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minute and methods. Process refers to manufacturing activity like semi finished product, by-product, finished product. Output is the product service which in other means the final product as per specifications. Demand forecast means consumer demand and the change in consumer demand in the market depend on the market competition. Manufacturing control system is the inventory and plant location measures for an effective and in time production system.

Production system is the application of management functions in production process through planning, organising, directing and controlling managerial functions in the process of converting input into desired output in an efficient and effective manner.

Production system includes all those operations by which the input can be converted into output for a desired product or a service. The service may be tangible or intangible it is the system which generates consumer satisfaction. Hence according to some authors production system is otherwise known as operation system so as production management can be referred as operations management.

## 1.5 TYPES OF PRODUCTION

Production can be divided into three categories. All the production process is related to conversion of input into output and services for the better use of mankind. Considering this type of production can be:

1. ***Flow Production:*** This is a type of production which is otherwise known as mass production. Under this category production is running in a sequence. There will be no gap in between two production processes. Time taken in each operation can be maintained by utilising update and more machines in order to have steady flow of operation. This type of production is more suitable for high demand products. The merit of this production is in each production operation there can be strict check and measure in input and output too. Maximum attention can be made towards supply of raw material, machine capacity and quality standards so that any defect in production process can be identified easily to have qualitative production in each process.

   *Example:* Motor Car.

2. ***Batch Production:*** Where there is less scope of flow production that is sequence of production is not available in those production organisations batch production is more suitable type of production. In this category each production is divided into small components. This is called batch production. Under this type of production process the entire production system is divided into various batch or components according to the need of the specification of the product. In order to smooth the production process different machines can be used for each batch and the quality in each batch can be measured properly. On the other hand a product can be available in different functional areas.

   *Example:* Pressing in one area, milling in other area, colour in other area etc.

3. ***Unit Production:*** This is a type of production where there is a specific order from the customer. Generally this type of production is for a specific period and not repetitive in character. This type of production undertaken by the organisation considering the demand of the customers for that product. This type of production has specific standard, quality, specification in size, colour, weight as well as packing also. Most of the production organisation does not prefer unit production due to its cost and in most of the cases it is not a regular production process.

   *Example:* Designed ornament, size foot wear etc.

## 1.6 BENEFITS OF PRODUCTION MANAGEMENT

Production management is essential and beneficial different parties like:

1. ***The Consumer:*** The benefit of production goes primarily to the customer. All the goods and services are meant for the use of customers. A good production management system helps the

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customer from higher productivity, better and reliable quality, reasonable price, satisfactory service and timely delivery of goods and services. So the benefit of production management system goes to the consumer in the society.

2. ***The Employee:*** A good production management system benefits the employees of an organisation. Higher remuneration, job security, stable employment opportunity, better working condition as well as job satisfaction can be possible when there is more and more production in a systematic manner. It is said that productivity and satisfaction are inter relate to each other. On the other hand high employee morale due to job satisfaction provides higher output.

3. ***The Investor:*** Maximum return on investment is the objective of each and every investor. Enterprise having good production management system ensures higher productivity which attracts the investors to invest more in this prosperous enterprise. More productivity ensures higher value in market in terms of security and asset value which is one of the benefits for the investors.

4. ***The Supplier:*** Most of the large, small and medium companies depend on the suppliers in terms of raw material, machine components, and allied services during the course of production. So the role of a supplier is crucial in production management system. A good production management system ensures that intercommunication and mutual confidence among the producer and supplier can be better. More is the production better is the partnership satisfaction of both the parties.

5. ***The Society:*** A better production management system will benefit the society as a whole. More timely production of goods and services in better quality ensures community satisfaction which leads to the society will benefit out of that. More productivity means better economic prosperity. Economic prosperity leads to social prosperity and social prosperity leads to all round development in the society.

## 1.7 RESPONSIBILTY OF A PRODUCTION MANAGER

Generally a production manger is in charge of a production organisation. The responsibility of a production manager is to look into five "P"s namely (1) product (2) plant (3) process (4) programs (5) people. The responsibilities are mentioned below:

1. ***Product:*** Product is the direct interface between the production and market. It is meant f or the customers in the market. All the production organisations are looking after the product. A product should be qualitative, low price, reliable, easy availability, smooth delivery, easy handling, after sales service and have good and long performance. It is the responsibility of a production manager to look into the above mentioned characteristics of a product while producing it in the organisation.

2. ***Plant:*** The primary responsibility of a production manager is to look into the plant of the organisation. While dealing with the plant it includes building, equipments, machinery and the other related aspects of the plant. The production manager should ensure that the plant must have the capacity to meet the present needs of the organisation as well as to meet the future requirements also. While dealing with the plant the production manager should be cautious about the maintenance of the machinery and equipments, safety in installation of machinery, operational efficiency of the equipments and environmental protection.

3. ***Process:*** It includes the manufacturing process. Transformation of input into output is the responsibility of a production manager. A finished product can be available with input converted into semi finished product and a semi finished product can be converted into finished product. Hence it is responsibility of a production manager is to look into all the processes so that the product can be available in time. In this process it is the duty of the production manager is look into the type of production, the number of process it needs, layout of the product, safety in each operation and the cost involved in each operation.

4. ***Programs:*** It includes the production schedule. Each and every product should be produced with a schedule. The schedule of production can be decided in advance so that the production

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***Production Control***

1. Making efforts to adhere to the production schedules.
2. Issuing necessary instructions to the staff for making the plans effective.
3. To ensure that goods produced according to the prescribed standards and quality norms.
4. To ensure that various inputs are made available in right quantity and at proper time.
5. To ensure that work progresses according to the predefined plans.

## 2.3 STAGES OF PRODUCTION PLANNING AND CONTROL

The stages of Production planning and control has three phases namely as follows:

1. Planning Phase
2. Action Phase
3. Control Phase

***Planning Phase***

Planning is an exercise of intelligent anticipation in order to establish how an objective can be achieved or a need fulfilled in restrictive circumstances. It has two categories of planning namely

1. Prior planning
2. Active planning.

*Prior Planning*

Prior planning means pre-production planning. This includes all the planning efforts, which are taking place prior to the active planning.

*Modules*

The modules of prior planning are as follows:

1. Product development and design is the process of developing a new product with all the features, which are essential for effective use in the field, and designing it accordingly. At the design stage, one has to take several aspects of design like, design for selling, design for manufacturing and design for usage.
2. Forecasting is an estimate of demand, which will happen in future. Since, it is only an estimate based on the past demand, proper care must be taken while estimating it. Given the sales forecast, the factory capacity, the aggregate inventory levels and size of the work force, the manager must decide at what rate of production to operate the plant over an intermediate planning horizon.
3. Aggregate planning aims to find out a product wise planning over the intermediate planning horizon.
4. Material requirement planning is a technique for determining the quantity and timing for the acquisition of dependent items needed to satisfy the master production schedule.

*Active Planning*

The modules of active planning are: Process planning and routing, Materials planning. Tools planning, Loading, Scheduling etc.

1. Process planning and routing is a complete determination of the specific technological process steps and their sequence to produce products at the desired quality, quantity and cost. It determines the method of manufacturing a product selects the tools and equipments, analyses how the manufacturing of the product will fit into the facilities. Routing in particular

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- What is the available capacity — what resources do we have?
- How can differences between priorities and capacity be resolved?

- ***Strategic Business Plan:*** It is senior management's statement of the broad direction of the firm, major goals and objectives the company expects to achieve over the next two to ten years or more. It is based on long-range forecasts and provides a framework that sets the goals and objectives for further planning by marketing, finance, engineering and production/operations. The level of detail is not high. It is concerned with general market and production requirements. It is often stated in dollars rather than units.
- ***Production Plan:*** Given the objectives set by the strategic business plan, production management is concerned with the quantities of each product group or family that must be produced in each period, the desired inventory levels, the resources of equipment, labour, and material needed in each period, and the availability of the resources needed. For effective planning, there must be a balance between priority and capacity. The planning horizon is usually six to 18 months and is reviewed perhaps each month or quarter.
- ***Master Production Schedule (MPS):*** is a plan for the production of individual end items. It breaks down the production plan to show, for each period, the quantity of each end item to be made. Inputs to the MPS are the production plan, the forecast for individual end items, sales orders, inventories, and existing capacity. The level of detail for the MPS is higher than for the production plan. The planning horizon usually extends from three to 18 months but primarily depends on the purchasing and manufacturing lead times. Master scheduling describes the process of developing a master production schedule; the term master production schedule is the end result of the process. Plans are reviewed and changed weekly or monthly.
- ***Material Requirements Plan (MRP):*** is a plan for the production and purchase of the components and/or services used in making the items in the MPS. The MRP establishes when the components and services are needed to make each end item. The level of detail is high. The planning horizon is similar to MPS, extending from 3 to 18 months.
- ***Purchasing and Production Activity Control (PAC):*** represents the implementation and control phase (execution phase). Purchasing is responsible for establishing and controlling the flow of raw materials into the factory. PAC is responsible for planning and controlling the flow of work through the factory. The planning horizon is very short and the level of detail is high.
- ***Capacity Management:*** At each level in the manufacturing planning and control system, the priority plan must be tested against the available resources and capacity of the manufacturing system. The basic process is one of calculating the capacity needed to manufacture the priority plan and of finding methods to make that capacity available. If the capacity cannot be made available when needed then the plans must be changed.
- ***Sales and Operations Planning (SOP):*** is a process for continually revising the strategic business plan and coordinating plans of the various departments. SOP is a cross-functional business plan that involves sales and marketing, product development, operations, and senior management. Operations represents supply, marketing represents demand. The SOP is the forum in which the production plan is developed and a dynamic process in which the company plans are updated on a regular basis, at least monthly. (See figure 2.5 and the benefits listed above.)
- ***Manufacturing Resource Planning (MRP II):*** The manufacturing planning and control system described here, is a master game plan for all departments in the company and works from the top down with feedback from the bottom. This fully integrated planning and control system is called a manufacturing resource planning, or MRP II, system. The phrase "MRP II" is used to distinguish the "manufacturing resource plan" (MRP II) from the "materials requirement plan" (MRP).
- ***Enterprise Resource Planning (ERP):*** is an accounting oriented information system for identifying and planning the enterprise---wide resources needed to make, ship, and account for customer orders. ERP encompasses the total company and MRP II is manufacturing.

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There are various other types of float (Independent, Early Free, Early Interfering, Late Free, Late Interfering), and float can also be negative. We shall not go into these situations at present for the sake of simplicity and be concerned only with Total Float for the time being.

Having computed the various parameters of each activity, we are now ready to go into the scheduling phase, using a type of bar chart known as the Gantt Chart.

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***Exercise 3.1***

A Social Project manager is faced with a project with the following activities:

| Activity-ID | Description | Duration |
|---|---|---|
| 1-2 | Social Work Team to live in Village | 5 Weeks |
| 1-3 | Social Research Team to do survey | 12 Weeks |
| 3-4 | Analyze results of survey | 5 Weeks |
| 2-4 | Establish Mother & Child Health Program | 14 Weeks |
| 3-5 | Establish Rural Credit Programme | 15 Weeks |
| 4-5 | Carry out Immunizations of Under Fives | 4 Weeks |

- Draw the arrow diagram, using the helpful numbering of the activities, which suggests the following logic:
- Unless the Social Work team lives in the village, the Mother and Child Health Programme cannot be started due to ignorance and superstitions of the villagers
- The Analysis of the survey can obviously be done only after the survey is complete.
- Until rural survey is done, the Rural Credit Programme cannot be started
- Unless Mother and Child Programme is established, the Immunisation of Under Fives cannot be started
  - ❑ Calculate the Earliest and Latest Event Times
  - ❑ Tabulate and Analyse the Activities
  - ❑ Schedule the Project Using a Gantt Chart



### 3.6.8 The PERT (Probabilistic) Approach

So far we have talked about projects, where there is high certainty about the outcomes of activities. In other words, the cause-effect logic is well known. This is particularly the case in engineering projects. However, in Research & Development projects, or in Social Projects which are defined as "Process Projects", where learning is an important outcome, the cause-effect relationship is not so well established. In such situations, the PERT approach is useful, because it can accommodate the variation in event completion times, based on an expert's or an expert committee's estimates.

For each activity, three time estimates are taken

- The Most Optimistic
- The Most Likely
- The Most Pessimistic

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## 4.1 INTRODUCTION

MRP is one of the most widely used systems for harnessing computer power to automate the manufacturing process.

IBM engineer Joseph Orlicky developed MRP in 1964 after he studied the Toyota Production System, which was the model for the production methodology. Power tool maker Black & Decker built the first computerized MRP system that same year, according to several sources.

It's important to note, however, that MRP and lean production are not the same and are considered by some practitioners to be antithetical, though some say MRP can help with lean production. MRP is considered a "push" system -- inventory needs are determined in advance, and goods produced to meet the forecasted need -- while lean is a "pull" system in which nothing is made or purchased without evidence of actual -- not forecasted -- demand.

Orlicky's ideas spread rapidly throughout the manufacturing sector after the 1975 publication of his book, Material Requirements Planning: The New Way of Life in Production and Inventory Management, and by the early 1980s, there were hundreds of commercial and homegrown MRP software programs.

## 4.2 BASICS OF MRP

Material requirements planning (MRP) is a system for calculating the materials and components needed to manufacture a product. It consists of three primary steps: taking inventory of the materials and components on hand, identifying which additional ones are needed and then scheduling their production or purchase. MRP uses information from the bill of materials (a list of all the materials, subassemblies and other components needed to make a product, along with their quantities), inventory data and the master production schedule to calculate the required materials and when they will be needed during the manufacturing process.

MRP is useful in both discrete manufacturing, in which the final products are distinct items that can be counted -- such as toys, subassemblies or automobiles -- and process manufacturing, which results in bulk products -- such as chemicals, soft drinks and detergent -- that can't be separately counted or broken down into their constituent parts.



### 4.2.1 MRP vs. ERP

An extension of MRP, developed by management expert Oliver Wight in 1983 and called manufacturing resource planning (MRP II), broadened the planning process to include other resources in the company, such as financials and added processes for product design, capacity planning, cost management, shop-floor control and sales and operations planning, among many others.

In 1990, the analyst firm Gartner coined the term enterprise resource planning (ERP) to denote a still more expanded and generalized type of MRP II that took into account other major functions of a business, such as accounting, human resources and supply chain management, all of it managed in a centralized database. Both MRP and MRP II are considered direct predecessors of ERP.ERP quickly expanded to other industries, including services, banking and retail that did not need an MRP component. However, MRP is still an important part of the ERP software used by manufacturers.

### 4.2.2 Objectives of Material Requirements Planning

Not surprisingly, the primary objective of MRP is to make sure that materials and components are available when needed in the production process and that manufacturing takes place on schedule. Effective inventory management and optimization is another goal of MRP. While MRP is designed to ensure adequate inventory at the required times, a company can be tempted to hold more inventory than is necessary, thereby driving up inventory costs. MRP can also improve manufacturing efficiency by using accurate scheduling to optimize the use of labour and equipment.

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Proponents of MRP and DDMRP say these approaches can help achieve a better matching of supply and demand. This achievement, in turn, can reduce product costs and increase revenues as customer demand is fully met and no revenue opportunities are lost from missed ship dates or inventory shortfalls.

### 4.2.3 JIT - Background and History

JIT is a Japanese management philosophy which has been applied in practice since the early 1970s in many Japanese manufacturing organizations. It was first developed and perfected within the Toyota manufacturing plants by Taiichi Ohno as a means of meeting consumer demands with minimum delays. Taiichi Ohno is frequently referred to as the father of JIT.

Toyota was able to meet the increasing challenges for survival through an approach that focused on people, plants and systems. Toyota realized that JIT would only be successful if every individual within the organization was involved and committed to it, if the plant and processes were arranged for maximum output and efficiency, and if quality and production programs were scheduled to meet demands exactly.

JIT manufacturing has the capacity, when properly adapted to the organization, to strengthen the organization's competitiveness in the marketplace substantially by reducing wastes and improving product quality and efficiency of production.

There are strong cultural aspects associated with the emergence of JIT in Japan. The Japanese work ethic involves the following concepts.

- Workers are highly motivated to seek constant improvement upon that which already exists. Although high standards are currently being met, there exist even higher standards to achieve.
- Companies focus on group effort which involves the combining of talents and sharing knowledge, problem-solving skills, ideas and the achievement of a common goal.
- Work itself takes precedence over leisure. It is not unusual for a Japanese employee to work 14-hour days.
- Employees tend to remain with one company throughout the course of their career span. This allows the opportunity for them to hone their skills and abilities at a constant rate while offering numerous benefits to the company.

  These benefits manifest themselves in employee loyalty, low turnover costs and fulfillment of company goals.`Just-in-time' is a management philosophy and not a technique.

  It originally referred to the production of goods to meet customer demand exactly, in time, quality and quantity, whether the `customer' is the final purchaser of the product or another process further along the production line.

  It has now come to mean producing with minimum waste. "Waste" is taken in its most general sense and includes time and resources as well as materials. Elements of JIT include:

  - ❑ Attacking fundamental problems - anything that does not add value to the product.
  - ❑ Devising systems to identify problems.
  - ❑ Striving for simplicity - simpler systems may be easier to understand, easier to manage and less likely to go wrong.
  - ❑ A product oriented layout - produces less time spent moving of materials and parts.
  - ❑ Quality control at source - each worker is responsible for the quality of their own output.
  - ❑ Poka-yoke - `foolproof' tools, methods, jigs etc. prevent mistakes
  - ❑ Preventative maintenance, Total productive maintenance - ensuring machinery and equipment functions perfectly when it is required, and continually improving it.

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the both buyer and seller organizations and partner banks also involved depend upon the entire set of documentation pertaining to each transaction to be able to recognize the sale, recognize value of consignment and effect necessary payment. Accounting practices of the organizations require detailed documentation as per bookkeeping practices and norms. Finally, goods and services are recognized and identified at every stage only with the set of authenticated documentation showing ownership based on which the customs allow them to be exported or imported into or out of the country. There are many more aspects like terms of carriage by the carrier coupled with insurance liabilities and coverage that call for set of documentation covering specific aspects of each transaction.

A supply chain manager needs to be aware of the complete set of documentation requirement along with the various aspects to be able to design processes and documentation control mechanisms. Errors in documentation will lead to financial damage, delays in delivery and performance that is what every manager aims to avoid.

## 4.4 AGGREGATE PRODUCT PLANNING

An organization can finalize its business plans on the recommendation of demand forecast. Once business plans are ready, an organization can do backward working from the final sales unit to raw materials required. Thus annual and quarterly plans are broken down into labor, raw material, working capital, etc. requirements over a medium-range period (6 months to 18 months). This process of working out production requirements for a medium range is called aggregate planning.

### 4.4.1 Factors Affecting Aggregate Planning

Aggregate planning is an operational activity critical to the organization as it looks to balance long-term strategic planning with short term production success. Following factors are critical before an aggregate planning process can actually start.

- Complete information is required about available production facility and raw materials.
- A solid demand forecast covering the medium-range period
- Financial planning surrounding the production cost which includes raw material, labor, inventory planning, etc.
- Organization policy around labor management, quality management, etc.



For aggregate planning to be a success, following inputs are required;

- An aggregate demand forecast for the relevant period
- Evaluation of all the available means to manage capacity planning like sub-contracting, outsourcing, etc.
- Existing operational status of workforce (number, skill set, etc.), inventory level and production efficiency

Aggregate planning will ensure that organization can plan for workforce level, inventory level and production rate in line with its strategic goal and objective.

### 4.4.2 Aggregate Planning as an Operational Tool

Aggregate planning helps achieve balance between operation goal, financial goal and overall strategic objective of the organization. It serves as a platform to manage capacity and demand planning. In a scenario where demand is not matching the capacity, an organization can try to balance both by pricing, promotion, order management and new demand creation. In scenario where capacity is not matching demand, an organization can try to balance the both by various alternatives such as.

- Laying off/hiring excess/inadequate workforce until demand decrease/increase.
- Including overtime as part of scheduling there by creating additional capacity.
- Hiring a temporary workforce for a fix period or outsourcing activity to a sub-contractor.

Notes

Inventory is always dynamic. Inventory management requires constant and careful evaluation of external and internal factors and control through planning and review. Most of the organizations have a separate department or job function called inventory planners who continuously monitor, control and review inventory and interface with production, procurement and finance departments.

## 5.2 DEFINING INVENTORY

Inventory is an idle stock of physical goods that contain economic value, and are held in various forms by an organization in its custody awaiting packing, processing, transformation, use or sale in a future point of time.

Any organization which is into production, trading, sale and service of a product will necessarily hold stock of various physical resources to aid in future consumption and sale. While inventory is a necessary evil of any such business, it may be noted that the organizations hold inventories for various reasons, which include speculative purposes, functional purposes, physical necessities etc.

The term inventory has been defined by several authors. The popular among them are :-"the term inventory includes materials-raw, in process, finished packaging, spares and others stocked in order to meet an unexpected demand or distribution in the future."

***– B.D. Khare, Inventory Control, NPC, p.1.***

From the above definition the following points stand out with reference to inventory:

- All organizations engaged in production or sale of products hold inventory in one form or other.
- Inventory can be in complete state or incomplete state.
- Inventory is held to facilitate future consumption, sale or further processing/value addition.
- All inventoried resources have economic value and can be considered as assets of the organization.



## 5.3 DIFFERENT TYPES OF INVENTORY

Inventory of materials occurs at various stages and departments of an organization. A manufacturing organization holds inventory of raw materials and consumables required for production. It also holds inventory of semi-finished goods at various stages in the plant with various departments. Finished goods inventory is held at plant, FG Stores, distribution centers etc. Further both raw materials and finished goods those that are in transit at various locations also form a part of inventory depending upon who owns the inventory at the particular juncture. Finished goods inventory is held by the organization at various stocking points or with dealers and stockiest until it reaches the market and end customers.

Besides Raw materials and finished goods, organizations also hold inventories of spare parts to service the products. Defective products, defective parts and scrap also forms a part of inventory as long as these items are inventoried in the books of the company and have economic value.

***Types of Inventory by Function***

| INPUT | PROCESS | OUTPUT |
|---|---|---|
| Raw Materials | Work In Process | Finished Goods |
| Consumables required for processing. Eg : Fuel, Stationary, Bolts & Nuts etc. required in manufacturing | Semi Finished Production in various stages, lying with various departments like Production, WIP Stores, QC, Final Assembly, Paint Shop, Packing, Outbound Store etc. | Finished Goods at Distribution Centers through out Supply Chain |
| Maintenance Items/Consumables | Production Waste and Scrap | Finished Goods in transit |

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Hence one is able to monitor the inventory of this category closely to ensure the inventory level is maintained at optimum levels for any excess inventory can have huge adverse impact in terms of overall value.

- ***A Category Items:*** Helps one identify these stocks as high value items and ensure tight control in terms of process control, physical security as well as audit frequency.

  It helps the managers and inventory planners to maintain accurate records and draw management's attention to the issue on hand to facilitate instant decision-making.

- ***B Category Items:*** These can be given second priority with lesser frequency of review and less tightly controls with adequate documentation, audit controls in place.

- ***C Category Items:*** Can be managed with basic and simple records. Inventory quantities can be larger with very few periodic reviews.

***Example:*** Take the case of a Computer Manufacturing Plant; the various items of inventory can be broadly classified as under:

| SKU Description | Classification of Inventory | Remarks |
|---|---|---|
| Processor Chips | A Class | Kept under High Value Storage/Asset Tracking / Access Control required |
| Memory Chips | A Class | Kept under High Value Storage/Asset Tracking / Access Control required |
| Hard Disk / Storage Media | A Class | Kept under High Value Storage/Asset Tracking / Access Control required |
| Software License | A Class | Kept under High Value Storage/Asset Tracking / Access Control required |
| Disk Drives | A Class | Normal Storage / Access Control Required |
| Cabinet / Case | B Class | Normal Procedures |
| Battery Pack | B Class | Normal Procedures |
| Monitor | A Class | Normal Storage / Access Control Required |
| Keyboard | B Class | Normal Procedures |
| Training Manuals | C Class | Minimal Procedures |
| Mouse | B Class | Normal Procedures |
| Stickers | C Class | Minimal Procedures |
| Screws & Nuts | C Class | Minimal Procedures |
| Power Cord | C Class | Minimal Procedures |
| Starter Assembly Pack-Instructions | C Class | Minimal Procedures |



***Disadvantages***

- Inventory Classification does not reflect the frequency of movement of SKU and hence can mislead controllers.
- B & C Categories can often get neglected and pile in huge stocks or susceptible to loss, pilferage, slackness in record control etc.

## 5.9 FACTORS AFFECTING INVENTORY OPERATIONS

Inventory management entails study of data on movement of inventory, its demand pattern, supply cycles, sales cycles etc. Active management calls for continuous analysis and management of inventory items to target at lean m inventory Management.

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Inventory Management function is carried out by the inventory planners in the company in close co ordination with procurement, supply chain logistics and finance, besides marketing departments. The efficiencies of inventory management are largely dependent upon the skills and knowledge of the inventory planners, the focus and involvement of management and the management policies coupled with the inventory management system.

However inventory operations management is not under the control of the inventory management team but rests with the third party service providers. In this section of the article we aim to uncover few of the critical areas and action points on the part of operations that can impact the inventory of the company.

1. ***Unskilled Labour and Staff:*** Inventory operations management is a process-oriented operation. Every task and action required to be carried out by the operatives will impact the inventory as well as the delivery lead times and other parameters. Therefore knowledge of what one is required to do and the effect of the action should be known to the operatives who are on the shop floor. For Example: If an operative is given a put away task, he should know how and where he should put away the pallet, how to scan the pallet ID and confirm it back to the system. Besides he should also know the impact of not completing any of these actions or doing something wrong. The impact his action will have on the system as well as physical inventory should be clear to the operative.

   Secondly different inventory items would have to be handled differently. Operatives who are carrying out the task should know why and what is required to be done. They should also know the consequences of not following the process. A pallet might have to be scanned for the pallet id and put away on a floor location, while a carton might have to be opened and scanned for individual boxes inside and put away into a bin. The operatives should be trained on the entire process and understand why and what he is doing.

   The WMS systems are quite operational and task intensive. Where the warehouses are being managed on RF based systems, the operatives should be able to manage the RF readers, understand how to access and complete transactions through the RF Guns.

   Often it is noticed that when the warehouse operations are being managed by a third party service provider and the principle customer is not present at the location, the quality of staff and operatives is compromised and people are not given adequate training before being allocated their responsibility. Such situations can lead to inventory discrepancies.

2. ***In adequate SOP, Training and emphasis on processes compliance:*** When a inventory management project kicks off at a third party warehouse location, both the principle customer as well as the third party service provider work on the project and setup basic processes, document them in Standard Operating Procedures and conduct training as a part of the project management methodology.

   However over a period of time, the nature of business requirements changes, resulting in change in the operating processes. These do not get documented in terms of amendments and the SOPs become outdated. Thereafter one finds that the new comers who are introduced on the shop floor are required to learn the processes by working along with others where as no training or SOP document is provided to him for reference. With the result they often have half-baked knowledge of the processes and carry on tasks not knowing why they are doing and what they are required to do.

   This situation is very dangerous for the health of the inventory and it shows slackness in the attitude of the third party service provider. Continuation of such a situation will lead to bad housekeeping, inventory mismatches, and discrepancies and also affect the service delivery. If left unchecked can lead to theft, pilferage and misuse of inventory.

   In any third party owned inventory operations warehouse, the principle client should ensure that periodic review and training is conducted for all staff. Inventory operations should be periodically reviewed and inventory counts and audits carried out regularly.

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discrepancy, it can be difficult to pinpoint the issue when you're looking back at an entire year.

- ***Spot Checking:*** If you do a full physical inventory at the end of the year and you often run into problems, or you have a lot of products, you may want to start spot checking throughout the year. This simply means choosing a product, counting it, and comparing the number to what it's supposed to be. This isn't done on a schedule and is supplemental to physical inventory. In particular, you may want to spot check problematic or fast-moving products.
- ***Cycle Counting:*** Instead of doing a full physical inventory, some businesses use cycle counting to audit their inventory. Rather than a full count at year-end, cycle counting spreads reconciliation throughout the year. Each day, week, or month a different product is checked on a rotating schedule. There are different methods of determining which items to count when, but, generally speaking, items of higher value will be counted more frequently.

### *Prioritize With ABC*

Some products need more attention than others. Use an ABC analysis to prioritize your inventory management. Separate out products that require a lot of attention from those that don't. Do this by going through your product list and adding each product to one of three categories:

A high-value products with a low frequency of sales

B moderate value products with a moderate frequency of sales

C low-value products with a high frequency of sales

Items in category A require regular attention because their financial impact is significant but sales are unpredictable. Items in category C require less oversight because they have a smaller financial impact and they're constantly turning over. Items in category B fall somewhere in-between.

### *Accurate Forecasting*

A huge part of good inventory management comes down to accurately predicting demand. Make no mistake; this is incredibly hard to do. There are so many variables involved and you'll never know for sure exactly what's coming—but you can get close. Here are a few things to look at when projecting your future sales:

- trends in the market
- last year's sales during the same week
- this year's growth rate
- guaranteed sales from contracts and subscriptions
- seasonality and the overall economy
- upcoming promotions
- planned ad spend

If there's something else that will help you create a more accurate forecast, be sure to include it.

### *Consider Drop shipping*

Drop shipping is really the ideal scenario from an inventory management perspective. Instead of having to carry inventory and ship products yourself—whether internally or through third-party logistics—the manufacturer or wholesaler takes care of it for you. Basically, you completely remove inventory management from your business. Many wholesalers and manufacturers advertise drop shipping as a service, but even if your supplier doesn't, it may still be an option. Don't be afraid to ask. Although products often cost more this way than they do in bulk orders, you don't have to worry about expenses related to holding inventory, storage, and fulfillment.