BIJU PATNAIK INSTITUTE OF IT & MANAGEMENT STUDIES
BHUBANESWAR

OPERATIONS STRATEGY

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3rd Semester	18MBA303D	Operations Strategy	L-T-P 3-0-0	3 Credits	35 hrs

COURSE OBJECTIVES

- To make understand the students about what is operations strategy and how its applied in the field of operations management
- To offer operations strategy in terms of business process, capacity, technology and facilities domains
- To analyze the operations strategy in terms of quality and cost perspective
- To build the students to use operations strategy in the filed of purchasing/sourcing and supply chain management

Module – I : Operations strategy – Introduction, Innovation and operations discipline– Operations performance – Operations Strategy framework– Developing an operations strategy – Value chain dynamics and operations decisions – Manufacturing Architecture and operations strategy in sales, service, Operation strategy model for service and product, Operational Strategy formulation, operation strategy evaluation and control, operation strategy competitiveness.

Module – II : Systems & Processes and Capacity Strategy and Management – Vertical integration and outsourcing –Business processes –Process of operations strategy substitution for strategy – Process of operations strategy implementation – Service Strategy– Service development and organization strategy, Capacity Strategy and Management–How to make decisions on capacity and capacity expansion – Technology Strategy–Process technology decisions – Facilities strategy – facilities strategy and globalization

Module – III : Quality Strategy, Purchasing and Supply network strategy - Quality Strategy and Change / Action programs–Sources of quality – Measures of quality – Competing on cost versus availability, cost versus features and innovativeness –Competition in the housing industry: Improving cost, quality, Purchasing and Supply network strategy–Sourcing and supplier management, Logistics systems and the fulfillment of supply chain – Supplier power and overseas sourcing: Moving up the value chain in outsourcing – Environmental and Social sustainability strategy – Models for gaining advantage in a global environment; How to position within a value chain

Module-I

BASIC CONCEPT OFOPERATION STRATEGY

Defining Operations Strategy

In order to provide a definition of Operations Strategy the concept of operations management and business strategy are first discussed.

What is Operations Management?

- Operations Management is about the management of the processes that produce or deliver goods and services. Not every organization will have a functional department called 'operations', but they will all undertake operations activities because every organization produces goods and/or delivers services. The operations manager will have responsibility for managing resources involved in these processes

- The role of operations management is to manage the transformation of an organization's inputs into finished goods and services using processes. Processes are actually present in all of the areas (HRM, finance, marketing etc.) of the organization.

The two main types of **transforming resources** are:

- Facilities, such as building, equipment and process technology.

- Staff, all the people involved in the operations process. In services the customer may well be involved as a transforming resource.

The three main types of **transformed resource** are:

- Materials, these can be transformed either physically (e.g. manufacturing), by location (e.g. transportation), by ownership (e.g. retail) or by storage (e.g. warehousing),

- Information, this can be transformed by property (e.g. accountants), by possession (e.g. market research), by storage (e.g. libraries), or by location (e.g. telecommunications),

- Customers, they can be transformed either physically (hairdresser), by storage (e.g. hotels), by location (e.g. airlines), by physiological state (e.g. hospitals), or by psychological state (e.g. entertainment).

The Role of Services in Operations Management

The rise to prominence of the service sector in the economies of developed countries is due to an increase in what are termed consumer services and producer services.

- Consumer services are services aimed at the final consumers and these have risen in line with people's increasing disposable income in developed countries.

- Producer services are used in the production and delivery of goods and services and constitute firms providing services such as consultancy advice, legal advice, IT support, and transportation and maintenance facilities.

Services can be classified by their tangibility, while the way they are delivered can be classified by their simultaneity.

Tangibility

- This is the most commonly used distinction between goods and services. Goods are tangible; they are a physical thing you can touch. A service is intangible and can be seen as a process that is activated on demand. In reality however both goods and services have both tangible and intangible elements and can be placed on a continuum ranging from low to high intangibility

Simultaneity

- This relates to the characteristic that services are produced and consumed simultaneously. This means theservice provider and customer will interact during the service delivery process. The amount of interaction is termed the degree of customer contact.

- It should not be assumed that all employees in a service operation have to deal directly with a customer. This distinction in services is denoted by 'back office' tasks which add value to the inputs of the service operation and 'front office' tasks which deal with the customer both as an input and output of the operation.

What is Strategy?

Strategy can be defined as follows (Johnson et al., 2008)

- Strategy is the *direction* and *scope* of an organization over the *long term*: ideally, which matches its *resources* to its changing *environment* and in particular its *markets*, *customers* or *clients* so as to meet *stakeholder* expectations.'

Strategy can be seen to exist at 3 main levels of corporate, business and functional:

Corporate level Strategy

- At the highest or corporate level the strategy provides long-range guidance for the whole organization – What business should we be in?

Business Level Strategy

- Here the concern is with the products and services that should be offered in the market defined at the corporate level – How do we compete in this business?

Functional Level Strategy

- This is where the functions of the business (e.g. operations, marketing, and finance) make long-range plans which support the competitive advantage being pursued by the business strategy- How does the function contribute to the business strategy?

What is Operations Strategy?

- **Operations strategy is the total pattern of decisions which shape the long-term capabilities of any type of operation** and their contribution to overall strategy, through the reconciliation of market requirements with operations resources.

- From the previous definition operations strategy is concerned with the reconciliation of market requirements and operations resources. It does this by:

    - Satisfying market requirements (measured by competitive factors) by setting appropriate performance objectives for operations

    - Taking decisions on the deployment of operations resources which affect the performance objectives for operations

- Using a market-based approach to operations strategy an organization makes a decision regarding the markets and the customers within those markets that it intends to target.

- The organization's market position is one in which its performance enables it to attract customers to its products or services in a more successful manner than its competitors. Competitive factors are how a product/service wins orders **(for example price, quality and delivery speed).**

- A resource-based view of operations strategy works from the inside-out of the firm, rather than the outside-in perspective of the market-based approach.

Here there is an assessment of the operations decisions regarding:

- **Structural decisions** - physical arrangement and configuration of resources.

- **Infrastructural decisions** - activities that take place within the operation's structure.

- The nature and complexity of formal and informal processes and tangible and intangible resources is central to the resource-based view of strategy; that is externally unobservable (within firm) factors are at least as important as observable industry market (between firm) factors in determining competitive advantage.

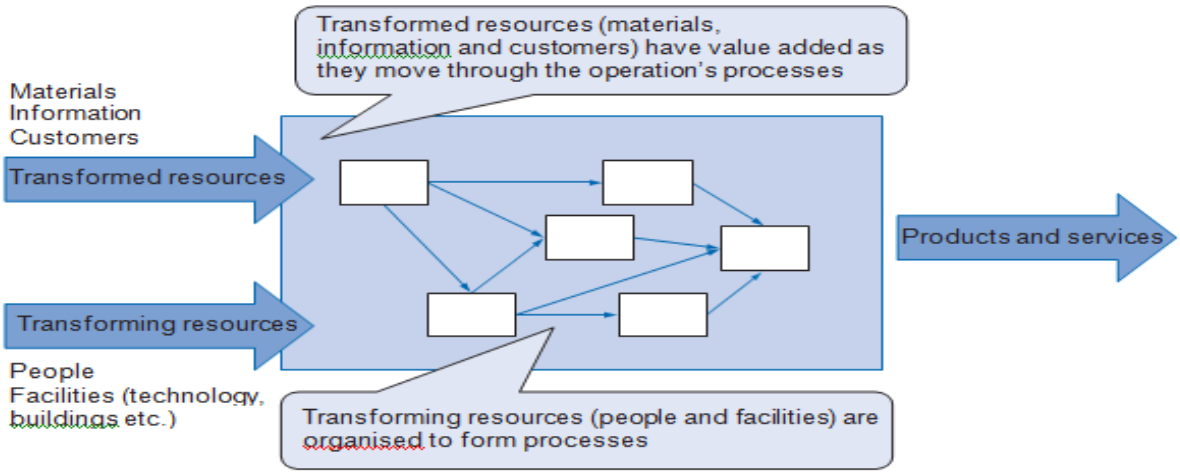
- It has been found that not all companies pursue strategy in accordance with a pure market-based approach and it has been found that competitiveness is not just a matter of simply improving performance along specific competitive dimensions in response to market needs, but incorporates the development of capabilities that provide specific operating advantages.

Thus the resource-based view of strategy is that operations take a more active role in providing long-term competitive advantage.

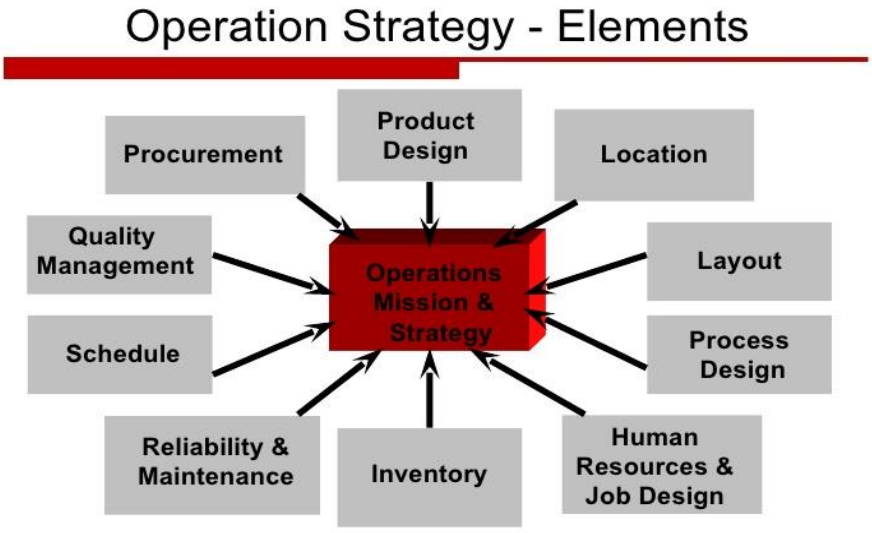
- What makes the **development of operation strategy** particularly challenging is that not only should the market-based and resource-based views of strategy need to be considered at a point in time, but the changing characteristics of markets and the need to develop operations capabilities over time means a dynamic as well as a static view of strategy is required.

OPERATION STRATEGY IN REAL WORLD

All operations transform input resources into products and services



ELEMENTS OF OPERATIONS STRATEGY-



4 PROSPECTIVES OF OPERATIONS STRATEGY

OPERATION RESOURCE	CAPABILITY GROWTH
TOP DOWN	STRATEGIC LEVEL WORK
BOTTOM UP	REAL OPERATION WORK GOES ON
MARKET REQUIREMENT	CUSTOMER DEMAND AND SATISFACTION

Four perspectives on operations strategy-top-down, bottom-up, market requirements and operations resources

INNOVATIONS IN OPERATION STRATEGY

Innovation and the S-curve-

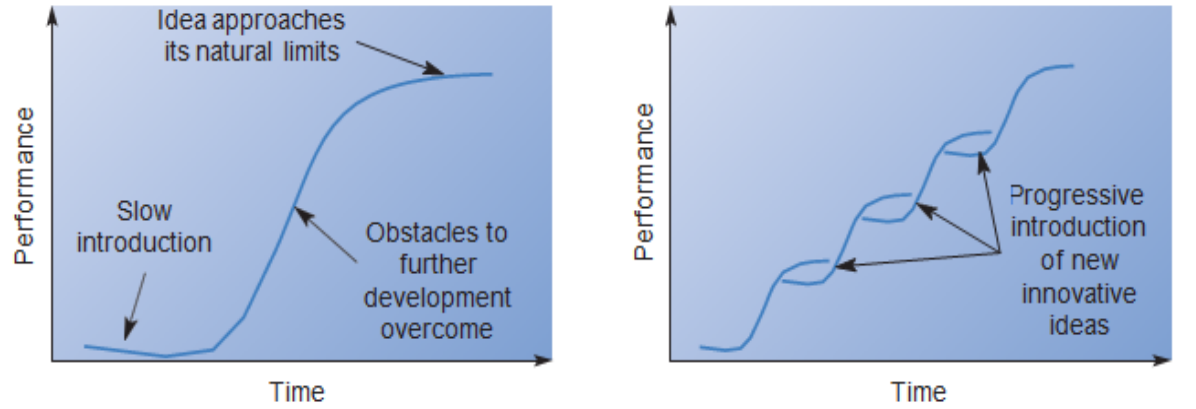
The word 'innovate' comes from the Latin 'innovāre', meaning 'to renew / alter' (OED, 2014).

The OED defines the verb 'to innovate' as:

1. To change (a thing) into something new; to alter; to renew.
2. To bring in (something new) the first time; to introduce as new.
3. To bring in or introduce novelties; to make changes in something established; to introduce innovations.

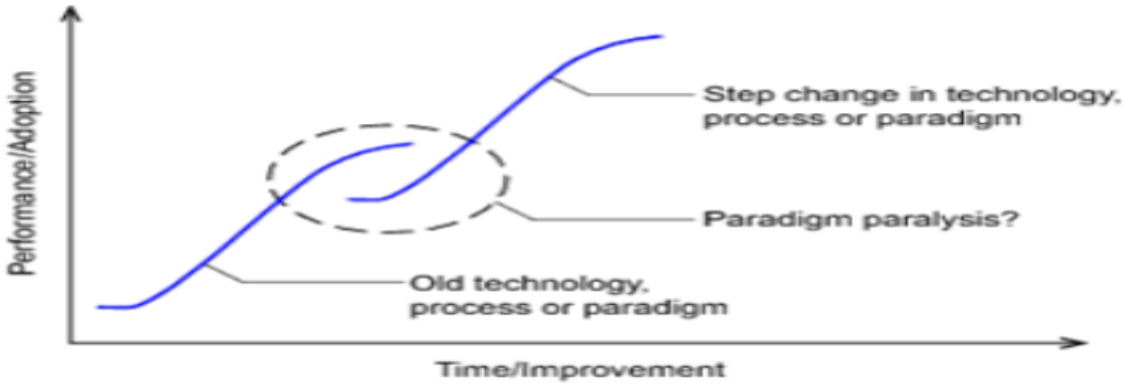
There are many theories of change, but one that is particularly relevant to innovation is centered on the S-curve. It is a way of depicting incremental, disruptive and radical innovation.

The s-shaped curve of innovation



(a) The basic S-shaped improvement in performance **(b)** Innovation following multiple S-shaped curves

DETAILED EXPLANATION-



In Figure, the vertical axis shows the performance of the item under consideration – this is sometimes equated to competitive advantage for business organisations. The horizontal axis shows effort – this could be time, resource investment or similar, which is associated with the innovation and its development. The S-curve shows the innovation from its slow early beginnings as the technology or process is developed, to an acceleration phase (a steeper line) as it matures and, finally, to its stabilisation over time (the flattening curve), with corresponding increases in performance of the item or organisation using it. Over time, the technology reaches its technological limit of usefulness or competitive advantage. At any point, there may be a step change in the technology – a radical innovation – resulting in a new S-curve.

Disruptive innovation can involve some elements from the old technology 'transferring' across – hence the S-curve overlaps.

In radical innovation, the 'gap' or discontinuity shown in Figure conveys the sense of a break from one technology to the other, newer, radical technology. Thus a radical technology fulfils the same need, but is based on a different knowledge and practice base.

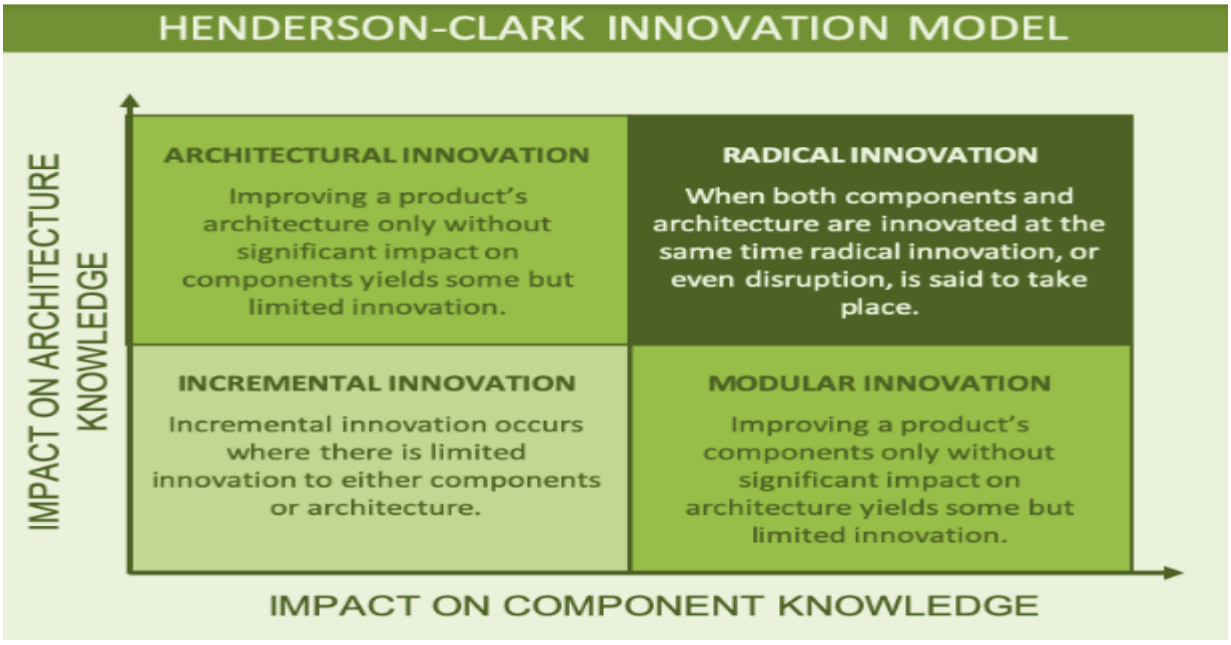
The S-curve can also be used to depict the diffusion of innovations in a culture over time.

The Henderson-Clark Innovation Model

The Henderson-Clark model of innovation focuses specifically on products and makes a distinction between components and architecture.

The core of point of the Henderson-Clark model is that there are these two different factors at play in relation to most of our products. The model says that while it's possible to innovate each of these areas independently (we can change the box we put stuff in and still put the same stuff in it, or we can keep the box the same and put new stuff in it), the most radical innovations come when we do both at the same time (create a new box, and put new stuff in it).

In some ways we can think of radical innovations here as "primary innovation", and the lesser levels of innovation as "incremental innovation".



The Henderson-Clark model can be thought of as a 2×2 matrix, with the vertical axis being scale of architectural innovation and the horizontal axis being scale of component innovation. When both levels of innovation are high, "radical innovation" occurs. When both are low, "incremental innovation" occurs. When only one level of innovation is high, you get either "architectural" or "modular" innovation.

Examples of Innovation In Practice

To help bring the Henderson-Clark Innovation Model to life, we're going look at some examples from the world of hard disks. Hard disks, and other data storage solutions, are a popular area of study for innovation because they evolve quickly and across many producers.

Incremental Hard Disk Innovation

Low level architectural innovation to a hard disc could see changes to the box that reduce friction and lead to an increase in the rotation spin of the drive. Similarly, low level component innovation could see marginal physical or material changes that lead to an increase in the magnetic disk's capacity.

The combined effect of these changes would be a hard disk that spins slightly faster an which holds slightly more data.

Component Hard Disk Innovation

An example of innovating in the component space without innovating architecture is upgrading the read/write heads in a hard drive. By introducing a wholly new component like this, perhaps made of new materials or to an entirely new design, it's possible to materially improve the overall product, without changing its architecture.

Architectural Hard Disk Innovation

An example of innovating in the architecture space is the progressive shrinking in hard disc dimensions. From the initial huge external hard drives the size of rooms, we've seen continued architectural innovation leading to the hard drives of today. In some instances this progression has seen a change the design of the discs in such a way that they are more compact and dense, in other instances, it's seen changes to the fundamental states of hard drives and the introduction of solid state drives.

Radical Hard Disk Innovation

An example of a radical innovation involving changes to both opponents and architecture is the transition from magnetic to optical technology in disk drives. Introducing laser readers required both new components and new architecture, but led to material improvements in the speed at which drives could read and write data, the volume of data that they could store and simultaneously shrank their size.

OPERATIONS PERFORMANCE-

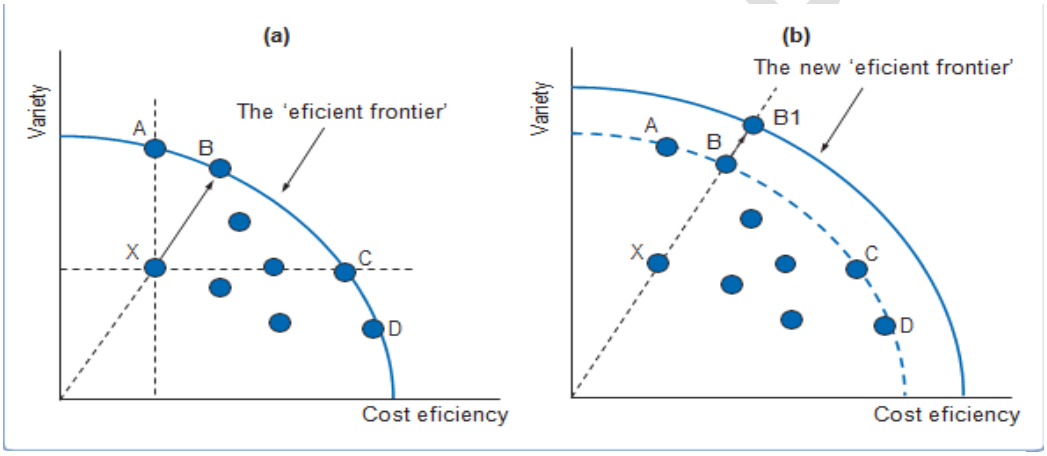
How do operations performance objectives trade off against each other?

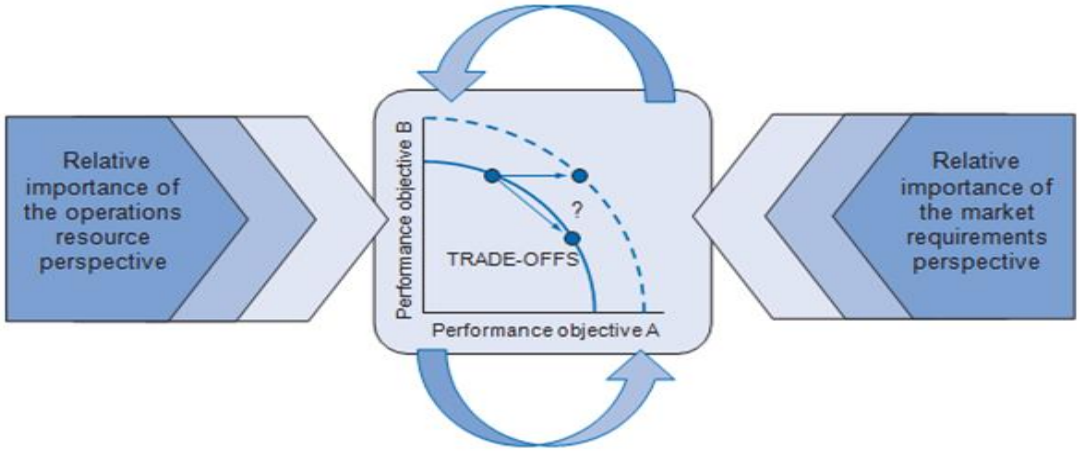
- **Trade-offs** is the extent to which improvements in one performance objective can be achieved by sacrificing performance in others.

- The "**efficient frontier**" concept is a useful approach to articulating trade-offs and distinguishing between repositioning performance on the efficient frontier and improving performance by overcoming trade-offs.

- **Trade-offs are the extent to which improvements in one performance objective** can be achieved by sacrificing performance in others

The efficient frontier



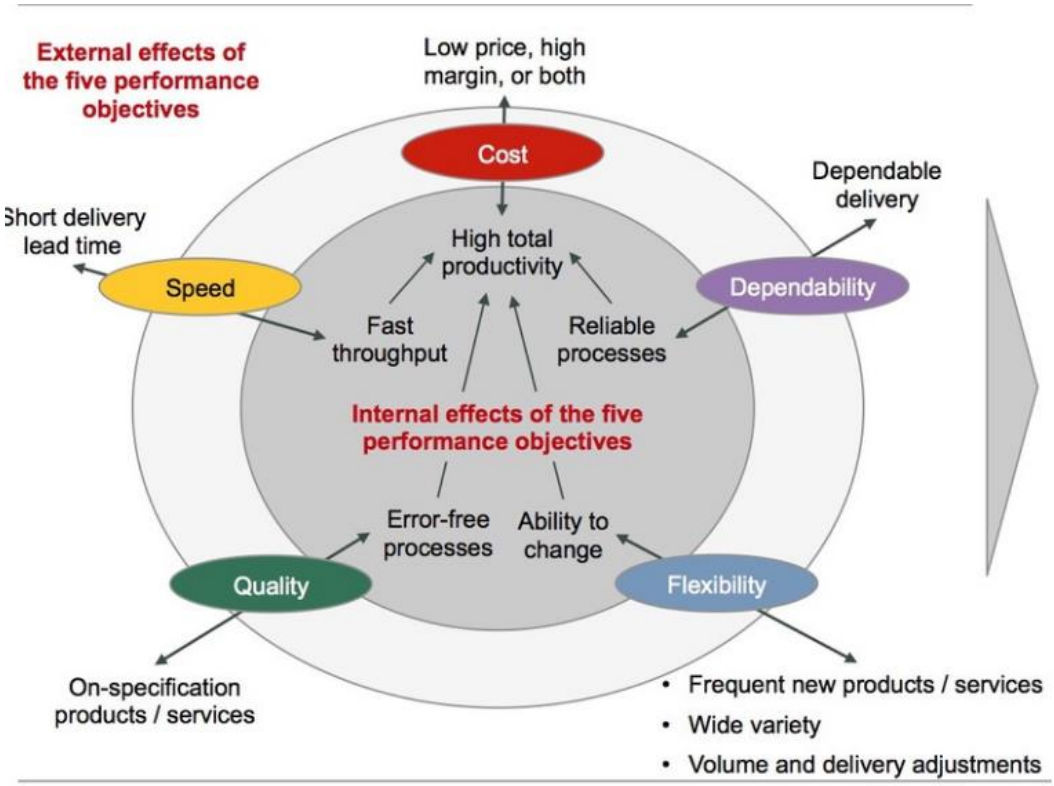


OPERATIONS PERFORMANCE JUDGEMENT

Operation performance depends on-

- costs(Appraisal cost, failure cost, internal cost, external cost)
- Operations depends on revenue (return-initial cost)
- Operations is directly proportional to the required level of investment
- Operations is inversely proportional to the risk of operational failure and Operations depends on the capabilities on which future innovation is based

5 OPERATIONS PERFORMANCE OBJECTIVES-



- **Operations Performance Objectives**
- five basic performance objectives that apply to all types of operations are to be analysed**.**
- **Performance Objectives**
- The five basic performance objectives are**:**
- Quality
- Speed
- Dependability
- Flexibility
- Cost

Internal & External Influences of Performance Objectives

Performance objectives have both *internal* and *external* influences. Internally, cost is influenced by the other performance objectives.

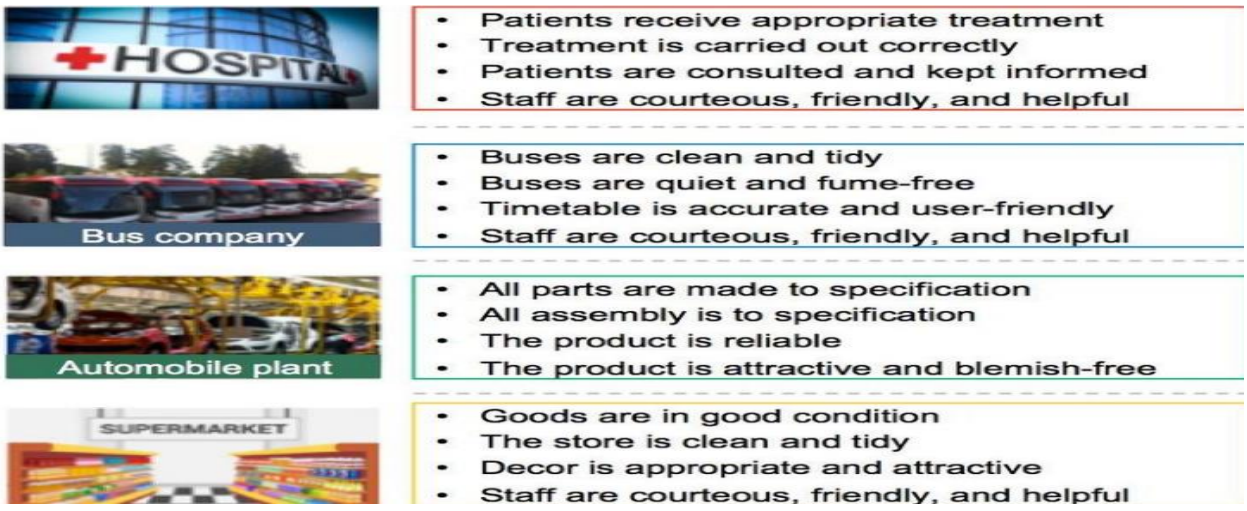
- Running an organization's operations requires a well-defined set of performance objectives.
- There are five basic performance objectives that apply to all types of operations. They are: ***cost, dependability, flexibility, quality, and speed.***
- These five objectives have internal and external implications, which are usually matched. Each of the various performance objectives has several internal effects, but all of them affect cost.

1*) Quality*

Quality refers to consistent conformance to the customers' expectations and has a major influence on their satisfaction or dissatisfaction.

The meaning of quality varies across businesses, as we can see from the four examples below (a hospital, a bus company, an automobile plant, and a supermarket).

Quality exerts a major influence on ***customer satisfaction*** and, in some ways; it is the most visible part of what an organization does.



2) Speed

Speed means the elapsed time between customers requesting products or services and their receipt of them.

The main benefit to the operation's (external) customers of speedy delivery of goods / services is that the faster they can get the product or service, the more likely they are to buy it, the more they will pay for it, or the greater the benefit they receive.

Within the operation, speed is also important. Fast response to external customers is greatly helped by speedy decision-making and speedy movement of materials and information inside the operation.

- The time between requiring and receiving treatment is kept to a minimum
- The time for test results is kept to a minimum

- The time between a customer setting out on the journey and reaching his or her destination is kept to a minimum

- The time between dealers requesting a vehicle of a particular specification and receiving it is minimum
- Time to deliver spare to service is minimum

- The time taken for the total transaction of going to the supermarket, making the purchases and returning is minimum
- Immediate availability of goods

3) ***Dependability***

Dependability means doing things on time for customers – exactly when they are needed or at least when they were promised.
Customers might only judge the dependability of an operation after the product or service has been delivered.
Over time, dependability can override all other criteria. No matter how cheap or fast a bus service is, if it is constantly late (or unpredictably early) or the buses are always full, then potential passengers will be better off calling a taxi.

Operations where internal dependability is high are more effective than those which are not, because dependability saves time, money, and gives stability to the operations.

- Proportion of cancelled appointments is minimum
- Keeping to appointment times
- Test results are returned as promised

- Keeping to the published timetable at all points on the route
- Constant availability of seats for passengers

- On-time delivery of vehicle to dealers
- On-time delivery of spares to service centers

- Predictability of opening hours
- Minimum proportion of out-of-stock goods
- Keeping to reasonable queuing times
- Constant availability of parking

4) **Flexibility**

Flexibility means being able to change what operations does, how it is doing it, or when it is doing it. *Customers usually demand four types of operations flexibility:*

– ***Product / service flexibility***: introduce new or customized products and services
– ***Mix flexibility***: a wide range or mix of products and services
– ***Volume flexibility***: ability to change the output level to produce different quantities of products and services over time
– ***Delivery flexibility***: ability to change the timing of delivery

- Introduction of new types of treatment
- Wide range of available treatments
- Ability to adjust the number of patients
- Ability to reschedule appointments

- Introduction of new routes
- Large number of locations served
- Ability to adjust the frequency of services
- Ability to reschedule trips

- Introduction of new models
- Wide range of options available
- Ability to adjust the number of vehicles
- Ability to reschedule manufacturing priorities

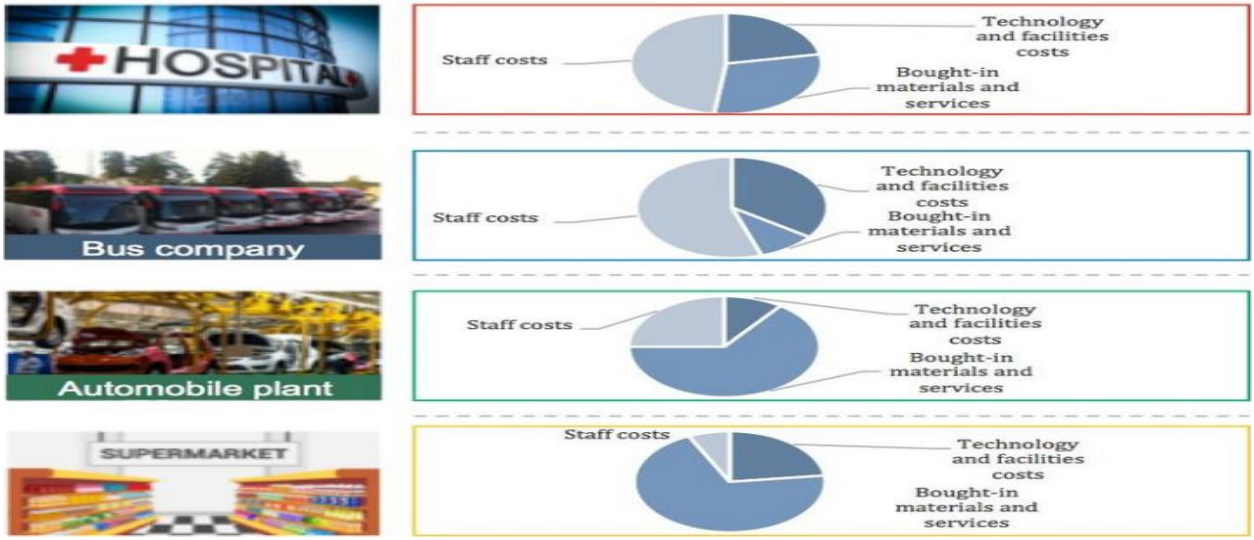
- Introduction of new goods or promotions
- Wide range of goods stocked
- Ability to adjust the number of customers
- Ability to obtain out-of-stock items

5) ***Cost***

The lower the cost of producing their goods and services, the lower can be the price to their customers.

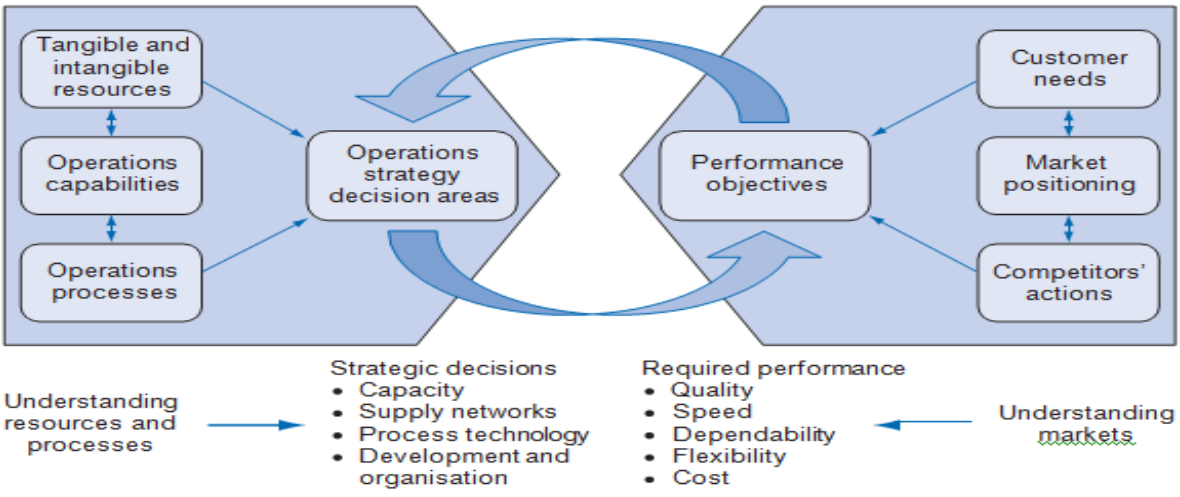
Even those companies which do not compete on price will be interested in keeping costs low. Every euro or dollar removed from an operation's cost base is a further euro or dollar added to its profits.

- The ways in which operations management can influence cost will depend largely on where the operation costs are incurred.



OPERATION STRATEGY FRAMEWORK

Operations strategy is the strategic reconciliation of market requirements with operations resources



STRATEGIC DECISIONS IN OPERATIONS-

CAPACITY-

For an organization, **capacity** would be the ability of a given system to produce output within the specific time period. In **operations**, **management capacity** is referred as an amount of the input resources available to produce relative output over period of time.

In general, terms capacity is referred as maximum production capacity, which can be attained within a normal working schedule.

Capacity planning is essential to be determining optimum utilization of resource and plays an important role decision-making process, for example, extension of existing operations, modification to product lines, starting new products, etc.

STRATEGIC CAPACITY PLANNING

A technique used to identify and measure overall capacity of production is referred to as strategic capacity planning. Strategic capacity planning is utilized for capital intensive resource like plant, machinery, labor, etc.

Strategic capacity planning is essential as it helps the organization in meeting the future requirements of the organization. Planning ensures that operating cost are maintained at a minimum possible level without affecting the quality. It ensures the organization remain competitive and can achieve the long-term growth plan.

SUPPLY NETWORK-

A supply network is a pattern of temporal and spatial processes carried out at facility nodes and over distribution links, which adds value for customers through the manufacturing and delivery of products. It comprises the general state of business affairs in which all kinds of material (work-in-process material as well as finished products) are transformed and moved between various value-added points to maximize the value added for customers.

A supply chain is a special instance of a supply network in which raw materials, intermediate materials and finished goods are procured exclusively as products through a chain of processes that supply one another.

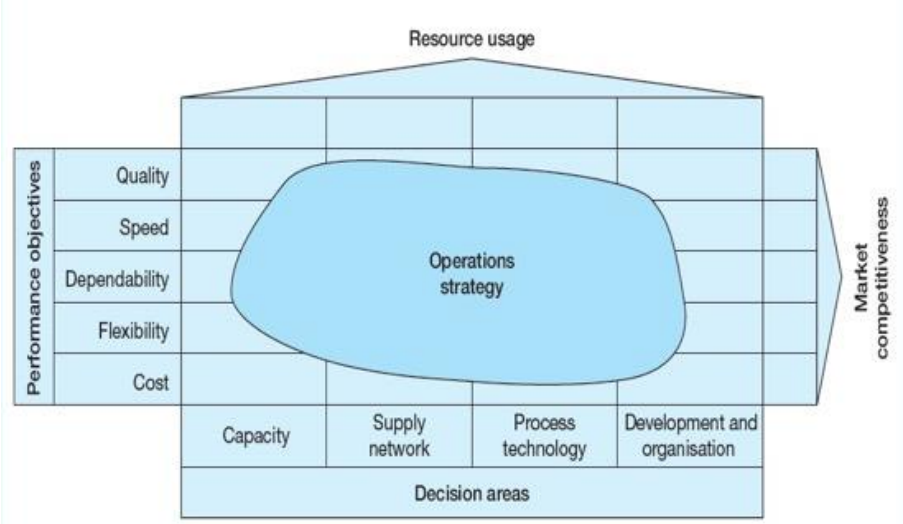
PROCESS TECHNOLOGY-

Process Technology is the sum of techniques, skills, methods, and processes used in the production of goods or services or in the accomplishment of objectives, such as scientific investigation. Technology can be the knowledge of techniques, processes, and the like, or it can be embedded in machines to allow for operation without detailed knowledge of their workings. Systems (e.g. machines) applying technology by taking an input, changing it according to the system's use, and then producing an outcome are referred to as technology systems or technological systems.

DEVELOPMENT AND ORGANIZATION-

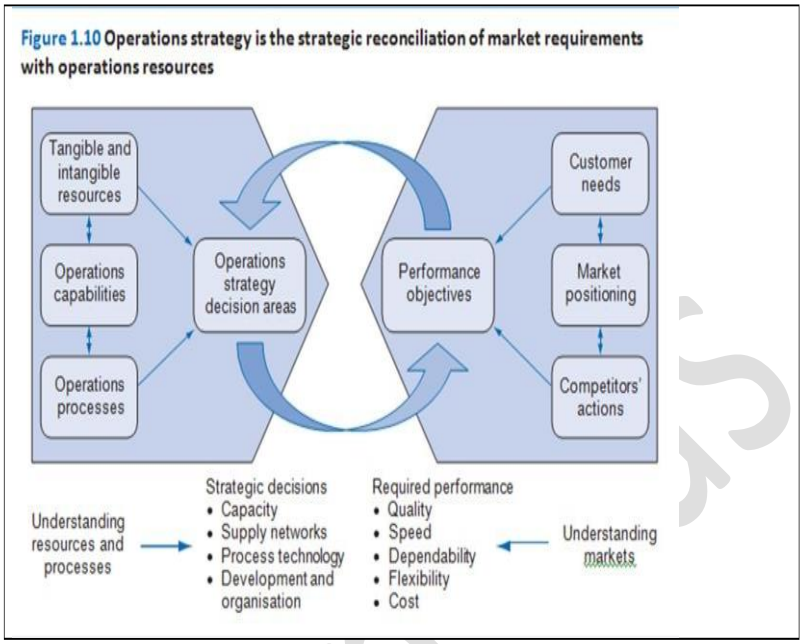
It is the administration of business practices to create the highest level of efficiency possible within an organization. It is concerned with converting materials and labor into goods and services as efficiently as possible to maximize the profit of an organization. Operations management teams attempt to balance costs with revenue to achieve the highest net operating profit possible.

The operations strategy matrix



(Market reconciliation with operations process)

EXAMPLES OF DECISION AREAS THROUGH CORPORATES- (BOTH SERVICE AND MANUFACTURE SECTORS)



Operations

EXAMPLE OF STEEL PLANT(MANUFACTURE SECTOR)

DECISION AREAS	
CAPACITY	ACCUMULATION OF STOCK KEEPING UNIT IN STEEL(INVENTORY)
SUPPLY NETWORK	ELECTRICITY DEPARTMENT, WATERRESOURCE GROUP (SUPPLY ASPECT) ETC
PROCESS TECHNOLOGY	LEAN OPERATION, JUST-IN-PRINCIPLE, MIS CONTROLLING
ORGANIZATION DEVELOPMENT	COST EFFECTIVENESS, HOLISTIC AND SUCESSFUL OPERATION ACTIVITIES

RECOUNCILATION OF MARKET WITH OPERATIONS-

EXAMPLE OF DECISION AREA OF KFC

CAPACITY	OCCUPIED AREA STORAGE HOUSE CAPACITY ALLOCATING LOCATION AND FOCUS ON EXPANSION
SUPPLY NETWORK	SUPPLY NETWORKING BY SUPPLY GROUPS (MATERIAL SUPPLY)
PROCESS TECHNOLOGY	MIS OPERATION AND UPGRADATION, LEAN PROCESS FOR LESS WASTAGE OF FOOD(JUST-IN-TIME WORK)
DEVELOPMENT OF ORGANIZATION	OVERALL MAINTENANCE WITH COST EFFECTIVENESS, NEW PRODUCT SEARCHING

In recouncilaion market analysis is directly proportional to operations.Here performance objective is related to market assesment and operation decision areas are purely related to operations.

COMBINED PARTS OF OPERATION DECISION AREAS-

TANGIBLE AND INTANGIBLE RESOURCES-

Tangible resources are physical items including cash, inventory, machinery, land or buildings. These items can be easily liquidated and have a set value. They are critical in accounting as they help a company understand its financial standing when entered on balance sheets and financial statements.

An **intangible** resource is a resource that is not physical in nature. Goodwill, brand recognition and intellectual property, such as patents, trademarks, and copyrights, are all **intangible assets**.

OPERATIONAL CAPABILITIES-

Operational capability is the ability to align critical processes, resources and technologies according to the overall guiding vision and customer focused value propositions coupled with the ability to deliver these processes effectively and efficiently.

OPERATION PROCESSES-

Operational process is an organized set of activities or tasks that produces a specific service or product.

COMBINED PARTS OF PERFORMANCE OBJECTIVES(MARKETING)

Customer need- A **need** is a desire that causes a **customer** to buy a product. If **customers** buy products to satisfy **needs**, then **needs** provoke **customers** to buy products.

Market positioning-Positioning refers to the place that a brand occupies in the minds of the customers and how it is distinguished from the products of the competitors.

In order to position products or brands, companies may emphasize the distinguishing features of their brand

Competitors action-Action taken by competitors to make sure that product / service will sustain in the market in a very long term. In this particular case competitors may **add some new additive features(Innovation)** in product/service for attracting more and more customer.

(Diagram of Reconciliation of operations process with market)

OUT COMES OF RECOUNCILATION-

1. Ease of taking product and service decision that which type of product or service has to be formed
2. Ease of finding correlation between the product we formed and product that is demanded in market by customer.
3. Ease of value chain analysis from **inbound logistics(raw material) to outbound logistics(market floatation of product/services)**
4. Product and service innovation models can be adopted as the choices and preferences of the customer are changing constantly.
5. Linear and directly proportional model **between resource utilization with market scenario** can be formed directly.

DEVELOPING OPERATIONS STRATEGY-

A market requirements perspective on product and service development depend on-

- **Quality** of product and service development
- **Speed** of product and service development
- **Dependability** of product and service development
- **Flexibility** of product and service development
- **Cost** aspect of product and service development

Once a business strategy has been developed, an operations strategy must be developed. This will provide a plan for the design and management of the operations function in ways that support the business strategy.

The operations strategy relates the business strategy to the operations function.

The operations strategy focuses on specific capabilities of the operation that give the company a competitive edge.

These capabilities are called **competitive priorities**. By excelling in one of these capabilities, a company can become a winner in its market.

STEPS TO DEVELOP OPERATIONS STRATEGY-

Strategic procurement process development

For any operations, (manufacturing or service) raw material procurement is the 1st priority. So procurement and sourcing are the two most crucial part of development of operations strategy.

So we follow-

- Conduct an internal needs analysis.
- Conduct an assessment of the supplier's market
- Collect supplier information
- Develop a **sourcing**/outsourcing strategy
- Implement the **sourcing** strategy.
- Negotiate with suppliers and select the winning bid.
- Implement a transition plan or contractual supply chain improvements

Inventory Planning and management development

- **Inventory planning** includes creating forecasts to determine how much **inventory** should be on hand to meet consumer demand.
- **Inventory control** is the process by which **managers** count and maintain **inventory** items in the business.

Development of Manufacturing and production operation-

- **Production** turns inputs, such as natural resources, raw materials, human resources, and capital, into outputs, which are products and services.
- The goal of customer satisfaction is an important part of effective **production and operations**.

Development of Logistics outsourcing-

Logistics Outsourcing can be defined as the strategic use of outside parties (business independency) to perform activities traditionally handled by internal staff and resources.

Advantages of Outsourcing Logistics

- Single point of contact
- Material flows optimization
- Substantial logistics costs savings
- Gain in productivity
- Ease of Global sourcing strategy

Development of sales and operations planning of product-

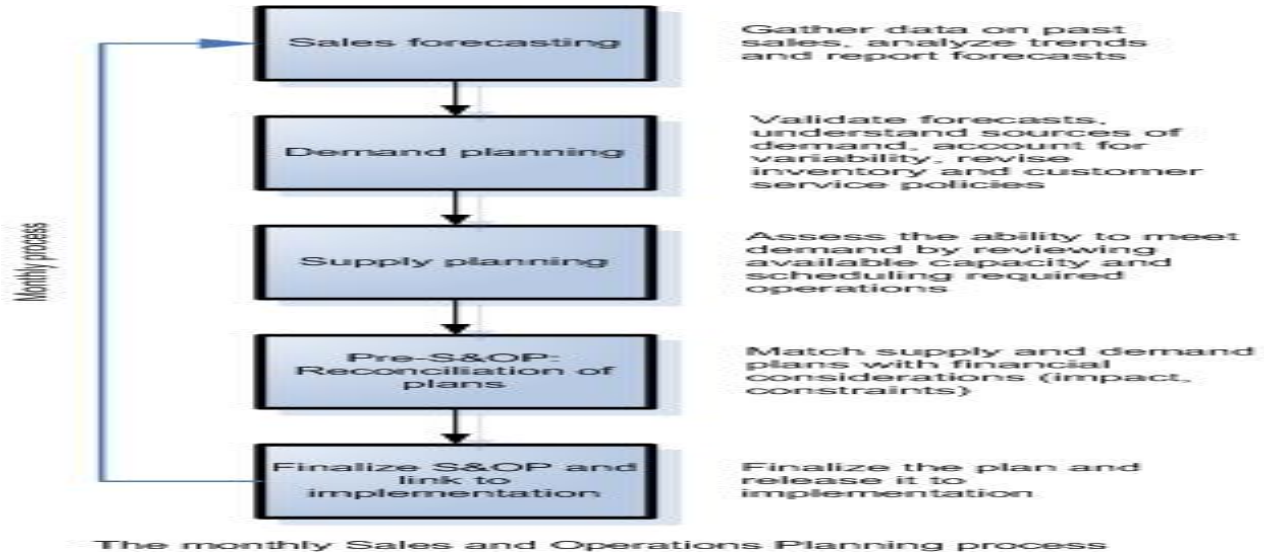
- Sales and operations planning (S&OP) is an integrated business management process through which the executive/leadership team continually achieves focus, alignment and synchronization among all functions of the organization.

- The S&OP process includes an updated forecast that leads to a sales plan, production plan, inventory plan, customer lead time (backlog) plan, new product development plan, strategic initiative plan and resulting financial plan.

The planning process

- S&OP is the result of monthly planning activities. It is usually based on an **Annual Operations Plan (AOP) that acts as the company's annual target in terms of sales and supply**. Therefore, the sales and operations plans are a means to gradually accomplish the AOP targets – by linking monthly sales and marketing planning directly to the operations side of a business.

The process for deciding upon the monthly S&OP is illustrated in the figure below.



The monthly Sales and Operations Planning process

(SALES AND OPERATIONS PLANNING DIAGRAM)

Development of supply chain and implementation system-

Supply chain is a system of organizations, people, activities, information, and resources involved in supplying a product or service to a consumer. Supply chain activities involve the transformation of natural resources, raw materials, and components into a finished product that is delivered to the end customer.

Example- Criteria selection and development of Supply chain in Odisha for regular supply of milk by OMFED

Development of Supply network design-

The primary purpose of a supply chain network design is to assess company policies and programs and to meet targets to accomplish long-term strategic objectives, and most business units or functional areas within a company are impacted by a network design project.

When designing a supply network the following steps must be followed:

- Define the business objectives(supply nodes),
- The project scope must be defined,
- The form of analyses to be done must be determined,
- Determine what tools will be used,
- Finally, the best design.

Development of Material handling equipment design-

- **Material handling equipment** (**MHE**) is mechanical equipment used for the movement, storage, control and protection of materials, goods and products throughout the process of manufacturing, distribution, consumption and disposal.
- The different types of handling equipment can be classified into four major categories. Transport equipment, positioning equipment, unit load formation equipment, and storage equipment.

Transport equipment

- Transport equipment is used to move material from one location to another (e.g., between workplaces, between a loading dock and a storage area, etc.), while positioning equipment is used to manipulate material at a single location.

Positioning equipment

- Positioning equipment is used to **handle material at a single location.(single position)**
- It can be used at a workplace to feed, orient, load/unload, or otherwise manipulate materials so that are in the correct position for subsequent handling, machining, transport, or storage.
- As compared to manual handling, the use of positioning equipment can raise the productivity of each worker when the frequency of handling is high, improve product quality and limit damage to materials

Unit load formation equipment

- Unit load formation equipment is used **to restrict materials so that they maintain their integrity when handled a single load** during transport and for storage.
- If materials are self-restraining (e.g., a single part or interlocking parts), then they can be formed into a unit load with no equipment. Examples of unit load formation equipment include pallets, skids, slipsheets, tote pans, bins/baskets, cartons, bags, and crates.

Storage equipment

- Storage equipment is used **for holding or buffering materials** over a period of time.
- The design of each type of storage equipment, along with its use in warehouse design, represents minimizing handling costs, by making material easily accessible, and maximizing the utilization of space (or cube).

Integrated material handling system development

- Integrated material handling systems connect equipment and software to support receiving, processing, and storage, picking and shipping activities throughout a facility.
- A properly designed integrated material system can help a company improve customer service, reduce inventory, shorten delivery time, and lower overall handling costs in manufacturing, distribution and transportation.

Material handling life cycle support system development-

It also referred to as the application development life-cycle, is a process for planning, creating, testing, and deploying an **information system.** The systems development life cycle concept applies to a range of hardware and software configurations, as a system can be composed of hardware only, software only, or a combination of both. There are usually six stages in this cycle:

- requirement analysis,
- design,
- development
- testing,
- implementation,
- Documentation and evaluation.

Supply chain Technology Strategy development-

Implementation of technology in supply chain will smoothen the supply chain and make it faster.

Some implemented and developed strategies are-

- Artificial Intelligence
- Block chain
- Big data
- GPS controlling system

Transportation Management system development-(TMS)

A transportation management system (TMS) is a subset of supply chain management concerning transportation operations and may be part of a planning system.

Transportation management systems manage four key processes of transportation management:

1. **Planning and decision making** –

   TMS defines the most efficient transport schemes according to given parameters, which have a lower or higher importance according to the user policy: **transport cost, shorter lead-time etc**.

2. **Transportation Execution** –

   TMS will allow for the execution of the transportation plan such as carrier rate acceptance, carrier dispatching, and **EDI. (Electronic data Interchange)**

3. **Transport follow-up** –

   TMS will allow following any physical or administrative operation regarding transportation: traceability of transport event by event (shipping from A, arrival at B, customs clearance, etc.), **editing of reception, custom clearance, invoicing and booking documents, sending of transport alerts (delay, accident, non-forecast stops.)**

4. **Measurement** –

   TMS need to have a logistics key performance indicator (KPI) reporting function for transport.

Overall strategic Planning for Operation strategy development-(corporate decisions)

Corporate planning is creating a strategy for meeting business goals and improving your business. A corporate plan is a roadmap that lays out business's plan of action.

Operational planning (OP) is the process of planning strategic goals and objectives to technical goals and objectives. It describes milestones, conditions for success and explains how, or what portion of, a strategic plan.

Operational plan by corporate addresses four questions:

- Where are we now?
- Where do we want to be?
- How do we get there?
- How do we measure our progress?

INTEGRATED OPERATION PLANNING BY CORPORATE DECISION-

a) Enterprise Model

- Ability to create a demand chain model
- Ability to create a supply chain model
- Ability to create a finance chain model

b) Integrated Planning

- Ability to create a plan across multiple functions
- Ability to create predictive and collaborative plans

c) Enterprise Optimization

- Ability to create optimized plans across multiple constraints
- Ability to create financial integration across optimization

OPERATIONS FORCASTING BY CORPORATES-

The methods we adopt in corporate strategy for smooth flow of product/services in processing and create a demand in market.

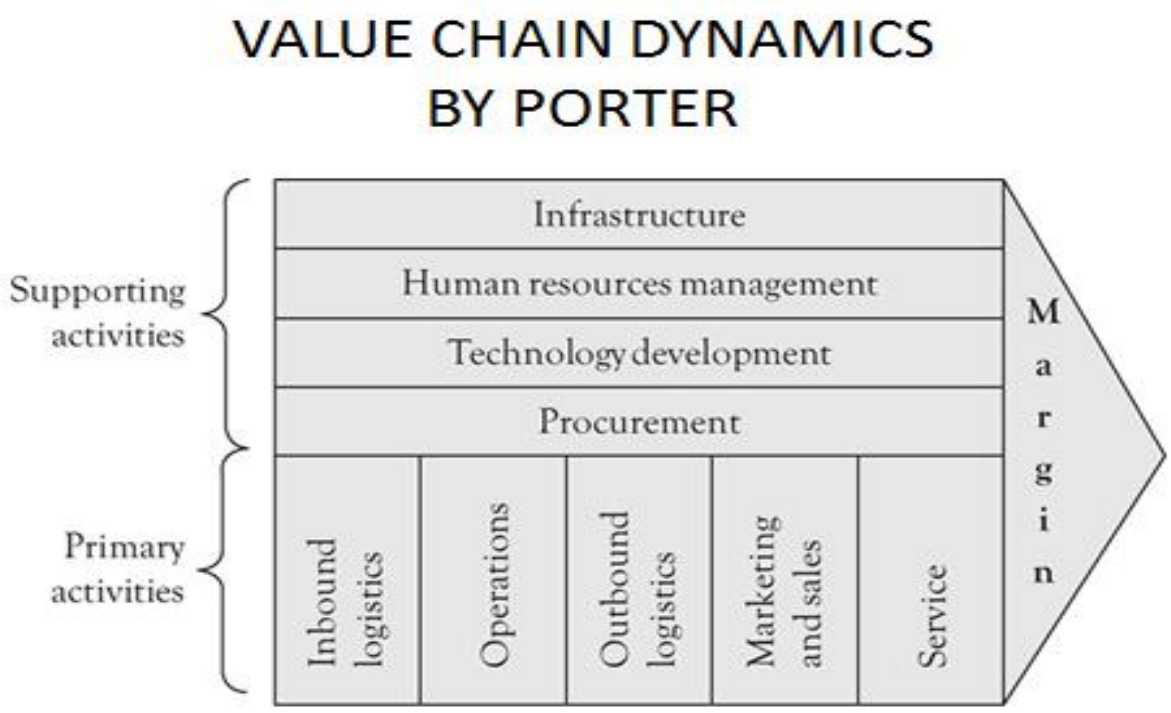
- **Delphi method**-is a structured communication technique or method, originally developed as a systematic, interactive forecasting method which relies on a panel of experts.

- **Scenario analysis-Scenario analysis** is a process of analyzing future events by considering alternative possible outcomes

- **Statistical surveys analysis**-A field of applied statistics, survey methodology studies the sampling of individual units from a population and associated techniques of survey data collection, such as questionnaire construction and methods for improving the number and accuracy of responses to surveys. Example- Market response analysis for a particular product and service

VALUE CHAIN DYNAMICS IN OPERATIONS-

A value chain is a set of activities that a firm operating in a specific industry performs in order to deliver a valuable product (i.e., good and/or service) for the market.



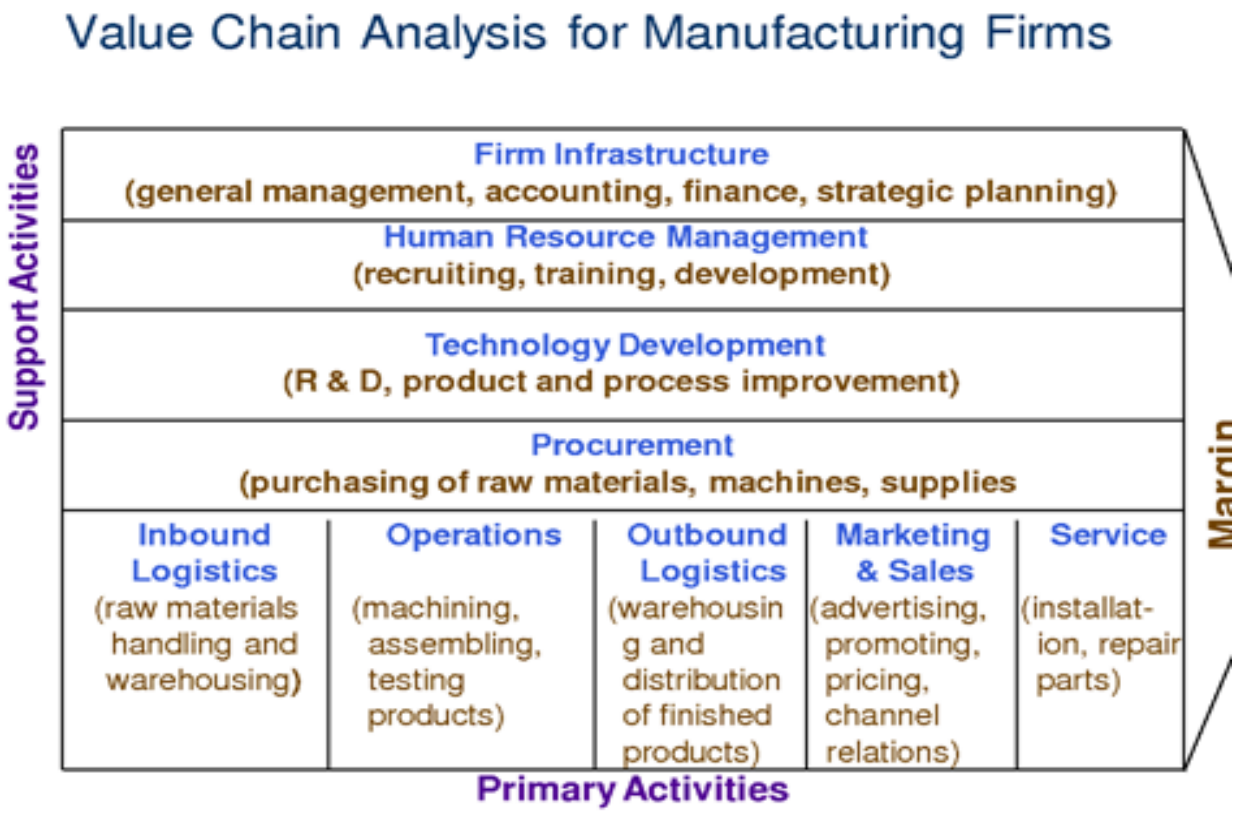
The primary activities are:

1. **Inbound Logistics** - involve relationships with suppliers and include all the activities required to receive, store, and disseminate inputs.
2. **Operations** - are all the activities required to transform inputs into outputs (products and services).
3. **Outbound Logistics** - include all the activities required to collect, store, and distribute the output.
4. **Marketing and Sales** - activities inform buyers about products and services, induce buyers to purchase them, and facilitate their purchase.
5. **Service** - includes all the activities required to keep the product or service working effectively for the buyer after it is sold and delivered.

Secondary activities are:

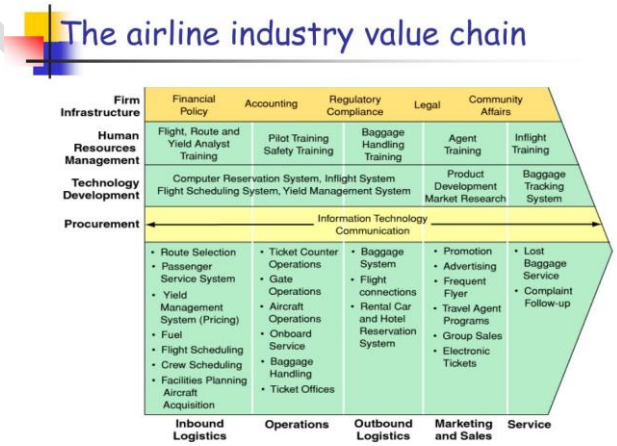
1. **Procurement** - is the acquisition of inputs, or resources, for the firm.
2. **Human Resource management** - consists of all activities involved in recruiting, hiring, training, developing, compensating and (if necessary) dismissing or laying off personnel.

3. **Technological Development** - pertains to the equipment, hardware, software, procedures and technical knowledge brought to bear in the firm's transformation of inputs into outputs.
4. **Infrastructure -** serves the company's needs and ties its various parts together, it consists of functions or departments such as accounting, legal, finance, planning, public affairs, government relations, quality assurance and general management.



(EXAMPLE OF VALUE CHAIN INMANUFACTURING FIRM)

(VALUE CHAIN IN SERVICE SECTOR (AIRLINE INDUSTRY)



MANUFACTURING ARCHITECHTURE AND OPERATIONS STRATEGY IN SALES AND SERVICES (study of Software framework for service)

Service Based Architecture for Manufacturing Sector

For service based architecture for manufacturing industry in sales prospective we require to discuss the enterprise architecture framework (EA) which shows sales with respect to customer prospective and detailed design of service framework**.**

An **enterprise architecture framework** (**EA framework**) defines how to create and use an enterprise architecture.

An architecture framework provides principles and practices for creating and using the architecture description of a system. It structures architects' thinking by dividing the architecture description into domains, layers, or views, and offers models - typically matrices and diagrams - for documenting each view.

EA framework

Enterprises architecture

It is divided into four architecture domains.

- **Business architecture-business architecture** is a discipline that "represents holistic, multidimensional business views of: capabilities, end-to-end value delivery, information, and organizational structure; and the relationships among these business views and strategies, products, policies, initiatives, and stakeholders.
- **Data architecture- data architecture** is composed of models, policies, rules or standards that govern which data is collected, and how it is stored, arranged, integrated, and put to use in data systems and in organizations
- **Applications architecture**-applications architecture describes the behavior of applications used in a business, focused on how they interact with each other and with users. It is focused on the data consumed and produced by applications rather than their internal structure
- **Technology architecture**.-An application of technological software in enterprise business.

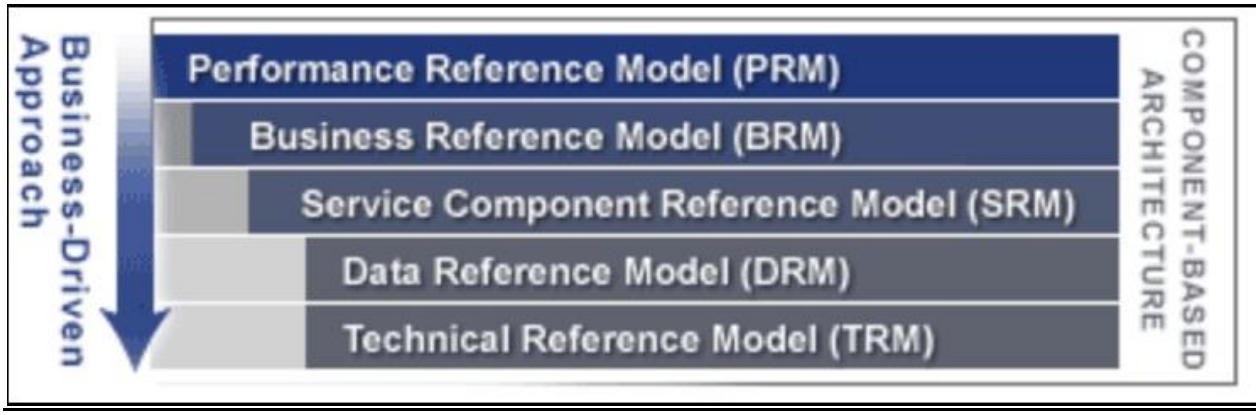
Layers of the enterprise architecture

Architecture domains have divided into layers, with the idea that each layer contains components that execute processes and offer services.

The view of architecture domains as layers can be presented as:

- **Environment** (the external entities and activities monitored, supported or directed by the business).

- **Business Layer** (business functions offering services to each other and to external entities).
- **Data Layer** (Business information and other valuable stored data)
- **Information System Layer** (business applications offering information services to each other and to business functions)
- **Technology Layer** (generic hardware, network and platform applications offering platform services to each other and to business applications).

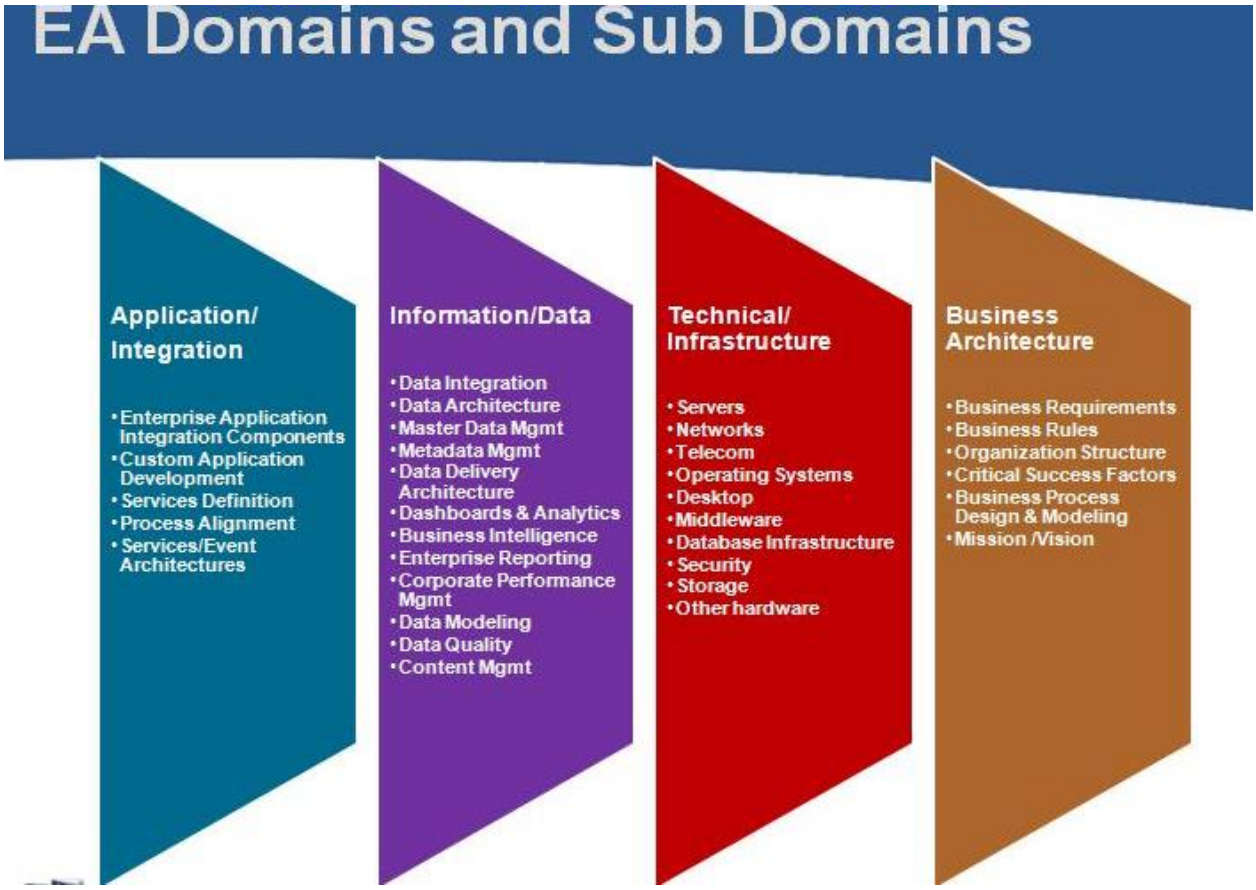


In each layer, the components, the processes and the services can be defined at a coarse-grained level and decomposed into finer-grained components, processes and services.

Components of enterprise architecture framework

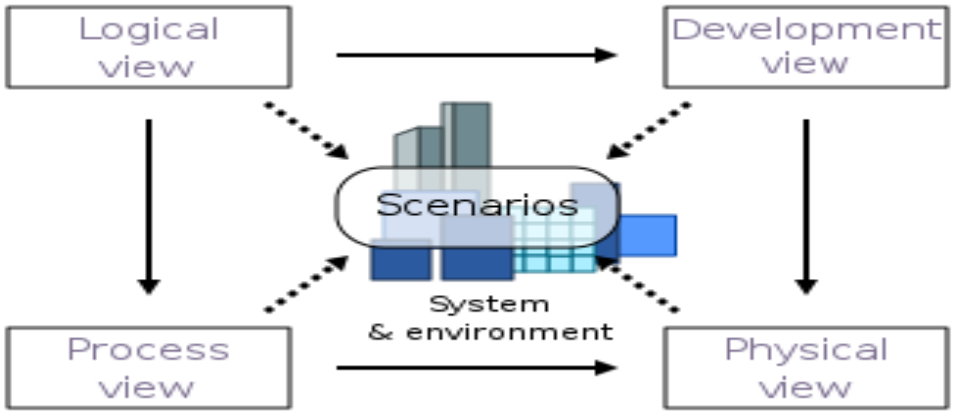
Enterprise architecture domains and subdomains

- The application and technology domains are characterized by **domain capabilities and domain services**.
- The capabilities are supported by the services.
- The application services are also referred to in **service-oriented architecture (SOA)**. The technical services are typically supported by **software products.**
- The data view starts with the data classes which can be decomposed into data subjects which can be further decomposed into **data entities.**
- The Enterprise Architecture Reference Traditional Model offers a clear distinction between the architecturedomains**(business,information/data,application/integration and technical/infrastructure).**



View model

A view model is a framework that defines the set of views or approaches used in systems analysis, systems design, or the construction of an enterprise architecture.



(VIEW MODEL)

Standardization-

The standard defines an architecture framework as conventions, principles and practices for the description of architectures established within a specific domain of application and/or community of stakeholders, and proposes an architecture framework is specified by:

1. the relevant stakeholders in the domain,
2. the types of concerns arising in that domain,
3. architecture viewpoints framing those concerns and
4. correspondence rules integrating those viewpoints cited before.

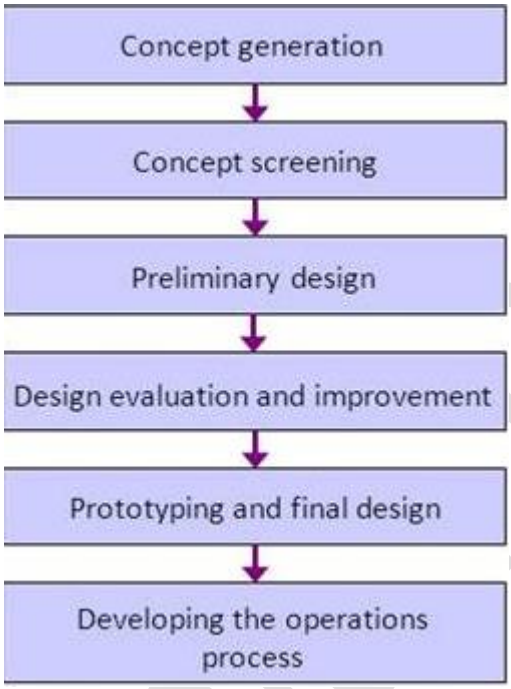
Architecture frameworks conforming to the standard can include additional methods, tools, definitions, and practices beyond those specified.

ADVANTAGES OF MANUFACTURING ARCHITECHTURE IN SALES AND OPERATIONS-

- Real-time Visibility with Integrations
- Upselling & Cross Selling with Shorter Sales Cycle
- Guided Selling, Comparison Study of Products for Customers
- 3D Product Visualization

OS MODEL FOR SERVICE AND PRODUCT (MANUFACTURING)

STAGE MODEL-



CONCEPT GENERATION- A product or service concept is the way in which a firm likes to position its products / services in the market, in terms of product features, quality, price, service, distribution, differentiating elements etc.

Types of methods-

- Design Thinking Method
- Development Method for Manufactured Goods/services

CONCEPT SCREENING-Concept Screening is a critical step in client's innovation process where we test multiple new **product** ideas developed in a **concept** boarder format.

The objective is to understand and measure the potential of each **concept** in order to define the one(s) which should be further progressed in the process.

PRELIMINARY DESIGN-Preliminary process planning is a manufacturability assessment process conducted in the early product design stage.
It supports product design to optimize product form, configuration, and material selection and to minimize the manufacturing costs.

DESIGN EVALUATION AND IMPROVEMENT-

Evaluation with **improvement** is a process of analyzing a **design** and testing it either through physical modeling, computer simulation, or mathematical modeling.

Example-Quality **improvement** ensures that a **product** will perform as expected and allows **improvements** to be made to the **design**.

PROTOTYPING AND FINAL DESIGN-

A prototype in design thinking is "A simulation or sample version of a final product, which is used for testing prior to launch." The goal of a prototype is to test products and services before spending lots of time and money into creating the final version of the sellable product.

DEVELOPING THE OPERATION PROCESS-

Focus on the most important goals of operation processes. Which are given below-

- New organizational structures.(in operations)
- Quality control measures.
- Faster delivery times.
- More employee time spent on service/product **development**.

DETAILED ANALYSIS OF OS MODEL DEVELOPMENT BY DESIGNING PRODUCT (MANUFACTURING)/SERVICES

The Design Process-Although different organizations will approach the design process differently it can be generally seen to be composed of the following steps:

- Idea Generation
- Feasibility Study
- Preliminary Design
- Final Design

Idea Generation

Ideas for new products and services can come from a variety of sources, including the organization's research and development (R&D) department, suggestions from customers, market research data, salespeople, competitor actions or developments in new technology.

RESEARCH AND DEVELOPMENT FUNCTION-

- For an organization that has a strategy of being first to the market with a new product or service, ideas will be devised principally from the organization's own R&D department.
- Competitors

- Competitors can provide a good source of ideas and it is important that the organization analyses any new products or services as they are introduced to the market and make an appropriate response.

Feasibility Study

Once a concept has been formulated it must then be submitted to a market, economic and technical analysis in order to assess its feasibility.

- **Market analysis**
  This consists of evaluating the design concept with potential customers through interviews, focus groups and other data collection methods.

- **Economic Analysis**
  This consists of developing estimates of production and delivery costs and comparing them with estimates of demand.

- **Technical Analysis**
  This consists of determining whether the technical capability to manufacture the product or deliver the service exists.

Preliminary Design

- Design concepts that pass the feasibility stage enter preliminary design.
- The specification of the concept - what product or service should do to satisfy customer needs - is translated into a technical specification of the components of the package (the product and service components that satisfy the customer needs defined in the concept) and the process by which the package is created.
- The specification of the components of the package requires a product and service structure which describes the relationship between **the components and a bill of materials (BOM)** or list of component quantities derived from the product structure.

Final Design-

The final design stage involves refining the preliminary design through the use of a prototype until a viable final design can be made.

A prototype could be to pilot a new retail store design to test customer reaction. **Simulation Modeling can be used to build a computer-based prototype of a product or service design.** The final design will be assessed in three main areas of **functional design, form design and production design.**

Functional design-

- It is ensuring that the **design meets the performance characteristics that are specified in the product concept.**
- Two aspects of functional design are reliability and maintainability.

- Reliability measures the **probability that a product or service will perform its intended function for a specified period of time under normal conditions of use.** Maintainability considers **the cost of servicing the product or service** when it is in use.

Form design

- It refers to the product aesthetics such as look, feel and sound if applicable.

Production design

- It involves ensuring that the design takes into consideration the ease and cost of manufacture of a product (i.e. that the product/service design considers the process design).

CONSIDERATION OF MASS CUSTOMIZATION -

- Mass customization is based on the assumption that market requirements are becoming increasingly fragmented, while operations resources are allowing a greater degree of flexibility and responsiveness.
- Therefore **mass customization aims to 'mass produce' a basic family of products or services which can still be customized to the needs of individual customers.**

- In terms of product and service design this will often involve the standardization and modularization of components to increase variety while reducing production costs.

CONSIDERATION OF SERVICE DESIGN-

Service package as a bundle of goods and services consisting of the following four features.

- **Supporting Facility**: The physical resources that must be in place before a service can be offered. Example- **warehouse, storage and stock keeping units(SKU)**
- **Facilitating Goods**: The material purchased or consumed by the buyer or items provided by the customer.
- **Explicit Services:** The benefits that are readily observable by the senses and consist of the essential or intrinsic features of the service.
- **Implicit Services**: Psychological benefits that the customer may sense only extrinsic features of the service.

Consideration of Job and Work Design

- Operations management deals with the management of personnel that create or deliver an organization's goods and services.
- Job design is concerned at the individual job level with the way in which tasks are grouped, assigned and structured in the organization.
- The main elements **of job and work design are behavioral aspects which impact on employee motivation and physical effects of work such as the interaction with physical devices and the environment.**

1. **Behavioral Aspects of Job Design-** Behavioral aspect of job designs are defined below-
    - **Skill Variety** - The extent to which a job makes use of different skills and abilities.
    - **Task Identity** - The extent to which a job involves completing a whole identifiable piece of work.
    - **Task Significance** - The extent to which a job has an impact on other people, both inside or outside the organization
2. **Physical Aspects of Job Design**-

In addition to behavioral factors job design should consider the physical effects of work. The term ergonomics is used to describe the **collection of information about human characteristics** and behavior to understand the effect of design, methods and environment.

- **Noise**: Excessive noise levels can not only be distracting but can lead to damage to the worker's hearing.
- **Temperature and Humidity**: Although humans can perform under various combinations of temperature, humidity and air movement, performance will be affected.

CONSIDERATION OF WORK STUDY MEASUREMENT IN OPERATION STRATEGY MODEL

- Work Study can be traced back to F.W.Taylor's work in developing scientific management approaches to find the best way to conduct work. It has been developed to measure the performance of jobs, consists of two elements, **work measurement and method study.**

- Work measurement determines the length of time it will take to undertake a particular task.
- The time needed to perform each work element can be determined by the use of historical data, work sampling or most usually time study.

a. **Time Study**-The **use of statistical techniques** to arrive at a standard time for performing one cycle of a repetitive job.
b. **Work Sampling**-A method for determining the proportion of time a worker or machine spends on various activities and as such can be very useful in job redesign and estimating levels of worker output.

CONCLUSION-

By considering all the conditions finally Operation Strategy (OS) Model for product and services have been formed. But with changing preferences of customers and marketing aspect all the considered factors in operations will be changed.

Repeated iteration process has to be adopted for redesigning the OS model.

Operations Strategy Formulation

There are many alternative procedures for developing an operations strategy for a particular organization. These will generally require an analysis of market requirements (marketing) and the operation's resource capabilities (operations). The procedure covered here is the Hill framework.

Hill framework for Operations Strategy Formulation

Hill (2005) provides an iterative framework that links together the corporate objectives; which provide the organizational direction, the marketing strategy; which defines how the organization will compete in its chosen markets, and the operations strategy; which provides capability to compete in those markets.

The framework consists of five steps:

- **Define corporate objectives**
- **Determine marketing strategies to meet these objectives**
- **Assess how different products win orders against competitors**
- **Establish the most appropriate mode to deliver these sets of products**
- **Provide the infrastructure required to support operations**

Step 1 Corporate Objectives

- Step 1 involves establishing corporate objectives that provide a direction for the organization and performance indicators that allow progress in achieving those objectives to be measured.
- The objectives will be dependent on the needs of external and internal stakeholders and so will include financial measures such as profit and growth rates as well as employee practices such as skills development and appropriate environmental policies.

Step 2 Marketing Strategy

- This involves identifying target markets and how to compete in these markets.

Step 3 How Do Products Win Orders in the Market Place?

- This is the crucial stage in Hill's methodology where any mismatches between the requirements of the organization's strategy and the operations' capability are revealed.

- This step provides the link between corporate marketing proposals and the operations processes and infrastructure necessary to support them.

- This is achieved by translating the marketing strategy into a range of competitive factors (e.g. price, quality, delivery speed) on which the product or service wins orders.

- These external competitive factors provide the most important indicator as to the relative importance of the internal operations performance objectives.

- The five basic internal operation's performance objectives allow the organization to measure its operation's performance in achieving its strategic goals. The performance objectives **are Quality, Speed, Dependability, Flexibility and Cost.**

- At this stage it is necessary to clarify the nature of the markets that operations will serve by identifying the relative importance of the range of competitive factors on which the product or service wins orders. Hill distinguishes between the following types of competitive factors which relate to securing customer orders in the marketplace.

  -- **order-winning factors** – They are key reasons for customers purchasing the goods or services and raising the performance of the order-winning factor may secure more business

  -- **Qualifying factors** – Performance of qualifying factors must be at a certain level to gain business from customers, but performance above this level will not necessarily gain further competitive advantage.

From the descriptions above it can be seen that it is therefore essential to meet both qualifying and order-winning criteria in order to be considered and then win customer orders.

Step 4 Delivery System Choice (Structural Decisions) and Step 5 Infrastructure choice (Infrastructural Decisions)

- A step 4 and 5 of Hill's methodology involves putting the processes and resources in place which provide the required performance as defined by the performance objectives.
- Hill categorizes operations decision areas into **delivery system choice, (structural decisions) and infrastructure choice (infrastructural decisions).**
- Delivery system choice concerns aspects of the organization's physical resources such as service delivery systems and capacity provisions.
- **Operations Infrastructural decisions** describe the systems, policies and practices that determine how the structural elements covered in step 4 are managed.

OPERATION STRATEGY EVALUATION-

Operation Strategy Evaluation is defined as the **process of determining the effectiveness** of a given strategy in achieving the organizational objectives in operations and taking corrective action wherever required.

We define various methods for evaluate OS. From these evaluation processes two important evaluation processes are discussed below-

1. **Balance Score Card-** The balanced scorecard (BSC) is a management system that evaluates your company's strategy by determining tactical activities related to operation processes.

Characteristics that define a Balanced Scorecard are:

- its focus on the strategic agenda of the organization;
- a focused set of measurements to evaluate performance against objectives;

- a mix of financial and non-financial data items (originally divided into four "perspectives" - Financial, Customer, Internal Process, and Learning & Growth)
- The balanced scorecard includes objectives, measures (key performance indicators or KPIs) that can help reach the targets.

Benefits of the balanced scorecard include:

- Getting the full picture of organization's activities in holistic aspects and special focus on operations process
- Acquiring feedback to continuously improve processes
- Tracking the right metrics over time
- Enabling us to cascade strategy down through the entire company

4 COMPONENTS OF BALANCE SCORE CARD

Financial Component-

- The financial component of the balanced scorecard includes how well the company is doing financially with revenue and expenses.
- Financial considerations include salaries, cost of benefits, training, travel expenses, equipment, supplies, rent and taxes.
- This information can assist Operations manager in determining ways to cut costs in areas like inventory, supply chain etc

Customer Component

- The customer component of the balanced scorecard includes such areas as customer satisfaction, delivery of product and quick response to customer issues.
- Customer concerns can include the quality of the product, the costs incurred for packing, shipping a product etc.

Processes Component

- The processes component of the balanced scorecard relates to the internal processes the company uses to get the work done.
- Areas such as information technology hardware and software in processing may be considered to determine efficiency in time and cost.

- Operations manager also can identify through the processes, including inventory control, quality, scheduling is providing the desired business results or not.

Learning and Growth Component

- The learning and growth component of the balanced scorecard refers to how much the company has learned and improved during the years of operation.
- Continuous improvement process and improvement through customer feedback with staffs utilization are the ways to enrich the operations of the corporate in a better way.

EXAMPLE OF BALANCE SCORE CARDS-

Balanced Scorecard example: Strategic map for an E-Commerce Business(service sector)

	Objectives	Goals	Indicators	Initiatives
Financial Perspective	To increase sales and reduce costs	15% increase in net sales and 10% decrease in operating costs	Financial statements	Negotiate with suppliers
Customer Perspective	To be a reference for a variety of products	Increase in launching new products every quarter by 15%	Number of new products launched per quarter	Create an innovation and development committee
Internal Process Perspective	To be able to develop new products constantly	Start at least five new product development projects every month	Project innovation reports	Acquire specific software for managing product development
Learning and Growth Perspective	To have extremely knowledgeable staff in product development	Have at least 2 professionals with masters degrees in product development	Number of product development professionals with masters degrees	Select an employee to receive masters training and hire another with a masters degree

Balanced Scorecard example: Strategic map for a Steel Manufacture sector (Manufacturing sector)

	Objective	Goals	Indicators	Initiatives
Financial prospective	More inventory utilization with cost effectiveness	15% target for increase in sales and decrease operating cost	Balance of trade of steel	Financial budgeting
Customer prospective	Variety with volume	New steel products	Well ISO marked and durable steel	Unique value addition in steel production
Internal Process prospective	Manufacturing rate with more productivity	Faster rating in production	Technology embedding in manufacturing steel	Auto monitoring GPS system for controlling human activities in steel plant
Learning and growth prospective	Skill development of staffs	Staff consiousness on production	Skill growth in productivity growing	Fit for adversity

2. **Bench Marking –**
    - Benchmarking improves and evaluates performance by identifying and applying best demonstrated practices to operations and sales in corporate.

- Operations Managers compare the performance of their products or processes externally with those of competitors and best-in-class companies, and internally with other operations that perform similar activities in their own firms.
- **The objective of Benchmarking** is to find evaluate superior performance by comparative way and understand the processes and practices driving that performance.

How Benchmarking works:

- Select a product, service or process to benchmark
- Identify the key performance metrics
- Choose companies or internal areas to benchmark
- Collect data on performance and practices
- Analyze the data and identify opportunities for improvement
- Adapt and implement the best practices, setting reasonable goals and ensuring companywide acceptance

Companies use Benchmarking to-

- **Improve performance.**
  Benchmarking identifies methods of improving operational efficiency and product design.
- **Understand relative cost position.**
  Benchmarking reveals a company's relative cost position and identifies opportunities for improvement.
- **Gain strategic advantage.**
  Benchmarking helps companies focus on capabilities that are critical to building strategic advantage.
- **Increase the rate of organizational learning.**
  Benchmarking brings new ideas into the company and facilitates experience sharing.

TYPE OF BENCH MARKING-

- **Strategic benchmarking.** –
  - Operations Managers use this type of benchmarking to identify the best way to compete in the market.
  - During the process, the companies identify the winning strategies (usually outside their own industry) that successful companies use and apply them to their own strategic process.
- **Performance benchmarking.-**
  - It is concerned with comparing company's products and services.
  - The tool mainly focuses on product and service quality, features, price, speed, reliability, design and customer satisfaction.
- **Process benchmarking.-**
  - It requires to look at other companies that engage in similar activities and to identify the best practices that can be applied to your own processes in order to improve them.
  - Process benchmarking is a separate type of benchmarking, but it usually derives from performance benchmarking.

A Step-by-Step Approach to Benchmarking

Following are the steps involved in benchmarking process:

- **Planning-**Prior to engaging in benchmarking, it is imperative that corporate stakeholders identify the activities that need to be benchmarked.

  For instance, the processes that would generally be core activities(core product process) can considered for bench marking.

- **Collection of Information-**Information can be broadly classified under the sub texts of primary data and secondary data.

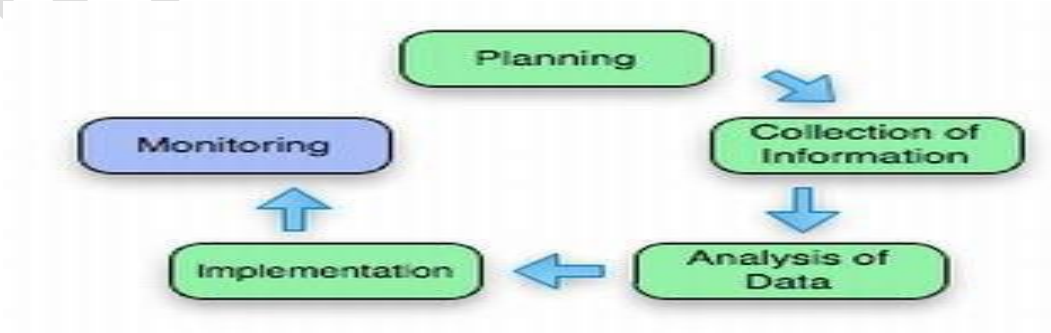
  To clarify further, here, primary data refers to collection of data directly from the benchmarked company/companies itself, while secondary data refers to information garnered from the press, publications or websites.

- **Analysis of Data-**Once sufficient data is collected, the proper analysis of such information is of foremost importance.

  Data analysis, data presentation (preferably in graphical format, for easy reference), results projection, classifying the performance gaps in processes, and identifying the root cause that leads to the creation of such gaps (commonly referred to as *enablers*), need to be then carried out.

- **Implementation-**This is the stage in the benchmarking process generally means that far-reaching changes need to be made, so that the performance gap between the ideal and the actual is narrowed and eliminated wherever possible.
- **Monitoring-**As with most projects, in order to reap the maximum benefits of the benchmarking process, a systematic evaluation should be carried out on a regular basis.

  Assimilating the required information, evaluating the progress made, re-iterating the impact of the changes and making any necessary adjustments, are all part of the monitoring process.



(BENCHMARKING PROCESS)

Example -Incorporation of Benchmarking in Manufacturing System

In automobile industry two wheelers market has more share than three wheelers and four wheelers. In India two wheelers are widely used than four wheelers, so in this case two wheelers are considered.

The two wheelers can be classified into five segments. They are: Geared Scooters, Un-geared Scooters, Motorcycles, Mopeds and Others.

Brand	2008 – 2009	2009 – 2010	2010 – 2011
1. Hero Honda	47.2	50.6	49.8
2. Bajaj	15.8	20.7	22.9
3. Others	37.0	28.7	27.3

(TABLE IS SHOWING MARKET SHARE OF 3 BRANDS)

PLANNING-

- From the market study Hero Honda and Bajaj are in first and second position respectively.
- So Hero Honda and Bajaj are identified as comparative organizations and Bajaj is benchmarked with Hero Honda.
- A few factors which are relevant and critical are identified and considered to Benchmark against toughest competitors in motorcycle segment.

DATA COLLECTION-

- We have collected data of Market Performance.
- The sale of motorcycles of Bajaj and Hero Honda and their percentage share in motorcycle segment is given below:

Financial Year	Bajaj (Units)	% Share of Bajaj in Motorcycles	Hero Honda Sales (Units)	% Share of Hero Honda in Motorcycles
2004-2005	89,675	13.5	2,30,194	4.8
2005-2006	1,29,263	16.1	2,68,945	33.52
2006-2007	1,36,017	14.8	4,07,563	44.5
2007-2008	2,00,183	17.0	5,30,600	45.0
2008-2009	2,55,176	15.8	7,61,700	47.2
2009-2010	4,22,016	20.7 10	10,29,555	50.63
2010-2011	6,56,018	22.9	14,25,195	49.8

ANALYSIS-

Analysis for Hero Honda-

- Hero Honda is joint venture of Hero cycles of India and Honda Company of Japan.
- Honda Motors has good technology and Hero group has largest distribution network in India.
- So their venture has become a great success and became world no. 1 Two-wheeler Company.

Analysis for Bajaj-

- Bajaj has a good brand equity, had a good distribution network but still, not been able to do much in the last few years.
- The share of geared scooters had fallen and it has become a major loss for Bajaj, which has more market share in geared scooters.
- The reason for the downfall of the company has been its inability to identify the demand trend.

ACTIONS AND IMPLEMENTATIONS-

To compete with the Hero Honda or overcome it, the following actions can be taken.

- Bajaj by reducing franchise amount for dealers can increase dealership network to interior and small towns so as to increase the sales.
- As a part of the advertisement strategy, Bajaj must sponsor major sports events and tournaments to enhance the sales.
- Market is interested in environmental friendly bikes. Bajaj, by product research and development, must maintain the emission levels as low as possible and manufacture environmental friendly bikes.
- Some of the Bajaj models are expensive. Cost must be reduced by value engineering methods and more of economy class should be manufactured.

- Implementation of technology with auto controlled method must be adopted with discarding heavy geared vehicle technology.

So Bajaj must keep track on product market, market trend and change ahead of its competitors.

MONITORING-

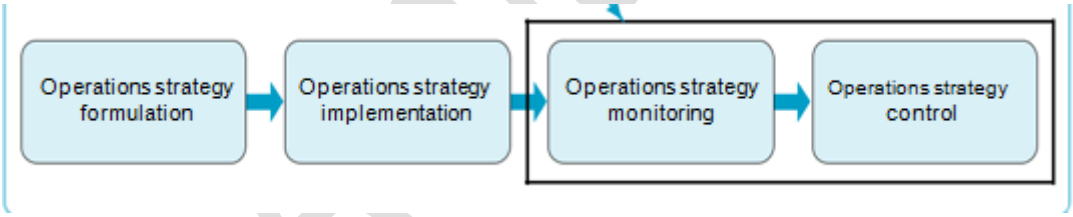
In the above case monitoring of processes of Bajaj has to be given more priority to establish the same pace of market with Hero Honda.

Process control and monitoring techniques are-

- **Total Quality Control**
- **Innovation and technology embedment**
- **Monitoring Just in time principle**
- **Shifting to new processing and automation**

OPERATION STRATEGY CONTROL AND MONITORING-

Strategic monitoring and control involves the monitoring and evaluation of activities, plans and performance with the intention of corrective future action if required.

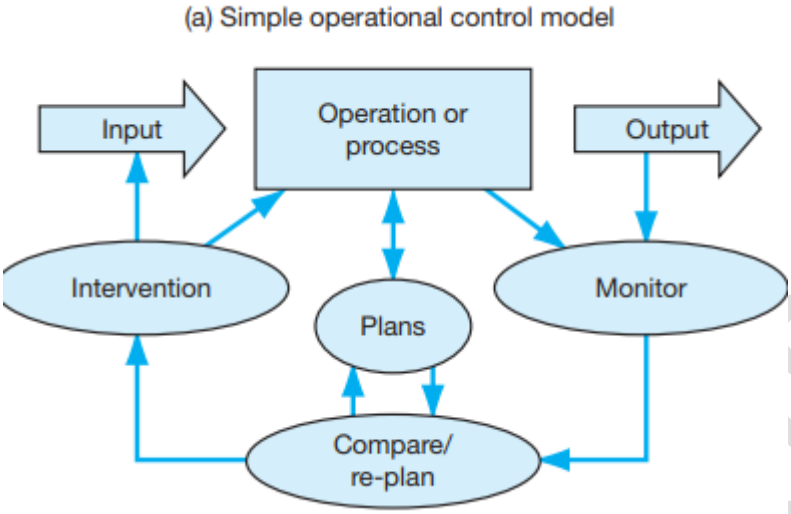


Having created a plan for the operation (strategy), each part of it has to be monitored to ensure that planned activities are indeed happening.

Any deviation from what should be happening (that is strategy) can then be rectified through some kind of intervention in the operation. Hopefully this will bring the operation back on course, which itself will probably involve some re-planning.

Eventually, however, some further deviation from planned activity will be detected and the cycle is repeated.

(OPERATIONAL CONTROL MODEL)



TYPES OF CONTROL IN OPERATIONS STRATEGY –

- **Expert control**-It is the expert panel in operations field who decides the point of control in the whole operation cycle. Example- Maggi changed its quality control point by experts after expert's opinion.
- **Trial and error control**-Although simple prescriptions may not be available in the early stages of making control interventions, the organization can learn how to do it through experience.

  For example, if a firm is introducing a new product or service into a new market, it may not be sure how best to arrange the launch. But if the launch is the first of several, the strategic objective must be not only to make as good a success of the launch as possible, but equally (or more) important, it must learn from the experience.

  The organization must put in mechanisms to gain knowledge and embed the learning into its decision making. It is these knowledge-building skills that ultimately will determine the effectiveness of trial and error control.

- **Intuitive control** – In this control the intuitive skill is required to control the activities in operations. Right perception based knowledge should be there to handle this type of control.
- **Negotiated control-** Success of this control depends on negotiation with senior operations manager by considering all terms and conditions.
  Example- Change of capacity in Inventory warehouse

Monitoring implementation and tracking Performance

Especially in times when environment is changing rapidly, organizations feel the need to detect change by tracking performance, scanning the environment, interpreting the information that they detect, and responding appropriately.

If the information resulting from this monitoring activity is to be useful for control purposes it should collect useful data and interpret its meaning through comparison with pre-existing standards or objectives, and then respond in some way.

At a strategic level, this interpretation process should involve simple data analysis.

Monitoring and controlling should be an exercise that tries to make sense of what is really happening with the implementation. To do this successfully any operations strategy process should:

- **Be tracking the appropriate elements so that it can assess progress;**
- **Compare progress against target we have set;**
- **Have some idea as to what risks the implementation faces.**

Tracking the appropriate elements

Performance measurement is a hugely important area for organizations of all kinds.

Accurately calibrating performance of activities and their outcomes has many advantages – as well as some risks.

Performance measurement is therefore central to successful strategy execution and has to be monitored as well as controlled.

Implementation and performance measurement is appropriate to track. Implementations with different strategic objectives will focus on different operations objectives.

- **Project objectives** – It indicates the progress of the implementation towards its end point.(start to end of activity)

- **Process objectives** – It indicates the consequences that the implementation has for the operations processes that it is intended to affect.

Project objectives-

Project objectives help to provide a definition of the end point which can be used to monitor progress and identify when success has been achieved.

This can be judged in terms of **cost, time and 'quality'.**

The relative importance of each project objective will differ for different types of implementation.

Some implementations in the aerospace sector, such as the development of a new aircraft manufacturing technology, which impacts on passenger safety, will place a very high emphasis on '**quality' objectives**.

With other implementations, for example where cash availability is limited, cost might predominate.

Other implementations emphasise time: for example, bringing new capacity online in time to honor a supply contract.

In each of these implementation projects, although one objective might be particularly important, the other objectives can never be totally forgotten.

Process objectives

These objectives are called process objectives because, when monitored, they measure the impact that the implementation has on the process within the operation.

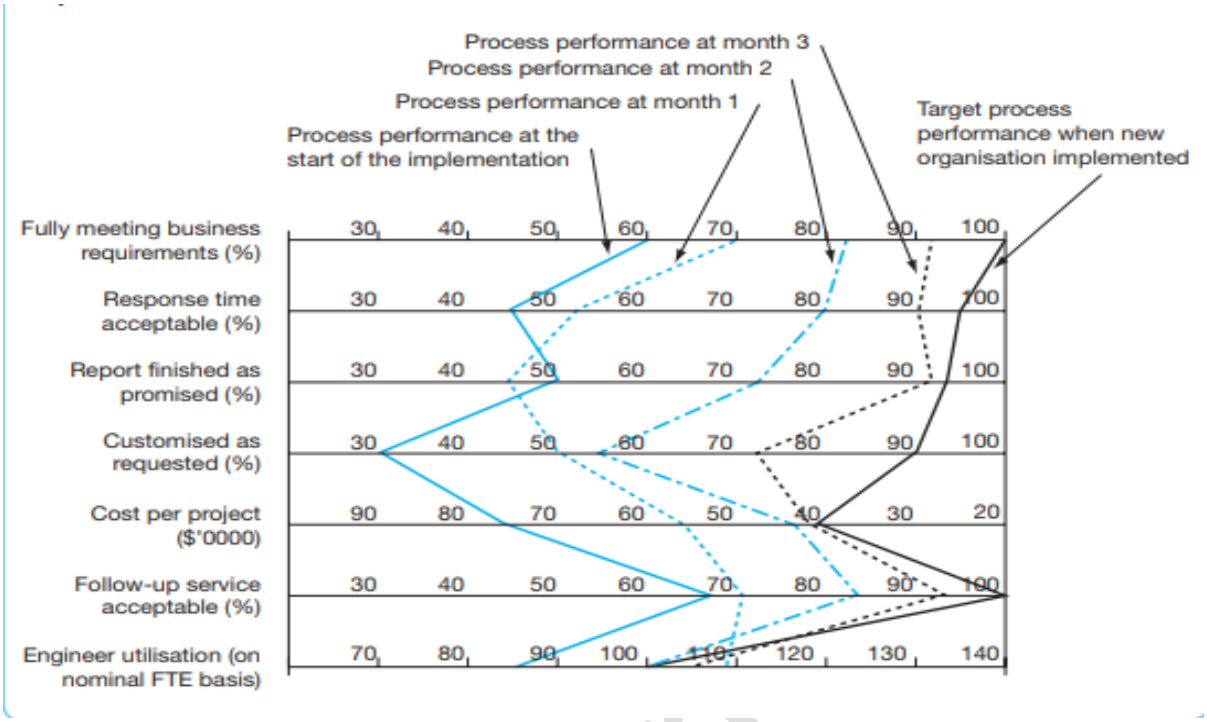
The effect an implementation has on five basic objectives (quality, speed, dependability, flexibility and cost) should be assessed.

In addition, broader measures such as return on assets, or more specific measures, such as capacity utilization, could also be used.

For example,

- A global oil exploration company is reorganizing its technical support function and, over time, is centralizing its risk assessment resources (they were previously organized on a regional basis). In this case the 'process' objectives are shown in Figure.

- Each objective has its performance under the original organizational structure marked, together with the performance of each objective that the new centralized structure should achieve.



(TRACKING OF PROCESS OBJECTIVES IN GLOBAL OIL EXPLORATION COMPANY)

The red queen effect

- For longer-term implementations, **target levels of process objectives** will not necessarily remain constant.
- They could shift during the implementation itself, especially in highly competitive or dynamic environments.
- For example, if competitors increase their performance during implementation, one's own performance will need to increase proportionately. This is called the **'Red Queen' effect**.

The dynamics of monitoring and control

- As implementation proceeds and monitoring indicates its progress, the trajectory of the implementation may have to be changed.
- **Competitive activity or more general environmental change** could affect the level of performance required.
- Operation finds a change of direction will depend on its agility, which, in turn, will depend on how operations resources are aligned with its market requirements.

Analysis of Tight alignment and loose alignment

We represent alignment is graphed between **market requirements and operations resource capability.**

Tight alignment-It is created when well defined market requirements and set of operation capabilities.

Market and operation capability will change over the time.

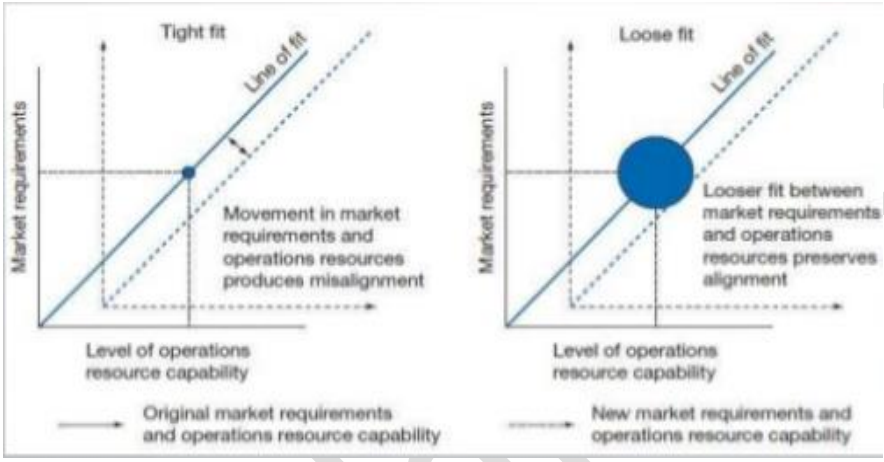
Reasons- Market is dynamic and changes over a period of time

Operation resources may also be faster or slower.

Narrow alignment- Narrowness between market and operations makes disruptive alignment.

So broader set of operations capability with market will provide stability.

Example- JIO mobile



RISKS GENERATION-From alignment we can get risk of-

- Pure and speculative risk;
- Controlling risk through prevention, mitigation and recovery;
- Adjustment cost risk;
- Intervention risk.

CONTROLLING RISKS-

Operations strategy practitioners are interested in how an operation can avoid failure in the first place or, if it does happen, how they can survive any adverse conditions that might follow.

In other words, how they can control risk.

A simple structure for describing generic mechanisms for controlling risk uses three approaches.

- **Prevention strategies** – are where an operation seeks to completely prevent (or reduce the frequency of) an event occurring.
- **Mitigating strategies** – are where an operation seeks to isolate an event from any possible negative consequences.
- **Recovery strategies** – are where an operation analyses and accepts the consequences of an event but undertake to minimize or alleviate or compensate for them.

Adjustment cost risk

Any implementation methodology will need to account for the costs of implementation.

These costs include both the direct and/or investment costs of providing whatever additional resources the strategy requires, and also what could be termed the adjustment cost of making any changes.

By adjustment costs we mean the losses that could be taken as consideration and adjusted.

ERROR IN CONTROLLING-

The concept of type I and type II errors is commonly used in operational control, and it is also useful in understanding strategic control.

It concerns the possibility of getting the decision of whether rightly controlled or any disruption is there.

Example-

Take the example of a pedestrian waiting to cross a street. He or she has two options: whether to continue waiting or to cross. If there is a satisfactory break in the traffic and the pedestrian crosses then a correct decision has been made. Similarly, if that person continues to wait because the traffic is too dense then he or she has again made a correct decision.

There are two types of incorrect decision or errors

One incorrect decision would be if he or she decides to cross when there is not an adequate break in the traffic, resulting in an accident – this is referred to as a type I error, taking action when one should not.

Another incorrect decision would occur if he or she decides not to cross even though there is an adequate gap in the traffic – this is called a type II error, not taking action when one should.

Type I errors are those that occur when a decision is made to do something when the situation does not warrant it. Applied to strategic control, a type I error is when there is a failure to intervene in an implementation even though an intervention is necessary. **Type I errors can occur when managers are 'over active'; with a bias towards being more interventionist that is necessary**.
Type II errors are those that occur when nothing is done, yet a decision to do something should have been taken as the situation did indeed warrant it. A type II error is when an intervention is made to the implementation when it was not necessary.

Type II errors may occur when the managers are too inert, failing to recognise the need for intervention where it actually exists.

Managers identifying and interpreting monitoring data face the risk of both type I and type II errors. Effective operations strategy control prompts the appropriate response at the appropriate time, avoiding both types of error.

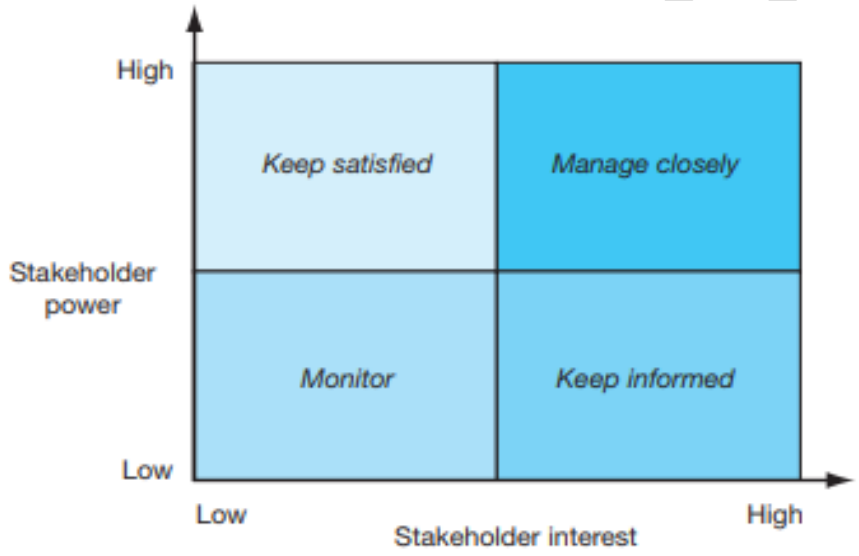
How does stakeholder management contribute to strategic control?

All implementation projects have stakeholders, who are the individuals and groups that have an interest in the project process or outcome, and should be included in its planning and execution.

One approach to discriminating between different stake - holders, and how they should be managed, is to distinguish between their power to influence the project and their interest in doing so.

This results in the power– interest grid. Stakeholders' position on the grid gives an indication of how they might be managed.

The stakeholder power- interest grid



(STAKEHOLDER POWER –INTEREST GRID)

COMPETITIVENESS IN OPERATION STRATEGY

Understanding competitiveness and its importance in operations strategies

Competition and market conditions in the industry guide the general thrust of the operations process, which provide the basis for determining the organization's strategy.

A careful analysis of **market segments and the ability of the competitors** to meet the needs of these segments will determine the best direction for focusing an organization's efforts.

competitive priorities should be established in the various areas of an organization. These will help the operations managers to identify their abilities or competencies, which will make profitable to the organization with the competitive edge.

Distinctive Competencies

Competitiveness or competitive advantage denotes a firm's ability to achieve market superiority over its competitors.

In the long run, a **sustainable competitive advantage** provides above-**average performance.**

A strong competitive advantage is derived from an **organization's competitive priorities**, or **distinctive competencies.**

A distinctive competency should have six (6) characteristics:

i. It is driven by **customer wants and needs.**
ii. It makes a significant contribution to the success of the business.
iii. It matches the **organization's unique resources with the opportunities** in the environment.
iv. It is durable and lasting and difficult for competitors to copy.
v. It provides a basis for further development.
vi. It provides direction and motivation to the entire organization.

Hence, we can conclude that distinctive competencies can be defined as those special attributes or abilities possessed by an organization that give it a competitive edge.

In effect, distinctive competencies relate to the way that organizations compete.

Depending on these distinctive competencies any company can achieve competitive advantagethrough acts of innovation and new ways of doing things, such as new product designs, production technologies, training programs, quality control techniques, or new way to manage supplier relationships.

Four (4) Distinctive Competencies /Competitive Priorities

The four distinctive competitive priorities can be characterized as follows

Cost Efficiency (Low product price): A company that emphasizes cost efficiency will see that it's capital, labor and other operating costs are kept low, relative to other similar companies.

Quality (Product performance): A company that emphasizes quality will consistently strive to provide a level of quality that is significantly superior to that of its competitors, even if it has to pay extra to do so.

Dependability (reliability, timely delivery): A company that stresses dependability can be relied upon to have its goods available for customers, or to deliver its goods or services on schedule, if it is at all possible.

Flexibility (new products or change in output volume): A company that develops flexibility can quickly respond to competitors' changes in product design, product mix, or production volume by changing their own.

Competitive priorities and some ways of creating them

Competitive Priority	Definition	ways of creation
Cost Efficiency	Unit cost of each product / service, including labor, material, and overhead costs	• Redesigning of products • New production technologies • Increase in production rate • Reduction of scrap • Reduction of inventories loss
Quality	Customers' perceptions of degree of excellence exhibited by products /services	• Use of CAD / CAM • Improve product / service in terms of : appearance, malfunction or defect rates, performance and function, war, endurance ability, after-sales service
Dependability (Delivery performance)	**Fast delivery** **On-time delivery**	• Larger finished-goods inventories, effective scheduling system • Faster production rates • Quicker shipping methods • (fast delivery) • More realistic promises • Better control of production of orders • Better information systems • (on-time delivery)
Flexibility	Ability to quickly change production to order products /services and other production volumes, customer responsiveness	• Change in type of production process used • Multi-skilled workers • Reduction of amount of work in process through JIT • Increase in production capacity

Time as a Distinctive Competency

Apart from the four factors (Cost efficiency, quality, dependency and flexibility), time is emerging as a critical dimension of competition in both manufacturing and service industries.

In an era of time-based competition, a firm's competitive advantage is defined not by cost but by the total time required to produce a product or service.

Traditional View of Competitiveness

The traditional literature on competitiveness suggests that a firm can possess two basic types of competitive advantages:

i. **Cost leadership**
ii. **Product differentiation**

Cost Leadership

Many firms gain competitiveness by establishing themselves as low-cost leaders in the market. These firms produce high volumes of mature products and achieve their competitive advantage through low prices. Such firms often enter markets that were established by other firms. They emphasize achieving **economies of scale** and finding cost advantages from all sources.

Low cost can result from **high productivity and high capacity utilization**.More importantly, improvements in quality lead to improvements in productivity, which in turn lead to lower costs. Thus a strategy of continuous improvement is essential to achieve **a low-cost competitive** advantage.

Product Differentiation

Product differentiation refers to any special features (e.g. design, cost, quality, ease of use, convenient location, warranty, etc.) that cause a product to be perceived by the buyer as more suitable than a competitor's product or service.

To achieve differentiation, a firm therefore must be unique in its industry along some dimensions that are widely valued by customers.

Modern View of Competitiveness

More recently, the modern view towards competitive advantage has been focused on adopting more Quality-based and Time-based competitiveness.

However at the same time keeping in mind cost-efficiency and product differentiation.

Quality

This focuses on satisfying the customer by integrating quality into all phases of the organization. This includes not only the final product or service that is provided to the customer, but also the related processes such as production, design, and after-sales service.

Time

It focuses on reducing the time required to accomplish various activities. By doing so, organizations seek to improve services to the customer, and to gain a competitive advantage over rivals who take more time to accomplish the same tasks.

Importance of Competitiveness in Operations Strategy

- The competitiveness of a firm is its ability to achieve market superiority over other competitors.
- Operations strategy, on the other hand, is a collective pattern of coordinated **decisions for the formulation, reformulation, and deployment of the organization's resources.**
- These decisions provide a competitive advantage in support of the overall strategic initiative of the firm or strategic business units.
- Operations strategy is a pattern of decisions made over time. These decisions focus on resource **configuration and deployment.**
- For example, how many work shifts, which type of machinery, what kind of reporting structure, and which type of information to use are all decisions about how to use resources. The resulting configurations of the firm's resources must provide or support the firm's strategic advantage in the market place.
- So for the survival of the firms, considerations of competitive advantage in operation strategy are very important.

Porter's Five Forces of Competitive Position Analysis

Porter's Five Forces Framework is a method for analyzing competition of a business.

Five forces	Features	Operational steps for existence in corporate/sustenance in market
Threat of new entrants	Profitable markets that yield high returns will attract new firms.	Strategic plannings have to be prepared for fighting with new entrants(Example-**no**

	This results in many new entrants, which eventually will decrease profitability for all firms in the industry	**compromise on quality, durability, longevity)**
Threat of substitute products or services	Substitute goods or services that can be used in place of a company's products or services pose a threat. When close substitutes are available, customers will have the option to forgo buying a company's product, and a company's power can be weakened.	Alternatives of products/services has to be designed Example- Coffee production with idea of tea production development should be developed
Bargaining power of customers (buyers)	The bargaining power of customers is also described as the **market of outputs: the ability of customers to put the firm under pressure**, which also affects the customer's sensitivity to price changes.	reduce buyer power, such as implementing a loyalty program Centralized system for pricing for suppliers for reducing liberalization of customer
Bargaining power of suppliers	The bargaining power of suppliers is also described as the market of inputs. **Suppliers of raw materials, components, labor, and services (such as expertise)** to the firm can be a source of power over the firm when there are few substitutes.	Mandate monitoring through **supplier score card system** Firm should judge whether supplier **is customer oriented or not.**
Intensity of competitive rivalry	The larger the number of competitors, along with the number of equivalent products and services they offer, the lesser the power of a company. When competitive rivalry is low, a company has greater power to charge higher prices and set the terms of deals to achieve higher sales and profits.	Unique product with embedded innovation to exist in competitive rivalry environment Ex- Artificial intelligence in Software company for more transparency and security High packaging of product of smooth delivery to customer

Example of Recommendations of McDonald's Five Forces Analysis (Porter's Model)

1. **Competitive rivalry or competition – Strong Force**
2. **Bargaining power of buyers or customers – Strong Force**
3. **Bargaining power of suppliers – Weak Force**
4. **Threat of substitutes or substitution – Strong Force**
5. **Threat of new entrants or new entry – Moderate Force**

HOW TECHNOLOGY PLAYS AN IMPORTANT ROLE FOR GAINING COMPETITIVE ADVANTAGES IN OPERATIONS STRATEGY-

A BRIEF IDEA **OF INDUSTRIAL 4.0 REVOLUTIONS** IN CONTRIBUTION TO COMPETITVE NESS-

- The **Fourth Industrial Revolution** or **Industry 4.0** is the ongoing transformation of traditional manufacturing and industrial practices combined with the latest smart technology.
- This primarily focuses on the use of large-scale **machine to machine communication (M2M) and Internet of Things (IoT)** deployments to provide increased automation, improved communication and self-monitoring, as well as smart machines that can analyze and diagnose issues without the need for human intervention.

Design principles and goals

- **Interconnection:** The ability of machines, devices, sensors, and people to connect and communicate with each other via the Internet of Things (IoT or processes) or the Internet of People (IoP,humanbeing)
- **Information transparency**: The transparency afforded by Industry 4.0 technology provides operators with vast amounts of useful information needed to make appropriate decisions. Inter-connectivity allows operators to collect immense amounts of data and information from all points in the manufacturing process, thus aiding functionality and identifying key areas that can benefit from development and improvement.
- **Technical assistance**: The ability of the systems to assist humans in decision making and problem solving and the ability to help humans with tasks that is too difficult or unsafe.
- **Decentralized decisions**: The ability of cyber physical systems to make decisions on their own and to perform their tasks as autonomously as possible. Only in the case of exceptions, interferences, or conflicting goals, are tasks delegated to a higher level.

CHALLENGES OF INDUSTRIAL 4.0 REVOLUTIONS (TECHNOLOGY EMBEDMENT) TO ACHIEVE COMPETITVENESS-

Economic • High economic costs • Business model adaptation • Unclear economic benefits/excessive investment	**Political** • Lack of regulation, standards and forms of certifications • Unclear legal issues and data security
Social • Privacy concerns • Surveillance and distrust • Threat of redundancy of the corporate IT department • Loss of many jobs to automatic processes and IT-controlled processes	**Organizational/ Internal** • IT security issues • Reliability and stability needed for critical machine-to-machine communication (M2M) • Need to maintain the integrity of production processes • Lack of adequate skill-sets to expedite the transition towards the fourth industrial revolution • Insufficient qualification of employees

APPLICATIONS OF INDUSTRIAL4.0 REVOLUTION TO ACIHEVE COMPETITIVENESS-

- ***Digitization and integration of vertical and horizontal value chains***
  - Vertically, Industry 4.0 integrates processes across the entire organization for example processes in product development, manufacturing, structuring and service
  - Whereas horizontally, Industry 4.0 includes internal operations from suppliers to customers plus all key value chain partners.
- ***Digitization of product and service offerings***
  - **Integrating new methods of data collection and analysis** for example through the **expansion of existing products or creation of new digitized products**, helps companies to generate data on product use and thus, to refine products in order to meet best the customers' needs.
- ***Digital business models and customer access***
  - Reaching customer satisfaction is a multi-stage, never-ending process that needs to be modified currently as customers' needs change all the time.
  - Therefore, companies expand their offerings by establishing disruptive digital business models to provide their customers digital solutions that meet their needs best.

A FEW SUCESSIVE CASES-

- **Smart factory (**Within modular structured smart factories, cyber-physical systems monitor physical processes, create a virtual copy of the physical world and make decentralized decisions.)

- **Predictive maintenance (**can identify maintenance issues in live – allows machine owners to perform cost-effective maintenance and determine ahead of time before the machinery fails or gets damaged.

- **3D printing (**increase flexibility, reduce warehousing costs and help the company towards the adoption of a mass customization business strategy by advantages of 3D printing)

- **Smart sensors(**Sensors and instrumentation are nowadays driving the central forces of innovation, not only for Industry 4.0, but as well for other "smart " megatrends, such as smart production, smart mobility, smart home, smart city and smart factory)

MINI CASE STUDIES/CASELETS

Case 1:

Product Development Risks

You have the opportunity to invest INR 100 billion for your company to develop a jet engine for commercial aircrafts. Development will span 5 years. The final product costing Rs. 500 million / unit could reach a sales potential, eventually of Rs. 2500 billion. The new engine can be placed in service 5 years from now, but only if it qualifies four years from now for certification clearing commercial use and only if it meets America's Federal Aviation Administration's (FAA) ever tightening standards for noise reduction. Certification also has to be obtained from India's Director General of Civil Aviation (DGCA). There is competition from world-class manufacturers like Pratt and Whitney and Rolls Royce who are developing competing engines. If you decide to proceed with the project, you must also determine where the new engines will be produced and develop the manufacturing facilities. If you decline to proceed, your company could invest its resources elsewhere and based on its track record, get attractive returns.

(a) What would be your line of action?

(b) In case of lengthy product design and development time, what kinds of risks are there?

Case 2:

Project Delays

The Assam Gas Cracker Project conceived as part of the Assam Accord signed in 1985 is yet to see the light of the day. It has been plagued by a host of problems starting from location to economic

viability. Originally planned at Tengakhat, it was later shifted to a place called Lepetkata. The project is now being implemented by GAIL (a Government of India enterprise) as the lead promoter (70% share) with another public enterprise OIL (20% share) and the Government of Assam as minor Partners. GAIL had to be brought in after India's largest private sector enterprise Reliance Industries backed out of the project saying that it was economically unviable. The land acquisition for the project (as of mid 2008) is yet to be completed and there is still a lot of uncertainty regarding the availability of raw materials for production. In the meantime, the project cost has spiraled many times over to INR 50 billion, which is likely to go up further.

(a) Discuss the importance of Project Management in the light of the above situation.

(b) As a project manager employed with GAIL, what would be your line of action to see to it that the project is not delayed any further?

(c) Why do projects suffer from time and cost overruns?

Case 3:

JIT in Action

A new phenomenon called 'Apparel on Demand' is slowly making its presence felt. It is an extension of JIT linking retailers and manufacturers for a just-in-time responsiveness. NaaR Clothing Inc., promoted by a young management graduate has recently ventured into the business of making reasonably priced custom jeans for women. It has partnered with many stores selling women garments. In the stores, women are electronically measured and information like color, fabric, style, etc., is recorded. The information reaches the NaaR manufacturing facility at Ahmadabad almost immediately through a state-of-the-art information system.NaaR guarantees delivery of the custom jeans within 10 days. With the growing acceptance of jeans among the women in India, specially in the urban areas, the market for women's jeans is growing at a fast pace. NaaR with its unique business model hopes to garner a significant share of this market. The promoter of NaaR along with her top executives is confident that their concept of JIT jeans would work.

(a) Do you think NaaR's strategy would work? Why or why not? What is the importance of retailers in its business strategy?

(b) Will customers wait for 10 days to have the jeans delivered? What can NaaR do to compete on customer service if delivery takes this much time?

(c) Comment on the necessity of a robust supply chain in the context of NaaR Clothing Inc.

Case4:

The Fitzgerald Machine Company

The Fitzgerald Machine Company is a $25MM per year custom metal fabrication shop. It has a work force of 30 machinists and 15 office personnel Don Bradish was hired from Peptine Corporation three months ago as Fitzgerald's production scheduler. His background includes an undergraduate industrial engineering degree and three years of purchasing experience with Peptine immediately after college. This made him a good fit for Fitzgerald's needs. He was hired by Jane Fitzgerald, Vice President of Operations and daughter of the company president.

Recently the company has been having difficulty meeting delivery schedule deadlines. Don was hired to improve the company's performance in on-time deliveries. So far, he has been learning the systems of the operations and studying possible solutions, but he has not yet determined the best course of action to recommend.

On Friday, June 21, a $300,000 order, which had been in the shop for nearly two months, was scheduled for shipment. On the Wednesday before scheduled delivery, the customer called and asked that delivery be delayed due to a labor dispute and work stoppage at his location. Although he expected the strike to be settled within one week or less, he was concerned that delivery of the order from Fitzgerald during the strike might cause unnecessary misunderstandings in the labor dispute. Don discussed this request with Jane, and they agreed to accommodate the customer's request on the condition that the customer agree to being billed on the originally scheduled delivery date and to pay on the originally contracted payment terms. The customer accepted those terms.

On Friday morning, June 21, the production manager reported to Don that the order would not be completed as scheduled and would probably require at least one more week to finish. Concerned about the impact of this delay on his job status, Don decided to investigate the cause of the delay before informing Jane of the problem. Before he could complete his inquiry, Jane called to inform him that she had just mailed the invoice for the order as agreed She also suggested that Don negotiate with the customer a storage fee for the order, which would be paid in addition to the billing arrangement. Don wondered what he should say to Jane next.

QUESTIONS-

1. **What is the real flavor of the case in terms of operation?**
2. **Objectify the case with suitable justification.**
3. **Is there any problem associated with the case? If yes then what is the feasible solution behind it?**

Module-II

VERTICAL INTEGRATION AND OUTSOURCING-

Vertical integration is a strategy used by a company to gain control over its suppliers or distributors in order to increase the firm's power in the marketplace, reduce transaction costs and secure supplies or distribution channels.

Forward integration is a strategy where a firm gains ownership or increased control over its previous customers (distributors or retailers).

Backward integration is a strategy where a firm gains ownership or increased control over its previous suppliers.

What is vertical integration?

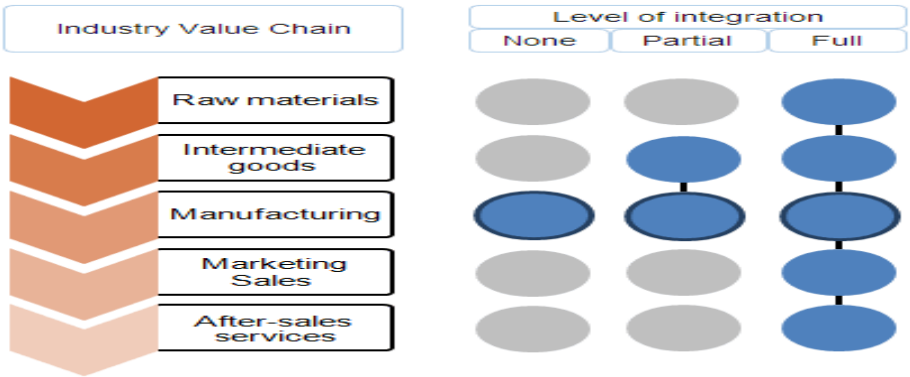
Vertical integration (VI) is a strategy that many companies use to gain control over their industry's value chain.

This strategy is one of the major considerations when developing corporate level strategy. The important question in corporate strategy is, whether the company should participate in one activity (one industry) or many activities (many industries) along the industry value chain.

For example, the company has to decide if it **only manufactures its products or would engage in retailing and after-sales services as well.** Two issues have to be considered before integration;

- **Costs**. An organization should vertically integrate when costs of making the product inside the company are lower than the costs of buying that product in the market.
- **Scope of the firm.** A firm should consider whether moving into new industries would not dilute its current competencies.

(DIAGRAM OF VERTICAL INTEGRATION)



Difference between vertical(VI) and horizontal integrations

VI is different from horizontal integration, where a corporate usually acquires or mergers with a competitor in a same industry.

An example of horizontal integration would be a company competing in raw materials industry and buying another company in the same industry rather than trying to expand to intermediate goods industry.

Horizontal integration examples: Kraft Foods taking over Cadbury, HP acquiring Compaq or Lenovo buying personal computer division from IBM.

Types of vertical integration

Forward integration- If the manufacturing company engages in sales or after-sales industries it pursues forward integration strategy. This strategy is implemented when the company wants to achieve higher economies of scale and larger market share. Forward integration strategy became very popular with increasing internet appearance. Many manufacturing companies have built their online stores and started selling their products directly to consumers, bypassing retailers. Forward integration strategy is effective when:

- Few quality distributors are available in the industry.
- Distributors or retailers have high profit margins.
- Distributors are very expensive, unreliable or unable to meet firm's distribution needs.
- The industry is expected to grow significantly.
- There are benefits of stable production and distribution.
- The company has enough resources and capabilities to manage the new business.

Backward integration-When the same manufacturing company starts making intermediate goods for itself or takes over its previous suppliers, it pursues backward integration strategy. Firms implement backward integration strategy in order to secure stable input of resources and become more efficient. Backward integration strategy is most beneficial when:

- There are only few small suppliers but many competitors in the industry.
- The industry is expanding rapidly.
- The prices of inputs are unstable.
- Suppliers earn high profit margins.or in peak demand

Advantages- Advantages of this strategy:

- Lower costs due to eliminated market transaction costs;
- Improved quality of supplies;
- Critical resources can be acquired through Vertical integration;
- Improved coordination in supply chain;
- Greater market share;

- Secured distribution channels;
- Facilitates investment in specialized assets (site, physical-assets and human-assets);
- New competencies.

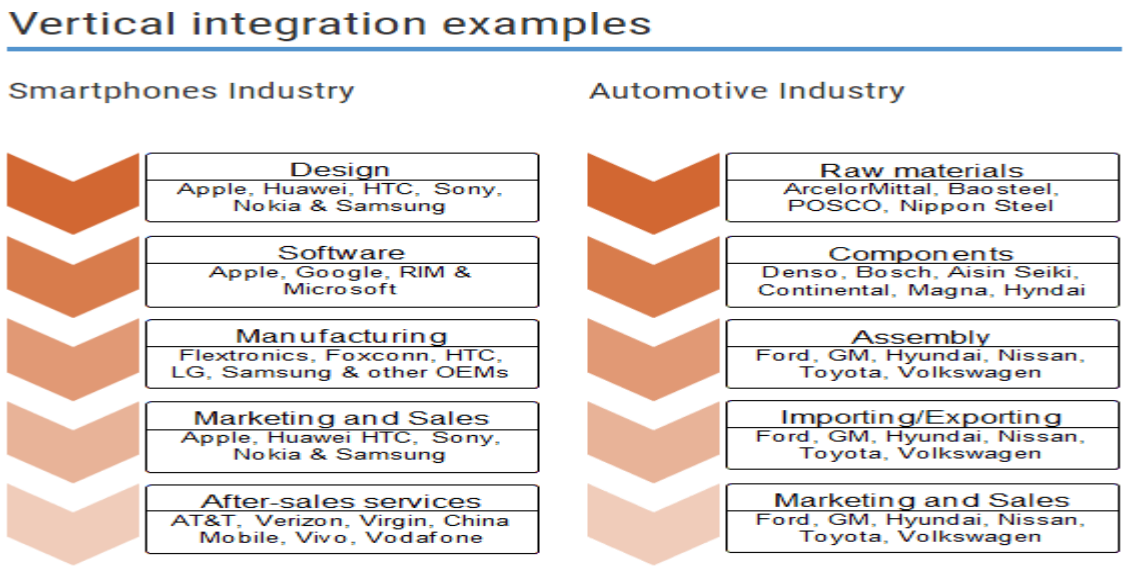
Disadvantages of Vertical integration:

- Higher costs if the company is incapable of managing new activities efficiently;
- The ownership of supply and distribution channels may lead to lower quality products and reduced efficiency because of the lack of competition;
- Increased bureaucracy and higher investments leads to reduced flexibility;
- Higher potential for legal repercussion due to size (An organization may become a monopoly);
- New competencies may clash with old ones and lead to competitive disadvantage.

Alternatives to Vertical integration

This strategy may not always be the best choice for an organization due to a lack of sufficient resources that are needed to venture into a new industry. Sometimes the alternatives to VI offer more benefits.

The available choices differ in the amount of investments required and the integration level. For example, short-term contracts require little integration and much less investments than joint ventures.



(EXAMPLES OF VERTICAL INTEGRATION)

OUT SOURCING- Outsourcing is a practice of hiring a third-party organization to carry out services that were initially performed in-house.

ADVANTAGES-

Reduced or Lowered Costs: This is one of the primary advantages of outsourcing processes because external organizations usually employ specialized technologies that allow them to complete a task faster and at a lower price.

Outsourcing Partner Competency: Another essential advantage of outscoring is the competency of the outsourcing partner. Outsourcing partners are experts in their domain; therefore, they can quickly and efficiently get started on an organizations process.

For instance, an IT company trying to build its digital presence will find more success at a lower cost with a digital agency than if it develops and trains an internal team.

Higher Quality: The outsourcing partners expertise leads to increase quality and better results. These specialists deal with specific tasks with a matter of routine and precision.

For instance, many automobile manufacturing companies outsource their tyre production because other companies can build higher quality tyres than the automotive manufacturer can in-house.

Better Return on Investment: Outsourcing specific processes reduce the cost required to invest in manufacturing plans, equipment needed to produce a particular product, and the labour needed to run the production efficiently. As long as an organization retains the bulk of the profit of the outsourced product or service, the return on investment is impressive.

Increase efficiency – choosing an outsourcing company that specializes in the process or service We want them to carry out for us, can help us to achieve a more productive, efficient service with greater quality.

OUTSOURCING STRATEGY-(MAKE OR BUY ANALYSIS)

It identifies the key issues involved in the process of evaluating whether or not to utilize an outsourcing strategy.

In some circumstances, it might make sense for a company to manufacture a product from sourced raw materials or components.

In others, companies might find it more profitable to pay another company to perform the manufacturing process and then sell the finished product. A major component of planning a supply chain strategy depends on a company's decision as to whether it will make a product, purchase the product to sell to customers or supply a service.

Using a global supply chain strategy, decisions must be made as to where and when these actions will take place because these directly impact the final price. For example, a company can choose to make a product in the following ways:

Make to stock	Companies manufacture a product in anticipation of customer orders.
Make to order	Companies only manufacture a product when they have received a firm order from a customer. Companies can pass orders on to a partnering manufacturer in a foreign market or a manufacturer in a domestic market, or produce the goods at a company manufacturing location.
Configure to order	Companies partially manufacture the product and complete it after a firm customer order is received.
Engineer to order	Companies manufacture a product to unique specifications provided by a customer.

DECISION FACTORS TO TAKE DECISION ON MAKE OR BUY THE PRODUCT/SERVICES-

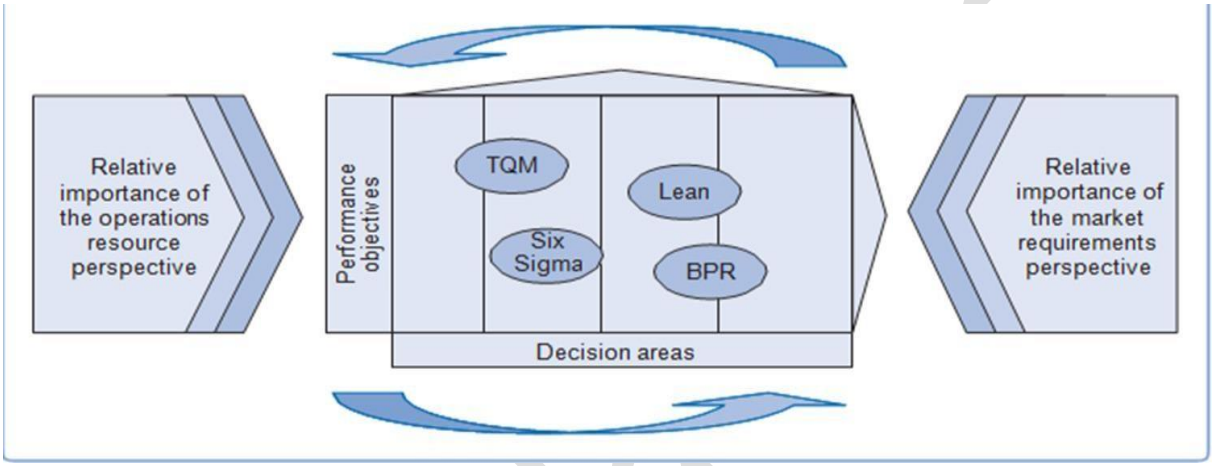
FACTORS	CONDITIONS
Cost	• If the goods or services are to be produced in-house, companies must consider the costs associated with labour and other capital assets. • If the manufacturing will be outsourced to a supplier, companies must factor in the costs of dealing with the supplier and correcting any errors to ensure quality control.
Production Capacity	• If the company does not have adequate production capacity, it can choose to subcontract out some or all aspects of production.
Competitive Advantage	• If a company does not want its competitors gaining knowledge about a proprietary product or process, it should not use external companies to produce its products.
Primary and Secondary Sourcing	• Companies must aim to ensure the supply of goods or services while minimizing the number of suppliers, maintaining quality standards and meeting cost objectives. • In some circumstances, a company will be able to, or will have to, use a sole source for their supplies. • However, the company should always have a contingency plan in case a sole supplier becomes unreliable, is taken over by a competing company or is affected by external events

KEY TAKEAWAYS

- A make-or-buy decision is an act of choosing between manufacturing a product in-house or purchasing it from an external supplier.

- Make-or-buy decisions, like outsourcing decisions, determine whether system of production is cost-effective or not and also determines advantages of producing in-house versus buying it elsewhere.
- There are many factors at play that may tilt a company from making an item in-house or outsourcing it.

BUSINESS PROCESSING WITH SUBSTITUTES IN OPERATIONS-



(Substitutes for operation strategy)

We adopt some of substituted strategies in operations in smooth flow of production. Specially substitutions are quality based which are discussed below.

Some of the strategies are-

- **Total quality management**
- **Lean operations**
- **Business processre engineering**
- **Six Sigma**
- **ERP-Enterprise resource planning**

Total Quality Management (TQM)

Total Quality Management (TQM) is a philosophy and approach which aims to ensure that high quality, as defined by the customer, is a primary concern throughout the organization and all parts of the organization work towards this goal. TQM does not prescribe a number of steps that must be followed in order to achieve high quality but rather should be considered a framework within which organizations can work. The TQM process will be dependent on factors such as customer needs, employee skills and the current state of quality management within the organization.

TQM is a philosophy that stresses:

1. The customer defines quality and thus, their needs must be met.
2. Quality is the responsibility of all employees in all parts of the organization , Identify and minimize all costs of quality
3. A continuous improvement culture must be developed to instill a culture which recognizes the importance of quality to performance.
4. A use of systems and procedures for improvement

TQM techniques

2 techniques associated with TQM and used to improve quality in operations are Statistical Process Control (SPC) and Six Sigma.

Statistical Process Control (SPC)-Statistical Process Control (SPC) is a sampling technique which checks the quality of an item which is engaged in a process. SPC should be seen as a quality check for process rather than product design.

Quality should be built in to the product during the design stage. SPC works by identifying the nature of variations in a process, which are classified as being caused by 'chance' causes or 'assignable' causes.

Chance Causes of Variation

All processes will have some inherent variability due to factors such as ambient temperature, wear of moving parts or slight variations in the composition of the material that is being processed. The technique of SPC involves calculating the limits of these chance-cause variations for a stable system, so any problems with the process can be identified quickly.

Assignable Causes of Variation

If an 'out-of-control' process is discovered, then it is assumed to have been caused by an assignable cause of variation. This is a variation in the process which is not due to random variation but can be attributed to some change in the process, which needs to be investigated and rectified.

The limits of the chance-cause variations are called control limits and are shown on a control chart, which also shows sample data of the measured characteristic over time. There are control limits above and below the target value for the measurement, termed the upper control limit (UCL) and lower control limit (LCL) respectively.

Six Sigma-Six Sigma is a quality improvement initiative to achieve quality levels which are within 6 sigma control limits, **corresponding to a rate of 3.4 defective parts per million (PPM).** Thus 6 sigma can be defined as the process of comparing process outputs against customer requirements.

However 6-sigma has developed from this examination of process variation to become a companywide initiative to reduce costs through process efficiency and increase revenues through process effectiveness.

6 sigma has an emphasis on training – level of expertise is denoted by black belt, green belt etc. Six Sigma contains plans for both increasing effectiveness and efficiency leading to so increased revenues and thus improving company performance.

Improving Effectiveness

The level of effectiveness of the organization is reflected in the level of customer satisfaction. This means that efforts to improve effectiveness will focus on identifying and meeting internal and external customer requirements.

Improving Efficiency

The aim of every process improvement approach using Six Sigma is to achieve measurable cost savings through a focus on decreasing process variation.

The DMAIC Methodology

6 sigma incorporates a structured approach to improvement called DMAIC. This is a five step methodology of define, measure, analyze, improve and control and is used to both improve process performance and to improve process or product design. It is a cyclical approach like the PDCA cycle.

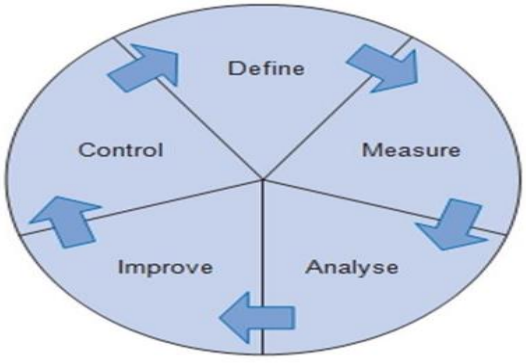
-- ***Define*** **– Identify a potential area of improvement and define the project scope.**

-- ***Measure*** **– Decide what characteristics of the process require improvement.**

-- ***Analyze*** **– Use the data collected in the measure phase to document current performance.**

-- ***Improve*** **– Eliminate the root causes of non-random variation to achieve improvements in predictability, dispersion and centering.**

-- ***Control*** **– Verify and embed the change through the use of techniques such as control charts.**



Lean operations-

Three key elements of Lean Operations are eliminate waste, involve everyone and continuous improvement.

Eliminate Waste

Waste is considered as any activity which does not add value to the operation. The priority should be to avoid these wastes-

Overproduction – making too much, too early

Waiting – Need to keep a flow of material/customers

Unnecessary Motions – ergonomics and layout

Involvement of Everyone

Some organizations view the lean approach as consisting almost exclusively of waste elimination. However effective waste elimination is best achieved through changes in staff behavior.

Lean aims to create a new culture in which all employees are encouraged to contribute to improvement efforts through generating ideas. In order to undertake this level of involvement the organization will provide training to staff in a wide range of areas, including techniques such as statistical process control (SPC) and more general problem solving techniques.

Continuous Improvement (CI)-

Continuous Improvement or Kaizen, the Japanese term, is a philosophy which believes that it is possible to get to the ideals of Lean by a continuous stream of improvements over time. Continuous Improvement is needed because customer's views are continually changing and standards are rising. Kaizen is about moving tacit knowledge to explicit knowledge.

CI enables ideas held tacitly to be explicitly incorporated by the organization.

Principles for implementing a continuous improvement effort include:

- *Create a mind-set for improvement*. Do not accept that the present way of doing things is necessarily the best. -- *Try and try again*. Don't seek immediate perfection but move to your goal by small improvements, checkingfor mistakes as you progress.
- *THINK*. Get to the real cause of the problem - ask why? five times.
- *Work in Teams*. Use the ideas from a number of people to brainstorm new ways.
- *Recognize that improvement knows no limits*. Get in the habit of always looking for better ways of doingthings.

Implementing Lean

The 'lean' approach aims to meet demand instantly, deliver perfect quality and eliminate waste in all its forms. One of the ways it does this is through replacing the traditional push production system with a pull production system sometimes called 'lean synchronization'. Other techniques include setup reduction and total preventative maintenance.

PUSH SYSTEM IN PRODUCTION-

In a push system, production is scheduled to meet the forecasted rate of demand. Also known as mass production, the push method has been around for centuries and this kind of system can easily become a wasteful strategy.

There are no limits on WIP and products are processed in large batches before moved down the production line or into storage.

An inaccurate prediction in this system can have a major impact on inventory levels or cycle times.

PULL SYSTEM IN PRODUCTION-

Pull systems on the other hand, are dependent on actual customer demand.

The idea is that nothing is made, and no process is started without a submitted order from the customer. But it's virtually impossible for an organization to order materials and plan a strict pull system.

We can develop a system that not only works for your specific product and facility but sets your organization up for Lean success through pull system.

JIT AND KANBAN FOR PULL SYSTEM-

Arguably the most important tool in operating this kind of production method is Kanban, a tool also developed by the Toyota Motor Corporation.

Kanban uses visual cues, like cards or bins, to trigger an action further down the production line.

Processes (like value-added activities) only occur when the bin or card is received, and operators ensure only quality products are moving to the next stage.

A system using JIT manufacturing and following the principles of Lean with a pull system will find their system is much more flexible.

It ensures production is only happening effectively eliminating overproduction and over-processing, which can hide defects and cause a whole bevy of other wastes.

Business Process Reengineering (BPR)

The fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service and speed' is called BPR.

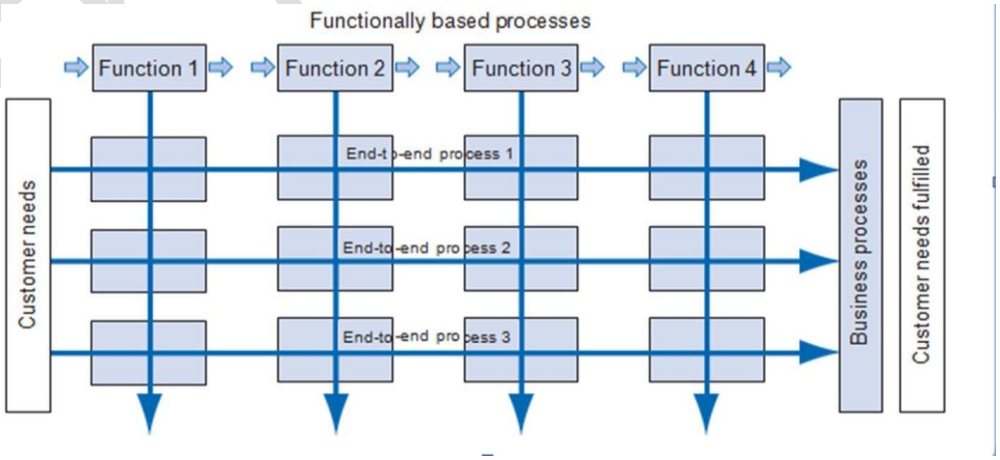
Implementing Business Process Redesign

The task of designing processes should be undertaken in a structured manner and the steps involved can be described as:

- Identifying and documenting the process activities
- Identifying processes for improvement
- Evaluating process design alternatives

1. **Identifying and documenting the process activities-** The identification of activities in a current process design is a data collection exercise using methods such as examination of current documentation, interviews, and observation. In order to provide a framework for the design and improvement of service processes, the techniques of process mapping and service blueprinting can be utilized.
2. **Identifying processes for improvement-** The identification of the relevant business processes for improvement can be undertaken using a scoring system in which prioritization is governed by importance to customers and performance against competitors.
3. **Evaluating Process Design Alternatives-** There are many ways in which a process can be designed to meet particular objectives and so it is necessary to generate a range of innovative solutions for evaluation. Three approaches which can be used to generate new ideas are:

   - **Generating new designs through brainstorming-**This approach offers the greatest scope for radical improvements to the process design but represents a risk in the implementation of a totally new approach.
   - **Modifying Existing Designs-**This approach is less risky and means the opportunity for a radical improvement if process design is missed.
   - **Using an established 'benchmark' design-**This approach applies the idea of identifying the best-in-class performer for the particular process in question and adopting that design.



(BPR PROCESS IN INDUSTRY)

Enterprise Resource Planning (ERP)

ERP is an information system that aims to manage the large amounts of data in an organization. ERP integrates sales, order, inventory, manufacturing and customer service activities. ERP systems provide software, databases, procedures and job descriptions for organization wide processes. The characteristics of ERP are:

-- Provides a cross-functional process view of the organization.

-- ERP applications include a set of inherent processes for all organizational activities. These processes may be documented in the form of a diagram, sometimes called a process blueprint.

-- Generally organizations must adapt their processes to the blueprint, although it may be possible to adapt ERP software to organizational procedures.

-- ERP stores information in a centralized database.

Manual Procurement Process

1. **Create Order**-Physically check for stock levels and Gather forms with previous purchases and potential suppliers
2. **Get Quotes**-Prepare forms requesting availability and pricing information and Collate quotation letters
3. **Approve Order**-Transfer requisition information to purchase orders and send to selected suppliers
4. **Receive Products and Services**-Match purchase order to delivery list when delivered and Generate goods receipt form
5. **Make Payment**-Match invoice from supplier with purchase order and goods receipt document Authorize and send payment.

But ERP Procurement Process follows-

ERP supports the procurement process by:

- **Supporting the execution of the process-** Documents can be quickly and easily created and stored in the system
- **Capture and store data-** For example all stock levels and supplier information displayed on purchase requisition screen All forms (goods receipt, purchase order, invoice) held on database for checking.
- **Help monitor performance**-Automatically generate exception reports if problems occur and Provides a variety of reports in response to queries

(HOLISTIC ASPECT OF ERP)

OPERATION STRATEGY IMPLEMENTATION-

- Operations strategy implementation is the way that strategies are operationalised or executed.
- It involves the processes that attempt to ensure that strategies are achieved.
- Implementation is an important part of operations strategy, even if it does come at the end of the operations strategy process.
- The way one implements any strategy will very much depend on the specific nature of the changes implied by that strategy and the organizational and environmental conditions that apply during its implementation.

What is operation strategy implementation?

One way of thinking about the underlying purpose of an operations strategy implementation is to use the 'line of fit', or alignment model.

Operations strategy can be illustrated by its position relative to its operations resource capabilities, the requirements of its markets, and the degree of 'fit' or alignment between them.

We focus on the idea of achieving sustainable alignment (implementation) between operations resource capabilities and market requirements.

We also stressed the difficulty of achieving alignment because of uncertain markets and operations resource capabilities.

In the given Figure moving along the market requirements dimension indicates a change in intended market performance. Moving along the operations resource capabilities dimension indicates changes in operations capabilities.

Using this model gives us a starting point for understanding the purpose of the operations degree of change involved in the strategy implementation. It is important to be clear regarding how much change is intended.

So, if, in Figure, point A is the current operations strategy and point B is the intended operations strategy, it is necessary to develop an understanding of current and intended market requirements and operations resource capabilities.

Certainly, without such an understanding it is difficult to expect the whole organization to comprehend why, how, and how much, things are going to change when the new strategy is implemented.

UNDERSTANDING- From this implementation phase we conclude that there is simultaneous correlation between market operations with operation resource. But, During the implementation from A to B in Figure the balance between market requirements and operations resource capabilities may not always be maintained. Sometimes the market may expect something that the operation cannot (temporarily) deliver. Sometimes operations may have capabilities that cannot be exploited in the market. At a strategic level, there are risks deriving from a failure to achieve fit between operations resources and market requirements.

To resolve this problem **a staff and line method strategy** has to be adopted.

STAFF AND LINE METHOD-

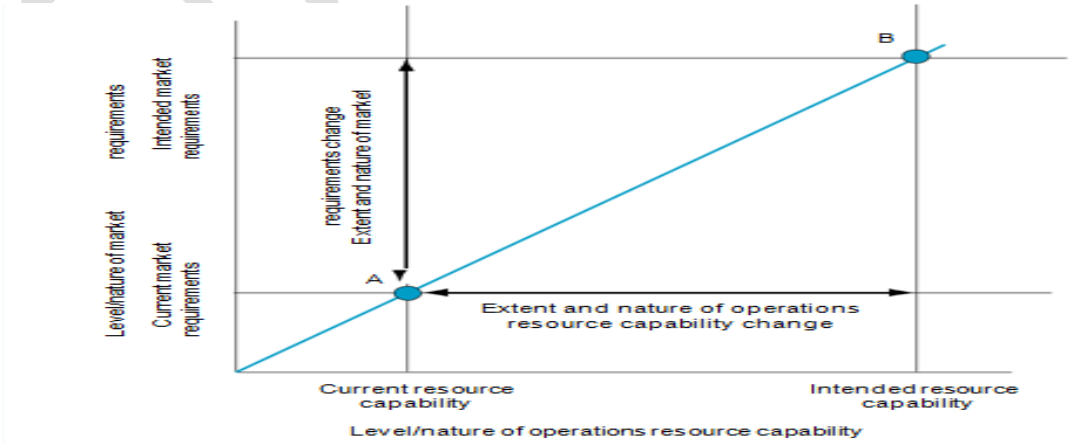
Staff and line are names given to different types of functions in organizations.

A "line function" is one that directly advances an organization in its core work.

This always includes production and sales, and also marketing. A "staff function" supports the organization with specialized advisory and support functions. For example, human resources, accounting, public relations and the legal department are generally considered to be staff functions.

Line is the production line of organization.

Both should be proportional to each other then only implementation of strategy will be matched with the present Assessment of market by staffs of organisation. Then only operational resource can be match with market preferences of customer for that particular designed product.



(OPERATION STRATEGY IMPLEMENTATION BY LINE OF FIT)

SERVICE STRATEGY IN OPERATIONS-

Operations management for services has the functional responsibility for producing the services of an organization and providing them directly to its customers. It specifically deals with decisions required by operations managers for simultaneous production and consumption of an intangible product. These decisions concern the process, people, information and the system that produces and delivers the service.

The services sector treats services as intangible products, service as a customer experience and service as a package of facilitating goods and services. Significant aspects of service as a product are a basis for guiding decisions made by service operations managers.

The extent and variety of services industries in which operations managers make decisions provides the context for decision making.

The six types of decisions made by operations managers in service organizations are:

- process,
- quality management,
- capacity & scheduling,
- inventory,
- service supply chain and
- information technology

Definition of services

According to this definition, service is something that cannot be manufactured. It can be added after manufacturing or it can stand alone as a service delivered directly to the customer.This definition has been expanded to include such ideas as "service is a customer experience."In this case the customer is brought into the definition as the experience the customer receives while "consuming" the service.

A third definition of service concerns the perceived service as consisting of physical facilitating goods, explicit service and implicit service. In this case the facilitating goods are the buildings and inventory used to provide the service. For example, in a restaurant the facilitating goods are the building and the food.

Service Design

Service design is the activity of planning and organizing people, infrastructure, communication and material components of a service in order to improve its quality and the interaction between the service provider and its users.

Mass Customization

Mass customization is based on the assumption that market requirements are becoming increasingly fragmented,whileoperationsresourcesareallowingagreaterdegreeofflexibilityandresponsiveness.Thereforem asscustomisationaimsto 'mass produce' a basic family of products or services which can still be customized to the needs of individual customers. In terms of product and service design this will often involve the standardization and modularization of components to increase variety while reducing production costs.

Operations decisions in service sector

Process decisions-

Process decisions include the physical processes and the people that deliver the services to the customer. A service process consists of all the routines, tasks and steps that are used to deliver service to customers along with the jobs and training for service employees. There are many ways to organize a process to provide customer service in an effective and efficient manner to deliver the service-product bundle. Several ideas have been advanced on how to design a service process.

IDEAS OF PROCESSING IN SERVICES-

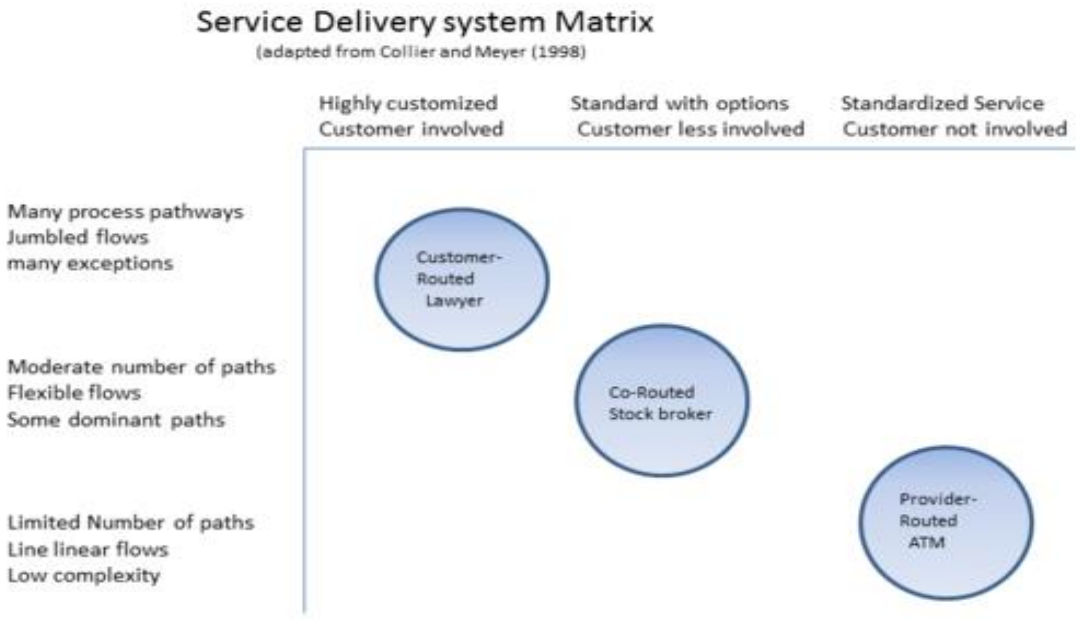
Customer contact- Design of a *service system* must consider the degree of customer contact. High-contact also provides the possibility of self-service where customers provide part of the service themselves.

Production-line approach- service processes could be made more efficient by standardizing them and automating them like manufacturing.
Example- McDonald's that has standardized both the services at the front counter and the backroom for producing the food. They have limited the menu, simplified the jobs, trained the managers (at "Hamburger U"), automated production and instituted standards for courtesy, cleanliness, speed and quality.

McDonald's has become a model for other service processes which have been designed for high efficiency, not only in fast food, but in many other services. At the same time, it leaves open the option for more customized and flexible services for customers who are willing to pay more for "better" or more personalized service.

Service process matrices- any different service process matrices have been proposed for explaining the relationship between service products that are selected and corresponding processes.

The Service Delivery System Matrix by Collier and Meyer (1998) illustrates the various types of routings used for service process depending on the amount of customization and customer involvement in the process.



Self-service- When self-service is accepted by the customer, it can reduce costs and even provide better service in the customer's eyes—faster service with less hassle.
Self-service falls in the provider-routed or co-routed part of the Service delivery matrix. Services that were previously customer-routed have been moved down the diagonal to be more efficient and accepted by customers.

Service Blueprint - The service blueprint is a way to describe the flow of a customer through a service operation from the start to the finish, along with the actions provided by the service providers in interaction with the customer.

Lean thinking- If *lean thinking* is applied, the time taken for each step in a service blueprint flowchart can be recorded, or a separate value-stream map can be constructed. Then the process can be analyzed for time reductions to reduce waiting and non-value added steps.
Changes are made to reducetime and waste in the process. Waste is anything that does not add value to the process including waiting time in line, customer hassle, and defects in service. But, lean thinking also requires attention to the customer and the people providing the service. It is important to apply important principles such as completely solve the customer's problem, don't waste time and provide exactly what the customer requires.

Queuing- Queuing is an analytic method for determining waiting time when customers must wait in line to get service. The length of the queue and waiting time can be calculated based on the arrival rate, service rate, number of servers and type of lines.

It should be predicted that the average service time must be significantly less than the average time between arrivals when there is randomness in arrivals and/or service time.

Service-profit chain- The service-profit chain links various aspects and tasks required to deliver superior service and profits. It starts with a high level of internal quality leading to employee satisfaction and productivity to deliver superior external customer service leading to customer satisfaction, customer loyalty and finally high revenues and profits.

Internal service Quality	-->	Employee Satisfaction & Productivity	---->	External Service Value	--->	Customer Satisfaction	---->	Customer Loyalty	--->	Revenue Growth &Profitability

Every link in this chain is important and the linkage between the service providers and the customer is essential in service operations. The service manager should not break any of the links in order to receive the results of high probability and growth.

1. QUALITY MANAGEMENT IN SERVICES-

SERVQUAL measurement- Using the customer experience approach, a questionnaire called SERVQUAL has been developed to measure the customer's perception of the service. The dimensions of SERVQUAL are designed to measure the customer experience in both explicit and implicit measures. The dimensions are:

1. Tangible: Cleanliness, appearance of facilities and employees
2. Reliability: Accurate, dependable and consistent services without errors
3. Responsiveness: Promptly assist customers in a timely manner
4. Assurance: Conveying knowledge, trust and confidence
5. Empathy: Caring, approach-ability and relating to customers

Quality management approaches- Quality management practices for services have much in common with manufacturing, despite the fact that the product is intangible. The following approaches are widely used for quality improvement in both manufacturing and services:

- The Baldrige Awards: A comprehensive framework for quality improvement in organizations
- The W. Edwards Deming Management Method: Fourteen Points for Management
- Juran's Approach: Planning, Improvement and Control
- Six Sigma: DMAIC (Design, Measurement, Analysis, Improvement and Control)

These approaches have several things in common. They begin with defining and measuring the customer's needs (e.g. using SERVQUAL). Any service that does not meet a customer's need is considered a defect. Then these approaches seek to reduce defects through statistical methods, cause-and-effect analysis, problem solving teams, and involvement of employees. They focus on improving the processes that underlie production of the service.

Service recovery- For manufactured products, quality problems are handled through warranties, returns and repair after the product is delivered. In high contact services there is no time to fix quality problems later; they must be handled by *service recovery* as the service is delivered.

Service guarantee- A *service guarantee* is similar to a manufacturing guarantee, except the service product cannot be returned. A service guarantee provides a specific monetary reward for failure of service delivery. Some examples are:

- Your package will be delivered by the time promised or you will not pay.
- We will fix your automobile or give you $100 if you must bring it back for repair.
- Customers that are not satisfied with their haircut, get the next haircut free.

2. CAPACITY MANAGEMENT OF SERVICES-

Forecasting

Forecasting demand is a prerequisite for managing capacity and scheduling. Forecasting demand often uses big data to predict customer behavior. The data comes from scanners at retail locations or other service locations. In some cases traditional time series methods are also used to predict trends and seasonality. Future demand is forecasted based on past demand patterns. Many of the same time-series and statistical methods for forecasting are used for service operations.

Capacity planning

Capacity planning is quite different between manufacturing and services given that service cannot be stored or shipped to another location.

capacity management can attempt to reduce peak demand and level it over time by the following actions in service sector.

- Higher prices during peak-demand times
- A reservation system to limit peak demand
- Advertising and promotion to shift peak demand

Management can also use various methods to manage and increase capacity of services including:

- Part-time labor
- Hiring and Layoff of Employees
- Using Overtime
- Subcontracting

Scheduling

Some of the scheduling applications for services are: scheduling of patients to operating rooms in hospitals and scheduling students to classes. Many scheduling problems have been solved by using operations research methods to optimize the schedule.

Inventory

Inventory management and control is needed in service operations with facilitating goods. Almost every service uses some amount of facilitating goods. The presence of facilitating goods is critical in retail and wholesale operations but these operations don't manufacture anything, rather they distribute goods and provide service while doing it.

One difference from manufacturing inventories is that services use only finished goods, while manufacturing has finished goods, work-in-process and raw-materials inventories.

As a result, manufacturing uses a Materials Requirements Planning System, while services do not. Services use Replenishment inventory control systems such as order-point and periodic-review systems.

3. SUPPLY CHAIN IN SERVICES-

Supply chains for service operations are critical to supply facilitating goods. A typical hospital supply chain is an example. A hospital will use many goods from suppliers to construct and furnish the building. During day-to-day operation of the hospital, inventories of supplies will be held for the operating rooms and throughout the building. The pharmacy will hold drugs and the kitchen will need supplies of food. The supply chain of facilitating goods in hospitals is extensive.

Service inputs are critical for manufacturing including capital from banks, energy, information systems and human resources. Services are part of the manufacturing supply chain.

Both manufacturing and service operations can purchase services from outside the organization. Internal business services such as accounting, legal, human resources, call centers, and information systems may be outsourced in part or entirely. Some of these services can also be purchased from offshore. Logistics services may be outsourced to Third Party Logistics (3PL) providers. These services include transportation, warehousing, order fulfillment, returns and tariffs.

4. INFORMATION TECHNOLOGY IMPLEMENTATION IN SERVICES-

The Internet and information technology has dramatically changed the delivery of services. Some of the major changes are as follows

1. Providing information and knowledge directly to consumers. Before the Internet, consumers used a variety of sources for acquiring knowledge including libraries, phone calls, universities and personal contacts. Now information can be provided immediately as a service by searching the Internet.
2. Providing service at a distance. Services such as call centers, banking, entertainment and legal services can be provided over long distances, even internationally.
3. Reservations can be made on the Internet to reserve capacity more easily than by calling ahead for the reservation.

4. Facilitating goods can be ordered directly by the Internet and delivered without traveling to a retail store. The services provided includes browsing for merchandise, order entry, order checking, payment, order confirmation, notification of delivery and return services.
5. Internal information systems now provide an array of management information to help managers make better decisions.

Management science and operations research (MSOR)

Analysis using MSOR methods has been extensive in services. Areas where they have been heavily applied are in inventory, capacity, scheduling, queuing and forecasting. With the advent of the Internet, information systems, big data and analytics, there are many opportunities to make improvements in decision making for services. The analytic techniques include statistics, management scienceand operations research.

ORGANIZATIONAL STRATEGY IN OPERATIONS FIELD-

STEP1-Define vision and mission-

A Mission Statement defines the company's business, its objectives and its approach to reach those objectives. A Vision Statement describes the desired future position of the company.

Here Elements of Mission and Vision Statements in operations are often combined to provide a statement of the company's purposes, goals and values to be achieved in operations.

STEPS2-Situational analysis of demand, cost, quality-

- Resource availability(assets, capabilities, processes, information, &knowledge)
- Present Competitive advantage trend analysis
- Sustainable competitive advantage(long term)
- Choose alternative in case any failure

STEP3-Need of change

-It is defined as the flow of competitiveness in the operations as well as market flow which have to be changed with respect to changing scenario.

Ex-5G launching planning

STEP4-strategic grouping

A strategic group is a concept used in strategic management that groups companies within an industry that have similar business models or similar combinations of strategies.

So that it would be easy to find resources as per the requirement and effective allocation can be done easily.

STEP5-strategic alternative for risk control in organization

The term **operational risk management** (**ORM**) is defined as a continual cyclic process which includes risk assessment, risk decision making, and implementation of risk controls, which results in acceptance, mitigation, or avoidance of risk.

3 tier implementation in organisation-

In Depth- In depth risk management is used before a project is implemented, when there is plenty of time to plan and prepare. Examples of in depth methods include training, drafting instructions and requirements, and acquiring personal protective equipment.

Deliberate-Deliberate risk management is used at routine periods through the implementation of a project or process. Examples include quality assurance, on-the-job training, safety briefs, performance reviews, and safety checks.

Time Critical-Time critical risk management is used during operational exercises or execution of tasks. It is defined as the effective use of all available resources by individuals, crews, and teams to safely and effectively accomplish the mission or task using risk management concepts when time and resources are limited.

SWOT ANALYSIS OF OPERATIONS IN ORGANIZATION-

- In operations of corporate, The **SWOT analysis definition** takes into consideration the weaknesses and strengths of the organization along with the threats and opportunities it faces in the external environment.
- Based on these factors, the company determines its future course of action, combining its strengths with imminent opportunities while trying to overcome weaknesses and combat threats in oprations.

Positioning Strategies in organization (Porter's generic strategy- application in operations field of corporates)

The Cost Leadership Strategy

- In cost leadership, the aim of a firm is to become the low-cost producer in the industry.
- The ways to implement cost advantage strategy depends and varies according to the structure of the industry. It includes technology, access to raw materials, economies of scale and other factors.

Differentiation Strategy

- In a differentiation strategy, the aim of a firm is to offer products or services that are unique and more attractive as compared to the competitors' product.
- Their focus is to become unique in its industry.
- To make it possible, companies choose one or more attributes that many buyers in an industry perceive as unique and important.

The Focus Strategy

- With the generic strategy of Focus, companies concentrate on particular niche markets in the industry.
- They analyze the market dynamic forces and the unique needs of customers within it, before developing uniquely low-cost or well-specified products for the market.
- Example-Gold, Costly hospital equipments

(PORTERS GENERIC STRATEGY MATRIX IN ORGANISATION)

CAPACITY STRATEGY AND MANAGEMENT-

Capacity Management

The setting of capacity to meet the demands of the organization is termed capacity management. The capacity management activity should be taken using a systematic approach using the following steps:

Measure Demand
Measure Capacity
Reconcile Capacity and Demand
Evaluate alternatives and make a choice

Measure Demand

This is usually the responsibility of marketing. An accurate demand forecast is needed of the units of capacity required over the medium term (not just income). Because a forecast can never be completely accurate it is useful to have a estimate of how much the demand might vary around an average value. Demand Forecasts may well after take into account:

-- Seasonality Effects over a year. Demand Seasonality due to climate, social, financial etc. and supply seasonality, eg. Food

-- Demand may also fluctuate over days and weeks.

Accurate forecasts are an important factor in enabling organizations to deliver goods and services to the customer when required and thus achieve a quality service. The accuracy of a forecast is also dependent on the time horizon over which the forecast is derived. Forecasts for short time horizons tend to be more accurate than for longer-term forecasts, so one way of improving accuracy is shortening the lead-time necessary for the organization to respond to a forecast. In order to produce accurate forecasts an organisation must collect up-to-date data on relevant information such as prices and sales volumes and choose an appropriate forecasting technique.

Measure Capacity

Capacity is not fixed but is a variable that is dependent on a number of factors. Capacity takes many different forms such as storage space, employee skills availability, equipment numbers and transportation facilities. Capacity is time-based and so capacity under-utilized due to a drop in demand cannot be used later when demand increases. Thus the actual capacity available will be less the more demand fluctuates.

Further factors that effect the measurement of capacity include the location of capacity. In services the time spent travelling to the location of the service delivery point can effect capacity. For example more letters can be delivered by one person in a city than in the country. Professional services will require extension customer contact which may vary greatly depending on the individual customer's needs. The effective capacity of the whole system may depend on a bottleneck resource. Two further issues to consider when measuring capacity are product mix and the definitions of design capacity.

Only when a narrow product (or service) range is involved can capacity be measured reasonably accurately and in this case be quoted in terms of output volume. With a changing product mix therefore it may be more useful to measure capacity in terms of input measures, which provides some indication of the potential output. For example in hospitals which undertake a range of activities, capacity is often measured in terms of beds available, an input measure. An output measure such as number of patients treated per week will be highly dependent on the mix of activities the hospital performs

Reconcile Capacity and Demand

Methods for reconciling capacity and demand can be classified into three 'pure' strategies of:

-- Level Capacity
-- Chase Demand
-- Demand Management.

Level Capacity

This capacity planning strategy sets processing capacity at a uniform level throughout the planning period regardless of fluctuations in forecast demand. This means production is set at a fixed rate, usually to meet average demand and inventory is used to absorb variations in demand. For a service organization output cannot be stored as inventory so a level capacity plan involves running at a uniformly high level of capacity. High utilisation, but poor service levels may result if this level is not sufficiently high.

Chase Demand

This strategy seeks to match output to the demand pattern over time. Capacity is altered by such policies as changing the amount of part-time staff, changing the amount of staff availability through overtime working, changing equipment levels and subcontracting. The chase demand strategy is costly in terms of the costs of activities such as changing staffing levels and overtime payments. The costs may be particularly high in industries in which skills are scarce.

Demand Management

While the level capacity and chase demand strategies aim to adjust capacity to match demand, the demand management strategy attempts to adjust demand to meet available capacity. There are many ways this can be done, but most will involve altering the marketing mix (e.g. price, promotion etc.) and will require co-ordination with the marketing function.

Evaluate alternatives & make a choice(DECISION)

Capacity management involves evaluating the capacity requirements and determining the best way to meet these using a capacity management approach which is feasible and low cost. In order to choose a capacity plan which meets the above criteria it is necessary to try to predict the consequences of that plan. This can be done with varying levels of accuracy and cost using the following methods:

-- **Cumulative Representations**

A running total or cumulative count of inventory, which should always meet or exceed cumulative demand.

It is used to ensure no stock-outs occur when using a level capacity plan.

-- Queuing

Theory and Simulation

Waiting time in queues is caused by fluctuations in arrival rates and variability in service times. Queuing theory can be used to explore the trade-off between the amount of capacity and the level of demand. Equations are given for single channel and multiple channel systems. These equations have been criticised because they make a number of assumptions. Simulation can give a more accurate estimate of capacity than queuing theory for a particular product mix.

--The Psychology of Queuing

A series of propositions which can be used by service organisations to instigate policies to influence customer satisfaction with waiting times. For example unoccupied time feels longer than occupied time, anxiety makes waits seem longer, unexplained waits are longer than explained waits and the more valuable the service the longer the customer will wait. These propositions may lead to the use of signs informing customers of how long they will need to wait for service for example.

TYPES OF CAPACITY-

Capacity is defined under 3 categories; design capacity, effective capacity and actual capacity. The operations utilisation of resources and the efficiency of its processes can then be calculated using these.

Design Capacity

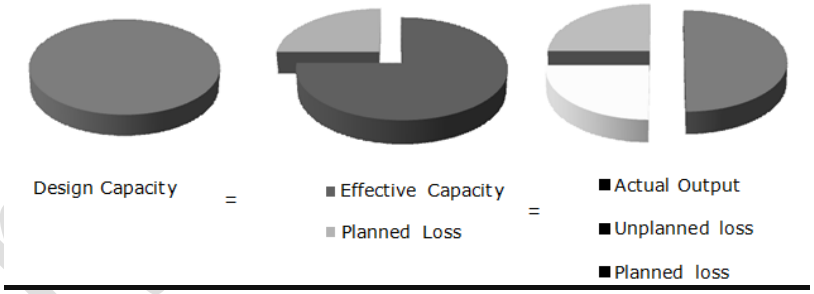
This is a theoretical number and not one that is applied to the daily production of an operation. Design capacity is the output that an operation can produce continuously, at ***maximum rate without stopping*** for any shift changeovers, maintenance or any other delays. What the process is capable of producing under perfect conditions. In some cases this might be interpreted as maximum capacity.

Effective Capacity

This considers how the operation will run on a long term basis, how it will be staffed and how it will be maintained. All ***planned*** stoppages under the normal working time frame are taken into consideration. This can also be known as *available capacity.* These stoppages may include shift changeovers, lunch breaks, set up times and many other operational factors.

Actual capacity

This is the same as effective capacity but contains ***unplanned losses*** as well as planned ones. These could include poor work rate, absenteeism or new staff training for example.



Actual output plus unplanned losses is the same as effective capacity. Therefore the operation which is working its assets efficiently is minimizing unplanned losses.

Efficiency and Utilisation Calculations

For the efficient use of the resources available, efficiency is output shown as a percentage of available capacity.

$$Efficiency = \frac{\text{actual output}}{\text{effective capacity}}$$

For an operation that has been well designed, there will be minimal planned losses. This allows the resources to be used to the best of their ability. Capacity utilisation is the measure of how much of the available capacity is used. Utilisation is output shown as a percentage of the

facilities or designed capacity.

$$Utilisation = \frac{\text{actual output}}{\text{design capacity}}$$

For example if the fitness trainer in the previous example only had 24 clients who arrive at their appointments on time, the calculation would be:

$$Utilisation = \frac{24}{30} = 80\% \times 100$$

Therefore the utilisation rate is 80%

These measures of capacity can tell an operation how well they are utilising their resources and how efficient the manufacturing process is.

Capacity Planning

When capacity needs to be increased or decreased, the operation must consider how this is going to be achieved. This is a key decision as the organization will have to make investment decisions based upon what level of capacity is to be selected and when it is to be provided. The operation has several ways in which it can respond to the changes in demand with its provision of capacity. The decision to provide capacity depends upon the selected strategy and the ability to store the product or timeliness of service production. The timing decisions of how and when to provide capacity need to be determined in line with demand.

Capacity Planning Methods

The organisation has 3 main choices;

1. It can provide capacity a head of the forecast so that it is ready to respond immediately which is known as a ***capacity leads demand*** strategy.
2. It can provide capacity as demand changes so that it expands and contracts its capacity to follow demand, which is a ***capacity match's demand*** strategy.
3. It can wait to see what demand is and then respond after it is confirmed, a capacity lags ***demand*** strategy.

Capacity Leads Demand

It is possible to have capacity ready to react to an increase in demand as ready and available capacity. This is where a buffer is provided in order to allow the operation to react quickly to increases in demand. This strategy adds capacity in anticipation of extra demand and is therefore an opportunistic strategy with the purpose of attracting customers away from competitors. This capacity strategy has an advantage in that the operation is ready to satisfy customer demand and meet short term opportunities.

However there is a risk of demand not rising and the operation is then left with the wasted costs of unused capacity.

It is a more expensive way of providing capacity as it requires investment to be made ahead of demand, but it is a useful strategy if the organisation is trying to build market share and the benefit of establishing a customer relationship outweighs the cost of providing excess capacity.

An example of a capacity leads demand approach would be an extension to a lecture theatre being built before student numbers were confirmed.

Capacity Matches Demand

For the provision of capacity in line with demand then this strategy is adopted. This is done by adding capacity in measured amounts in response to changing demand in the market. This is usually accomplished by flexible addition of capacity either from flexible labour or flexible facilities that are able to meet the demand upon requirement. Either good planning is in place or there is a risk of underutilized resources.

This strategy relies heavily on forecasting and accurate information as investment decisions are made in line with the forecast. Incorrect forecasting will cause missed opportunities or wasted resources.

This often happens in services where staff are the flexible resource and can be brought in to cover peak demand yet sent home in quieter times, such as a toy store catering to Christmas demand or a restaurant expanding and contracting capacity in line with anticipates peaks and troughs in customer demand.

Capacity lags demand

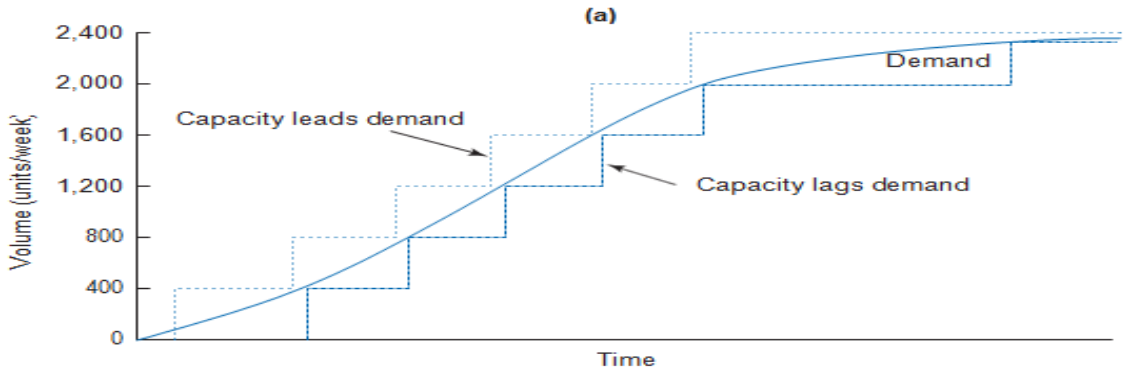
Here increments of capacity are only added after the demand has increased by providing capacity after the demand rises. This allows the organization to provide capacity with certainty and reduces the risk of incorrect investment into capacity increases. However this method does rely on the ability to provide products and services on short lead-time and assumes that the customer is prepared to wait.

This is less risky than providing investment ahead of demand; however, it has the disadvantage that customers may not be prepared to wait for the product or service and opportunities can therefore be lost.

Producing products on a lead time can be frustrating for customers, it can be almost impossible to buy a sofa from a store and have it delivered on the day, most have a four week lead time to allow the manufacturers to plan their capacity ahead of time. This is becoming an increasingly unusual strategy for consumer goods as consumers are often less tolerant of waiting.

LAGGING, LEADING AND MATCHING PHASE

Figure 4.8 (a) Capacity-leading and capacity-lagging strategies and (b) smoothing with inventory means using the excess capacity of one period to produce inventory which can be used to supply the under-capacity period



Measuring capacity

When measuring capacity the unit of measure can be either an input or an output to the process. The key is to take the most logical unit that reflects the ability of the operation to create its product or service. However, where the input is more complicated to measure, such as machine hours on a process layout, then output is a more suitable measure. The unit of time could be a minute, an hour, a day or a week, or whatever time scale fits the operation, but the unit of output and time scale needs to be consistent.

Input measures of capacity

When using input measures of capacity, the measure selected is defined by the key input into the process. Where the provision of capacity is fixed, it is often easier to measure capacity by inputs, for example; rooms available in a hotel or seats at a conference venue. Input measures are most appropriate for small processes or where capacity is relatively fixed, or for highly customized or variable outputs such as complicated services.

Output measures of capacity

The output measures count the finished units from the process such as mobile phones produced in a day or cars manufactured per week. This measure is best used where there is low variety in the product mix or limited customization.

Table An example of possible input or output measures.

Process	Input capacity measure	Output capacity measure
Music festival	Square metres of land	Number of festival attendees
Hotel	Rooms available	Number of guests per week
Car Manufacturing plant	Machine capacity	Cars produced per month
Milk Bottling Plant	Machine hours available	Bottles filled per day
Lecture theatre	Number of seats available	Students on courses
Wedding planning service	Consultants available	Weddings per season

Capacity can be measured from looking at the operation as a whole and then calculated on the

resources and facilities available and process time. Table shows the alternatives that can be used for input/output measures.

For example, the measure of output capacity could be cars per shift or tones per hour or customers per day. However, the capacity of a surgeon or a University Professor may not be measured in this manner. In these cases, capacity could be shown in the form of working hours per week.

A simple formula for capacity can be:

$$Capacity = \frac{\text{Time available}}{\text{Time of task}}$$

For example, a service provider works an eight hour day, takes two fifteen minute coffee breaks and has a half hour lunch break. The time available for work is seven hours per worker per day.

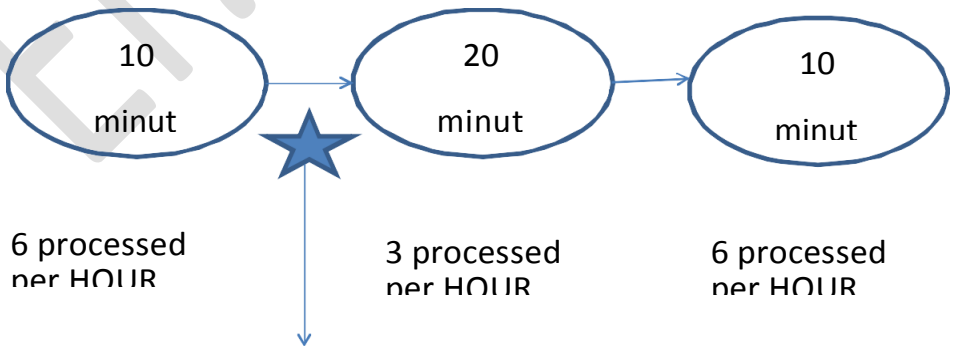
If this particular worker was fitness instructor and he spends 70 minutes with each customer (10 minutes for the consultation and booking and 1 hour for the gym session), how many clients could the instructor process during a five day week?

$$\frac{7 \text{ hours per day} \times 60 \text{ minutes per hour}}{70 \text{ minutes per client}} \times 5 = 30 \text{ clients per week}$$

30 Clients per week can be expressed as the capacity of the fitness operation.
This is a simplified measure as it presumes that the fitness instructor doesn't have time off sick or do any other activities such as maintain the gym equipment or diversify into other areas such as taking classes. Most processes will not have just one activity; many will have interlinking processes with different capacity constraints on each.

Here the operation will have to consider the capacity of the whole process and not individual constituent processes. Also the individual process durations may differ. If the first part of the process takes 10 minutes but stage 2 takes 20 minutes and stage three takes 10 minutes then a backlog will appear at stage 2.

Figure shows the bottleneck point in a simple process



Bottleneck

The diagram shows that the output of a process will be constrained by the slowest point. This is referred to as a 'bottleneck' in the process.

However it is not always possible to accurately predict how long each stage is actually going to take. A hair dresser, for example, may allocate thirty minutes to each haircut, forty minutes to each hair colorant and ten minutes to styling, but individual customers may take more time and others less. In such circumstances it may not be possible to accurately locate the bottleneck in variable processes.

This shows an important feature of capacity planning, assumptions must be made as to what the process is capable of in order to understand the output of the operation. However, although assumptions are needed to plan the process, often in reality these assumptions can be found to be inaccurate.

Capacity Timing

The ability to increase or decrease capacity can be viewed in 3 time phases; short term, medium term and long term.

Short-term planning – this is a reactive time scale and can be as immediate as adjusting capacity on the same day or on a time scale of up to around 3 months (depending on the industry) Here, only flexible resources can be applied to increase the capacity. It may be costly to the operation as the speed of readjusting the resources may be higher on short term timescales. In many cases employees are the most readily available resource. Examples of this may in evolve measures such as;

- Over time for existing staff
- Having multi-skilled staff who can be reallocated to where a bottle neck has occurred. An example of this could be the tannoy call in a supermarket requesting, *'all till trained staff to report to the checkout'* in order to increase the capacity for payment, where queues are backing up at the checkout.

Medium-term planning – this time scale is beyond the immediate managing of the operation and has a horizon of around 3 – 18 months. This gives the operation more time to make plans to adjust capacity and therefore the changes are more significant than the short term plans.

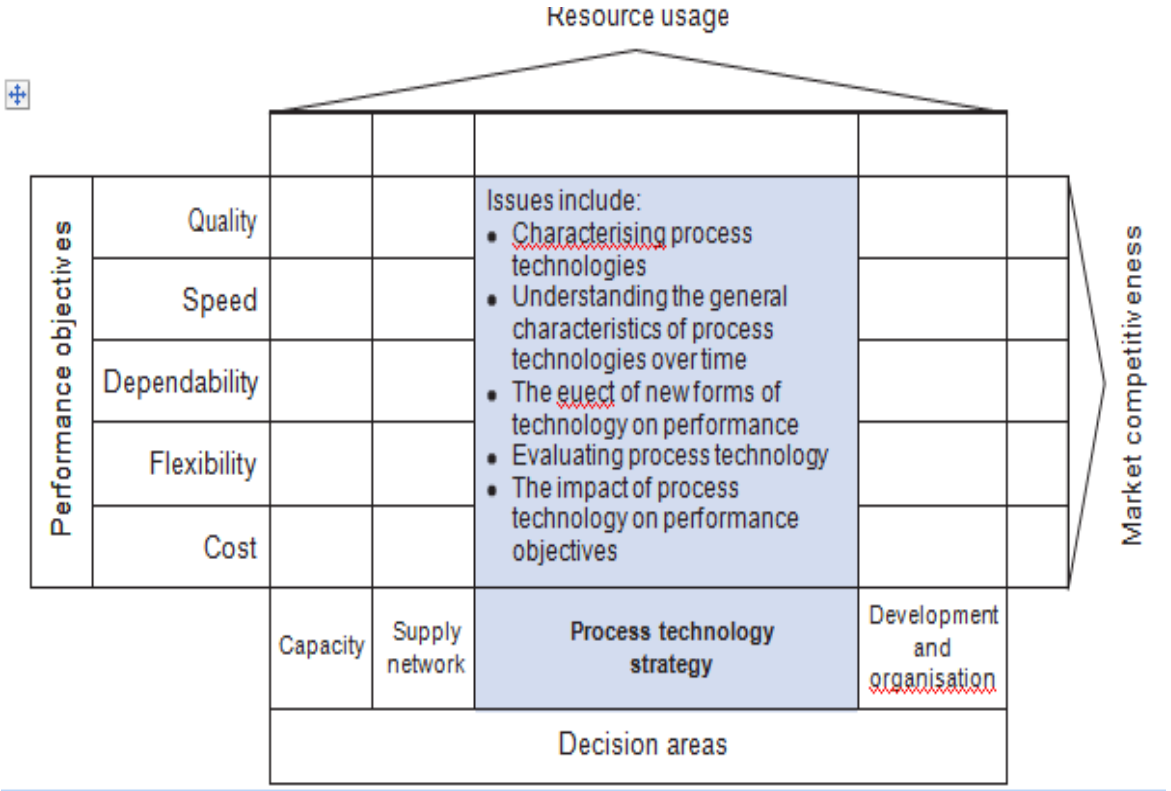
- Hiring or firing contract staff
- Leasing in facilities, for example if processing calls, additional call centre support can behired.

Long-term planning – this planning is a time scale beyond 12- 18 months. Here the investment decisions tend to be more significant and will link to the strategy of the operation. The changes will take a long time to implement but are also difficult to reverse. There are many more options available to consider with long term decisions relating to capacity and the possibilities for increases are far greater. They could include;

- New trained full time staff or fire existing staff
- New processes that may be faster

- New Machinery on a manufacturing line
- Information systems or technology can be applied to increase efficiency and capacity
- Additional facilities

PROCESS TECHNOLOGY STRATEGY-



Process Technology

The objective of an operations system is to convert transformed resources from inputs into outputs in the form of goods and services. Process technology is the application of technology to transformed resources which can be in the form of:

1. material
2. information
3. customers

Some process technologies can process a combination of these (e.g. airport check-in). Process technologies can also be used for indirect processing such as for yield management and forecasting.

DEFINITION- Process Technology Strategy Process technology strategy is defined as the set of decisions that define the strategic role that direct and indirect process technology can play in the overall operations strategy of the organization and sets out the general characteristics that help to evaluate alternative technologies.

Process Technology Strategy:

Process Technology Strategy determines-

What does the technology do which is different from other similar technologies?

How does it do it?

What constraints does using the technology place on the operation?

What skills will be required from the operations staff in order to install, operate and maintain the technology?

What capacity does each unit of the technology have? What is the expected useful lifetime of the technology?

Process Technology for Materials

Software Systems:

- **Computer Aided Design (CAD)**: A CAD system allows the designer to create drawings on a computer screen to assist in the visual design of a product or service.
- **Computer Aided Process Planning (CAPP):** This transmits a process plan of how parts will be manufactured to a machine tool. It can also sequence parts through a number of process steps. Uses group technology to process parts in families.
- **Computer Aided Engineering (CAE):** This takes the drawings in a CAD system and subjects the designs to simulated tests.
- **Hardware Technologies:**
- **Computer Aided Manufacturing (CAM):** This extends the use of CAD by transmitting the design held in the CAD system electronically to computer controlled machine tools.
- **Automated Material Handling Systems (AMH):** These are designed to improve efficiency in the movement, storage and retrieval of materials. An example is an Automated Guided Vehicle (AGV).
- **Flexible Manufacturing Cell (FMC):** These are systems that integrate individual items of automation to form an automated manufacturing system.
- **FlexibleManufacturingSystems (FMS):**The seextend the facilities of a FMC by in corporating automatic part loading and unloading facilities and an automated guided vehicle system for parts movement.
- **Computer Integrated Manufacture (CIM):** This is the automation of the product and process design, planning and control and manufacture of the product.

Process Technology for Information

Most organisations use some form of computer-based technology to accumulate, organise and distribute information. In order to understand how the information technology is applied, it is useful to outline some of the types of information systems that use information technology in manufacturing and service organisations.

Operational Information Systems are used in the daily running of a business.

- ***Transactionprocessingsystems(TPS)*.**Thesesystemsinvolverecordingandprocessingdatath atresultsfrom an organisation's business transactions.
- ***Officeautomationsystems(OAS)***.OASareusedtomanagetheadministrativefunction sinanoffice environment and are often critical to service-based industries.
- ***Workflow Management Systems* (WFMS)**. These automate a businessprocess.

- ***Process control systems*.** These include systems such as CAD, CAM and FMS which are important in manufacturing industries for controlling the manufacture of goods. (These process materials and information).

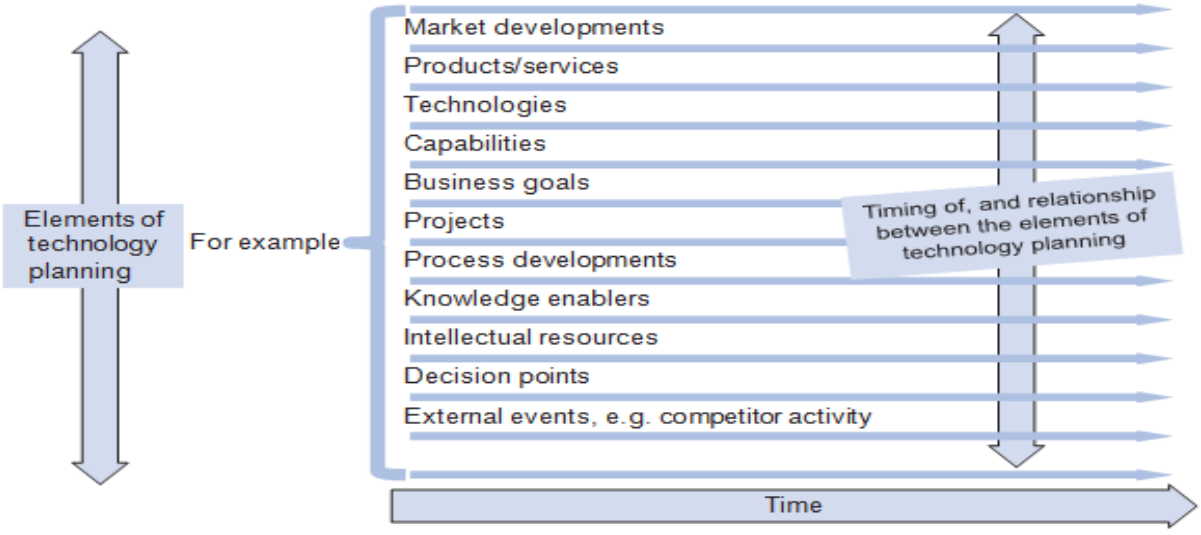
Management Information Systems are used to support tactical and strategic decision making.

- ***DecisionSupportSystems(DSS).***Theseprovideinformationandmodelsinaformtofacilitat etacticaland strategic decisionmaking.
- ***InformationReportingSystems(IRS).***Theseprovidepre-specifiedreportsforday-to-daydecisionmaking.
- ***ExecutiveInformationSystems(EIS).***Theseprovideseniormanagerswithasystemtoanalyse ,compareand highlight trends to help govern the strategic direction of accompany.

Enterprise systems (ES) aim to support the business processes of an organisation across any functional boundaries that exist within that organisation. The main types of enterprise system are:

- **Enterprise resource planning (ERP)** which is concerned with internal production, distribution and financial processes.
- **Customer relationship management (CRM)** which is concerned with marketing and sales processes.
- **Supply chain management (SCM)** which is concerned with the flow of materials, information and customers through the supplychain.
- **Supplier relationship management (SRM)** which is concerned with sourcing, purchasing and the warehousing of goods and services.

TECHNOLOGICAL ROAD MAP



1. Scale and Scalability-

By scalability we mean the ability to shift to a different level of useful capacity quickly, cost-effectively and flexibly.

Scalability, however, does depend on the ability of IT systems to work together.

scalability could be expressed as a measure of how well a piece of software handles change in expected workload behavior situations

BENEFITS-

Scalability is an attribute that describes the ability of a process, network, software or organization to grow and manage increased demand.

A system, business or software that is described as scalable has an advantage because it is more adaptable to the changing needs or demands of its users or clients.

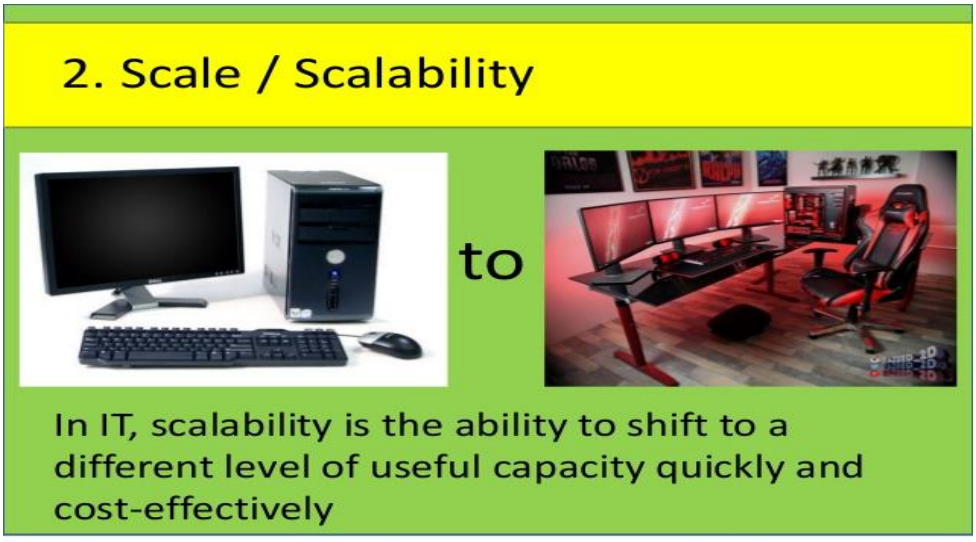
Scalability is often a sign of stability and competitiveness, as it means the network, system, software or organization is ready to handle the influx of demand, increased productivity, trends, changing needs and even presence or introduction of new competitors.

EXAMPLE-

For understanding scalability, here are two examples.

First, a basic anti-virus program can become premium and be used by enterprises through downloading certain add-ons or paying for subscription. Because more resources may be added to it, it is considered scalable.

On the other hand, more computers and servers can be added to a network in order to increase throughput or intensify security. This makes the network scalable.



2. *Automation*

Strategies of Automation

1. Specialization of operations: The first strategy involves the use of special purpose equipment designed to perform one operation with the greatest possible efficiency.

2. ***Combined operations:*** Production occurs as a sequence of operations. Complex parts may require dozens, or even hundreds, of processing steps. The strategy of combined operations involves reducing the number of distinct production machines or workstations through which the part must be routed.

3. ***Simultaneous operations:*** A logical extension of the combined operations strategy is to perform at the same time the operations that are combined at one workstation. In effect, two or more processing (or assembly) operations are being performed simultaneously on the same workpart, thus reducing total processing time.

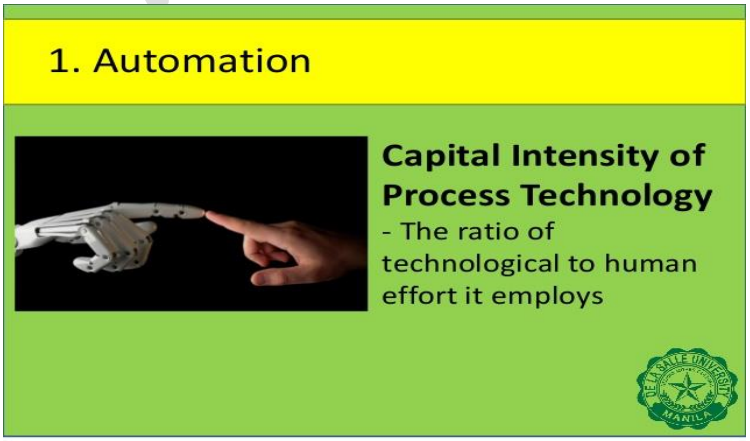
4. ***Integration of operations:*** Another strategy is to link several workstations into a single integrated mechanism using automated work handling devices to interconnect among stations.

5. ***Increased flexibility:*** It involves the use of the flexible automation concepts. Prime objectives are to reduce setup time and programming time for the production machine. This normally translates into lower manufacturing lead time and lower work-in-process.

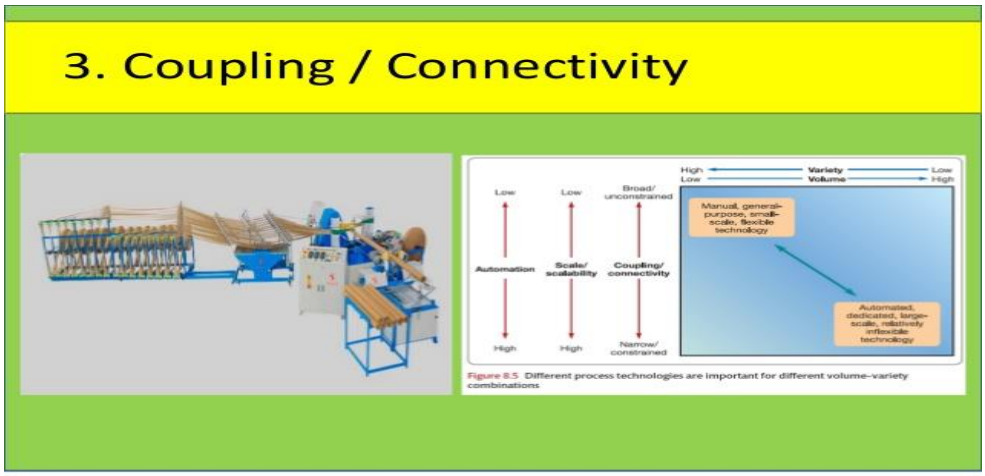
6. ***On-line inspection:*** Inspection for quality of work is traditionally performed after the process. This means that any poor quality product has already been produced by the time it is inspected.

Incorporating inspection into the manufacturing process permits corrections to the process as product is being made. This reduces scrap and brings the overall quality of product closer to the nominal specifications intended by the designer.

7. ***Computer integrated manufacturing (CIM):*** CIM involves extensive use of computer applications, computer data bases, and computer networking in the company.



3. Coupling and Connectivity



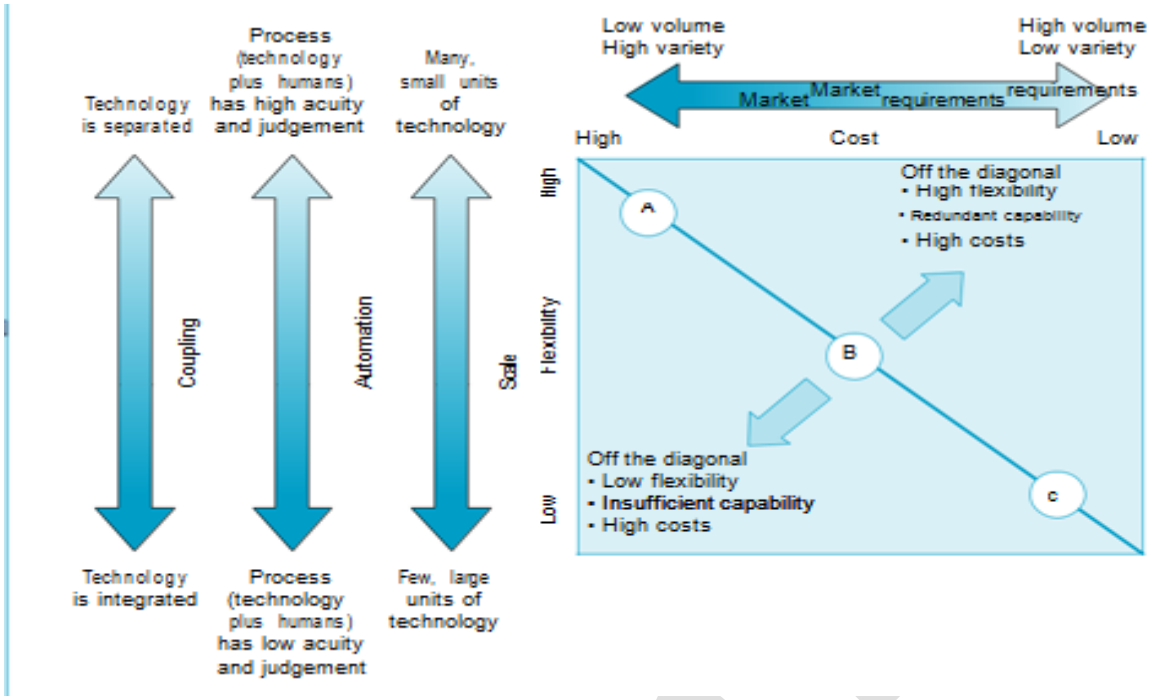
The issues connected with connectivity are similar to those concerned with scalability and analytical content.

Coupling is the act of joining two things together. In software development, coupling refers to the degree to which software components are dependant upon each other.

For instance, in a tightly-coupled architecture, each component and its associated components must be present in order for code to be executed or compiled. In a loosely-coupled architecture, components can remain autonomous and allow middleware software to manage communication between them.

In a decoupled architecture, the components can operate completely separately and independently.

PRODUCT PROCESS TECHNOLOGY MATRIX-By combining coupling, automation, scalling we got the following matrix which shows variation from low to high with cost connectivity(i.e cost reduction)



(PRODUCT PROCESS TECHNOLOGY MATRIX)

FACILITY STRATEGY/ (PLANT LAYOUT)

Facilities layout design refers to the arrangement of all equipment, machinery, and furnishings within a building envelope after considering the various objectives of the facility. The layout consists of production areas, support areas, and the personnel areas in the building.

The need for facilities layout design arises both in the process of designing a new layout and in redesigning an existing layout.

SCOPE OF FACILITY LAYOUT/PLANT LAYOUT

- Plant layout has broad scope of operations as it not only deals with the primary decisions of machines and other facilities, but also concerned with all the improvements that have to be made to the existing layout based on the subsequent developments in the production methods.

- In simple terms, a plant layout is a floor plan which is meant for determining and arranging the machinery and equipment of a plant at the most suitable place such that both the materials flow and handling can be obtained at low cost.

PRINCIPLES OF PLANT LAYOUT

The principle of Minimum Travel: Operations manager must design layout in such a way that the distance between operations is minimum which intern helps in avoiding the labor & time wastages there by reducing the cost of material handling.

The Principle of Sequence: The machines & operations must be arranged sequentially. This principle is effectively attained in product/ line layout.

The Principle of Usage: The available space needs to be optimally utilized. This principle has wide acceptance in towns and cities where a piece of land is very much expensive

Principle of compactness: All the significant factors need to be fully integrated and related, producing a well-integrated and final layout.

The Principle of Safety & Satisfaction: The layout must have provisions for safety of workers. It must be planned, based on the comfort and convenience of the workers for making them feel satisfied.

Principle of Flexibility: The layout must allow improvements with less difficulty and at minimumcos.

The Principle of Minimum Investment: The ideal layout must provide savings in fixed capital investment not by ignoring the installation of required facilities but by efficiently and optimally using the available facilities (economies of scale).

Facility Layout Objective

A model facility layout should be able to provide an ideal relationship between raw material, equipment, manpower and final product at minimal cost under safe and comfortable environment. An efficient and effective facility layout can cover following objectives:

- To provide optimum space to organize equipment and facilitate movement of goods and to create safe and comfortable work environment.
- To promote order in production towards a single objective
- To reduce movement of workers, raw material and equipment
- To promote safety of plant as well as its workers
- To facilitate extension or change in the layout to accommodate new product line or technology upgradation
- To increase production capacity of the organization

An organization can achieve the above-mentioned objective by ensuring the following:

- Better training of the workers and supervisors.
- Creating awareness about of health hazard and safety standards
- Optimum utilization of workforce and equipment
- Encouraging empowerment and reducing administrative and other indirect work

Factors Influencing the Plant layout

Materials: some arrangement must be done for purpose of storing and moving the raw materials into plant until they get converted into finished products. The nature, type & form of raw material (i.e. liquid /solid, seasonal, market conditions,/ Material specification.

Product: The nature of product (Size, demand) influences the type of layout required. Production of ship-building, the product is fixed whereas the production resources such as men

& machinery need to be brought towards the product. The demand of product also affects the layout (Storage, handling)

Machinery: The size and type of machinery which dictated by the product type, quantity of production, management policies.

Type of Industry: Plant layout decisions also influenced by the type of industry.

-Synthetic Industries: In this type several elements undergo production process to form finished product. Ex: Chemical, paper industry.

Location: The location of the plant also affects plant layout.

A: type of building is decided by the terrain and size of the site.

B: location: influences the plant layout decisions

Managerial Policies: Layout is influenced by managerial policies which are as follows.

A: The production volume & scope for expansion.

B: The level of automation required.

C: Production or purchase of equipment.

D: Desire for rapid delivery of goods to customers, policy of purchasing.

E: Personnel policies.

TYPES/CLASSIFICATIONOF PLANT LAYOUTS

A plant layout mainly deals with the arrangement and grouping of machines which are used for producing goods. Mostly grouping is employed on different product lines. The selection of a particular layout relies on many factors.

- Process layout/ Functional layout/ Job-shoplayout.
- Product Layout/ Line processing layout/ flow linelayout
- Fixed position Layout / StaticLayout.
- Cellular manufacturing Layout/ Group TechnologyLayout
- Combination Layout/ HybridLayout.

PROCESS/FUNCTIONAL/JOBSHOP LAYOUT

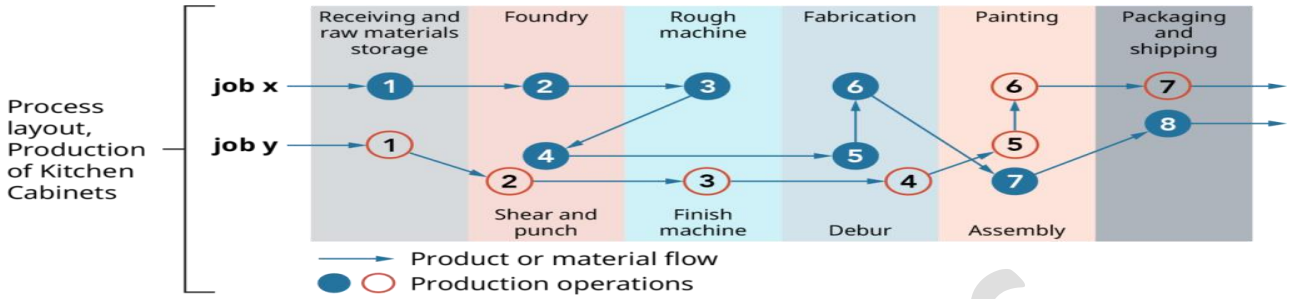
Process Layout: is a type of layout which is characterized by the presence of similar machines or similar operations at specified location.

It is known by different names. It is also called as functional layout or Job shop layout or bath production layout.

In Process layout: The machines are grouped on the basis of their operational characteristics. I.e. machines that are performing the same operation are installed at a specific location.

All drilling machines are installed in drilling DPT. All lathe machines are installed in turning

DPT. All welding machines are installed in welding dept.



(Process layout)

Advantages of process layout

Flexibility-It is more flexible when compared to a product layout. Changes in operations as well as their order can be made without disturbing the existing layout. Any new operation can be added.

Lower investment-General purpose machines which are usually of low cost are used. Duplication of machinery is avoided. Further general purpose machines do not become obsolete as rapidly as special purpose machines.

No stoppage of production-In case of breakdown of any machine, the whole process does not come to a standstill. Work of the machine which suffers from breakdown can be transferred to the other machines.

Scope for expansion-Different capacity lines can be expanded under this type of layout. New machines and labor can be added without upsetting the existing order of arrangement.

Full utilization of equipment-Process layout facilitates full utilization of equipment. General purpose machines are used in each department which can perform a variety of jobs. There is no need to provide a separate machine for each product line.

Better supervision-Because of specialization in operation, an efficient and Better supervision is possible.

Disadvantages of process layout

The following are the disadvantages of process layout:

Inefficient material handling-Materials have to be carried forward and backward quite frequently. Mechanization of material handling becomes difficult. Fixed path material handling equipment like conveyor belts, chutes etc cannot be used and cost of material handling is quite.

High space requirement-Space requirement is more than product layout. More storage space is to be provided around machines for waiting material to be processed.

High investment in inventory-Due to the lack of continuous flow of production there is high in-process inventory. Frequently materials have to be carried back and forth. This results in delays and therefore the investment in inventory is high.

High supervision cost-Cost of supervision is high because the number of employees per supervisor is less resulting in reduced span of control. Further, the work is to be checked after each operation.

Longer production time-Time required for production is more in the case of product layout.

Skilled labor required-Skilled labor needs to be employed to perform variety of operations in general purpose machines.

PRODUCT /LINE PROCESS /FLOW LINE LAYOUT

Product Layout: refers to the sequential or orderly arrangement of machines in one line based on sequencing rules.

It is also called as **Straight line Layout or Layout for serialized manufacture**

In this layout, there exist several machines such that the partly processed product (WIP) of machine becomes an input for the other machine.

Advantages of product layout

The following are the advantages of product layout:

Smooth flow of production: The entire production process is integrated. Therefore the possibility of stoppage of production at different stages of production is eliminated. So smooth flow of production is ensured.

Lower material handling costs: Since machines are arranged based on the sequence of operations, there is no backtracking (back and forward movement) or cris-crossing of materials. Therefore, cost and time involved in handling of materials is minimized. Transportation cost involved in transporting materials from one machine to another is eliminated

Lesser work-in-progress: Since the production process is continuous and uninterrupted, work-in-progress is less. Investment in work-in progress is less and the storage space required is also minimized.

Optimum space utilization: Since all machines are arranged sequentially, space available can be utilized in an optimum manner. Even in case of congested space, arrangement of machines would not be a problem, because the machines can be arranged in U shape.

Effective utilization of resources: Product layout ensures effective utilization of resources by ensuring:

a. minimum movement of workers
b. continuous production process and reduced wastage

c. less working-progress and
d. mechanization of materials handling,

Effective supervision: Since production process is integrated and continuous, supervision and control of the manufacturing process is easy. Inspection points are integrated into the production line.

Production control: Since the production process is continuous, production control is facilitated. The management can plan for the operations and adopt measures to complete the work according to the plans.

Savings in time: Time spent for transporting materials can be minimized. Since machines are arranged based on the sequence of operations, mechanized equipment such as conveyor belts can be used for transporting materials. This results in significant saving of time.

Disadvantages of Product Layout

The following are the disadvantages of product layout

Rigidity: The layout is not flexible. Since the operations are performed in a sequential manner, adjustments in the course of production cannot be made.

Expansion is difficult: It is difficult to expand production beyond the capacity of each line of production.

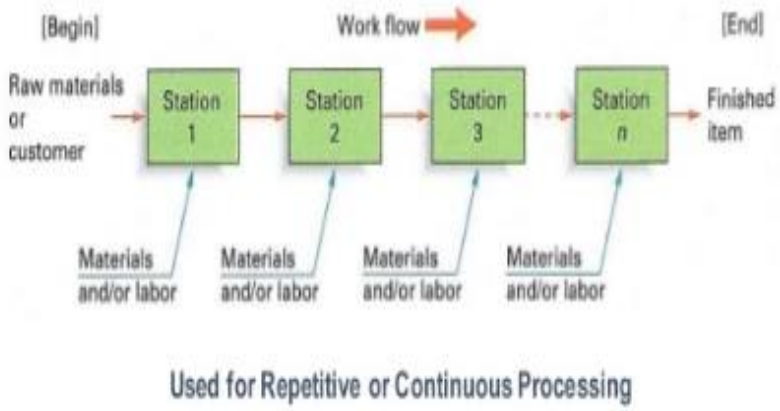
Costly: This type of layout is costly. Machines in this type of layout are arranged on the basis of sequence of operations and not according to functions. Therefore it results in duplication of similar type of machines needed for different lines of production.

Supervision difficult: Under this layout, there are no departments for various types of work. Therefore specialization in supervision is difficult.

Complete stoppage during breakdown: Since output of one machine is the input of the next machine, any breakdown of one machine results in the complete stoppage of work.

Monotony: Since workers are engaged in repetitive nature of work, it results in monotony. Workers may lose interest in the job. The labor force has very little opportunity to display its talent.

High labor cost: Since workers work on specific machines, they lack knowledge to work on other machines. Therefore in case of absenteeism of a worker engaged in any particular work, the entire workflow may get affected. The organization may need to employ and train surplus workers who can work on any machine.



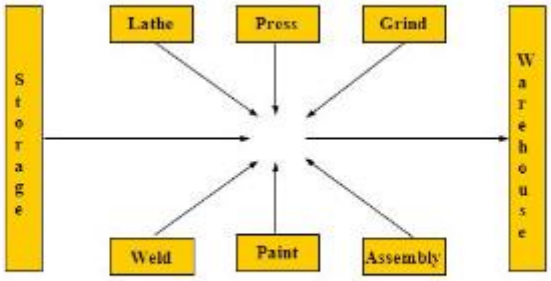
(Product layout)

FIXED POSITION /STATIONARY/STATICLAYOUT

Fixed Position Layout**: In this type of layout, material remains at a fixed place and the complete job is done at a fixed station with materials.**

-men and machines are moved to the place of materials for the necessary operations.

- This type of layout is suitablefor
  Hydraulic turbines, ship building, Locomotive Industry.



(Fixed position layout)

Advantages of fixed position layout

In fixed position layout men and machines can be used for many purposes intended in the production of different products.

Again in the fixed position layout often the investment on layout is very small.

In fixed position layout the workers often identifies themselves with the product and normally takes pride in it when the work is complete.

Disadvantages of fixed position Layout

In fixed position layout often characterized with high cost and difficulty in transporting hence some bulky product are avoided

Space.- For many fixed-position layouts, the work area may be crowded so that little storage space is available. This also can cause material handling problems.

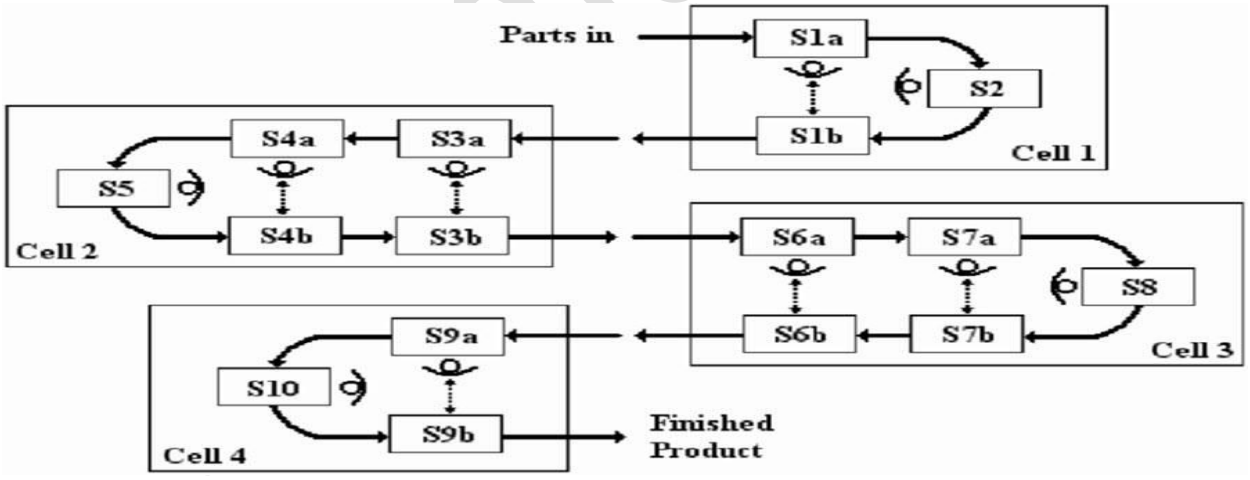
Administration-. Oftentimes, the administrative burden is higher for fixed-position layouts.

CELLULAR LAYOUT-

Cellular layouts are the actual organization of a department so that similar products are manufactured together.

The most effective cells manufacture a small portion of similar products and contain all of the needed equipment and supplies to complete the process for that cell.

For example, machine one might be right by the door so that employees do not have to walk across the warehouse to begin production, followed by machine two, three, four, and so on (keeping in mind that all of the supplies to run the machine need to be located right next to the machine). This helps move manufacturing smoothly from one process to the next.



(Cellular layout)

Advantages of Cellular layout

Reduction in setup time-Setup time is defined as period required preparing a device, machine, process or system to be ready to function or accept a job. Manufacturing cells are designed to process parts having similar shapes and relatively similar sizes. So it is not required to change or adjust machines and tools within cells to process similar parts. Thus setup time is greatly reduced in cellular manufacturing.

Improvement in machine utilization

In cellular manufacturing, single machine can be used to manufacture one or more products in each cell. Unnecessary machines are identified and removed from the manufacturing process. Reduction in setup time also reduces idle time for machines thus machine utilization is improved in cellular manufacturing.

Reduction in production lead time

Production lead time is defined as period between receipt of an order and until when it is available for packing or shipment. Production lead time is reduced in cellular manufacturing because of reduction in setup time, reduction in work in progress, reduction in material handling time, reduction in material flow distance and improvement in machine utilization.

Reduction in material flow distance

Material flow distance is defined as total distance travelled by all parts/materials to manufacture a single product or a variety of different products. By reducing it we can significantly reduce total manufacturing cost & time. Material flow distance is low in cellular manufacturing because every parts travel only in a small area (cell). In each cell, machines are close together. By efficient layout design of machines in each cell, 30 to 70% reduction in material flow distance can be achieved.

Reduction in work in progress

Work in progress refers to all materials and partly finished products that are at various stages of the production process. Work in progress excludes inventory of raw materials at the start of the production cycle and inventory of finished products at the end of the production cycle. With reduced setup times, the amount of work in progress can be reduced. Work in progress can be reduced by 50% when the setup time is cut in half.

Disadvantages of cellular layout

Poorly balanced cells-It is more difficult to balance the flow of work through a cell than a single-product assembly line, because items may follow different sequences through the cell that require different machines or processing times.

Expanded training and scheduling of workers-Training workers to do different tasks is expensive and time-consuming and requires the workers' consent.

Increased capital investment-Existing equipment may be too large to fit into cells or may be underutilized when placed in a single cell.

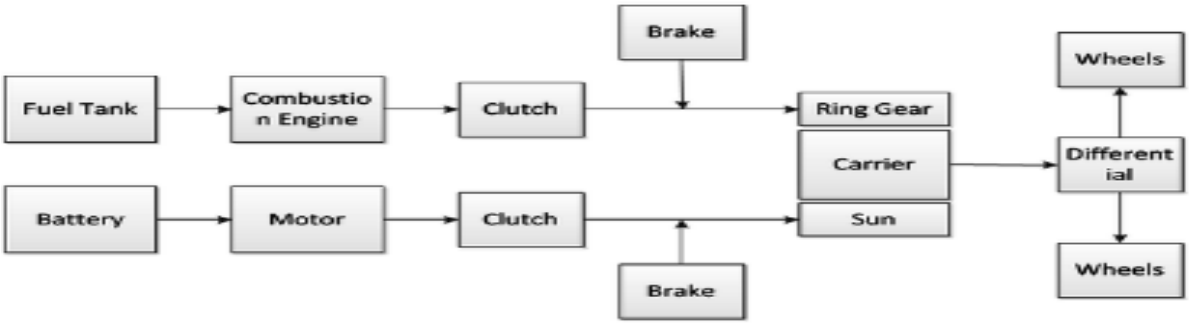
Additional machines of the same type may have to be purchased for different cells.

The cost and downtime required to move machines can also be high.

HYBRID LAYOUT-

This layout contains a mix of process and Product layout.

This layout is considered for special production line.



(Hybrid layout of a vehicle manufacturing)

LAYOUT PLANNING TOOLS & TECHNIQUES

The different techniques that are available and useful for layout planning are

- Templates
- Operations Sequence Analysis.
- Line balancing.

Template: It is a two dimensional technique which is the most commonly used. Templates are the design patterns which consist of a thin plate, made up of wood or metal and which serve as a gate for performing mechanical activities.

- It constitutes the scaled representation of the physical object of the layout.

- Templates are fixed for preparing plans, for drawing several possible layouts. The best possible option can be explored by eliminating the unnecessary handling and backtracking of materials.
- It is usually employed for re-designing the existing department/building
- For verifying the layout design configuration decided by other layout technique.

Operations Sequence Analysis: It is an early approach to process type layout. It develops a good plan for arranging the departments graphically so that the layout problem gets an optimal solution.

Through the operations sequence analysis, the relative locations of operating department with respect to one another can be predicted.

Line Balancing: It is an important activity of an assembly line operation, which is mainly used for the equitable distribution of work among the employees so that total number of employees can be greatly reduced.

Line balancing is not an easy task because there are different alternative methods that can be far more easily applied than line balancing for the decision of work.

Some of the methods used by operation researchers to study line balancing problems include linear programming, dynamic programming and other optimal methods.

Structural Decisions

Structural decision areas which need to be aligned with the operations strategy are covered below.

Process Types

Process Types are ways of describing the general approach taken to designing and managing processes. They are based on two important factors in process design: the volume and variety of the products and services that an organisation processes.

Manufacturing Process Types

In manufacturing, process types can be considered as five categories of project, jobbing, batch, mass and continuous.

Categories of manufacturing	features
Project	• Processes that produce products of high variety and low volume are termed projects. • Project processes are used to make a one-off product to a customer specification. • A feature of a project that the location of the product is stationary.
Jobbing	• Processes that produce products of high variety and low volume are termed jobbing. • Jobbing processes are used to make a one-off (or low volume) product to a customer specification. • A feature of a jobbing process is that the product moves to the location of transforming resources such as equipment.
Batch	• Processes that produce products of medium variety and medium volume are termed batch. • The size of a batch or group can range from one to hundreds. • A feature of batch processes is that, because it is difficult to predict when a batch of work will arrive at a machine, a lack of coordination can lead to many products waiting for that machine at any onetime.
Mass	• Processesthatproduceproductsofhighvolumeandlowvarietyaretermedlineormassprocesses. • Although theremaybevariantswithintheproductdesigntheproductionprocesswillessentiallybethesamefor all the products. • Because of the high volumes of product it is cost effective to use specialised labour and equipment.
Continuous	• Processes that operate continually to produce a very high volume of a standard product are termed continuous. • The products produced by a continuous operation are usually a continuous flow such as oil and gas. • Continuous processes use a large amount of equipment specialised and dedicated to producing a single product.

Service Process Types

Three service process types, professional service, service shop and mass service are categorized in terms of their ability to cope with different volume and variety characteristics.

Category	Features
Professional Service	• Professional Service processes operate with high variety and low volume. • They are characterised by high levels of customisation, in that each service delivery will be tailored to meet individual customer needs. • This customisation requires communication between the service provider and customer and so professional services are characterised by high levels of customer contact and a relatively high proportion of staff supplying the service in relation to customers. • The emphasis in a professional service is on delivering a process rather than a tangible product associated with aprocess.
Service Shop	• Service Shop processes operate with a medium amount of variety and volume. • There will be a certain amount of customization of the service, but not as extensive as in professional services. • There will be therefore a mix of staff and equipment used to deliver the service. • There is an emphasis both on the service delivery process itself and any tangible items that are associated with the service.
Mass Service	• Mass Service processes operate with a low variety and high volume. • There will be little customisation of the service to individual customer needs and limited contact between the customer and people providing the service. • Because the service is standardised it is likely that equipment will be used to improve the efficiency of the service delivery process. • The emphasis in a mass service is on the tangible item that is associated with the service delivery.

PRODUCT PROCESS MATRIX-(IN MANUFACTURING UNIT)

	Product structure	Low Volume Unique Product	Low Volume Multiple Products	High Volume Standardized Product	Very high volume Commodity product
Process structure	Project				
Jumbled flow		Job Shop			
Disconnected line flow			Batch		
Connected line flow				Assembly-line	
Continuous flow					Continuous

A company's place on the matrix depends on two dimensions – the process structure/process lifecycle and the product structure/product lifecycles. The process structure/process lifecycle is composed of the process choice (job shop, batch, assembly line, and continuous flow) and the process structure (jumbled flow, disconnected line flow, connected line flow and continuous flow).

The upper-left modules (project, job shop, batch processes) tend to have higher skilled workers with a larger range of skills for better flexibility and are more labor-intensive compared.

They usually cater to local and/or niche markets.

The lower-right manufacturing processes (mass production; assembly line and continuous processes) require only unskilled or semi-skilled workers to monitor and maintain the equipment as they are far more capital intensive processes.

The matrix highlights efficiency and flexibility of the operations with the upper-left modules favoring flexibility with high-cost productions and the lower-right modules favoring efficiency with the ability to spread their large fixed costs over a wider base, reducing cost per unit.

Distinctive competence

Distinctive competence is a characteristic or aspect of the company that gives it a comparative advantage over its competitors, usually categorized by cost/price, quality, flexibility and service/time.

Flexibility

- The wide range of skilled labor and use of general-purpose equipment allows upper-left processes to have distinctive competence in flexibility in their product/service provided, specifically in unique product designs.
- Lower-right processes do not have that aspect of flexibility since they rely on specialized machinery with unskilled or semi-skilled workers. However, they have better flexibility when it comes to quantity.

Quality

- Upper-left processes excel in quality when it comes to unique designs based on the customers' specifications or if the product is considered artisan.

- While upper-left processes cater products to specific customers, lower-right processes can take advantage of consistently producing homogeneous products to eliminate flaws and improve designs over time for a more reliability to the end user.

Service/Time

Upper-left processes can claim distinctive competence through face-to-face interaction and personal attention while lower-right processes are more time-efficient.

Cost/price

Businesses that use the upper-left processes are likely able to charge higher prices because of their ability to cater to individual customers and to compensate for the skilled labor. Lower-right processes are more cost-efficient because their large volumes allow them to take advantage of economies of scale.

GLOBALISATION STRATEGY IN OPERATIONS-

Global operations Strategy-Operation management stategy in context of global application is called global operations management.

Global operations career-

Supply chain and logistics manager-Supply chain managers work across multiple functions and companies to ensure that a finished product not only gets to the end consumer but meets all requirements as well.

Purchasing Manager- Purchasing managers are responsible for buying the best quality equipment, goods and services at the most competitive prices to enable a company or organisation to operate.

Operations research Analyst-Operations research analysts are high-level problem-solvers who use advanced techniques, such as optimization, data mining, statistical analysis and mathematical modeling, to develop solutions that help businesses and organizations operate more efficiently and cost-effectively.

Key issues to be considered for Managing Global Operations Management

Managing global operations would focus on the following key issues:

- To acquire and properly utilize the following concepts and those related to global operations, supply chain, logistics, etc.
- To develop criteria for conceptualization and evaluation of different global operations.
- To associate success and failure cases of global operations to political, social, economical and technological environments.
- To envision trends in global operations.

STRATEGIES IN GLOBAL LEVEL

- **GLOBAL LOGISTICS-** Global logistics is the process of managing the flow of goods through the supply chain, from the place where they are made to the place where they are consumed.

- Global logistics requires close and intricate collaboration between a host of business partners.

- Global delivery services manage the movement of goods. Logistics real estate companies own and operate facilities that are essential nodes for transport, management and storage, while a host of service providers provide the software, security, labor and business intelligence that keep the global logistics system working.

Growth in global logistics is fueled by three fundamental trends:

- increasing consumption,
- rising e-commerce and
- Ongoing reconfiguration of the supply chain to move goods more quickly and efficiently.

The enduring strength of these trends across the world means is an indication that global logistics will continue to play an essential role in the world economy.

GLOBAL SUPPLY CHAIN MANAGEMENT-

Global supply-chain management (GSCM) is defined as the distribution of goods and services throughout a trans-national companies global network to maximize profit and minimize waste. Essentially, global supply chain-management is the same as supply-chain management, but it focuses on companies and organizations that are trans-national.

Global supply-chain management has six main areas of concentration:

- logistics management,
- competitor orientation,
- customer orientation,
- supply-chain coordination,
- supply management, and operations management.

These six areas of concentration can be divided into four main areas: marketing, logistics, supply management, and operations management.

GLOBAL INVENTORY MANAGEMENT –

Global Inventory management is the supervision of non-capitalized assets, or inventory, and stock items in international level. As a component of supply chain management, inventory management supervises the flow of goods from manufacturers to warehouses and from these facilities to point of sale.

Contribution of Inventory management software systems in global controlling-

Inventory management software systems generally began as simple spreadsheets that track the quantities of goods in a warehouse but have become more complex since.

Inventory management software can now go several layers deep **and integrate with accounting and ERP systems.** The systems keep track of goods in inventory, sometimes across several warehouse locations in Global scenario.

Inventory management software can also be used to calculate costs -- often in multiple currencies -- so that accounting systems always have an accurate assessment of the value of the goods.

TECHNOLOGY EMBEDMENT IN GLOBAL OPERATIONS STRATEGY-

Technology strategy (**information technology strategy** or **IT strategy**)in global is the overall plan which consists of objectives, b principles and tactics relating to use of technologies within a particular organization.

Software tools-

Supply-chain-management software (SCMS) is the software tools or modules used in executing supply chain transactions, managing supplier relationships and controlling associated business processes.

A requirement of many SCMS often includes forecasting. Such tools often attempt to balance the **disparity between supply and demand by improving business processes and using algorithms** and **consumption analysis** to better plan future needs globally.

SCMS also often includes integration technology that allows organizations to trade electronically with supply chain partners.

Most of the software systems available today are integrated with the Finance - Accounts Payables, Accounts Receivables and General Ledger. This makes it easy to manage book keeping for the organisations with ease. A tightly integrated Purchasing & Sales process enables the organizations to handle their day to day activities with less effort and make it connective globally.

CASE STUDY ON GLOBAL OPERATIONS STRATEGY

CASE :-Boeing's Global Strategy Yields Competitive Advantage

Boeing's strategy for its 787 Dreamliner is unique from both an engineering and global perspective.

The Dreamliner incorporates the latest in a wide range of aerospace technologies, from airframe and engine design to superlightweight titanium graphite laminate, carbon fibre and epoxy, and composites. Another innovation is the electronic monitoring system that allows the airplane to report maintenance requirements to ground-based computer systems. Boeing has also worked with General Electric and Rolls-Royce to develop more efficient engines. The advances in engine technology contribute as much as 8% of the increased fuel/payload efficiency of the new airplane, representing a nearly two-generation jump in technology.

This state-of-the-art Boeing 787 is also global . Led by Boeing at its Everett, Washington facility, an international team of aerospace companies developed the airplane. New technologies, new design, new manufacturing processes, and committed international suppliers are helping Boeing and its partners achieve unprecedented levels of performance in design, manufacture, and operation.

The 787 is global not only because it has a range of 13 800 km but also because it is built all over the world—with a huge financial risk of over $5 billion (USD), Boeing needed partners. The global nature of both technology and the aircraft market meant finding exceptional developers and suppliers, wherever they might be. It also meant finding firms willing to step up to the risk associated with a very expensive new product. These partners not only spread the risk but also bring commitment to the table. Countries that have a stake in the 787 are more likely to buy from Boeing than from the European competitor Airbus Industries.

Boeing teamed with more than 20 international systems suppliers to develop technologies and design concepts for the 787. Boeing found its 787 partners in over a dozen countries; a few of them are shown in the table on the left.

The Japanese companies Toray, Teijin Seiki, Fuji, Kawasaki, and Mitsubishi are producing over 35% of the project, providing whole composite fuselage sections. Italy's Alenia Aeronautica is building an additional 10% of the plane. Many U.S. companies, including Crane Aerospace, Fairchild Controls, Goodrich, General Dynamics, Hamilton Sundstrand, Honeywell, Moog, Parker Hannifin, Rockwell Collins, and Triumph Group are also suppliers. Boeing has 70% to 80% of the Dreamliner built by other companies. And even some of the portion built by Boeing is produced at Boeing facilities outside the United States, in Australia and Canada.

The global Dreamliner is efficient, has a global range, and is made from components produced around the world. The result: a state-of-the-art airplane reflecting the global nature of business in the 21st century and one of the fastest-selling commercial jets in history.

Some of the International Suppliers of Boeing 787 Components

Latecoere	France	Passenger doors
Labinel	France	Wiring
Dassault	France	Design and PLM software
Messier-Bugatti	France	Electric brakes
Thales	France	Electrical power conversion system and integrated standby flight display
Messier-Dowty	France	Landing gear structure
Diehl	Germany	Interior lighting
Cobham	UK	Fuel pumps and valves
Rolls-Royce	UK	Engines
Smiths Aerospace	UK	Central computer system
BAE Systems	UK	Electronics
Alenia Aeronautica	Italy	Upper centre fuselage and horizontal stabilizer
Toray Industries	Japan	Carbon fibre for wing and tail units
Fuji Heavy Industries	Japan	Centre wing box
Kawasaki Heavy Industries	Japan	Forward fuselage, fixed sections of wing, landing gear wheel well
Teijin Seiki	Japan	Hydraulic actuators
Mitsubishi Heavy Industries	Japan	Wing box
Chengdu Aircraft Group	China	Rudder
Hafei Aviation	China	Parts
Korean Airlines	South Korea	Wingtips
Saab	Sweden	Cargo and access doors

CASE STUDY

SIXSIGMA IN GENERAL ELECTRIC

Thanks to ex-CEO of General Electric Jack Welch, the companies throughout the business sector know Six Sigma as a staple of good business practice. In fact, more than half of all Fortune 500 companies use Six Sigma to improve and streamline their own processes. However, Six Sigma wasn't always around. In fact, it took a long time since its earliest inception for companies to start using it effectively.

Manufacturers like Motorola pioneered modern Six Sigma in the 1980s, although earlier versions of the methodology existed as far back as the 1920s. Henry Ford's business model and manufacturing techniques all reflect some of Six Sigma's core principles. But Six Sigma's relationship with General Electric is something special. After Jack Welch brought Six Sigma into the General Electric fold, those same principles would go on to generate enormous interest. And not just in the US, but around the world. Before Six Sigma, there was little else like it, and nothing else more effective.

General Electric's adoption of Six Sigma methodology marks a turning point in the history of process improvement. Jack Welch is also important for helping to build Six Sigma's reputation, which carries on into the present day. But what difference did Six Sigma make to General Electric? And when did it first begin? In this article, we look at the history of Six Sigma at General Electric, how they have used it, and how they benefited.

Six Sigma before General Electric

Before we can answer the above questions, we first need to understand what the conditions were that made it necessary for General Electric to adopt Six Sigma practices. What set them on that course? Motorola pioneered Six Sigma was in 1981. Their lead engineers concluded that their mandatory method for measuring defects per thousands of opportunities did not provide enough fine detail. As such, they decided to switch to measuring in millions, to provide more granular data. One of the most prominent benefits of doing so was the staggering increase in savings the company experienced.

Six Sigma's early success here led to Six Sigma methodology becoming a permanent fixture of Motorola's operations during the mid-80s. Furthermore, outside companies had noticed Six Sigma's successes, which sparked interest in how they could utilize it themselves. While the interest was great during this period, there were still few companies who managed to implement Six Sigma successfully. Least of all on the same scale as Motorola. However, it was only a decade later when General Electric began using Six Sigma. This was the beginning of an exciting new renaissance for process improvement.

Jack Welch and General Electric

In the late 1980s, General Electric turned their focus towards ensuring excellent quality. They did so through their use of the Work-Out program, which exposed GE to a world of new ideas. The

groundwork laid here by GE's Work-Out would be important for the onset of Six Sigma shortly afterward. Jack Welch, the former CEO of GE, is, of course, responsible for Six Sigma's implementation here. He instigated a new corporate policy for GE that pledged to acquire Six Sigma goals by the millennium. Welch took a lot of inspiration from companies like Motorola, using Six Sigma concepts in much the same way.

Implementing Six Sigma

It was in 1995 when General Electric's implementation of Six Sigma began. Welch was the driving force behind this implementation, acting as a figurehead for the rest of the company to rally behind. Under his watch, he strove to ensure the company fully integrated Six Sigma into their operations. This change in operations began when Welch became aware of GE's many setbacks, the company often falling short of its potential. Welch recognized that GE required a complete overhaul of all its fundamental operations.

Working with engineers and consultants, Welch detected a great deal of defect that had previously gone unnoticed. This build-up of waste was holding the company back, losing them money, and slowing down their production. Welch knew what to do. He had seen it in action and knew it could save General Electric from itself. He knew Six Sigma could help streamline the company, make it more efficient and productive, eliminate waste, and change it for the better. It did.

Timeline of Implementation

General Electric's implantation of Six Sigma took five years, and the end-result was a reported twelve billion dollars in savings. The enormity of Six Sigma's success here cannot be understated. Welch would go on to become a lifelong advocate of the Six Sigma methodology, championing its effectiveness in businesses, large and small, all over the world. Six Sigma's present day success is rooted in that of Jack Welch and General Electric. Following its unprecedented achievement at General Electric, many more companies started using Six Sigma. By the late 90s, some of the biggest corporations, such as Samsung, Ford, Boeing, Amazon, and GlaxoSmithKline were all using Six Sigma. Many of these companies, including a huge number of multi-nationals, experienced immediate and continuous success through Six Sigma implementation. This snowball effect cemented Six Sigma's reputation in the business world, ensuring that it continues to succeed even today.

How Did They Do It? – Training

General Electric began their Six Sigma implementation through a strong emphasis on the importance of training. By training their employees in data-based problem analysis, they overcame many obstacles for which they had previously been unprepared. All GE employees were required to take a training program in using Six Sigma methodologies in the workplace. The course lasted for thirteen days or 100 hours and required them to complete a Six Sigma project before the year 1999. Their training covered a variety of areas, including how to use DMAIC. Employees would learn how to define and identify processes, as well as to measure process output. Additionally, they would analyze criticality of process inputs, while devising improvements through modifying the inputs. Finally, they

would learn how to control processes by controlling the relevant inputs. Upon completion of the course, employees would then undergo follow-up training to bolster their new skills and utilize them.

Six Sigma Mentoring

Mentoring was another important aspect of General Electric's Six Sigma training and implementation. They would hire full-time Six Sigma Master Black Belts (MBB) to help implement Six Sigma, driving process changes, as well as training other staff. Each MBB mentored employees involved with GE's core processes for Black Belt level training. This involved a four-month training program in which they learned to apply Six Sigma techniques in their work, while mentored by their MBBs. This dedication to training and mentoring allowed GE to quickly generate a team of full-time Black Belts to implement projects. Furthermore, GE also provided part-time project leaders and employees with Six Sigma Green Belt training to support their Black Belts' work.

Strong Leadership

Finally, Six Sigma demands effective leadership if it is to be successful. Without a strong leader to direct and support your Six Sigma Belts, any attempts at implementing Six Sigma will likely fail. General Electric, however, is a prime example of the importance and success of strong leadership, training, and mentoring. Without these three key factors, much of what GE did may not have been successful. Furthermore, Jack Welch supported GE's Six Sigma implementation through ensuring fundamental commitment from both his senior executives and employee population. He linked opportunities for promotion and bonuses with quality improvement, aligning employee incentives with Six Sigma goals.

QUESTIONS TO BE DISCUSSED-

1. What is the objective and real output of this case discussion?
2. What is the futuristic value of this case study by which General Electrics will be benefited?
3. How business competitiveness can be achieved from this detailed study of General Electrics?
4. Discuss the dimensions of success in field of operations keeping view to the implementation of six sigma in General Electrics.

Module-III

QUALITY STRATEGY

Quality Strategy

Garvin (1988) provides 5 different perspectives on a definition of quality:

- **Transcendent** – The 'best' available – Rolls Royce
- **Product Based** – measurable attributes – car acceleration, speed etc.
- **User Based** – individual requirements – offer lots of options
- **Operations Based** – conforms to internal specification – no defects
- **Value Based** – 'value for money' – meets needs for lowest price

Defining Product Quality

How do customers define product quality? Garvin (1984) defines eight dimensions of quality or quality characteristics which the customer looks for in a product:

- **Performance**
- **Features**
- **Reliability**
- **Conformance**
- **Durability**
- **Serviceability**
- **Aesthetics**
- **Other perceptions**

The customers will trade-off these quality characteristics against the cost of the product in order to get a value for money product. This implies no one way to superior product quality.

Defining Service Quality

How do customers define service quality? Parasuraman, Zeithaml and Berry (1985) define quality in services along 5 dimensions:

- **Reliability** – delivered OK every time
- **Responsiveness** – delivery quick service and respond quickly to problems
- **Assurance** – employees delivering service should show competence
- **Empathy** – employees demonstrate an effort to understand customer needs
- **Tangibles** – physical surroundings must be appropriate

The customers use these 5 dimensions to form their judgment of service quality, which are based on a comparison of expectations and perceptions of that service quality; the difference is the service quality gap. The Service Gap Model can be used to help identify the gap between what customers expect from a service and what they perceive they are actually getting.

Total Quality Management (TQM)

Total Quality Management (TQM) is a philosophy and approach which aims to ensure that high quality, as defined by the customer, is a primary concern throughout the organization and all parts of the organization work towards this goal. TQM does not prescribe a number of steps that must be followed in order to achieve high quality but rather should be considered a framework within which organizations can work.

The TQM process will be dependent on factors such as customer needs, employee skills and the current state of quality management within the organization.

TQM is a philosophy that stresses:

- The customer defines quality and thus, their needs must be met.
- Quality is the responsibility of all employees in all parts of the organization
- Identify and minimize all costs of quality
- A continuous improvement culture must be developed to instill a culture which recognizes the importance of quality to performance
- A use of systems and procedures for improvement

The customer defines quality

This implies a need to discover customer needs and then focus quality improvement on meeting them. So the customer should be the focus of decision making, but operations managers should still assess what is feasible for the organization to do.

Quality is the responsibility of all employees in all parts of the organization

- All staff, whether directly involved in production/ customer contact, or not can set in motion a chain of events which customers will eventually see as poor quality products or services.
- Staff is required not only to avoid mistakes, but think positively about improving how they perform their jobs.
- Service Levels Agreements (SLA) provide a formal definition of service between internal areas of the organization

Identify and minimize all costs of quality

Quality gurus argue that the cost of poor quality and thus the benefits of improvement in quality should be identified, so quality costs can be classified:
The cost of achieving good quality:

- **Prevention**; trying to prevent problems – design of processes and products
- **Appraisal**; checking to see if problems have occurred during or after the creation of the product/service-testing, inspection

The cost of poor quality:

- **internal failure; costs** which are dealt with inside the operation – scrap, rework
- **external failure; costs** going out of the operation to the customer – returns, loss of goodwill
- Traditionally it was assumed that an optimum level of spend can be identified because failure costs decrease as appraisal and prevention expenditure increases.
- This model was criticized because it assumes **failure (poor quality)** is acceptable, it assumes that costs are known and measurable and it implies that prevention is inevitably costly.
- The zero defect cost of quality model assumes it costs no more to remove the last error than the first (it might take longer to find the source of the error though), it needs proactive involvement of people in order to identify the causes of errors and the optimum number of defects is zero.

A continuous improvement culture must be developed

- TQM espouses the process of continuous improvement (CI).

A use of systems and procedures for improvement

A key aspect of TQM is developing the procedures which support improvement.

- **ISO 9000** provides a quality standard between suppliers and a customer developed by the International Organization for Standardization.
- Having a predefined quality standard reduces the complexity of managing a number of different quality standards when a customer has many suppliers.
- The standard is general enough to apply to almost any good or service, but it is the specific organization or facility that is registered or certified to the standard.
- Other programmes which attempt to provide national and international standards for quality are the **European Quality Award (EQA) and the Deming Prize.**

STEPS OF QUALITY STRATEGY

Juran trilogy

The Quality Crisis Identification (1)-(by **Juran Quality Trilogy)**

Quality Planning: As with all management activities and processes, Quality journey begins with planning the activities that needs to be done to adhere to the Vision, Mission and Goals of the organization and to comply with customer and compliance requirements. Quality Planning comprises of -

- Understanding the customer,
- Determining their needs,
- Defining the product/service features, specifications
- Designing the product/service
- Devising the processes that will enable to meet the customer needs.

Quality Control:

- Once the processes are defined, the responsibility is now with operations, to adhere to the processes and specifications required by the product/service.

- For this purpose periodic checks and inspection has to be done, metrics need to be tracked, to ensure that the process is in control and meets specifications and the metrics need the set target.

- Wherever there is a defect a corrective and preventive action needs to be done, and root cause has to be arrived at. Also the deviation in the metrics and process audit results need to be monitored and corrected for meeting the required target as specified by the processes.

Quality Improvement:

- However robust the process design and the product features are, there are chances that it may fail to meet customer requirements and design targets. It might be due to some special causes that are present in the system and might be due to change in business scenarios, customer requirements, market completion and many more forces.

- The role of Quality Improvement is to identify and prove the need for improvement from the exiting performance levels even though they meet the target and devise means and ways to achieve the new target and implement them successfully.

Statistical quality control chart

- **Statistical process control (SPC)** is a method of quality control which employs statistical methods to monitor and control a process.

- This helps to ensure that the process operates efficiently, producing more specification-conforming products with less waste (rework or scrap).

- SPC can be applied to any process where the "conforming product" (product meeting specifications) output can be measured.

- Key tools used in SPC include **run charts, control charts**, a focus on **continuous improvement,** and **the design of experiments**. An example of a process where SPC is applied is manufacturing lines.

SPC must be practiced in 2 phases:

- The first phase is the initial establishment of the process, and the second phase is the regular production use of the process.
- In the second phase, a decision of the period to be examined must be made, depending upon the change in 5M&E conditions (Man, Machine, Material, Method, Movement, Environment) and wear rate of parts used in the manufacturing process (machine parts, jigs, and fixtures).
- An advantage of SPC over other methods of quality control, such as "inspection", is that it emphasizes early detection and prevention of problems, rather than the correction of problems after they have occurred.
- In addition to reducing waste, SPC can lead to a reduction in the time required to produce the product. SPC makes it less likely the finished product will need to be reworked or scrapped.

Control charts

The data from measurements of variations at points on the process map is monitored using control charts. Control charts attempt to differentiate "assignable" ("special") sources of variation from "common" sources.

Stable process

- When the process does not trigger any of the control chart "detection rules" for the control chart, it is said to be "stable".
- A process capability analysis may be performed on a stable process to predict the ability of the process to produce "conforming product" in the future.
- A stable process can be demonstrated by a process signature that is free of variances outside of the capability index. A process signature is the plotted points compared with the capability index.

Excessive variations

When the process triggers any of the control chart "detection rules", (or alternatively, the process capability is low), other activities may be performed to identify the source of the excessive variation.

The tools used in these extra activities include:

- Ishikawa diagram(cause effect diagram)
- Designed experiments, and
- Pareto charts.

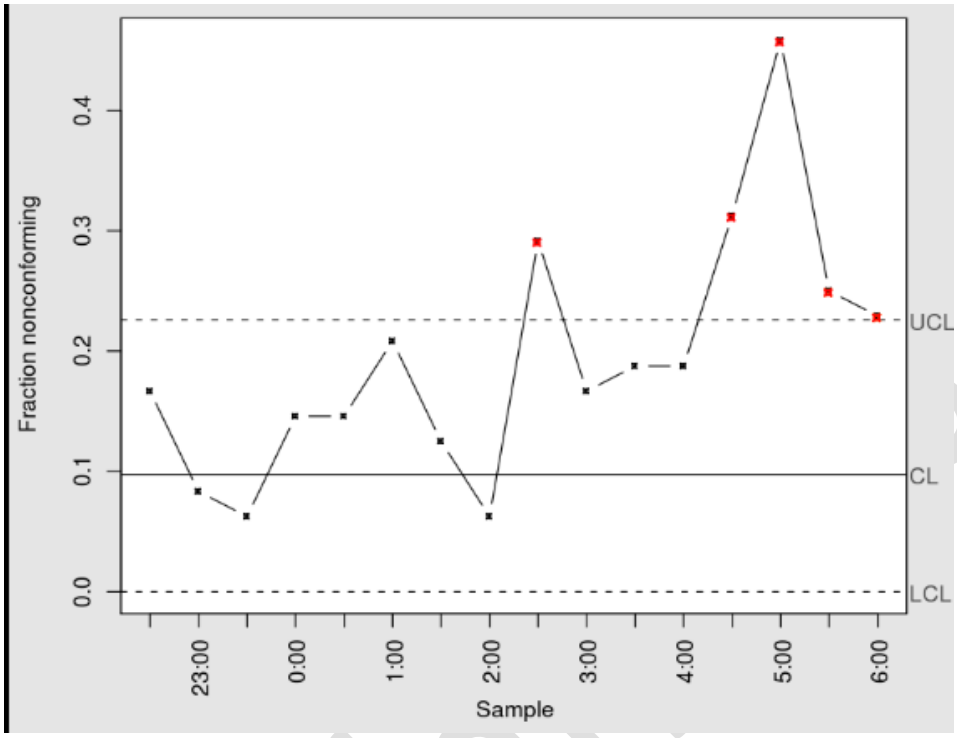
➢ Designed experiments are a means of objectively quantifying the relative importance (strength) of sources of variation. Once the sources of (special cause) variation are identified, they can be minimized or eliminated.

➢ Steps to eliminating a source of variation might include: **development of standards, staff training, error-proofing, and changes to the process itself or its inputs.**

Process stability metrics

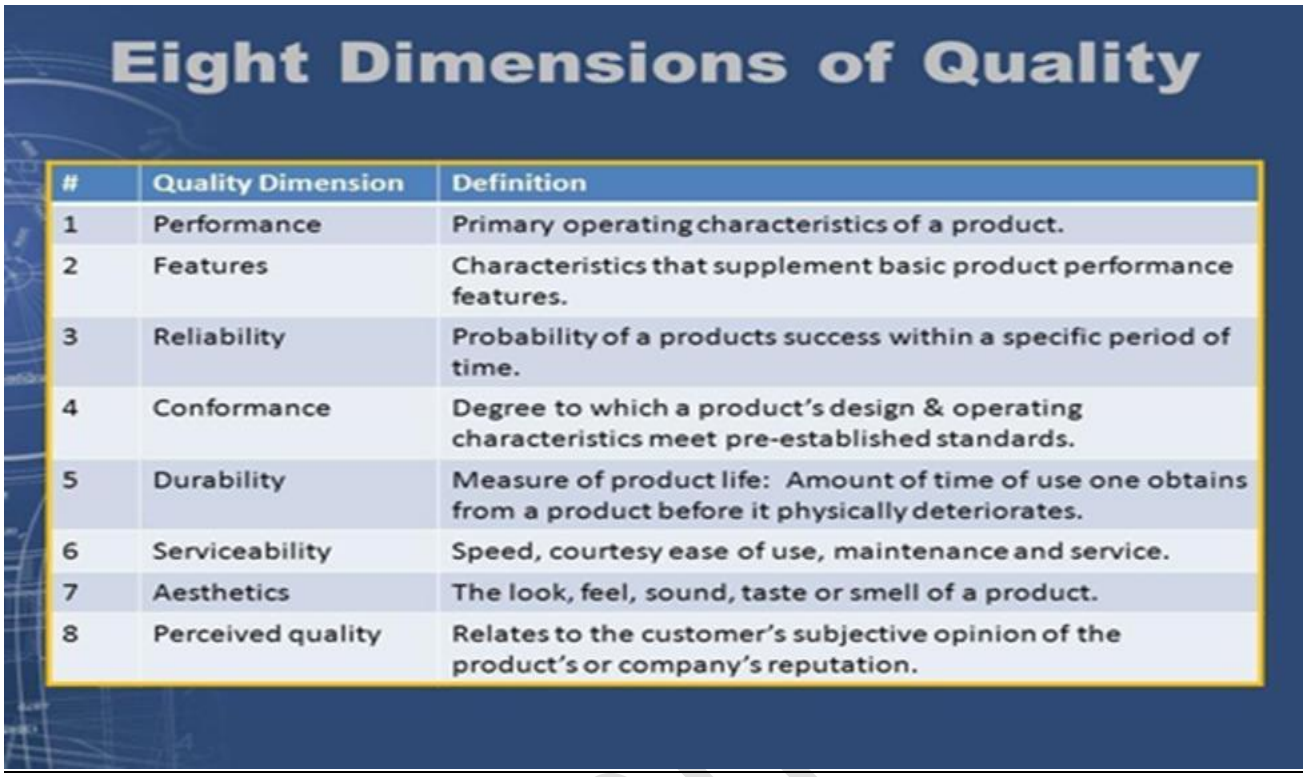
➢ When monitoring many processes with control charts, it is sometimes useful to calculate quantitative measures of the stability of the processes. These metrics can then be used to identify/prioritize the processes that are most in need of corrective actions.

➢ These metrics can also be viewed as supplementing the traditional process capability metrics.



(Control chart in TQM)

MEASURESOFQUALITY



SOURCESOF QUALITY

Assurance of quality standards (ISO-9000)-

- **A**ssurance of quality is defined as a source of generation of quality
- **ISO 9000** is defined as a set of international standards on quality management and quality assurance developed to help companies effectively document the quality system elements needed to maintain an efficient quality system. They are not specific to any one industry and can be applied to organizations of any size.

Control mechanism-

- A system of maintaining standards in manufactured products by testing a sample of the output against the specification.

- Quality control is a process by which entities review the quality of all factors involved in production. ISO 9000 defines quality control as "A part of quality management focused on fulfilling quality requirements".

Customer‘s objective-

- The overarching objective of customer service is to resolve service issues, which involves improving the customer experience and results in increased customer loyalty. This creates source of quality.

Qualitative aspect of value chain

It is the customer value addition in each phase of value chain and quality.

COMPETING ON COST VS AVAILABILITY

In this particular topic we have to clear in our mind that availability means resources i.e. raw materials for production.

In production house availability means raw material and here objective is to find out effect of cost on raw material.

Inventory means stock. Sometimes we can consider stock of raw materials as the availability.

What to order and how much quantity has to be available for production should be inclined towards cost effectiveness.

INVENTORY MANAGEMENT-(COST VS. RESOURCE OR RAWMATERIAL/STOCK)

The effective inventory management should-

- Maintain sufficient stock of raw material in the period of short supply and anticipate price changes.
- Ensure a continuous supply of material to production department facilitating uninterrupted production.
- Minimize the carrying cost and time.
- Maintain sufficient stock of finished goods for smooth sales operations.
- Ensure that materials are available for use in production and production services as and when required.
- Ensure that finished goods are available for delivery to customers to fulfill orders, smooth sales operation and efficient customer service.
- Minimize investment in inventories and minimize the carrying cost and time.

Inventory Control

Inventory control is concerned with the acquisition, storage, handling and use of inventories so as to ensure the availability of inventory whenever needed, providing adequate provision for contingencies, deriving maximum economy and minimizing wastage and losses.

INVENTORY	PRIMARY USAGE	INVENTORY MANAGEMENT FUNCTION
1. Raw Material	Production and Assembly	Stores all components and materials for production
2. Sub-assemblies in process manufactured items	Production and Assembly	Monitor movement of stores and all in process inventories
3. Finished goods and Service Parts	Sales	To maintain adequate finished products to fill customer orders and parts needed for after sales service
4. Repair parts	Maintenance and Service	To keep adequate supply of parts and avoid costly delays when equipment fails
5. Office Supplies	Administration	To stock forms, papers, stencils and items of clerical book keeping
6. Computer Supplies	Data Processing	Maintain tapes, cards, repair parts for EDP

(INVENTORY MANAGEMENT)

ECONOMIC ORDERING QUANTITY (EOQ) OR AVAILABLE RAWMATERIAL IN INVENTORY MANAGEMENT-

Inventory Holding Costs /Carrying Costs

- Storing inventory either in your warehouse or in a sales outlet incurs additional costs.
- Holding inventory means labor costs for handling duties, additional utilities and rent/mortgage costs due to the physical spaces required.
- The just-in-time or JIT inventory purchasing model can reduce inventory holding costs by ordering inventory exactly when it is needed, preventing storage backups and freeing up employees' time to focus on more productive tasks.

Inventory Ordering Costs-

- Ordering costs are costs that are associated with the acquisition of inventory, irrespective of the value of goods purchased.
- These costs include the salaries of the staff associated with the placing, processing and expediting of purchase orders.

- The freight and handling costs incurred with respect to every purchase also forms part of this. Therefore, it can be inferred that the ordering costs are inversely proportional to the number of orders placed.

GRAPHICAL PROPERTY OF COST	COSTS ASSOCIATED
Directly proportional with quantity of inventory(available raw material)	**Holding cost/ordering cost**
Inversely proportional with quantity of inventory(available raw material)	**Carrying cost**

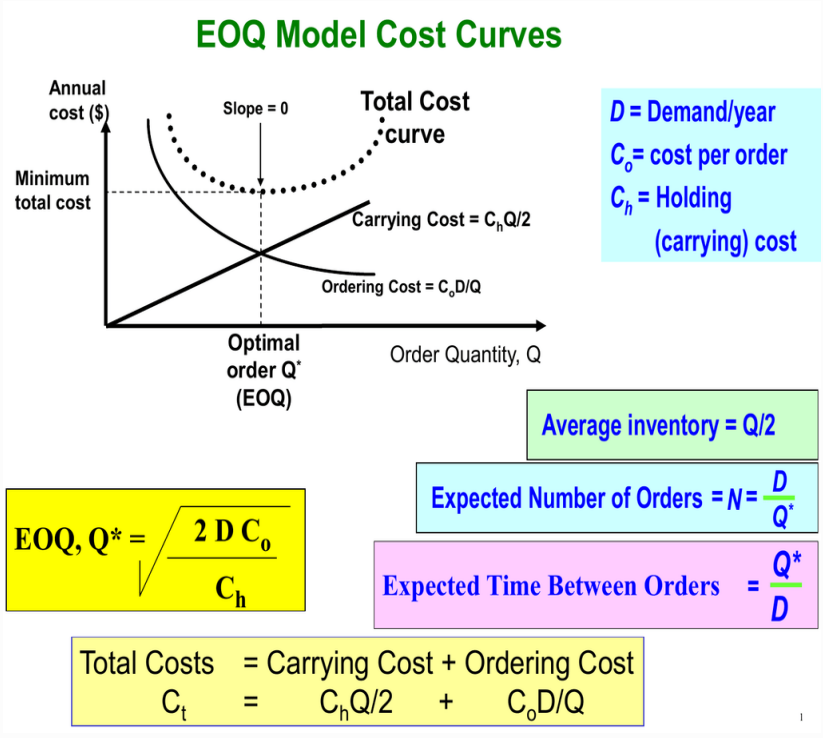
Total cost-

The total cost of inventory is the sum of the purchase, ordering and holding costs. As a formula:

TC = PC + OC + HC,

- **Where TC is the Total Cost of inventory;**
- **PC is Purchase Cost of material;**
- **OC is Ordering Cost; and**
- **HC is holding Cost.**

GRAPHICAL PROPERTY OF EOQ MODEL-



INTERPRETATION-

Total inventory cost is comprised of the following main costs:

- Cost of purchase
- Order Costs
- Holding Costs

If we change the order quantity, it can affect the different types of inventory costs in different ways.

Larger order size results in lower order costs because fewer orders need to be placed to cover the annual demand. This however results in higher holding costs because of the increase in inventory levels.

Conversely, smaller order size results in lower holding costs because of the decline in average inventory level. However, as lower quantity of inventory is ordered each time, the number of orders needed to increase in order to fulfill the annual demand which leads to higher ordering costs. Reducing the order size may also affect the cost of purchase due to the loss of trade discounts that are based on the order quantity.

EQUILIBRIUM POINT- The point where carrying cost and ordering costs are meeting at a point this point is in equilibrium and we get economic quantity available for optimum cost for production. In this way cost is affected by availability of the raw material in production house. EOQ model offers a method of finding the optimal order quantity that minimizes inventory costs by finding a balance between the opposing inventory costs.

COST VS FEATURES AND INNOVATIVENESS

Innovation can include the utilization of new business models, the development of new processes and services, and the enhancement of existing products too.

Technology does support and drive innovation and features. Technological advancements can allow manufacturers to create higher quality goods faster than before; with less expense and help them realize more efficient operations to become more competitive.

Innovators and engineers are constantly improving upon existing technologies to fulfill unmet needs, provide goods for untapped markets, and most importantly, looking forward to stay ahead of the competition with cost saving.

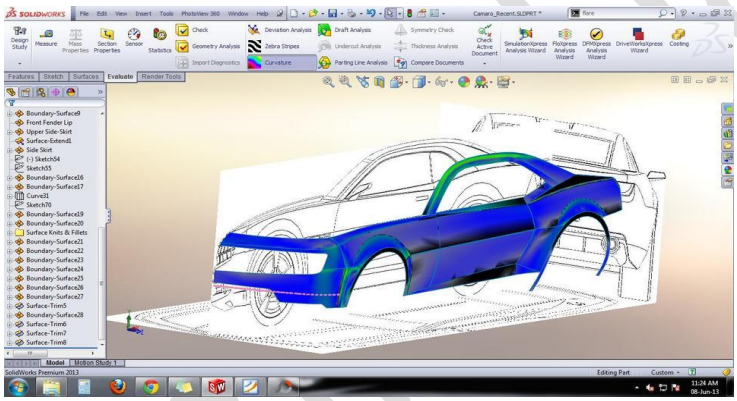
Here are **five technologies** that are impacting manufacturing innovation.(Applications)

Additive Manufacturing / 3D Printing

- It covers any and all processes involved in printing a 3-dimensional product, the reason it's commonly referred to as 3D printing.

- Additive manufacturing includes a technique called cold spraying, which involves blasting metallic particles through a nozzle at high speeds, binding particles together to form shapes. This creates a part by building materials layer by layer through the control of a computer.

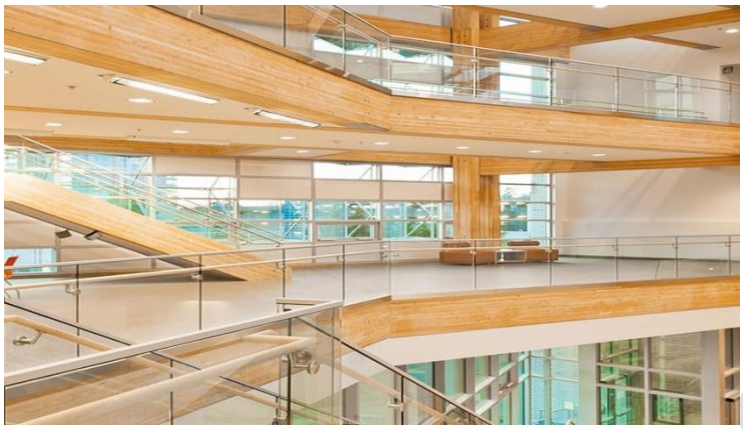
- The end result is a high precision replica of an original design, there is less waste during the production process and can save the manufacturer money.



(CAR DESIGN IN 3D PRINTING TECHNOLOGY)

Advanced Materials

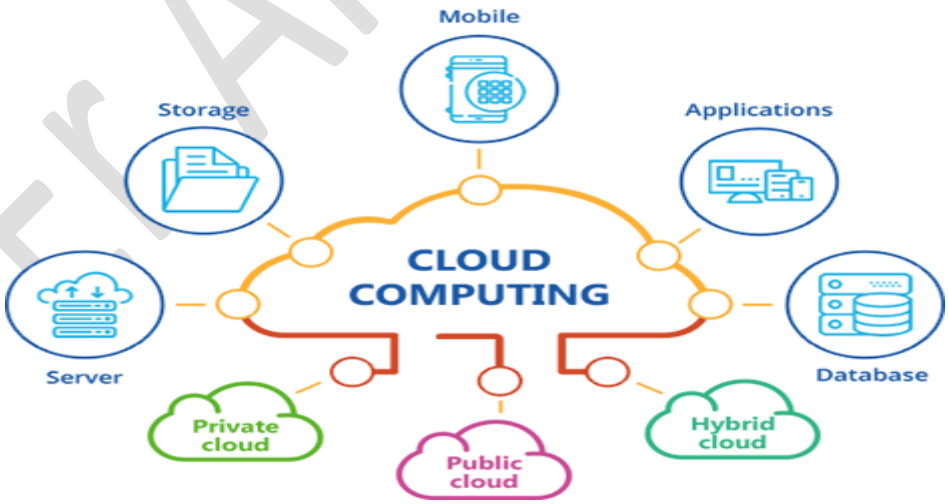
This includes advanced composites, which have to date been largely restricted to use in a limited number of high-cost applications. However, efforts are underway to develop manufacturing processes that lower cost and speed production such that advanced composites are integrated into a much wider range of products and applications in the coming years.



(ADVANCED MATERIAL)

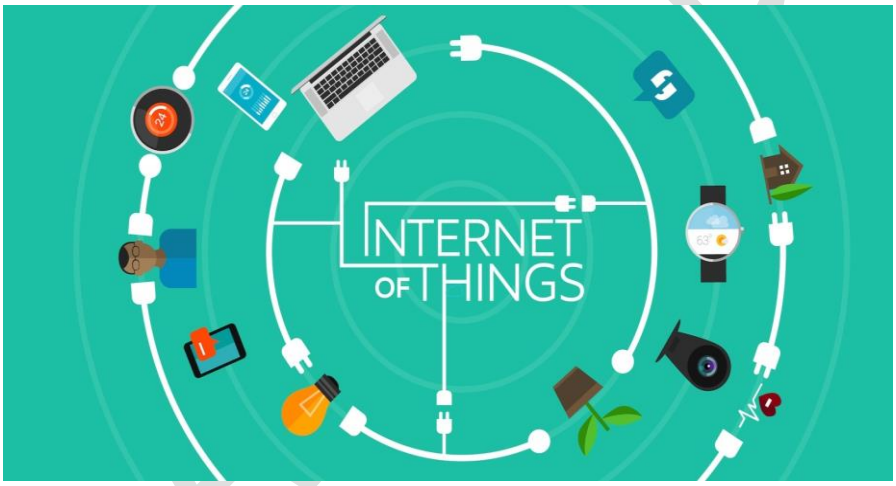
Cloud Computing

- Cloud based computing uses network connected remote services to manage and process data.
- Life in the cloud will gain momentum, but security concerns must be continually addressed.
- Companies are increasing use of this technology across various geographic locations to share data to make better business decisions. Cloud Computing helps reduces costs, improve quality control and shorten production times.



Internet of Things (IoT)

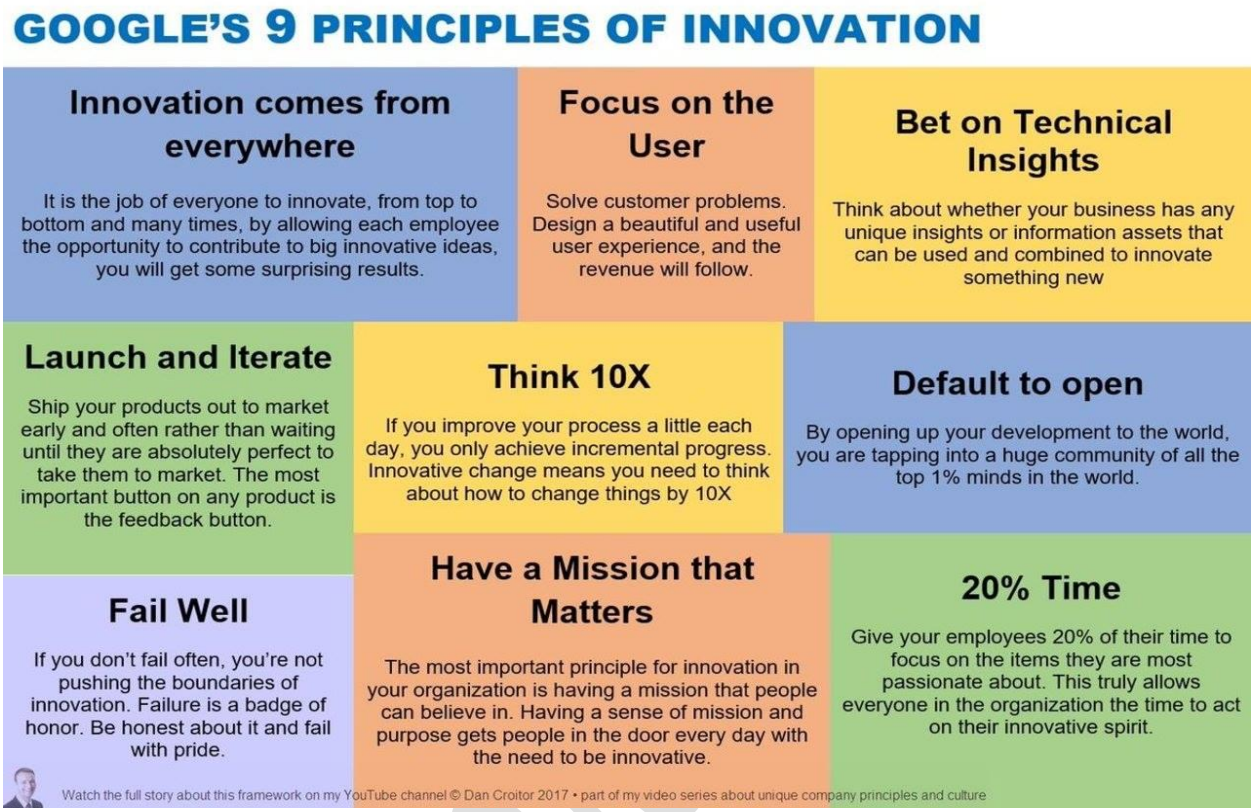
- Smart technology is not brand new, but it is steadily developing into the wave of the future for manufacturing.
- Imagine a workplace where connected equipment will be able to communicate via the Internet and computerized manufacturing machinery will be able to "talk to each other" and send/receive notifications about operating conditions.
- Once a problem is detected, a notification is sent to other networked devices so the entire process can be automatically adjusted.
- The end result will be reduced downtime, improved quality, less waste and lower costs. This technology will lead to the development of new types of positions for the manufacturing workforce.



ADVANTAGES OF INNOVATION IN COST SAVING

- **Improved productivity and quality**
- **Reduced costs**
- **Increased competitiveness**
- **Improved brand recognition and value**
- **New partnerships and relationships**
- **Increased turnover and improved profitability**

GOOGLE -9 PRINCIPLES OF INNOVATION-



COMPETITION IN THE HOUSING INDUSTRY(COST,QUALITY,PURCHASE)

In house industry means industry within boundary. It means all production and delivery of services will be inside the industry.

IN-HOUSE QUALITY MANAGEMENT & QUALITY CONTROL SUPPORT

Managing an existing Quality System and planning/implementing a **Quality Management System (QMS)** within an organization requires a significant investment of time and talent.

When extra resources are required, you can rely on **Quality Support Group (QSG)** for Quality Management Systems support.

QSG's Quality Assurance support services in housing production include:

- Development and implementation of **Quality Management Systems (QMS)**
- Documentation of Quality Management System – **procedures, processes, manuals, templates**

- Worldwide **Auditing Support services of supplier and sub-supplier compliance with quality, regulatory, standards, and other requirements**

- Resident and on-site representation for Quality Assurance activities, including:

  - **Management Review support**
  - **Internal audits**
  - **Corrective actions / Problem Solving activities**
  - **Test / Inspect**
  - **Change Management**
  - **Process Validations**

- Nonconformance control and management, development and control of corrective action plans
- **Root Cause Analysis (RCA)** to identify, understand, and correct and prevent the recurrence of nonconformance
- Review and development of **Production Part Approval Process (PPAP) and Advanced Product Quality Planning (APQP)**
- **Supplier Development, Process Improvements, Implementation of Best Practices**

QSG's Quality Control support services include:

- Source Inspection
- Receiving Inspection, In-Process Inspection, Final/Pre-Shipment Inspections
- Compliance Inspection to Government and Industry standards, regulations, requirements

IN HOUSE COST MANAGEMENT-

In housing industry we follow two types of cost management systems-

1. **Project cost Maagement**
2. **Product cost management(In service sector it is service)**

Project Cost Management (PCM)

- It is a method that uses technology to measure cost and productivity through the full life-cycle of enterprise level projects.
- PCM encompasses several specific functions of project management including estimating, job controls, field data collection, scheduling, accounting and design. PCM's main goal is to complete a project within an approved budget.
- From project initiation to completion, project cost management has an objective to simplify and cheapen the project experience in housing industry.

Product cost management

Product cost management (PCM) is a set of tools, processes, methods, and culture used by housing industries who develop and manufacture products to ensure that a product meets its profit (or cost) target.

Depending on the scope the practitioner assigns to PCM, it may include one or more of the following processes.

- Change management and building a cost/profit-conscious culture.
- Building cost management into the Product Lifecycle Management processes
- DFM – Design for Manufacturing
- DFA – Design for assembly
- DTC – Design to Cost
- DFP – Design for Procurement
- VA/VE – Value Analysis / Value engineering
- DFSS – Design for Six Sigma
- Cost targeting
- Should Cost / Price
- Make Buy
- Capital asset justification
- Commodity Pricing
- Spend analysis

Tools

- Initially, PCM(Product cost Management) was done with pencil and paper.
- However, with the advent of computers, companies started to create internal software for predicting, controlling, minimizing, recording, and sharing product costs.
- With the invention of spreadsheets, PCM tools got a major boost in ease of use and adoption.
- In the late 1970s, specialized third-party software was developed that could do some of the activities included in PCM.
- Today, there are several tools that directly or indirectly promote themselves as "Product Cost Management" software solutions..

HOUSING INDUSTRY PURCHASE MANAGEMENT-

To understand purchasing in housing industry we have to know-

Supply and Demand

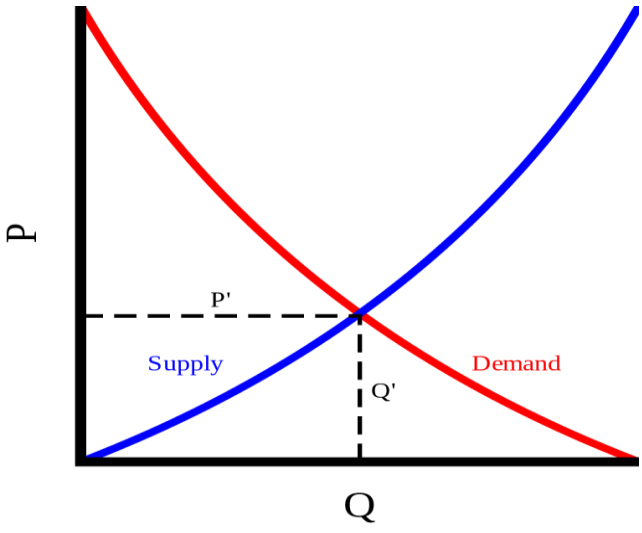
- The **law of supply and demand** is a basic economic principle that explains the relationship between supply and demand for a good or service, and how their interaction affects the price of that good or service.
- When there is a high demand for a good or service, its price rises. If there is a large supply of a good or service but not enough demand for it, the price falls.
- The theory of supply and demand is one of the most basic principles in economics. Supply and demand work against each other until the point at which the **equilibrium** price is achieved—that is the price where supply is equal to demand in the market.

Demand

- The **law of demand** dictates that people will have low or no demand for a good that has a higher price. People tend to sacrifice something that comes at a higher cost, which curbs demand.
- Similarly, lower prices drive demand, meaning **consumers value** and purchase something more when it's cheaper.

Supply

- When it comes to the **law of supply,** prices drop when there is an increase in the supply of a good or service in the market.
- But when prices increase, the number of goods and services tend to drop. That's because it tends to cost more to produce and sell goods at a higher price.



RELATION WITH PURCHASING MATERIAL IN HOUSING INDUSTRY (DEMAND SUPPLY MATRIX)

SUPPLY / DEMAND	HIGH	LOW
HIGH	MORE PURCHASING OF MATERIAL FOLLOWED BY A LESS LOSS IN MATERIAL	STRATEGY FOR STRONG LOGISTICS BY HOUSING INDUSTRY FOR MORE AND MORE SUPPLY OF MATERIAL
LOW	LOSS IN PRODUCTION PROSPECTIVE	FINDING OUT THE FAULTS THAT WHY LESS SUPPLY AND DEMAND AND RECTIFICATION SHOULD BE DONE

PURCHASING STRATEGY IN OPERATIONS-

Purchasing is an important function of materials management. In any industry purchase means buying of equipments, materials, tools, parts etc. required for industry.

The importance of the purchase function varies with nature and size of industry.

In small industry, this function is performed by works manager and in large manufacturing concern; this function is done by a separate department.

Objectives of Purchasing

The basic objective of the purchasing function is to ensure continuity of supply of raw materials, sub-contracted items and spare parts and to reduce the ultimate cost of the finished goods.

The objectives of the purchasing department can be outlined as under:

- **To avail the materials, suppliers and equipments at the minimum possible costs**
- **To ensure the continuous flow of production**
- **To increase the asset turnover**

- **To develop an alternative source of supply**
- **To establish and maintain the good relations with the suppliers**
- **To achieve maximum integration with other department of the company**
- **Efficient record keeping and management reporting**

Parameters of Purchasing and Production in Operations

The success of any manufacturing activity is largely dependent on the procurement of raw materials of right quality, in the right quantities, from right source, at the right time and at right price popularly known as **ten 'R's'** of the art of efficient purchasing.

They are described as the basic principles of purchasing.

There are other well-known parameters such as right contractual terms, right material, right place, right mode of transportation and right attitude are also considered for purchasing.

PARAMETERS	FEATURES
RIGHT PRICE	• It is the primary concern of any manufacturing organization to get an item at the right price.
RIGHT QUALITY	• Right quality implies that quality should be available, measurable and understandable as far as practicable.
RIGHT TIME	• For determining the right time, the purchase manager should have lead time information for all products and analyze its components for reducing the same.
RIGHT SOURCE	• The source from which the material is procured should be dependable and capable of supplying items of uniform quality. • The buyer has to decide which item should be directly obtained from the manufacturer
RIGHT QUANTITY	• The right quantity is the most important parameter in buying. Concepts, such as, economic order quantity, economic purchase quantity, fixed period and fixed quantity systems, will serve as broad guidelines.
RIGHT ATTITUDE	• The purchase manager should be innovative and his long-term objective should be to minimize the cost of the ultimate product.

	• He will be able to achieve this if he aims himself with techniques, such as, value analysis, materials intelligence, purchases research, SWOT analysis, purchase budget lead time analysis, etc.
RIGHT CONTRACTS	• The buyer has to adopt separate policies and procedures for capital and consumer items. • He should be able to distinguish between indigenous and international purchasing procedures. • He should be aware of the legal and contractual aspects in international practices.
RIGHT MATERIAL	• Right type of material required for the production is an important parameter in purchasing.
RIGHT TRANSPORTATION	• Right mode of transportation has to be identified as this forms a critical segment in the cost profile of an item.
RIGHT PLACE OF DELIVERY	• Specifying the right place of delivery, like head office or works, would often minimize the handling and transportation cost.

Purchasing Strategy

Needs Analysis

At this stage, the company recognizes and documents a need for goods or services to solve a particular problem. The procurement team describes the need to be met, and works with others to determine how best to do so.

Purchase Requisition to Purchase Order

The "purchasing" portion of the purchasing process kicks off with a purchase requisition submitted to the purchasing department or purchasing manager by the individual, team, or department requesting the goods or services. The purchase requisition contains full details on the items or services to be obtained.

Purchase Order Review and Approval

Approved purchase orders are sent to accounting to verify the funds exist in the appropriate budget to cover the requested goods and services.

Requests for Proposal

Pos (purchased orders) that receive budget approval are returned to the procurement department and, as required, used to **create *requests for proposal* (RFPs), also known as *requests for quotation*, or *RFQ*s. These are dispatched to vendors to solicit bids to fulfill the order for goods or services.**

Potential suppliers submit their bids, and are carefully reviewed based on their performance history, compliance records, and important characteristics such as average lead times, reputation, and price.

Contract Negotiation and Approval

The vendor with the winning bid is then awarded a contract, which is further refined before signing to ensure optimal terms and conditions and to ensure a mutually satisfactory arrangement for both parties.

Once the contract is signed, the purchase order is a legally binding agreement between buyer and seller.

Shipping and Receiving

The supplier delivers the goods or services within the agreed-upon timeframe. Once they've been received (in the case of goods) or performed (in the case of services), the purchaser

carefully reviews the goods and services to ensure they've received what was promised, and notifies the vendor of any issues.

Three-Way Matching

Three-way-matching is the comparison of shipping documents/packing slips with the original purchase order and the invoice issued by the supplier. This comparison is used to ensure all the information related to the transaction is accurate.

Invoice Approval and Payment

Successfully matched orders are approved for payment. Any modifications or additional charges may require another layer of approvals before payment can be issued.

Once approved, payment is issued to the vendor. Ideally, such payments are made with the goal of capturing early payment discounts and other incentives while avoiding late payment fees.

Accounting Records Update

Completed orders are recorded in the company's books, and all documents related to the transaction are securely stored in a centralized location.

SUPPLYNETWORK AND ITS STRATEGY

A **supply-chain network (SCN)** is an evolution of the basic supply chain. Due to rapid technological advancement, organizations with a basic supply chain can develop this chain into a more complex structure involving a higher level of interdependence and connectivity between more organizations, this constitutes a supply-chain network.

Businesses are often part of a larger network of organizations, a supply-chain network can be used to highlight interactions between organizations; they can also be used to show the flow of information and materials across organisations.Supply-chain networks are now more global than ever and are typically structured with five key areas:

- External suppliers,
- Production centers,
- Distribution centers (DCs),
- Demand zones
- Transportation assets

Overview

- All organizations can purchase the components to build a supply-chain network, it is the collection of physical locations, transportation vehicles and supporting systems

through which the products and services firm markets are managed and ultimately delivered.

- Physical locations included in a supply-chain network can be manufacturing plants, storage warehouses, carrier cross docks, major distribution centers, ports, and intermodal terminals whether owned by a company, suppliers, a transport carrier, a third-party logistics provider, a retail store or an end customer.
- Transportation modes that operate within a supply-chain network can include the many different types of trucks, trains for boxcar or intermodal unit movement, container ships or cargo planes.
- There are many systems which can be utilized to manage and improve a supply-chain network include Order Management Systems, Warehouse Management System, Transportation Management Systems, Strategic Logistics Modeling, Inventory Management Systems, Replenishment Systems, Supply Chain Visibility, Optimization Tools and more.
- Emerging technologies and standards such as the RFID(**Radio-frequency identification** (**RFID**) and the GS1 Global Standards are now making it possible to automate these Supply Chain Networks in a real time manner making them more efficient than the simple supply chain of the past.

A supply-chain network can be strategically designed in such a way as to reduce the cost of the supply chain.

It has been suggested by experts that 80% of supply chain costs are determined by location of facilities and the flow of product between the facilities.

Supply chain network design is sometimes referred to as 'Network Modeling'; due to the fact a mathematical model can be created to optimize the supply-chain network

Companies have been led to modify their basic supply chain, investing in the tools and resources to develop an improved SCN design that takes into account taxation regulations, new entrants into their industry and availability of resources has resulted in more complex network designs.

There is no definitive way to design a SCN as the network footprint, the capability and capacity, and product flow—all intertwine and are interdependent. Following on from this, there is also no single optimal SCN design, in designing the network there is an apparent trade-off between responsiveness, risk tolerance and efficiency.

Though designing a supply-chain network can cut costs within a company, it is important to note the supply chain is not static but rather a continually improving model and adapt in response.

A key part of designing the supply-chain network is ensuring the network is versatile enough to cope with future uncertainties.

Though there is inherent uncertainty about the future, a supply chain network risk analysis can be conducted; by using information available, the future business environment can be characterized.

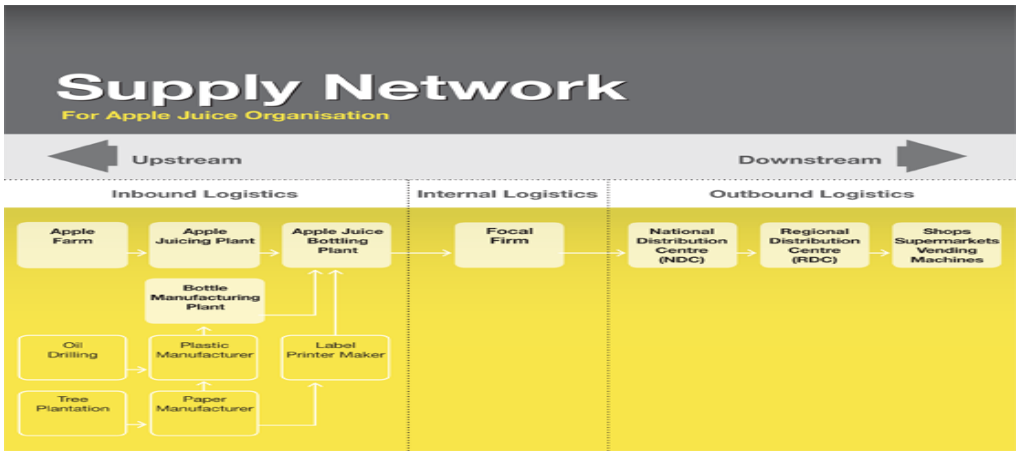
Endogenous uncertainty

An uncertainty can be categorized as 'endogenous' when the origin of the risk is within the supply-chain network itself, such as market volatility or technological turbulence.

Exogenous uncertainty

An uncertainty can be categorized as 'exogenous' when the origin of the risk is external to the supply-chain network. Exogenous uncertainties can be further categorized; ongoing risks such as economic volatility can be described as a 'continuous risk'. '

Discrete' events refer to infrequent events that could disrupt the supply-chain process, such as natural disasters.



(SUPPLY NETWORK IN APPLE JUICE ORGANIZATION)

STRATEGY FOR SUPPLY NETWORK-

Strategy 1: Adopt a demand-driven planning and business operating model based on real-time demand insights and demand shaping.

- The right prediction and contingency planning tools will ensure a complete view and an effective response to risks such as suppliers going out of business, political upheaval, and natural calamities affecting manufacturing.
- Companies then can adjust pricing and promotions strategies to shape demand, move additional product quickly, drive revenue growth, or further expand margins for a high-demand product with limited market supply.

Strategy 2: Build an adaptive and agile supply chain with rapid planning and integrated execution.

- Once executives are able to better understand and shape demand and risk, they need to adapt their supply chains to changing market opportunities and events.
- Companies must deploy **dynamic planning capabilities and continually fine-tune operations** to ensure responsive agility to meet changing demand.

Strategy 3: Optimize product designs and product management for supply, manufacturing, and sustainability to accelerate profitable innovation.

- Innovation is crucial for being one step ahead of the competition. But innovation doesn't exist in a vacuum. To be successful, products must be manufactured at the right cost, place, and time with innovation.
- Decisions made in the early cycles of product development can make or break the product.
- Designs must be optimized for **supply, manufacturability, and supply chain operations.** All true costs to deliver must be accurately captured and analyzed to maintain balance across the end-to-end business.

Strategy 4: Align your supply chain with business goals by integrating sales and operations planning with corporate business planning.

- Although sales and operations planning processes provide coordination among sales, manufacturing, and distribution, there still are disconnects and **gaps among finance, strategy, and operations in many companies.**
- One way to bridge these gaps is with integrated business planning that involves people, process, and technology elements of the business.
- This process integrates financial strategic budgeting and forecasting systems with operations planning and allows smart trade-off decisions to be made for the business.

Strategy 5: Embed sustainability into supply chain operations.

- The triple bottom line of people, profit, and planet has never been more important than it is today. Studies show that companies striving for social and environmental sustainability achieve major competitive advantages, especially with regard to **production efficiency, supplier management skills, and attractiveness to employees.**

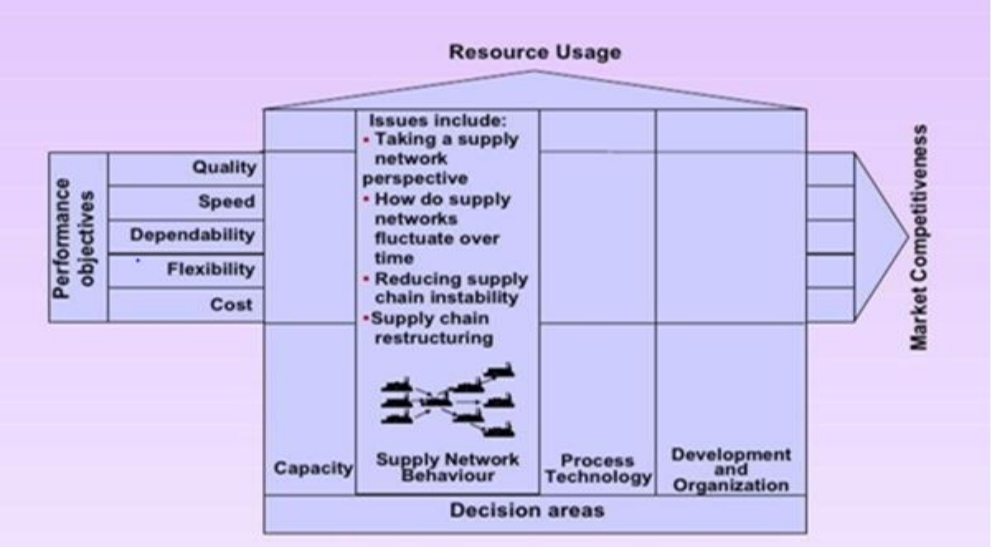
Ensure a reliable and predictable supply.

Without reliable supply to customer-facing stakeholders to meet agreed-upon service levels, a manufacturer will tend to hold inventory buffers to ensure meeting customer service levels. This costs the business and, even worse, may mean the wrong products are at the wrong place

at the wrong time, resulting in supply shortfalls. Working on continuous improvement and operational excellence strategies is a foundation for successful end-to-end supply chain operations

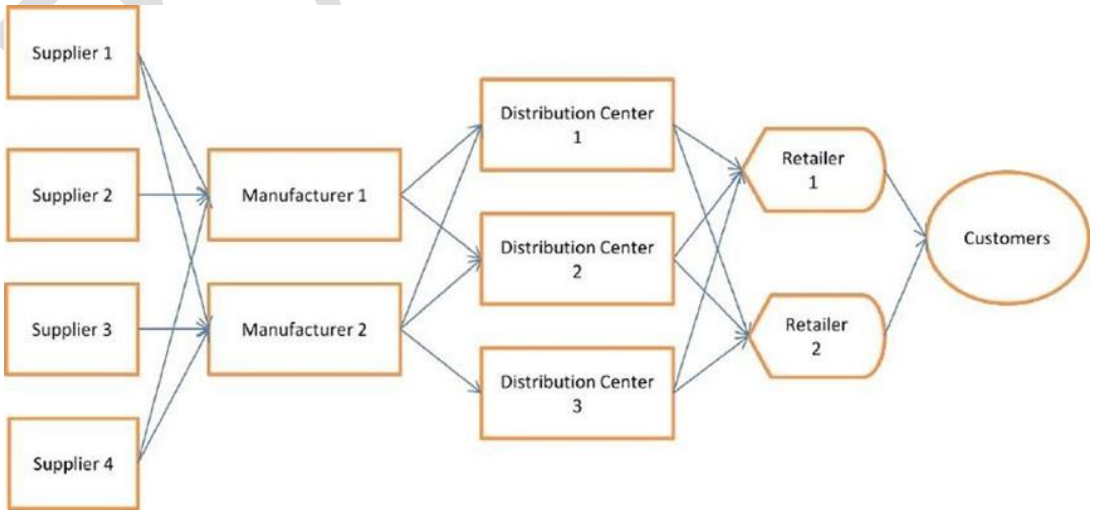
The right processes, practices, and tools can help.

The demands on supply chain managers to rapidly respond to change and increase profitability are greater than ever. The good news is that effective strategies and solutions exist that support each one of the previous five strategies and they can deliver immediate return on investment.



(SUPPLY NETWORK FRAMEWORK IN OPERATION STRATEGY)

SCN (supply chain network)-



SOURCING AND SUPPLIER MANAGEMENT, SUPPLIER POWER-

Strategic sourcing is an institutional **procurement** process that continuously improves and re-evaluates the purchasing activities of a company.

In the services industry, strategic sourcing refers to a service solution, sometimes called a **strategic partnership**, which is specifically customized to meet the client's individual needs. In a production environment, it is often considered one component of **supply chain management.**

Modern supply chain management professionals have placed emphasis on defining the distinct differences between strategic sourcing and procurement.

Procurement operations support tactical day-to-day transactions such as **issuing purchase orders** to suppliers, whereas strategic sourcing represents to strategic planning, supplier development, contract negotiation, supply chain infrastructure, and **outsourcing** models.

The steps in a strategic sourcing process are defined as:

1. Assessment of a company's current spending (what is bought, where, at what prices?).
2. Assessment of the supply market (who offers what?).
3. Total cost analyses (how much does it cost to provide those goods or services?).
4. Identification of suitable suppliers.
5. Development of a sourcing strategy (where to purchase, considering **demand and supply situations, while minimizing risk and costs).**
6. Negotiation with suppliers (products, service levels, prices, geographical coverage, Payment Terms, etc.).
7. Implementation of new supply structure.
8. Track results and restart assessment (**Continuous cycle**)

(SOURCING CYCLE)

SUPPLIER MANAGEMENT-

Projects: Dolphin Project — peter

Supplier Management

Stages	Initiate Supplier Management	Analyze Supply	Develop Supplier Strategic	Engage Supplier	Review Supplier Relationship
SRM Process Module	• Supplier segmentation • Internal governance • Internal kick-off meeting	• Supplier baselining • Cost analysis • Business requirements • Supplier analysis • Relationship analysis	• Strategy analysis • Options generation • Supplier relationship strategy	• Relationship governance • Supplier kick-off • Contract management • Supplier performance management • Supplier development • Supplier breakthrough • Project implementation	• SRM review
Activities	• Allocate suppliers into segment • Set up governance • Conduct kick-off meeting	• Create a detailed spend profile • establish understanding of price and cost drivers • Define business requirements • Analyze supplier	• Apply strategic analysis tools • Conduct options meeting • Finalize supplier strategy	• Confirm gonvernance • Conduct kick-off meeting • Document contract terms • Set up performance management • Develop supplier • Create breakthrough • Implement activities	• Conduct internal review c supplier
Gate	G1 - Project Charter	G2 - Business Requirements	G3 - Relationship Strategy	G4 - Supplier Performance	G5 - SRM Review

(PRACTICAL DASHBOARD OF SUPPLIER MANAGEMENT)

THE 5-STEP SUPPLIER MANAGEMENT PROCESS

IDENTIFYING THE SET OF BUSINESS GOALS AND OBJECTIVES

It is important to identify the set of business goals and objectives for which suppliers are required.

IDENTIFYING RELEVANT SELECTION CRITERIA FOR CHOOSING SUPPLIERS

The selection criteria depends on the type of the organization and its requirements from suppliers, standard measures include pricing, quality of past work, industrial recognitions, legal reputation, etc.

EVALUATING AND SELECTING SUPPLIERS

Majority of the organizations evaluate the suppliers based on the pricing they have quoted. However, it is equally important to factor in the other criteria that we have identified.

NEGOTIATING AND CONTRACTING WITH THE SELECTED SUPPLIER(S)

It defines Collaborate with the suppliers to ensure that the negotiation process runs smoothly with minimal roadblocks.

EVALUATING SUPPLIER PERFORMANCE

The supplier management process doesn't just end once we choose the suppliers. After their selection and on boarding, we need to periodically evaluate their performance to see how well they are fulfilling the set objectives and requirements.

STRATEGIES TO IMPROVE SUPPLIER MANAGEMENT

IMPLEMENT SUPPLIER INFORMATION MANAGEMENT (SIM)-

Having a supplier information system will enable you to:

1. Streamline supplier data from disparate sources to gain meaningful insights
2. Collaborate with suppliers to improve supplier relationship management
3. Monitor the suppliers' capabilities to feet current and future demands
4. Evaluate supplier risks and identify mitigating measures

CREATE KPIS TO MEASURE SUPPLIER PERFORMANCE

KPIs enable supplier performance measurement to evaluate the value-creation and identify problem areas.

COLLABORATE WITH YOUR SUPPLIERS FOR EFFECTIVE SUPPLIER RELATIONSHIP MANAGEMENT

Ensure that we have accurately communicated your business objectives and goals to your suppliers. When the purpose is understood, suppliers can offer propositions that provide maximum value for your business needs.

EVALUATE SUPPLIER RISKS AND IDENTIFY MITIGATION MEASURES

This is one of the most crucial strategies you need to employ for a well-run supplier management process.

It is important to identify supplier risks that plague supply chain, dissolve costs savings, and disrupt performance.

KEY FACTORS DRIVING SUPPLIER MANAGEMENT

- **Increasing operational scale**
- **The increasing complexity of supply chains**
- **Growing risks in a supply chain**
- **Managing supplier data**
- **Establishing long-term supplier relationships**
- **Leveraging supplier relationships**
- **An increasing competition**
- **Matching industrial standards**

ADVANTAGES OF SUPPLIER MANAGEMENT-

- Managing a growing supplier base effectively
- Achieving cost savings and quality control
- Improving the organization's supply transparency
- Tracking compliance to relevant parameters
- Evaluating supplier performance
- Building development programs to support suppliers
- Assessing and mitigating supplier risk
- Building a supplier management process

LOGISTICS SYSTEM

Logistics Management:

The management process which integrates the movement of goods, services, information and capital, right from the sourcing of raw material, till it reaches its end consumer is known as Logistics Management.

The objective behind this process is to provide the right product with the right quality at the right time in the right place at the right price to the ultimate customer. The logistic activities are divided into two broad categories they are:

Inbound Logistics: The activities which are concerned with procurement of material, handling, storage and transportation.

Outbound Logistics: The activities which are concerned with the collection, maintenance and distribution or delivery to the final consumer.

Apart from these, other activities are warehousing, protective packing, and order fulfillment, stock control, maintaining equilibrium between demand and supply, stock management. This will result in savings in cost and time, high quality products etc.

Logistics vs. Supply Chain Management:

Basis For Comparison	Logistics Management	Supply Chain Management
Meaning	The process of integrating the movement and maintenance of goods in and out the organization is Logistics.	The coordination and management of the supply chain activities are known as Supply Chain Management.
Objective	Customer Satisfaction	Competitive Advantage
Evolution	The concept of Logistics has been evolved earlier.	Supply Chain Management is a modern concept
How many organizations are involved?	Single	Multiple
One in another	Logistics Management is a fraction (activity) of Supply Chain Management.	Supply Chain Management is the new version of Logistics Management.
Technology	Transportation Management System (TMS), Warehouse Management System (WMS)	Customer Relationship Management (CRM), Enterprise Resource Planning (ERP)

Key Differences between Logistics and Supply Chain Management:

The following are the major differences between logistics and supply chain management:

- The flow and storage of goods inside and outside the firm is known as Logistics. The movement and integration of supply chain activities is known as Supply Chain Management.

- The main aim of Logistics is full customer satisfaction. Conversely, the main aim behind Supply chain Management is to gain substantial competitive advantage.
- There is only one organization involved in Logistics while a number of organizations are involved in Supply Chain Management.
- Supply Chain Management is a new concept as compared to Logistics.
- Logistics is only an activity of Supply Chain Management.

Logistics Components:

The management of logistics can involve some or all of the following business functions, including:

- Inbound transportation
- Outbound transportation
- Fleet management
- Warehousing
- Materials handling
- Order fulfillment
- Inventory management
- Demand planning

Why Logistics is Important?:

Although many small businesses focus on the design and production of their products and services to best meet customer needs, if those products cannot reach customers, the business will fail. That's the major role that logistics plays. But logistics also impacts other aspects of the business, too.

The more efficiently raw materials can be purchased, transported, and stored until used, the more profitable the business can be. Coordinating resources to allow for timely delivery and use of materials can make or break a company. And on the customer side, if products cannot be produced and shipped in a timely manner, customer satisfaction can decline, also negatively impacting a company's profitability and long-term viability.

Types of logistics:

1) ***Procurement logistics*** – the process of providing the enterprise with material resources, the allocation of resources in the warehouses of the enterprise, storage and delivery into production.

2) ***Industrial Logistics*** – Materials Management, while passing through its production units, moving from the primary source of raw materials to finished products.

3) ***Distribution logistics*** – a complex of interrelated functions included in the distribution of material flow between the various wholesale purchases, i.e. in the wholesale trade.

4) ***Transport logistics*** – management of cargo transportation.

5) ***Information logistics*** – the part of logistics, which is the link between supply, production and marketing of products and organizes the data flow, which accompany the material flow in the process of being, relocate.

LOGISTICS STRATEGY FOR BUSINESS

Business logistics

One definition of business logistics speaks of "**having the right item in the right quantity at the right time at the right place for the right price in the right condition to the right customer".**

- Business logistics incorporates all industry sectors and aims to manage the fruition of project life cycles, supply chains, and resultant efficiencies.
- The term "business logistics" has evolved since the 1960sdue to the increasing complexity of supplying businesses with materials and shipping out products in an increasingly globalized supply chain, leading to a call for professionals called "**supply chain logisticians**".
- In business, logistics may have an internal focus (inbound logistics) or an external focus (outbound logistics), covering the flow and storage of materials from point of origin to point of consumption (supply-chain management).
- The main functions of a qualified logistician include inventory management, purchasing, transportation, warehousing, consultation, and the organizing and planning of these activities. Logisticians combine professional knowledge of each of these functions to coordinate resources in an organization.
- There are two fundamentally different forms of logistics: one optimizes a steady flow of material through a network of transport links and storage nodes, while the other coordinates a sequence of resources to carry out some project (e.g., restructuring a warehouse).

(BUSINESS LOGISTICS)

THE STEPS OF LOGISTICS SYSTEM-

Nodes of a distribution network-The nodes of a distribution network include:

- Factories where products are manufactured or assembled
- A depot or deposit, a standard type of warehouse for storing merchandise (high level of inventory)
- Distribution centers for order processing and order fulfillment (lower level of inventory) and also for receiving returning items from clients
- Transit points for cross docking activities, which consist of reassembling cargo units based on deliveries scheduled (only moving merchandise)
- Traditional retail stores of the Mom and Pop variety, modern supermarkets, hypermarkets, discount stores or also voluntary chains, consumers' co-operative, groups of consumer with collective buying power. Note that subsidiaries will be mostly owned by another company and franchisers, although using other company brands, actually own the point of sale.

There may be some intermediaries operating for representative matters between nodes such as sales agents or brokers.

Logistic families and metrics

A logistic family is a set of products that share a common characteristic: weight and volumetric characteristics, physical storing needs (temperature, radiation,...), handling needs, order frequency, package size, etc. The following metrics may be used by the company to organize its products in different families

Physical metrics used to evaluate inventory systems include

- stocking capacity,
- selectivity,
- superficial use,
- volumetric use,
- Transport capacity,
- Transport capacity use.

Monetary metrics used include space holding costs (building, shelving, and services) and handling costs (people, handling machinery, energy, and maintenance).

Other metrics may present themselves in both physical and monetary form, such as the standard Inventory turnover.

Handling and order processing

- Unit loads for transportation of luggage at the airport. In this case, the unit load has a protective function.
- Unit loads are combinations of individual items which are moved by handling systems, usually employing a pallet of normed dimensions.
- Handling systems include: trans-pallet handlers, counterweight handler, retractable mast handler, bilateral handlers, trilateral handlers, AGV (Automated guided vehicle) and other handlers.
- Storage systems include: pile stocking, cell racks (either static or movable), cantilever racks and gravity racks
- Order processing is a sequential process involving: processing withdrawal list, picking (selective removal of items from loading units), sorting (assembling items based on the destination), package formation (weighting, labeling, and packing), order consolidation (gathering packages into loading units for transportation, control and bill of lading).formation (weighting, labeling, and packing), order consolidation (gathering packages into loading units for transportation, control and bill of lading).

- Picking can be both manual and automated. Manual picking can be both man to goods, i.e. operator using a cart or conveyor belt, or goods to man, i.e. the operator benefiting from the presence of a mini-load ASRS, vertical or horizontal carousel or from an Automatic Vertical Storage System (AVSS). Automatic picking is done either with dispensers or depalletizing robots.
- Sorting can be done manually through carts or conveyor belts, or automatically through sorters.

Transportation

- Cargo, i.e. merchandise being transported, can be moved through a variety of transportation means and is organized in different shipment categories. Unit loads are usually assembled into higher standardized units such as**: ISO containers, swap bodies or semi-trailers**.
- Especially for very long distances, product transportation will likely benefit from using different transportation means: multimodal transport, intermodal transport (no handling) and combined transport **(minimal road transport)**. When moving cargo, typical constraints are maximum weight and volume.
- Operators involved in transportation include: all train, road vehicles, boats, airplanes companies, **couriers, freight forwarders and multi-modal transport operators**.
- Merchandise being transported internationally is usually subject to **the Incoterms standards** issued by the International Chamber of Commerce.

Configuration and management

Similarly to production systems, logistic systems need to be properly configured and managed.

Actually a number of methodologies have been directly borrowed from operations management such as using Economic Order Quantity models for managing inventory in the nodes of the network.

Distribution resource planning (DRP) is similar to MRP, except that it doesn't concern activities inside the nodes of the network but planning distribution when moving goods through the links of the network.

Traditionally in logistics **configuration** may be at the level of the warehouse (node) or at level of the distribution system (network).

➢ configuration means solving a number of interrelated technical-economic problems: dimensioning rack cells,
➢ choosing a palletizing method (manual or through robots),
➢ rack dimensioning and design, number of racks,
➢ number and typology of retrieval systems (e.g. stacker cranes).

Configuration at the level of the distribution system concerns primarily the problem of location of the nodes in geographic space and distribution of capacity among the nodes.

The first may be referred to as **facility location (with the special case of site selection) while the latter to as capacity allocation.**

The problem of outsourcing typically arises at this level: the nodes of a supply chain are very rarely owned by a single enterprise.

Distribution networks can be characterized by numbers of levels, namely the number of intermediary nodes between supplier and consumer:

- **Direct store delivery, i.e. zero levels**
- **One level network: central warehouse**
- **Two level network: central and peripheral warehouses**

Once a logistic system is configured, **management**, meaning tactical decisions, takes place, once again, at the level of the warehouse and of the distribution network. Decisions have to be made under a set of constraints: internal, such as using the available infrastructure, or external, such as complying with the given product shelf lifes and expiration dates.

At the warehouse level, the logistician must decide how to distribute merchandise over the racks. Three basic situations are traditionally considered:

- **shared storage,**
- **dedicated storage (rack space reserved for specific merchandise) and**

- **class-based storage (class meaning merchandise organized in different areas according to their access index).**

Picking efficiency varies greatly depending on the situation.

For a man to goods situation, a distinction is carried out between high-level picking (vertical component significant) and low-level picking (vertical component insignificant).

A number of tactical decisions regarding picking must be made:

- **Routing path**: standard alternatives include transversal routing, return routing, midpoint routing, and largest gap return routing
- **Replenishment method**: standard alternatives include equal space supply for each product class and equal time supply for each product class.
- **Picking logic**: order picking vs batch picking

At the level of the distribution network, tactical decisions involve **mainly inventory control and delivery path optimization.**

Warehouse management system(WMS) and control(WCS)

- Although there is some overlap in functionality, warehouse management systems (WMS) can differ significantly from warehouse control systems (WCS).
- WMS **plans a weekly activity forecast based on such factors as statistics and trends**, whereas a WCS acts like a floor supervisor, working in**real-time to get the job done by the most effective means.**
- A WCS can prevent that problem by working in real-time and adapting to the situation by making a last-minute decision based on current activity and operational status.
- Working synergistically, WMS and WCS can resolve these issues and maximize efficiency for companies that rely on the effective operation of their warehouse or distribution center.

Logistics outsourcing

- Logistics outsourcing involves a relationship between a company and an LSP (logistic service provider), which, compared with basic logistics services, has more customized offerings, encompasses a broad number of service activities, is characterized by a long-term orientation, and thus has a strategic nature.

- **Third-party logistics (3PL)** involves using external organizations to execute logistics activities that have traditionally been performed within an organization itself.According to this definition, third-party logistics includes any form of outsourcing of logistics activities previously performed in house.

- For example, if a company with its own warehousing facilities decides to employ external transportation, this would be an example of third-party logistics. Logistics is an emerging business area in many countries.

- The concept of a **fourth-party logistics** (4PL) provider was first defined by Andersen Consulting (now Accenture) as an integrator that assembles the resources, planning capabilities, and technology of its own organization and other organizations to design, build, and run comprehensive supply chain solutions.

- Whereas a third-party logistics (3PL) service provider targets a single function, a 4PL targets management of the entire process. Some have described a 4PL as a general contractor that manages other 3PLs, truckers, forwarders, custom house agents, and others, essentially taking responsibility of a complete process for the customer.other 3PLs, truckers, forwarders, custom house agents, and others, essentially taking responsibility of a complete process for the customer.

Horizontal alliances between logistics service providers

- Horizontal business alliances often occur between logistics service providers, i.e., the cooperation between two or more logistics companies that are potentially competing.
- In a horizontal alliance, these partners can benefit twofold. On one hand, they can " resources which are directly exploitable". In this example extending common transportation networks, their warehouse infrastructure and the ability to provide more complex service packages can be achieved by combining resources.

  On the other hand, partners can "access intangible resources, which are not directly exploitable".

Logistics automation

- **Logistics automation** is the application of computer software or **automated machinery** to improve the efficiency of logistics operations. Typically this refers to operations within a warehouse or distribution center with broader tasks undertaken by **supply chain engineering** systems **and enterprise resource planning systems.**

- Industrial machinery can typically identify products through **either barcode or RFID(Radio-frequency identification) technologies**. Information in traditional bar codes is stored as a sequence of black and white bars varying in width, which when read by laser is translated into a digital sequence, which according to fixed rules can be converted into a decimal number or other data.

- Sometimes information in a bar code can be transmitted through radio frequency, more typically radio transmission is used in RFID tags.

- An RFID tag is a card containing a memory chip and an antenna that transmits signals to a reader. RFID may be found on merchandise, animals, vehicles, and people as well.

(RFID TECHNOLOGY)

SOCIAL SUSTAINABLE STRATEGY

According to the Western Australia Council of Social Services (WACOSS)"Social sustainability occurs when the formal and informal processes; systems; structures; and relationships actively support the capacity of current and future generations to create healthy and livable communities.

Socially sustainable communities are equitable, diverse, connected and democratic and provide a good quality of life.

Sustainability is important for both large and small companies.

In addition to the obvious benefits to the environment, society and the economy, sustainability brings many benefits to companies as it helps:

- reduce costs;
- encourage product innovation;
- maintain / increase sales;
- remain competitive in the long term;
- recruit, retain and motivate personnel;
- improve the company's reputation and its standing in the local community;
- enhance relationship with retailers;

- improve relations with financial stakeholders and when seeking new sources of finance;

STAKEHOLDER ENGAGEMENT BY RAIC MODEL (SOCIAL SUSTAINABILITY)

RACI model

- **R = Responsible (also recommender)**- Those who do the work to complete the task.
- **A = Accountable** (also approver or final approving authority)- one ultimately answerable for the correct and thorough completion of the deliverable or task
- **C = Consulted** (sometimes consultant or counsel)- Those whose opinions are sought, typically subject-matter experts; and with whom there is two-way communication.
- **I = Informed** (also informee)- Those who are kept up-to-date on progress.

Example of a responsibility assignment (or RACI) matrix

Code	Name	Project sponsor	Business analyst	Project manager	Technical architect	Applications development
Stage A	Manage sales					
Stage B	Assess job					
Stage C	Initiate project					
- C04	Security governance (draft)	C	C	A	I	I
- C10	Functional requirements	A	R	I	C	I
- C11	Business acceptance criteria	A	R	I	C	I
Stage D	Design solution					

CSR Model-

Corporate social responsibility (**CSR**) is a type of international private business self-regulation that aims to contribute to societal goals of a philanthropic, activist, or charitable nature by engaging in or supporting volunteering or ethically-oriented practices.

CAROLL MODEL FOR CSR IN PRODUCT/SERVICE SECTOR-

- **Philanthropic responsibility** involves giving back to the community and donating to worthy causes in the form of time, money or other resources.

- **Environmental responsibility** entails efforts to reduce your carbon footprint by adopting environmentally friendly policies.

- **Ethical responsibility** requires that fair business practices be used by your company and all those in your supply chain. This affects the way employees are treated, contracts are won and business is conducted.

- **Economic responsibility** refers to operating with sound philanthropic, environmental and ethical business practices in a way that's profitable and can sustain long-term growth.

Key benefits of good CSR practices

- Stronger brand image
- Increased customer loyalty and sales
- Operational cost savings
- Employee recruitment and retention
- Access to funding and financing
- Improve relations with regulatory bodies

CSR MODEL MECHANISM-

MECHANISM STEPS	WHAT DOES IT MEAN
Understand	• Determine what CSR means to company and how it relates to overall mission and purpose.
Evaluate	• Look at what organization is already doing in terms of CSR activities.
Research	• Find out which CSR issues are most significant to business. • Start by referencing online lists for relevant issues in sector. Look at the CSR or sustainability reports of larger companies in industry to see which issues they're tackling.
Prioritize	• Identify which CSR issues are most important to customers and stakeholders and deal with those first. • Engaging employees and customers is a great way to get going and gain support.
Integrate	• Holistic correlation system building
Identify opportunities	• Having strong CSR credentials can pave the way for new opportunities such as entering new markets, developing niche products and forging strategic partnerships.
Communicate	• Ensure effectively communicate CSR activities to various target audiences through as many channels as possible.

ENVIRONMENTAL STRTEGY IN OPERATIONS-

APPLICATION OF GREEN LOGISTICS IN ENVIRONMENTAL STRATEGY

Green Logistics: Green logistics has its origin in the mid 1980s and was a concept to characterize logistics systems and approaches that use advanced technology and equipment to minimize environmental damage during operations.

- **Green Logistics is defined as "efforts to measure and minimize the environmental impact of logistics activities, these activities include a proactive design for disassembly".**
- Green logistics is a form of logistics which is calculated to be environmentally and often socially friendly in addition to economically functional.
- It describes all attempts to measure and minimize the ecological impact of logistics activities.
- This includes all activities of the forward and reverse flows of products, information and services between the point of origin and the point of consumption. It is the aim to create a sustainable company value using a balance of economic and environmental efficiency.
- Green logistics describes all attempts to measure and minimize the ecological impact of logistics activities. This includes all activities of the forward and reverse flows of products, information and services between the point of origin and the point of consumption.
- It is the aimed to create a sustainable company value using a balance of economic and environmental efficiency.

Green logistics is the process of minimizing damage to the environment due to the logistics operations of an organization.

Logistics includes transportation and resource intensive processes such as procurement, inventory management, warehousing, order fulfillment and distribution. It also includes processes such as **reverse logistics and disposal logistics** that concern reuse, recycling and waste disposal.

COMPONENTS EFECTED BY GREEN LOGISTICS-

COMPONENTS	FEATURES
Transport	Minimizing the emissions and energy consumption of transportation. For example, a telecom company that moves to electric vehicles for field service.
Reuse	Reuse such as a process of reusing durable packaging in your supply chain.
Efficiency	Reducing waste to improve operational efficiency. For example, an ecommerce company that fits each order into a reasonable size of box without wasted space.
Design for Logistics	Designing things to be easier to transport. For example, furniture that requires minor assembly but fits into an efficient standard size box.
Proximity	Reducing transport by doing things closer to the customer. For example, local sourcing of parts.
Sourcing	Sourcing from environmental responsible partners and implementing controls and audits to continually validate their environmental practices.
Reverse Logistics	Reselling, refurbishing, remanufacturing, reusing and recycling items that are returned by the customer.
Returns Avoidance	Preventing returns with techniques such as digital tools to make sure clothing fits the customer before shipping it.
Quality of Life	Working to improve quality of life in the communities where you operate. For example, improving the safety of transport.
Waste is Food	The principle that business processes don't

	release anything into the environment that couldn't be safely consumed by an organism. For example, hydrogen powered vehicle that emits water as a waste product. Related to the idea of a circular economy.

Importance of Green Logistics

- Inserting logistics into recycling and the disposal of waste materials of all kinds, including toxic and hazardous goods, has become a major new market. Reverse distribution is a continuous embedded process in which the organization (manufacturer or distributor) takes responsibility for the delivery of new products as well as their take-back.

- This would mean environmental considerations through the whole life-cycle of a product (production, distribution, consumption and disposal). For example, BMW is designing a vehicle whose parts will be entirely recyclable.

A business gain can gain the following benefits from getting into 'green logistics' –

- Reduction in CO2 emissions
- Unlocking significant cost savings
- Heightened supply chain optimization
- Boosted business performance

Green Logistics in Application- Case Study

IKEA Model

IKEA is a global furniture store that provides "cheap furniture that as many as possible can afford". Ikeas company view of green logistics is firstly to remove the wooden pallets from the entire supply chain. Instead of wooden pallets they are using Paper/cardboard pallets and so called ledges. Underneath these ledges there are aplastic legs underneath the goods. Because of this approach they are dramatically decreasing transportation, Co2 emissions, PP/LL can be packed with less space than with normal wooden pallets. Also IKEAs Iway always monitoring system steer transport partners to use low Co2 equipments. The Iway monitoring system is IKEAS own measuring system. The goals for IKEA within green logistics are as the following:

- 2012 60% total flow integrated to non-wooden pallets
- 2014 100% of total flow integrated to non-wooden pallets
- 2015 all transport partners are fulfilling the Iway standards (IKEA sets a standard for Corporate Social Responsibility.)

APPLICATION OF REVERSE LOGISTICS IN ENVIRONMENTAL STRAEGY

Definition:

- Reverse logistics refers to all procedures associated to product returns, repairs, maintenance, recycling and dismantling for products and materials.
- Overall it incorporates running products in reverse through the supply chain to gain maximum value.
- Reverse logistics is for all operations related to the reuse of products and materials.
- It is "the process of moving goods from their typical final destination for the purpose of capturing value, or proper disposal. Remanufacturing and refurbishing activities also may be included in the definition of reverse logistics.

Reverse logistics component of environmental sustainability:

There are three main principles in sustainable development:

- ***Environmental Sustainability,*** ensuring a tolerable development for all essential ecological processes, especially the diversity of biological resources

- ***Social and Cultural Sustainability,*** which guarantees a favorable economic development, members of society, culture and values compatible with the existing culture and civilization, to preserve community identities

- ***Economic Sustainability,*** having a role in ensuring efficient economic development, resources is handled so that it also will exist in the future.

Reverse Logistics is the process of disposing of used products or a new initial point of the supply chain, such as the customer returns, overstock, expired food, also redistributing them using specific rules to collect their management.

Reverse logistics refers to recoverable material components after consumption, waste and packaging, which go on backward, from the consumer production that is incorporated into a new economic cycle.

Benefits of Reverse Logistics:

- Reduced administrative, transportation and aftermarket support costs.
- Increased velocity.
- Increased service market share.
- Higher achievement of sustainability goals.
- Greater customer service and higher retention levels.
- Improved reverse supply chain visibility, increased productivity, and greater responsiveness to customers.
- A synchronized supply chain to now include forward traditional logistics, inbound logistics, and reverse logistics.
- Transparency in supply chain operations across your network.
- Automatic consolidation of data from partners and systems.
- Transparency into the entire product life-cycle.
- Distribution and refurbishment center management.

Implement of Reverse Logistics Strategies in an organizations:

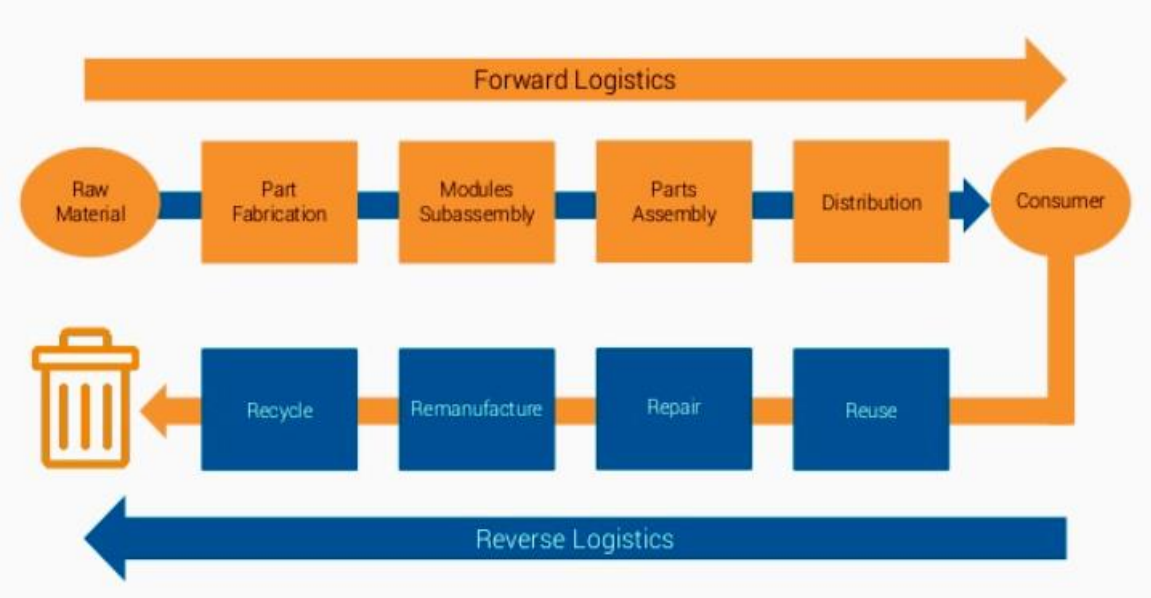
- Allows a trader to receive products back from the consumer or send unsold merchandise back to the manufacturer to be taken apart, sorted, **reassembled or recycled; minimizing overall costs for an organization.**

- Reverse logistics can be valuable in **increasing product lifecycles, supply chain** complexity, maintainable practices and consumer preferences; which have to be improved on to maintain productivity and growth.

- Gains can include; increasing speed of production, **reducing costs (transportation, administrative, and aftermarket maintenance, repair and replacement)**, retaining customers by improving service goals and meeting sustainability goals.

- **More value** can be extracted from used/returned goods instead of wasting manpower, time and costs of raw materials involved in the original supply chain.

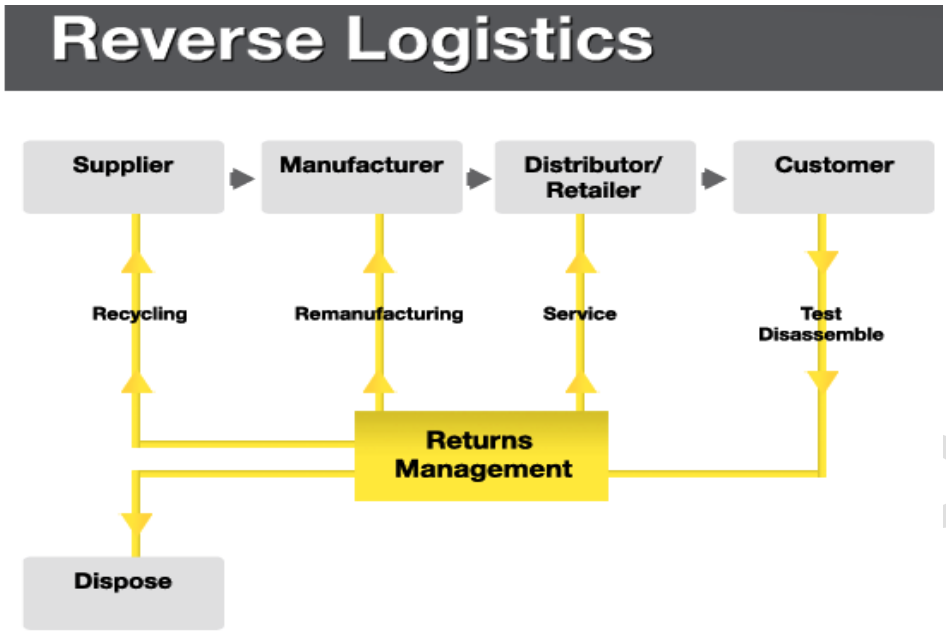
- **Improved customer satisfaction and loyalty** by paying more attention to faulty goods, and repairs of merchandise. Reverse logistics can include gaining feedback to make improvements and to improve the understanding of real reasons for product returns.



(FIGURE OF REVERSE LOGISTICS)

Why is it important to deal with organizations who implement reverse logistics?

Organizations that implement reverse logistics are able to improve customer service and response times; reduce environmental impact by reducing waste and improve overall corporate citizenship.



(REVERSE LOGISTICS IN ORGANIZATIONS)

- For example; a manufacturer produces product A which moves through the supply chain network reaching the distributor or customer.
- Any process or management after the sale of product A involves Reverse Logistics. If product A happened to be defective the customer would return the product.
- The manufacturing firm would then have to organize shipping of the defective product, testing the product, dismantling, repairing, recycling or disposing the product.
- Product A will travel in reverse through the supply chain network in order to retain any use from the defective product. This is what reverse logistics is about.

Importance of Reverse Logistics:

- **Reverse logistics** is only seen as an expense to an organization. But it can be profitable; reusing and recycling can often reduce costs.
- Reverse costs are less clearly visible and therefore not looked upon as a priority; often organizations avoid difficult problems.
- It is difficult to forecast for reverse flow of the product and to know exactly what and how much merchandise will be returned by the customer, therefore return flow needs to be recorded and planned so it can be estimated and managed effectively.

- Organizations only look at faulty customer returns, not the total volume of returned products such as end-of-life strategies for products that are perfectly functional but replaced with newer versions of the product. Therefore these organizations miss the total volume of reverse flow which if managed properly can lead to large gains.

- Many organizations do not have the expertise, manpower or infrastructure for processing returns and expanding to start up a new operating system of returns. These organizations should consider outsourcing to a **qualified third party logistics organization (3PL).**

- Reverse logistics is often seen as more complicated and less structured than the normal supply chains due to variation in product quality, defect rates and maximum life span. This doesn't mean organizations shouldn't try and tackle the challenge. By creating **structured flow path** ways for different product scenarios most of these problems can be handled.

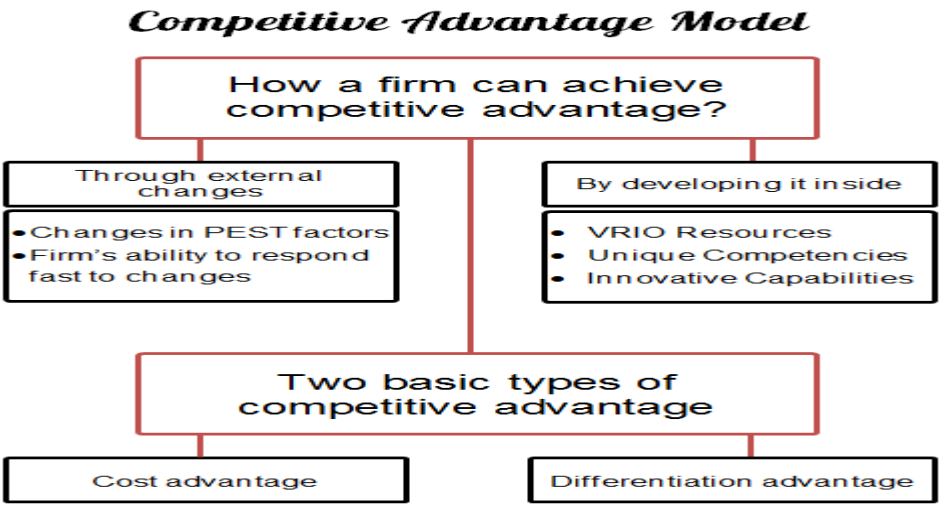
MODELS FOR GAINING ADVANTAGES IN GLOBAL ENVIRONMENT(STRATEGIC DECISION)

Competitive advantage means superior performance relative to other competitors in the same industry or superior performance relative to the industry average.

An organization that is capable of outperforming its competitors over a long period of time has **sustainable competitive advantage.**

There are many ways to achieve the advantage but only two basic types of it: **cost or differentiation advantage.**

A company that is able to achieve superiority in cost or differentiation is able to offer consumers the products at lower costs or with higher degree of differentiation and most importantly, is able to compete with its rivals.



How a company can achieve it?

An organization can achieve an edge over its competitors in the following two ways:

- **Through external changes**. When PEST factors (PEST stands for political, economic, socio-cultural and technological factors) change, many opportunities could provide many benefits for an organization. A company can also gain an upper hand over its competitors when it's capable to respond to external changes faster than other organizations.
- **By developing them inside the company**. A firm can achieve cost or differentiation advantage when it develops VRIO resources (Value, Rarity, Imitability, Organization), unique competences or through innovative processes and products.

External Changes

Changes in PEST factors.- PEST stands for political, economic, socio-cultural and technological factors that affect firm's external environment. When these factors change (positive change) many opportunities arise that can be exploited by an organization to achieve superiority over its rivals.

For example, new superior machinery, which is manufactured and sold only in South Korea, would result in lower production costs for Korean companies and they would gain cost advantage against competitors in a global environment.

Changes in consumer demand, such as trend for eating more healthy food, can be used to gain at least temporary differentiation advantage if a company would opt to sell mainly healthy food products while competitors wouldn't. For example, KFC.

Internal Environment

VRIO resources.- A company that possesses VRIO (Value, Rarity, Imitability, and Organization) resources has an edge over its competitors due to superiority of such resources. If one company has gained VRIO resource, no other company can acquire it (at least temporarily). The following resources have VRIO attributes:

- Intellectual property (patents, copyrights, trademarks)
- Brand equity
- Culture
- Know-how
- Reputation

Unique competences-Competence is an ability to perform tasks successfully and is a cluster of related skills, knowledge, capabilities and processes.

Innovative capabilities- Most often, a company gains superiority through innovation. Innovative products, processes or new business models provide strong competitive edge due to the first mover advantage.

For example, Apple's introduction of tablets or its business model combining mp3 device and iTunes online music store.

Two basic type's competitive advantage model

M. Porter has identified 2 basic types of competitive advantage: cost and differentiation advantage.

Cost advantage.

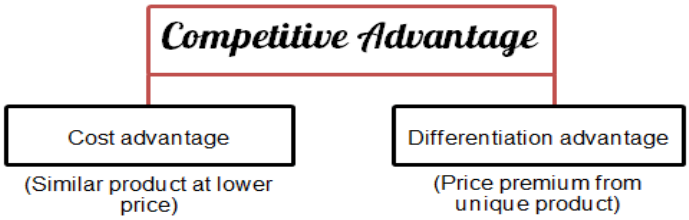
Porter argued that a company could achieve superior performance by producing similar quality products or services but at lower costs.

In this case, company sells products at the same price as competitors but reaps higher profit margins because of lower production costs. The company that tries to achieve cost advantage (like Amazon.com) is pursuing cost leadership strategy. Higher profit margins lead to further price reductions, more investments in process innovation and ultimately greater value for customers.

Differentiation advantage.

Differentiation advantage is achieved by offering unique products and services and charging premium price for that. Differentiation strategy is used in this situation and company positions itself more on branding, advertising, design, quality and new product development (like Apple Inc. or even Starbucks) rather than efficiency, outsourcing or process innovation. Customers are willing to pay higher price only for unique features and the best quality.

The cost leadership and differentiation strategies are not the only strategies used to gain competitive advantage. Innovation strategy is used to develop new or better products, processes or business models that grant competitive edge over competitors.



(PORTER'S STRATEGY)

COST LEADERSHIP MODEL-

- In business strategy, **cost leadership** is establishing a competitive advantage by having the lowest cost of operation in the industry.
- Cost leadership is often driven by company efficiency, size, scale, scope and cumulative experience (learning curve).
- A cost leadership strategy aims to exploit scale of production, well-defined scope and other economies (e.g., a good purchasing approach), producing highly standardized products, using advanced technology.
- In recent years, more and more companies have chosen a strategic mix to achieve market leadership. These patterns consist of simultaneous cost leadership, superior customer service and product leadership.

Target/Market Scope	Advantage	
	Low Cost	Product/Service Uniqueness
Broad (Industry Wide)	Cost Leadership Strategy	Differentiation Strategy
Narrow (Market Segment)	Focus Strategy (low cost)	Focus Strategy (differentiation)

(COST LEADERSHIP POSITION)

FOCUSSING STRATEGY TO GAIN COMPETITVE GAINING IN GLOBAL SCENARIO-

- In adopting a narrow focus, the company ideally focuses on a few target markets (also called a segmentation strategy or niche strategy). These should be distinct groups with specialized needs.
- The choice of offering low prices or differentiated products/services should depend on the needs of the selected segment and the resources and capabilities of the firm.
- The firm typically looks to gain a competitive advantage through product innovation
- A focused strategy should target market segments that are less vulnerable to substitutes or where a competition is weakest to earn above-average return on investment.
- Examples of firm using a focus strategy in Hotel industry(Example- Taj Restaurant)

3C MODEL FOR GAINING COMPETITVE ADVANTAGES-

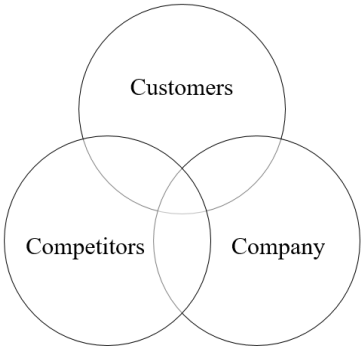
The **3Cs Model** is an industry model, which offers a strategic look at the factors needed for success. It was developed by Japanese organizational theorist Kenichi Ohmae.

The 3Cs model points out that a strategist should focus on three key factors for success. In the construction of a business strategy, three main elements must be taken into account:

1. The Company
2. The Customers

3. The Competitors

Only by integrating these three, a sustained competitive advantage can exist. Ohmae refers to these key factors as **the three Cs or *strategic triangle*.**



(3C INTEGRATION MODEL)

The Customer

Clients are the base of any strategy according to Ohmae.

Therefore, the primary goal is supposed to be the interest of the customer and not those of the shareholders for example. In the long run, a company that is genuinely interested in its customers will be interesting for its investors and take care of their interests automatically. Segmentation is helping to understand the customer.

Segmenting by objectives

The differentiation is done in terms of the different ways that various customers use a product. Customer thinking is not one of the prime functions for consideration.

Segmenting by customer coverage

This segmentation normally emerges from a trade-off study of marketing costs versus **market coverage**. There appears always to be a **point of diminishing returns** in the cost versus coverage relationship. The corporation's task is to optimize its range of market coverage, geographically and/ or channel wise.

Segmenting the market once more

In fierce competition, competitors are likely to be dissecting the market in similar ways. Over an extended period of time, the effectiveness of a given initial strategic segmentation will

tend to decline. In such situations it is useful to pick a small group of customers and reexamine what it is that they are really looking for.

A market segment change occurs where the market forces are altering the distribution of the user-mix over time by **influencing demography, distribution channels, customer size, etc**. This kind of change means that the **allocation of corporate resources must be shifted and/ or the absolute level of resources committed in the business must be changed.**

The Competitors

Competitor based strategies can be constructed by looking at possible sources of differentiation in functions such as: **purchasing, design, engineering, sales and servicing.**

The Corporation (The industry)

The make or buy decision of product or services of corporation are dependent on the competitiveness of market. If demand is in peak so corporate has to adopt buy strategy to save time. Otherwise make strategy decision of corporate with innovative technology will help to achieve competitiveness.

POSITIONING IN VALUE CHAIN

For positioning each component of value chain, value chain mapping is the most important to establish each component.

VALUE CHAIN POSITIONING THROUGH THE PROCESS OF MAPPING-

Value chain maps demonstrate how a product in an industry moves from raw material through production, processing, and other steps, until it eventually winds up with the final consumer.

The map highlights the range of activities that occur within the value chain. The map will also outline transformation steps or functions, actors, relationships and support services and position.

The components that are generally needed in order to map the value chain for positioning include the following: transformation steps, value chain end markets (consumers), value chain actors & customers and support services.

COMPONENTS TO BE MAPPED FOR POSITIONING-

Transformation Steps

Transformation steps are the stages a given product goes through along the value chain. Mapping transformation steps determines what are the real components for value chain which will move forward.

For example if the product is bananas, the first transformation step is "input supplies," and would include things like seeds or fertilizer, or any other components needed to grow the bananas. The last transformation step for bananas would be "consumption."

Steps a product transforms through:

- Input Supplies
- Producing
- Processing
- Wholesaling
- Retailing
- Exporting
- Consumption

Value Chain End Markets (Consumers)

It is purely customer based and in this component we identify the position of customer in value chain by mapping. In terms of structure, typically the markets are placed in order of their value, from left to right (lower value markets on the left, higher value markets on the left). Some examples of end markets that would go along with product include:

- Rural Consumers
- Quasi-Urban (medium-size) Consumers
- Urban Consumers

Value Chain Actors

Value chain actors are those who participate in a value chain should be positioned through mapping process.
The actors are-

- Rural & Large input suppliers
- Small & Large wholesalers
- marketers
- Small traders & Rural marketers

Support Services

Examples of support services which are mapped for positioning include:

- Financial institution- Microfinance institution (MFI),NGOs

STEPS FOR MAPPING TO POSITION THE VALUECHAIN

- **Collect Market Research-**

  - Collect all the market research that's been compiled.
  - The program designer should have data from several sources, including:
    - Key informant / in-depth interviews
    - Focus group discussions
    - Market observations(review the market)

- **Analyze the findings and study the implications**

  - Evaluate the market research and the other information the program designer has collected so far to determine what the unique characteristics of the value chain are.
  - Consider the relationships between the value chain actors, and determine the linkages.

DRAWING THE VALUE CHAIN MAP AND FOCUS ON POSITIONING(EXAMPLE OF FARMING SECTOR)

Now the program designer will begin to actually draw the map of the value chain of positioning based on the comprehensive analysis. The program designer will use the lists made in the Inputs section.

Write out each step in the Transformation Process

- Start with the transformation steps- the program designer comes up with when gathering inputs, and begins listing those steps vertically along the of the map.

(TRANSFORMATION PROCESS FROM INPUT TO COSUMPTION DOWN TO UP IN FARMING SECTOR)

Identify the various End Markets (Consumers) in the Value Chain

- Use the list of End Markets (Consumers) – the primary consumers to which the product of the value chain is sold.
- Arrange the list of market segments in order from lowest to highest value, beginning with low value markets on the left, and moving to the right as the markets reach a higher level.
- Rural customers, Quasi-Urban Customers, Urban customer, International Consumers - Low- vs. Medium- vs. High-income consumers

NB-Note that because consumers are not considered value chain "actors," they should be listed within circles, not squares.

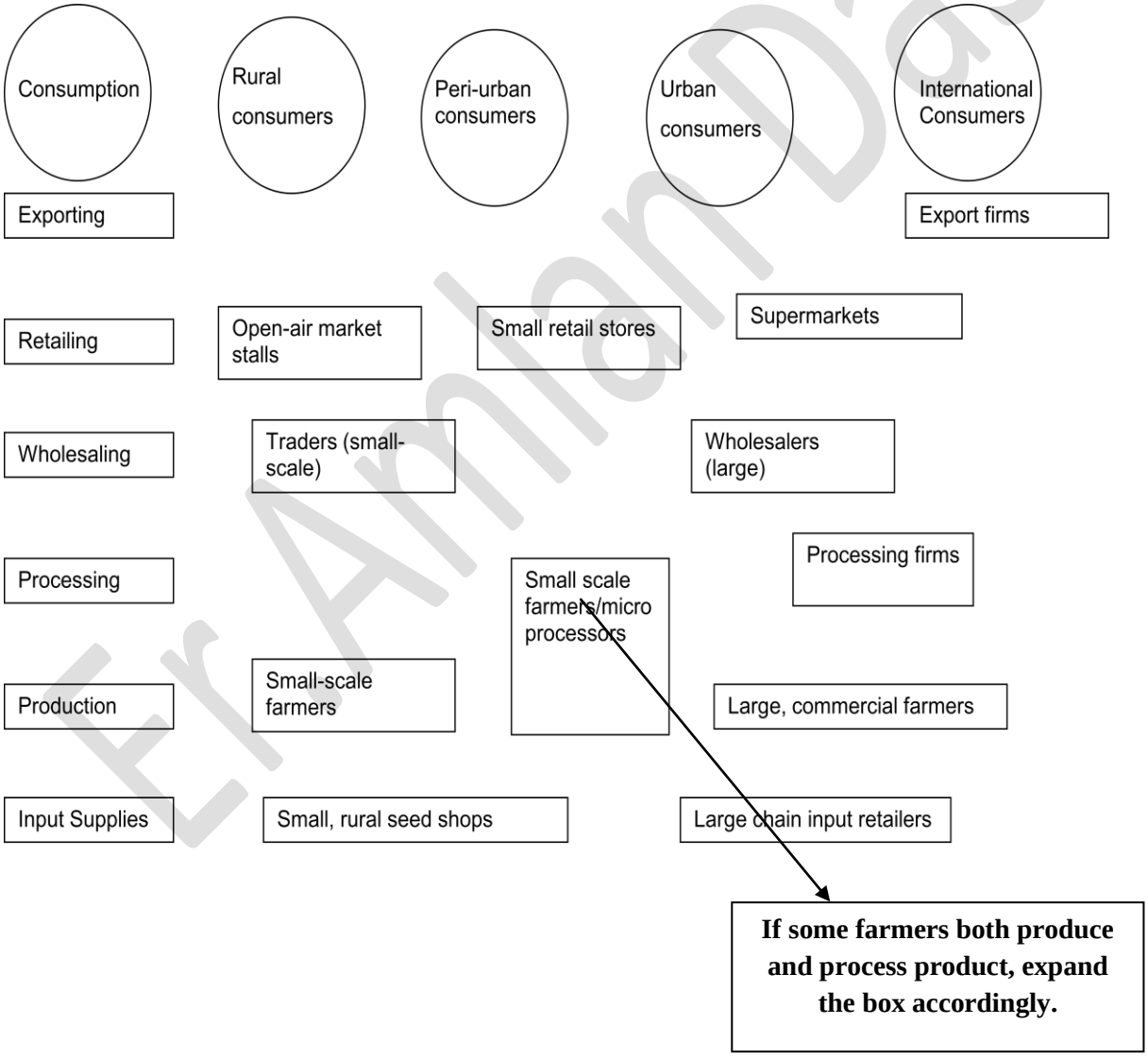
In addition to the steps of the transformation process listed along the left side of the map, we have now added the consumers in the value chain. They are placed on the map, as noted above, across the top of the map in circles.

(END MARKETS MAPPING IN VALUE CHAIN OF FARMING SECTOR)

Identify the different Actors in the Value Chain

- Here, use the next set of inputs – the list of identified key Actors in the Value Chain
- Starting at the bottom of the value chain map, begin placing each actor on the map, according to the relevant value chain activity (the boxes on the left side of the map) and the relevant market (the circles across the top of the map).
- Continue to place each actor according to their value chain activity and the markets themselves for the remaining levels of the value chain.

ACTORS MAPPING IN THE VALUE CHAIN IN FARMING SECTOR-



Depicting Relationships

If developing a detailed map, it might be a good idea to include support services as an overlay. Use arrows to show the flow of services from one actor to another in the transformation flow.

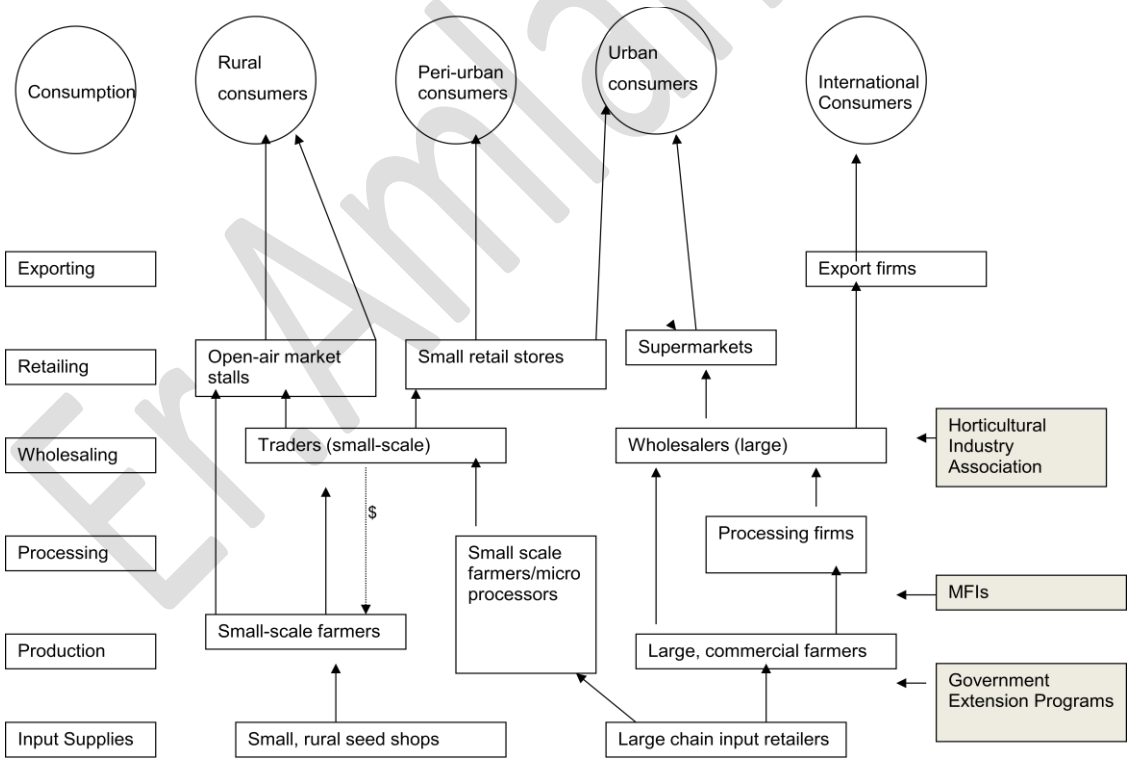
Services from actors outside the value chain can also be included on the map. It is important that these services are placed at the far side of the map (and not in the value chain).

Shading the box differentiates these actors from those within the value chain.

These should include the range of service providers.

- EX. Technology providers, technical service providers, business service providers, financial service providers etc.

SUPPORT SERVICES POSITIONING THROUGH MAPPING IN FARMING SECTOR-



(SUPPORTING SERVICES IN FARMING SECTOR WITH SHADED OUTSIDERS ACTORS)

OUTCOME-

Finally we have positioned transformation steps, value chain actors, and end markets (consumers) from this above example.

ADVANTAGES-

- Describe the value chain structure and relationships
- Identify the key stakeholders
- Depict product flow from inputs to final market
- Help identify gaps or bottlenecks in production flow

KEY TAKE AWAY FROM VALUE CHAIN POSITIONING

- A value chain is a step-by-step business model for transforming a product or service from idea to reality.
- Value chains help increase a business's efficiency so the business can deliver the most value for the **least possible cost.**
- The end goal of a value chain is to create a competitive advantage for a company by increasing productivity while keeping costs reasonable.
- The value-chain theory analyzes a firm's five primary activities and four support activities.

CASELET- AGCO SUPPLY CHAIN

Like Deere & Company, AGCO is a leading global force in the manufacture and supply of agricultural machinery. The company grew substantially over the course of two decades, achieving a considerable portion of that growth by way of acquisitions. As commonly happens when enterprises grow in this way, AGCO experienced increasing degrees of supply chain complexity, along with associated increases in cost, but for many years, did little to address the issue directly, primarily due to the decentralized and fragmented nature of its global network.

In 2012, AGCO's leaders recognized that this state of affairs could not continue and decided to establish a long-term program of strategic optimization.

With five separate brands under its umbrella, AGCO's product portfolio is vast. At the point when optimization planning began, sourcing and inbound logistics were managed by teams in various countries, each with different levels of SCM maturity, and using different tools and systems.
As a result of the decentralized environment, in which inbound logistics and transport management were separate operational fields, there was insufficient transparency in the supply chain. The enterprise as a whole was not taking advantage of synergies and economies of scale (and the benefits of the same). These issues existed against a backdrop of a volatile, seasonal market.

Following a SCOR supply chain benchmarking exercise, AGCO decided to approach its cost reduction and efficiency goals by blending new technology—in the form of a globally integrated transport management system (TMS)—with a commitment to form a partnership with a suitably capable 3PL provider.

As North and South American divisions of the company were already working with a recently implemented TMS, leaders decided to introduce the blended approach in Europe, with commitments to replicate the model, if successful, in its other operating regions.
With the technology and partnership in place, a logistics control tower was developed, which integrates and coordinates all daily inbound supply activities within Europe, from the negotiation of carrier freight rates, through inbound shipment scheduling and transport plan optimization to self-billing for carrier payment.

Within a year and a half of their European logistics solution's go-live, AGCO achieved freight cost reductions of some 18%, and has continued to save between three and five percent on freight expenditure, year-on-year, ever since. Having since rolled the new operating model out in China and North America, the company has reduced inbound logistics costs by 28%, increased network performance by 25% and cut inventory levels by a quarter.

QUESTIONS-

Q1. Discuss the Objective

Q2. Summarize the case with embedding concepts of scm.

Q3.Give your suggestion as an operation manager in this case prospective

Q4. Does logistics carries a crucial part in this story? If yes, then justify.

CASELET-SUCCESSFUL SUPPLY CHAIN COST REDUCTION AND MANAGEMENT: INTEL

One of the world's largest manufacturers of computer chips, Intel needs little introduction. However, the company needed to reduce supply chain expenditure significantly after bringing its low-cost "Atom" chip to market. Supply chain costs of around $5.50 per chip were bearable for units selling for $100, but the price of the new chip was a fraction of that, at about $20.

Somehow, Intel had to reduce the supply chain costs for the Atom chip, but had only one area of leverage—inventory.

The chip had to work, so Intel could make no service trade-offs. With each Atom product being a single component, there was also no way to reduce duty payments. Intel had already whittled packaging down to a minimum, and with a high value-to-weight ratio, the chips' distribution costs could not be pared down any further.

The only option was to try to reduce levels of inventory, which, up to that point, had been kept very high to support a nine-week order cycle. The only way Intel could find to make supply chain cost reductions was to bring this cycle time down and therefore reduce inventory.

Intel decided to try what was considered an unlikely supply chain strategy for the semiconductor industry: *make to order*. The company began with a pilot operation using a manufacturer in Malaysia. Through a process of iteration, they gradually sought out and eliminated supply chain inefficiencies to reduce order cycle time incrementally. Further improvement initiatives included:

- Cutting the chip assembly test window from a five-day schedule, to a bi-weekly, 2-day-long process
- Introducing a formal S&OP planning process
- Moving to a vendor-managed inventory model wherever it was possible to do so

Through its incremental approach to cycle time improvement, Intel eventually drove the order cycle time for the Atom chip down from nine weeks to just two. As a result, the company achieved a supply chain cost reduction of more than $4 per unit for the $20 Atom chip—a far more palatable rate than the original figure of $5.50.

MODULE-I

PROBABLE SAMPLE QUESTIONS ON UNIVERSITY BASED PATTERNED

(2 MARKS QUESTIONS)

1. What is the difference between operations strategy and operations Management?
2. What are the Elements of operation strategy?
3. What is Operation network level of analysis?
4. What is S-shaped innovation?
5. What is Henderson Clark Models of Innovation?
6. What are five genetic performance objectives?
7. What is Flexibility in operation strategy?
8. Define Operation strategy framework
9. Define Value chain dynamics
10. Define Operation decision area
11. What is manufacturing architecture in os?
12. What is Formulation of operations strategy?
13. What is OS evaluation process
14. What is Controlling and monitoring of OS.
15. Define Stage Model of Product and Service Sector
16. Why do we consider Operation strategy competitiveness?

Long questions (16 marks)

1. Operations performance objectives are key indicators of operations strategy. Elucidate.
2. Trade off in operation performance plays significant role Elucidate.
3. Does operation performance make or break the organization? If yes then how?
4. What are the sub strategies in operations? Explain in details
5. Innovation plays a magnificent role in operations. Elucidate
6. Illustrate value chain dynamics in operations with real corporate examples.
7. Formulation of operation strategy carries a crucial role in organization. Explain.
8. Explain OS evaluation process with methodologies.
9. Control and monitoring in operation are vital for OS. Illustrate.
10. OS follows a strategy of competitiveness. Comment
11. Explain about operation strategy frame work with suitable examples.
12. Explain developing an operations strategy with suitable corporate examples.
13. Operation strategy is vital for Operations and production house. Justify.
14. Market demand is directly influenced by Operations process of product/services. Justify the statement.

PROBABLE MCQS QUESTIONS (MODULE-1)

1. Operations strategy useful for-
   a. Maximize effectiveness, efficiency in production and cost minimization
   b. Minimize effectiveness, efficiency in production and cost maximization
   c. Maximize effectiveness, efficiency in production and cost maximization
   d. None of the above

2. Operations performance is judged by-
   a. Different types of costs
   b. Risk of operational failure
   c. Building capabilities
   d. All of the above

3. Which is not one of the types of different flexibilities in operations processing?
   a. Product flexibility
   b. Time flexibility
   c. Mix flexibility
   d. Volume flexibility

4. Which of the followings are defining the evaluation of strategy by balanced score card method?
   a. Learning and growth
   b. Financial Aspect
   c. Internal process and customer focus
   d. All of the above

5. The responsibilities of the operations manager are:
   a) planning, organizing, staffing, procuring, and reviewing
   b) planning, organizing, staffing, directing, and controlling
   c) forecasting, designing, planning, organizing, and controlling
   d) forecasting, designing, operating, procuring, and reviewing

6. Which is not a significant difference between manufacturing and service operations?
   a) cost per unit
   b) uniformity of output
   c) labor content of jobs
   d) Measurement of productivity

7. Works cost implies
   a) primary cost
   b) factory cost
   c) factory expenses
   d) primary cost + factory expenses
8. Which is an operational decision area?
   a) Process technology
   b) Capacity development
   c) Organizational development
   d) All of the above

9. Which of the following is a step of formation of operation strategy by Hills?
a) objective of operation
b) Process decision
c) Risk forecasting
d) None

10. Which of the following is a supporting activity in value chain analysis?
a) Procurement
b) Technology
c) Operations
d) Both a and c

11. In a running system of competition, all the competitors try to maximize the utilization and manufacturing of product demanded by consumers are called-
a) order winners
b) order qualifiers
c) order supplier
d) none of these

12. In stage model of service and manufacturing sectors, strategy is followed by –
a) bottom to top
b) top to bottom
c) Both
d) None of the above
13. Which is not a component of Porter ‘s generic strategy in operations?
a) Competitiveness
b) cost leadership
c) Differenciation
d) Focus strategy

14. Which is not a methodology for controlling and monitoring of operations strategy?
a) Delphi method
b) Statistical and historic view
c) Hit and trail method
d) Intuitive method

15. A complete new feature has been added into Samsung mobile. What type of innovation system is here applied?
a) Radical
b) modular
c) Architectural
d) Incremental

16. Operations strategy follows line of fit in implementation phase. It implies-
a) market and operation process are directly proportional to each other
b) market and operation process are inversely proprotional to each other
c) market and operation process are independent to each other
d) None of these

17. The factor influencing the timing of the capacity change is-
a) lead time
b) required level of service
c) economy of scale
d) all of the above

18. What is benchmarking in evaluation in operation strategy evaluation?
a) highlighting how key operational elements 'shape up' against 'best in class' competitors, key areas for focused improvement can be identified.
b) highlighting only how key operational elements 'shape up' against 'best in class' competitors
c) finding key indicators from operations risk analysis
d) none of these

19. Cost concept used in rebirth of new project and new strategy is-
a) opportunity cost
b) appraisal cost
c) failure cost
d) none of these

PROBABLE QUESTIONS (UNIVERSITY PATTERN QUESTIONS)

Probable: OS Module (2)

Questions :

Short Notes –

a) Substitutes for operations strategy
b) Make or Buy decision in operations
c) Vertical Integration in OS (Operations Strategy)
d) Outsourcing strategy in operations.
e) Six sigma implementation in OS
f) Lean substitute in OS
g) Business Process Re-engineering.
h) Total Quality Management.
i) Operations Strategy Implementation.
j) Organization strategy Vs Service Strategy
k) Capacity Strategy and Decision in OS
l) Technology decision in OS
m) Facility location in OS
n) Globalization in OS.
o) Volume Vs Layout Matrix

Long question :(16 marks)

a) Substitute in OS plays a crucial role in decision making elucidate.
b) Explain Facility Strategy in Operations and its types?
c) Technology decision is important ingredient of OS. Discuss.
d) Globalization strategy is the present development in OS. Discuss with example.
e) Lean substitute is a bare minimum requirement in industrial process. Explain the statement.
f) What is vertical integration? Discuss with suitable examples.
g) Capacity management is an important decision area of operation strategy. Are you agree with this? If yes then why? Elucidate.
h) Product and process in operation follow technology strategy. Explain.
i) Outsourcing makes the system of operation ease. Explain with examples.
j) What is business process Re-engineering? Elucidate with example.
k) Volume or aggregate product depends on layout. Discuss.
l) What is operation strategy implementation? What are the factors responsible for this? Elucidate with suitable corporate example.
m) Make Vs Buy decision depends on Vertical integration with outsourcing. Elucidate.

n) What is facility lay outing and explain different types of lay outing.
o) Explain Design of production system.
p) Explain Standardized Service Strategy.
q) Explain Capacity Planning in detail.

Short questions-(2 Marks)

a. What is mass customization?
b. What is Job shop?
c. What is six sigma? Give example.
d. What is Business Processing reengineering?
e. What is ERP?
f. What is the difference between batch and continuous production?
g. What is fixed point lay outing?
h. What are the factors responsible for capacity management?
i. What is TQM?
j. What do you mean by**SERVQUAL?**
k. What is vertical integration?
l. What is outsourcing?
m. What is Just in time principle?
n. What is lean substitute in OS?
o. What is the difference between product and process layout?
p. What is Kanban principle in lean operation?
q. What is pull and push system in production house?
r. What is cellular layout?
s. What is technology processing?
t. What is strategy implementation?
u. What do you mean by globalization in os?
v. What is line balancing?
w. Write characters of batch production.
x. What is hybrid layout in os?

MODULE 2MCQS

1. Which of the following explain the need for facility location selection?
   (a) When the existing business unit has outgrown its original facilities and expansion is not possible.
   (b) When a business is newly started.
   (c) When the lease expires and the landlord does not renew the lease.
   (d) All of these.

2. Which of the following is the first step in making a correct location choice?
   (a) Develop location alternatives
   (b) Decide the criteria for evaluating location alternatives
   (c) Evaluate the alternatives
   (d) Make a decision and select the location

3. Which of the following technique emphasizes transportation cost in the determination of facility location?
   (a) Location rating factor technique
   (b) Transportation technique
   (c) Centre-of-gravity technique
   (d) Both (b) and (c)

4. Transportation cost mainly depends on which of the following factors?
   (a) Distance
   (b) Weight of merchandise
   (c) Time required for transportation
   (d) All of the above

5. In which of the following site selection techniques, a weight age between '0' to '1' is provided to factors that influence its location decision?
   (a) Location rating factor technique
   (b) Transportation technique
   (c) Centre-of-gravity technique
   (d) None of these
6. Which of the following does not cause to production delay?
   (a) Shortage of space
   (b) Long distance movement of materials
   (c) Spoiled work
   (d) Minimum material handling

7. Process layout is also known as _____.
   (a) Functional layout
   (b) Batch production layout
   (c) Straight line layout
   (d) Both (a) and (b)

8. Which of the following facility layout is best suited for the intermittent type of production, which is a method of manufacturing several different products using the same production line?
   (a) Product layout
   (b) Process layout
   (c) Fixed position layout
   (d) Cellular manufacturing layout

9. In which of the following layout type, materials are fed into the first machine and finished products come out of the last machine?
   (a) Product layout
   (b) Process layout
   (c) Fixed position layout
   (d) Cellular manufacturing layout

10. Which of the following is not an advantage of using product layout?
   (a) Minimum material handling cost
   (b) Minimum inspection requirement
   (c) Specialized supervision requirement
   (d) None of these

11. **The objective of ISO-9000 family of Quality management is**
   a. Customer satisfaction
   b. Employee satisfaction
   c. Skill enhancement
   d. Environmental issues

12. Defects per part million indicates which method-
   a. Sixsigma
   b. Lean Opeation
   c. Both
   d. None of these

13. Reducing wastage in processing we follow-

   a. Lean processing
   b. Material Purification
   c. Kaizen process
   d. Quality dimension

14. Vertical integration is followed for-

a. Reduce time
b. Process cost reduction
c.Both
d. Reverse logistics

15. Which is a factor for capacity strategy?

a. Economy of scale
b. ABC analysis
c. Location or facility management
d. Both a and c

16. Process technology decision based on-

a. Scalability
b.Automation
c. Coupling
d.All of the above

17. Globalization in operation is the recent development. Which below defines the statement?

a. Global franchise
b. Global logistics
c.Addressing global issues of logistics risks
d. All of the above

18. Business process reengineering is advantageous for-

a. process rectification
b. reducing internal failure cost
c.both
d. none of the above

19. DMAIC is the implementation of-

a. 6-sigma
b. BPR
c.ERP
d.MRP

20. A daily routine planning is required for which capacity management system-

a. Short term capacity
b.medium capacity
c. Long term capacity
d.None of these

MODULE 3

PROBABLE QUESTIONS

SHORT NOTES-(2 MARKS)

1. Job shop
2. Quality strategy and action
3. Environment and social sustainability strategy in operations
4. Reverse Logistics
5. Logistics vs. supply chain management
6. Model for gaining global advantages
7. Supply chain networking
8. Value chain positioning
9. Competition in in-house industry
10. Cost vs. resource availability
11. Cost vs. innovativeness of production house
12. Supplier strategy in operations
13. Quality and service dimensions
14. Quality action(Juan strategy of controlling)

LONG QUESTIONS-(16 MARKS)

1. Quality crisis is now a day's challenging part in manufacturing as well as servicing unit. Elucidate how to overcome crisis and establish good quality dimensions with corporate examples.
2. Environmental challenge is now an issue of addressing in present industrial operations. Give elaborate justification with keeping view to environmental strategy.
3. Corporate social responsibility is recent and upcoming future of operations. Comment.
4. Cost creates innovativeness but innovativeness follows cost. Explain with suitable examples.
5. Supplier is the origin of operational derivatives of whole operations cycle. Explain with suitable example of supplier strategy.
6. What is value chain positioning? Sometimes it is noticed that wrong value chaining creates wrong marketing value. Do you agree with this? If yes then why? And if it is no then why?
7. Supply chain networking is the big management in operations cycle of production. Elucidate with right example.
8. Purchasing strategy is the key to supply chain. Give justification with suitable example
9. Explain Competitive advantages gaining models.
10. What is value chain positioning? Explain in details

11. Supplier management is the key factor for supply chain system. Is it? Justify with suitable example
12. Logistics management is the challenge for present competitive world. How it can be achieved in a better way by corporate? Justify with suitable corporate examples.

Module-III

MCQS

1. Logistics is the part of a supply chain involved with the forward and reverse flow of
   a. goods
   b. services
   c. cash
   d. all of the above

2. 3-PL stands for
   a) Three points logistics
   b) Third party logistics
   c) Three points location
   d) None of the above

3. Horizontal integration is concerned with
   a. Production
   b. Quality
   c. Product planning
   d. All of the above

4. **Consider the following statement (s) related to the Sustainable strategy.**
   I. It refers to a process or state that can be maintained indefinitely.

   II. Natural resources must use in ways that do not create ecological debts by over exploiting the carrying and productive capacity of the earth.

   III. A minimum necessary condition for sustainability is the maintenance of the total natural capital stock at or above the current level.

   Code:

   a) Only I
   b) Only II
   c) Only II & III
   d) I, II & III

5. The major decision areas in supply chain management are
a) Location, production, distribution, inventory
b) planning, production, distribution, inventory
c) location, production, scheduling, inventory
d) location, production, distribution, marketing

6. Which is a quality dimension?
a) Performance
b) Conformity
c) Aesthetic value
d) All of the above

7. Juran has suggested 3 quality steps. Arrange the steps chronological order-
a. Quality planning-improvement-control
b. Planning-control-improvement
c. Either a or b
d. None of the above

8. Source of quality is generated by-
a. Control action plan
b. Customer demand
c. Assurance in quality standards
d. All of the above

9. character responsible for the best logistics in supply chain system-
a. Nodes of a distribution network
b. Warehouse management and control
c. Horizontal alliances between logistics service providers
d. All of these

10. What is key a diffentiation factor between 3PL and 4PL logistics?
a. Information technology
b. Processing time
c. Lead supply node
d. None of these

11. Which one of the following is a benefit of supplier management?
a. managing a growing supplier base effectively
b. improving the organization's supply transparency
c. leveraging supplier relationship management
d. all of the above

12. A stable supply chain is effected by-
a) Uncertain sourcing
b) b.Risks in procurement
c) Disruption in logistics
d) all of the above

13. Reverse logistic suppliers generates economy of-
a. Circular
b. Rectangular
c. Square
d. None of the above

14. Advantage of value chain positioning is-
a. Activities mapping
b. Risk identification and planning
c. Capacity minimization
d. None of these

15. 3 c's in gaining competitive advantages are defined as-
a. Customer,company,competitors
b. Cost, customer, controlling
c. Cost, company
d. None of these

16. Which one is a supplier management process?
a. identifying the set of business goals and objectives
b. identifying relevant selection criteria for choosing suppliers
c. evaluating and selecting suppliers
d. all of these

17. Zero defects in manufacturing is
a. is a relevant goal only in electronic assembly
b. is readily achievable in all areas
c. is the goal of TQM
d. is an unobtainable and misleading idea

18. Which of the following is not one of the major categories of costs associated with quality?
a) a.prevention costs
b) appraisal costs internal failures
c) none of the above

d) they are all major categories of costs associated with quality

19. Which of the following activities is not a direct responsibility of operations management? a.

a) Determining the exact mix of products and services that the customers will want
b) Designing the operation's products,services and processes
c) Developing an operations strategy for the operations
d) Planning and controlling the operation

20. To reduce inventory management costs, many companies use a system called _____, which involves carrying only small inventories of parts or merchandise, often only enough for a few days of operation.

a. reduction-inventory management
b. supply chain management
c. economic order quantity
just-in-time logistics