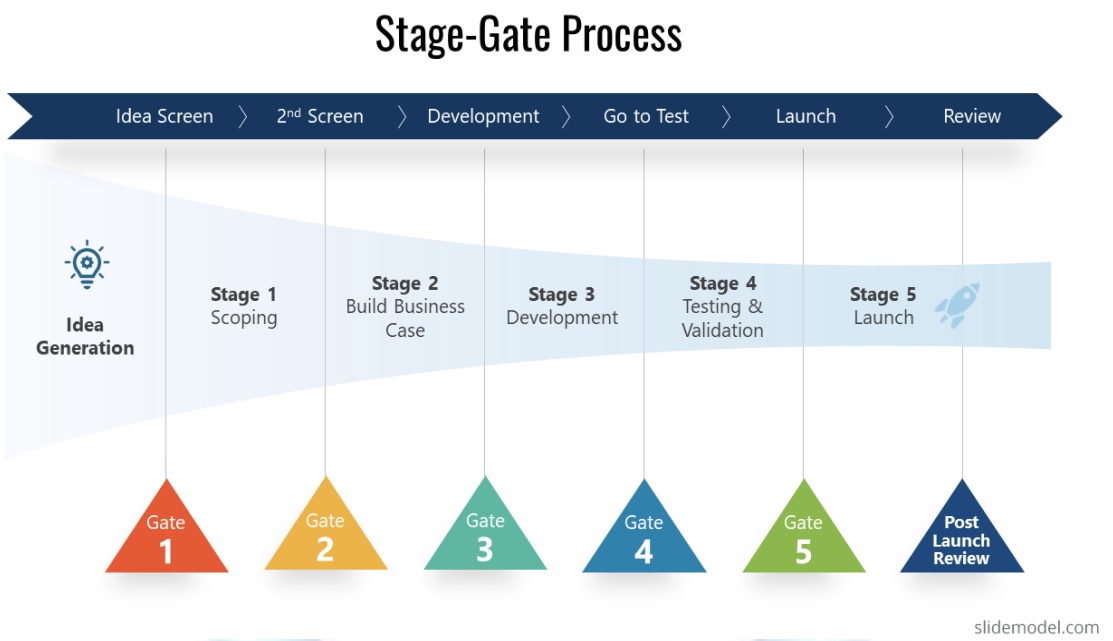
UNIT-III

Product Design - Criteria, Approaches-Product development process - stage-gate approach - tools for efficient development. Process - design, strategy, types, analysis. Facility Layout – Principles, Types, Planning tools and techniques.

WHAT IS THE STAGE GATE PROCESS?

The **Stage Gate Process**, also known as the **Phase Gate Process**, guides the product development process through six main phases. The stages in the Stage-Gate are Discover, Scoping, Define Business Case, Development, Testing and Validation and Launch.



The guides product development through six stages, from idea to launch. The standard process consists of six stages and five gates.

Stage 0: Idea Generation

In this Stage zero of the Phase Gate Process, the team discovers the situation or project. This Stage involves the research activities required to understand the case based on clear ideas and accurate information. This Stage can include qualitative and quantitative research methods, market research, ideas generation methods (i.e. mind maps, brainstorming and reversed brainstorming) and problem exploration tools

Stage 1: Scoping

The team provides a clear statement of the problem. In this Stage, the team tries to identify whether the idea is viable and can present a market opportunity. This goal can be achieved through tools such as the SWOT analysis, which helps the team evaluate the idea based on strengths, weaknesses, opportunities, and threats.

Stage 2: Build Business Case

Once the idea is formed and there is a clear vision of the solution, the team works to build a product definition and analysis, a business case, a project plan, and a feasibility review. This business case aims to convince the different teams involved in the product development and its viability. They can use tools such as the Business Model Canvas which provides a clear vision of the product's market value.

Stage 3: Development

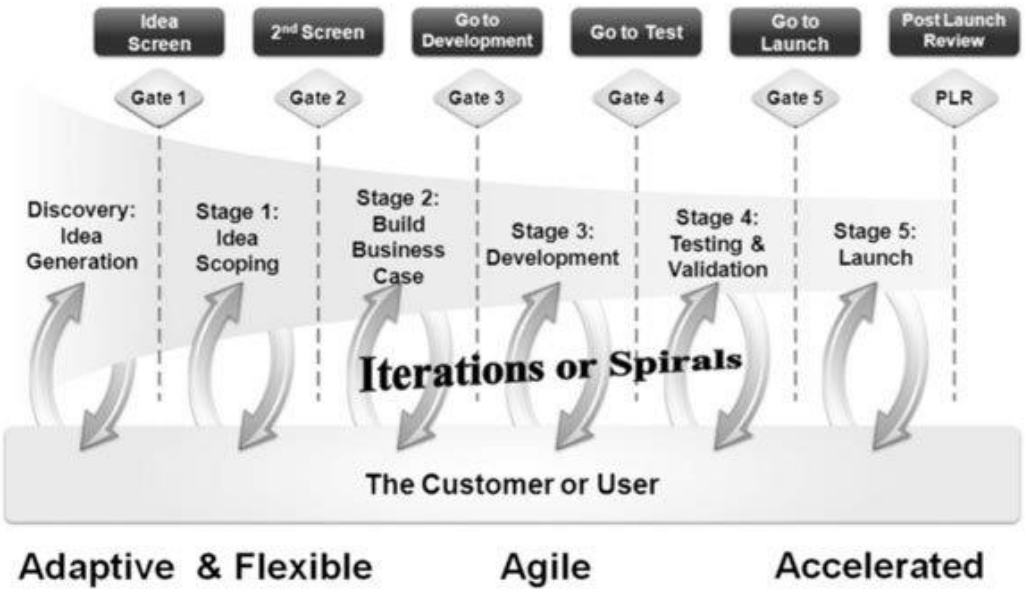
The team applies the plan formulated during the above stages and puts it into action by building a prototype for the product. This Stage's timeline is critical to achieving six factors: specific, measurable, actionable, realistic, and time (SMART). The timeline is constantly updated based on the production status.

Stage 4: Testing and Validation

In this Stage, the prototype is tested, and feedback is collected to improve the prototype. The testing includes team testing for problems and issues in the product. Then, it goes for the field test, where consumers test the product in a beta version and a marketing test to identify market feasibility for the product.

Stage 5: Launch

Once the product passes all the stages, it moves directly to the launch stage, where the product is introduced to the market based on a marketing strategy. In this Stage, the marketing team plays an essential role in creating the market need and increasing market exposure for the product.



Description of the Gates

Between every two stages, a Gate is used to validate and test the outcome of each Stage and ensure it meets the requirements. The process at each Gate includes three main steps:

Input: The deliveries from the previous Stage will be evaluated in this specific Gate.

Criteria: The metrics and the KPIs will evaluate the deliveries.

Output: The evaluation results and the decision to move to the following Stage or return to the previous.

Based on the output of the above three steps, there are five decisions based on the Stage evaluation:

Go: The team can go to the following Stage.

Kill: The project is not feasible enough, and it needs to end.

Hold: the project will be halted because of a specific reason.

Recycle: A few amendments are needed before moving to the following Stage.

Conditional Go: The development can go forward based on a conditional statement (i.e. apply specific modifications).

FACILITY LAYOUT

- Facility layout is an arrangement of different aspects of manufacturing in an appropriate manner as to achieve desired production results.
- Facility layout considers available space, final product, safety of users and facility and convenience of operations.

- It ensures that there is a smooth and steady flow of production material, equipment and manpower at minimum cost.
- Main objective of the facility layout planning is to design effective workflow as to make equipment and workers more productive.

Factors affecting Facility Layout

Facility layout designing and implementation is influenced by various factors. These factors vary from industry to industry but influence facility layout. These factors are as follows:

- The design of the facility layout should consider overall objectives set by the organization.
- Optimum space needs to be allocated for process and technology.
- A proper safety measure as to avoid mishaps.
- Overall management policies and future direction of the organization

Design of Facility Layout

Principles which drive design of the facility layout need to take into the consideration the objective of facility layout, factors influencing facility layout and constraints of facility layout. These principles are as follows:

- Flexibility: Facility layout should provide flexibility for expansion or modification.
- Space Utilization: Optimum space utilization reduces the time in material and people movement and promotes safety.
- Capital: Capital investment should be minimal when finalizing different models of facility layout.
- A manufacturer might opt for a U-shaped production line, for example, rather than a long, straight one, to allow products and workers to move more quickly from one area to another.

Types of Layouts in Industries -

Generally, there are 5 types of layouts that are widely in usage by industries. They are -

1. Plant Layout
2. Process Layout
3. Product Layout
4. Combination Layout
5. Fixed Position Layout

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1.Plant Layout -

● It refers to arrangement of the various facilities and services of the plant within the area of the site selected previously.

● Plant layout design starts along with factory building

● All the facilities like equipment's, raw materials, machinery, tools, futures, workers, etc. are placed at appropriate place.

● In deciding the place for equipment, the supervisors and workers are consulted and their due consideration is taken into account before they put into plant location

● However, consultation may not mandatory but consideration will help organization to have co-operation with employees while in production as it will create a multiplier effect on production

● Placing the equipment where it is not convenient for employees while being in production will impact the production levels.

2.Process Layout:

● It is also referred as functional layout

● Process Layout focuses on keeping similar machines or similar operations at one place in layout.

● Here, all similar functional Equipment's are placed at one location and are grouped into one department.

● Process Layouts are more suitable for industries, as its production of goods is done based on series of activities or process a site

Suitability of Process Layout -

This type of Layout is most preferable when -

- Several types of products need to be produced
- If volume of production of individual products is low
- When production of products needs continuous handling by mechanical methods
- If need of any intermittent production

Advantages of Process Layout -

- Flexibility in production

- As equipment's are grouped together supervisory is easy
- Reduction of Costs, as they are grouped together
- Production capabilities are increased
- Minimize movements of employees from one equipment to another equipment
- Helps an organization to evaluate easily an employee at production levels, as employee works a more or less at constant location site and helps to determine his incentives for his/her production capabilities.

Disadvantages of Process Layout -

- More floor space is required to keep all equipment together
- Sometimes, it becomes difficult to control activities of production
- Generally, these are said to be utilized as WIP units, meaning Work in progress, where a production material comes as input here, it processes those and then sends that material to another equipment as input. In such cases, there are chances of Congestion at production site.
- Automatic material Handling becomes difficult
- Process Layout takes more time to finish or complete the product production at its stage
- It needs regular inspection or constant supervisory
- Effective cooperation and coordination is required at production site among employees.

3.Product Layout -

- Product Layout refers to sequential arrangement of machines and components parts in one line based on sequence rules of production
- In simple terms, we can say that it is layout where a raw material moves in straight line from one equipment to another equipment in order to complete it as finished good
- Look at below picture to understand product Layout

Raw material → Machine 'A' → Machine 'B' → …. → Finished Product

- Product layout is also called as "Line Type Layout" or "Straight Line layout"

Suitability of Product Layout

This layout is most preferable in below cases:

- If production is of continuous nature in mechanical methods
- If product layout needs a standardize for one or few products

- Applied in large volume of production
- Inspection on series of operations is less

Advantages of Product Layout -

- As this type of layout prefers mechanical feeding into devices, it brings down cost of production
- Takes less time for production
- Considered as highly economical among layouts
- Better Production controls
- Small floor space for single machine
- Reduction in WIP (work in progress) areas
- Does not require a Skillful human resources at site operations
- Better coordination
- Production process is simple in nature
- Workers movement completely low

Disadvantages of Product layout -

- Lack of Flexibility in production operations
- Supervisory on operations are bit low
- Less Scope for expansion of this layout
- As the production is done in sequence manner, any break down of one equipment in the process, the production will be down or stopped until it is repaired or replaced
- Investment in this type is expensive, as production units need to keep a spare or extra

equipment at handy to replace any equipment in case of failure while in production process

4. Combined Layout

- This type of layout is a combination of Product layout and Process layout
- Also called as "Group Technology Layout", or "Hybrid Layout"
- Most of organizations use this type of layout in their production units
- For example, files, hacksaws, circular metal saws, wood saws etc.

Suitability:

- When production of products is in various shapes and sizes
- The equipment in layouts are arranged as per requirements of design of product and its final outcome
- Used when several items of products are produced but not in bulk

Advantages and Disadvantages:

- This type of layout inherits the advantages and disadvantages from Product and process Layouts
- However, its usage in organizations purely based on its products produced for market and its business

5. Fixed Position Layout

- This type of layout is about transfer of productional resources like- human resources, or machines towards the production site which is already fixed and stable
- This layout is also called as Static Layout or fixed Location Layout
- Example - In hospital, the robotics (equipment) are fixed in operation theatre and they are flexible to move as per doctor's directions while performing a surgery

Suitability:

- Widely applicable to use if industry is of heavy type like in manufacturing of Locomotives, ships, aircrafts etc.
- If manufacturing of few pieces of items
- Used where transfer of bulk volume of material is required

Advantages of Fixed Position Layout -

- Low investment for layout
- Helps to produce differentiated products (ex- Aircrafts produced in various models)
- Very Flexible in nature, the workers get easily associated with it
- Production centers work can be designed in independent manner

Disadvantages of Fixed Position layout -

- Transfer of machines from one place of another place, if required is a loss of time and costly
- These type of Layout need very expensive equipment’s for its operations

- High Skilled Professional are needed to operate the machines in layout
- Optimum utilization can be obtained in this layout, as the equipment's are fixed in nature and its movements will be some constraints.