

BE-102

Design & Engineering

Module-3

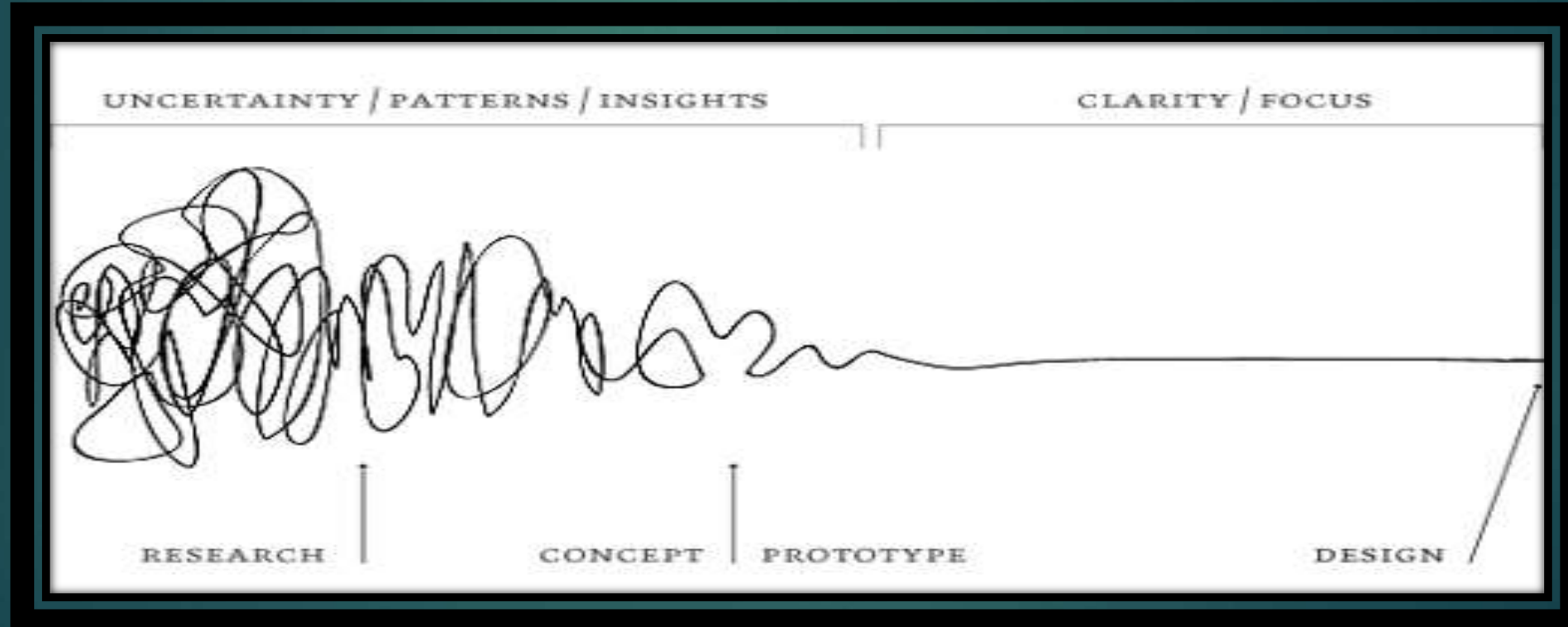
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MEA ENGINEERING COLLEGE
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Prototyping: The first stage of testing and implementation of a new product, called prototyping, consists of building a prototype of the product-the first fully operational production of the complete design solution. A prototype is not fully tested and may not work or operate as intended. The purpose of the prototype is to test the design solution under real conditions.



Rapid Prototyping

Rapid prototyping is a group of techniques used to quickly fabricate a scale model of a physical part or assembly using three-dimensional computer aided design (CAD) data. Construction of the part or assembly is usually done using **3D printing** or "additive layer manufacturing" technology.



FAB LAB

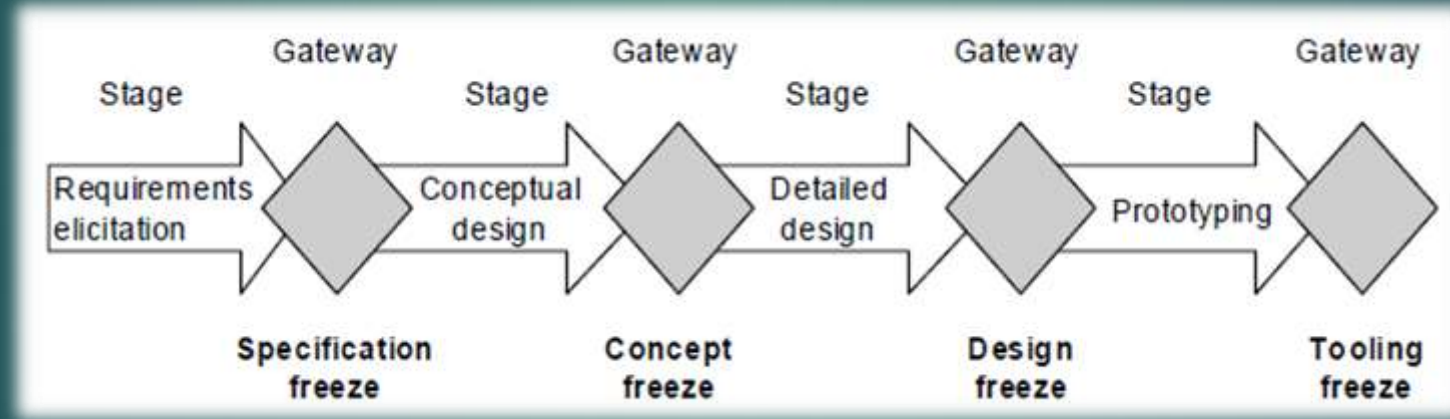
Testing & Evaluation of Design

- Testing and evaluation, allows the client / customer to view the prototype and to give his/her views. Changes and improvements are agreed and further work carried out.
- A focus group can try out the prototype and give their views and opinions. Faults and problems are often identified at this stage. Suggestions for improvement are often made at this stage.
- Safety issues are sometimes identified, by thorough testing and evaluation. The prototype can be tested to British and European Standards.
- The prototype can be tested against any relevant regulations and legislation. Adjustments / improvements to the design can then be made.
- Evaluating a prototype allows the production costs to be assessed and finalised.
- Component failure is often identified during the testing process. This may mean a component is redesign and not the entire product.

Freezing the Design

‘Design Freeze’ describes the end point of the design phase at which a technical product description is handed over to production

Although Design Freeze refers to an unchanging design, in reality a complete freeze is not possible.



Cost Analysis



Cost Analysis Defined

Cost analysis is a thorough **assessment of the direct and indirect costs** leading to the final price of the goods or service

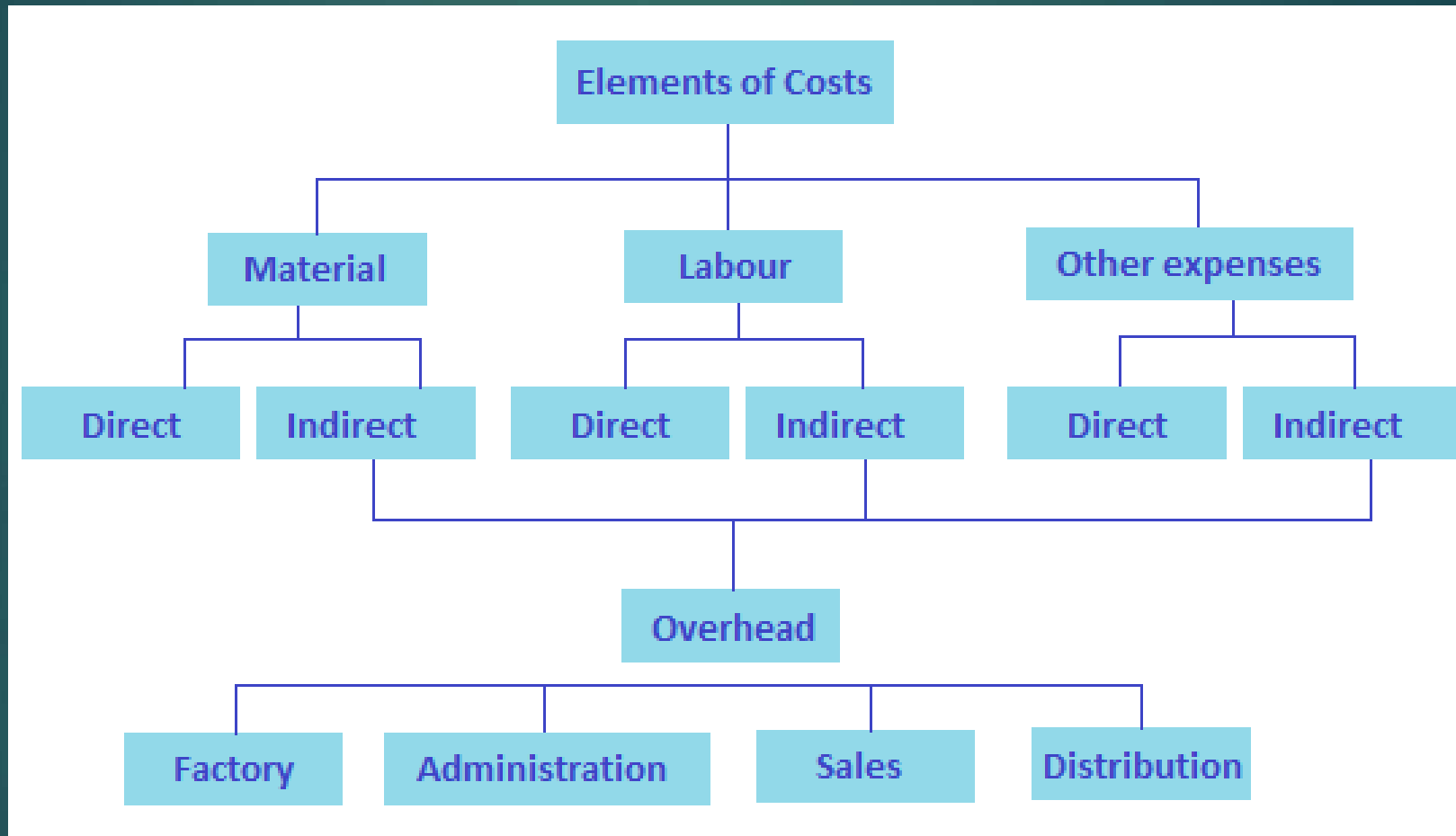
- ▶ To determine actual cost of a product or the process.
- ▶ To compare the actual cost with the estimated cost.
- ▶ To provide the management with actual cost figures so that it can frame practical sales policies and cost structure etc.
- ▶ To ascertain departmental efficiency on the basis of a actual cost it incurs for production
- ▶ To determine profitability of products.



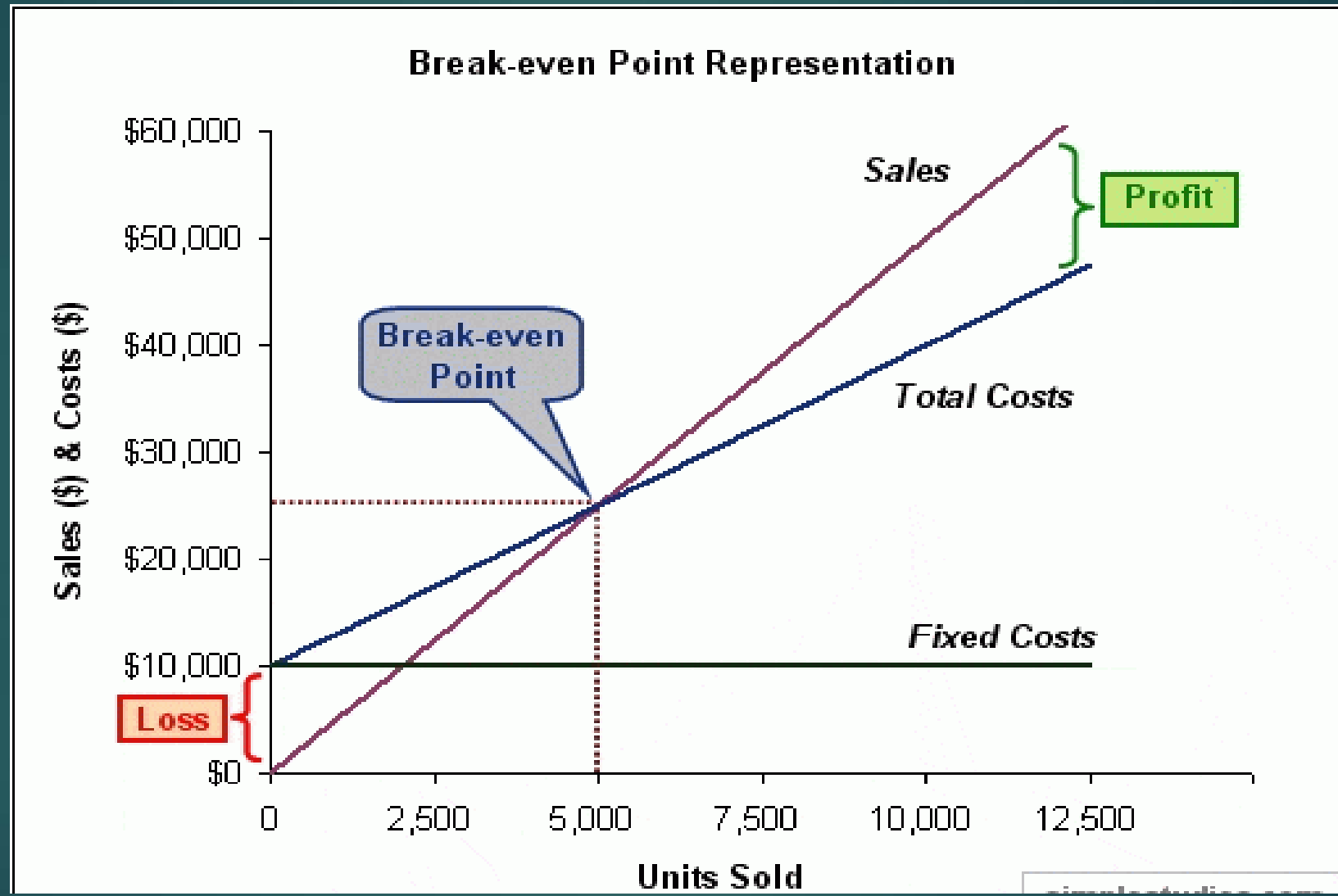
Common Cost Elements



Classification of Cost



Break-even analysis



Engineering the design



Planning

- ❖ Planning for Manufacture
- ❖ Planning for Distribution
- ❖ Planning for Use
- ❖ Planning for Retirement of the Product



Planning

- ▶ It is the road map for development
- ▶ It defines the present situation in detail
- ▶ It helps in deciding objectives both in quantitative and qualitative terms
- ▶ Planning fills the gap between input (need) and output(product)
- ▶ Plan should be a realistic view of expectations
- ▶ Planning are flexible
- ▶ Planning is important when way to achieve, goals of objective are many.

"A GOAL
WITHOUT
A PLAN
IS JUST
A WISH"



Benefits

- ▶ Planning reduces uncertainty, risk and confusion in operation
- ▶ Planning guides decision making by managers
- ▶ Planning helps in achieving coordination and control
- ▶ Planning is an element of flexibility makes an organisation capable of coping with changing environment challenges
- ▶ Planning leads to economy and efficiency in operations

“Failing to plan,
is planning to fail.”

Limitations

- ▶ Planning can minimise risk but cannot eliminate risk
- ▶ Planning is a big process so its time and money consuming
- ▶ Planning cannot foresee every thing thus may be obstacles
- ▶ Planning once planned reduces creativity
- ▶ Planning doesn't guarantee success

Essentials of good plan

- ▶ The planning process must be continuous, creative and communicated to the lowest level
- ▶ Planning should be time bound
- ▶ Planning should not be rigid
- ▶ Planning should essentially achieve satisfaction of user

Schedule

SUN	MON	TUE	WED	THU	FRI	SAT



Scheduling

- ▶ The schedule must portray the activities required to support the project plan.
- ▶ Provides time-scaled network schedules that define when work tasks are to be performed.
- ▶ Produces reports that provide the Project Manager, the information necessary to monitor schedule status and to initiate corrective action if required.
- ▶ Provides assistance in implementation of corrective action when required

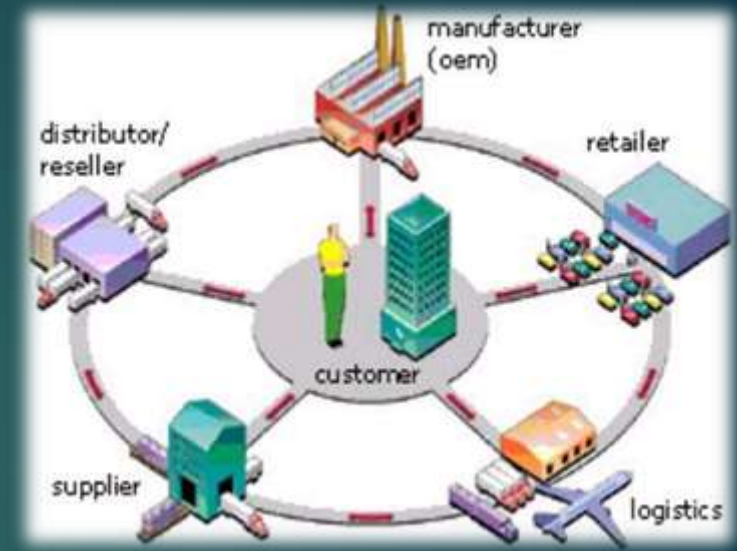
Supply chains

Also referred to as the logistics network

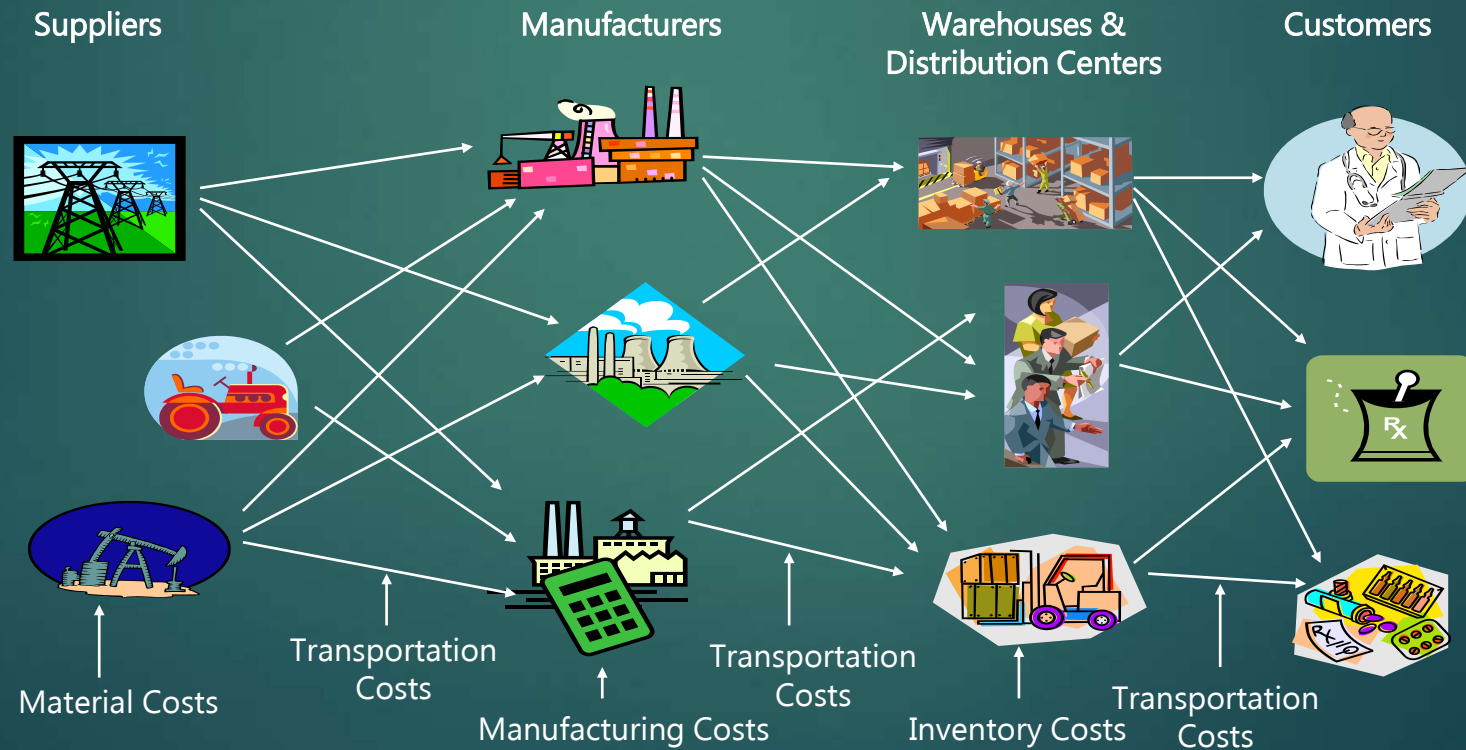
- Supply chain management is the management of network of interconnected businesses involved in the ultimate provision of goods and services required by the end customer.
- Supply chain management spans all movement and storage of raw materials, work-in-process inventory and finished goods from point-of-origin to point-of-consumption.

Critical aspect:

- Everyone is involved
- Systems approach to reducing costs
- Integration being the key



The Supply Chain – Another View



Supply Chain Management – In a nutshell is

SCM is all about effective integration of...

✓ Right Product



✓ At Right Place



✓ Right Quantity



✓ At Right Time



✓ Right Quality



✓ At Right Value





Inventory



What is inventory?

A physical resource that a firm holds in stock with the intent of selling it or transforming it into a more valuable state.



Purpose of inventory management

- How many units to order?
- when to order? discount

Types of Inventories

Raw materials

Purchased parts and supplies

Finished Goods

Work-in-process (partially completed products)

Items being transported

Tools and equipment

Inventory Costs

Carrying cost

- cost of holding an item in inventory

Ordering cost

- cost of replenishing inventory

Shortage cost

- temporary or permanent loss of sales when demand cannot be met

Inventory Management



- ▶ Inventory Management tries to optimize the ordering of stocks and safety stocks along the supply chain, aiming to minimize holding and backorder costs while fulfilling the typically uncertain demand of customers.
- ▶ It develop methods for the measurement and control of inventory system performance under uncertainty.
- ▶ Applications are the distribution of safety stocks in supply networks in the process industries, spare parts distribution, and reorder policies in retailing.

Material handling

- ▶ Short distance movement of goods or materials within a storage area or in plant, involving loading, unloading, palletizing, de-palletizing, etc.
- ▶ Now a days AGV-automated guided vehicles are used to perform this function.

Manufacturing process

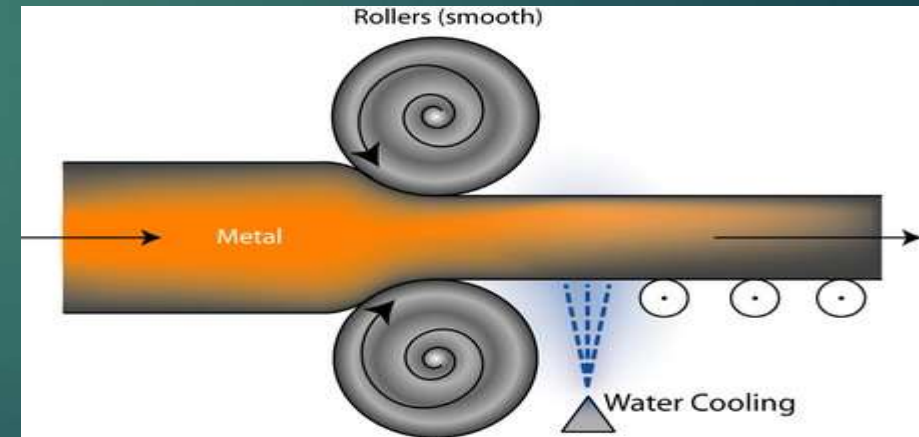


- ▶ Process are classified into:
 - ▶ Primary shaping process
 - ▶ Machining process
 - ▶ Joining process
 - ▶ Surface finishing process
 - ▶ Process affecting change in properties.

Primary shaping process

- ▶ Two types:

- ▶ One which produce finished product (deforming process) i.e. requires no metal removal Examples: casting , forging, rolling etc...
- ▶ One which requires machining operations (material removal process)



Machining process

- ▶ Other wise called as secondary process.
- ▶ Additional process for the products undergone in primary to get dimensional accuracy or to proper design.
- ▶ Examples: turning, threading, grinding ,drilling etc...



Joining & Surface finishing process

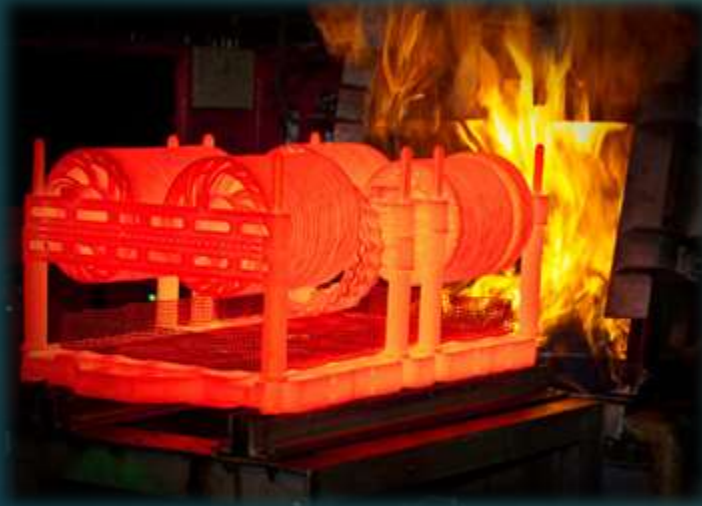
- Joining parts in general fabrication work.
 - Examples : welding , soldering , brazing , riveting etc...
- ▶ Process to get good surface finish
 - Examples: buffing , lapping etc...



Process effecting change in properties

- ▶ Process for imparting certain properties to the metal parts to make them possible for particular operations.

Examples: heat treatment , cold working , hot working etc.



Classification of manufacturing process

- ▶ Job production
 - ▶ Small number of pieces produced only once - **Prototype**
 - ▶ Small number of pieces when need arises- **Parts of stopped models**
 - ▶ Small number of pieces periodically after time interval – **Raincoats**
- ▶ Batch production
 - ▶ Batch produced only once
 - ▶ Batch produced repeatedly at irregular intervals
 - ▶ Batch produced periodically at non intervals to satisfy continuous demands

So job production involves less quantity and more varieties while batch production involves large quantity of identical parts

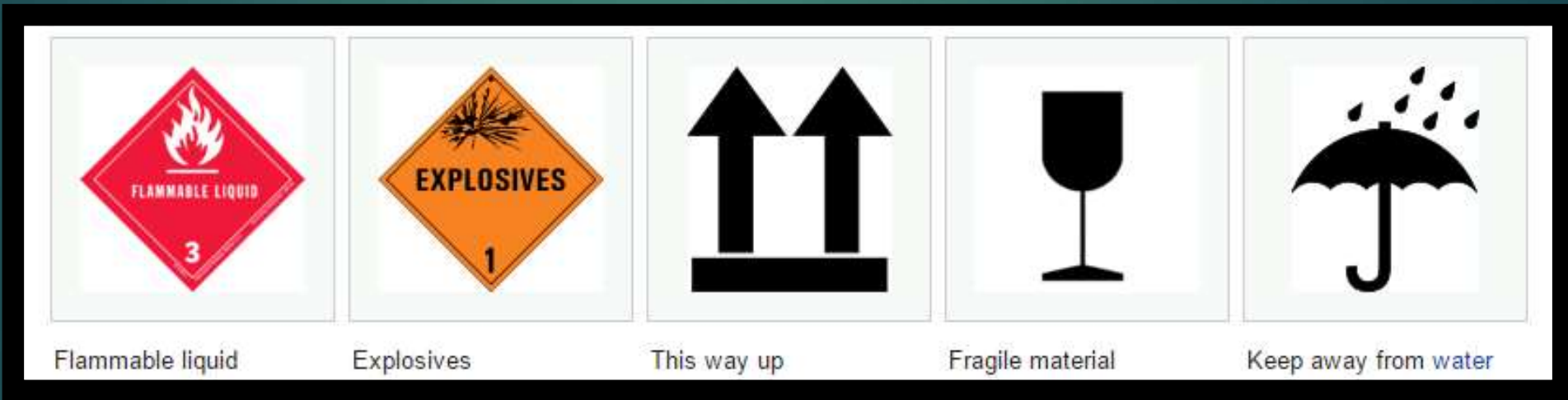
Storage



- ▶ Inventory control is concerned with achieving an optimum balance between two competing objectives. The objectives are:
 - To minimize investment in inventory
 - To maximize the service levels
- ▶ Inventory is a stock of physical goods held at a specific location and at a specific time. Each distinct item in the inventory at a location is termed stock. Each location is a stock point.

Packaging

- ▶ To store, distribute, protect the product
- ▶ It is a marketing strategy by applying certain graphics to attract costumers
- ▶ Helps a lot during transportation by means of certain symbols



Packing Process



Primary



Secondary



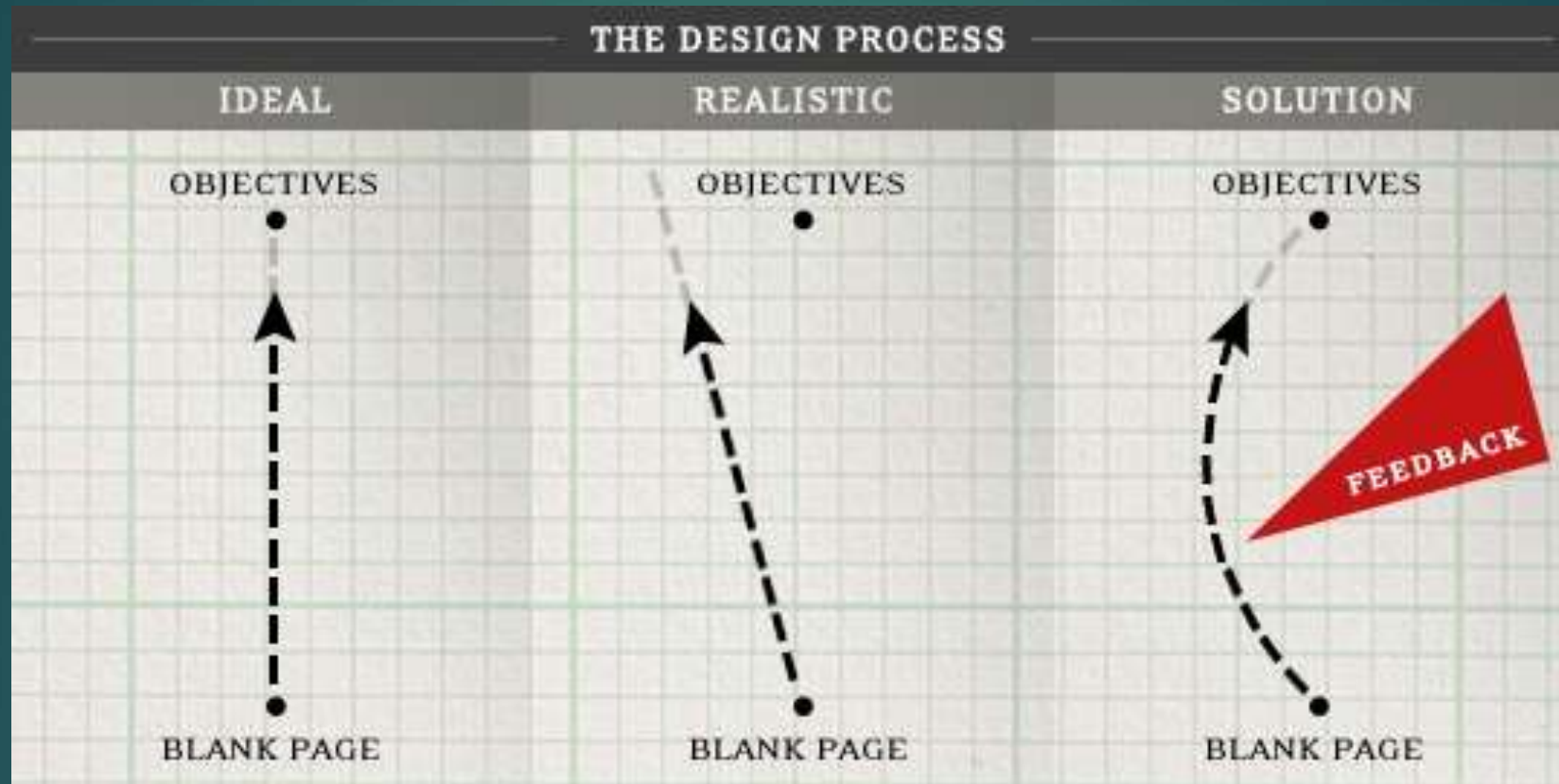
Tertiary

Package Design



What are the advantages of this package design ?

Feed-back On Design

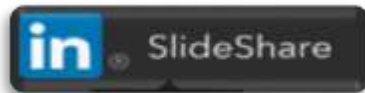


Importance of Feed-Back in Design Process

- ▶ Prevent a meandering design from veering too far from timeline, budget, scope, or other project constraints,
- ▶ Allow others to help, teach, and guide when there are weaknesses or confusion,
- ▶ Familiarize colleagues, managers, and clients with the design process,
- ▶ Invest everyone in the project early on,
- ▶ Distribute responsibility for developing creative output,
- ▶ Help build team trust, and eliminate destructive ego

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Thank You!
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