: researcher's primary data, 2025

Picture 5. root cause analysis using the FTA method

Based on the source of the problem found by the researcher related to the operational activity problem, it was then analyzed based on the type of work field at PT Kereta Api Logistik Bandung.

1. Administration Section
   a. Data entry
   b. Facilities
2. Loading and Unloading Operations Section
   a. Competence of human resource
   b. Facilities
3. Loading List Section
   a. Logistics system management

The solution to these problems is as below :

1. Administration Section
   a. Data entry
      The data entry process requires precision and good communication with consumers. This is because the data entry process also requires direct communication with consumers and data input. For someone who is not used to multitasking, the data entry process will take longer. Therefore, this process requires time for the writer to become accustomed to the data input process.
   b. Facilities
      A stable internet network and a device with better specifications are required so that the transaction process becomes more effective and efficient.
2. Loading and Unloading Operations Section
   a. Competences of human resource
      Of course, by conducting training that can be done either from the company or outsourcing in order to produce professional workers or can also directly recruit those who have educational backgrounds according to the job description or who have national certifications issued by BNSP (National Professional Certification Agency) through various LSP (Professional Certification Institutions). This certification is designed based on the Indonesian National Qualifications Framework (KKNI) and covers various levels of professions, from operators to managers so that it can strengthen the team that has an impact on better operational activities and reduces employee workload, in addition to making the logistics process more efficient.
   b. Facilities
      The first thing to consider is loading and unloading facilities, such as expanded space or altered layouts. Furthermore, the storage process also faces the same problem of insufficient space, which can be solved by expanding the storage area. Furthermore, storage methods that need to be improved include paying attention to items with special labels.
3. Loading List Section
   a. Logistics system management
      So that this process can be carried out effectively and efficiently, KAI Logistik Bandung can implement an e-logistics system. To realize the e-logistics system, the company can build an integrated system and develop website-based

inventory control.

4. Conclusion

This study aims to analyze operational problems at PT Kereta Api Logistik (KALOG) Bandung using the Fault Tree Analysis (FTA) approach. The results of the analysis indicate that there are several factors that are the main sources of operational problems, namely human error in data input, limited supporting facilities and infrastructure, suboptimal warehouse management, uneven human resource competency, and the use of a manual logistics system. Through the application of FTA, the root of these problems can be systematically mapped so that the solutions offered are more focused, including increasing accuracy in data management, providing adequate facilities, optimizing warehouse layouts, increasing human resource capacity through training and certification, and developing an integrated digital-based e-logistics system. Thus, this study provides a practical contribution to PT KAI Logistik in improving the effectiveness and efficiency of rail-based operations, as well as an academic contribution in the form of the application of the FTA method as a relevant analytical approach to identify and minimize operational risks in the logistics sector.

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