IMPROVE ON TIME DELIVERY:

A CASE STUDY AT JM FLOUR MILL

By

ONG WEN ING

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DECLARATION

I hereby declare that the project is based on my original work expect for quotations and citation which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at the USM or any other institutions.

Name:

Date: 16th December 2014

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ABSTRAK

Ketepatan masa penghantaran dikatakan adalah pandangan sebagai petunjuk prestasi utama bagi bahagian gudang dan logistik. Pencapaian atau prestasi penghantaran menunjukkan keberkesanan rantaian bekalan atau ósupply chainô membekalkan produk kepada pelanggan dan tahap kepuasan pelanggan. Penelitian ini difokuskan pada kajian kes yang dijalankan di sebuah kilang tepung di Malaysia.

Dalam kertas kajian ini, kepentingan ketepatan masa penghantaran dikenalpasti dan punca-punca masalah penghantaran dikaji. Untuk kajian ini, wawancara mendalam telah dijalankan dan data telah dianalisis dari kilang tepung untuk menyiasat isu-isu. Dari kajian karya teknikal, Analisis SWOT, Analisis TOWS, Analisis Fishbone hingga Analisis Proses Aliran, kajian ini mendapati punca masalah ketepatan masa penghantaran dan memberi cadangan untuk mempertingkatkan situasi.

Kajian ini menyumbang kepada industri makanan khususnya dalam industry tepung kerana situasi, pembatasan dan cabaran adalah sama. Ini boleh digunakan sebagai strategi dan garis panduan unutk penambahbaikan kerana kajian dalam industri pengilangan sebahagian besarnya belum lagi diterokai dan dikaji.

Kata kunci: ketepatan masa penghantaran, ósupply chainô, logistik, kepuasan pelanggan, kilang tepung,

ABSTRACT

On time delivery is view as a key performance indicator for warehouse and logistic departments. The delivery performance indicated how effective the supply chain is at supplying products to the customer and the customer satisfaction level. Present research is focused on a case study conducted in a flour mill in Malaysia.

In this study, the importance is highlighted and the causes of the delivery issues are investigated. For this study, in-depth interview was carried out and data was analysed from the flour mill to investigate the issues. From literature review, SWOT analysis, TOWS analysis, Fishbone Analysis to Process Flow Analysis, the study found the cause of delivery problems and given the recommendations for improvement.

The research contributes to the food industry specifically flour milling as the situations, constraints and challenges are similar. This can be used as a strategy and a guideline of improvement since this milling industry study has largely remain unexplored.

KEYWORDS: on time delivery, supply chain, logistics, customer satisfaction, flour mill,

CHAPTER 1: INTRODUCTION

1.0 Introduction

This chapter introduces the research outline of the study. It begins with the background of the study, problem statement followed by research objectives and research questions of the case study. Finally, this chapter ends with the significance of the study.

1.1 Background of the study

Delivery performance is viewed as level up to which products and services supplied by an organization meet the customer expectations (C. Rao, K. Rao, V.V. Muniswamy, 2011). It actually represents how successful is the company or the supply chain system is at providing products and services to customers. Delivery performance or on-time delivery is a critical aspect in achieving customer satisfaction, loyalty and greater sales. Particularly, in food and processing industry, delivery on time is seen as a very important criterion because it is highly related to shelf life, freshness and storage of the products. A suitable and systematic inventory control system is often implemented in a company to ensure that the process is smooth from customer ordering to manufacturing to delivering to the end customers.

Importance of delivery on time in food industry is actually much more significant compared to non-food industry. Food freshness and shelf life greatly affect the product and delay in delivering may threaten human health. When food is contaminated and consumed, the consequences are serious such as food poisoning,

serious illness or if condition got severe then it may cause death. That is the reason why there are more stringent and strict laws that governed the food industry to ensure the manufacturers abide the laws. However there is a lot of restriction in delivery on time. Factors like storage areas, space, stock controls and demand will influence the amount to be manufactured or delivered and also time of delivery.

Lean concept was introduced after Toyota Production System created in the early days. As times advanced, improvement on the system made and now it has becoming a concept that received massive attention in most of the industry and organizations. Lean manufacturing, lean production, lean manpower and lean inventory are mentioned in most of the company as it helps manage the cost and reduce the waste to the lowest as possible. Lean manufacturing was derived by the Japanese manufacturing and it was said to be improving the smoothness of the process and reducing the wastage. (Anonymous, (http://www.lean.org/WhatsLean/History.cfm), 2013) This is seen as a vital and crucial for success in the company. In wheat flour industry where itôs pricing are seen as very competitive and aggressive has been seen adopting this concept. This commodity market relies heavily on the manufacturing cost therefore reducing cost is essential to gain profit to sustain in the market. This industry will need to consider strategic issues that are being faced in the current situation.

Most manufacturers face difficulty to have good delivery performance or on time delivery due to the space of the warehouse. Storage areas or warehouse is one crucial element when it involves orders, production and delivery. Warehouse size is constraint to place sufficient goods in order to be delivered. These restrictions are linked to demand and production that caused the products to be delayed in delivery.

The requirements for good delivery on time involve when and how much to order which is the forecasting of market demand and available storage areas to store the products. In food industry, it is very important to monitor and keep track of the products in inventory. Most of the food is perishable goods that are not able to be stored for too long. Accurate and good forecasting is important in ensuring that these perishable goods are able to reach market in time and has enough time for customers to consume. It appears that the lead time will greatly interrupt the product movement. From this we observed that there is a close relationship between delivery on time and customer satisfaction. Delaying delivering products are likely to trigger discontent and dissatisfaction among customers.

In flour mills, insufficient space may cause the amount of products generated to be restricted and when the stock in need, it is not able to be delivered. Generally, wheat flour is packed into different sizes ranges from 25kg to 1kg. For non-consumers sectors, the packaging is in 25kg bags which are big, bulky and requires a lot of space. Generally, each flour mill has different range of category and products which may have more than 10 brands and each brand will have a minimum storage level in the warehouse at all time. For consumer sectors, the packaging size is 1kg which is packed into cartons. These cartons will be stacked onto pallets but there is a limitation on how much stacking can be done to prevent damages to the cartons. Small warehouse may not able to cater to the customers especially when there is a demand increase or during peak season when demand is higher. When most of the current manufacturers and companies are taking on lean concept, storage area becomes a concern because it increases the cost of the products.

1.2 Problem Statement

In wheat flour industry, on time delivery is one key point to the success of a company. Perishable products like flour must be delivered to customer on time to conserve the freshness. Wheat flour is used in many industries to make products such as breads, steam buns, cakes, biscuits, flat breads (roti canai), noodles and even batters. The consumption is high and the product is fast moving. Typical industry such as wet noodle or also known as ómee kuningô is common to have few big players which are factory scale and also small players that are small medium enterprise that are available in every region. This product is required to be produced daily as it has short shelf life and their stock needs to replenish frequently. It is crucial for the small players where the warehouse is small and they may not able to stock up the products but to order frequently after used up. The frequency of ordering can be as frequent as every 3 to 7 days depending on capacity. When orders are not fulfilled, then it may be cancelled by the customers as there are other choices available.

One must know that wheat flour has shelf life and it is always not preferred to keep long in the storage area or warehouse. Wheat flour naturally attracts pests such as weevils, beetles and moth to cultivate and grow in the surrounding and in the product. Any storage that is not properly maintained, improper inventory management or products that are kept too long have high chances to generate serious infestations. Infestation is easily spread and get out of control when poor monitoring is done. In the end, this infestation will cause big losses to the company as products are not able to be delivered to the customers. The infested products will be rejected, downgraded and to be sold as industry flour for non-human consumption which is lower in price and profit.

Customers will not be pleased if products received are already infested. General perception is that the infested flour is old and unwanted flour. Furthermore, customer may need to process before use when flour is infested. This may tarnish the brand name of the company. Further clearing up on the infestations will cause even huge damage and cost because the company may have to shut down for a period of time and the pest control service is expensive. Therefore it is important to ensure that the industry is managing inventory in a lean concept that is suitable and efficient to work in the market. Whenever there is a glitch in the communications, there will be a delay in delivering and therefore generating unsatisfactory feedback and complaints from the customers.

This clearly shows that the relationship between delivery time and customer satisfaction is closely interrelated. Insufficient control of inventory control will affect delivery on time and indirectly affect customer satisfactions. Flour mills have to determine the key factors of managing good and balance inventory. Delivery performance have to be monitored and evaluated to ensure customer received products on time and satisfaction level is always on parity or above average.

Since establishment of the flour mill in 2008, the company sales were slow at the beginning stage and slowly through these 5 years it gradually increases. The mill started to run at twenty percent capacity in year 2009 to now, year 2013, it is estimated that the mill is running at sixty percent of the mill capacity. This means that the mill is producing 60% of the intended maximum flour capacity per month. During the first few years, production was low as the flour produced is new in the market but slowly it is well accepted in the market when the customers are used to the quality and then eventually the sales increased. Sales have increased from

average 1000 metric tons of flour sold every month in the year of 2009 to average 3000 metric tons flour sold every month in the year of 2013.

Since late 2011, there have been more cases of complaints where products were not able to be delivered to the customers on time and there are some complaint cases of infestations which relate to quality issues. Such complaints and feedbacks have bad effects where it upset customers, gives a bad reputation to the company products and the most important is it may tarnish the current creditable branding of the company. Most of the customers require consistent source of products and quality in order to produce their own products hence quality, delivery on time and infestation is the upmost priority. Moreover, some sales personnel also complaint on insufficient flour in warehouse that causes them to delay in delivering and required them to explained to customers. Most of the time, sales personnel were required to reallocate the existing stock and distribute among the customers to ensure that they received some minimum stocks to prevent customer run out of flour to be used and caused dissatisfaction. Looking at the feedbacks and complaints, it is a significant concern to the management and company as the problem persist.

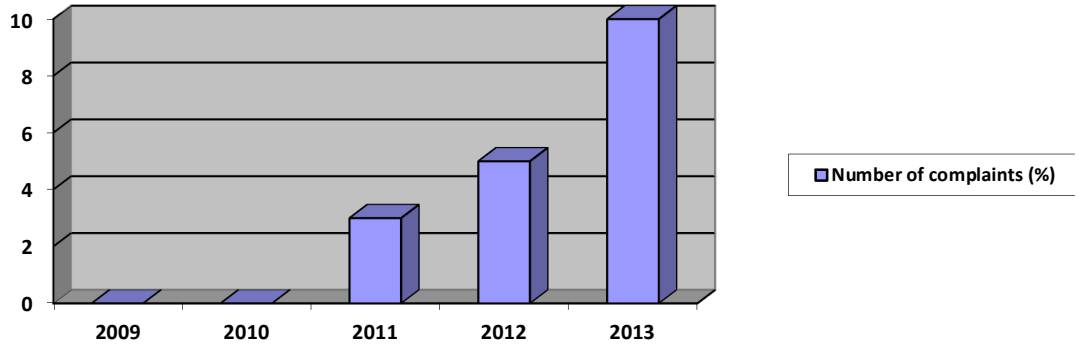

Figure 1.1: Number of complaints (%) received by JM Flour Mill for the past 5 years.

This study is proposed to investigate the increase of the complaints in on time delivery and the current inventory management system, suggestions to improve the process that may help the on time delivery. The company has been receiving delivery complaints starting in 2011 and the number continuously increases for the past 3 years. Complaints received are from various customers who are the dealers and customers making various products. Generally, there are few categories of complaint in flour mills which are flour quality performance, delivery problems, infestations, and packaging material problems. Some of the complaints are not recorded because the sales and technical executives are able to resolve the problems personally but it is feed backed to the management without records. These reflected that the actual situation and number is actually higher than the actual records.

This research will be valuable to the company and industry as the issue is a common dilemma that may be faced by the other companies. The solution can be a benchmark or guide for improvement in the same area or same issue.

1.3 Research Objectives

This case study aims to explore the inefficiency issues faced by JM Flour Mill in on time delivery. The case issue leads in outlining the following research objectives:

Research Objective 1: To identify the root cause of the increased customer complaints in on time delivery.

Research Objective 2: To recommend solutions to improve the internal process that will help to improve on time delivery.

1.4 Research Questions

The research objectives which are resulted from the above specific research questions are formulated as below:

Research Question 1: What are the root causes that lead to the increased customer complaints in on time delivery?

Research Question 2: How to improve the current internal process that will help to improve on time delivery?

1.5 Significance of the Study

The study contributes to the company by identifying the root cause of late delivery issue. This is significant to the company to improve the current situation faced in the company and to mitigate the severity of the problem. By reducing the problems faced in the current situations, company is able to regain confident of the customer and eventually boost customer satisfaction level. Besides that, the study look into the possibility of improvement by looking at the overall profile and structure of the company to provide recommendations on how to improve the current performance of the on time delivery.

Moreover, the study is also important provide information on the issue to the food industry especially grain milling industry regardless of which type of flour or grain as the general environment and restrictions are the same. By understanding the concept and problems, it can be a guide and prevention on the crisis.

1.6 Definition of the Key Terms

Terms, words, or phrases here are conceptually and operationally defined for better understanding.

On time delivery ï refers to delivery to customer on a range of dates promised.

Infestation ï refers to huge amount of pest inhabit the product or a place.

FIFO ï refers to first in, first out which is products produced first to be sell off first or delivered first.

Breakdown ï refers to the mechanical or system failure causing downtime.

Shelf life ï refers the length of time that a commodity that may be stored without become unfit for use or consumption.

Pest control ï refers to the management of the species defined as pest.

1.7 Organization of the Chapters

This management project is organized into seven chapters. Chapter 1 provides an introduction of this case study. Chapter 2 presents the industry profile followed by Chapter 3 which is literature review. Chapter 4 discusses methodology of the case study. Chapter 5 presents the case write up. Chapter 6 presents the case analysis. Finally, Chapter 7 provides a discussion, including suggestion, limitation and contribution of the case study and conclusion of this case study.

CHAPTER 2: INDUSTRY PROFILE

2.0 Introduction

In this chapter, a thorough industry profile on Malaysia wheat flour industry will be discussed, reviewed and studied to understand the overview of the profile.

2.1 Malaysian Wheat Flour Industry

In Malaysia, wheat flour industry important as wheat flour is the second staple food after rice. Wheat flour is used to produce breads, noodles, roti canai, biscuits, cakes, batters and also to cater to the non-food industrial. According to statistic, in 2013, there are no less than 14 flour mills in the country importing some 1.5 million tonnes of wheat yearly. Nationwide, Malaysians now consume 960,000 tonnes of wheat flour per year (The Star, 6th Dec 2013). This high consumption creates competitions among the existing flour mills and the need to expand the business. Although Malaysian consumption may be considered high, competitiveness in this commodity industry triggered pricing war between the existing manufacturers or key players.

Generally there are 6 major local players in the Malaysian wheat flour industry. Some of these flour mills are groups that has more than one flour mill in Malaysia while some are smaller flour mills where they have only one flour mill but significantly big in size that is producing considerable huge amount that is distributed around peninsular or west Malaysia.

2.2 Major Flour Mills in Malaysia

These major key players in Malaysia are namely United Malayan Flour Sendirian Berhad, Interflour Malaysia, Federal Flour Mills Berhad, Malayan Flour Mills Berhad, Seberang Flour Mill Sendirian Berhad and Kuantan Flour Mills Berhad. Few of these players are having few flour mills distributed in west peninsular and east Malaysia.

One of the major players, Interflour Malaysia has 4 flour mills spread out strategically in Port Klang, Kuching, Labuan, and Lahad Datu where each mill is designed and able to cater the flour products to the customers located within the approachable distance. The flour caters to various big institutional customers throughout peninsular and west Malsysia. In 2013, Interflour Malaysia is sold 270,000 tonnes of flour in the consumer flour industries. As one of the largest flour millers in South-East Asia, the companyôs four mills have a production capacity of 1,800 tonnes of wheat per day (The Star, 6th Dec 2013). Interflour Group is one of the largest in Asia with mills in Indonesia, Vietnam, Malaysia and Turkey. Currently there are diversifying the business in various sectors including grain handling terminal facility.

Another major player is United Malayan Flour (1996) Sdn. Bhd. (UMF) that was incorporated in 1961, with principal activities in the production and distribution of wheat flour, food products and other raw commodities throughout Malaysia and region. Currently there is only one mill in Malaysia which is located in Penang. This group is producing high quantity of flour where they also have biscuit factory which produce big volume of biscuits which supplies to this region. Although the flour mill

is located in Penang, the flour is distributed from Penang till Johor and even to Singapore where the company own a trading company in that country.

Seberang Flour Mill Sdn. Bhd. (SFM) was incorporated in 1987 under the Soon Soon Group of Companies which is one of the largest grain, oilseed and oil processing group in the region, with its headquarters and corporate office in Prai, Penang, Malaysia. Seberang Flour Mill produces wheat flour through a fully automated wheat flour mill with advanced technical facilities located in the Prai Industrial Estate. There are 2 mills located in west Malaysia, one in Penang and another one is in Port Klang. The flour is distributed throughout whole peninsular Malaysia thru their sales office such as Ipoh and Kota Bahru.

Malayan Flour Mills Berhad (MFM) is a pioneer in the flour milling industry in Malaysia. The modern flour mill started at Lumut, Perak on 15 October 1966. Recent years, there were expansion plan and the new plant was built at the same area. Currently, there are 2 plants which one located in Lumut and the other one located in Pasir Gudang, Johor. The estimated capacity for the Lumut plant is 810 metric tonnes per day and the capacity for Pasir Gudang plant is 410 metric tonnes per day. Their production is mainly for domestic consumption while less than 5% is exported to Singapore and Brunei. Malayan Flour Mill has more flour mills distributed in the neighbour countries such as Vietnam where they are big player in the industry and in the country.

One of the important factors to generate good revenue in the commodity price war is to control the cost and maximize production. There are few areas of costing that can be control and inventory management is one of the important areas. Inventory management is greatly associated to cost where it comprises warehouse

cost, damage while in storage, ordering cost, delivering cost and etc. This determines the product cost and total revenues to the company. If the company is spending considerably high expenses on inventory, there is no value added to the product and will not company will not benefit from these expenses. Not too much difference with other industry, flour mill has similarities to most of the food companies. Maximizing production efficiency is also important as the cost to produce is low and will be translated to higher profit margin. Lean manufacturing is strongly required in the industry as it helped the industry to maintained quality and to increase slim margin profit.

CHAPTER 3: LITERATURE REVIEW

3.0 Introduction

In this chapter, literature which related to on time delivery, inventory management, lean manufacturing concept, and customer satisfaction were reviewed.

3.1 On time delivery

Delivery performance has been deemed as a crucial strategy in the company where competition is intense. Many companies now are competing for market share on the basis of on time delivery. On time delivery is sometime used as the key performance indicator of the performance in logistic and warehouse department. Researches had been done to determine how successful is the company based on the delivery performance. The effort to improve delivery performance is seen as to gain competitive advantage and efficiency improvements (C. Rao, K. Rao, V.V. Muniswamy, 2011).

Not much delivery performance studies are done in food manufacturing line but ample in servicing industry. Researcher argued that quality is not the only vital factor determining the customer satisfaction but also other factors (Mpwanya, 2005). Food manufacturing lines that are maintaining close customer supplier relationship, delivery performance is part of the evaluation done by customers. The delivery performance greatly affects the repeating purchasing process and customer perception towards the company. When customers are disappointed several times, the solution would be sourcing another supplier as an alternative option. There is a

high chance that the customer not returning if the perception on the delivery service is bad or they found a more reliable service.

3.2 Inventory management

Inventory management is one important section encompasses of inventory counts, waste or yields, theft, processes, ordering and delivering procedures. Most of the companies implemented inventory management is to reduce the large inventories kept internally and to reduce the cost incurred. Traditionally the inventory is being taken manually and it is time and energy consuming. As technology improved, system has been created and more efficient way has been found to monitor the inventory. Researcher argued that inaccuracy of inventory in food industry causes more time used to monitor inventory, cost increased and creating higher risk throughout the organizations (Ruankaew, PhD and Williams, 2013).

As agreed by some researcher, it is important to implement the right inventory management approach to gain more customers through customer satisfaction and it is also agreed that manufacturing company needs special attention because there is a variety of factors affecting the system (Imeokparia, 2013). Few factors to be considered will be the level of stock, the lead time, the process of standardization and flow of information. According to the USDA, the flow of information is also as important as the flow of product. It is observed that data shall be received from the demand or customers then to production to generate product and to become inventory before going out the market. All these require a series of information and communication from one end to another end. To give an efficient

and effective inventory management, these are also some of the consideration before implementing the right system.

3.3 Lean Inventory Management

According to Lean Enterprise Institute, after the manufacturing concept was established by Henry Ford in the 1910s. After that, in the 1930s, the Japanese visited the plant, refined the manufacturing process and invented the Toyota Production System. Numerous theorist and researchers have done studies on this concept and they are continuing to spread and promote this concept to the world.

There is a general perception that lean manufacturing and related continuous improvement businesses are tougher to be applied in the industries that have larger batch of production or manufacturing (Imeokparia, 2013). This perception is true and easy to be understood because when producing large batch of products, the inventory is higher and it is harder to do estimation and forecasting. Generally, larger batches also incurred more cost in terms material, inventory holding cost and reject cost. Besides that large batch also involves more variables which encourage inaccuracy in the information throughout the system as argued by some researchers (Ruankaew, PhD and Williams, 2013). Studies should be constructed and tested on the system to ensure that the lean inventory management works well with the product.

One important factor to consider when planning on lean inventory management is the storage. Storage plays a strategic role in attaining overall logistics cost and service goals (Altekar, 2005). The basic that warehouse decision involves ownership, layout, number, size, layout, products stocked in the warehouse. These

factors are affecting the overall flow, manpower requirement and the system including the amount of products required to be stocked. Studies need to be conducted in order to ensure maximum utilization and also to avoid shortages.

3.4 Customer Satisfaction

Customer satisfactions come from where customer views and perceptions towards the product and service that they paid for (Eckert, 2007). These perceptions are very subjective and hard to measure. For different product or industry, customersô expectations towards quality, price, and service is different. Most of the researcher argued that the importance of having lean inventory management is to fulfil the customer needs where time wasted on waiting the products will definitely reduce the satisfaction levels. To implement lean inventory management requires a lot more than just inventory control. Companies will requires collaboration in lean manufacturing and lean supply (Lehtinen and Torkko, 2005). It is also importance for the company to practice lean productive maintenance. With the co-operation from all departments and team, then only it is possible to generate smooth lean inventory management system. As suggested in some papers, loss of sales and customer dissatisfaction can occur and by implementing good inventory management can gain competitive advantage among the competitors (Ruteri and Qi Xu, 2009). It is important that the company to get prepared, equipped and ready for the system in terms of manpower, knowledge, time, cost to use the new system.

3.4.1 Customer Loyalty

According studies, customers are satisfied when suppliers fulfilled their orders in time (Wilding, 2003). Customerôs responses towards the delivering and services reflect the perceptions and the loyalties towards the company. This delivering service will need buffer stocks to fulfil customer orders or enter into long term relationships which require commitment and trust (Wang, 2002). This shows that customer satisfaction will result to repeated purchase and will built a long term relationship between the company and the customers. Repeated purchase will bring positive in words of mouth where it is indirectly translates into one advertising channel for the company. The key factors that need to be focused on are building relationship and creating value (Wilding, 2003). Inventory postponement are situations where inventory is not available and part delivery is delayed and orders cannot be fulfilled on time which give negative feedbacks and negative customers relationships (Imeokparia, 2013). Delaying inventory usually give customers perception that the company does not have enough resources and not stable to give continuous products.

3.4.2 Quality

In terms of quality, the key factors that usually measured are the delivery time and the freshness of the product. End customers expect whole and partially processed food to be safe, fresh and continuous available (Anonymous, 2009). Customerôs priority and perception is to have the fresh products as the shelf life for food is short and according to study, the freshness is assumed to drop exponential over time but still captures some demand (Bai, 2005). By practicing lean manufacturing, reducing the time in the storage area, the freshness can be shortened which translate to maintaining the quality and reducing customer displeasure.

3.5 Inventory Management and Problems Faced

Along with the changes in flour industries, large customers are minimizing their own inventories (Doodley, 1996). When this trend happens, the flour mill is greatly affected. Inventories will be transferred to flour mill where they will need to hold huge amount of stock at any time because the orders will be high when the large customers run out of stock. Many companies are interested in to more knowledge and explore about Lean and the conditions required for implementation of the system in their company (Kovacheva, 2010). But companies may not have the operational processes to support and sufficient capabilities to implement the system. A company that is going towards lean system needs to have sufficient resources in terms of technical and support to prevent failure after implementation. The companies are required to actively and constantly update the system. One of the common challenges is that the companyôs preparation for the system and when the company is ready to implement lean inventory management**.**

CHAPTER 4: RESEARCH METHODOLOGY

4.0 Introduction

This chapter describes the methodology of conducting this research, these includes the data collection methodology, interviewed personnel, documents and data reviewed as well as analysis tools utilized.

4.1 Data Collections

This case study will be conducted using 2 different methods, which are interview and documents review. Ten semi structured interviews will be conducted to 10 employees from different departments and positions. The interviewees selected include Factory Manager, Production Manager, Warehouse Manager, Warehouse Supervisor, QA and Technical Manager, Maintenance Engineer, Technical Executive, Sale Executive, Senior Miller and Accounts Manager to ensure thorough information are collected. Interview directed to Warehouse Manager and Warehouse Supervisor are to uncover the current inventory management problems faced and the problems foreseen if there is plan to improve the system while interview directed to Warehouse Manager, Production Manager, Senior Miller and QA and Technical Manager is to uncover the problems and levels of delays of inventory faced in inventory management. Besides that, Production Manager and Senior Miller are able to reveal the problem and restriction faced during operation. Interview directed to Sales and Technical Executive that are directly in touch with customer is to critically uncovering the perceptions, feedbacks of the customers and customersô level of

satisfaction towards the company and the incidents triggered from inventory management. Interview conducted with Accounts Manager is to understand the situation of rejected products cost and significant is the losses.

Another method of data collections is to review the documents and observations in the warehouse. Documents such as company details, reported customer complaints, records of rejected goods internally and from customers shall be studied to uncover the problem of the inventory management and the level of unsatisfactory of the customers.

4.2 Data linkage

Research question	**Data source**	**Justification**
What are the root causes that lead to the increased customer complaints in on time delivery?	Interview with Sales Executive, Technical Executive and QA and Technical Manager.	Sales Executive and Technical Executive deal directly with the customer orders and are able to report on reason of complaints and the levels of seriousness. QA and Technical Manager handle and processes the complaints and feedback to management. They would be the person to evaluate if complaints are genuine or not true and the reason that the complaints increased.

	Interview with Warehouse personnel.	Warehouse personnel deals with the inventory check and control including releasing stock to customers, reporting stock level daily and triggering production for all low level product. Besides that, they are able to know the warehouse limitations and constraints.
	Interview with Production personnel.	Production Manager deals with the operation from resources planning to production. Besides that, they are able to know the limitations and constraints in the operations.
	Interview with Accounts Manager.	Information gathered from Accounts Manager is to look into the current losses due to the rejects and look into the seriousness of the issue.
	Documents review	Study on the numbers of

		complaint filed to do an analysis on the figures to know the current system performance.
How to improve the current internal process that will help to improve on time delivery?	Interview with Production Manager.	Production Manager has good understanding on the process flow and is able to identify which processes are significantly important and crucial to the operation.
	Interview Senior Miller.	Senior Miller will be the person handling operation and facing the problems or difficulty in the process. He is able to highlight the areas of improvement and give very genuine comment on the efficiency of the process.
	Interview with warehouse personnel.	Warehouse Supervisor will be the person facing the problems or difficulty in the warehouse. He can give very genuine

		comment on the efficiency of process, inventory, and delivery then highlight areas for improvement.
	Interview with Maintenance Engineer.	Information gathered from Maintenance Engineer shall be able to verify the important of the process, comment on the efficiency of the process, comment on the restriction during operation and highlight areas for improvement.

Table 4.1: Data linkage between research questions and the data source

4.3 Case Analysis Tools

Four types of analysis tools are selected in this case study, namely SWOT analysis, TOWS, root cause analysis or Ishikawaôs fishbone analysis, process flow analysis or process mapping.