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Analysis of the Causes of Discrepancy of Stock Taking of Spare Parts in Spare Parts Warehouses Using the Dmaic Method

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Abstract
PT. XYZ, a manufacturing company specializing in scanners and printers, experienced a significant discrepancy between the actual part count and the system data during its 2024 stock opname. A root cause analyze using the DMAIC methodology identified errors in the returned parts process from production as the primary issue. This discrepancy resulted in a substantial financial loss of Rp.271,810,000. By implementing more effective work instructions and standard operating procedures, the discrepancy was reduced by (Rp.176.094.963), resulting in cost savings of (Rp.95.715.037) for the company.

Keywords: Stock Opname, DMAIC, Warehouse Management, Analyze.

Introduction

PT. XYZ is a company engaged in manufacturing electronic components with the main products being printers and scanners. The company routinely carries out stock taking activities every six months. This activity aims to maintain the optimal availability of goods stock at PT. XYZ. In every industry, inventory management is an important aspect that must be considered. Inventory plays a role as the main support for the smooth production process to the delivery of goods to consumers. Keeping the right amount of stock at an optimal level is a challenge that many companies, especially those with complex supply chains, often face.

The problems faced by PT. XYZ is the difference between the number of stock of goods recorded in the system and the actual number in the company. This difference was identified after stock taking activities were carried out in the first six months of 2024. Stock taking is the process of calculating the number of goods in a warehouse and matching them with inventory bookkeeping records. (Wulung et al., 2014, p. 23) The stock taking process is carried out manually, including counting small parts, such as screws, sliders, porous pads, and so on, to large and high-value parts, such as Main Board Assy, PCB Panel, Wi-Fi Module Card, and others.

Based on the background that has been explained, we conducted an analysis to identify the factors that affect the difference in stock between the actual amount and the data in the system at PT. XYZ. This analysis uses the DMAIC (Define, Measure, Analyze, Improve, and Control) method. DMAIC is a framework used to optimize products and business processes and assist companies in identifying the root cause of problems that occur. Therefore, the DMAIC approach is applied in the analysis of stock inconsistencies resulting from stock taking at PT. XYZ to overcome these problems. The purpose of this analysis is to find out the cause of stock discrepancy in PT. XYZ and make improvements based on the identified causes.

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Stock Opname

Stock taking is the activity of calculating the physical inventory of goods in the store or warehouse. In general, this activity is carried out to find out exactly and accurately about the compatibility of goods with internal bookkeeping records. (Annisa et al., 2021, p. 3)

DMAIC Method

The DMAIC method is a framework used to optimize products and business processes, as well as help companies identify the causes of problems that occur (Cici & Bambang, 2024, p. 1036)

Warehouse Management

Warehouse management is a series of processes that aim to optimize the use of storage space, minimize damage to goods, and ensure the availability of goods according to needs. (Adiguna et al., 2017, p. 612)

Analysis

Analysis is the first step before we write a research report. This stage involves breaking down the problem into small parts and then studying the parts and their relationships to gain a complete understanding. (Umar, H. 2005, p. 42).

Method

Research methods are a systematic approach to collecting, analyzing, and interpreting data to answer research questions or test hypotheses. (Singarimbun, M. & Effendi, S. 1995). The method used in this study is to directly review the process of storing activities (the activity of returning leftover goods to the warehouse and recording the data in the inventory system) directly, as well as looking at the actual condition of the goods in the warehouse and checking the data in the existing system. The research time we conducted lasted for 2 months to see the problem and carry out the improvement process as well as see the results of the improvement process that we carried out.

DMAIC

We use the DMAIC method to find the source of the problem and solve the problem that occurs in PT. XYZ.

a) Define

At this stage we define the problems that occur at PT. XYZ and looking for the source of the problem. In this case, it is the difference between the number of goods in the system and the actual number of goods in the company.

b) Measure

The results of our quantitative analysis show that the difference in the number of goods has resulted in financial losses, indicating the importance of improving the inventory control system to prevent greater losses in the future.

c) Analyze

Based on the in-depth analysis we conducted, it can be concluded that the losses experienced by the company are caused by several main factors, namely (Data entry errors, Inaccuracy of operators, suboptimal training quality). These findings provide a strong foundation for us to formulate a comprehensive improvement strategy.

d) Improve

Through an in-depth analysis of existing work processes, we have redesigned the company's work procedures with a focus on optimizing efficiency. The result is the preparation of new IK and SOP, which is expected to improve the productivity and quality of the company's output

e) Control

To ensure the continuity of the improvements that have been made, we will implement a continuous monitoring system and instill a culture of continuous improvement throughout the organization. Through continuous training and effective feedback mechanisms, we are confident that we can achieve continuous performance improvement.

Variables Studied

This study aims to measure the level of component discrepancy and evaluate the efficiency of the component return process at the storing stage. The variables to be analyzed include the total number of components that experience non-conformities, the frequency of returns, and the percentage of returns to total production.

Data Collection Techniques

The data collection methods / variables used in this study are:

a) Observation

Observation is a data collection technique that is carried out through observation, accompanied by recording the state or behavior of the target object. (Hasibuan, M,P et al., 2023, p. 9)Through participatory observation, we will conduct a comprehensive evaluation of the component storage and return process, focusing on cycle time, data accuracy, and the physical condition of the components.

b) Data sampling

The step taken by the researcher before collecting data is to determine the subject. The subject is an individual who participates in the research from which data will be collected (Hadjar, I. 1996) Sampling is carried out on several items that have a high value or high transaction frequency. The data from the system is then compared with the results of physical calculations carried out by the audit team.

c) Field Studies

Conducting interviews is a technique that is carried out by asking directly to parties related to the research to obtain the information needed. (Fauzan, A. & Ma'arif, S. 2022, p. 85).

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Result and Discussion

The DMAIC method was carried out in this research in the process of discrepancies that occur in warehouses, warehouses are an important part of the company. (Fitriaji, A,A. & Domodite, A. 2022, p. 6). The DMAIC method consists of 5 stages, namely: the problem definition stage (Define), the problem measurement stage (Measure), the analysis stage (Analyze), the improvement stage (Improve) and the control stage (Control) as follows:

1. Define

Based on the results of stock taking in 2024 at PT. XYZ, it was identified that there was a significant disparity between the inventory data recorded in the warehouse system and the physical number of components in the warehouse. This inaccuracy of inventory data has the potential to cause various problems, such as errors in production planning, shortage or excess inventory, and wasted costs due to ordering components that do not meet needs. This study aims to identify the root cause of these problems through an in-depth analysis of the component turnover process in PT. XYZ, with the hope of formulating effective solutions to minimize financial losses and improve the company's operational efficiency.

2. Measure

To measure the amount of losses experienced by the company, we take samples from several parts that have a difference in the number of parts found to find the level of difference. The following is data on the number of discrepancies in 2024:

Table 1. Discrepancies Rate Data for the First Half of 2024

Part Name	Stock System	Stock Actual	Discrepancies
Main Board Assy	1.120	923	17,58%
PCB Panel	1.200	1.131	5,75%
Module Card Wifi	13.500	11.917	11,72%
FFC 16 Pin	22.500	20.588	8,49%

The above data is calculated using the following formula:
Margin rate (%) = stock actualstock system×100%
According to the data above, it can be calculated that the losses experienced by the company are 43.54%.

Table 2. Total Discrepancies Loss Data for the First Half of 2024

Part Name	Price per unit	Total Loss
Main Board Assy	IDR 250,000	IDR 49,224,000
PCB Panel	IDR 100,000	IDR 69,000,000
Module Card Wifi	IDR 100,000	IDR 158,300,000
FFC 16 Pin	IDR 30,000	IDR 57,360,000

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The above data is calculated using the following formula:
Total Loss = price per unit ×number of system stock × Discrepancies Rate (%)100
According to the data above, the company suffered a loss of Rp. 271,810,000 in 4 parts that experienced the most discrepancy in 2024.

From this analysis, we also get existing improvisation/improvement data about the level of difference found in the stock taking process carried out by the company:

Table 3. Discrepancies Rate Data for the Second Half of 2024

Part Name	Stock System	Stock Actual	Discrepancies
Main Board Assy	1,535	1,489	2.99%
PCB Panel	1,867	1,689	9.53%
Module Card Wifi	12,342	11,189	9.34%
FFC 16 Pin	35,292	34,239	2.98%

The above data is calculated using the following formula:
Margin rate (%) = stock actualstock system×100%

Efforts to improve the recording system and increase the frequency of stock taking have yielded positive results. Data analysis shows that there is a significant decrease in the discrepancy rate, which is 18.7%. The current discrepancy rate is recorded at 24.84%, indicating an increase in the accuracy of the company's inventory data.

Table 4. Total Loss Data for the Second Half of 2024

Part Name	Price per unit	Total Loss
Main Board Assy	IDR 250,000	IDR 11,474,125
PCB Panel	IDR 100,000	IDR 17,792,510
Module Card Wifi	IDR 100,000	IDR 115,274,280
FFC 16 Pin	IDR 30,000	IDR 31,551,048

The data above is calculated using the following formula: IDR 176,091,963
Total Loss = price per unit ×number of system stock × Discrepancies Rate (%)100

With efforts to improve the recording system and increase the frequency of stock taking, the company managed to reduce the discrepancy rate from 43.54% to 24.84%. This has an impact on improving the efficiency of inventory management, thus successfully reducing financial losses from IDR 271,810,000 to IDR 176,091,963, or equivalent to savings of IDR 95,718,037.

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From the data obtained, it is known that the losses experienced by the company are reduced through the following data:

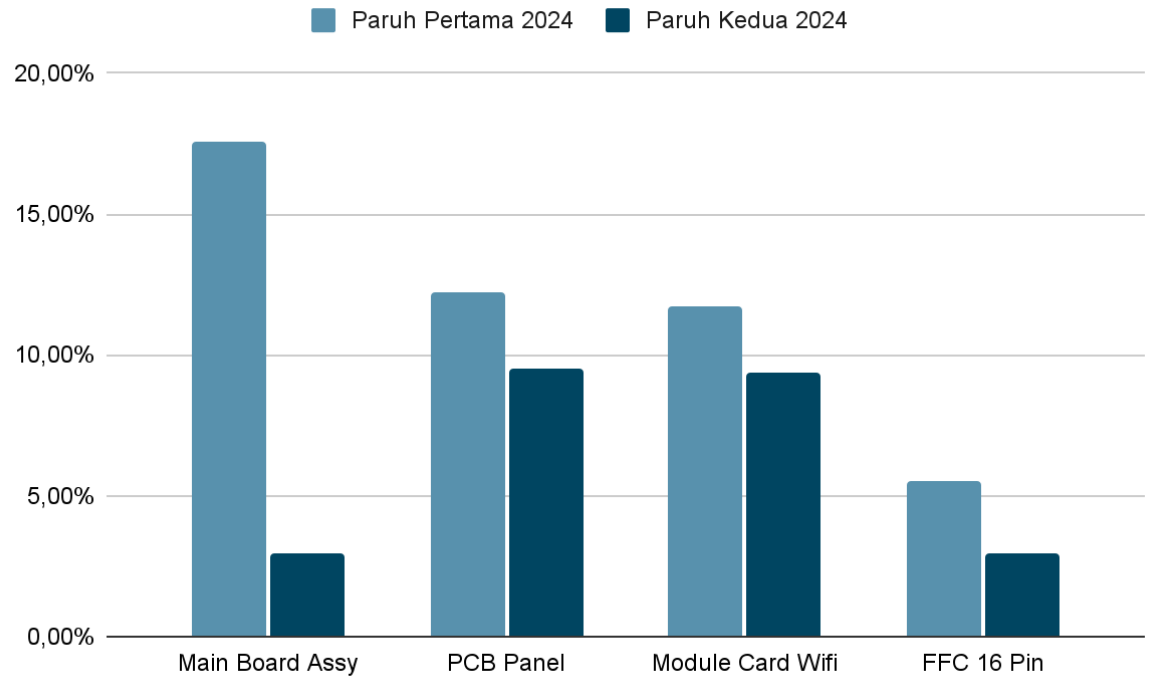

Figure 1. Figure 1 : Comparison Chart of the Degree of Discrepancies of PT. XYZ in 2024

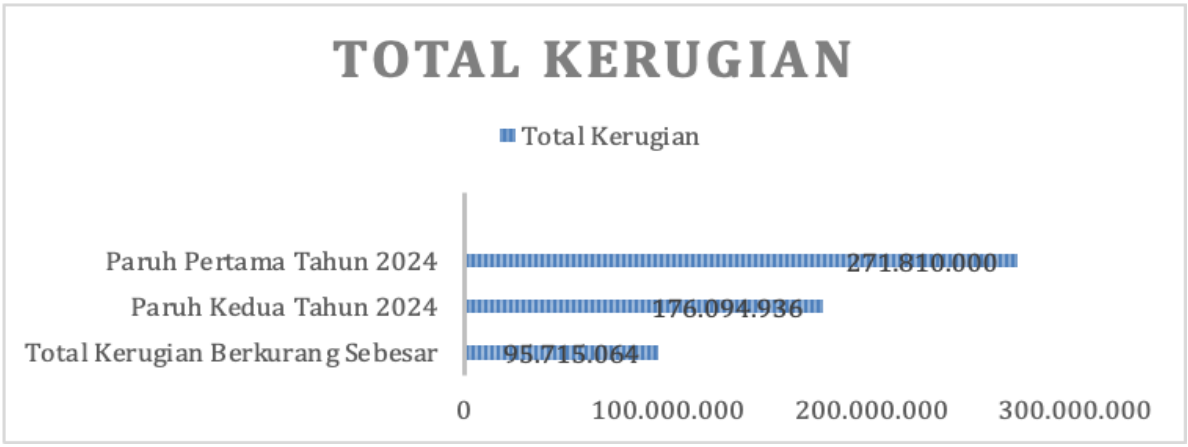

Figure 2. Graph 2: Diagram of the Results of First, Second Half Losses and Total Reduced Losses.

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3. Analyze

In this stage, we directly analyzed the storage process at PT. XYZ.
We found several factors that cause discrepancy as well as factors that cause discrepancy in PT. XYZ. :

a. Production Operators: Lack of training that makes production operators less understanding how to carry out the storing process, resulting in wrong part codes or inappropriate goods, as well as wrong quantities in the parts to be stored.
b. Storing / Storing operators: incorrectly entering data into the system (human error) and not rechecking after receiving parts from production, thus causing data inconsistencies, which causes discrepancies.
c. Warehouse Operator: Do not recheck the parts received from storing, which may cause the missing parts to be incorrectly coded or wrong in the actual number of parts.

4. Improve

Production Operator: Create a WI to carry out the process of counting parts before being stored and create a storing tag that contains details of the parts to be stored such as:

STORING TAG			
Date	08/09/2024		
Partcode	516507290		
Part name	Module Card Wifi		
Line	B11		
No	Pcs	Packing Bag	Total Pcs
1.	70	2	140
2.			
3.			
4.			
Total			140

Production	Storing
Tyna	Arwen

Figure 3. Restoring Tag Before Improvement

STORING TAG			
Date	08/09/2024		
Partcode	516507290		
Part name	Module Card Wifi		
Line	B11		
*Noted : Jika ada perbedaan perhitungan harus di ulang			
No	Pcs	Packing Bag	Total Pcs
1.	70	2	140
2.			
3.			
4.			
Total			140

Production	Leader	Adjustment	Storing
Tyna	Wazri	APPROVED	Arwen

Figure 4. Restoring Tag After improvement

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Storing operator: Every time a component is received from a production operator, the storage operator is required to re-verify the number of components physically and compare it with the number listed on the restoring tag. If a discrepancy is found, the storage operator must create a non-conformance report that includes details of the components, the different quantities, and the type of non-conformity found. This report is then submitted to the production leader for further investigation and corrective action, such as additional training for production operators or adjustments to the data recording system.

Table Record Wrong Actual Production								
No	Partname	Part Code	Vendor	Quantity	Actual Quantity	PIC Production	PIC Storing	Adjustment
1.	Mainboard Assy	212789000	PT. SMC	30	32	Epan	Dwi	Wrong Quantity
2.								
3.								
4.								

Figure 5. Storing Component Non-Conformity Recording Data Form

Warehouse Operator: To ensure the accuracy of inventory data, the warehouse operator will verify every incoming shipment of goods. This verification includes checking the conformity between the data on the shipping document and the physical condition of the goods. As a complement, physical counting activities of goods are carried out on a daily basis to detect inconsistencies early and prevent data recording errors.

Check Sheet Storing						
No	Part Name	PartCode	Quantity	Location	Leader Location	OK/NG
1.	Module Card Wifi	516507290	70	B2 C002	Andreas Silitonga	OK
2.						
3.						

Figure 6. List Data Check Sheet Storing

Check Sheet Daily Stock Opname						
No	Part Name	Part Code	Quantity	Actual Quantity	Block B	OK/NG
1.	Module Card Wifi	516507290	70	70	B2 C002	OK
2.	Main Board Assy	212789000	30	31	B2 C003	NG
3.						

Figure 7. Check the Daily Stock Taking Data List

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5. Control

Implement various procedures to ensure that all stages of work are carried out in accordance with applicable standard operating procedures, so that consistent performance is obtained. Here are the various controls carried out by the author:

a) Production Operator: To ensure the accuracy of the data, the operator must ask the leader to verify through sampling the results of the calculation of leftover production goods. The leader's approval will be marked with a signature on the shipping label as confirmation that the calculation results have been verified.
b) Storing operator: Giving an OK stamp to the restoring tag that has been checked (number of parts, writing part names, and writing part codes) in accordance with (IK) Work Instructions to indicate that the verification process has been carried out by the storing operator and meets the set standards. This is also a form of visual and administrative documentation to ensure that the soring process has been carried out correctly in accordance with the applicable Ik and SOPs.
c) The procedure for storing goods in the warehouse will be revised. All storage operators are now required to recalculate 100% of all goods to be stored. This change was made to improve the reliability of inventory data and comply with the new standard operating procedures.
d) Warehouse Operators: To achieve performance consistency, all warehouse operators will be given additional work instructions (IK) which require regular checks on check sheet storage and the implementation of daily stock taking. This step aims to improve the accuracy of inventory data and the efficiency of the storage process.

Conclusion

Based on the author's analysis, it can be concluded that the factors causing the discrepancy that occurred PT. XYZ includes a lack of training that makes production operators less understand how to carry out the storing process, errors in entering data into the system by storage operators, and not rechecking by warehouse operators. In this case, the author made several improvements to minimize the losses experienced by the company due to discrepancies that occurred in the company. For example, making WI to carry out the process of counting parts before storing, the storage/storing operator is obliged to physically recalculate the number of components and compare them with the number listed on the restoring tag, requiring the warehouse operator to verify every incoming shipment of goods.

The author also compared the level of discrepancy experienced by companies after improvements. This comparison was carried out by again sampling data on stock taking activities carried out in the second half of 2024 carried out by PT. XYZ. It can be seen that the level of discrepancy in the 4 parts that experienced the highest level of discrepancy in the first half of 2024 experienced a decrease in the level of discrepancy. This proves that the changes made by the author have a significant impact on reducing the losses experienced by the company. Although, the level of discrepancy decreases. However, there is still discrepancy that occurs in the company. In this case, it can be suggested that the author can identify other causes of discrepancy in the number of parts in the system and the actual number of parts in the company. It is hoped that in the future, the author can conduct a more in-depth analysis of the causes of the discrepancies that occurred at PT. XYZ.

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