MATERIALS MANAGEMENT

Construction materials management …syllabus

- Materials flow system.
- role of MM in construction management and its linkage with other functional areas.
- vendor networking,
- buyer-seller relationships.
- EOQ model and its variations,
- material codification and classification,
- concept of logistics and supply chain management,
- role of ERP in MM
- material resource information systems,

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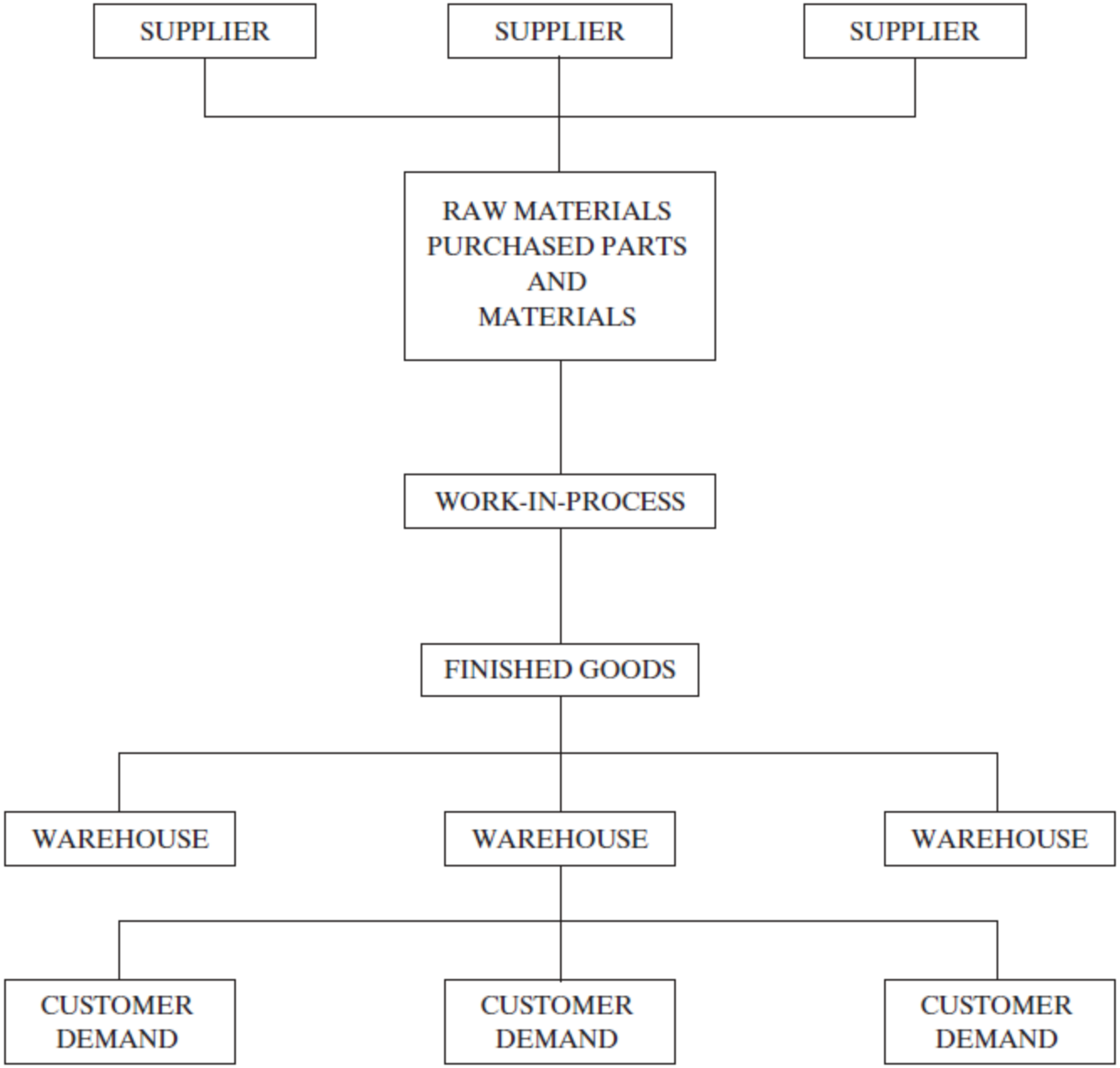
INTRODUCTION:
Construction materials:

cover all types of materials used in construction including electrical and mechanical fittings, fixtures, devices and instruments that are incorporated during the construction of permanent works and temporary supporting works at site.

- Cement and steel
- Bricks, sand, lime, stone chips
- tiles
- Steel fabricated parts
- Timber items
- Sanitary & electrical material
- Fixtures & fastenings
- Tar/ Bitumen
- Others:- Water proofing chemicals

Categories:	Examples
Raw materials	bricks, blocks, aggregates, cement, uncut reinforcement steel and timber
Partially processed materials	cut and bent reinforcement steel, softwood timber window and door frames
Completed components	uPVC windows, precast concrete cladding units, kitchen fittings, hardwood door frames, boilers and air conditioning units
Small items used in the construction process	nails, screws, nuts and bolts, ironmongery, paints, adhesives and preservatives
Office supplies	paper, pens, pencils, paper clips, envelopes and printer cartridges
Maintenance materials	cleaning fluids, light bulbs and refuse bags



Inventories and flow of materials

Definition…
Efficient materials management

an integrated approach covering numerous functions,

- materials planning,
- purchasing,
- inventory control,
- store-keeping and warehousing,
- handling and transportation,
- codification and standardization
- disposal of surpluses.

- It is concerned with planning, organizing and controlling the flow of materials from their initial purchase through internal operations to the service point through distribution.

OR

- Material management is a scientific technique, concerned with Planning, Organizing &Control of flow of materials, from their initial purchase to destination

Materials planning: Aim

To develop a plan for the procurement and stocking of construction materials so as to provide, at the site,

- materials of the right quality,
- in the right quantity,
- at the right prices,
- from the right sources and
- at the right time.

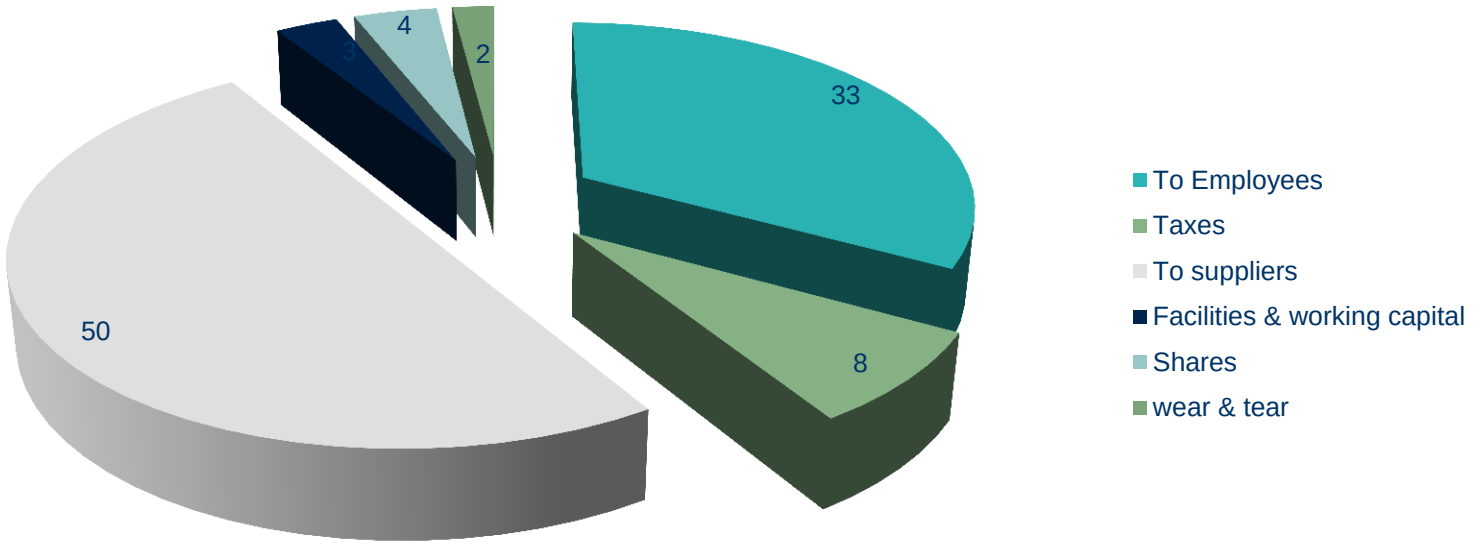
Materials planning: Functions

- identifying the materials,
- estimating their quantities,
- defining the specifications,
- forecasting the requirements,
- locating the sources for procurement,
- getting the samples of materials approved,
- designing the materials inventory,
- developing the procurement plans
- monitoring the flow of materials, till the connected construction works are completed.

Importance of materials management

- lies in the fact that any significant contribution made towards reducing cost of materials will improve the profitability
- Profit can be increased by – increasing the sales – but it is very difficult to achieve - has many barriers
- Results of efforts towards reducing 5% material cost equals increased sales of 30%
- Experts claim that efforts in reducing material cost by 1 Rs. = rise in sales of 10 Rs.

Spending…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2
33
50
8
To Employees
Taxes
To suppliers
Facilities & working capital
Shares
wear & tear

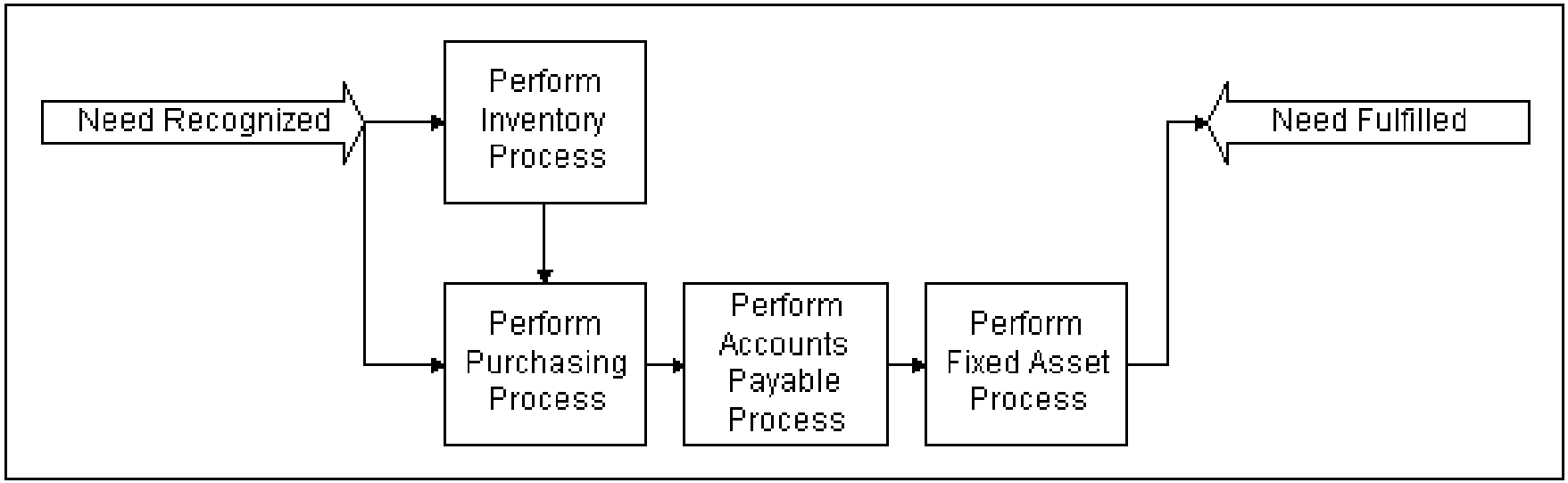
Purpose

- To gain economy in purchasing
- To satisfy the demand during period of replenishment
- To carry reserve stock to avoid stock out
- To stabilize fluctuations in consumption
- To provide reasonable level of client services

Material Expenditure

Sr. No.	*Avg. Exp. Of Materials (%)*	*Industry*
01	> - 65	Cotton yarn, Earthmoving equipments, Sugar, Wool, Jute, Commercial vehicles, Fabrication
02	60 - 65	Cotton textile, Bread
03	55 - 60	Engineering, Non ferrous
04	50 - 55	Ship building, Chemicals, Tyre, Machine tools, Cement, Electricity,
05	45 - 50	Pharmaceuticals
06	40 - 45	Steel, News paper, Aircrafts, Fertilizers

Process


Need Recognized
Perform Inventory Process
Perform Purchasing Process
Perform Accounts Payable Process
Perform Fixed Asset Process
Need Fulfilled

MM Functions

Scope of materials management is vast; some major functions:

- Material planning
- Purchasing
- Receiving
- Stores
- Inventory control
- Scrap & Surplus disposal
- Codification

Functions defined

- Materials planning and control:
  - Material planning & control is done based on sales forecast and production plans; it involves
    - **Estimating the individual requirement of materials**
    - **Preparing materials budget**
    - **Forecasting the levels of inventories**
    - **Scheduling the order**
    - **Monitoring the performance**

- Purchasing
  - Purchasing includes
    - Selection of source of supply
    - Finalisation of terms of purchase
    - Placement of purchase order
    - Follow-up
    - Maintenance of smooth relations with suppliers
    - Approval of payments
    - Evaluating and rating the suppliers

- Stores and Inventory control
  - This involves physical control of materials.
    - Preservation of stores
    - Minimising obsolesce and damage
    - Maintaining stores records
    - Proper location and stoking
    - Physical verification of stock
    - Reconciling stock with records…

Inventory control covers

- Setting the inventory levels
- ABC analysis
- EOQ
- Setting safety stock levels
- Lead time analysis
- Reporting

Table 11.1 Advantages of centralized and local purchasing (George Stukhart 1995)

Centralized	Local
• Low unit price due to large volume of purchase. For some items there can be an agreement on rate for the country as a whole, valid for a particular period during which the rates are fixed irrespective of general increase observed in the same item. • Smoother purchasing action due to well-laid-out process. • Specialized person having better market knowledge involved in the process. • Dealing with regular suppliers and, hence, better negotiated price.	• Faster response to material requirement for the project. • Better project control and regulated expense towards purchasing expenses. In centralized procurement, the indirect cost towards purchasing cost may be debited in wrong proportion to a particular project.

Table 11.2 Advantages and disadvantages of early procurement

Advantages	Disadvantages
• Materials availability is assured and, hence, work will not suffer. Proper quality and price of materials can be assured as there is time to look around and shop.	• Materials may be stolen or may deteriorate during storage. Materials will require space for storage, which may also be needed for other uses. They need to be guarded and accounted for. Money locked up in the purchase of materials does not get interest and other works may suffer due to this.

Table 11.3 Advantages and disadvantages of late procurement

Advantages	Disadvantages
• All the disadvantages of early procurement are avoided.	• All the advantages of early procurement are lost. If guaranteed delivery dates are available, it may be satisfactory to arrange for deliveries to be made a week in advance of the starting date of the work.

Materials Codification

- Important especially for companies where thousands of different items are used
- There are different systems of codification followed by construction organizations—namely :
  - numeric, alphanumeric, and color codification.

- Example: Numeric codification

-3 4 06 5 12 100 (see Figure

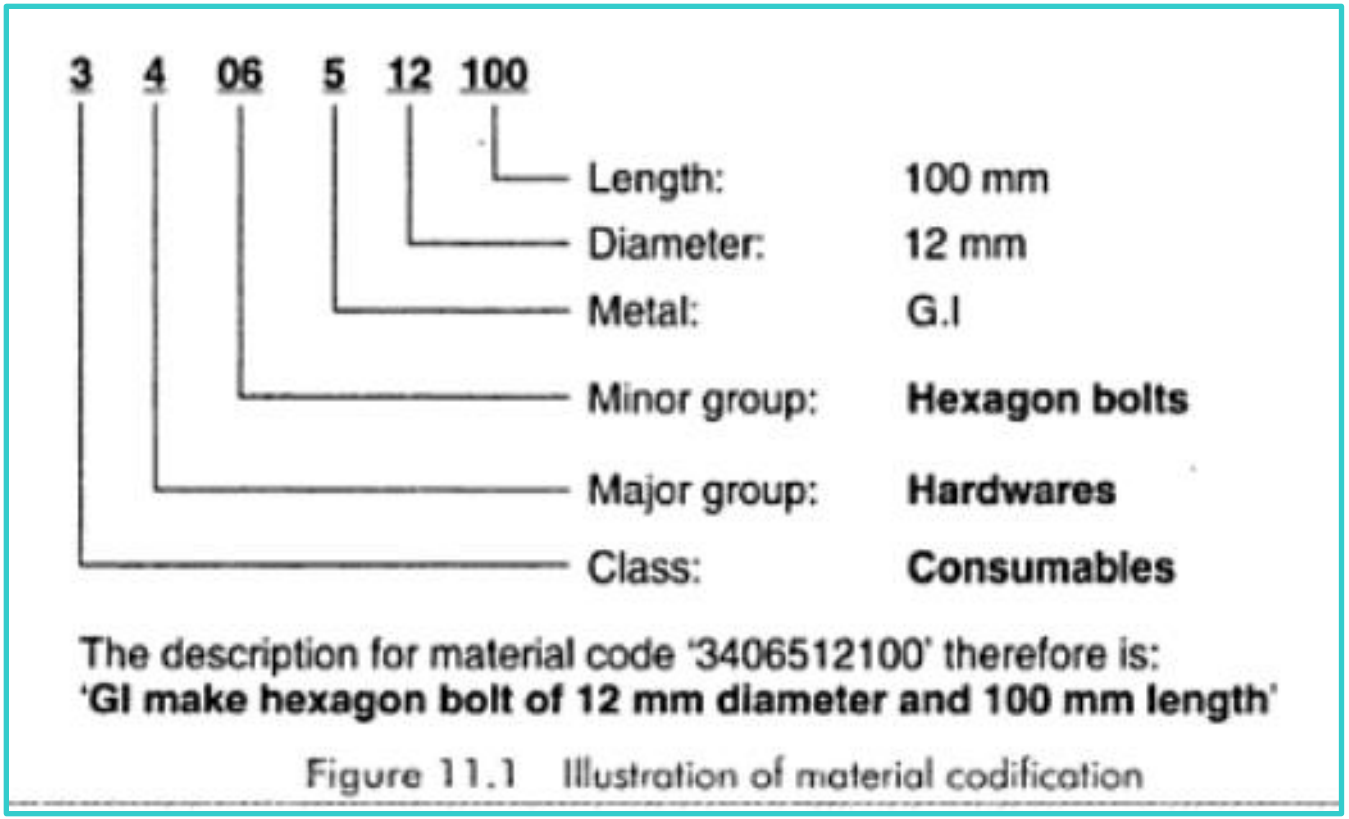


Figure 11.1 Illustration of material codification

Advantages of proper codification

A proper system of material codification serves the following purposes:

- proper identification of items by all departments concerned
- avoiding use of long description of items
- avoiding duplicate stocks under different descriptions
- material accounting and control
- ensuring receipt and issue documents are posted in appropriate records
- helps in mechanization of records

- If these functions are separately handled, conflict of interest occurs
    - Purchasing department if operated independently may treat discount as an important parameter for purchasing; which will result in sub-optimization.
- That is; we need to balance the conflicting objectives from total organisations point of view.

- **Integrated set-up:**
  - Materials manager is responsible for all interrelated functions.
  - He is in position to exercise control and coordinate the conflicting objectives of individual functions.
  - Helps in rapid data transfer through effective and informal communication system.

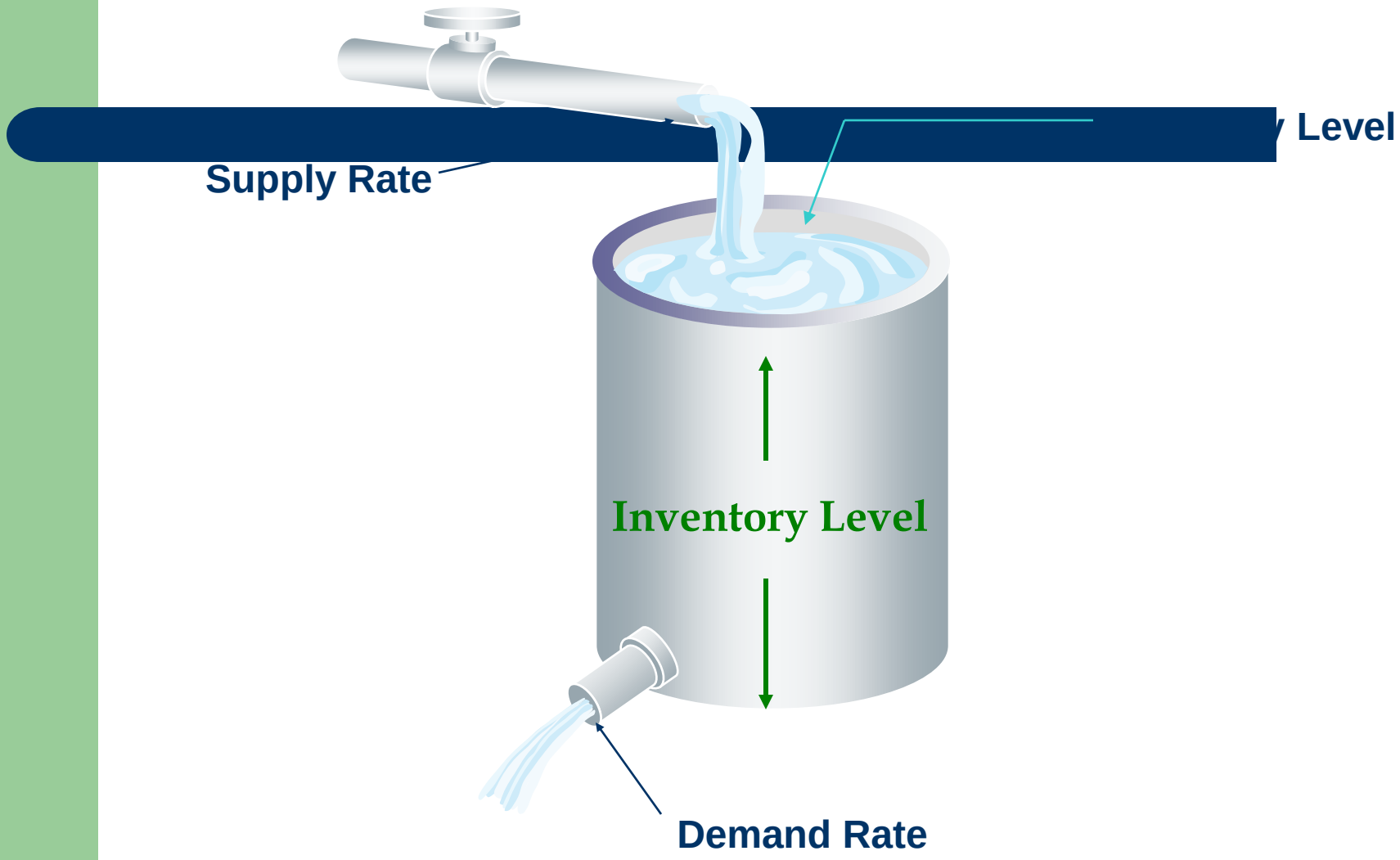
Out put:

- Integrating of various functions ensures that message channels are shortened and
- the various functions identify themselves to a common materials management departments;
- which in turn results in greater coordination and better control

Advantages of Integrated concept

- Better accountability
- Better coordination
- Better performance
- Adaptability to EDP (electronic data processing)
- Other

Water Tank Analogy for Inventory



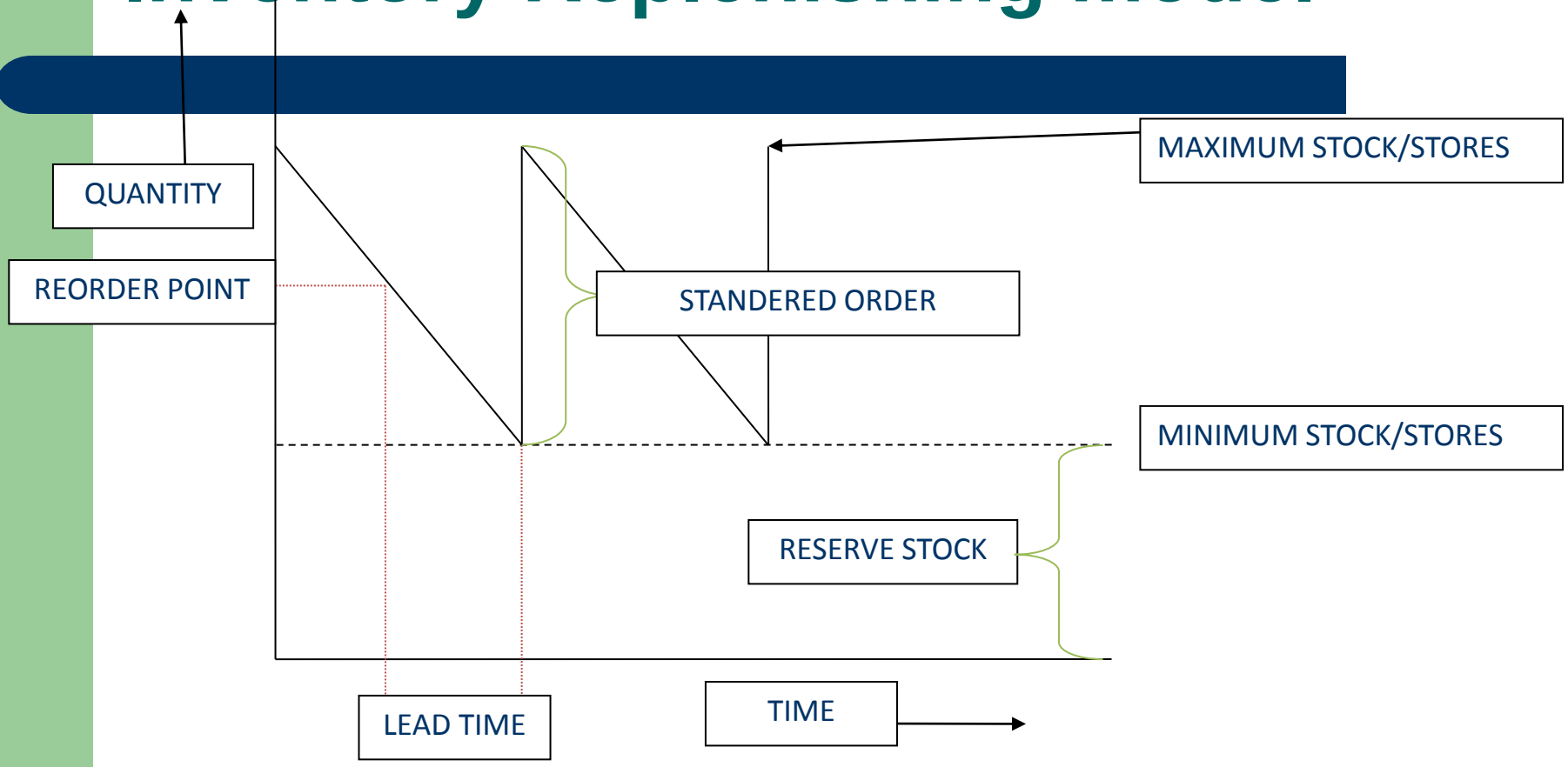
MATERIALS MANAGEMENT

INVENTORY

What Is Inventory?

- Stock of items kept to meet future demand
- **Inventory-**A physical resource that a firm holds in stock with the intent of selling it or transforming it into a more valuable state.
- **Inventory System**- A set of policies and controls that monitors levels of inventory and determines what levels should be maintained, when stock should be replenished, and how large orders should be

Inventory Replenishing model



Classification of inventories according to the function they perform

- **Anticipation Inventory**
  - created ahead of a peak selling season, a promotion program, vacation shutdown, or possibly the threat of a strike.
  - They are built up to help level production and to reduce the costs of changing production rates.

- **Fluctuation Inventory (Safety Stock/buffer stock/reserve stock)**
  - Is held to cover random unpredictable fluctuations in supply and demand or lead time.
  - Safety stock is carried to protect against this possibility.
  - Its purpose is to prevent disruptions in manufacturing or deliveries to customers.

- **Lot-Size Inventory**
  - Items purchased or manufactured in quantities greater than needed immediately create lot-size inventories.
  - This is to take advantage of quantity discounts; to reduce shipping, clerical, and setup costs; and in cases where it is impossible to make or purchase items at the same rate that they will be used or sold.
- **Transportation Inventory (**pipeline or movement inventories)
  - exist because of the time needed to move goods from one location to another such as from a plant to a distribution center or a customer.
  - The average amount of inventory in transit is:

$$I = \frac{tA}{365}$$

    - where I is the average annual inventory in transit, t is transit time in days, and A is annual demand.
  - Notice that the transit inventory does not depend upon the shipment size but on the transit time and the annual demand.
  - The only way to reduce the inventory in transit, and its cost, is to reduce the transit time.

- **Hedge Inventory**
  - Some products such as minerals and commodities—for example, grains or animal products—are traded on a worldwide market.
  - The price for these products fluctuates according to world supply and demand.
  - If buyers expect prices to rise, they can purchase **hedge inventory** when prices are low.

- **Maintenance, Repair, and Operating Supplies (MROs)**
  - support general operations and maintenance but that do not become directly part of a product.
  - include maintenance supplies, spare parts,and consumables such as cleaning compounds, lubricants, pencils, and erasers.

Two Forms of Demand

- Dependent
  - Demand for items used to produce final products
  - Tires stored at a Goodyear plant are an example of a dependent demand item
- Independent
  - Demand for items used by external customers
  - Cars, appliances, computers, and houses are examples of independent demand inventory

NEED

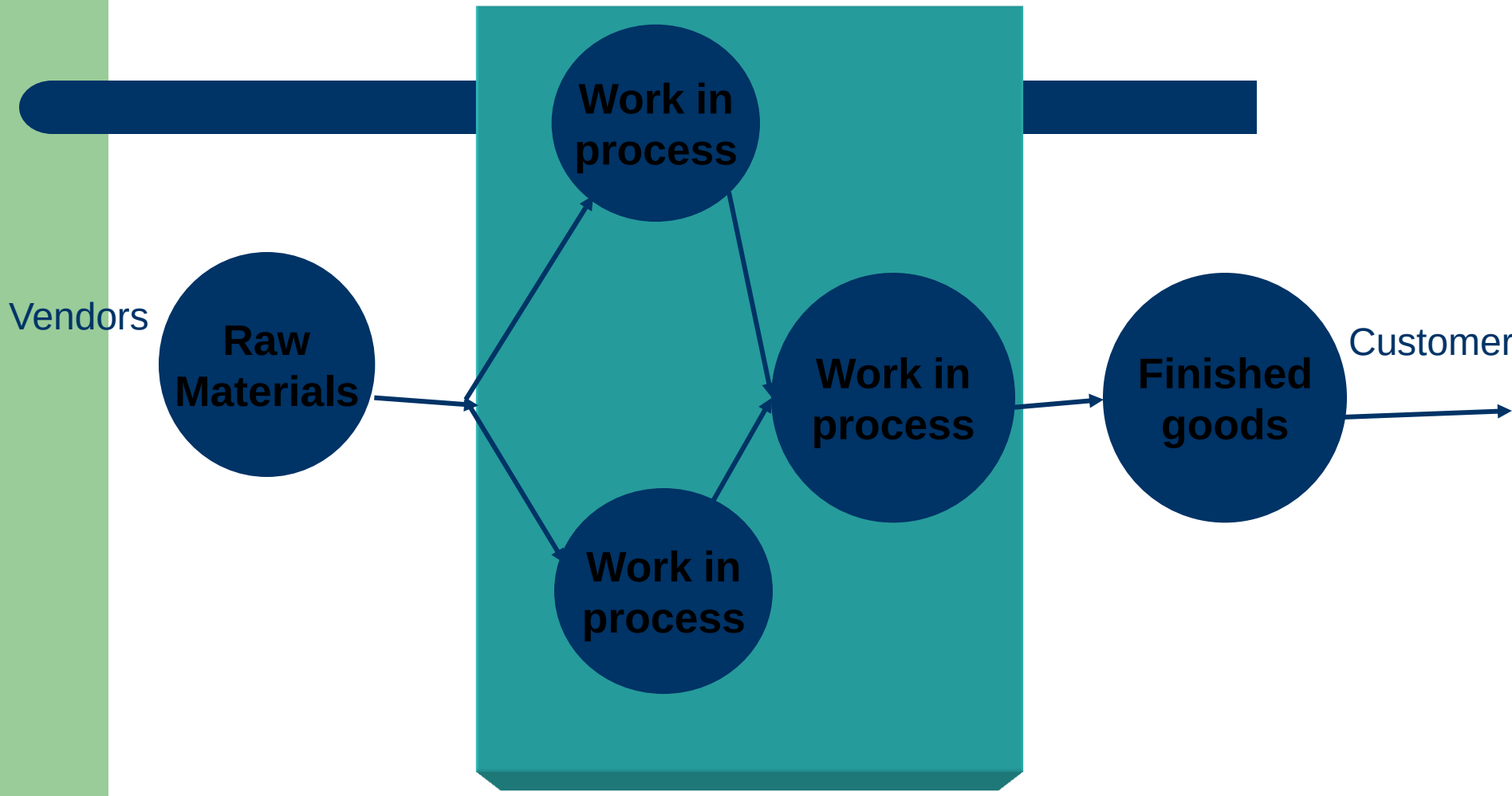
- Inventory enables a constant rate of production for the firm, even if
  - Source of supply are not too reliable,
  - Due to power shortage,
  - Transport or labour problems.

Types of Inventory

- Raw materials
- Purchased parts and supplies
- Work-in-process (partially completed) products (WIP)
- Items being transported
- Tools and equipment

Common Construction Materials

Types of Inventory



- **SYMTOMES OF POOR INVENTORY MANAGEMENT**

  - Excessive material down time due to material shortage,
  - Periodic lack of adequate storage space,
  - Widely varying costs of inventory losses,
  - Continuous growing inventory quantities,
  - Inability to meet delivery schedule, and
  - Uneven production.

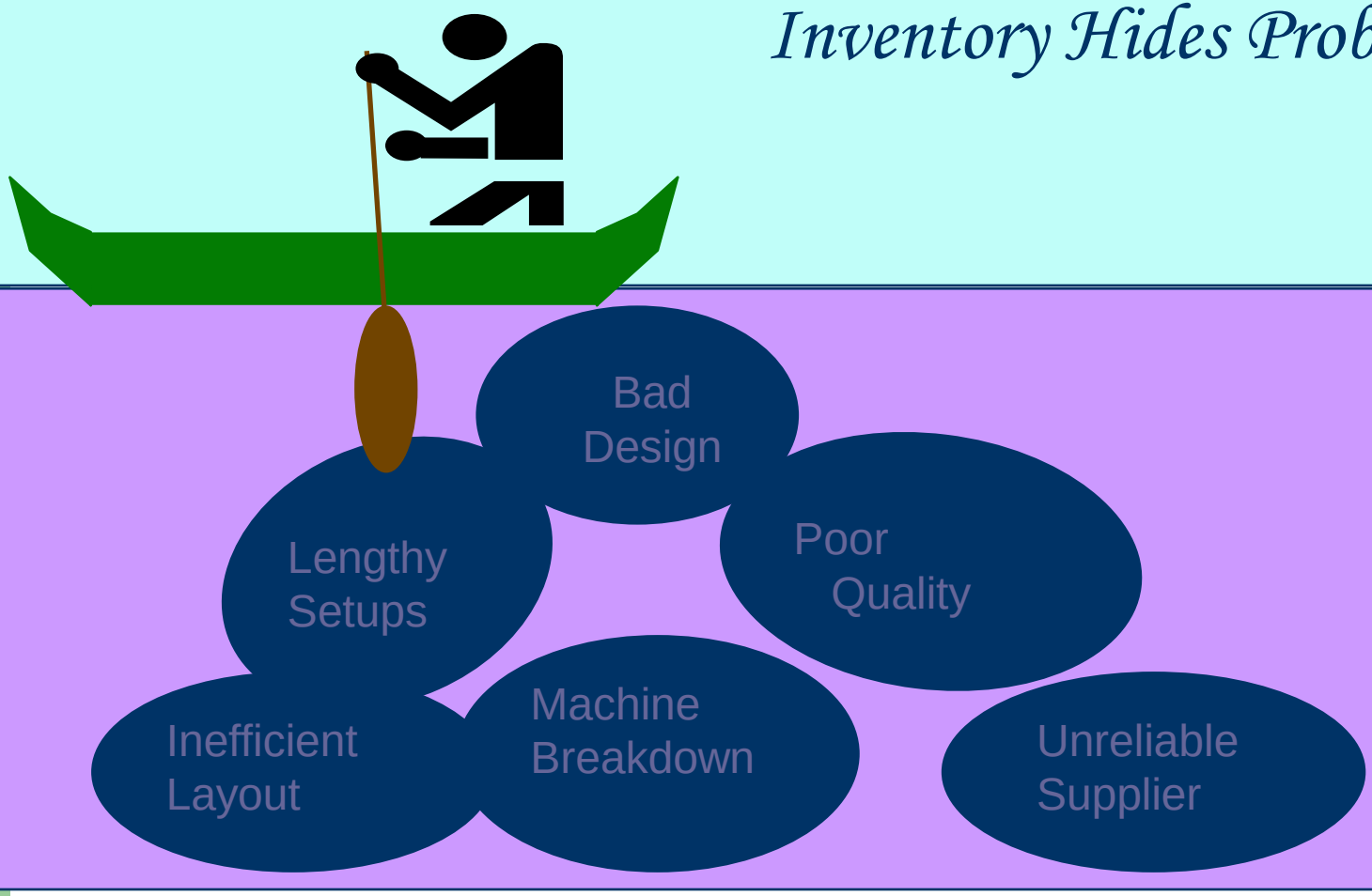
Reasons To Hold Inventory

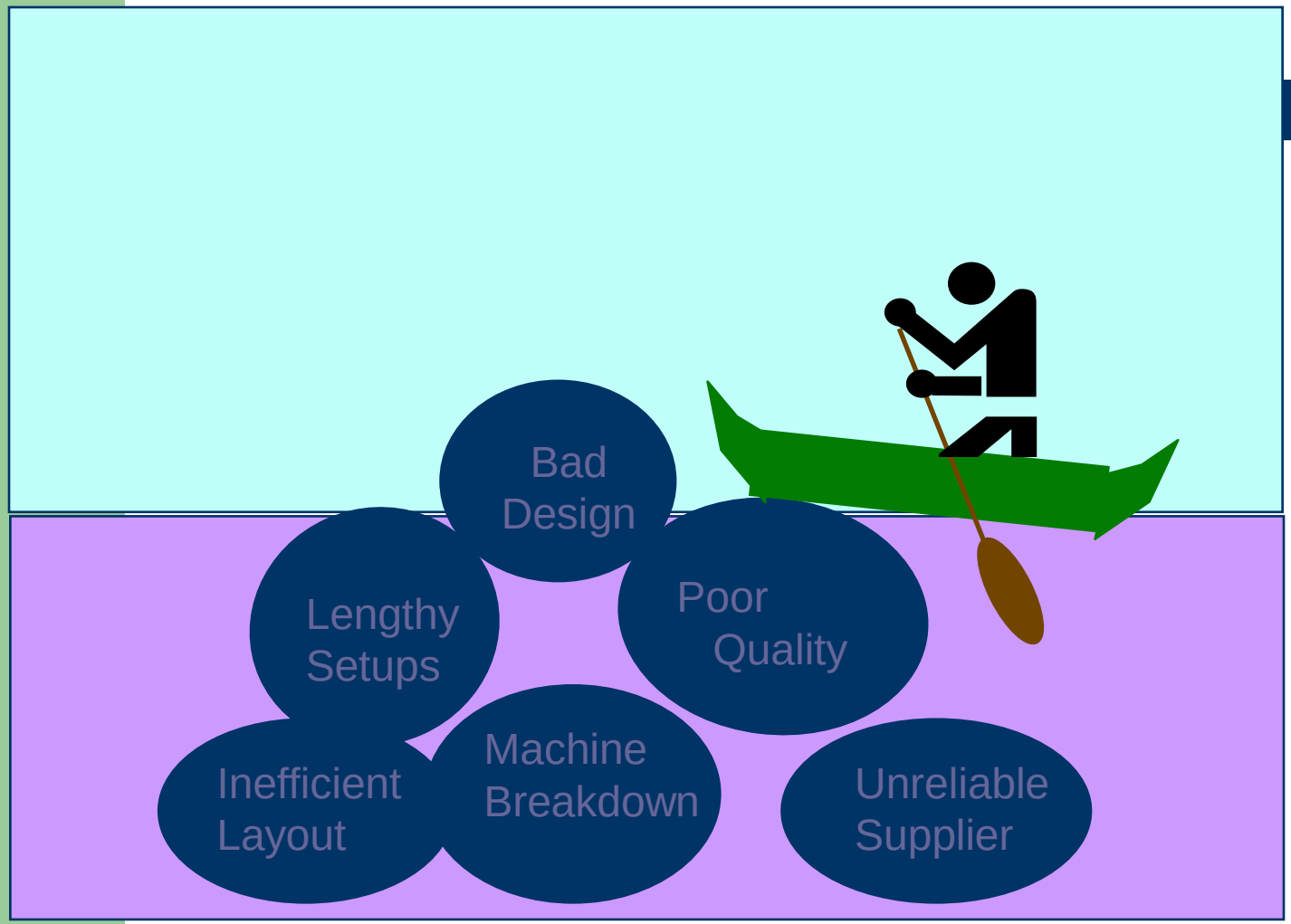
- Meet variations in customer demand:
  - Meet unexpected demand
  - Smooth seasonal or cyclical demand
- Pricing related:
  - Temporary price discounts
  - Hedge against price increases
  - Take advantage of quantity discounts
- Process & supply surprises
  - Internal – upsets in parts of or our own processes
  - External – delays in incoming goods
- Transit

Reasons To NOT Hold Inventory

- Carrying cost
  - Financially calculable
- Takes up valuable factory space
  - Especially for in-process inventory
- Inventory covers up “problems” …
  - That are best exposed and solved

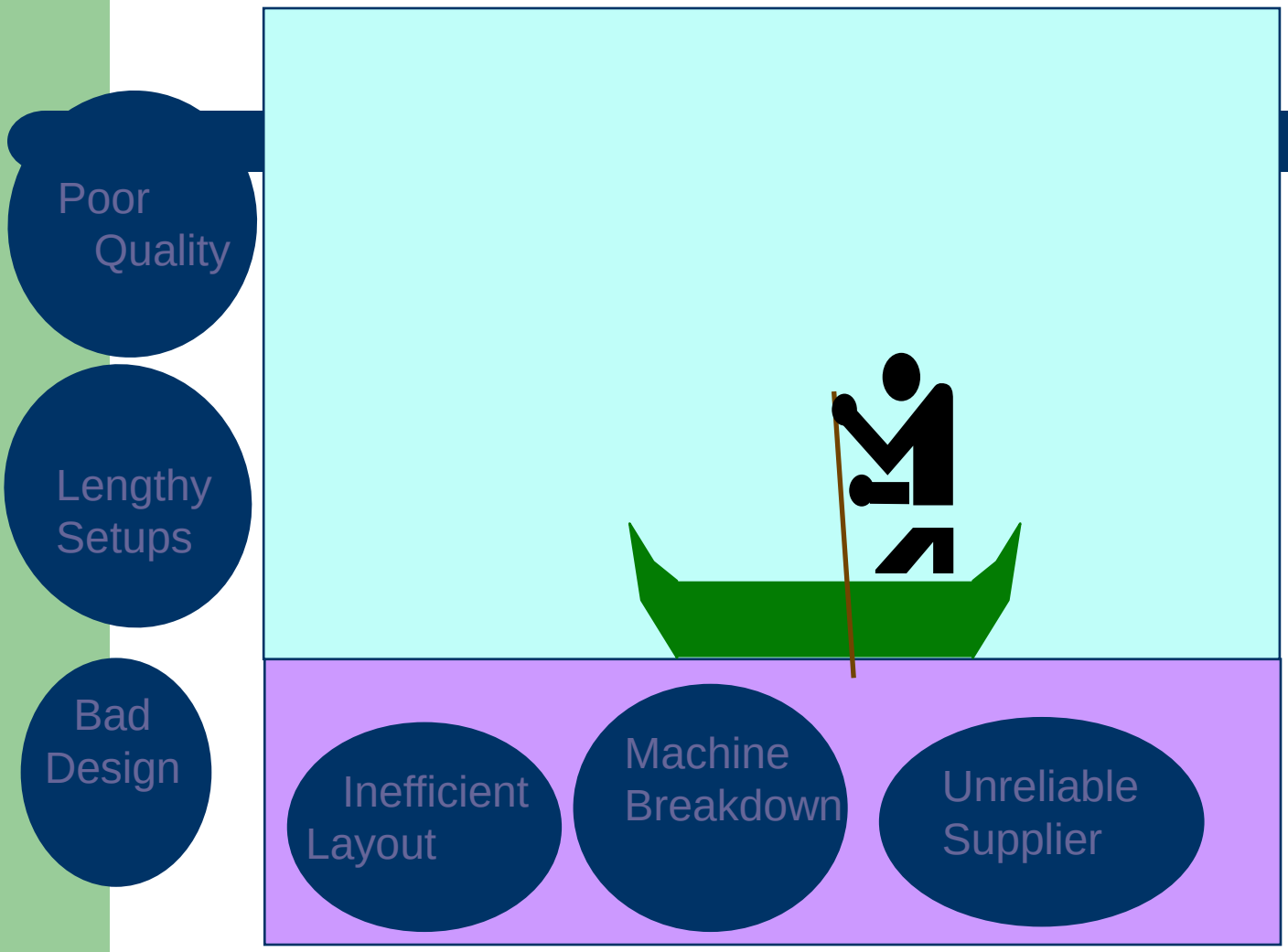
Inventory Hides Problems





To Expose Problems:

Reduce Inventory Levels



Remove Sources of Problems and Repeat the Process

- **Systems Approach**:

  - This approach states that inventory should be managed by developing and then following proper systems.

Aim of systems approach is to reduce the size of inventories without destroying their effectiveness.

Steps to be taken:

- Better fore-casting,
- Fewer variety,
- Centralized inventories,
- Finding reliable sources of suppliers, who will supply items of right quality in right place, in right time with right cost,
- Effective follow up,
- Control through reporting system at regular frequency,
- Effective budgetary control.

Value through Inventory

- **Quality** - inventory can be a “buffer” against poor quality; conversely, low inventory levels may force high quality
- **Speed** - *location* of inventory has gigantic effect on speed
- **Flexibility** - location, level of anticipatory inventory both have effects
- **Cost** - direct: purchasing, delivery, manufacturing

  indirect: holding, stock out.