



**Faculty of Manufacturing Engineering**

**DEVELOPMENT OF RAW MATERIALS STORAGE MANAGEMENT  
SYSTEM FOR JAPAN-MALAYSIA TECHNICAL INSTITUTE**

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**Master of Manufacturing Engineering  
(Manufacturing System Engineering)**

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**DEVELOPMENT OF RAW MATERIALS STORAGE MANAGEMENT SYSTEM FOR  
JAPAN-MALAYSIA TECHNICAL INSTITUTE**

**HISHAMMUDIN BIN AHMAD**

**A thesis submitted  
in fulfillment of the requirements for the degree of Master of Manufacturing  
Engineering (Manufacturing System Engineering)**

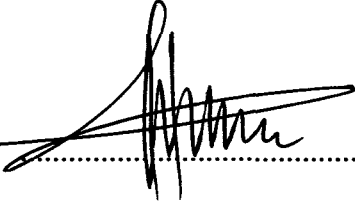
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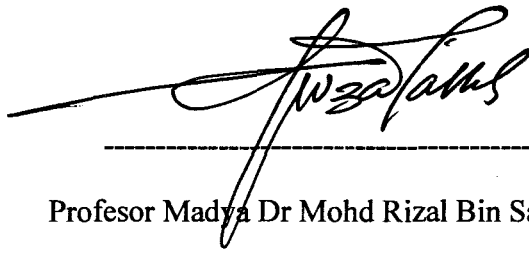
## DECLARATION

I declare that this thesis entitle “DEVELOPMENT OF RAW MATERIALS STORAGE MANAGEMENT SYSTEM FOR JAPAN-MALAYSIA TECHNICAL INSTITUTE is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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## APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment of the requirements for the degree of Master of Manufacturing (Manufacturing System Engineering). The member of supervisory committee is as follow:



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## **DEDICATION**

To my beloved wife, sons and daughters. Thanks for all your understanding and outstanding support.

## **ABSTRACT**

This study is about to develop the inventory control system for managing the raw materials issuing problems for teaching and learning purposes at Japan – Malaysia Technical Institute (JMTI), Bukit Minyak, Pulau Pinang. The objectives for this study are to identify the problem involved in the current situation for raw material storage system, develop one systematic approach by using database management system and analyze the effectiveness of developed system. Microsoft Access will be used as a platform for development of the database. The material management system is about the management functions related to the complete cycle of materials flow, from the purchase and internal control of production materials to the planning and control of work-in-progress, to the warehousing, shipping and distribution of the finished product to the customer. In this study, the material planning methods is used in re-order point system under economic order quantity for control the level of raw materials inventory at JMTI storage area. Direct observation on the site and also the interview with the person-in-charge of the store will be conducted. The comparison results between before and after the implementation of the system will be presented for future development of JMTI.

## **ABSTRAK**

*Kajian ini adalah tentang pembangunan sistem kawalan inventori untuk mengawal aliran bahan mentah untuk proses pengajaran dan pembelajaran di Institut Teknikal Jepun Malaysia (JMTI), Bukit Minyak, Pulau Pinang. Objektif kajian ini adalah untuk mengenalpasti masalah semasa yang melibatkan sistem penyimpanan bahan mentah, kemudian membangunkan suatu system yang sistematik dengan menggunakan pengurusan pengkalan data dan menganalisis keberkesanan sistem yang telah dibangunkan. Perisian Microsoft Access akan digunakan sebagai asas pembangunan pengurusan pengkalan data untuk sistem stor ini. Di dalam system pengurusan bahan, gambaran tentang fungsi pengurusan adalah berkaitan kitaran aliran bahan secara lengkap, daripada pembelian dan kawalan dalaman termasuk perancangan dan kawalan bahan semasa kerja, di gudang, penghantaran produk siap kepada pelanggan. Untuk kajian ini, salah satu kaedah perancangan bahan digunakan iaitu kaedah titik pesanan semula di bawah pesanan kuantiti ekonomi untuk mengawal tahap inventori bahan mentah di stor JMTI berada di tahap cemerlang. Pemerhatian terus dan sesi temuduga dengan penyelia stor digunakan untuk kaedah pengumpulan data. Untuk memastikan sistem pengkalan data yang efektif, semua pengumpulan data mestilah tepat dan dianalisa dengan cara yang terbaik. Keputusan dengan membandingkan antara sebelum dan selepas pelaksanaan sistem ini akan memberikan kesan kepada pembangunan JMTI pada masa hadapan.*

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My sincere appreciation also extends to all my colleagues and others who have provided assistance at various occasions. Their views and tips are useful indeed. Unfortunately, it is not possible to list all of them in this limited space. Last but not least I am very grateful to all my family members for their support and understanding.



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## LIST OF ABBREVIATIONS

DBMS	-	Database Management System
EOQ	-	Economy Order Quantity
GUI	-	Graphical User Interface
IDE	-	Integrated Development Environment
JIT	-	Just-in-Time
JMTI	-	Japan Malaysia Technical Institute
MoHR	-	Ministry of Human Resources
MoF	-	Ministry of Finance
TPM	-	Total Preventive Maintenance
TQM	-	Total Quality Management
TKM	-	Teknologi Kejuruteraan Mekatronik
TKP	-	Teknologi Kejuruteraan Pembuatan
TKE	-	Teknologi Kejuruteraan Elektronik
TKK	-	Teknologi Kejuruteraan Komputer
RAD	-	Rapid Application Development

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# CHAPTER 1

## INTRODUCTION

### 1.0 Background

Globalization of new millennium in industrial world is highly competitive and required extra commitment and effort to strategies and fulfills the demand from customer through improving the quality of the product and customer service. Computer technology changing is very fast and it is very significant to our human life especially in industrial sector either produce the products or provide the services. It is also significant in the manufacturing processes by eliminating all the wastes and improving the customer satisfaction and also complying with the international standard in terms of quality of products or services.

In many industries, good management in storage of consumable materials can prevent the shortage of materials and also ensure the completion of finished product following the production planning. So that, it can be delivered according to customer's targeted delivery date. Servicing or government sectors are also applied the similar processes with regard to serve high quality of services to all Malaysian citizens and the country. For that reason, the government sectors are required to improve or enhance its processes efficiently when dealing with their stakeholders.

This study will focus on the inventory management system especially for improving the Japan Malaysia Technical Institute (JMTI) raw materials storage system for the teaching and learning purposes. In the first place, this study will observe the current implementation procedure specifically on the consumable material management system and then, a monitoring system will be developed to monitor the inventory status frequently in its storage area.

## **1.1 Problem Statement**

This study is focused on the raw materials re-ordering management system at JMTI, Penang as one of the public institution under Ministry of Human Resources (MoHR). Through the observations and experiences, the existing system is manually implemented and not systematic approach. It has initiated unbalance level of raw materials inventory especially for the teaching and learning purposes.

In the current practice, re-order process is being made when the quantity of items reached at the minimum quantity level. The organization also doesn't have any proper ordering procedures which lead to run out of consumable materials. The maximum and minimum level of quantity has not been decided for controlling the availability of the items.

The most significant problem of the current system is in updating the stock level which will consume a lot of time. The consequence of these problems will effect badly the teaching and learning sessions that has been planned.



## **1.2 Research Objective**

The objectives of this research are as follows:

- a) To study current storage system at Japan Malaysia Technical Institute (JMTI);
- b) To develop a re-order system for raw materials management system; and
- c) To analyse the effectiveness of developed system.

## **1.3 Scope Of The Study**

This research will be conducted at Japan Malaysia Technical Institute (JMTI), Bukit Minyak, and Penang. Generally JMTI consist of four main departments and those are Mechatronic Department, Manufacturing Department, Electronic Department and Computer Department. This study will be focused on raw materials re-ordering system for Mechatronic Department only as a pilot project. The necessary information will be collected not only from Mechatronic Department but also from the JMTI asset officer.

Then, the comparison will be made between the current and the proposed system to measure its effectiveness.

## **1.4 Research Benefit Expexted**

Based on the concepts and techniques that have been discussed in this study, a few expected benefits will be generated such as:

- a) To understand the basic concept of inventory management and also the important of inventory for improving organization productivity by reducing inventory cost and eliminating the waste.

- b) To prepare consumable materials stock at optimum level for storage purposes.
- c) To plan the budgeting on consumable materials.
- d) To have good communication among the instructors in the department and other related department.
- e) To enhance teaching and learning session.
- f) To minimize the storage area.
- g) To enhance 5S culture at working place for the instructors and students

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.0 Introduction**

Inventory management is very important for any organisations and it is related with the operation and financial control. The appropriate and efficient inventory systems are necessary to ensure that the products or services provided fulfil the needs of end users. This chapter will discuss in details on the inventory management system by referring to academic books, journals, magazines, articles, and also from website. This chapter will also discuss a few related models in order to support this study.

#### **2.1 Materials Management**

Materials Management is a term used to describe the grouping of management functions related to the complete cycle of materials flow, from the purchase and internal control of production materials to the planning and control of work inprogress, to the warehousing, shipping and distribution of the finished product (Genin et al. 2008). It is a core activity of all types of organizations. All organizations are continuously involved in procurement, storage and stock replenishment of different types of production materials.

In a manufacturing organization, materials management contributes the greater importance, though it also adds to the greater degree of complexities. Cost of managing the

materials will be varied from 40% to 80% of the production cost or sales depending on the organization (Vollmann et al. 2005). Material management is an important management tool which will be very useful in getting the right quality and quantity of supplies at right time. Therefore, by having a good inventory control and adopting sound methods of condemnation and disposal, it will improve the efficiency of the organization and also make the working atmosphere better

## **2.2 Inventory Management**

Managing inventory of an organization is a vital task and need high concentration and focus especially at the management level. Inventory is the stock of any item or resource used in an organization. It includes the raw materials, finished products, component parts, supplies, and work-in-process. An inventory system is the set of policies and controls that monitors levels of inventory and determines what levels should be maintained, when stock should be replenished, and how large orders should be made (Jonsson et al. 2006). The purposes of inventories are:

- i. To maintain independence of operations,
- ii. To meet variation in product demand,
- iii. To allow flexibility in production scheduling,
- iv. To provide a safeguard for variation in raw material delivery time, and
- v. To take advantage of economic purchase order size.

(Piasecki, 2001) mentioned that in today's leading technology, many companies are not taking advantage of the fundamental inventory models. There are various software

packages in aiding companies with inventory control, but if the input data are inaccurate, it may lead to poor results.

The inventory cost is not only interest on stocks but also cost of store building for storage, insurance and obsolescence and movement of inputs from place of storage to the factory where the materials have to be finally used to convert them into finished goods (Mohd Saberi, 2007). Japan industries have adopted the concept of Just in Time (JIT) at which the components or materials are received when it is required and the detailed instructions are given to suppliers so that the components can be delivered according to the schedule (Shah and Ward, 2003). For the most ideal situation, company should keep its stock for a few hours and at the most for one day need. JIT purchasing is the purchase of materials (or goods) so that they are delivered just as needed for production (or sales). Benefits include lower inventory holdings (reduced warehouse space required and less money tied up in inventory) and less risk of inventory obsolescence and spoilage. A recent survey of senior manufacturing executives showed that 71% used some form of JIT in their processes (Pragman, 1996).

JIT manufacturing can be a real money-saver for a company. Companies are not only more responsive to their customers, but they also have less capital tied up in raw materials and finished goods inventory, allowing companies to optimize their transportation and logistics operations.

Dell, which participates in the computer technology industry, is the only company within its industry that effectively utilizes just in time. This strategy provides Dell with a time-to-market advantage. Dell's use of just in time results in cost savings, superior customer satisfaction, limited waste, and the ability to provide their suppliers with more information. In the end these benefits all result in a cost savings for Dell and higher revenue.

### **2.2.1 Objectives of Inventory Management**

The primary objectives of inventory management are to minimize the possibility of disruption in the production schedule of a firm for want of raw material, stock and spares, and to keep down capital investment in inventories. So it is essential to have necessary inventories. Excessive inventory is an idle resource of a concern. The concern should always avoid this situation. The investment in inventories should be just sufficient in the optimum level. The major dangers of excessive inventories are the unnecessary tie up of the firm's funds and loss of profit, excessive carrying cost, and the risk of liquidity.

The excessive level of inventories consumes the funds of business, which cannot be used for any other purpose and thus involves an opportunity cost. The carrying cost, such as the cost of shortage, handling insurance, recording and inspection, are also increased in proportion to the volume of inventories. This cost will impair the concern profitability further. On the other hand, a low level of inventories may result in frequent interruptions in the production schedule resulting in under-utilization of capacity and lower sales. The aim of inventory management thus should be to avoid excessive inventory and inadequate inventory and to maintain adequate inventory for smooth running of the business operations. Efforts should be made to place orders at the right time with the right source to purchase the right quantity at the right price and quality.

The effective inventory management should maintain sufficient stock of raw material in the period of short supply and anticipate price changes. Ensure a continuous supply of material to production department facilitating uninterrupted production. Minimize the carrying cost and time for manufacturing. Maintain sufficient stock of finished goods for smooth sales operations. Ensure that materials are available for use in production and production services as and when required. Ensure that finished goods are available for delivery to customers to fulfil orders, smooth sales operation and efficient customer service.

Minimize investment in inventories and minimize the carrying cost and time. Protect the inventory against deterioration, obsolescence and unauthorized use. Maintain sufficient stock of raw material in period of short supply and anticipate price changes. Control investment in inventories and keep it at an optimum level.

### **2.3 Inventori Control System**

Inventory control is concerned with the acquisition, storage, handling and use of inventories so as to ensure the availability of inventory whenever needed, providing adequate provision for contingencies, deriving maximum economy and minimizing wastage and losses. Hence Inventory control refers to a system, which ensures the supply of required quantity and quality of inventory at the required time and at the same time prevent unnecessary investment in inventories. It is one of the most vital phases of material management. Reducing inventories without impairing operating efficiency frees working capital that can be effectively employed elsewhere. Inventory control can make or break a company. This explains the usual saying that inventories are the graveyard of a business.

Designing a sound inventory control system is in a large measure for balancing operations. It is the focal point of many seemingly conflicting interests and considerations both short range and long range.

The aim of a sound inventory control system is to secure the best balance between too much and too little. Too much inventory carries financial risks and too little reacts adversely on continuity of productions and competitive dynamics (Piasecki, 2001). The real problem is not the reduction of the size of the inventory as a whole but to secure a scientifically determined balance between several items that make up the inventory.

The efficiency of inventory control affects the flexibility of the firm. Insufficient procedures may result in an unbalanced inventory. Some items out of stock, other

overstocked, necessitating excessive investment. These inefficiencies ultimately will have adverse effects upon profits. Turning the situation round, difference in the efficiency of the inventory control for a given level of flexibility affects the level of investment required in inventory. The less efficient is the inventory control, the greater is the investment required. Excessive investment in inventories increase cost and reduce profits, thus, the effects of inventory control of flexibility and on level of investment required in inventories represent two sides of the same coin. Control of inventory is exercised by introducing various measures of inventory control, such as ABC analysis fixation of norms of inventory holdings and reorder point and a close watch on the movements of inventories.

### **2.3.1 Inventories Control Techniques**

#### **i. ABC Analysis of Inventories**

The ABC inventory control technique is based on the principle that a small portion of the items may typically represent the bulk of money value of the total inventory used in the production process, while a relatively large number of items may from a small part of the money value of stores (Tanwari, 2000). The money value is ascertained by multiplying the quantity of material of each item by its unit price.

#### **ii. Fixation of Norms of Inventory Holdings**

Either by the top management or by the materials department could set the norms for inventories. The top management usually sets monetary limits for investment in inventories. The materials department has to allocate this investment to the various items and ensure the smooth operation of the concern. It would be worthwhile if norms of inventories were set by the management by objectives, concept. This concept expects the top management to set the inventory norms (limit) after consultation with



the materials department. A number of factors enter into consideration in the determination of stock levels for individual items for the purpose of control and economy.

iii. **Minimum Level**

The minimum level of inventories of their reorder point may be determined on the following bases consumption during lead-time, consumption during lead-time plus safety stock, stock out costs, and customer's irritation and loss of goodwill and production hold costs. To continue production during Lead Time it is essential to maintain some inventories. Lead Time has been defined as the interval between the placing of an order (with a supplier) and the time at which the goods are available to meet the consumer needs (Segerstedt, 2006).

There are sometimes fluctuations in the lead-time and in the consumption rate. If no provision is made for these variations, stock out may take place-causing disruption in the production schedule of the company. The stock, which takes care to the fluctuation in demand, varies in lead-time and consumption rate is known as safety stock. Safety stock may be defined as the minimum additional inventory, which serves as a safety margin or buffer or cushion to meet an unanticipated increase in usage resulting from an unusually high demand and or an uncontrollable late receipt of incoming inventory. It can be determined on the basis of the consumption rate, plus other relevant factor such as transport bottleneck, strikes or shutdowns.

In the case of uncertainly, the probabilistic approach may be applied to determine the safety margin. To avoid stock out arising out of such eventualities, companies always carry some minimum level of inventories including safety stock. Safety stock may not be static for all the times. A change in the circumstances and in

the nature of industry demand, necessitates are adjusted in its level. In this study an effort has been made to examine how the current companies determine their minimum level for re-order inventories, safety stock, whether a level of study is maintained throughout the year or not (Roach, 2005).

For each type of inventory a maximum level is set that demand presumably will not exceed as well as a minimum level representative a margin of safety required to prevent out of stock condition. The minimum level also governs the ordering point. An order to sufficient size is placed to bring inventory to the maximum point when the minimum level is reached.

iv. **Maximum Level**

The upper limit beyond which the quantity of any item is not normally allowed to rise is known as maximum level. In the data gathering, one of the method uses is economic order quantity. Economic Order Quantity (EOQ) is used to identify minimize stock outs and find the optimal order quantity while minimize total cost that associated with each product. The fixation of the maximum level depends upon a number of factors, such as, the storage space available, the nature of the material i.e. chances of deterioration and obsolescence, capital outlay, the time necessary to obtain fresh supplies, the EOQ, the cost of storage and government restriction.

v. **Re-Order Level**

Also known as the 'ordering level' the reorder level is that level of stock at which a purchase requisition is initiated by the storekeeper for replenishing the stock. This level is set between the maximum and the minimum level in such a way that before the material ordered for is received into the stores, there is sufficient quantity on hand to cover both normal and abnormal circumstances (Heizer and Render, 2006). The fixation of ordering level depends upon two important factors, first is maximum delivery period and second is maximum rate of consumption.

vi. **Re-Order Quantity**

The quantity, which is ordered when the stock of an item falls to the reorder level, is known as the reorder quantity or the EOQ or the economic lot size (Putra,2008). Although it is not a stock level as such, the reorder quantity has a direct bearing upon the stock level in as much as it is necessary to consider the maximum and minimum stock level in determining the quantity to be ordered. The re-order quantity should be such that, when it is added to the minimum quantity, the maximum level is not exceeded. The re-order quantity depends upon two important factors, order costs and inventory carrying costs. It is, however, necessary to remember that the ordering cost and inventory carrying cost are opposed to each other. Frequent purchases in small quantities, no doubt reduce carrying cost, but the ordering costs such as the cost of inviting tenders of placing order and of receiving and inspection, goes up (Bassin, 1990). If on the other hand purchases are made in large quantities, carrying costs, such as, the interest on capital, rent, insurance, handling charges and losses and wastage, will be more than the ordering costs. The EOQ is therefore determined by balancing these opposing costs. According to (Chen, 1998) the Re-Order Point quantity reflects

the level of inventory that triggers the placement of an order for additional units. Where as, the quantity associated with safety stock protects the company from stock outs or backorders. Safety stock is also known as a buffer. In Figure 2.1, the graph illustrates how the reorder point is connected with the lead time and the order quantity as a function of time. The reorder point show as this formula:

$$\text{Reorder Point} = \text{Lead Time} \times \text{Demand per Day} + \text{Safety Stock} \quad (2.1)$$

The economic order quantity indicates how many units to order or produce. Quantity of Re-order Point (ROP) and Safety Stock reflects the level of inventory that triggers the placement of an order for additional units. For determination of the order point is based on three factors:

- i. Usage – Usage refers to the quantity of inventory used or sold each day
- ii. Lead Time – The lead time for an order is the time in days it takes from the placement of an order to when the goods arrive or are produced. Many times companies can project a constant, average figure for both usage and lead time
- iii. Safety Stock – The quantity of inventory kept on hand by a company in the event of fluctuating usage or unusual delays in lead time is called safety stock. Safety stock helps to prevent stockouts should any of these unexpected conditions occur.

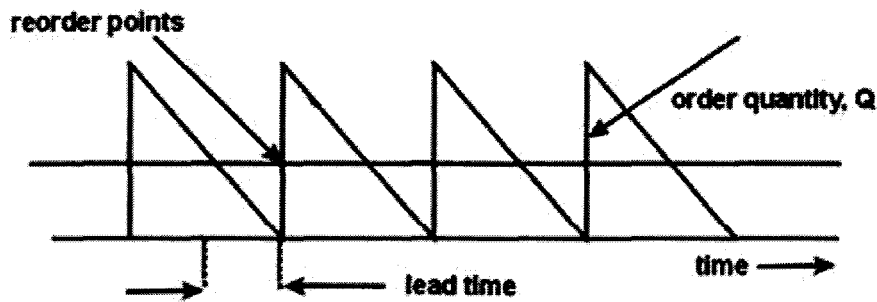


Figure 2.1: Reorder Point (Source: Moinzadeh et al, 1989)

ii. **Economy Order Quantity**

The EOQ refers to the order size that will result in the lowest total of order and carrying costs for an item of inventory. If a firm place unnecessary orders it will incur unneeded order costs. If a firm places too few order, it must maintain large stocks of goods and will have excessive carrying cost (Piasecki, 2001). By calculating an economic order quantity, the firm identifies the number of units to order that result in the lowest total of these all costs as show at Figure 2.2.

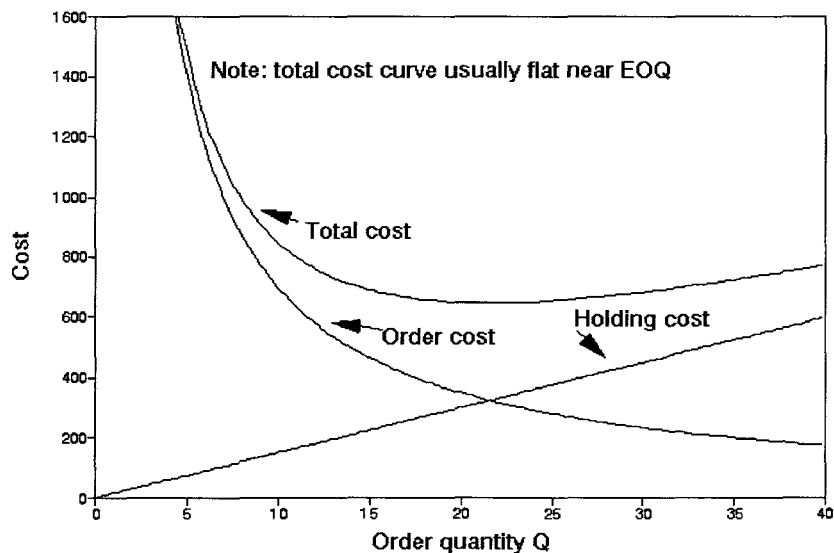


Figure 2.2: Economic Order Quantity (Source: Moinzadeh et al, 1989)

The EOQ formula is:

$$EOQ = \sqrt{\frac{(2QO)}{C}} \quad (2.2)$$

Where:

EOQ = economic order quantity in units

Q = estimated annual quantity used in units (can be found in the annual purchases budget)

O = estimated cost of placing one order

C = estimated cost to carry one unit in stock for one year

#### **2.4 EOQ Help in Inventory Management**

Inventory Management also known as stock management is a crucial part of working capital management. EOQ is one of the most prominent models used widely for effective inventory management. EOQ calculates the ordering quantity of inventory using inputs of carrying cost, ordering cost, annual usage of the said inventory. Two important questions of inventory management are how much inventory should be ordered? And when should it be ordered? In manufacturing and merchandising companies, inventory management is overemphasized. It is because the inventory covers major part of the asset pie. Inventory is a part of current assets and it occupies a major share of working capital and hence it is necessary to ensure that it does not block too much of finance . The first thing that should be evaluated is the type of costs associated with it. However, there is a general presumption that inventory cost means the cost price of product stored as inventory. Practically, there are other costs as well, which are associated with inventory like ordering cost, carrying cost etc.

## **2.5 Inventory Management System with Ms Office**

Microsoft Office is an excellent tool for developing all kinds of business applications, including an inventory management database. A database is a collection of similar information; storing it on a computer provides means of analysing and manipulating this information. The database program included in the Microsoft Office suite can be used to develop a comprehensive database management system, including complete information about the various products the company produces. Microsoft Office Access and Microsoft Office Excel possess many similarities, which can make it difficult to decide which one program will use. For example, both programs can store large amounts of data, run powerful queries and analysis tools to slice and dice that data, and perform sophisticated calculations that return the data need.

However, each program has clear advantages and disadvantages, it depending on the type of data that want to manage and what perpose with that data. For example, if the goal is to maintain data integrity in a format that can be accessed by multiple users, MS Access is best choice, whereas MS Excel is better suited for complex numerical data that want to analyze in depth.

### **2.5.1 Microsoft Office Access**

Access is the best choice for track and record data regularly, and then display, export, or print subsets of that data. Access forms provide a more convenient interface rather than an Excel worksheet for working with the data. Access can use for automate frequently performed actions, and Access reports will summarize the data in printed or electronic form. Access provides more structure data; for example, for control what types of data can be entered, what

values can be entered, and it can specify how data in one table is related to data in other tables. This structure helps to ensure that only the correct types of data are entered. Access stores data in tables that look much the same as worksheets but Access tables are designed for complex querying in relation to data stored in other tables. The advantages of using Access such as anticipate many people working in the database and you want robust options that safely handle updates to your data, such as record locking and conflict resolution. It can anticipate the need to add more tables to a data set that originated as a flat or nonrelational table. And also access can run complex queries and produce a variety of reports or mailing labels. Access usually use are some common area such as managing contacts, inventory and asset tracking, order tracking, task tracking, organizing lending libraries, event planning, nutrition tracking keep track of recipes, and log diet and exercise activities.

### **2.5.2 Microsoft Office Excel**

As a spreadsheet program, Excel can store large amounts of data in workbooks that contain one or more worksheets. However, instead of serving as a database management system, such as Access, Excel is optimized for data analysis and calculation. This flexible program to build models for analyzing data, write simple and complex formulas to perform calculation on that data, pivot the data any way that needed, and present data in a variety of professional looking charts. The advantages of using excel are as below:

- i. Require a flat or nonrelational view of your data instead of a relational database that uses multiple tables, and when your data is mostly numeric.
- ii. Frequently run calculations and statistical comparisons on your data.
- iii. Want to use PivotTable reports to view hierarchical data in a compact and flexible layout.



- iv. Plan to create charts regularly and want to use the new charting formats that are available in Office Excel 2007.
- v. Want to emphasize your data by using conditional formatting icons, data bars, and color scales.
- vi. Want to perform sophisticated what-if analysis operations on your data, such as statistical, engineering, and regression analysis.
- vii. Want to keep track of items in a simple list, either for personal use or for limited collaboration purposes.

For excel also have some common area to use such as accounting, budgeting, billing and sales, reporting, planning and scheduling, data tracking in a time sheet or list, and using as calendars

### **2.5.3 Access vs. Excel**

Access databases and Excel spreadsheets although originally very different, have evolved to have similar functions. Although either type of program can do many, but not all, of the things that the other one does, there are some things which are easier in one program than the other.

Excel is not database management systems. Excel spreadsheets store data in rows and columns called worksheets. The areas within the worksheet where the rows and columns intersect are called cells. The most common use of spreadsheets is to manage basic information such as telephone numbers, employee names, financial data, calculations, etc.

Access stores data in tables that look similar to worksheets but function quite differently. Tables, the foundation of all relational databases function both independently and interdependently with other tables to allow the database user to combine data from multiple sources and analyze and/or report information in almost limitless ways.

## **2.6 Visual Basic Software**

Visual Basic is a third-generation event-driven programming language and integrated development environment (IDE) from Microsoft for its COM programming model first released in 1991. Visual Basic is designed to be relatively easy to learn and use. Visual Basic was derived from BASIC and enables the rapid application development (RAD) of graphical user interface (GUI) applications, access to databases using Data Access Objects, Remote Data Objects, or ActiveX Data Objects, and creation of ActiveX controls and objects. The scripting language VBScript is a subset of Visual Basic.

A programmer can create an application using the components provided by the Visual Basic program itself. Programs written in Visual Basic can also use the Windows API, but doing so requires external function declarations. Though the program has received criticism for its perceived faults, version 3 of Visual Basic was a runaway commercial success, and many companies offered third party controls greatly extending its functionality. The final release was version 6 in 1998. Microsoft's extended support ended in March 2008 and the designated successor was Visual Basic .NET (now known simply as Visual Basic).

## **2.7 Computerise System And Research Area**

Computerise system are extremely used in critical environments such as financial, medical, and military system (Mallouli et al. 2008). Accordingly, there is a need for computerise systems which can adapt to different background, different fields and different environment. Actually many organizations nowadays realize the importance of implementing web based system that potentially lead to savings in term of reduced the inefficiency and increase the productivity. With computerise system that provide real time information, it can be accessible from any location. In addition, computerise system with reliable automated database.

management is an alternative to provide cost and time efficient compared to traditional method.

Currently, Ministry of Finance (MoF) gives guideline to ministry and agencies to manage the store. The term of store used based on Malaysian government defined it is a place to store and implement recording, storage, receipt, operation, production and maintenance for stocks. Meanwhile, stock means the items unused and should be keep for operation and maintenance including offices supply, spare parts, laboratory, workshop, kitchen, training, domestic, broadcasting, book that are controlled by officer or person in charge. Actually, the impact of poor inventory management, disorganized and inefficiency can cause government suffered lost, obsolescence, shrinkage and theft of goods stored. Poor inventory management practices are identified with collaboration between stock and accounting system. According to (Rajeev, 2008) lack of qualified staff contribute to low inventory management practices.

As the result, the issue of store management weakness often rose in the Auditor General's Report. Government takes into account with reviewed and update in order to facilitate its implementation in agency level. There are eight steps that government takes into government store management procedures which cover acceptance, record stocks, storage, production, inspection, safety and hygiene, disposal, loss and write-off. Store function is to provide services to customer supply to perform the following tasks:

To received goods order from supplier by validating and certifying items.

- i. To keep stock in accordance with the methods and locations using optimal storage space.
- ii. To issue stock according to the customer requirements.
- iii. To maintained the stock with the good condition.
- iv. Maintain records for each transaction in order to make sure stock are accurate, organized and up to date.

- v. To manage the accumulation of stocks to ensure availability of stocks in accordance with prescribed level.
- vi. Handling and packaging the stock to customers.
- vii. Identify any weakness that can cause stock rift, obsolete, damaged and not use.
- viii. Provide security, hygiene and fire control systems to maintenance stores.
- ix. Manage action on the missing stock.

(Karim et al. 2011) proposed a study which presented a model for computerise based inventory management system to put in place in five different laboratories of Engineering Department in large public universities in Malaysia. This is related with JMTI's need in order to have a reference model of computerise based system to ease stock management. Inventory management system is much easier by quickly and efficiently cataloguing all information included quantity present, cost item and indoor location warehouse by using database or software (Tanwari, A. Q, 2000). (McNeely, M. 2006) highlighted that universities are encourage and want to create programs to support minimization waste. As reported by (Siong et al. 2008), computerise based and applications provide low cost and enhance delivery performance in the National Heart Center Singapore.

## **2.8 Summary**

Some application of computerise based management system, models and simulations related to inventory management have been presented. Hence, the related studies mentioned before will be employed and applied into the Model of Raw Material Storage Management System at JMTI.

## **CHAPTER 3**

### **METHODOLOGY**

#### **3.0 Introduction**

This chapter will introduce the steps that will be performed during the implementation of this study. The major activities involved in this study are data collection and database management system development. The system will be developed using a relational database which is Microsoft Access.

#### **3.1 Collecting Data**

The data collected through interview session will be used to develop the re-order database management system for raw materials or consumable item at Japan – Malaysia Technical Institute (JMTi) Seberang Perai Tengah, Penang. JMTi offer four courses such as Diploma in Mechatronic Engineering, Diploma in Manufacturing Engineering, Diploma in Electronic Engineering and Diploma in Computer Engineering. This study will be specifically implemented at Mechatronic Department for developing the raw materials re-orders management system. This department has been chosen because it has a lot of raw materials or consumable items that is necessary for the teaching and learning purposes.

### **3.1.1 Reviewing the Current Storage System**

The current storage system had been reviewed to get the necessary information involved, so that it can help to develop an effective raw material management system. This new system will give benefits on:

- the stock management
- The flow of raw material within the storage area.
- The enhancement of current stock management system.
- The problems occurred in the store will be more visible.

### **3.1.2 Interview**

The conducted interview will involve the persons who are managing the storage area including the storekeeper and also the persons that directly in-charged of the current system. The data needed including name of the item, part number, quantity, location of the items, supplier involved, etc.

## **3.2 Database Management Inventory System: Design Methodology**

(Connolly, 1999) explained that the design methodology is a structured approach that uses procedures, techniques, tools and documentation aids to support and facilitate the process of design. There are a lot of steps involved in developing the database management inventory system. Database design methodology can be divided into three main phases which are conceptual, logical and physical design. The main aim of each phase is as follows:

- *Conceptual database design*

To build the conceptual representation database including the identification of important entity and relationship types.