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AN ANALYSIS OF INVENTORY MANAGEMENT AT MJS RESTAURANT, JAKARTA

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Abstract- The emergences of business competition in Jakarta, especially in hospitality sector, become stronger. It also perceived by MJS, which has been in hospitality sector for 5 years. Therefore, it encourages MJS to be able to prepare a fully develop management in order to survive and thrive in the business competition. One of MJS' efforts is trying to maximize the effectiveness and efficiency of the supply chain process, which the inventory management becomes its main pillar, in order to deliver the best quality at the right price. MJS inventory management divided into three processes, namely Planning, Executing, and Controlling. Planning is a process that determines the forecast of demand and order quantity. Executing consist a series activity of inventory, which are incoming inventory, inventory storage, and inventory come out. Whereas, controlling is a process to make sure the entire inventory is come in, stored, and come out as planned. MJS face some problems in the three phases. The use of qualitative method that dominate the planning process, become inappropriate as MJS commonly found large difference between MJS's forecast and the reality in terms of the demand forecast. Besides, the other problems, such as errors in inventory storage and lack of controlling activity against the suppliers, increase the amount of damaged inventory. The use of inappropriate calculation method for demand forecasting and order quantity, and also the lack of standard operation procedure (SOP) that led to inconsistency of staff's performance, summed up into the main problem that faced by MJS. Therefore, MJS is recommended to use two operation management tools in order to minimize the possibility of that operation problems occur in the future. The use of quantitative method to calculate the demand forecast using a moving average technique and the calculation of optimal order quantity using a computerized Material Requirement Planning system are recommended to solve the problems in planning process. While, the implementation of SOP is recommended to prevent the inconsistency of staff's performance.

Keywords: Inventory Management, Forecasting, Supply Chain Management, Optimal Order Quantity, MRP, SOP, MJS, Restaurant.

Introduction

As both a capital city and economic center of Indonesia, Jakarta is progressing at a high speed. Hospitality and culinary sectors, among others, are experiencing a great momentum and projected to continue enjoying a strong performance in the coming years. Arrays of up to date and unique restaurants and cafes are opening up for business throughout the city. The competition is getting intense for the existing business such as MJS Restaurant.

As an experienced player in the field, MJS is well aware of the change and makes an effort to keep afloat. Recognizing that the key to survive it must be able to deliver well-prepared foods and beverages at the right prices (Ginsburg, M., 2010), MJS search ways to improve from many aspects. But, the current economy does not make it easy to maintain quality of food delivered alongside the prices. Prices of staple ingredients are volatile and reach all time high in the current months. One approach to tackle this issue is to look at the supply chain and discover a way to solve it.

At the moment MJS appears to be in an excellent condition despite the changing in competition landscape and poor economic condition. It must have done something right to its supply chain. Supply chain usually composed independent agent with individual preferences (Sridhar et al., 1999). Therefore, this study will focus on the internal side of supply chain, which is MJS and gain deeper insight. Even though there is no single "silver bullet" in improving organizational performance, inventory turnover is significantly related to an index of overall company performance (Vastag, G. &Whybark, D.C., 2005). For this reason, the study aim to discover MJS's inventory management and its connection to overall company performance.

Theoretical Foundation

Forecasting Overview

Forecasting is the combination of intuition, data calculation or at times the combination of both. There are some mathematical models that can be used in the calculation, based on the time horizon that it needs to covered. Yet, at the end, a good judgment by the management usually comes in hand to adjust the result to the company's circumstances. Forecasting play a significant role in anticipating demand. Therefore, it is importance in all aspect of business as almost every business activity is constructed to fulfill the anticipated demand. For instance, human resources, capacity and supplier change management are three activities that is directly impacted by product forecasts.

A Forecast is usually classified by the future time horizon that it covers. Time horizon fall into three categories (Heizer&Render, 2008):

- Short-Range Forecast

  Normally this forecast span less than one year. The short period of time forecasted generate tendency for the result to be more accure than the longer one. Furthermore, the short range forecast usually exercise mathematical techniques while the medium and long range forecast tend to utilize less quantitative method. Mostly, this method is utilised for purchase planning, job scheduling, job assignment and production levels.

- Medium-Range Forecast

  This forecast method usually strectch from 3 months to 3 years. This forecast usually handles more broad issues with long completion period. This method is best used in budget, cash, sales, and production planning.

- Long-Range Forecast

  Generally forecast 3 years or more, this forecastis used in new product planning, expansion and r&d process.*As the time horizon lengthens, it is likely that forecast accuracy will diminish* (Heizer & Render, 2008). Thus, this type of forecsat is the least accurate compare to the other time span and need to be updated periodically to maintain its value and integrity.

There are three types of forecast that organizations executed in planning their future operations, such as economic, technological and demand forecast. Economic forecast evolves around foreseeing future inflation rates, money supplies and other business cycle indicators. Technological Forecast, in the other hand, focuses on anticipating technological advancement in the industry. For instance, events like emergence of new product or progress in equipments are the subject that this type forecast attempted to predict. The last type of forecast is demand forecast, which also called sales forecast. This forecast drives a company's productions, capacity, and scheduling system and serves as inputs financial, marketing and personal planning.

Forecasting Techniques

Generally there are two types of forecasting techniques employed in forecasting process. Quantitative use an array of mathematical method that rely on historical data to predict future. In the other hand, qualitative employ subjective intuition, emotion, personal experience and value

system in creating a forecast. Sometimes, each technique is employed individually to construct a forecast. Although in practice the combination of both is typically more effective.

Qualitative Techniques

There are four qualitative forecasting methods, which are:

1. Jury of executive opinion. The estimation of demand is drawn from high-level experts and management judgment combine with statistical models.
2. Delphi Method. The participants involved in this process are decision makers, staff personnel and respondents. The staff role in this process is to create and distribute series of questionnaire. Then, respondent are the group of people whose judgment in the questionnaire will be valued as an input to decision makers. Finally, it is decision makers who will construct the actual forecast.
3. Sales Force Composite. Each salesperson will create a forecast for their region and those forecasts will be reviewed and combined to create overall forecast.
4. Consumer Market Survey. In this process, the company will ask input from customers about future purchasing plans. This type of forecasting approach usually suffers from overly optimistic view of customer input.

Quantitative Techniques

Moving Averages

A moving-average forecast uses a number of historical actual data values to generate a forecast. Moving averages are useful if we can assume that market demands will stay fairly steady over time(Heizer& Render, 2008).

Mathematically, the simple moving average (which serves as an estimate of the next period's demand) is expressed as

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Where *n* is the number of periods in the moving average-for example 4, 5, or 6 months, respectively, for a 4-, 5-, or 6-period moving average.

Measuring Forecast Error

The overall accuracy of any forecasting model-moving average, exponential smoothing, or other-can be determined by comparing the forecasted values with the actual or observed values. If F_t denotes the forecast in period $_t$, and A_t denotes the actual demand in period $_t$, the forecast error (or deviation) is defined as:

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Several measures are used in practice to calculate the overall forecast error. These measures can be used to compare different forecasting models, as well as to monitor forecasts to ensure they are performing well. Three of the most popular measures are mean absolute deviation (MAD), mean squared error (MSE), and mean absolute percent (MAPE).

- Mean Absolute Deviation (MAD) is computed by taking the sum of the absolute values of the individual forecast errors (deviations) and dividing by the number of periods of data (*n*):

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- Mean Squared Error (MSE) is the average of the squared differences between the forecasted and observed values. Its formula is:

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- Mean Absolute Percent Error (MAPE) is computed as the average of the absolute difference between the forecasted and actual values, expressed as a percentage of the actual value. That is, if we have forecasted and actual values for *n* periods, the MAPE is calculated as:

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Inventory Management

Simply put, inventory management is driven first by the customers who pull goods out of the inventory, and second by the company who push the goods out of inventory due to orders and demand. Inventory management is mainly about identifying the amount and the position of the goods that a firm has in their inventory. Inventory management is imperative as it helps to defend the intended course of production against the chance of running out of important materials or goods.

Inventory management is a very important function that determines the health of supply chain as well as the impacts the financial health of the balance sheet. Good system can push inventory to the efficient level. There are five types of cost that need to be considered when analyzing the inventory decisions, which are holding costs, ordering costs, cost of item, setup costs, and stockout costs.

Inventory management also includes making essential connections between the replenishment lead time of goods, asset management, the carrying costs of inventory, future inventory price forecasting, physical inventory, available space for inventory, demand forecasting and much more.By balancing these competing requirements, a company will discover their optimal inventory levels. This is an ongoing process, as the firm will need to shift and adjust as it changes and expands.

There are two inventory models that are differentiated by the type of demand. There are independent and dependent demand. Independent demand is the demand of inventory that does not affect the other object in inventory. For example, finished goods that are ordered from a supplier. This type of demand usually based on customer orders and forecast based on historical data. The second type is Dependent demand. Dependent demand is demand of the inventory that is dependent upon the demand of another item. For example, demand of raw material and component are categorized as dependent demand. This is because the demand of both goods is decided by the quantity of finished goods expected to be produced at the end. The companies need different approach in managing these two types of demands.

There are two types of inventory system that are used to control the independent demands:

1. Q System

Also known as Fixed-order quantity models, Q system is a model attempt to determine the specific point, R (reorder point), at which an order will be placed and the size of that order, Q. The fixed-order quantity is also called the Q-system since the order quantity Q is fixed. With a fixed-order quantity system, an order of size Q is placed when the inventory available (currently in stock and on order) reaches the point R. R is determined as the average demand over the lead time (that is, the time between ordering and receiving) plus a safety stock to reflect variation in demand over time.

2. P System

P system is a fixed-time period system, where inventory is counted only at particular times and the size of the order varies. Compared to the Q-system, the P-system, does not have a reorder point but rather a target inventory. Inventory is monitored at discrete point in time. The P-system does not have an economic order quantity since it varies according to demand. The P-system requires a larger safety stock for the same service level.

On the other hand, to manage the inventory management that has dependant demand, there are two common types of model, namely Material Requirements Planning (MRP) and Enterprise Resource Planning (ERP) (Heizer & Render, 2008). MRP provides such a clean structure for dependant demand that used in a production environment. ERP is an information system for identifying and planning the enterprise-wide resources needed to take, make, ship, and account for customer orders. Effective use of dependant models requires that the operations manager know the following (Heizer & Render, 2008) :

1. Master production schedule (what is to be made and when)
2. Specifications or bill of material (materials and parts required to make a product)
3. Inventory availability (what is in stock)
4. Purchase orders outstanding (what is on order, also called expected receipts)
5. Lead times (how long it takes to get various components)

Root Cause Analysis

Root cause is a class of problem solving methods aimed at identifying the root causes of problems or events and resolve the problem and improve performance. It should be used as soon as a problem has been identified and the RCA process should not be delayed until a problem becomes too large and unwieldy.There are lot of root cause analysis types in use today, but only three types of root causes analysis is commonly used:

1. Fish bone diagram: which is also called an Ishikawa diagram, is a diagram used in quality control and product design. It is sometimes also referred to as a cause-and-effect diagram because it is designed to show the causes of specific events.
2. Current Reality Tree: a method for determining the root problems that affect the quality of the output of a business process. In a current reality tree, the worst thing that happened or almost happened is placed at the top. If the error did occur, the current reality tree does not have a prevention or recovery side.
3. Anova: is analysis of variance. It is the statistical technique for determining the degree of difference or similarity between two or more groups of data. It will determine the problem based on statistic calculation.

Methodology

Preliminary Research

Preliminary research is the first step in a research to determine the topic and to identify the problem that faced the company. After getting the research topic, the research continues with doing research in the restaurant, MJS.

Problem Identification

Problem identification has been determined on preliminary research using adjusted situation and condition at MJS. The upcoming problem is around the management of the inventory at MJS.

Theoretical Foundation

Theoretical foundation is an effort to understand the basic concept of knowledge and information of the performed research, so the research's problem solved and there are suggestions. The other purpose of theoretical foundation is giving theoretical knowledge and as one of the part of collecting theoretical data that is used to solve the research's problems. The resources used in this research are supplement books that related to the research, journals, and websites.

Data Collecting

The method of this research is observation and interview. It aimed to get the data needed by this research. The method is to observe the inventory management of business process from planning, executing, to controlling. The interview involves asking to the division of operation which handles the management of inventory.

Data Collecting is a way to gain the necessary information used in the research. The data consist of two kinds, primary data and secondary data:

1. Primary Data
   Primary data is self collected and processed data. In this research, primary data gained from direct observation and interview with the related party inside the company, during the research.
2. Secondary Data
   Secondary data is a data based on company file such as historical data, organization structure, and company system and production process.

Processing and Data Analysis

After all the necessary data is collected, the research continues to data processing. Analysis data is done by observing every aspect of planning, executing, and controlling of inventory management in MJS.

Conclusion and Recommendation

The conclusion can be taken based on data analysis, so the conclusion would be obtained to answer the objectives of the research. Besides that, through data analysis, suggestion can also be taken for the company, which is MJS.

Data Analysis

MJS Operation Overview

In operation management of a restaurant, the process is bound around raw material procurement, storage, processing, serving and maintaining the overall service. MJS operation is not far different from this general practice as illustrated in figure 4.1.1. The raw material procurement process consists of some sub-activities such as inventory forecasting (demand calculation and quantity order decision), ordering, payment and receiving order. Then the storing process divided into three categories based on its nature. Storage categorized into dry, frozen and fresh storage.

The next activity in order is preparation. In this process, inventories are taken out of the storage and put into the kitchen or the next process, which is cooking. After cooking process, the food is displayed and waits for customer order. After the order is received, food will be delivered to the table and payment will be done at the end o service. This data is then recorded as an addition to the existing historical data. The buffet concept in MJS alter the operation slightly in which the raw material processing take place in a consistent manner uninfluenced by customer order. Therefore, there is displaying process that takes place after cooking process. Moreover, waste management is become more essential at the end of the whole process to anticipate probability of leftover food.

Forecast

Forecasting process in MJS is an action to determine the approximate number of sales in the specified time period. The estimated sales amount is then transferred into the amount estimation of raw material/inventory needed, which refer to the standard recipe that owned by MJS. Forecasting process generally carried out through two techniques, which are qualitative method by using staffs' intuition and quantitative method by using the calculation of moving average techniques. The database is derived from historical data that stored in MJS' filing system. Through the techniques of this forecasting process, MJS tries to minimize the occurrence of two common problems in inventory management, which are overstock and lack of stock.

Order Request

This is the stage in which the order is placed to the supplier. The order list and quantity as the result of forecasting activities, being proceed in this stage. The order is sent through email by staffs and then confirmed by the suppliers through phone. Order request filled in an order form which made by the staff. The order form contain with inventory list, order quantity, and additional explanation for specific request. There are three main categories of inventory of MJS with three different period between orders.

Purchasing

This stage represents the process of payment by MJS. For the daily supply the payment is processed after MJS receive confirmation from the supplier, which mean this transaction takes place every day. For the other categories, the payment is processed in the same manner following each order time.

Receiving Order

This stage illustrates the process in which the orders are delivered to MJS. In this stage, staffs confirm the amount delivered and place the receipt to the office. The orders then handed to the storage staff. MJS allows delivery across different categories to arrive at the same time.

Storing

This is the stage in which received orders are set to the storage area based on their categories. Although this approach does not become an issue in the previous step, it affects the storing process slightly more. In some occasions where the orders across three categories arrive at the same time, disorganization occurred and cause staffs to set inventory in the wrong storage area.

Preparation

In this stage the inventory is withdrawn from the storage and being prepared for cooking. It is on this stage that the inventory amount is being deducted and re-calculates.

Cooking

This stage illustrates the process in which the raw material is processed into foods. This process is executed several times a day and involved a large amount raw material. There are two scheduled cooking time which are at 04.00-08.00 AM and 00.00-05.00 PM. Also, there is unscheduled cooking that is determined by the manager at hand.

Holding

This stage is unique to MJS operation flow due to the buffet system. The foods are being displayed at the front area of MJS, allowing incoming customer to browse through them before being seated to their table. MJS has set time limit for this stage. Therefore, if there is any food still left on the display after the time limit will be replaced with the fresh one.

Figure. Displaying area

Food Ordered Received

This stage is when the customer put their order while browsing through the display area. The beverages order are noted at the time customer seated and look through the menu located on the

table. The order delivered to two separates location which is the display area (to prepare the food) and to the kitchen (to mix the drinks).

Serving

In this stage, process delivering food and beverages take place. The food is delivered from the display area and beverages are sent from the kitchen. A re-checking activity is done by waiters each time they deliver customer's order to ensure all orders have been delivered.

Payment

This stage transaction between MJS and customer takes place. MJS is currently using a newly-implemented point-of-sales system. This system has decreased the amount of time spent in this stage. Also, the system has eliminated possibility of human error in the transaction.

Cleaning

This process is done when the customer leaves their table after making the payment. The entire cutlery and food scraps on the table carried to the washing room. At the same time, tables and chairs are handled by another waitress to be cleaned and set up like the beginning.

Waste Management

This process is the activity of managing the unsold food on the displaying area, that have been replaced after the time limit. Those entire unsold foods then being recorded to determine the amount of food that was not sold. Any decision on the treatment of these entire food, such as disposal, distributing to employees and officers, or re-sell it by giving discounts for these foods, are also determined in this stage.

Inventory

MJS categorizes inventory across three types which are dry inventory, frozen inventory and fresh inventory. These categories are based on the character and lifetime of the inventory.

Dry inventory has the longest lifetime among the three categories. Usually this inventory consisted of preserves and canned foods which have long period of expiry times. Also, spices such as salt, sugar, syrup, sauce and so forth are included in this category.

The second category is frozen inventory. This category consisted with fresh food that has gone through freezing process which helps prolong its lifetime. The inventories categorized as frozen are products like chicken, fish and beef.

The fresh category has the shortest lifetime and unable to go through freezing. The freshness of the inventory will affect the quality of cooking result. The products are vegetables, tempe, chili and so on.

MJS Inventory Management

The inventory management of MJS focused on the process of managing how the inventory goes in and out of the storage area. As illustrated in previous section, Inventory Management are consisted of three main stages which are planning, executing and controlling. Planning consisted of forecasting process, in which demand is calculated in order to decide future order amount. MJS Inventory Management is using the theory of P-System (Fixed-periodic system), which means the planning of inventory needed is done once at a specified time, for one order period. Thus, ordering is determined by the time (period), and also the target inventory. Executing made up of ordering activities, receiving the inventory and the storing stage. In controlling, analysis of supplier service level and stock opname are the main activities.

Planning

Planning process has a main focus of which was to determine the estimated demand of food menu in MJS. In this case, the demand is reflected by sales record in prior periods. By determining the amount of the estimated demand, MJS expected to mitigates the occurrence of two main issues in inventory management, which are lack of stock and overstock. Therefore the forecasting methods used to achieve maximum accuracy.

In doing forecasting methods, MJS conducted two approaches, which are qualitative and quantitative techniques. The use of qualitative techniques dominates the sales forecasting of food that served in the restaurant (a la carte), and quantitative techniques dominates the sales forecasting in MJS' catering business. The data reference comes from historical data that used for the calculation and determination of the decision. Qualitative technique is often been the standard approach in determining the estimated amount of demand. This technique is based on management intuition and personal experience management, as shown in figure 4.2.1.1 below.

Figure Qualitative method in forecasting activities

Management intuition conducted by seeing at the trends on historical data, upcoming events, and personal experience. This approach is done without mathematical calculations. It is purely done by using the instinct of inventory staffs. For quantitative techniques, staff inventory using a simple moving average approach. MJS Management believes that the demand character in the culinary business can be mapped by day characteristics. It means that the Monday's demand in this week will be pretend similar to the Monday's demand in previous weeks. The data is taken usually from 4-6 period. However, the use of quantitative techniques more often been applied to the forecasting for their "catering for corporation" program.

Executing

In MJS, executing process is a series of activities, when the inventory will be in and out. This process have five main activities, which are order request, purchasing, receiving order, storing, and preparation. Order request are the activities of placing order to suppliers that is done by sending the order form through the email and receiving confirmation from supplier.

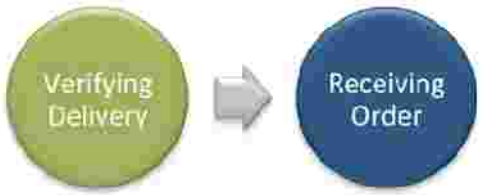
Purchasing is a payment activity of purchased inventory through cooperation with financial division. Receiving order contain with the activities of receiving inventory that being ordered from suppliers and the verification of it's condition. Storing is an activity where inventory, which is not/has not been used, stored in each storages, depend on the types of inventory. The last activity of this phase is preparation. Preparation is the activities where inventories are released towards cooking activity and the data of inventory in hand being collected. Ensure that inventory come in, stored, and come out as planned is the main objectives of this phase.

Executing is a quite complicated phase. It is considering various types of inventory (3 types), with each of different treatment. In certain times, all of these inventory types can be come in and out at the same time, so the precision in its organization is very necessary. Procurement of fresh inventory category is held every day. In other words, this type of inventory will going in and out every day. So does the process of executing. Moreover, for such activities like preparation can be done over and over in a day, since the given schedule of cooking activities take place 2 times a day. Some occasions, such as the high demand for one or more menus that outpace the forecasted demand, make a repetition of the preparation process becomes higher.

For frozen inventory category, the procurement is held once every week. Thus, the storing activities get enough attention during the process, because this type of inventory can be easily damaged if not in the correct storage treatment. So does dry inventory category. Although this category has lower sensitivity to damage if compared to fresh and frozen inventory, storing activity still being concerned. The procurement of this type is held once every month. That means quantity of each inventory that come in every month will be so big, which require good data collection and storing management. For frozen and dry inventory, preparation activity still held every day, over and over, depends on how much cooking activities scheduled on that day.

Controlling

Controlling process is a process where MJS trying to ensure that the inventory does not come in or come out without a plan and/or unnoticed by the staff and/or without data entry. To avoid that problem, MJS management put 2 activities in controlling their inventory management. These activities run simultaneously with other activities in the executing process. Verifying delivery activities is conducted during the receiving order activity in phase of executing and stock opname activity carried out during the preparation activities in executing phase.



Verifying delivery chart

Verifying delivery activity performed to control the stock, which come in from the inventory supplier. This activity's form is checking on the number and condition of every order that come in. It performed to ensure that there are not any errors from the supplier in supplying inventory based on the order. Shortage of the amount or the imperfection condition, become a things that avoided by the MJS. So, when finding things that beyond the expectation or management's plan, inventory staff can quickly respond it, such as requesting exchange of goods when there are inappropriate conditions or requesting additional number of goods if it comes less than it should be.

Figure Stock opname chart

Stock opname activity is aimed to control the stocks, which come out from the MJS storage inventory. This activity's form is synchronize the existing stock with the existing data in every

preparation activity. The amount of inventory that included in the preparation activity are being recorded, then the rest of the data that owned by inventory staff is synchronized by the number of remaining inventory in storage. This is intended to prevent loss of inventory in the storage. By performing stock opname in every preparation process, MJS minimize the possibility of inventory loss, which does not come out according to the plan or data.

Inventory Management Problem Identification

Planning

MJS's owner aware about the advantage of forecasting but find that the perfect execution is hardly possible with the quality of existing staffs. The existing process of forecasting in MJS is not executed properly as the owner stated in the interview:

"The forecasting process in MJS goes as far as formality. It is regarded essential for any business to forecast which why every business must do it. Which is how i think you see what happened here, that MJS forecast for the sake of formality. Personally, i understand the advantage it can brings to MJS, whether to forecast sales or raw material procurement. Yet, with the quality of staffs, who have minimum knowledge to do forecasting, it is just difficult to run the proper forecast process. What we do here, simply intuitive."

Based on inventory's types, fresh and frozen inventory in MJS are categorized as the perishable product, which means the product has a short lifetime. It requires a very accurate method of forecasting. Unfortunately, the dominance of the use of qualitative methods in forecasting activity in MJS often ends up with the unexpected result. Qualitative method does not seem appropriate in the forecasting process of perishable product category that has many variables, such as product lifetime and stochastic demand.

Table Forecast Error on January 2012

No	List of Inventory	Types of Inventory	Forecasted Value (F)	Actual Demand (A)	Forecast error (A–F)
1	Ayam	Frozen	300 kg	375 kg	75 kg
2	Tempe Mendoan	Fresh	450 kg	480 kg	30 kg
3	Ikan Tongkol	Frozen	150 kg	175 kg	25 kg
4	Telor	Dry	140 kg	200 kg	60 kg
5	Beras Putih	Dry	415 kg	430 kg	15 kg
6	Bayam	Fresh	1 kg	2,5 kg	1,5 kg
7	Daging Rawon	Frozen	150 kg	190 kg	40 kg

The table above shows the forecast error that occurred in March 2013 on some inventory. For fresh and frozen categories, the above data is accumulated for one month. This shows the weakness that occurs in qualitative forecast. Moreover, for some inventory like chicken, significant errors often occur in several consecutive months, as happened in the month of January to April.

Table Forecast error for chicken from February to April

	Forecasted value	Actual Demand	Absolute Deviation
January	300 kg	375 kg	75 kg
February	340 kg	400 kg	60 kg
March	360 kg	390 kg	30 kg
April	320 kg	375 kg	55 kg

Using the above data, it can be calculated the average forecast error of each month through the calculation of Mean Absolute Deviation (MAD).

$$?A \quad ? \frac{??A? ?A? ?A? ?A?}{?} ? \quad ?A(\text{in kg})$$

The calculation above shows the average forecast error of each month for inventory chicken. From the data, that being collected for 4 months, shown an average of out of stock for the 55 kg. It is describing how much lost sales, which led to the opportunity cost, experienced by MJS every month.

Stock out is often happens in some case of the inventory management, which cause some of the menu cannot be served in the display area. In fact, it often happens in main inventory, like rice and egg. It turns out that both of the inventories were not the kind of fresh neither variant nor frozen inventory. It can not be imagined that restaurants like MJS could have a stock out on rice. For several occurrences, these problems can be handled, like purchasing rice in nearby hawkers or restaurants, but still it would contribute the excess cost on operational activity. Stock out turns out to give huge potential on lost sales and loss trust for customers. The uncompleted product display, or undisplayed favorite menus will result in customer's disappointment.

On the other hand, from the staff point of view, the forecast is not well executed due to the belief of its insignificance for the performance. Further, this belief cause staffs to undermine this process and its execution in the operational flow. In the end, inventory staffs often leave the task of forecasting to the MJS' chef. This perspective is illustrated in the interview with one of the kitchen staffs:

"It is the chef's responsibility to do the forecast and we let them do so. Sometimes, the order never change and we keep ordering the same quantity. It is not like it cause any significance difference to the overall operation."

In MJS, sometimes it would be chefs' responsibility to forecast raw material demands for each day. Based on researcher's observation, the chefs forecast the raw materials on their own account which make the result is unreliable and vague. The period between forecast is not scheduled nor decided with the management. This issue holds up owner's statement that MJS indeed rely on individual intuition.

Beside all of that, there is a fundamental problem in forecasting activity, which can become the fatal mistake. Forecasting that performed by MJS is the demand forecasting to finished foods. Yet, the results of forecasting directly become the quantity order by transferred it first using their standard recipe. However, the demand forecasting and the calculation of quantity order are different things in terms of inventory management's theories. Inventory needs are not necessarily same as the demand. Demand is only one of several variables that fill the equation of quantity order's calculation.

Executing and Controlling

Executing and controlling are phases where the problems often occur. The problems happened because of the density of activities in both phases, especially for some periods or in a time when entire types of inventory come into the activity simultaneously. The staff's negligence usually occurs and disrupts the MJS inventory management system.

The first thing comes from receiving order activity. The numbers of orders inventory each day make the supplier commit some mistakes several times. The inappropriate amount and the imperfect condition of the goods are the problems that commonly faced. This case certainly mess up MJS's

forecasting when the orders finally cannot entirely be fulfilled. This problem compounded with bad activity of verifying delivery on controlling process, which done by the inventory staff. MJS management tried to build a kinship system to the supplier, but it makes the staff did not follow-up on any issues that appear. Suppose mismatched numbers or conditions of ordered goods occurred, the staff only give warnings to the supplier involved to not repeat this mistake, without asking for addition or refund for damaged goods. It surely makes the performance of forecasting become such a waste. Since in the end of the day, it is the supplier who decide the amount of inventory quantity, which they comply to supply. On the other hand, the potential of loss sales, which expected to result in loss trust for the customers became unbearably high.

Some problems also come from storing activity. Several types of MJS's inventory are sensitive to temperature and bacteria, especially in fresh and frozen category. Storing activity will determine the quality of the inventory. Unfortunately, inventory staff often tolerates the existence of some inventory that is not in appropriate storage. It usually occurs after the preparation process, which sometimes the chef decided not to use the entire inventory, which have been prepared, so there are some inventories that need to be returned to its original storage. It most frequent happened to chicken, meat, or fish. The staff thought that if they only left the chicken, meat, or fish outside the freezer briefly, it will not make them become damaged, so they can take care of other things which more urgent. However, they often forget to return the appropriate storage. In fact, the condition of frozen inventory not always fresh, considering that these products could have saved for a few days. It makes the sensitivity of the products against damage become higher. Unfortunately, some inventories become damaged and should be discarded.

Table Defect Data for 'Ikan Tongkol' from June to December 2012

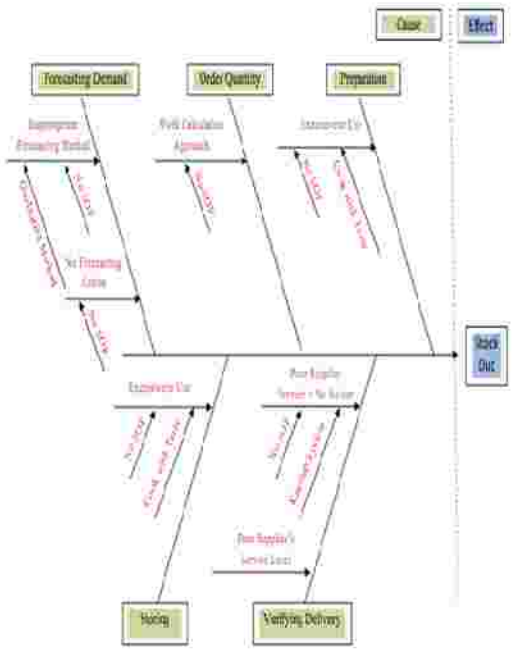
	Total Inventory	Total defect	Percentage
June	110 kg	7.5 kg	6.81 %
July	110 kg	0	0
August	125 kg	12 kg	9.6 %
September	140 kg	4.5 kg	3.21 %
October	150 kg	0	0
November	140 kg	5 kg	3.57 %
December	110 kg	8 kg	7.27 %
		Mean =	4.35 %

The next problem comes from preparation activities. In MJS, the whole foods have a standard recipe. By using standard recipe, the inventory staff can do the preparation activity easily to prepare the needs of inventory in cooking activities. However, MJS has some chef who 'cook with flavor' to keep the quality of the taste. Yet, it often resulted in excessive use of inventory. Whereas, standard recipe is the benchmark to make the results from forecasting demand to become the inventory quantity required. Finally, in the stockopname activity often find that the data does not match with the rest of the existing inventory. Inventory becomes run out faster than the time that has been planned. Again, the potential of the stock out become higher.

Other Problem

In running the operational activity, MJS very riveted with the decision from the managers in each division. Managers' mistakes or negligence regarded as errors to the operation of MJS. MJS does not have Standard Operation Procedure (SOP) that can be used as guidelines for every employee to do their works. Because of that problem, the performances of every staff become more complicated. The absences of standard procedures cause some conditional things that require

initiative and responsiveness from staff. While, the expected initiative and responsiveness from the staff are even more often do not happen because of the fear to make mistakes and they tend to wait for the decision from their boss. Finally, the MJS's operation work system seems does not reactive against the various problems that might be emerged.



Root Cause Analysis

Because of many problems that occur in the MJS inventory management, it is necessary to find the root cause that may cause all or most of these problems. By using fishbone / ishikawa diagram, it would seem clear the causality of MJS inventory management problems.

Fishbone Diagram

Fishbone diagram above shows that the root of the problem lies in the lack of SOPs in controlling all MJS' inventory management activities. Almost all the problems that often arise in the MJS' inventory management activities caused by human error. This is certainly due to the absence of procedural standards which functioned to guide and control the performance of the staff. Thus, since the existence of SOPs will determine the performance of each activity in each process, the lack of SOPs in MJS must be the main focus for management team to be fixed.

However, fundamental errors that occur in the process of MJS' inventory planning also deserve attention. This is because the weight of error on any forecasting process looks pretty significant, so it has a big influence on the occurrence of stock outs. Thus, a significant improvement can be reached by fixing these two root causes on MJS' inventory management.

Conclusions and Recommendation

Conclusions

In general, the performance of inventory management in MJS can be considered quite good. This can be seen through the framework of the activities of each process are actually able to cover all types of possible errors. Details of each activity has been designed to avoid errors that could damage the process of inventory management and increased operational cost. The movement of percentage range of MJS' operational cost to income each month is also not very significant, only ± 3%.

However, since the emergence of problems in the body of MJS inventory management is often been seen, the potential of increased cost that beyond the desired rate is becomes high and should receives attention. Through this research, it can be concluded that there are two issues that are pretty basic and needs to be fixed, which are the use of inappropriate forecasting methods, as well as the inconsistencies on inventory staffs performance.

Forecasting methods that dominantly used today, which is qualitative method is less precise method in dealing with uncertain demand like this. Moreover, talking about perishable inventory, in

this case fresh and frozen inventory, which when passed through a short period of its lifetime, the inventory becomes worthless and just being cost for MJS. It needs to use mathematical calculations to consider all the variables that may arise. Thus, the results would reach the expected point of forecast accuracy. By reaching the demand forecast accuracy, MJS will be able to maximize the efficiency and effectiveness of the use of inventory, which in turn will minimize the expenditure / increase the value of their profit.

Work consistency of the inventory staff looks very problematic. Various problems emerge due to negligence of any staff in performing their duties. It is also acknowledged by the owner of MJS, that people becomes the biggest problem that challenge them for this time. Lack of initiative, experience, and capabilities, as well as a fairly high ego looks to be the cause of this inconsistency. Inconsistency on performance of each individual, will make the emergence of problems can not be controlled. Problems can arise from anywhere, even for the smallest thing.

Over the time, this thing can provide a major influence on the achievement of cost-profit MJS. The current errors significance of MJS' inventory management is practically normal. However, these errors occur one after another each month. When one issue is resolved in this month, another problem came. Conceivably, if a set of problems occurred in one period, the impact on the percentage of operational cost to income could be doubled from the current average.

There needs to be a tool that can help staffs to work in a consistent state every time, to improve performance or at least maintain the stability of the performance of the people on the inventory management MJS. That way, the problem can be controlled, and pressed up at the desired point.

Recommendations

Since the two fundamental problems that faced by MJS are being concluded, researcher recommends two operation management tools to address both of these issues.

Planning Problem

The understanding about planning process in the MJS's inventory management has to be changed, which should be separated between forecasting activity and the calculating of order quantity. The demand of forecasting needs to be calculated by using quantitative method, specifically by using moving average. This technique just need the historical sales data, in some days that have same characters,to calculate forecasted demand. For instance, to determine the forecasting demand for Monday is using the historical data every Monday in the last two months, so the simple moving average can be calculated.

$$?A` \quad ?6P \quad ?AP \quad ? \frac{? \ ?Að \quad ?A?6? \quad ? \ ?6P}{?}$$

n = number of periods

In some occasional events, the use of qualitative method can strengthen the forecasting. By using the quantitative method as the main method, MJS can eliminate the "gambling factors" and increase the probability of achievement accurate results. Meanwhile, for calculating order quantity activity needs to be sorted by the type of its demand. MJS's inventory demand included in dependent demand, which means the demand for one item is related to the demand for another item. For the example, to determine the demand for chili is depending on the demand of *ayam rambut setan*. From this demand category, can be known that the best and efficient tools (in terms of time) to calculate the quantity order is MRP system. MRP or Material Requirement Planning is production control system. It is include inventory management system. Inventory system in MRP can be used to determine the optimal quantity order through its lot-sizing techniques. This system

also integrates a wider range of activities such as production setting, (cooking) schedules, supplier service level control, and procurement schedule. Computerized system, which owned by this tool, will very helpful to improve the efficiency of staff's performance, so the probability of the occurrence of errors in each activity, especially for rush hour, can be reduced.

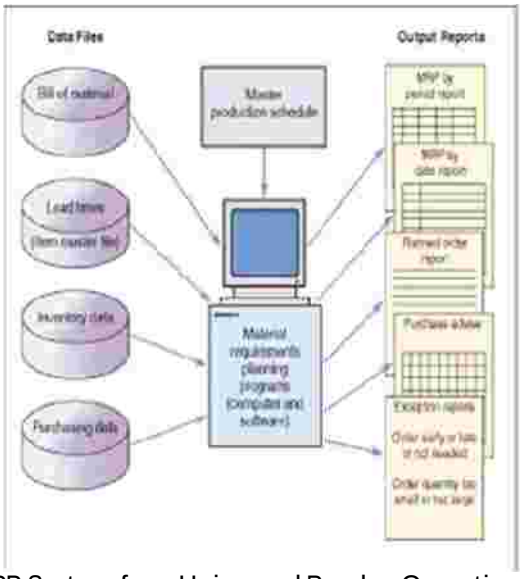


Figure Computerized MRP System from Heizer and Render, Operations Management, Pearson

Inconsistency of Staffs Performance Problem

The absence of Standard Operation Procedure (SOP) in MJS inventory management led to the occurrence of the inconsistency performance by the inventory staff. SOP will be used as employee's guidance in performing their duties. SOP contains the employee's working process, step-by-step. The used of SOP will become employee's guidelines in dealing with any existing conditions. The researcher recommends the SOP form that can be used by MJS management as work guidelines for all inventory staff. This recommendation consists of 3 (three) SOP that differentiated based on type of inventory.

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