Inventory management efficiency analysis: A case study of an SME company

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Abstract. The research aims to examine factors that affect inventory mismanagement in a Small Medium Enterprises (SME), which is a market leader in the Heavy Equipment Spare part Industry. Despite its status as market leader, the company deals with various inventory problems, for examples slow-moving stocks, delivery delays to customers, and so forth. Those problems, at the end, may reduce company’s profit. In order to determine the main factors, this study applies quantitative and qualitative methods. Quantitative methods, specifically Pareto diagram and Inventory Turnover Ratio (ITR), are mainly used to evaluate sales and inventory management. ITR is affected by spare part quantity, warehouse area used, and the material amount. The top five ITR ratings are examined further through observation, interview, and questionnaire techniques. Meanwhile, the qualitative method is applied to evaluate the company’s inventory information systems, procedures and coordinations among departments, and human resources. Our findings suggest that the unintegrated company’s information system and lack of qualified human resources are the main factors affect inefficient inventory management. The research benefits to industry by suggesting the importance of information systems and human resources to inventory management. As for academics, this research enriches inventory management literature.

1. Introduction

Finished goods are one of the most important things for trading companies to meet customer demands and thus to increase customer satisfaction [1]. They must be managed efficiently and effectively [2]. Wiryawan explains that growth companies must concern with value-adding activities such as in production and procurement in order to increase companies’ competitiveness [3]. One of the important activities in production and procurement is inventory management. Fail to manage inventory properly is likely to cause delays in production, unsatisfied customers, or working capital curtailment [4].

Inventory refers to the goods or materials used by a firm for the purposes of production and sale. Usually, nearly 60% of operational cash is allotted for the inventory in project [5]. Thus, good inventory management is compulsory to maintain material at optimal costs. Companies need to implement better internal control, for example establishing policy, building employee capacity, preparing planning, and so forth in order to increase inventory cost efficiency. Five factors affect inventory policy decisions [6-7], namely system structure, market characteristics, lead times, and costs.
By performing a performance measurement, companies may figure out how effective and efficient their inventory management. Prior literature suggest that the measurement of management efficiency and effectiveness can be done by using inventory turnover ratio [8,9]. Raoa and Raob states that the inventory turnover ratio measures the number of times a company sells its inventory during the year [8]. A high inventory turnover ratio indicates how good a company sale its products.

The biggest challenge in inventory management is efficiency. Okwaro, Iravo, and Berut, who conducted a study at the Kenya Seed Company, found that incompetent procurement staffs, poor inventory audit practice, outdated procurement system systems, and long bureaucratic procedures caused management inefficiency [10]. Hanson, Ackah, and Agboyi identify six activities that can improve inventory management efficiency [11]. They are top management commitment, ABC analysis, other logistics activities performance improvement, better demand forecasting, inventory management software, and postponement involves modifying or customizing products after the main manufacturing process is complete.

One of methods used to analyze the factors that affect inventory management inefficiency is fishbone diagram. Bose applied fishbone diagrams to evaluate supply chain and business processes in a hospital [12]. He found that fishbone diagram is a helpful method to examine factors that cause the occurrence of management inefficiency.

2. Research method
This study applies case study method to evaluate the practice of inventory management at PT ABCD. PT ABCD is a foreign company engaged in the heavy equipment industry for Excavator machines and Asphalt Pavers. Its machine excavator manufacturing and assembly plants is in Karawang, West Java. Meanwhile, the company still imports Asphalt Paver from Japan. The business scope is spare part sales and after-sales services.

Despite its promising performance, the company is struggled with its inventory management. Its inventory turnover is lower compare to its competitors. The inventory planning is not aligned with the sales planning either. As a result, the company suffers higher maintenance cost and frequent delivery delay.

In applying case study method, we combine qualitative and quantitative approach which allow us to collect data with greater depth. We conducted observation, interview, and document analysis when we evaluate the inventory management. The interviewers are 5 key personals (1 manager and 4 supervisors). Their job descriptions are closely related with inventory management. The data collection was done in December 2018 – January 2019.

As shown in figure 1, we apply ABC analysis and Pareto diagram to classify the crucial spare parts that have to be managed. This is consistent with previous researches by Lancioni and Howard [4] and Karthick et al. [13], that used ABC analysis and Pareto diagram for inventory management. ABC analysis classifies the items into three levels, namely high, medium and low. Inventory turnover is calculated by using the following formula:

\[
\frac{\text{Cost of Good Sold from Stock Sales during the Past 12 Months}}{\text{Average Inventory Investment during the Past 12 Months}}
\]  

(1)
3. Result and discussion

Our study finds that PT. ABCD manages its inventory inefficiently. The first indicator is the irregular inventory layout. There are significant amounts of inventories that are purchased more than what the company has planned. Those inventories have been kept in the warehouse for more than its normal turnover period. By using Pareto diagram (ABC), this study finds three material categories which significantly affect the efficiency of spare part management (see Table 1).

| No | Category               | Amount | Quantity | Space |
|----|------------------------|--------|----------|-------|
| 1  | Filter                 | 3      | 3        | 1     |
| 2  | Lubricant oil          | 12     | 11       | 5     |
| 3  | Undercarriage          | 5      | 8        | 7     |
| 4  | Seal, O-Ring & Belt    | 2      | 1        | 3     |
| 5  | GET                    | 11     | 6        | 8     |
| 6  | Electrical Parts       | 7      | 7        | 4     |
| 7  | Engine Parts           | 1      | 2        | 2     |
| 8  | Attachment             | 4      | 10       | 11    |
| 9  | Hyd Component          | 8      | 15       | 13    |
| 10 | Hyd Inner Parts        | 6      | 9        | 9     |
| 11 | Cabin                  | 15     | 13       | 12    |
| 12 | Common Parts/Others    | 14     | 4        | 6     |
| 13 | Swing Device/Motor     | 10     | 12       | 14    |
| 14 | Excavator              | 9      | 5        | 10    |
| 15 | Paver                  | 13     | 14       | 15    |

The Pareto result started from one until 15. Those numbers are the highest numbers that reveal the most significant potential factors to total inventory. Based on data above, the three most significant factors are engine parts, seal (O-Ring & Belt), and filter.
The qualitative analysis is conducted by applying the fishbone diagram and why and why analysis to determine the main factors that cause inventory cost inefficiency. Figure 2 depicts the fishbone diagram at Company PT ABCD. There are six main factors derived from field observation, which are equipment, process, people, materials, environment, and management.

![Fishbone Diagram](image)

**Figure 2.** Fishbone diagram in company PT. ABCD.

Each factor is described below:

3.1. **People**
Employees who are assigned to manage inventory activities do not have any formal or informal education or training in inventory management. As a result, employees are less competent to manage material in the warehouse. Spare parts are located only based on empty (unused) space which cause inventories scattering in many places. At the end, it is very time consuming to find particular inventories when needed.

3.2. **Process**
PT ABCD does not have any formal Standard Operating Procedure related to inventory management that involves coordination among departments. Every department tend to work independently rather than as a team. These circumstances are worsening by unintegrated information system. Most of information process are done manually. As a result, the company tend to respond slowly to any customer-demand changes.

3.3. **Equipment**
Integrated system is crucial in supporting collaboration among departments so the company may respond customer demands faster. Unfortunately, PT. ABCD does not develop enterprise resource planning that may support their decision-making.

3.4. **Material**
PT ABCD sells imported spare parts that require longer delivery time. PT. ABCD frequently orders wrong inventory. As a result, when the spare parts ordered to supplier in terms of quantity and/or specification do not match with customers’ orders, the delivery to customers are delayed significantly. Numbers of customers’ complain is above the company’s expectation every month.
3.5. Environment
Incorrect spare part layout causes many non-valued added activities and time inefficiency. This is caused by employees’ lack of ability to manage the warehouse.

3.6. Management
At the management level, the head of department prepares sales planning unsystematically. Since they do not maintain customer data regularly, the company finds difficulty to analyse customers demand. As a result, the deviation between the sales planning and the actual sales are significant at each period.

4. Conclusion
The research aims to evaluate factors that affect inventory mismanagement in a Small Medium Enterprises (SME). Based on the above findings, this study concludes that the main factors inventory cost efficiency is the unintegrated company’s information system and lack of qualified human resources. Integrated information system is very important to provide real time information for management. It also makes better coordination among departments. The implementation of integrated information system must be supported with competent human resource. Trainings and retaining competent staffs are necessary. For future studies, we suggest to examine the optimal inventory quantity and lead time delivery to maximize efficiency and customer satisfaction.

Acknowledgment
We are thanking to our head of faculty who always support our research and our university to give us funding to finish our research and join the international conference in Bali.

References
[1] Kempa E 2009 Stock Management in A Manufacturing and Trading Company Advanced Logistic Systems Journal 3 226-230
[2] Wagner S M and Lindemann E 2008 A case study-based analysis of spare parts management in the engineering industry Production Planning & Control: The Management of Operations 19(4) 397-407
[3] Wiryawan B A 2019 Institutional Change and the Impact Towards Innovation Competitiveness in the Industrial Development of the Batam Free Trade Zone Indonesian Journal of Computing, Engineering and Design 1(1) 9-16
[4] Lancioni R A and Howard K 1978 Inventory Management Techniques International Journal of Physical Distribution & Materials Management 8(8) 385-428
[5] Subramani T, Nair V B, David A, Ghouse B M and Kumar N S 2017 A Study of Inventory Management System in Construction Industry International Journal of Application or Innovation in Engineering & Management 6(5) 304-311
[6] Muckstadt J A and Sapra A 2010 Principles of inventory management: when you are down to four, order more (New York: Springer)
[7] Howard K 1984 Inventory Management in Practice International Journal of Physical Distribution & Materials Management 14(2) 3-36
[8] Raoa C M and Raob K P 2009 Inventory Turnover Ratio as A Supply Chain Performance Measure Serbian Journal of Management 4(1) 41-50
[9] Reynolds D 1999 Inventory-Turnover Analysis: Its Importance for On-site Food Service SAGE Journals 40(2) 54–58
[10] Okwaro F, Iravo M and Berut Z 2017 Factors Affecting Inventory Management Efficiency in Kenya Seed Company, Kitale Branch, Kenya International Journal of Recent Research in Commerce Economics and Management 4(1) 19-39
[11] Hanson O-Y, Ackah D and Agboyi M R 2015 Assessing the Impact of Efficient Inventory Management in on Organization International Journal of Advanced Research in Computer
[12] T Kanti Bose 2012 Application of Fishbone Analysis for Evaluating Supply Chain and Business Process- A Case Study on the ST James Hospital *International Journal of Managing Value and Supply Chain* 3(2) 17–24

[13] Karthick M, Karthikeyan S and Pravin M C 2014 A Model for Managing and Controlling the Inventory of Stores Items based on ABC Analysis *Global Journal of Researches in Engineering: G Industrial Engineering* 14(2) 1-6