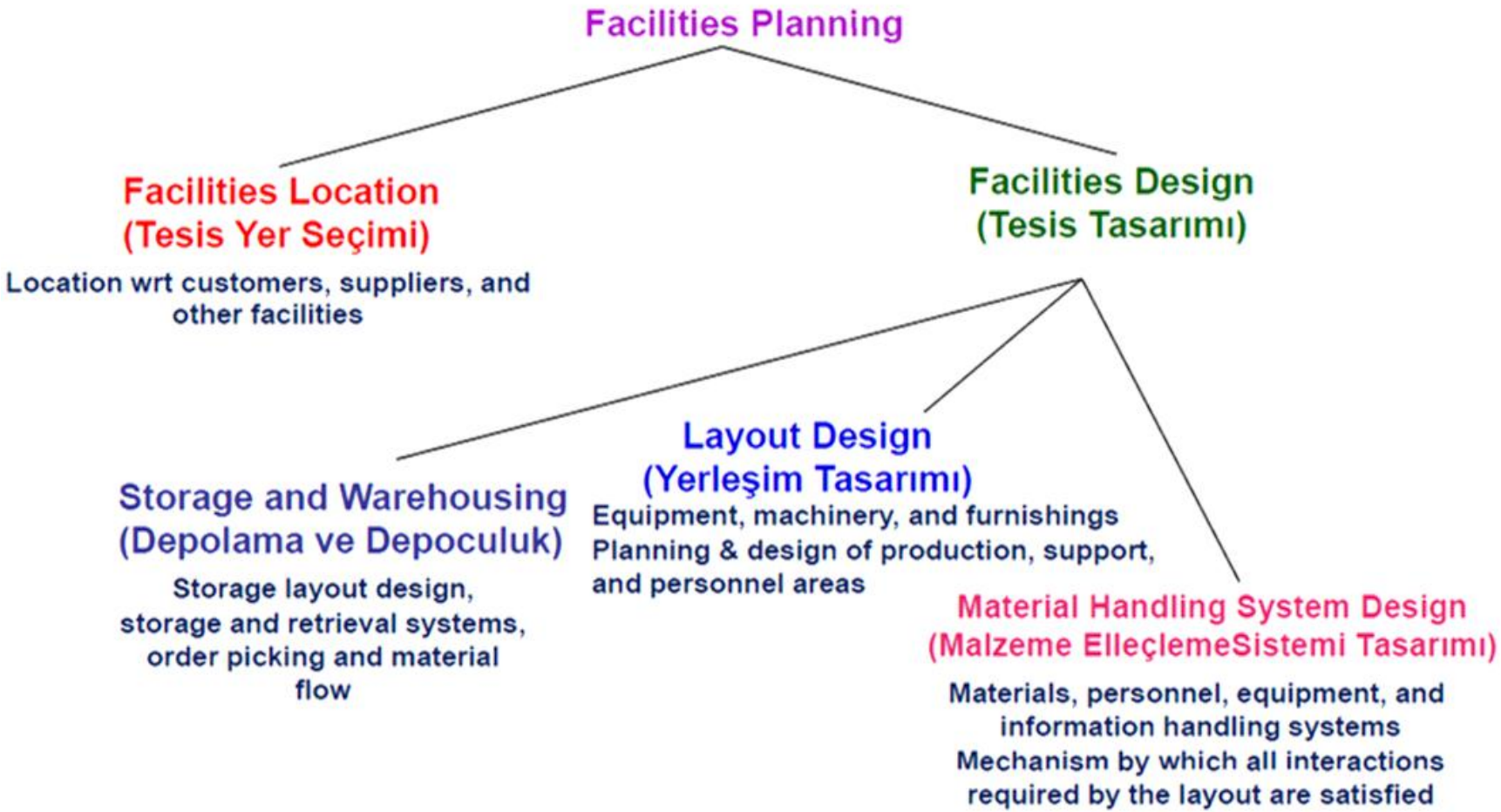
Terminology

- Facilities planning, Facility planning
  - Tesis planlama
- Facilities design
  - Tesis tasarımı
- Facility layout
  - Tesis yerleşimi
- Facility location
  - Tesis yer seçimi
- Material handling system
  - Malzeme elleçleme sistemi
- Warehouse and storage
  - Depo ve depolama

Facilities planning



Facilities planning

- A strategy
- Has broad applications
  - a manufacturing facility
  - a new hospital
  - an assembly department
  - an existing warehouse
  - baggage department of an airport, etc.
- Considers the facility as a dynamic entity
- A key requirement for a successful plan is its adaptability and its ability to become suitable for new use

Why do we plan facilities?

Primary causes that trigger a new facility or an altered facility or an extension are:

- Expanding production based on increased demand
- Entering a new field of endeavor
- Replacing an obsolete or inadequate facility
- Reallocating or consolidating production facilities
- Improving service to market
- Energy and environmental issues

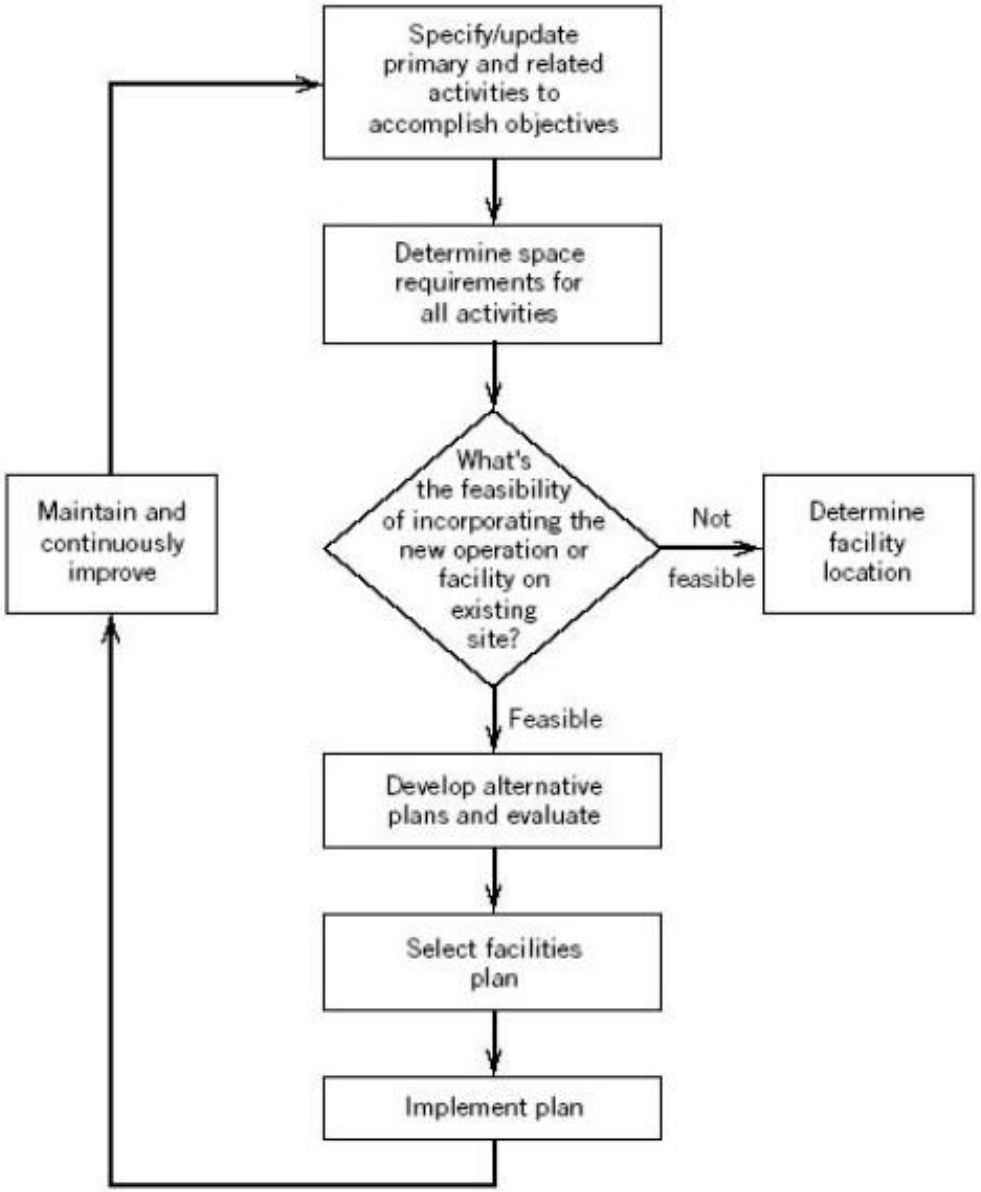
LONG TERM STRATEGIC DECISIONS

Facilities planning and supply chain

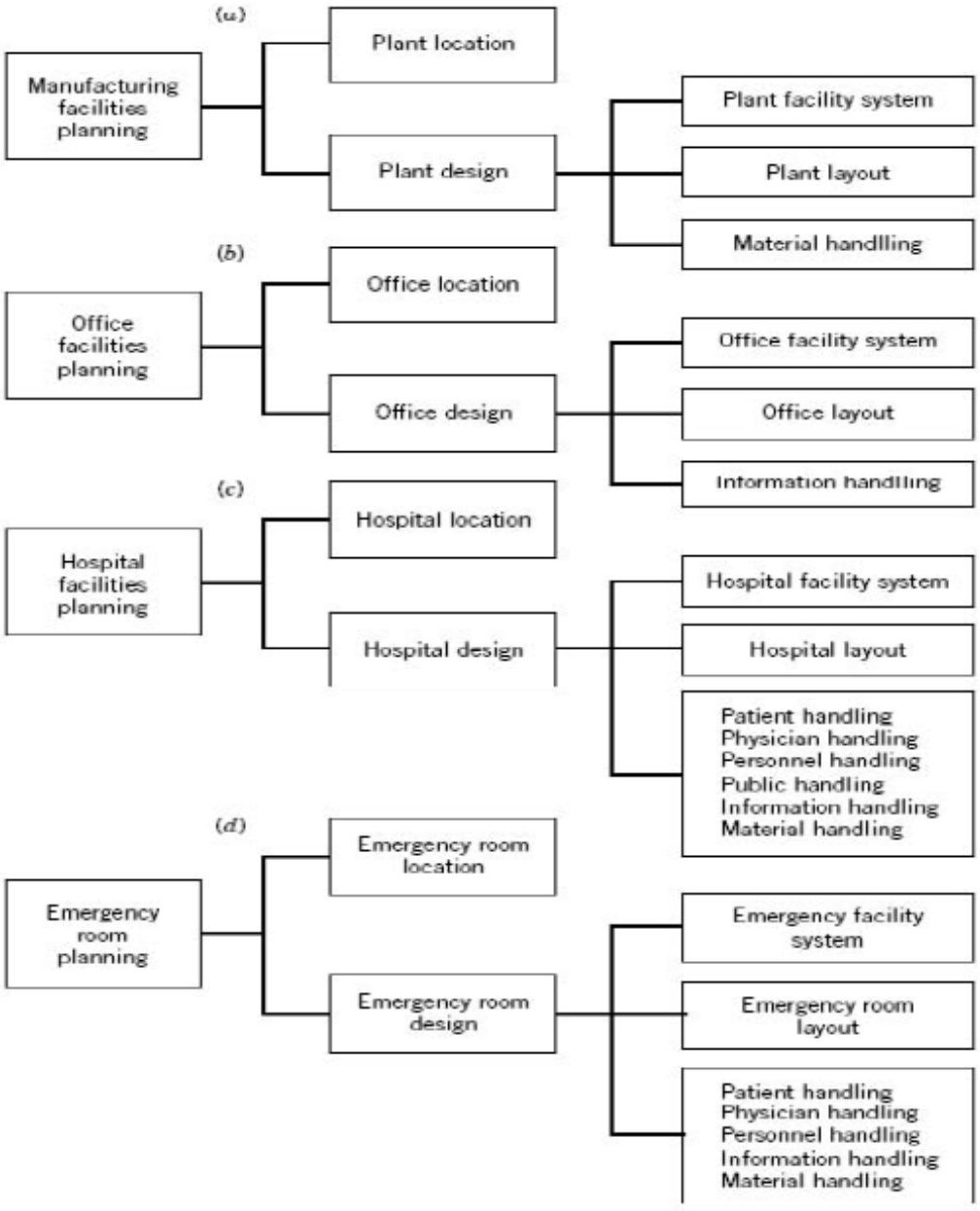
All facilities in the supply chain should have the following characteristics:

- Flexibility: handle variety of requirements without being altered
- Modularity: systems that cooperate efficiently over a wide range of operating rates
- Upgradability: incorporate advances in equipment systems and technology
- Adaptability: taking into consideration the implications of calendars, cycles, and peaks in facility use
- Selective operability: understanding how each facility segment operates and allows contingency plans to be put in place
- Environmental and energy friendliness: sustainable site development, energy efficiency, water savings, materials selection, indoor environmental quality, etc.

Continuous improvement in facilities planning



Facilities planning for specific types of facilities



Significance of facilities planning

- Approximately 8% of gross national product (GNP) is spent annually on new facilities in the U.S.
- Over $300 billion will be spent annually in U.S. alone on facilities that will require planning or re-planning
- Yet, adequate planning is not being performed and there exists a significant opportunity to improve the facilities planning process

Significance of facilities planning

- Impact on production:
  - Costs
  - Service
  - Ease of operations
- Impact on material handling and maintenance costs
- Impact on employee health and morale
- Impact on facility's capability to adapt to change and satisfy future requirements
- Environmental impact, energy efficiency and sustainability

Significance of facilities planning

Example:

- 20-50% of total operating expenses are related to material handling
- Effective facilities planning can reduce these costs by at least 10-30%

If effective facilities planning were applied, the annual manufacturing productivity would increase approximately three times

Objectives of facilities planning

- Improve customer satisfaction
- Increase return on assets (ROA)
- Maximize speed for quick customer response
- Reduce costs and increase profitability
- Integrate the supply chain
- Improved material handling and good housekeeping
- Utilize people, equipment, space, and energy effectively
- Maximize return on investment (ROI)
- Be adaptable and promote ease of maintenance
- Provide employee safety, job satisfaction, energy efficiency, and environmental responsibility
- Assure sustainability and resilience

Systematic approaches

"The plan is nothing,
but planning is everything."
D. D. Eisenhower

- Engineering design process
- Facilities planning process
- Winning facilities planning process

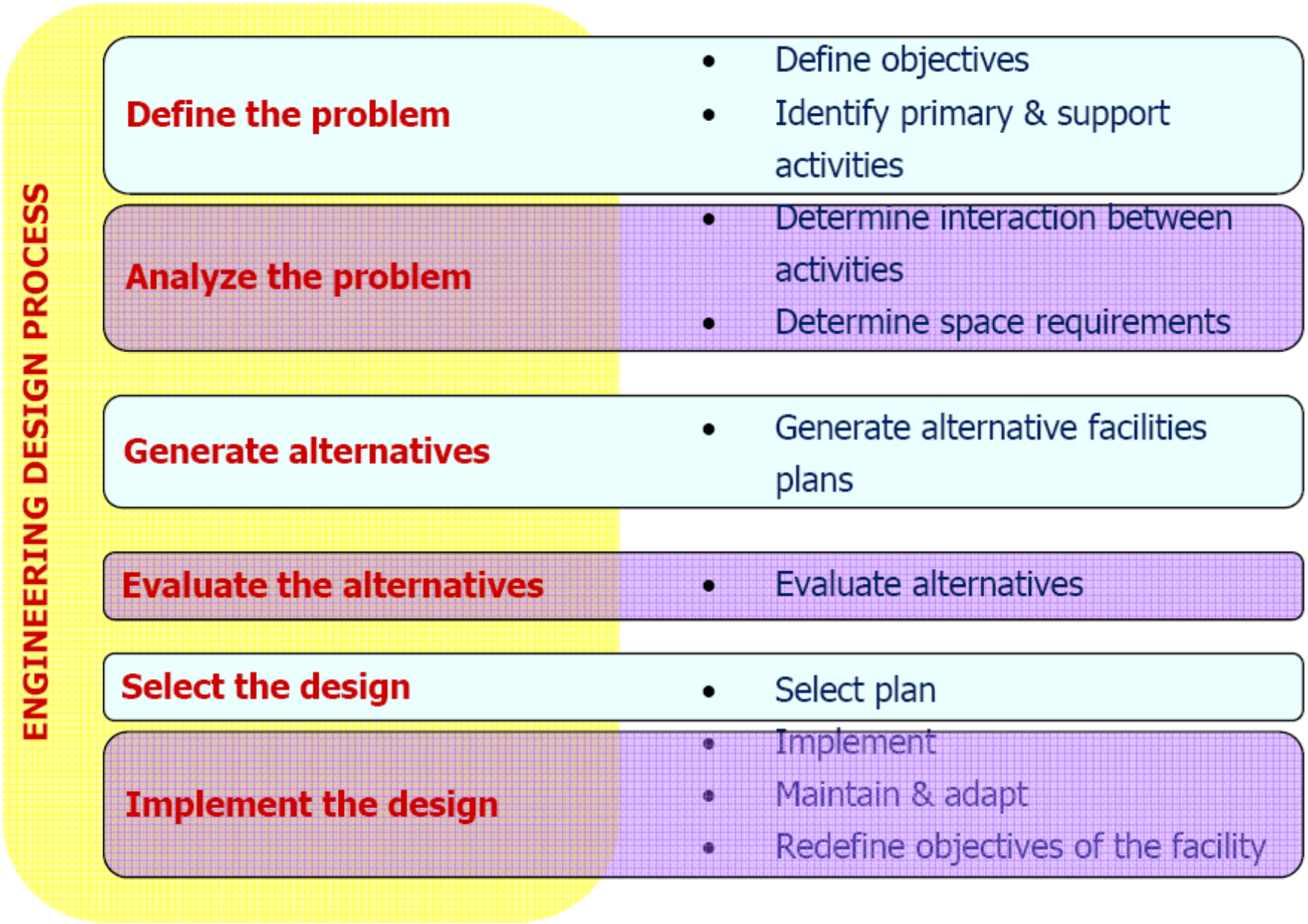
Engineering design process

1. Define the problem
2. Analyze the problem
3. Generate alternative designs
4. Evaluate the alternatives
5. Select the preferred design
6. Implement the design

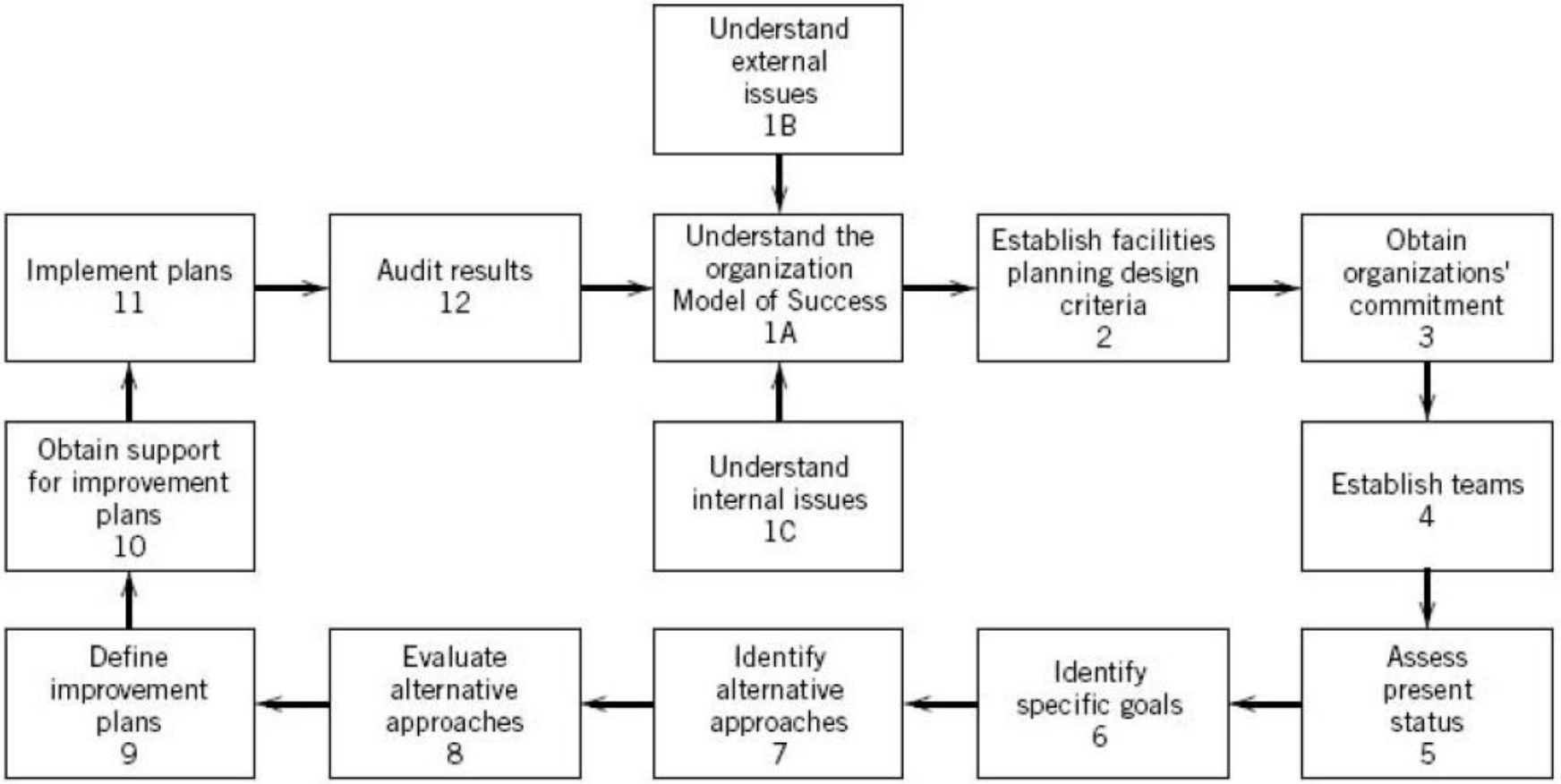
Facilities planning process

1. Define the problem
   - Define or redefine the objective of the facility
   - Specify the primary and support activities to be performed
2. Analyze the problem
   - Determine the interrelationships among all activities
   - Determine the space requirements for all activities
3. Generate alternative designs
   - Generate alternative facilities plans
4. Evaluate the alternatives
   - Evaluate alternative facilities plan
5. Select the preferred design
   - Select a facilities plan
6. Implement the design
   - Implement, maintain, and continuously improve the facilities plan

Facilities planning process



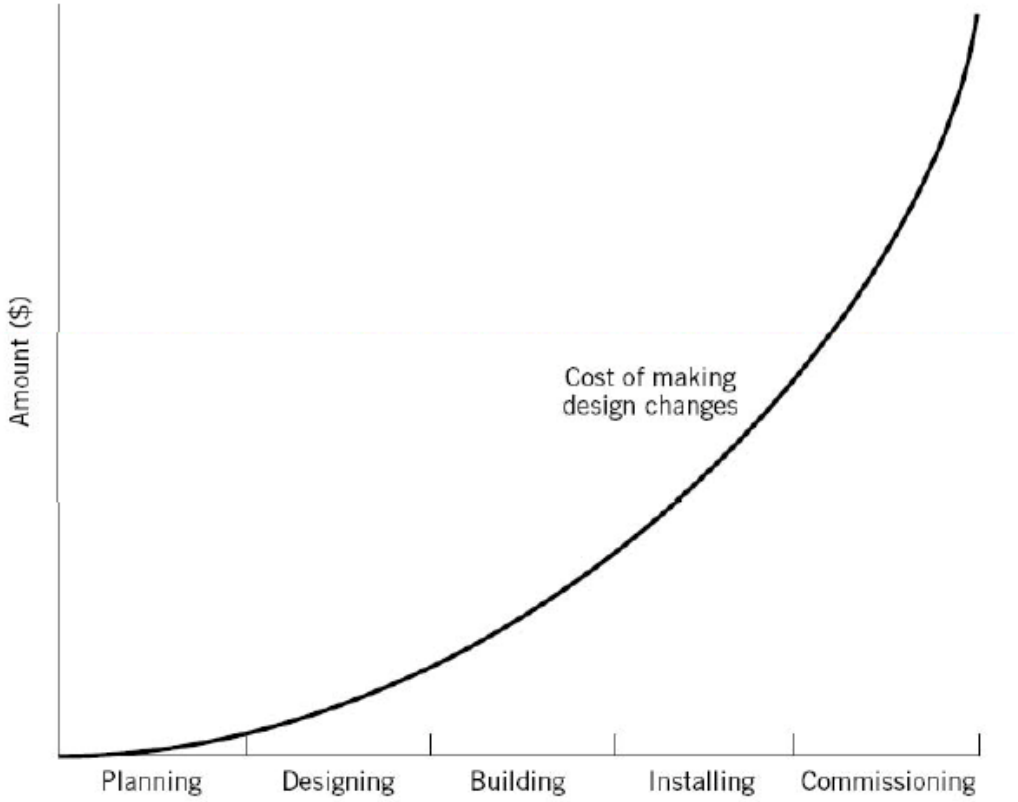
Winning facilities planning process



Comparison

Phase	The Engineering Design Process	The Facilities Planning Process	The Wining Facilities Planning Process
Phase I	Define problem.	1. Define or redefine objective of the facility. 2. Specify primary and support activities.	1A Understand the organization Model of Success. 1B Understand external issues. 1C Understand internal issues. 2. Establish facilities planning design criteria. 3. Obtain organizational commitment.
Phase II	Analyze the problem. Generate alternatives. Evaluate the alternatives. Select the preferred design.	3. Determine the interrelationships. 4. Determine space requirements. 5. Generate alternative facilities plan. 6. Evaluate alternative facilities plan. 7. Select a facilities plan.	4. Establish teams. 5. Assess present status. 6. Identify specific goals. 7. Identify alternative approaches. 8. Evaluate alternative approach. 9. Define improvement plans. 10. Obtain support for improvement plans.
Phase III	Implement the design.	8. Implement the plan. 9. Maintain and adopt the facilities plan. 10. Redefine the objective of the facility	11. Implement plans. 12. Audit results

Significance of planning



Cost of making design changes during a project

Examples of inadequate planning

- A large consumer products company decided to allow each of its acquisitions to remain independent, thus requiring the management of many duplicate supply chains
- A significant investment in storage equipment for a “quick fix”. The solution did not provide the required throughput and was not compatible with long-term needs.
- A textile firm installed a large high-rise AS/RS. The system could not be used because it required additional changes.
- …

The projects were interrupted and significant delays occurred because proper facilities planning had not been performed.

Different perspectives for facilities planning

- Civil engineer
- Electrical/Mechanical engineer
- Architect
- Construction management/Contractor
- Real-estate agent
- City planner
- Industrial engineer

IE perspective for facilities planning

- An **industrial engineer** is concerned with the development, improvement, implementation and evaluation of integrated systems of people, money, knowledge, information, equipment, energy, materials, analysis and synthesis
- Facilities integrate various sub-systems
  - Space requirements for operation and flow
  - Personnel requirements
  - Equipment requirements
  - Design and layout
  - Increasing efficiency via technology and information systems

An example from a production plant

IE perspective

- Why are there so many equipments?
- Why are the components, equipments and machines organized like this?
- Why is this facility this big/small?
- Why are there open/closed areas?
- How many people are going to work?
- Does this design satisfy the expectations?
- etc.

Facilities planning

- Determines how an activity's tangible fixed assets should contribute to meeting the activity's objectives
- Consists of facilities location and facilities design
- Is part art and part science
- Can be approached using the engineering design process
- Is a continuous process and should be viewed from a life-cycle perspective
- Represents one of the most significant opportunities for cost reduction and productivity improvement

Facilities location

- Refers to its placement with respect to customers, suppliers, and other facilities with which it interfaces
- Includes placement and orientation on a specific plot of land
- Determines how the location of a facility supports meeting the facility's objective
- Macro issues

Facilities design

- Consists of the facility systems, the layout and the handling system
- Facility systems consist of the structural systems
- Layout consists of all equipment, machinery, and furnishings within the building
- Handling systems consists of the mechanism needed to satisfy the required facility interactions
- Microelements

Facility Location

- Single facility location problems
- Multiple facility location problems
- Discrete location models