Strategic Product and Service Design

The essence of an organization is the goods and services it offers

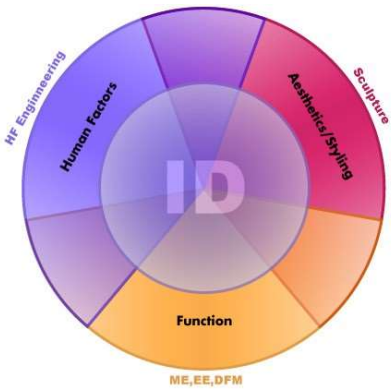
…..Every aspect of the organization is structured around them..

Product and service design – or redesign – should be closely tied to an organization's strategy

1

What is Industrial Design?

- *Mission: Enhance the user's experience*
  - *Form / Aesthetics*
  - *Simplified Functionality*
  - *Improved Human Factors*
  - *Spirit - wow factor, novel, cool…..etc.*



Source: MITSloan

2

What Does Product & Service Design Do?

1. Translate customer wants and needs into product and service requirements
2. Refine existing products and services
3. Develop new products and services
4. Formulate quality goals
5. Formulate cost targets
6. Construct and test prototypes
7. Document specifications
8. Translate product and service specifications into *process* specifications

Involve Inter-functional Collaboration

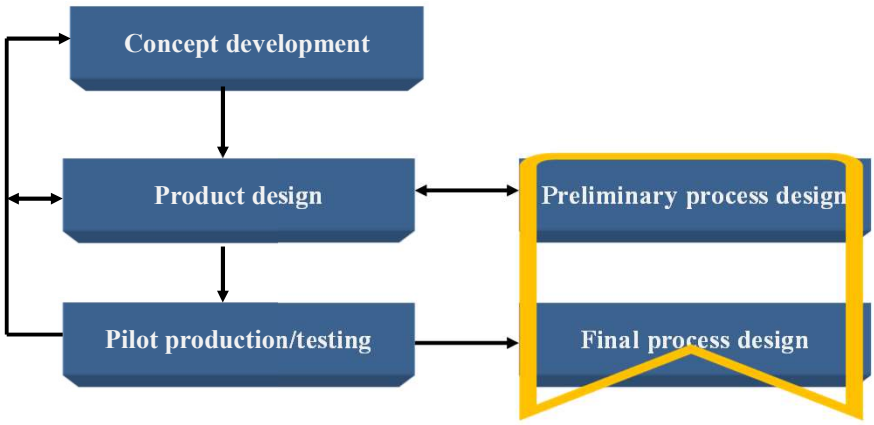
3

Key Questions

1. Is there a demand for it?
   - Market size
   - Demand profile
2. Can we do it?
   - **Manufacturability** - the *capability* of an organization to produce an item at an acceptable profit
   - **Serviceability** - the *capability* of an organization to provide a service at an acceptable cost or profit
3. What level of quality is appropriate?
   - Customer expectations
   - Competitor quality
   - Fit with current offering
4. Does it make sense from an economic standpoint?
   - Liability issues, ethical considerations, sustainability issues, costs and profits

4

New Product Design Process



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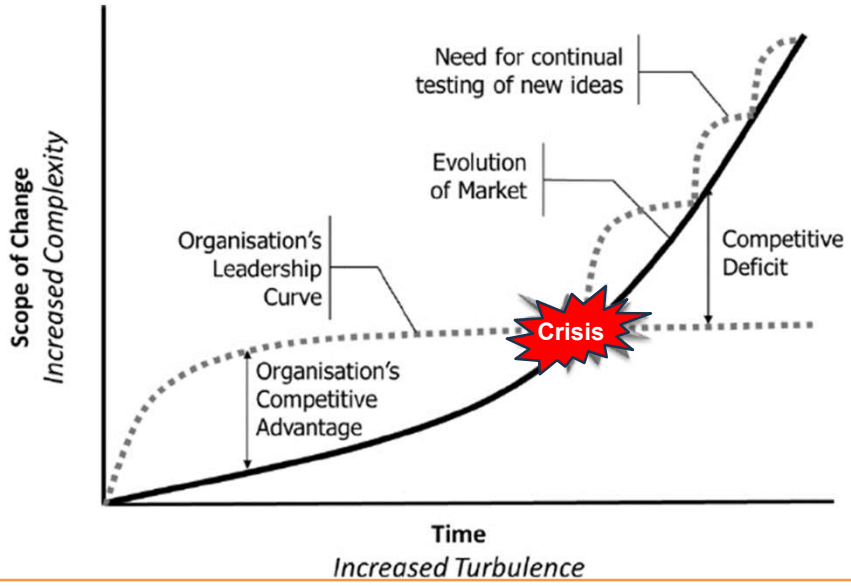
The context of present day organizations



6

Sustainability

- Sustainability
  - Using resources in ways that do not harm ecological systems that support human existence
- Key aspects of designing for sustainability
  - Cradle-to-grave assessment (Life-Cycle assessment)
  - End-of-life programs
  - The 3-Rs
    - Reduction of costs and materials
    - Re-using parts of returned products
    - Recycling

7

Other Design Considerations

- Strategies for product or service *life stages*
- *Standardization*
- Product or service *reliability*
- Product or service *robustness*
- Degree of *newness*

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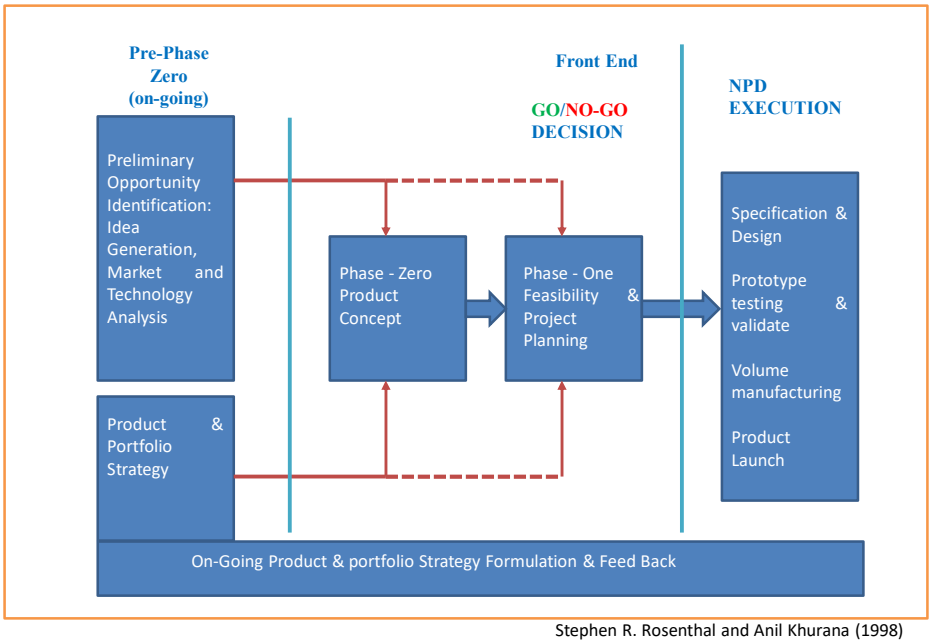

Stephen R. Rosenthal and Anil Khurana (1998)

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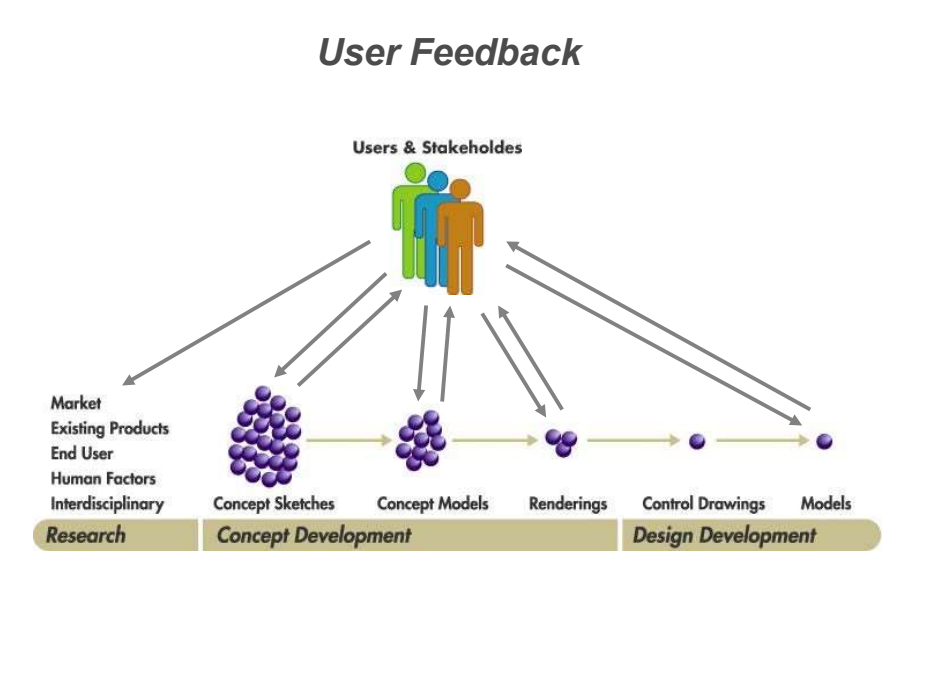


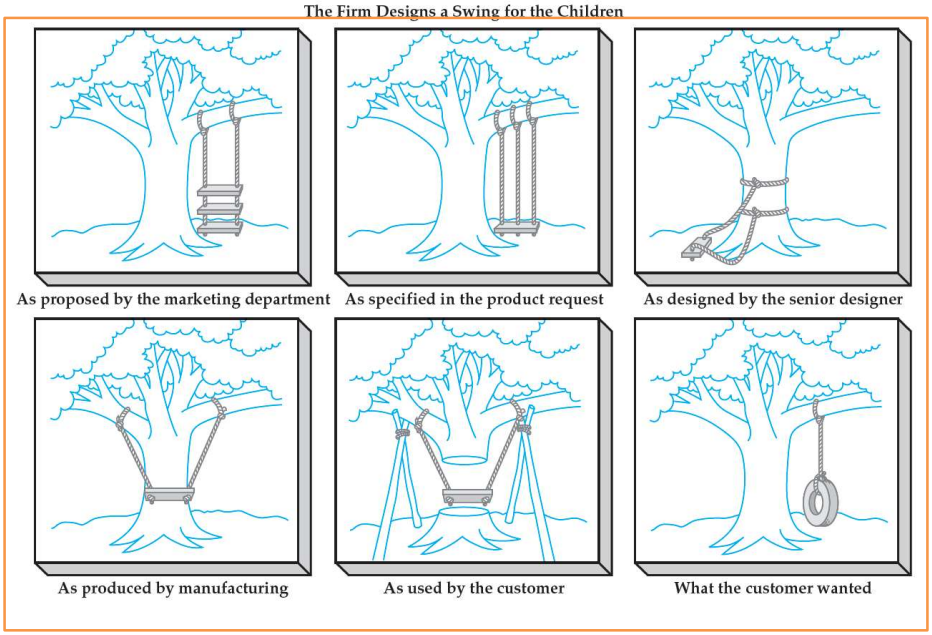
10

What is a Successful Design?

- Completely committed to a particular human *need (or market)*
  - *Function*
  - *Form*
  - *Ergonomics*
  - *Emotion*
- Must be honest
- Cannot completely fail on any one attribute

11

Lack of cooperation in designing a swing.



12

The Medical Refrigerators help store vaccine vials that require extremely cold temperatures.

Kamal Nandi, Business Head and Executive Vice President, Godrej Appliances said…..

“We have received an order of Rs 95 crore for 9,000 medical refrigerators (with storage temperature of 2-8°C) and 3,000 chest freezers (with storage temperature of -25°C) from the health ministry, the Government of India.

…….There is another 3,000 units order for medical refrigerators from UNICEF India,” he added.

13

Godrej Appliances to launch ultra-cool freezers in India for COVID-19 vaccine storage…. Dec 23, 2020.

14

Nandi said, in January 2021, the company will be launching a vertical freezer with a storage temperature of -70°C which will be an ultra-cool freezer.

The Pfizer vaccine for COVID-19 needs to be stored at -70°C…
…… while the Moderna vaccine needs a temperature of -20°C (though it can be kept in the refrigerator at +2°C to +8°C for up to a month).

The AstraZeneca-Oxford vaccine needs a storage temperature of +2°C to +8°C.

15

Eleonora Maersk

"Triple E" vessel: Economy of scale, Efficiency, Environment
Capacity: 18,000 TEU

16

TEU capacities for common container sizes				
Length	Width	Height	Volume	TEU
20 ft (6.1 m)	8 ft (2.44 m)	8 ft 6 in (2.59 m)	1,360 cu ft (38.5 m^3)	1
40 ft (12.2 m)	8 ft (2.44 m)	8 ft 6 in (2.59 m)	2,720 cu ft (77 m^3)	2
45 ft (13.7 m)	8 ft (2.44 m)	8 ft 6 in (2.59 m)	3,060 cu ft (86.6 m^3)	2 or 2.25
48 ft (14.6 m)	8 ft (2.44 m)	8 ft 6 in (2.59 m)	3,264 cu ft (92.4 m^3)	2.4
53 ft (16.2 m)	8 ft (2.44 m)	8 ft 6 in (2.59 m)	3,604 cu ft (102.1 m^3)	2.65

Twenty-Foot Equivalent Unit is is a measure of volume in units of twenty-foot long containers, often used to describe the capacity of container ships and container terminals

17

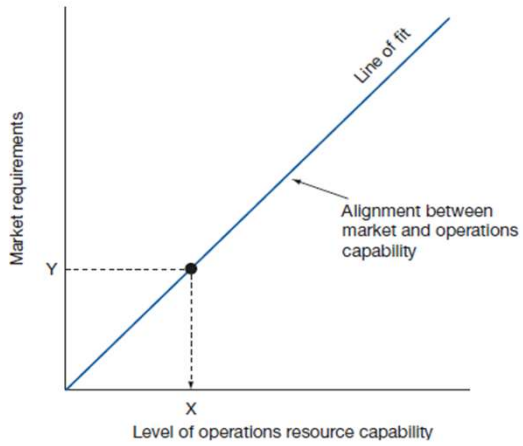
18

Economies of Scale - Made of Steel

- The Economics of Very Big Ships
- Economy of Container Ships
  - Allows a T-shirt made in China to be sent to the Netherlands for just 2.5 cents.
  - The Eleonora Maersk and the other seven ships in her class are among the largest ever built:
  - Almost 400 m long, or the length of four soccer fields, and another half-field across.
  - The ships can carry 7,500 numbers of 40-foot containers, each of which can hold 70,000 T-shirts.
- On this voyage, the Eleonora was carrying supplies for Europe's New Year celebrations: 1,850 tons of fireworks, including 30 tons of gunpowder.

19

In operations strategy 'fit' is the alignment between market and operations capability

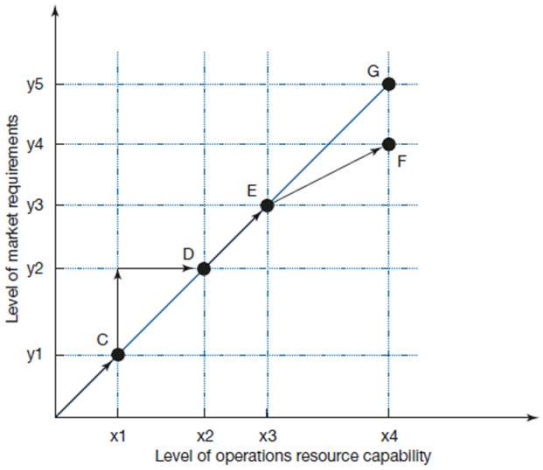


Movement up in Y-axis indicates enhanced level of market performance, reflecting factors such as strength of brand/reputation, degree of differentiation……

Position on X-axis will be determined by factors such as resource efficiency, process control, innovation and so on.

20

In operations strategy 'fit' is the alignment between market and operations capability



Transition from point C to D indicates improving capability to match the market requirements

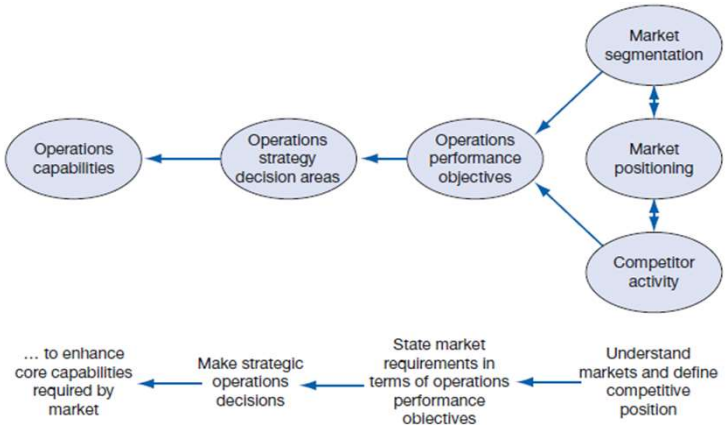
…Over time market requirements shifting from y2 to y3, added underlying capabilities.

This incremental growth phase
is represented by the transition from point 'D to E'

Position 'F' indicates a need to meet 'y4' requirements

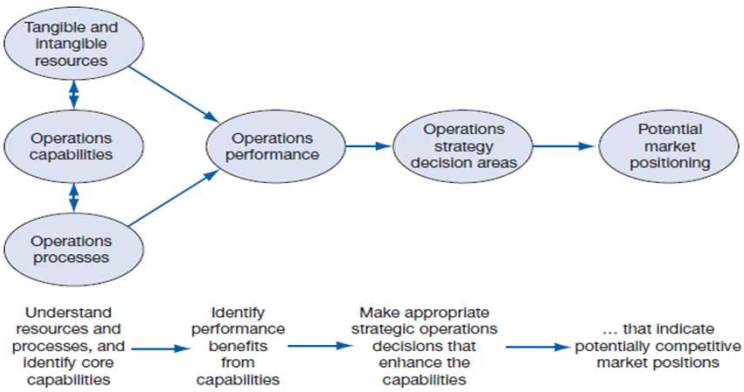
21

Align operations resources with market requirements



22

Align market positioning with operations resources capabilities



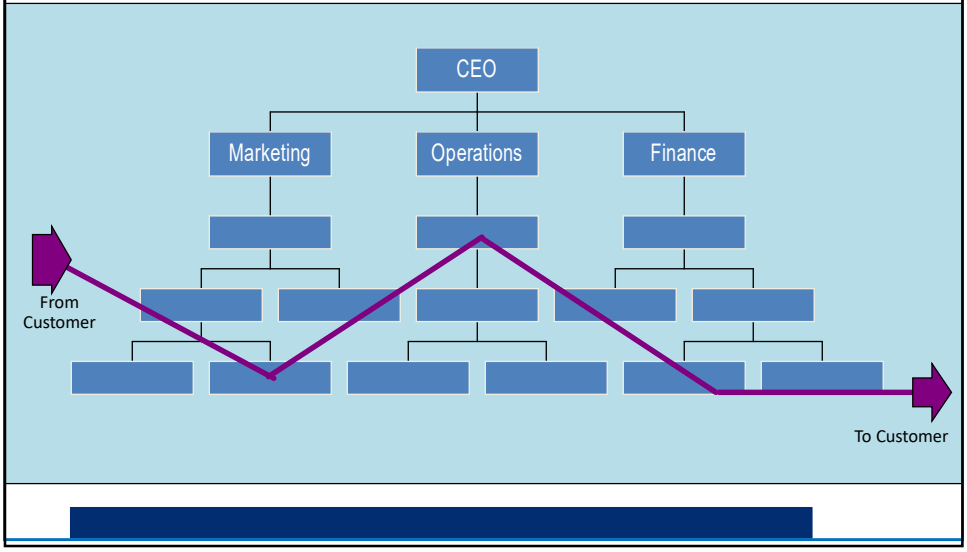
23

Process

- Process: Process can be viewed as a sequence of steps connecting inputs to outputs
- Example:
- A customer walks-in to Paint shop – Orders a particular shade-store employee enters information into a machine that automatically dispenses appropriate pigments in to a can of base white paint—another machine shakes the can –
- Result: Consistent color throughout the can – customer walks-away
- The simple process used to create customized paint combined: customer preference, employee skills and technology

24

Process View of Business



25

Questions to Ask in Process-Flow Analysis

- **What** does the customer need? What operations are necessary? Can some operations be eliminated, combined, or simplified?
- **Who** is performing the job? Can the operation be redesigned to use less skill or less labor? Can operations be combined to enrich jobs?
- **Where** is each operation conducted? Can layout be improved?
- **When** is each operation performed? Is there excessive delay or storage? Are some operations creating bottlenecks?
- **How** is the operation done? Can better methods, procedures, or equipment be used?

26

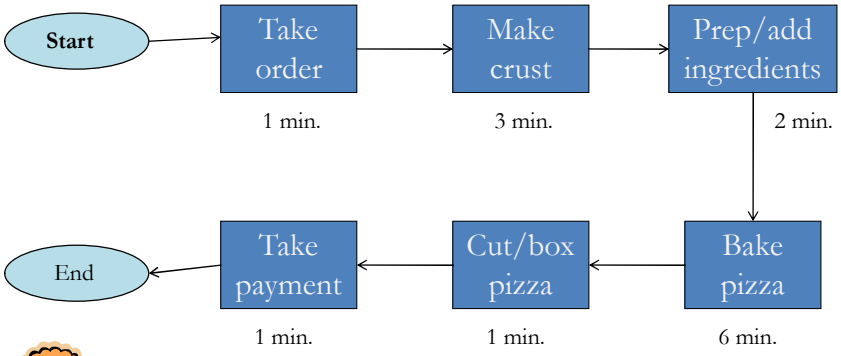
Pizza: example

Activity	Minutes	Who/What
Take order	1	Assistant
Make crust	3	Chef
Prepare/add ingredients	2	
Bake pizza	6	Oven
Cut/box pizza	1	Assistant
Take payment	1	Assistant

Details: Assume all toppings added to every pizza
Oven can bake up to 1 pizza at a time

27

Map the process



28

What is process capacity?

3 resources:

Assistant takes 3 min. per pizza, can process 20 pizzas per hour.

Chef takes 5 min. per pizza, can process 12 pizzas per hour.

Oven takes 6 min. per pizza, can process 10 pizzas per hour.

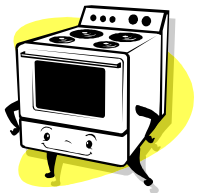
Therefore, process capacity (flow rate) = 10 pizzas/hour

29

What is the process bottleneck?

The OVEN is the slowest activity….. that determines process capacity.

The process cannot produce more than the slowest activity (flow rate = 10 pizzas/hr).



30

Symbols for Flow-Process Chart

Operation - task or work activity

Inspection - inspection of product for quantity or quality

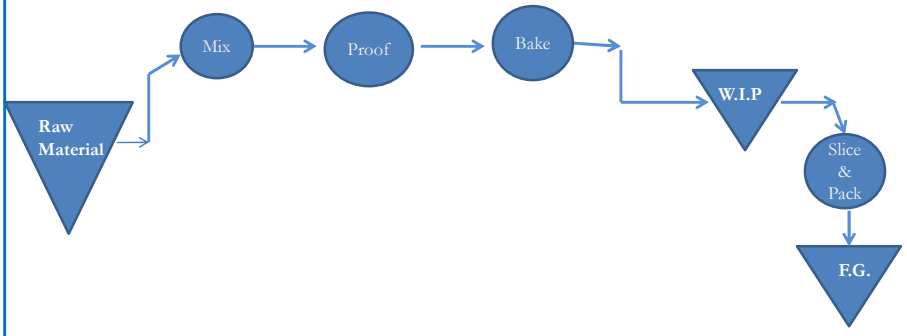
Transportation - movement of material from one point to another

Storage - inventory or storage of materials awaiting next operation

Delay - delay in the sequence of operations

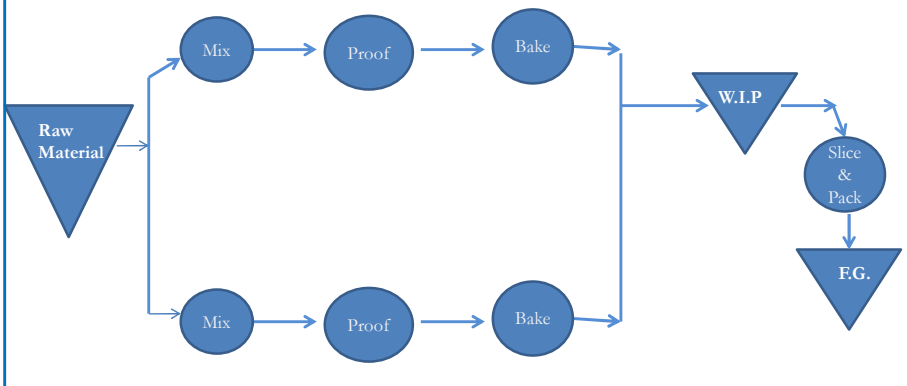
31

Process Flow for Bread-Making



32

Process Flow for Bread-Making with Two-Parallel Baking Lines



33

Objectives of Facility Layout

- Minimize material-handling costs
- Utilize space efficiently
- Utilize labor efficiently
- Eliminate bottlenecks
- Facilitate communication and interaction
- Reduce manufacturing cycle time
- Reduce customer service time
- Eliminate wasted or redundant movement

34

Objectives of Facility Layout contd..

- Facilitate entry, exit, and placement of material, products, and people
- Incorporate safety and security measures
- Promote product and service quality
- Encourage proper maintenance activities
- Provide a visual control of activities
- Provide flexibility to adapt to changing conditions
- Increase capacity

35