Planning to Increasing Production Flexibility on Highest Unmatching Ratio Products in Automotive Company with DMAIC Approach

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Abstract. This study aims to increasing production flexibility on highest unmatching ratio products in an Indonesia company. This study focuses on the problem of an inability to absorb orders fluctuations by dealer or end customer at one of Indonesia's leading automotive companies. If it is not solved, it will potentially causes cancelation order. Therefore, the necessary improvements in order to increase the production flexibility of the company. Method used in this research is DMAIC (Define, Measure, Analyze, Improve & Control) in way to get the right solution. Improvements will have an impact on opportunity cost and unmatching ratio. In this study, absorption scheme fluctuations order on a weekly basis in the form of WOC (Weekly Order Change) with adding a safety stock of unique part by using Q-model calculations. The results obtained from this study is the profit as the opportunity cost IDR 431,635,851 and unmatching ratio decrease from 4.9% in before condition become 1.2% in after condition.

1 Introduction

Nowadays competition in the industries or companies requires a companies to improve performance or to innovate on an ongoing basis in order to survive. Therefore industries must be focus to face up industry 4.0 became challenge each industry to improve performance and output company must be reached. So companies must be innovate in all areas to improve competitiveness. If they are not able to adjust to the situation will decline or allow the company will go bankrupt. Likewise with automotive companies need to increase their competitiveness.

Business processes within an automotive company can be divided into three major, such as sales and marketing, manufacturing, ordering and shipping. The first area is the sales and marketing functions to market the product and deal directly with the dealer, before product to end customer. Area ordering and shipping which starts from suppliers to the process of unpacking. Automotive companies are in manufacturing area where the production. In this area, often encountered major problems associated with the production flexibility of

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automotive companies. This problem is an inability to absorb fluctuations in orders placed by a dealer or end customer. This caused a difference or gap (unmatching order) between what is available on dealers with what is required by end customers.

Case study this research at one of big automotive industry in Indonesia. This company has the five models of cars produced for local markets, Model 2 has the highest unmatching order of 4.9%. So this research will focus on the Model 2 only. If it can't be overcome, it would potentially occur cancelation order. In the competitive automotive industry increasingly stringent, customers can easily move to another brand. With the problems described above and through the journals sources, this study offers an increased production flexibility of automotive companies that can also be used as a competitive weapon in manufacturing firms (Awwad, 2008). It will increase production flexibility and can decrease unmatching ratio so that the potential cancelation orders can be minimized or even eliminated. If the value of unmatching ratio decreases, it will be able to improve customer satisfaction in terms of waiting time to get the product, it would also have an impact on the company profitability.

This research focused on finding solutions to these problems. The method used in this research is DMAIC (Define, Measure, Analyze, Improve, Control) to get the right solution. DMAIC is a methodological approach to problem solving that includes key improvement measures sequentially. Therefore, this study was entitled "Planning to Increasing Production Flexibility on Highest Unmatching Ratio Products in Automotive Company with DMAIC Approach".

2 Literatur Study

2.1 Toyota Production System

Toyota Production System is triggered by Saichi Toyoda, Kiichiro Toyoda and Taiichi Ohno of Toyota Motor Corporation as a physical embodiment, or way, to achieve the ultimate goal of the six requirements with cost reduction (Monden, 1998). Basically, the main purpose of the TPS is speeding up time by way of the elimination of waste. TPS philosophy used throughout Toyota Manufacturing and affiliates worldwide. In addition, the term TPS is also known by another name, Lean Manufacturing. The main features are reflected in the two pillars of JIT and Jidoka and at the base of the standardized work and kaizen.

2.2 Flexibility

Flexibility plays a significant and important role in the preparation, implementation, and monitoring both for manufacturing and operations strategy (Awwad, 2008). This is why flexibility becomes a strategic weapon in various manufacturing companies. Flexibility is applied in a company (manufacturing flexibility) will make a company more efficient and effective in the face of rapid environmental change. Manufacturing flexibility emerged as a competitive weapon that should be considered the result by many users flexibility, such as the need to change the design of products, shortening product life cycle, using the strategy of change, and cope with uncertainties such as machinery, technology, customer demand, and expectations of the customer (Awwad, 2008).

2.3 Inventory

Inventory is a general term that indicates anything or organizational resources stored in anticipation of the fulfillment of the request (Rangkuti, 2004). In inventory system demand can be divided into two: deterministic and probabilistic. In this study, demand is probabilistic quantity is not known with certainty. Probabilistic demand encourages companies to conduct proper planning inventory control based on the total cost of inventory is the smallest of total accumulation purchase costs, the cost of the message, save costs, shortage costs, and transportation costs. In practice the logistics system, transportation costs include fixed and variable costs (Burhan, 2010).

2.4 Q-model

Q-Model method known method with fixed order quantity models. An inventory control model in which the requested amount is fixed and the purchase was triggered by the decline of inventories to certain inventory level. The method is widely used in Define how many economical to do for ordering is a method of EOQ (Economic Order Quantity). EOQ and its variations are still widely used in industry for inventory management for this type of demand-free. Formulation Q in which an Economic Order Quantity (EOQ):

$$T = \sqrt{\frac{2 \times D \times S}{H}} \quad (1)$$

The formulation of safety stock is determined by calculation:

$$SS = Z \times \sigma \times \sqrt{LT} \quad (2)$$

The formulation of the reorder point is determined by calculation:

$$ROP = (D \times LT) + (Z \times \sigma \times \sqrt{LT}) \quad (3)$$

2.5 Six Sigma & DMAIC

Six Sigma and the DMAIC methodology looks like the last generation of approaches to generate improvements, the addition of the concepts, methods, tools, and remove restrictions on the identification (Snee, 2010). DMAIC approach can be defined as a structured repair procedure (Cunha & Dominguez, 2015). Basically, the steps in the DMAIC is all about improving processes with a key measurement in business. The key is to use the tools, techniques, and calculations can help. So the steps DMAIC is offered as a road map but also flexible in its application. DMAIC improvement in the cycle is the current primary tools we will use Six Sigma projects (Gejdos, 2015).

3 Research Methodology

This study was developed with the DMAIC method that consists of five stages, namely Define, Measure, Analyze, Improve, Control (Carretero, Rosa, & Sanchez-Rodas, 2016). DMAIC phases in this study are described in Table 1.

Table 1. DMAIC Phases

Phase	Input	Process	Output
Define	Problems in automotive company	Analyze journals and reports	Research topic
Measure	Unmatch order	Measuring before condition	<ul style="list-style-type: none">- Unmatching ratio- Sigma level
Analyze	Prim and secunder data	<ul style="list-style-type: none">- Fishbone- Pareto chart	Customer importance rate
Improve	<ul style="list-style-type: none">- Part list- Demand- Lead time- Cost (Unit cost, ordering cost, holding cost)	<ul style="list-style-type: none">- Making scheme to increasing production flexibility- Grouping unique part- Calculating Q-model- Interview and observe	<ul style="list-style-type: none">- Scheme of WOC (Weekly Order Change)- Unique part- Calculating safety stock- Calculating order quantity- Calculating reorder point
Control	Evaluate an impletion of improvement will execute	Making an action plan	<ul style="list-style-type: none">- Flexibility Check Part- Flowchart WOC (Weekly Order Change)

4 Results and Discussion

Safety stock were prepared only for unique part. With the aim to reduce the risk of part shortages if there are fluctuations in the order that resulted in changes in variant Model 2. Before WOC (Weekly Order Change) implementation, there is no safety stock, including for unique part Model 2. The draft increased flexibility of production use WOC (Weekly Order Change) scheme the company must procure safety stock as an implementation of the WOC (Weekly Order Change) have an impact on procurement of safety stock. Each part has safety stock with varying amounts. It depends on parts used and level of uniqueness of parts.

There are two components of costs between inventory costs (total costs) and cost of opportunity lost on circumstances before and after. The first cost is cost of inventory sum from costs of purchase, costs of the message, and save costs. The decision was taken inventory in this study on conditions in which procurement of safety stock only for unique parts of which were obtained from suppliers import, so has ordering and delivery lead time is longer than the local supplier. So if local supplier decision could be made by considering storage costs, in this study a comparison decision of inventory is obtained from the comparison of the total cost of procurement on safety stock with conditions of procurement for parts that have a lead time of booking and delivery quite long, so if there is a shortage it can be ascertained that the procurement costs specifically for the part will be much more expensive compared to cost of storage, because it must make deliveries by air to shorten the lead time.

When viewed from the cost of inventory, before circumstances indicate better conditions, where there is no inventory cost at all. When compared with the situation after that once there is a fee of IDR 2.812.191.099 due to the impact of their procurement of safety stock to 82 unique parts. At an opportunity cost which is the cost incurred for selecting a particular business decision than any other business decision. In the state before there is opportunity lost where the chances of company's inability to meet fluctuations in

demand. Opportunity lost value obtained by IDR 3.243.826.950 every month, which is derived from multiplication unmatching ratio, average demand, assuming profit. The average value of demand in July-October 2015 and the assumption of profit earned from the selling price of the cheapest sources of Autobild magazine in February 2016. By contrast, in the state after there is an opportunity to make a profit as the opportunity cost of IDR 431.635.851 every month. This value is obtained from the reduction of opportunity lost on the circumstances before cost of inventory on the state after.

In terms of cost, increased flexibility of production by applying the WOC (Weekly Order Change) is a good decision. Although the company must pay for the provision of safety stock, but it is more profitable than company choose do not to procurement of safety stock. This case will happen that automotive companies are not able to meet fluctuations in demand. Even feared if this situation continues to be able to lower customer confidence towards automotive company.

Value unmatching ratio before and possible values unmatching ratio after to get improvement stage by researchers. Implementation of the WOC (Weekly Order Change) will be held in the month of June 2016, so value of the condition after unmatching ratio can not be seen. Used assumption that by applying the WOC (Weekly Order Change) will be reduced unmatching ratio amounted to 75% of situation before in which 75% was found that the scheme on WOC, dealers have the right to be able to change order in the first week, second, and third of every month. So that in every last week, fluctuations in demand can not be absorbed by the auto manufacturers. Obtained assuming that the WOC (Weekly Order Change) can reduce unmatching ratio of 75%. Figure 4. Here is a ratio that indicates.

In circumstances after unmatch order value can be lowered as much as 1,689 units to 423 units in the state after. It's also affecting depreciation unmatching ratio to 1.2% in the state after that was worth 4.9% on the circumstances before. Based on the analysis in terms of unmatching ratio, increased flexibility of production by applying the WOC (Weekly Change Order) is a good decision because it can decrease the value unmatching ratio.

5 Conclusion

After performing data processing using DMAIC approach, the conclusions obtained from this research are automotive companies increase production flexibility characterized by the falling value of unmatching ratio of 3.7% by obtaining the value of safety stock for a unique part Model 2 local market products. Before the repair, the company has opportunity lost by IDR 3.243.826.950 and after repair companies get opportunity cost of IDR 431.635.851.

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