



Analysis of Factors Causing Delays in Delivery of Electronic Products to PT XYZ

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Abstract. This research aims to find out what factors hinder the delivery of electronic goods and analyze steps to improve the delivery process so that it will make it easier for companies to prevent and determine what to do. The research method used is descriptive qualitative by conducting interviews with informants and collecting data and analyzing the data using *Pareto diagrams* and *fishbone diagrams*. After getting the results, researchers will provide improvement solutions using the 5W+1H approach. The results obtained from this analysis are that delays in the delivery of electronic goods at PT XYZ mostly occur due to *short-ages* and there are problems with the machine.

Keywords: Delay In Delivery, Pareto Diagram, Fishbone Diagram

1 Introduction

Manufacturing companies have a series of activities that include product design, material selection, planning, production (manufacturing), quality assurance, management and sales carried out by a company. From a technical perspective, manufacturing is considered as the process of making raw materials through chemical and physical processes to convert them into products with the desired shape, properties, and appearance [10].

According to [14] production planning must be accompanied by effective inventory management. Inventory must be kept sufficient without hampering the production process, so that the company can be consistent in meeting customer demand. Good inventory management will also affect the number of goods produced, whether the goods produced will match the number of goods ordered by consumers or not. In addition to inventory management, manufacturing companies must manage delivery efficiency and reliability to maintain a smooth flow from raw materials to finished products. Timeliness of delivery is a critical factor, because customers expect products to arrive on schedule to support their operations. PT XYZ is a manufacturing company. This company operates in the electronic component and assembly industry, producing various models at one time and making them based on orders received. In 2022, PT XYZ will experience delays in delivering goods. The following is data on delays in delivery of goods in 2022:

Table 1. Delay Data Delivery of goods in 2022

Delay Data Delivery of goods in 2022		
Month	Total orders	Delay orders
January	110,383	660
February	108,490	451
March	96,053	962
April	91,630	593
May	89,745	470
June	194.911	539
July	<i>closed</i>	<i>closed</i>
August	112,630	352
September	236,422	1,055
October	<i>103.703</i>	<i>789</i>
November	<i>closed</i>	<i>closed</i>
December	<i>187,095</i>	<i>495</i>
TOTAL	1,331,062	6,366

(Source: Researcher, 2024)

This is caused by part shortage and machine failed. Part Shortage is a shortage of materials that will be used to make an item. Machine Failed is the occurrence of a problem with the machine while working on an item. Usually if part occurs shortage, then recovery will occur parts shortage, as well as machine failure.

These factors have a very significant impact on the production process at PT Apart from having an impact on the product manufacturing process, this also has an impact on orders on the following date or month, because if the order cannot be sent on time there will be a possibility of delays in delivery of the next order. Based on the table above, researchers want to conduct research regarding product delivery delays at PT XYZ in 2023. Whether delivery delays still occur or not. Thus, the problem formulation of this research is: First, what are the problems that cause delays in product delivery? Second, what impact can be caused by delays in product delivery? Third, what solutions can be provided to overcome the problem of delays in product delivery?

This research focuses on factors that influence delays in the delivery of goods at PT XYZ in 2023, because delays that occur in 2022 will still continue. The aim is to determine whether the delay factors in 2022 are the same as in 2023 and to provide useful solutions for companies in dealing with this problem. Based on this background, the analytical method that will be applied in this research is descriptive qualitative, the analysis technique uses the Miles & Huberman analysis technique using the fishbone diagram and Pareto charts.

2 Literature Review

2.1 Delay

Delay is a portion of the estimated implementation time that cannot be utilized according to the activity plan, causing one or several activities to be delayed or not completed

on time according to the planned schedule [8]. If a job has been targeted to be completed at a predetermined time but for some reason it cannot be fulfilled, it can be said that the job is delayed.

According to [11] lead Time in the manufacturing sector is the time required by a company to fulfill an order, namely the period between the start and completion of a process. [13] explains that lead Time is the time required from ordering until the goods arrive at the company. It concluded that lead Time is the standard time required to complete a process in the company. In the manufacturing industry, especially at PT XYZ, leads Time is very important, because each department must complete the entire process within the specified time so that the company can achieve its targets efficiently and effectively, using manpower and machines.

2.2 Delivery

Delivery is the process of distributing goods and services from producers to consumers, which is an important part of marketing activities to facilitate the transfer of these products. The shipping process creates a distribution channel or delivery channel that connects producers with consumers. Delivery of goods is the activity of sending goods that occurs as a result of the sale of merchandise [7]. In general, goods delivery is the physical process of preparing the delivery of goods from the warehouse to the destination location in accordance with the ordering and shipping documents, as well as ensuring the goods meet the specified handling requirements. In this delivery process, problems often occur both internally and externally. Examples of reasons for late delivery of goods are:

- a. Problems in the production process, such as machine failure failure), can result in delays in processing goods due to problems with the machines used for production.
- b. Errors in order processing occur when the number of orders increases but the material available in the warehouse is insufficient (shortage), resulting in delays in the delivery of goods.
- c. Logistics problems, such as disruptions in transportation systems that are slow or hampered due to bad weather, such as heavy rain. Apart from bad weather, delays in transportation can also be caused by administrative errors in documents. This error can cause the sender's transportation or container to be delayed at customs, which can result in a shortage of goods. For example, material that was supposed to arrive this week may experience delays due to random checks check which causes the container from the sender to be stuck in red line.
- d. Delays in delivery may occur in the event of conflicts between countries or international conflicts.

2.3 Supply Chain Management (SCM)

Supply Chain Management is the integration of material and service procurement activities, the transformation process into semi-finished goods and final products, as well as distribution to consumers [3]. These supply chain management practices include a series of activities carried out within an organization to achieve supply chain manage-

ment effectiveness. These activities include forming strategic partnerships with suppliers, establishing strong relationships with consumers, increasing information sharing, ensuring information quality, and implementing postponement principles.

2.4 Make To Order (MTO)

Make to Order (MTO) is a production technique in which the manufacturer starts the production process only after receiving an order from the customer. In this system, products are made according to the specifications desired by the customer. This strategy is an approach where the entire production, assembly and distribution process of a commodity is driven by actual consumer demand. The process of manufacturing new goods begins once an order is received from a customer, and the number of units produced is based on instructions from the customer.

Make to Order (MTO) in manufacturing is often known as a process-focused approach, where multi-purpose machines/equipment and skilled labor are used intensively [5].

3 Research methods

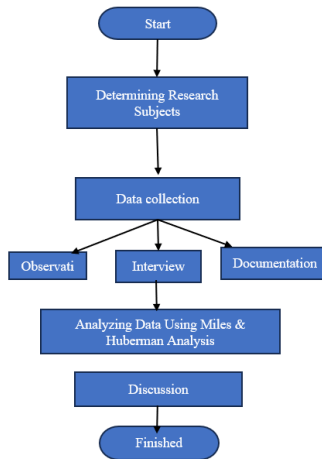


Fig. 1. Research Flow

This research uses a qualitative descriptive method to identify obstacles in the production process that cause delays in the delivery of goods. Data collection was carried out through observation, interviews and documentation.

3.1 Informants/Research Subjects

Accuracy in selecting and determining the type of data source will influence how rich the data will be. In this research, the selection of informants or research subjects as samples will be carried out non- randomly or non- probability sampling using purposive sampling. This is because researchers only need samples in the form of people who

have special skills or who are experts in their work or field. Research data sources can be grouped into two, namely:

3.1.1 Primary Data Sources

Primary data is information obtained directly by the researcher from the source without going through other parties (from the object directly), then collected and processed by the researcher himself or by individuals in an organization [1]. Informants are selected from among those who have relevant experience in the research field, people who hold special roles in a division, and who are easy to contact. Therefore, the subjects of this research are individuals who are directly involved or who carry out work in production, namely Department Head PC (production control), Department head store, Department head SMT (pcb assembly), and Department head PD 2.

3.1.2 Secondary Data Sources

Secondary data is information obtained by researchers indirectly from the original source (research object), but through the intermediary of other sources. Secondary data sources include various types of materials such as textbooks, journals, magazines, newspapers, official documents, regulations, and the like that are relevant to the topic being researched. In this research, the secondary data source obtained is files file regarding data on delays in delivery of goods in 2022 and 2023.

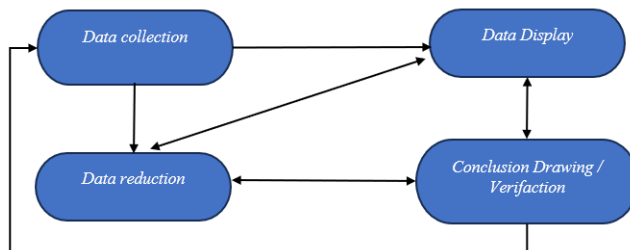


Fig. 2. Analysis Interactive (Flowchart)

3.2 Data Collection Techniques

Instruments are data collection tools that have a crucial role in facilitating information collection in the field [1]. Qualitative data collection techniques are basically temporary because their use depends on the context of the problem and the type of data desired [9].

In the research process, even though the data collection tools are prepared carefully, good data results are not always guaranteed if the data collection techniques are not appropriate [9]. There are various ways to apply data collection techniques, namely:

3.2.1 Observation Method

Observation is a method for collecting data that involves deliberately, systematically and selectively observing and listening to interactions or phenomena that are occurring [1]. There are various types of observations that can be seen from how many researchers are involved (participation) and the research situation (research settings). Researcher involvement can be divided into two categories, namely participant observation and non-participant observations. In Participant observation, the researcher is actively involved in the activities of the group being observed, becoming part of the group without other members knowing that they are being observed [1].

3.2.2 Interview Method

Interviews are a method commonly used to collect information directly from research respondents [1]. According to [11] In-depth interviews are a process of getting answers for research purposes through face-to-face dialogue between interviewer and respondent, with or without an interview guide. In in-depth interviews, the interviewer and respondent are involved in social interactions that last for quite a long time. A distinctive characteristic of in-depth interviews is deep involvement in the respondent's life.

3.2.3 Documentation Method

This method is used to dig up historical information. The document method is a form of qualitative research in which documents are interpreted by researchers to provide meaning around an assessment topic [1].

3.3 Miles & Huberman Analysis Technique

The essence of interactive data analysis techniques there are several stages taken to analyze qualitative data [9], namely:

3.3.1 Data Reduction

Data reduction is an attempt to simplify information, by focusing on significant elements, then organizing data based on certain concepts, categories and themes. The data reduction process includes steps such as summarizing information, coding the collected data, combining data into single themes, and identifying patterns or groups of data.

In research this, data reduction will be done with select relevant data for answer question study. So, from That in reducing data, researchers will focus on the goal from research this for know factor causal factors happen lateness delivery goods with through interviews and data presentation.

3.3.2 Data Display (Data Presentation)

This form of analysis is carried out by presenting the data in narrative form, where the researcher describes the results of the data findings in the form of sentence descriptions,

charts, graphs, matrices, relationships between categories that are sequential and systematic. In this stage the description can be displayed in table form and then an explanation is provided in paragraph form. This analysis technique will make it easy for readers to see a summary of the data.

3.3.3 Conclusion Drawing / Verification

From this research, conclusions are drawn (data verification) carried out continuously throughout the research process. Even though the conclusions have been explained during the data reduction process, they are not final, there is still the possibility of additions and deletions. However, if at the previous stage the conclusion corresponds to the data obtained in the field accurately and is valid, then the conclusion can be considered a convincing conclusion or can be valid. The following is an explanation of the fishbone diagram, Pareto diagram chart, and the 5W+1H approach, namely:

1) Ishikawa Diagram or Fishbone Diagram

Fishbone diagrams are a method used to help solve existing problems by analyzing the causes and effects of a situation in a diagram that looks like a fishbone.

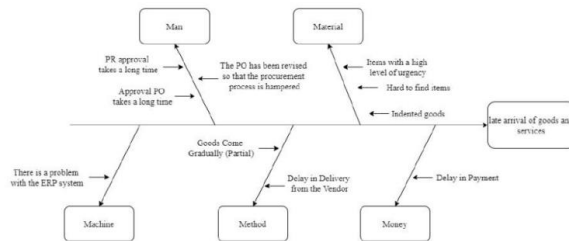


Fig. 3. Example of a Fishbone Diagram Image

2) Pareto Charts

Pareto diagram is one of the tools from QC 7 (Seven Quality Control Tools) which is commonly used for quality control. Essentially, the Pareto Diagram is a graphical representation in the form of a bar that shows problems based on the number of events from largest to smallest. Problems are listed from most frequently occurring to least frequently occurring. The graph displays the highest bar on the left, decreasing to the lowest bar on the right. The Pareto diagram is very useful in determining and identifying problem solving priorities.

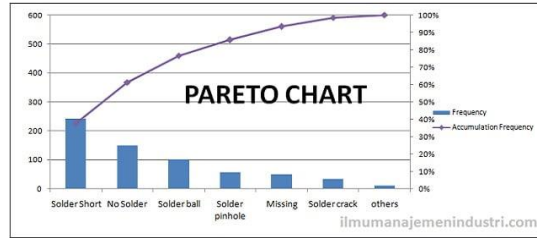


Fig. 4. Example of a Pareto Chart Image

3) 5W+1H approach

The 5W1H Method adheres to the principles: “if you don't ask, you won't know” and “a problem well explained is a problem half solved” [4]. This method is used to describe and analyze a problem by answering 5 questions starting with the letter W (What, Where, When, Who, Why) and 1 question starting with the letter H (How). Since all these questions are open-ended and cannot be answered with YES or NO, this method reveals various aspects of a given problem.

4 Results and Discussion

4.1 Data Collection

Data collection in this research was carried out in 3 ways, namely:

1) Observation method

In this research, researchers are involved in the daily activities of the subjects being observed or are data sources, or carry out moderate participant observation. There is a balance in which the researcher is partially part of the environment, but not completely involved. Researchers participated in several activities in collecting data through participant observation, but not in all activities. This means that the researcher takes part in carrying out activities in the observation, for example the researcher as an employee in the production division Control always updates delivery delay data every day. Researchers took part in the question and answer process regarding what happened which prevented the product from being sent on the specified date. However, not all process activities are carried out by researchers, for example when producing or processing a product.

2) Interview Method

Interviews require interaction of at least 2 people which has important implications. Interviews in this research were conducted with people or employees who work in the production section, namely PC (production) employees control), departments head stores, departments SMT head (PCB assembly or Printed Circuits Board), and Department head PD (production) 2.

- 3) In this research, researchers used documents such as Excel documents files list of POs that will be used as analysis data for delays in delivery of goods. Kanban card and kit set list is an example that researchers got when interviewing sources from the Inventory division.

4.2 Data Reduction

This data reduction means focusing the analysis according to needs and organizing it systematically. The data reduced at this stage can provide a detailed picture, and after that it is continued at the next stage to be presented with a picture that is easier to understand. In this case, the data obtained is data on delays in delivery of goods in 2023.

Table 2. Delay Data Delivery of goods in 2023

Data Delay Delivery of goods in 2023		
Month	Total orders	Delay orders
January	107,862	806
February	162,972	1,194
March	<i>closed</i>	<i>closed</i>
April	166,453	341
May	182,539	242
June	187,023	1,164
July	205,500	1,093
August	207,800	301
September	178,910	120
October	<i>closed</i>	<i>closed</i>
November	<i>closed</i>	<i>closed</i>
December	<i>closed</i>	<i>closed</i>
TOTAL	1,399,059	5,261

(Source: Researcher, 2024)

Based on the data in table 2, the causes of delays in goods are due to various problems, namely shortage, function failed, checker problem, and machine failed. If these problems occur, they will have an impact on other product manufacturing processes.

The cause of delays in goods is shortage, function failed, checker problem, and machine failed. These problems have an impact on the processing of other products, as seen in the status table that records recovery parts shortage, recovery function fail, recovery problem checker, and recovery machine failed.

Recovery occurs when the problem item can be reworked, such as the required material has arrived in case of a shortage. Function Failed occurs if the finished product does not function when tested, so the production department must recheck each part of the product to find damage or components that are not installed.

Recovery Function failure occurs when a problem with the product has been found and repaired, so that the product can be worked on again. Problem and machine checker Failed is a problem that occurs on the machine during the product processing process. Recovery occurs when the checker and machine have been repaired, and the product

can be processed again. Recovery affected is the impact of shortage, function failed, checker problem, and machine failed which causes other products not to be worked on on time.

Apart from data on delays in the delivery of electronic goods at PT XYZ in 2023, researchers also obtained evidence from sources in interviews. This interview was compiled by the author regarding what things hinder product delivery. Such as the obstacles expressed by the informant mother (DM) as Department Head Production Controls

"Usually because there are parts shortage, part shortage is a part that is lacking. Then there are problems with the machine when it is in use. Usually these two things happen often, which is why there is a delay in the delivery of goods."

The same thing was conveyed by the informant (IS) as Department Head Production 2,

"Usually because there are parts or materials that are lacking or in shortage. There are also machine failures, function failures, checker problems, usually we call engineering to repair the machine first"

Furthermore, the same thing was also conveyed by the informant (EN) as the Department PCB Assembly Head (Printed Circuits Board),

"It could be because there is a problem with the machine, there is a shortage of components, there is a replacement of components or materials, FA (failure analysis), namely checking whether the item is okay or not, whether the soldering is working or not."

The same thing was also conveyed by the informant (BS) as the Leader Of Inventory about what caused it to happen parts shortage,

"Firstly, human error can occur from the human side. Sometimes we forget to ask the vendor for goods or we miss it, which could be said to be careless. The second is because the vendor no longer has the material or the vendor has run out of material. Furthermore, weather and environmental factors also have an influence. "Once our container containing material from a vendor was damaged due to a rainstorm."

Of all the informants interviewed regarding the causes of delays in delivery of goods, it showed that part shortage, function failed, checker problem, and machine failed is the cause of delays in the delivery of goods.

4.3 Data Display

4.3.1 4.3.1 Pareto Diagram

At this stage, the data that has been explained in detail previously is presented in a shorter and easier to understand form. A Pareto diagram will be created from delivery delay data to analyze the percentage of delays, so that companies can use this data for evaluation.

In the first stage, the data in table 3 will be clarified. It was found that the relevant data in making a Pareto diagram was the delay information. In the second stage, a table is created containing the frequency of delays and also a description. The time period of this data is 2023.

Table 3. Frequency Lateness Delivery Year 2023

No.	Causes of Delay	Delay Frequency
1	<i>Fa (failure analysis)</i>	1
2	<i>Recovery affected by F.A</i>	1
3	<i>Function fail</i>	4
4	<i>Recovery affected by function failed</i>	2
5	<i>Recovery problem checker</i>	5
6	<i>Recovery shortage</i>	9
7	<i>Waiting program for function</i>	1
8	<i>Shortage</i>	7
9	<i>Recovery affected by quality issues</i>	1
10	<i>Problem checker</i>	2
11	<i>Affected by function failed</i>	1
12	<i>Recovery affected by S9xxx new design coils soldering issues</i>	2
13	<i>Recovery function failed</i>	1
14	<i>Recovery supplies</i>	3

(Source: Researcher, 2024)

In the third stage, data calculations were carried out and totaling the total frequency of delays, as well as carrying out cumulative calculations and obtained the following results:

Table 4. Cause Data Calculation Results Delay in 2023

No.	Causes of Delay	Delay Frequency	Cumulative Calculation	Cumulative Presentation
1	<i>Fa (failure analysis)</i>	1	1	3%
2	<i>Recovery affected by F.A</i>	1	2	5%
3	<i>Function fail</i>	4	6	15%
4	<i>Recovery affected by function failed</i>	2	8	20%
5	<i>Recovery problem checker</i>	5	13	33%
6	<i>Recovery shortage</i>	9	22	55%
7	<i>Waiting program for function</i>	1	23	58%
8	<i>Shortage</i>	7	30	75%
9	<i>Recovery affected by quality issues</i>	1	31	78%
10	<i>Problem checker</i>	2	33	83%
11	<i>Affected by function failed</i>	1	34	85%

No.	Causes of Delay	Delay Frequency	Cumulative Calculation	Cumulative Presentation
12	Recovery affected by S9xxx new design coils soldering issues	2	36	90%
13	Recovery function failed	1	37	93%
14	Recovery supplies	3	40	100%

(Source: Researcher, 2024)

Next, the data listed in the table will be processed using Ms. Excel. The following is a Pareto diagram of delays in delivery of goods based on the results of the table process using Ms. Excel.

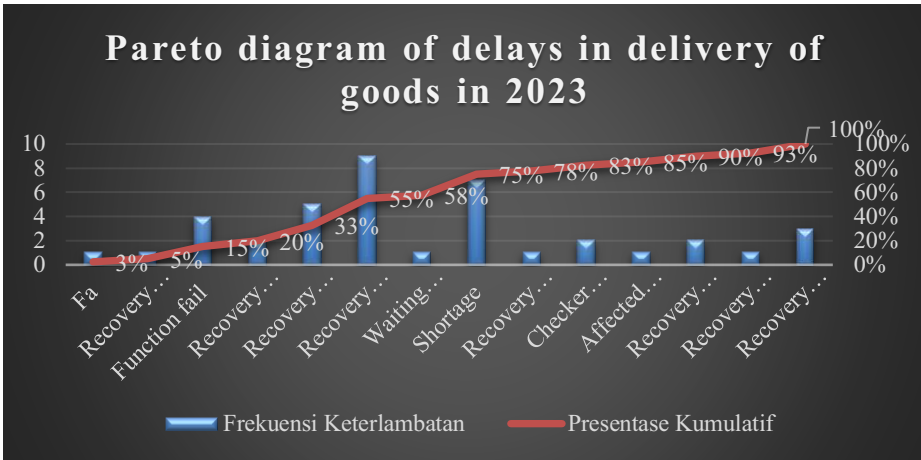


Fig.5. Pareto Diagram for Late Delivery of Goods in 2023

The Pareto diagram above, it can be seen that *recovery Shortage* is the highest impact as a cause of delays in the delivery of goods. *Recovery parts This shortage* occurs because there are materials or components that have been *in short supply* so it has an impact on other orders.

4.3.2 Fishbone diagram

The problem that the company faces is late delivery, so to determine what factors cause late delivery, observations are made on machines, the environment, materials and people (labor). These causes were obtained by direct observation in the field and status data from table 3.

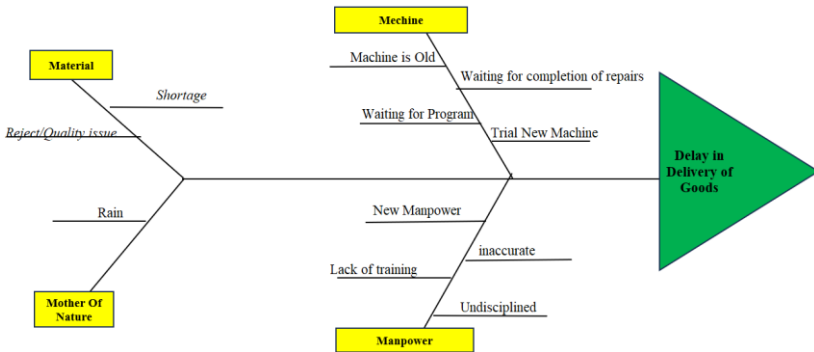


Fig.6. Fishbone Diagram of Delay Factors in Delivery of Goods in 2023

The following is an analysis of the fishbone diagram on:

1) Manpower

- a) New employees often struggle with adapting to the work environment, understanding their roles, and integrating with the team, leading to more mistakes. This is frequently due to inadequate training, which affects both new and existing workers.
- b) Employees who are not thorough can cause significant operational problems due to small mistakes that may have larger consequences. This often occurs when they become complacent and fail to double-check their work.
- c) Indiscipline among employees, such as arriving late, frequent absences, not following procedures, or missing deadlines, can cause significant operational problems.

2) Material

- a) Material shortages in manufacturing companies, caused by late supplier deliveries, market demand changes, inventory planning errors, or weather, can delay production schedules, increase operational costs, and reduce production capacity.
- b) Rejected materials are a common issue in manufacturing, caused by machine settings, operator errors, or supplier imperfections. This leads to additional costs, production delays, increased production costs, and potential declines in customer satisfaction due to compromised product quality.

3) Machine

- a) Old machines, used daily for a long time, can cause production problems due to lengthy repair times and difficulty in finding replacement parts, leading to extended downtimes.
- b) Production delays occur when machines experience errors during processing or loading. The maintenance department is called for repairs, which can take a long time. Once repairs are completed, the machine can be used again, resolving the issue.

4) Mother of Nature

Rain can disrupt the loading of finished goods, increasing the risk of work accidents and damage to goods or facilities. Weather volatility can also disrupt production schedules, leading to delivery delays and potential financial losses.

4.4 Conclusion Drawing / Verification

Based on the data obtained by researchers, it can be concluded that the delay occurred due to several factors, namely shortage, fa, function failed, checker problem, and also recovery. This data is strengthened by interviews that the author conducted with sources, while it can be concluded that delays occurred due to material and machine shortages failed. Usually if this problem occurs, it will definitely have an effect on subsequent orders. The effect is recovery parts shortage, recovery machine or checker problem, or even recovery affected.

Then, based on the Pareto Diagram prepared by the author, it can be seen that the most frequent delays in deliveries in 2023 at PT XYZ are due to recovery parts shortage. As explained, recovery parts Shortage occurs when problematic goods or missing materials have arrived so that the product can be reworked. This means that the material is already in short supply so that production cannot work on the product before the material arrives and is supplied to the line. Furthermore, based on the fishbone diagram prepared by the author, it can be concluded from the four delay factors:

- 1) Material: namely the occurrence of the part shortage or lacking material.
- 2) Machine: namely because the machine is old, waiting for repairs to be completed, trial new machine.
- 3) Manpower lack of training, new workforce, less thorough.
- 4) Mother Of Nature: occurrence of rain, unpredictable weather factors.

Most significant impact regarding delays in the delivery of goods at PT what (what must be repaired), who (who is responsible for implementing the improvements), where (where the improvements are carried out), when (where the improvements are carried out), why (when the improvements are carried out), and how (how the implementation of the improvement process will be carried out).

Table 5. Shortage Problems Depth 5W+1H

Indicator	Material
<i>What ?</i> (What should repaired ?	1. Lack of material 2. Material reject / quality issue
<i>Who ?</i> (Who) is responsible answer to implementation repair ?	1. Material shortages can occur become not quite enough answer <i>store leader</i> and management <i>inventory</i> 2. <i>Material reject / quality issue</i> can become not quite enough answered the <i>store leader</i> , manager Procurement , <i>QC engineering</i> , and vendors as party material seller
<i>Where ?</i> (Where) repair will done ?	shortages and <i>material rejects / quality issues</i> can do repair in : 1. Procurement and Supplier Management : Evaluation Supplier : Assess return performance suppliers and search supplier possible alternatives provide quality materials high and reliable. Agreement Quality : Establish agreement more quality strict with supplier For Ensure materials are received fulfil required standards . 2. Inventory Management : Stock Management : Optimizing management inventory For ensure availability of sufficient materials and reduce risk lack. Safety Stock : Determines level stock safety (safety stock) is adequate For anticipate fluctuation demand and supply. 3. Quality Control : Material Inspection : Improve procedure Incoming material inspection For detect and eliminate defective materials before used in production.
<i>When ?</i> (When) repair the will done ?	1. Quick after problem identified , team must do analysis root reason For understand source problem. 2. Internal audit of procurement , inventory and production processes For identify areas of need repair. 3. Give information or discussion with supplier about matter that's it in a way Keep going continuously when find problem this Again.
<i>Why ?</i> (Why should done repair ?	shortages and <i>material rejects/quality issues</i> If happen so lateness delivery will happen Keep going continuous improvement must done For increase quality products that PT XYZ sells For increase satisfaction customers , besides That For reduce cost and time in progress.
<i>How ?</i> (How) implementation plan repair ?	1.Contact the vendor regarding matter the 2.Do improvements to parts procurement for example with look for supplier alternative For reduce risk dependency on one supplier. 3. Enhancement inventory management with increase safety stock. 4. Control quality more strict with material inspection.

(Source: Researcher, 2024)

5 Conclusions

After analyzing shipping delay factors using Pareto and fishbone diagrams, companies can easily find a solution. From the Pareto diagram, it is identified that recovery parts shortages, material stocks that often run out, and machine problems are the most frequent causes of delays. The fishbone diagram reveals that running out of materials, indiscipline and carelessness of the workforce, as well as machines that are old and require constant repair are the main causes of delays. Therefore, companies need to focus on these factors: ensuring material stocks with regular physical checks and preparing reserve stocks, providing special training to the workforce, and allocating a budget for replacing old machines in the following year.

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