Sudan University of Science and Technology

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Inventory Management Best Practices with Application to Sudanese Industry

A project submitted in partial fulfillment for the requirements of the degree of B.SC (Honor) in Mechanical Engineering

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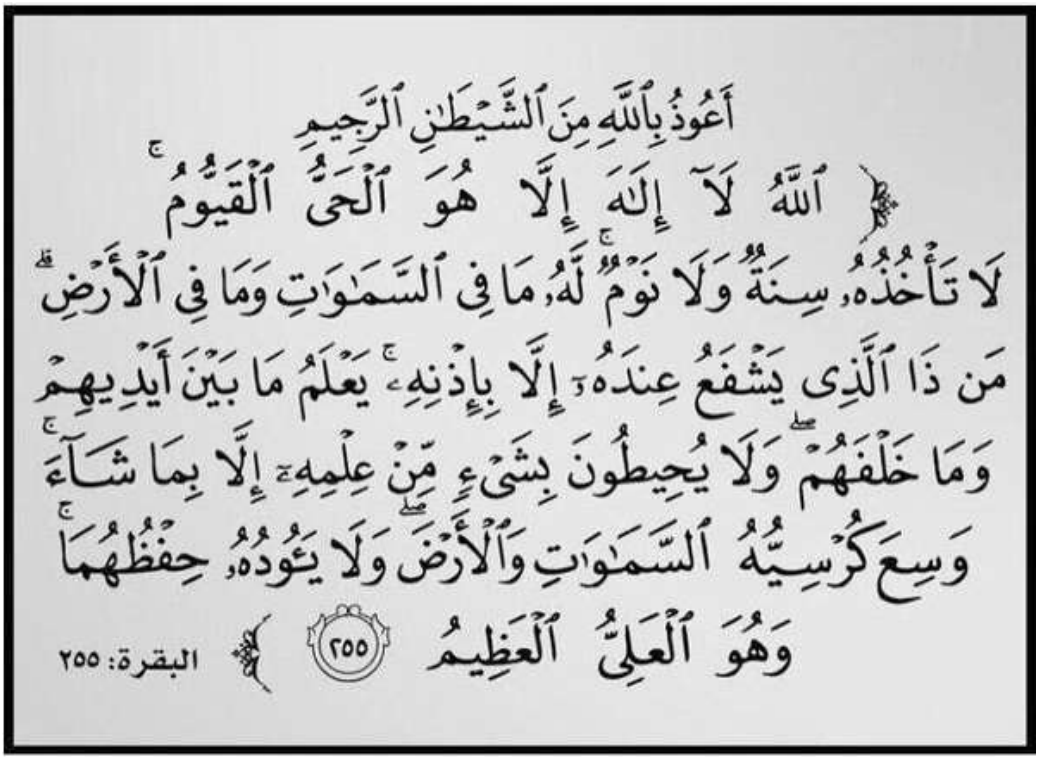

صدق الله العظيم

Dedication

This project is dedicated to our beloved family and many friends. A special feeling of gratitude to our loving parents, whose words of encouragement and tenacity still ring in our ears. We also would like to dedicate this work to our many friends who have supported us throughout this process. We will always appreciate all they have done.

Acknowledgement

We would like to thank everyone that has been supporting us through our academic lives, especially those who helped us during the mechanical engineering course. We are thankful for our supervisor and mentor Prof. Widatalla Alamin, because he was beside us in every step throughout the research, and for his guidance and support by providing us with the best advice and resources to overcome different challenges.

Abstract

The purpose of this project is to find the optimum practices for managing inventory, and determining the practices being followed in the Sudanese industry. In order to collect the required data to determine the inventory management procedures we developed a questionnaire and made sure to include specific questions that will produce the required information that we need about the inventory management system. The next step is handing out the questionnaires in order to conduct a field survey. We tried to cover as wide a range of industrial facilities as possible to make sure we have a diverse pool of samples that will accurately represent the industry of the country. The final step is the data analysis procedure in which we opted to use the SPSS Statistics v.23 software. This software provides a helpful platform to analyze questionnaires in the most accurate way possible. Data is inserted into the software in the form of a code providing all the variables of the questions and the system proceeds to translate them in the form of tables, graphs, and all kinds of charts. After analyzing the data we go ahead and compare the practices being used in the country to the worldwide standards. After conducting the study, we determined that most of the Sudanese companies and factories don’t tend to follow the best practices for managing their inventory.

المستخلص

الغرض من هذا المشروع هو إيجاد أفضل الممارسات لإدارة المخزون، وتحديد الممارسات المتبعة في الصناعة السودانية. من أجل جمع البيانات المطلوبة لتحديد إجراءات إدارة المخزون قمنا بتصميم استبيان والتأكد من تضمين أسئلة محددة من شأنها أن تنتج المعلومات المطلوبة التي نحتاجها حول نظام إدارة المخزون. الخطوة التالية هي تقديم الاستبيانات من أجل إجراء مسح ميداني. حاولنا تغطية مجموعة واسعة من المنشآت الصناعية قدر الإمكان للتأكد من أن لدينا مجموعة متنوعة من العينات التي من شأنها أن تمثل بدقة القطاع الصناعي للبلد. الخطوة الأخيرة هي إجراء تحليل البيانات الذي اخترنا استخدام برنامج التحليل الاحصائي ويوفر هذا البرنامج منصة مفيدة لتحليل الاستبيانات في أدق طريقة ممكنة. يتم إدراج البيانات في البرنامج في شكل رموز مع توفير جميع المتغيرات من الأسئلة ويقوم النظام بترجمتها في شكل جداول ورسوم بيانية. بعد تحليل البيانات نمضي قدما بمقارنة الممارسات المستخدمة في البلاد إلى المعايير العالمية. بعد إجراء الدراسة توصلنا لاستنتاج أن معظم الشركات والمصانع لا تتبع الطرق المثلى لإدارة المخزون الخاص بها.

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Chapter One: Introduction

1.1 Introduction

The word ‘inventory’ has been defined in many ways, as indicated in the literature. Three definitions have been chosen which seem to be more appropriate to the topic developed in this dissertation. “Inventories are stockpiles of raw materials, suppliers, components, work in process, and finished goods that appear at numerous points throughout a firm’s production and logistics channel.” [1] According to Chase, Jacobs and Aquilano, inventory is the stock of any item or resource used in an organization. An inventory system is the set of policies and controls that monitor levels of inventory and determine what levels should be maintained, when stock should be replenished, and how large orders should be. [2]

Inventory management is the ongoing process of overseeing and controlling the entire operation of production from the start of ordering the raw materials required to processing them through the process production line while monitoring and ensuring no errors occur at any step of production all the way to having the finished product ready for shipment. It is an important part of doing business. It is the means by which companies remain stocked with all of the essential goods that they need to sell to customers and complete daily operations. When products are sold, they must be replenished at a rate that doesn't lead to huge overstocks or frequent sold-outs. [3]

1.2 Historical Background

Historically, inventory management has often meant too much inventory and too little management or too little inventory and too much management. There can be severe penalties for excesses in either direction. Inventory problems have proliferated as technological progress has increased the organization’s ability to

produce goods in greater quantities, faster and with multiple design variations. The public has compounded the problem by its receptiveness to variations and frequent design changes. [4]

Since the mid-1980s the strategic benefits of inventory management and production planning and scheduling have become obvious. The business press has highlighted the success of Japanese, European, North American firms in achieving unparalleled effectiveness and efficiency in manufacturing and distribution. In recent years, many of the firms have 'raised the bar', yet again by coordinating with other firms in their supply chains. For instance, instead of responding to unknown and variable demand, they share information so that the variability of the demand they observe is significantly lower. [5]

In the United States of America and other Western Countries, productivity improvement was pursued through reducing the amount of direct manufacturing labor expended per unit of output. This was a valid strategy because of the high labor content in many manufactured products. However, the proportion of unit cost due to labor has been steadily decreasing in recent years. In fact, the ratio of purchased materials to sales (in dollars) reached 60 percent for U.S. firms in 1985. Even large manufacturing firms, such as the U.S auto assemblers, purchase up to 60 percent of the value of the product. This implies that management of raw materials inventories is an area that shows great promise for productivity improvement. Japanese firms received much deserved attention in the mid-to late 1980s because of their remarkable performance on quality and inventory management. The tremendous interest in Just-in-Time manufacturing (JIT) indicates that work-in-process inventory management is also an area ripe for improvement. [6]

1.3 Problem Statement

Inventory management problems can interfere with a company's profits and customer service. They can cost a business more money and can lead to an excess of inventory overstock that is difficult to move. Most of these problems are usually due to poor inventory processes and out-of-date systems.

1.4 Project Objective

The objective of this project is to find the best practices for inventory management and compare them to the ones being used in the Sudanese industry.

1.5 Project Scope

This study was implemented in several industrial facilities in the country, conducting field surveys and collecting data for the research mainly through the use of a questionnaire.

Chapter Two:
Literature Review

2.1 Introduction

This chapter demonstrates the basic information of the inventory management system, and review some of the case studies of inventory management.

Inventory management is one of the most important business processes during the operation of a manufacturing company as it relates to purchases, sales and logistic activities. It is concerned with the control of stocks throughout the whole supply chain. Inventory control sits at the data level where the day-to-day business is organized. Inventory management is concerned with maintaining the correct level of stock and recording its movement.

2.2 Nature of Inventory

Inventory or stock (in common terms) is considered to be the central theme in managing materials. The inventory turnover ratio (ITR) is a barometer of performance of materials management function. In the generally understood term, inventory means a physical stock of goods kept in store to meet the anticipated demand. However, from materials management perspective, an apt definition of inventory is “a usable but idle resource having some economic value.” This brings to the fore a paradox in the concept of inventory perceived as a “necessary evil.”
It is necessary to have physical stock in the system to take care of the anticipated demand because non-availability of materials when needed will lead to delays in production or projects or services delivered. However, keeping inventory is not free because there are opportunity costs of “carrying” or “holding” inventory in the organization. Thus, the paradox is that we need inventory, but it is not desirable to have inventory. It is this paradoxical situation that makes inventory management a challenging problem area in materials management. It also makes a high inventory turnover ratio as a desirable performance indicator. [7]

2.3 Types of inventory

Employing the generic definition of inventory, a large spectrum of situations can be structured as inventory management problems. These include the following:

i. Raw materials inventory as input to manufacturing system

ii. Bought-out-parts inventory which directly goes to the assembly of a product as it is.

iii. Work-in-progress or work-in-process inventory or pipeline inventory.

iv. Finished goods inventory for supporting the distribution to the customers.

v. Maintenance, repair, and operating (MRO) supplies. These include spare parts, indirect materials, and all other sundry items required for production/service systems.

2.4 Effective Inventory Management

Effective inventory management is the result of outstanding inventory control and inventory management. Inventory control is managing the inventory that is already in your warehouse, stockroom, or store. On the other hand, inventory management is determining when to order products, how much to order, and the most effective source of supply for each item in each warehouse. That is, ensuring that you have the right quantity of the right item in the right location at the right time. [8]

An effective inventory management system should:

- Ensure a continuous supply of raw materials to facilitate uninterrupted production.

- Maintain sufficient stocks of raw materials in periods of short supply and anticipate price change.
- Maintain sufficient finished goods inventory for smooth sales operation, and efficient customer service.
- Minimize the carrying cost and time.
- Control investment in inventories and keep it at an optimum level.

2.5 Reasons to Hold Inventory

From the resource management point of view, we should not have inventories as these constitute the idle resources. However, if we did not have inventories, there will be shortages, production delays, and project delays. Some of the reasons for having inventories in the production/service system are as follows:

i. Time lag between placing orders and getting supplies at the point of consumption – Whenever we place a replenishment order, there is a time lag between placing the order and getting the materials at the point of use. This is called "replenishment lead time." In most cases the lead time is nonzero, and at times it is quite high. This necessitates holding of inventory to take care of demand during the lead times.

ii. Variability of lead times – In most cases, there is some degree of variability in lead times because the supply environment is perhaps "just-in-case" (JIC) type. Inventory has to be maintained as a shield to cope with the supply uncertainty. Inventory is the premium an organization pays for operating in a just-in-case supply environment. If there was no such uncertainty and if demand and supply are deterministic, then in just-in-time (JIT)-type environment, no or low inventory will be required. The greater the amount of supply uncertainty, the greater the amount of additional inventory required.

iii. Demand variability – If either we are unable to estimate the demand correctly or if there are uncertainties in demand, additional inventory will be required to act as a shield to absorb the demand variability. The greater the demand variability, the greater the amount of additional inventory required.

iv. Seasonal inventory – If the demand is cyclic or seasonal, then sometimes building inventory in the lean period to meet the peak period demand is employed as a strategy in aggregate production planning. This strategy results in inventory in some part of the year. [9]

2.6 Characteristics of Inventory Management

The following are the main characteristics that define inventory management:

i. Demand:

- Constant against Variable.
- Known against Random.

ii. Lead time:

- If items are ordered from outside, lead time is the time elapsed from the instant that the order is placed until it arrives.
- For items produced internally; lead time is interpreted as the amount of time required to produce a batch of items.

iii. Review time:

- Continuous Review: inventory level is known at all times (supermarkets).
- Periodic Review: inventory level is known at discrete points in time (small grocery).

iv. Excess Demand: how the system reacts to excess demand:

- Backorder
- Lost sales

v. Changing inventory:

- Limited shelf-life
- Obsolescence

2.7 Inventory Costs

Inventory costs are the costs related to storing and maintaining inventory over a certain period of time.

i. Holding Cost:

- Cost of providing the physical space to store items.
- Taxes and insurance.
- Breakage, Spoilage, deterioration, and obsolescence.
- Opportunity cost of alternative investment.

ii. Order Cost:

- It depends on the amount of inventory that is ordered or produced.

iii. Penalty Cost:

- Known as shortage cost or stock-out cost.
- It is the cost of not having sufficient stock in hand to satisfy the demand when it occurs.

- Back order.
- Lost sales.

2.8 Inventory Models

An inventory model is a mathematical model that helps businesses in determining the optimum level of inventories that should be maintained in a production process, managing frequency of ordering, deciding on quantity of goods or raw materials to be stored, tracking flow of supply of raw materials and goods to provide uninterrupted service to customers without any delay in delivery. [10]

2.8.1 Fixed Reorder Quantity System

Fixed Reorder Quantity System is an Inventory Model, where an alarm is raised immediately when the inventory level drops below a **fixed quantity** and new orders are raised to replenish the inventory to an optimum level based on the demand. The point at which the inventory is ordered for replenishment is termed as **Reorder Point**. The inventory quantity at Reorder Point is termed as **Reorder Level** and the quantity of new inventory ordered is referred as **Order Quantity**.

i. Average Demand (Dav): It is the average number of order requests made per day.

ii. Average Lead Time (TL): The time required to manufacture goods or product.

iii. Average Lead Time Demand (DL): Average number of orders requested during the Lead Time

$$DL = Day \; X \; TL \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.1)$$

iv. Safety Stock (S): It is the extra stock that is always maintained to mitigate any future risks arising due to stock-outs because of shortfall of raw materials or supply, breakdown in machine or plant, accidents, natural calamity or disaster, labor strike or any other crisis that may stall the production process. The quantity of safety stock is often derived by analyzing historical data and is set to an optimized level by evaluating carefully the current cost of inventory and losses that may be incurred due to future risk.

v. Reorder Level (RL): Reorder level is the inventory level, at which an alarm is triggered immediately to replenish that particular inventory stock. Reorder level is defined, keeping into consideration the **Safety Stock** to avoid any stock-out and **Average Lead Time Demand** because even after raising the alarm, it would take one complete process cycle **(Lead Time)** till the new inventories arrive to replenish the existing inventory.

$$RL = S + DL \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.2)$$

The fixed reorder system has been used for some time and keeps stock levels fairly stable. As a result, this ensures that there are no stock outs unless there is a great level of fluctuations in demand.

The fixed order will also have been set after the economic order quantity has been established, so the fixed order ensures that orders are placed when they are economically viable, so there is less wastage in terms of ordering supplies.

The fixed point also enables the stock to be monitored and replenished with little human input. The technology assists to monitor stock levels and orders are

generated automatically, so there is no risk of someone simply ‘forgetting’ to place an order.

2.8.2 Fixed Reorder Period System

Fixed Reorder Period System is an Inventory Model of managing inventories, where an alarm is raised after every **fixed period of time** and orders are raised to replenish the inventory to an optimum level based on the demand. In this case replenishment of inventory is a continuous process done after every fixed interval of time. It is also called as **Fixed Period Deficit Ordering system**, because every time the order is placed, the order quantity is different.

i. Regular Intervals (R): Regular Interval is the fixed time interval at the end of which the inventories would be reviewed and orders would be raised to replenish the inventory.

ii. Inventory on Hand (It): Inventory on hand is the Inventory level measured at any given point of time.

iii. Maximum Level (M): It is the maximum level of inventory allowed as per the production guidelines. The maximum level is derived by analyzing historical data.

iv. Order Quantity (O): In this system, inventory is reviewed at regular intervals (R), inventory on hand (It) is noted at the time of review and order quantity is placed for a quantity of (M) – (It).

$$O = M - It \quad \text{……..……} \quad (2.3)$$

2.8.3 Economic Order Quantity (EOQ)

The Economic Order Quantity (EOQ) is the number of units that a company should add to inventory with each order to minimize the total costs of inventory—such as holding costs, order costs, and shortage costs. The EOQ is used as part of a continuous review inventory system in which the level of inventory is monitored at all times and a fixed quantity is ordered each time the inventory level reaches a specific reorder point. The EOQ provides a model for calculating the appropriate reorder point and the optimal reorder quantity to ensure the instantaneous replenishment of inventory with no shortages. It can be a valuable tool for small business owners who need to make decisions about how much inventory to keep on hand, how many items to order each time, and how often to reorder to incur the lowest possible costs.

The EOQ model assumes that demand is constant, and that inventory is depleted at a fixed rate until it reaches zero. At that point, a specific number of items arrive to return the inventory to its beginning level. Since the model assumes instantaneous replenishment, there are no inventory shortages or associated costs. Therefore, the cost of inventory under the EOQ model involves a tradeoff between inventory holding costs (the cost of storage, as well as the cost of tying up capital in inventory rather than investing it or using it for other purposes) and order costs (any fees associated with placing orders, such as delivery charges). Ordering a large amount at one time will increase a small business's holding costs, while making more frequent orders of fewer items will reduce holding costs but increase order costs. The EOQ model finds the quantity that minimizes the sum of these costs.

The basic EOQ relationship is shown below:

$$TC = PD + HQ/2 + SD/Q\ldots\ldots\ldots\ldots\ldots\ldots(2.4)$$

Where;

- TC is the total annual inventory cost—to be calculated
- P is the price per unit paid
- D is the total number of units purchased in a year
- H is the holding cost per unit per year
- Q is the quantity ordered each time an order is placed
- S is the fixed cost of each order

2.9 Enterprise Resource Planning

Enterprise resource planning (ERP) is a process by which a company (often a manufacturer) manages and integrates the important parts of its business. An ERP management information system integrates areas such as planning, purchasing, inventory, sales, marketing, finance and human resources.

2.9.1 Inventory Management Software

Inventory management software is a software system for tracking inventory levels, orders, sales and deliveries. It can also be used in the manufacturing industry to create a work order, bill of materials and other production-related documents. Companies use inventory management software to avoid product overstock and outages. It is a tool for organizing inventory data that before was generally stored in hard-copy form or in spreadsheets. [11]

2.9.2 Purpose of IM Software

Companies often use inventory management software to reduce their carrying costs. The software is used to track products and parts as they are transported from a vendor to a warehouse, between warehouses, and finally to a retail location or directly to a customer.

Inventory management software is used for a variety of purposes, including:

a. Maintaining a balance between too much and too little inventory.

b. Tracking inventory as it is transported between locations.

c. Receiving items into a warehouse or other location.

d. Picking, packing and shipping items from a warehouse.

e. Keeping track of product sales and inventory levels.

f. Cutting down on product obsolescence and waste.

g. Avoiding missing out on sales due to out-of-stock situations.

2.9.3 Advantages of an ERP Inventory Management Software

There are several advantages to using inventory management software in a business setting:

a. Cost savings.

A company's inventory represents one of its largest investments, along with its workforce and locations. Inventory management software helps companies cut expenses by minimizing the amount of unnecessary parts and products in storage. It also helps companies keep lost sales to a minimum by having enough stock on hand to meet demand.

b. Increased Efficiency

Inventory management software often allows for automation of many inventory-related tasks. For example, software can automatically collect data, conduct calculations, and create records. This not only results in time savings, cost savings, but also increases business efficiency.

c. Warehouse Organization

Inventory management software can help distributors, wholesalers, manufacturers and retailers optimize their warehouses. If certain products are often sold together or are more popular than others, those products can be grouped together or placed near the delivery area to speed up the process of picking.

d. Updated Data

Up-to-date, real-time data on inventory conditions and levels is another advantage inventory management software gives companies. Company executives can usually access the software through a mobile device, laptop or PC to check current inventory numbers. This automatic updating of inventory records allows businesses to make informed decisions.

e. Data Security

With the aid of restricted user rights, company managers can allow many employees to assist in inventory management. They can grant employees enough information access to receive products, make orders, transfer products and do other tasks without compromising company security. This can speed up the inventory management process and save managers' time.

f. Insight into Trends

Tracking where products are stocked, which suppliers they come from, and the length of time they are stored is made possible with inventory management software. By analyzing such data, companies can control inventory levels and maximize the use of warehouse space. Furthermore, firms are more prepared for the demands and supplies of the market, especially during special circumstances such as a peak season on a particular month. Through the reports generated by the inventory management software, firms are also able to gather important data that may be put in a model for it to be analyzed.

2.9.4 Disadvantages of an ERP Inventory Management Software

There are two main disadvantages of inventory management software:

a. Cost

Cost can be a major disadvantage of inventory management software. Many large companies use inventory management software, but small businesses can find it difficult to afford it. Barcode readers and other hardware can compound this problem by adding even more cost to companies. The advantage of allowing multiple employees to perform inventory management tasks is tempered by the cost of additional barcode readers. Use of smartphones as QR code readers has been a way that smaller companies avoid the high expense of custom hardware for inventory management.

b. Complexity

Inventory management software is not necessarily simple or easy to learn. A company's management team must dedicate a certain amount of time to learning a new system, including both software and hardware, in order to put it to use. Most inventory management software includes training manuals and other information

available to users. Despite its apparent complexity, inventory management software offers a degree of stability to companies. For example, if an IT employee in charge of the system leaves the company, a replacement can be comparatively inexpensive to train compared to if the company used multiple programs to store inventory data.

2.10 Inventory Management Best Practices

Effective inventory management can have a direct effect on the overall health of the organization. It can greatly improve a company's sales and costs, or it can have a negative impact if it's poorly managed. Here is a list of the best practices to ensure optimization of inventory management systems.

2.10.1 Organizing of Inventory

Inventory is one of the most important aspects of a company and it must be organized to an extent that everyone knows where everything is placed and how much of it is available. Many companies just keep everything in the same place without knowing which item belongs to which part of the inventory, therefore this leads to waste of time searching for parts for when they are needed.

Inventory management software, especially one that uses barcode technology, is a key tool to the success of controlling your inventory. It is important to keep track of your inventory level by counting you on-hand inventory. There are a couple of ways to go about counting your inventory- A periodic inventory count is one where the entire inventory is counted at some pre-determined interval. It could be monthly, quarterly, semi-annually or annually. The process of counting the entire inventory is time-consuming, even when barcode is used. The count won't be accurate if the business is functioning normally during the count. A periodic

inventory count requires that all functions that affect inventory levels stop until the count is completed and recorded.

Because taking a periodic inventory count is such a major undertaking, even in a small business, many companies perform cycle counts throughout the year and a periodic count only at year end as an audit. Once an effective cycle count program is installed, many companies eliminate the periodic inventory count altogether. The concept of an inventory cycle count is that by counting smaller sections of the inventory at frequent intervals the process of the count is much less exhausting and the inventory count is more accurate.

2.10.2 Demand Forecasting

Demand forecasting is predicting future demand for the product. In other words, it refers to the prediction of probable demand for a product or a service on the basis of past events and current trends in the present. Demand forecasting enables an organization to make various business decisions, such as planning the production process, purchasing raw materials, managing funds and deciding the price of the product. An organization can forecast demand by making own estimates called guess estimate or taking the help of specialized consultants or market research agencies.

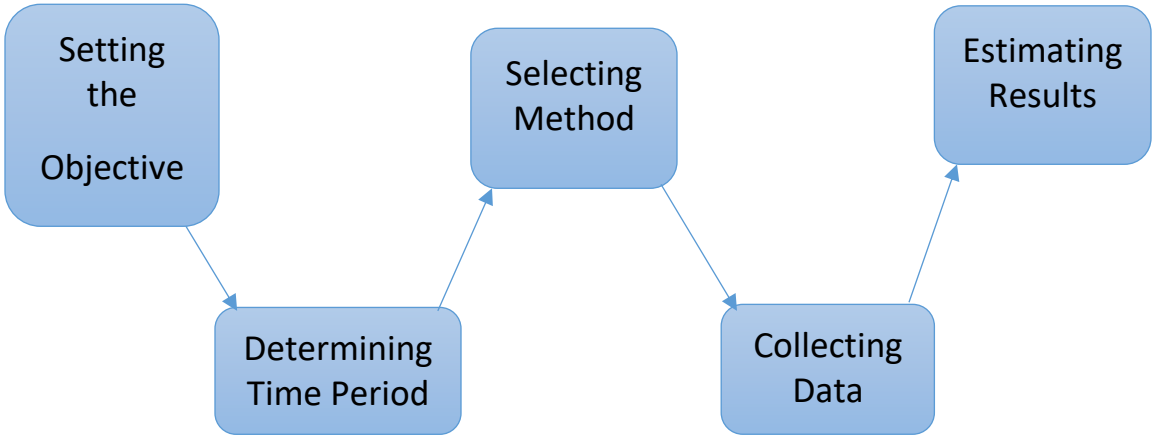

Figure 1: Steps for Demand Forecasting

The steps involved in demand forecasting (as shown in the figure above) are explained as follows:

1. Setting the Objective:

Refers to the first and foremost step of the demand forecasting process. An organization needs to clearly state the purpose of demand forecasting before initiating it. Setting objective of demand forecasting involves the following:

- Deciding the time period of forecasting whether the organization should go for short-term or long-term forecasting.
- Deciding whether to forecast the overall demand for a product in the market or only for the organization's own products.
- Deciding whether to forecast the demand for the whole market or for a segment of the market.

2. Determining Time Period:

Involves deciding the time perspective for demand forecasting. Demand can be forecasted for a long period or a short period. In the short run, determinants of demand may not change significantly or may remain constant, whereas in the long run, there is a significant change in the determinants of demand. Therefore, an organization determines the time period on the basis of its set objectives.

3. Selecting a Method for Demand Forecasting:

Constitutes on of the most important steps of the demand forecasting process. Demand can be forecasted by using various methods. The method of demand forecasting differs from organization to organization depending on the purpose of forecasting, time frame, and data requirement and its availability. Selecting the

suitable method is necessary for saving time and cost and ensuring the reliability of the data.

4. Collecting Data:

Requires gathering primary or secondary data. Primary data refers to the data that is collected by researchers through observation, interviews, and questionnaires for a particular research. On the other hand, secondary data refers to the data that is collected in the past; but can be utilized in the present research work.

5. Estimating Results:

Involves making an estimate of the forecasted demand for predetermined years. The results should be easily interpreted and presented in a usable form. The results should be easy to understand by the readers or management of the organization. [12]

2.10.3 Economic Modeling

Economic models incorporate using specific algorithms and mathematical formulas to determine set variables. They offer great assistance for large corporations to calculate inventory levels and determine how much to order and when to order it. Many companies rely only on the monitoring of stock movement to determine how many items to order and when to order them, which almost always tends to give inaccurate data. Therefore, the use of economic models is highly recommended as it provides great accuracy in results and eliminates uncertainty in making decisions.

There are three major types of Inventory models widely used in business:

i. Fixed Reorder Quantity System.
ii. Fixed Reorder Period System.
iii. Economic Order Quantity.

Each of these models was explained in detail previously in this chapter.

2.10.4 Optimization of Reordering Parameters

The reordering parameters used by the enterprise resource planning (ERP) materials management system to generate replenishment orders are the main determinants of inventory outcomes. Reordering parameters should be optimized periodically to reflect changes in usage, lead time, criticality and other factors.

Minimum and maximum inventory levels must be set to avoid the chance of stock-outs and having an excess of unwanted inventory. Safety Stock levels must be calculated regularly to maintain the results are up to date.

The frequency at which new orders are made is an essential aspect of effective inventory planning. Several factors impact effective inventory planning. For example, marketing campaigns can play a role alongside sourcing. So a cross-functional team should set production and ordering schedules. Production alone determines lot sizes, usually based solely on minimizing production costs. By weighing all factors and using a sales and operations planning process, cross-functional teams ensure that the right products are available for big promotions.

2.10.5 Efficient Warehouse Design

It is important to have a well-designed warehouse and a process of moving inventory in and out of the warehouse that works smoothly.

There are companies that specialize in laying out efficient warehouses – it can be a complex planning process. Unless you have literally thousands of items and need some advanced warehouse management processes, the best way to lay out your warehouse, is by using common sense. Group the fast-moving items together and toward the front of the warehouse for easier access. Decide if you want to store in order of part number or in any case use a logical layout. Put groups of like items together, for example. You want it to be intuitive for your warehouse workers. Are you using shelving? Leave room for new part numbers or excess inventory – and/or figure out where you can put overages if the shelves are full. Are some of the items in large boxes or too large individually for shelving? Designating a floor "location" is often the best choice. The location can be up against a wall or taped off in the middle of the warehouse.

2.10.6 Liquidate Unwanted Inventory

Many Companies face the issue of having an excess of unwanted or obsolete stock which costs the business by taking up space in the warehouse and requiring costs for storage. Once we have separated the stock from the stuff in your warehouse, you need to start getting rid of the unwanted inventory.

Most successful distributors have a documented plan for liquidating unwanted inventory. Among the strategies that have proved successful are:

i. Transfer the excess stock to another company location where the inventory is needed: A product may be "dead" in one branch, but still active in another location. Why spend money to buy more of the product when you've already invested in inventory that became unwanted at another company location? This

option is particularly effective if the cost of transporting the product between branches is a small fraction of the value of the item.

ii. Return material to the vendor: This option depends on the vendor itself, some vendors are very good with accepting returns. While others have set charges and conditions for returns that it becomes difficult. It is best to remind the supplier of the items which you may have to return before making a large order.

iii. Reduce the price to "move" the excess inventory: This strategy is effective when the customer is willing to purchase older products for a significantly lower price than that of new products.

iv. Reuse the material for a different purpose: Some materials can be repurposed and used to manufacture other products such as chemicals, plastics, steel etc.

v. Selloff unwanted inventory: This is the most common option as it rids you of the excess items while in the same time earning back some of the value of the item.

vi. Throw away material that can't be liquidated: Even if you do not receive any payment, the free space you gain in your warehouse may make the effort worthwhile and you can continue with your production without worrying about storage space.

2.10.7 Optimization of Safety Parameters

The safety of the warehouse is of the utmost importance as it can be exposed to several risks that damage goods and cost the company. One of those risks is theft, which is very common in most countries therefore the security of the warehouse facility must be maintained to ensure no trespassers get into the warehouse at any time.

Another major danger is the risk of fire which is very dangerous and costly if it occurs as it endangers the life of the people in the warehouse and the goods of the company. Fire safety systems must be installed to ensure no fires ever break out.

Smoke detectors must be installed and connected to sprinklers to extinguish any fire that breaks out.

There are other dangers such as heavy rain which can damage the warehouse and its contents if it leaks inside. Therefore, we must make sure the warehouse building is well-insulated to prevent any leakage of water. Also draining channels must be installed to distribute the flow of water into the sewers.

2.11 Previous Studies

In this section, we are going to illustrate some of the relevant case studies regarding inventory management systems.

2.11.1 A case Study of Coca-Cola Bottling Company

Inventory management has become highly developed to meet the rising challenges in most corporate entities and this is in response to the fact that inventory is an asset of distinct feature. The inventory management situation of the Nigeria Bottling Company, Ilorin Plant has been revealed using the EOQ model. It was also seen that the company through a well-built policy is able to handle its idle stock without incurring unnecessary costs. A basis for inventory planning and control was also provided in this study. Though looking through the inventory policy of the company, it can be said to be dynamic to some extent but the analysis and findings have revealed the need to remedy some situations in the company's management of inventory.

The study thus suggests some recommendations to remedy certain defects in the company inventory policy and if these recommendations are implemented, the company's inventory management situation will attain a greater height. First, emphasis should be normally placed on the economic order quantity model because it was seen to be in the best interest of manufacturing companies to

maintain an optimal level of materials in store, the level that minimizes total cost of investment in inventory. To achieve this successfully, different costs, which are associated with inventory, should be segregated and accumulated in such a way that EOQ can be easily determined. Secondly, in the analysis we also mentioned that there was a positive relationship between inventory and sales and between inventory and production cost. This does not imply that inventory automatically determines production costs or sales and vice-versa. However, it does show that inventory levels can be a useful indication of what level of sales to expect. It is thus recommended that the sales and marketing department of the company should pay closer attention to the growth pattern of inventory usage and incorporate it in sales forecasting technique. Lastly, materials management unit should also pay attention to sales growth over the years and thus take into consideration, the apparent relevance of sales and production cost in making decision with regards to inventory. [13]

2.11.2 A Case Study of Inventory Management in a Manufacturing Company in China

In this study, we focus on optimizing inventory management in the improvement of supply chain management. Reducing inventory is considered one of the most important aspects of inventory management. But in practice, low inventory level is not always a good solution. Manufacturers need to maintain the right amount of inventory at the right level.

It is clear that the ultimate purpose of reducing inventory levels is to reduce cost and increase profit through optimization of supply chain efficiencies. Reducing inventory is the main task of inventory management. If suppliers do not guarantee the availability of a requested quantity of raw materials (such as some scarce

natural resource), or the price changes regularly (usually when it is increased), then keeping strategic inventories is necessary. Today, high inventory levels still happen at many manufacturers, even well-known ones. For example, in LT China, some managers in material management feel that implementing advanced inventory management for some materials is unnecessary, because 1) warehouse costa are cheap in mainland China; 2) postponement payment to suppliers can make inventory take up less capital; 3) the lifecycle and preservation time of furniture and sport equipment are longer than those for electronic products and fast food etc.

Therefore, although implementing advanced inventory management always sounds good in theory, in practice, the balance of cost and benefit should be considered. [14]

2.11.3 A Study of Retail Product Availability

Securing the optimum retail product availability rates creates the basic prerequisite for its sale, product availability draws an increasing attention of large retailers and manufacturers. Product availability in retail stores is often described and analyzed through-out - of stock problem.

From the customer's point of view, Roland Berger Consultants define the given problem as "A product not found in the desired form, flavor or size, not found in saleable condition, or not shelved in the expected location". Hereby, they distinguish between classic, dual placement and delisting out-of-stocks.

Campo and Sloot view stock-out from the temporal aspect, where it can be temporary or permanent. If the product is not shelved in the retail store on the designated or labelled place, and the customers suppose that it will be available relatively soon, this stock-out is regarded as temporary. On the other hand, if the

stock-out appears as a result of the retailer's deliberate decision to reduce the product assortment (wishing to cut costs, encourage the purchase of other product or limit cooperation with suppliers), it is qualified as permanent.

We can conclude from the study that the managers who watch after the stock through time aspect, exact specification and available through the time have significant benefits and will receive optimum benefits. [15]

Chapter Three: Methodology

3.1 Introduction

Inventory Management plays an essential role in the industrial environment. Thus, its effective implementation requires explicit management actions. Steps need to be clearly identified and necessary measures must be taken to ensure organizational responsiveness to the techniques being implemented. In this chapter we will be discussing the data collection and analyzing methods.

3.2 Data Collection Method

In order to obtain the required data we will be using a series of questionnaires. The questionnaire will be handed to a qualified employee in the field of study to answer the questions that will give us a clear overview of the inventory management techniques that are being used in the facility. Thus, we will be able to compare the results with the best practices for inventory management.

3.3 Field of Study

The study was conducted over a large scale in the Sudanese industry. We covered as many sectors as possible and as many factories as possible. Some of the sectors we covered specialized in food products, some specialized in chemical products, some specialized in plastic and ceramics while some specialized in construction.

3.4 Data Analysis Method

In order to analyze the data we will be using Microsoft excel and SPSS statistics. This software helps us to analyze data from the questionnaires and translate them into the form of tables for easier understanding. First off the questions are inserted into the system in the form of a code and then answers for

each questionnaire are typed in as a code as well which will give us a percentage of every answer. After we analyze the data we compare the results with the best practices to determine if the optimum method is being used or not.

3.5 SPSS Statistics

The software name stands for Statistical Package for the Social Sciences (SPSS). It is a widely used program for statistical analysis in social science. It is also used by market researchers, health researchers, survey companies, government, education researchers, marketing organizations, data miners, and others. It can perform highly complex data manipulation and analysis with simple instructions.

Chapter Four
Results and Discussion

4.1 Introduction

Inventory management has various best practices. Utilizing these practices in your inventory management procedure can greatly affect the health of the company.

In this chapter we are going to discuss the basic and some other minor best practices and collect data from many different industrial facilities in the country and analyze those results and compare them to the practices we have set to determine the inventory management effectiveness.

Data collection was completed through the field survey using a questionnaire that is handed to several facilities to fill out. We tried to cover as many sectors as possible to ensure diversity is maintained to get the most accurate data regarding the industry field in the country.

4.2 Field Survey Locations

The field survey was conducted by handing out the questionnaires over 30 industrial facilities. Out of those 30 only 20 cooperated and provided the required data. These facilities are:

Coldair Factory	G. D. Pasgianos Factory
Sayga Milling Factory	Capo Food Company
Afi Industrial Company	Abanoub Steel Co.
Al-Safa for Plastics	Dal Fodder Company
Amipharma Labs of Medicine	Tajouj Factory for Detergents
Salfonya Factory for Detergents	Reel Factory for Ready Concrete

Coca-Cola Factory	Aseel for Laundry Detergents
Best Dairy Products	Elie Factory for Detergents
El-Mohandes Coating and Solvents	Salomi Italy for Ceramics and Marble
Swiss Factory for Sweets and Drinks	Fresh Factory for Detergents

4.3 Data Analysis

In this section, we are going to illustrate the results obtained through the questionnaires and present them in a numerical form using tables.

4.3.1 Organizing of Inventory

Table 1: Do you divide your inventory into safety, replenishment and excess stock?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	16	80.0	80.0	80.0
	No	4	20.0	20.0	100.0
	Total	20	100.0	100.0	

Source: Field Survey Jul-Aug 2017

The table shows that the majority of the samples which is 80.0% break down their inventory into the three major categories which are the safety, replenishment and excess or obsolete stock. The rest of the samples don't organize their inventory.

Table 2: Are there raw materials that are more significant than others?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	15	75.0	75.0	75.0
	No	5	25.0	25.0	100.0
	Total	20	100.0	100.0	

Source: Field Survey Jul-Aug 2017

The above table shows that 75.0% of the samples pay more attention to some materials than others due to its significance in many aspects such as its nature, value, application and other considerations. Whereas the remaining 25.0% deal with all their raw materials in the same way.

4.3.2 Safety Stock

Table 3: Do you use a specific method to calculate safety stock levels?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	2	10.0	10.0	10.0
	No	6	30.0	30.0	40.0
	Depending on stock movement	7	35.0	35.0	75.0
	Mathematic formulas	5	25.0	25.0	100.0
	Total	20	100.0	100.0	

Source: Field Survey Jul-Aug 2017

The table above demonstrates that 35% of the samples only estimate the safety stock level depending on the stock movement both in the facility and the market. While 25.0% use formulas of their own to determine the safety stock level. Another 10.0% uses methods that they refused to disclose in the questionnaire. Whereas 30.0% don't even calculate the safety stock level.

Table 4: Do you recalculate safety stock levels on a regular basis?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	15	75.0	75.0	75.0
	No	5	25.0	25.0	100.0
	Total	20	100.0	100.0	

Source: Field Survey Jul-Aug 2017

This table shows that 75.0% of the samples recalculate the safety stock levels on a regular basis to ensure that they are up to date. While 25.0% keep using the same data which becomes inaccurate over time due to changes in industry and economy.

4.3.3 Demand Forecasting

Table 5: Do you use a specific method for forecasting demand?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	4	20.0	20.0	20.0
	No	5	25.0	25.0	45.0
	Depending on stock movement	5	25.0	25.0	70.0
	Using previous sales data	6	30.0	30.0	100.0
	Total	20	100.0	100.0	

Source: Field Survey Jul-Aug 2017

This table shows that 30.0% of the samples use the previous sales data to forecast demand for the upcoming period, while another 25.0% depend on the stock movement estimation. However 25.0% don't pay attention to the forecasting of demand and think it's unnecessary.

Table 6: Is there a specific procedure to meet seasonal demand?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	16	80.0	80.0	80.0
	No	4	20.0	20.0	100.0
	Total	20	100.0	100.0	

Source: Field Survey Jul-Aug 2017

This table shows that 80% percent of the samples consider seasonal trends in their forecasting procedure while the other 20% don't bother doing it.

4.3.4 Storage Area Design

Table 7: Are your current storage facilities adequate?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	12	60.0	60.0	60.0
	No	2	10.0	10.0	70.0
	Needs more space	5	25.0	25.0	95.0
	Needs more shelves	1	5.0	5.0	100.0
	Total	20	100.0	100.0	

Source: Field Survey Jul-Aug 2017

This table illustrates that 60% of the samples consider their storage facilities to be effective and efficient with no room for considerable improvements. While 25.0% expressed their need for more space of storage whether it being in additional partitions or new locations for storage. Another 5.0% of the samples expressed their need for more advanced shelving technologies. Whereas 10.0% of the samples considered their storage area to be ineffective but did not disclose their opinions on how to improve them.

4.3.5 Excess Stock

Table 8: Do you have frequent buildup of excess stock?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	10	50.0	50.0	50.0
	No	10	50.0	50.0	100.0
	Total	20	100.0	100.0	

Source: Field Survey Jul-Aug 2017

This table shows that 50.0% of the samples have a frequent buildup of excess or obsolete stock. While 50.0% don't have excess stock.

Table 9: Are there targeted plans to reduce excess inventory?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	6	30.0	35.3	35.3
	No	4	20.0	23.5	58.8
	Selling them	2	10.0	11.8	70.6
	Reusing for another purpose	5	25.0	29.4	100.0
	Total	17	85.0	100.0	
Missing	System	3	15.0		
Total		20	100.0		

Source: Field Survey Jul-Aug 2017

The above table shows that 25.0% of the samples tend to reuse their excess inventory for different purposes. While 10.0% sell them to those who need it. Another 20% don't have any plans to get rid of their excess inventory some are due to the hazardous nature of the inventory and the danger it poses to the human if they are exposed to it. Note that 15% of the samples did not provide their data for this section.

Table 10: Does management monitor the write-offs of excess inventory?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	14	70.0	82.4	82.4
	No	3	15.0	17.6	100.0
	Total	17	85.0	100.0	
Missing	System	3	15.0		
Total		20	100.0		

Source: Field Survey Jul-Aug 2017

This table shows that 70.0% of the samples require the management to monitor and provide permission to the write-offs of excess inventory. While 15.0% just go through with the procedure without the management knowing and recording the activities. Note that 15.0% of the samples didn't provide data for this section.

4.3.6 Inventory Counting Procedure

Table 11: What is your inventory counting procedure?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Barcode	1	5.0	5.0	5.0
	Cycle counting	15	75.0	75.0	80.0
	Annual Period Counting	3	15.0	15.0	95.0
	Other method	1	5.0	5.0	100.0
	Total	20	100.0	100.0	

Source: Field Survey Jul-Aug 2017

This table shows that 75.0% of the samples use cycle counting to count their inventory while 15.0% use the period counting method. The barcode method is used by only 5.0% whereas another 5.0% use a different method than the mentioned.

4.3.7 Reordering Parameters

Table 12: Do you follow a specific method to determine the reorder point?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	2	10.0	10.0	10.0
	No	9	45.0	45.0	55.0
	Depending on stock movement	5	25.0	25.0	80.0
	Mathematic formulas	4	20.0	20.0	100.0
	Total	20	100.0	100.0	

Source: Field Survey Jul-Aug 2017

This table shows that 25.0% of the sample depend only on the stock movement to determine the reorder point while only 20.0% use mathematic formulas of their own. Also 10.0% did not disclose the method they use whereas 45.0% don't even use the ROP method.

Table 13: Who determines the optimal frequency of making new orders?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Production planning managers	10	50	50.0	50.0
	Cross-functional team	10	50.0	50.0	100.0
	Total	20	100.0	100.0	

Source: Field Survey Jul-Aug 2017

This table shows that 50% of the samples depend on the production planning managers to make that decision while the other 50% deploy a cross-functional team to carefully carry out this procedure while taking into consideration all the possible variables.

Table 14: Do you have minimum and maximum stocking levels?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	18	90.0	90.0	90.0
	No	2	10.0	10.0	100.0
	Total	20	100.0	100.0	

Source: Field Survey Jul-Aug 2017

This table shows that 90.0% of the samples ensure that they have a maximum and minimum level of stock to uphold while the other 10.0% don't pay attention to this area.

4.3.8 Economic Modeling

Table 15: Do you use the economic order quantity method?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	13	65.0	65.0	65.0
	No	7	35.0	35.0	100.0
	Total	20	100.0	100.0	

Source: Field Survey Jul-Aug 2017

The above table illustrates that 65.0% of the samples tend to use economic models to determine the economic order quantity. While the remaining 35.0% don't use this method.

4.3.9 Safety Parameters

Table 16: Are there precautions against the risk of theft?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	20	100.0	100.0	100.0

Source: Field Survey Jul-Aug 2017

Table 17: Are there precautions against the risk of fire?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	20	100.0	100.0	100.0

Source: Field Survey Jul-Aug 2017

Table 18: Are there precautions against the risk of rain?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	20	100.0	100.0	100.0

Source: Field Survey Jul-Aug 2017

The previous three tables illustrate that 100% of the samples showed their commitment to the safety parameters and their resistance against all risks of loss whether it may be through theft, fire or rain.

4.4 Discussion

Through the tables shown in the previous section of this chapter we have accurately analyzed the data obtained from the results of the questionnaires. After studying the tables and inspecting the data we are able to correlate the results with the best practices to determine whether or not they are being used and if yes how much of it is actually being applied.

4.4.1 Organizing of Inventory

By studying the results of the data analysis we find that a great 70% of the samples properly organize their inventory by breaking it down into the three main categories– safety, replenishment and excess or obsolete stock. This distribution of inventory allows for more fluid and smooth movement of stock seeing that we know where every little thing is stored and having it available for when we need it. Also giving more significance to some of the critical parts of the raw materials affects the revenue of the company in some way given that this raw material goes into manufacturing a product that is high in value, application or other real-life considerations. Using cycle counting to monitor the inventory level is the most effective technique as it doesn't take as much time and effort as period counting which requires to count the entire inventory annually and that can be very exhausting especially for large-scale companies.

4.4.2 Demand Forecasting

Results have demonstrated that 65% of the samples tend to forecast the demand for their products to make sure they can prepare their production plan to meet the requirements and not to fall behind in schedule. Which can greatly affect the health of the company's revenue for either the better or the worst if it's neglected.

4.4.3 Economic Modeling

The results show that 50% of the samples apply the use of economic models to determine the economic order quantity to make. The EOQ model is the most effective and efficient method to determine exactly how much of an order to make therefore it must be implemented to improve the accuracy of orders instead of relying on the stock movement which tends to differ from time to time.

4.4.4 Optimization of Reordering Parameters

The results illustrate that only 50% of the samples adhere to the reordering parameters which are divided into many aspects including the reorder point which requires a specific model to carefully determine exactly when to make a new order. The identity of the person making the new order plays a huge part as well, seeing how there tend to be many factors that affect the sales of a product so the use of a cross-functional team is recommended to take into account all the factors such as seasonal trends, economic considerations and also promotions. The safety stock level is an important factor to determine the reorder point seeing how maintaining a steady level can always prevents frequent stock-outs. Having a computer software that monitors the stock level is the most effective method because it alerts us whenever the stock is nearing a critical level.

4.4.5 Efficient Warehouse Design

The results demonstrate that 60% of the samples are satisfied with their current warehouse design. An effective storage area must be of a spacious design providing enough room for all kinds of inventory without facing the possibility of a full storage and having to disturb your production plan. The use of shelving technology is highly recommended as it allows you to stack items in an organized manner without any complexity. Moving platforms must be provided as well as

enough forklifts to easily move the items inside the warehouse. Also the logistics must be taken into account to ensure the effective and less time-consuming movement of the stock from the production line all the way to the storage area.

4.4.6 Liquidate Unwanted Inventory

The results show that 70% of the samples manage their unwanted inventory in the best way they see fit. Excess inventory can prove to be a liability to the health of the system. Proper measures must be taken to reduce their presence. The best way to do that is to sell unwanted inventory to make some kind of profit so you don't be at a complete loss. Some parts of raw materials can retain their value. Another method is to reuse the unwanted inventory -if possible- to serve a different purpose such as manufacturing a similar product. The least recommended method is to destroy the excess inventory or donating it to whoever has use for it.

4.4.7 Optimization of Safety Parameters

The results illustrate that a perfect 100% of the samples have implemented precautionary procedures to safeguard their goods against the risk of loss through theft, fire and rain. The risk of theft is unfortunately very common in our country, therefore companies must take strict measures to safeguard themselves against this risk. Securing the storage area is of the essence. The storage area must be for authorized personnel only and it's best to use fingerprint scanners as a method to grant access into the facility. It's recommended to use surveillance cameras to monito the area at all times. Also having a stationed guard is highly recommended. Fire systems should also be implemented to safeguard against the risk of fire as it's very costly. Fire alarms, smoke detectors, water hydrants; these should all be present in the storage area. Rain can also have a negative damage on inventory so we must ensure that the storage building is well insulated to prevent

and leakage during rainfall. Also drain channels must be constructed around the storage area.

Table 19: Data table for 20 industrial facilities

	A	B	C	D	E
1		Applying BP		Not Applying BP	
2		Count	Percentage	Count	Percentage
3	BP1	14	70%	6	30%
4	BP2	13	65%	7	35%
5	BP3	10	50%	10	50%
6	BP4	10	50%	10	50%
7	BP5	12	60%	8	40%
8	BP6	14	70%	6	30%
9	BP7	20	100%	0	0%

BP1 ≡ Organizing of Inventory

BP2 ≡ Demand Forecasting

BP3 ≡ Economic Modeling

BP4 ≡ Optimization of Reordering Parameters

BP5 ≡ Efficient Warehouse Design

BP6 ≡ Liquidate Unwanted Inventory

BP7 ≡ Optimization of Safety Parameters

Chapter Five: Conclusion and Recommendations

5.1 Conclusion

This project is an approach to determine the optimal practices and techniques that must be followed to maintain a healthy inventory management system.

i. The best practices that should be applied have been identified on a worldwide standard.
ii. The practices being used in the Sudanese industry have been identified and we compared its effectiveness in accordance with the worldwide standards.
iii. A field survey was conducted over a large scale of the industry covering as many sectors as possible to maintain diversity.
iv. The required data was collected through a series of questionnaires that aim to determine the inventory management practices followed by the targeted facility.
v. The software that was used to analyze the data is the SPSS statistics v.23. Microsoft Excel was also used to represent the results in a numerical form.
vi. We came to the conclusion that most companies in the country don't tend to follow the optimal methods for managing inventory.

5.2 Recommendations

i. Forecasting estimates must be calculated regularly and accurately depending on the demand for the product in the market and previous sales data of the company.
ii. Various inventory models must be used to obtain the required data mathematically which always proves to be the most effective.
iii. The use of an enterprise resource planning software is recommended as it organizes the flow of the inventory by doing many tasks like tracking previous orders and making new orders.

iv. 4. The system operator must be knowledgeable to be able to deal with the ERP software.

5.3 Limitations

i. Must ensure the data is as accurate as possible as it can’t be one hundred percent accurate.
ii. Failure to adhere to the best practices or complacency in managing inventory can have critical consequences.
iii. The operator might not be familiar with the software and therefor requires training.

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Appendices

جامعة السودان للعلوم والتكنولوجيا

كلية الهندسة الميكانيكية

قسم الانتاج

استبيان

الطرق المثالية لإدارة المخزون في السودان

اسم المركز :

.....

الوظيفة

مهندس ☐ فني ☐ تقني ☐ موظف ☐

النوع

ذكر ☐ أنثى ☐

العمر

29-20 ☐ 39-30 ☐ 49-40 ☐

1. هل تقوم بتقسيم المخزون الخاص بك الى الثلاثة انوع الاساسية وهى مخزون الأمان، إعادة التزويد والمخزون الفائض؟

نعم ☐ **لا** ☐

2. هل تتبعون طريقة معينة لحساب مستوى مخزون الأمان؟

نعم ☐ **لا** ☐

إذا كانت الإجابة نعم، وضح الطريقة.

_____
_____
_____

3. هل تعيدون حساب مستوى مخزون الأمان بشكل متكرر لضمان أحدث النتائج؟

نعم ☐ **لا** ☐

4. هل تتبعون طريقة معينة للتنبؤ بالطلب على السلع؟

نعم ☐ **لا** ☐

إذا كانت الإجابة نعم، وضح الطريقة.

_____

_____

_____

5. هل لديكم اجراءات معينة لملاقاة الطلب الموسمي؟

نعم ☐ **لا** ☐

6. هل ترى ان منطقة التخزين الحالية مناسبة؟ هل تظن انه من الممكن تطويرها؟

نعم ☐ **لا** ☐

إذا كانت الإجابة لا، ماذا تقترح لتطويرها؟

_____

_____

_____

7. هل لديكم تراكم متكرر من المخزون الفائض او الخارج عن الحاجة؟

نعم ☐ **لا** ☐

8. هل هناك خطط محددة للتخلص او التقليل من المخزون الفائض؟ ان كان كذلك رجاءا قم بوصفها.

نعم ☐ **لا** ☐

ان كان كذلك رجاءا قم بوصفها.

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9. هل تقوم الإدارة بمراقبة المخزون الفائض والموافقة على عمليات التخص منه؟

نعم ☐ **لا** ☐

10. ماهى الطريقة التتي تتبعها لحساب كمية المخزون؟

الباركود ☐ **الحساب الدوري** ☐ **لحساب اليدوي السنوي** ☐

في حالة استخدامكم لطريقة أخري الرجاء توضيحها.

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11. هل تتبع طريقة معينة لتحديد نقطة إعادة الطلب؟

نعم ☐ **لا** ☐

الرجاء توضيحها.

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12. من هو المسؤول عن القيام بالطلبات الجديدة؟

مدير التخطيط الصناعي ☐ **فريق مكون من عناصر من قطاعات مختلفة** ☐

في حالك استخدامكم لطريقة أخري الرجاء توضيحها.

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13. هل لديك مستوى أدنى وأقصى من المخزون يجب الحفاظ عليه؟

نعم ☐ **لا** ☐

14. هل تستخدمون طريقة كمية الطلب الإقتصادية لحساب كمية الطلب؟

نعم ☐ **لا** ☐

إذا كانت الإجابة لا، ماهى الطريقة التي تسخدمونها؟

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15. هل تعطي أهمية لبعض أجزاء المخزون –مثل المواد الخام- اكثر من غيرها؟

نعم ☐ **لا** ☐

16. هل قامت الإدارة بأخذ الاحتياطات اللازمة لحماية المخزون ضد خطر السرقة؟

نعم ☐ **لا** ☐

17. هل قامت الإدارة بأخذ الاحتياطات اللازمة لحماية المخزون ضد خطر الحرائق؟

نعم ☐ لا ☐

18. هل قامت الإدارة بأخذ الاحتياطات اللازمة لحماية المخزون ضد خطر الأمطار؟

نعم ☐ لا ☐