Chapter 1

Introduction

Facilities Planning Defined

- *Facilities planning* is a complex and broad subject that cuts across several specialized disciplines. (civil, electrical, industrial, mechanical, etc)

- *A facility* could be:
  - new factory
  - new hospital
  - School
  - Bank
  - Store
  - existing warehouse
  - assembly department
  - office
  - baggage department of an airport.
  - Etc.

Facility Management:

- Coordinating the physical workplace with the people and work of the organization integrating the principles of business administration, architecture, and the behavioral sciences.

- Facility management encompasses multiple disciplines to ensure functionality of the built environment by integrating people, place, processes and technology.

Facility Planning:

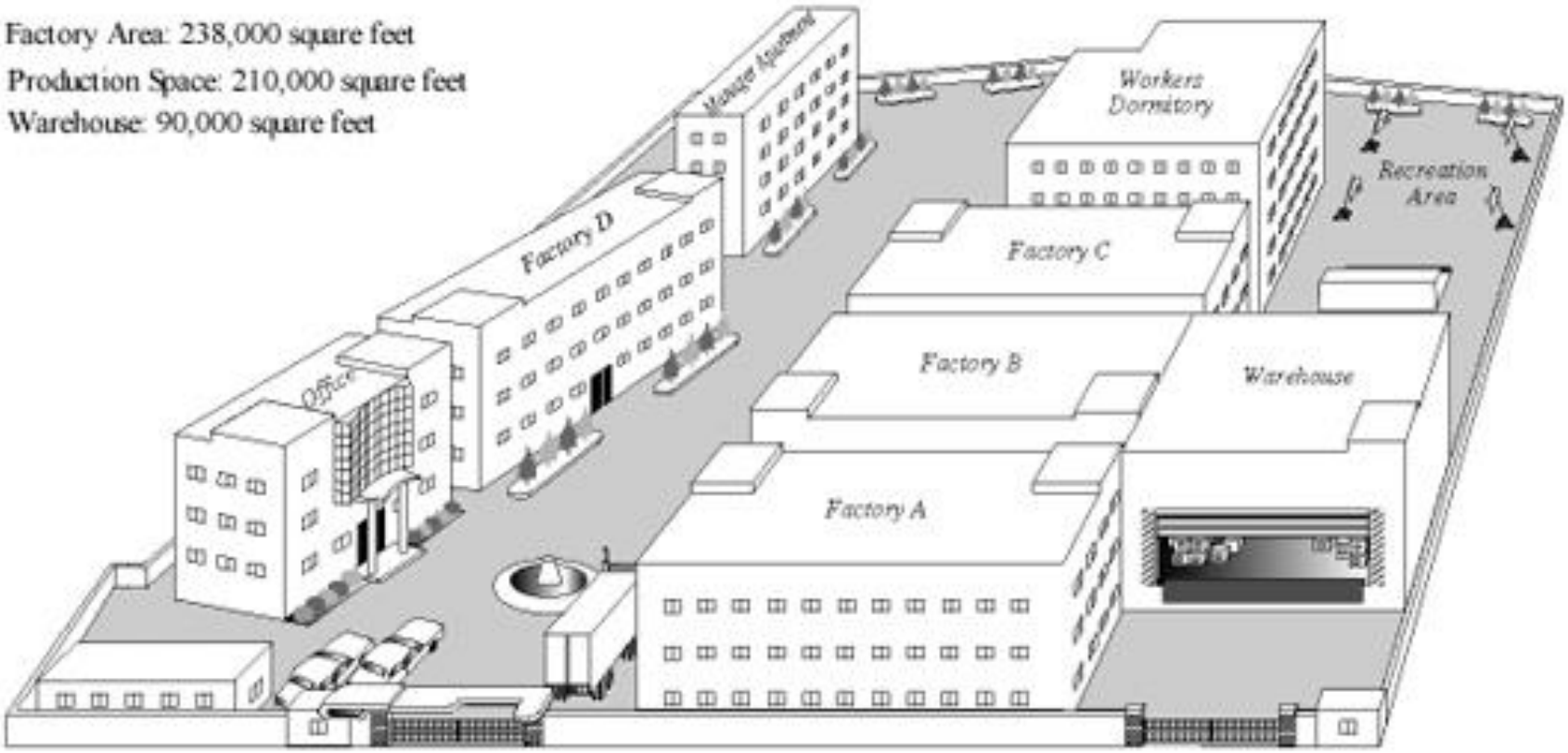
- the tactical day-to-day issues and not the more macro topics addressed in SFP. It solves problems related to specifics, such as where individuals sit or the type of equipment required accommodating a specific situation.

Strategic facility Planning :

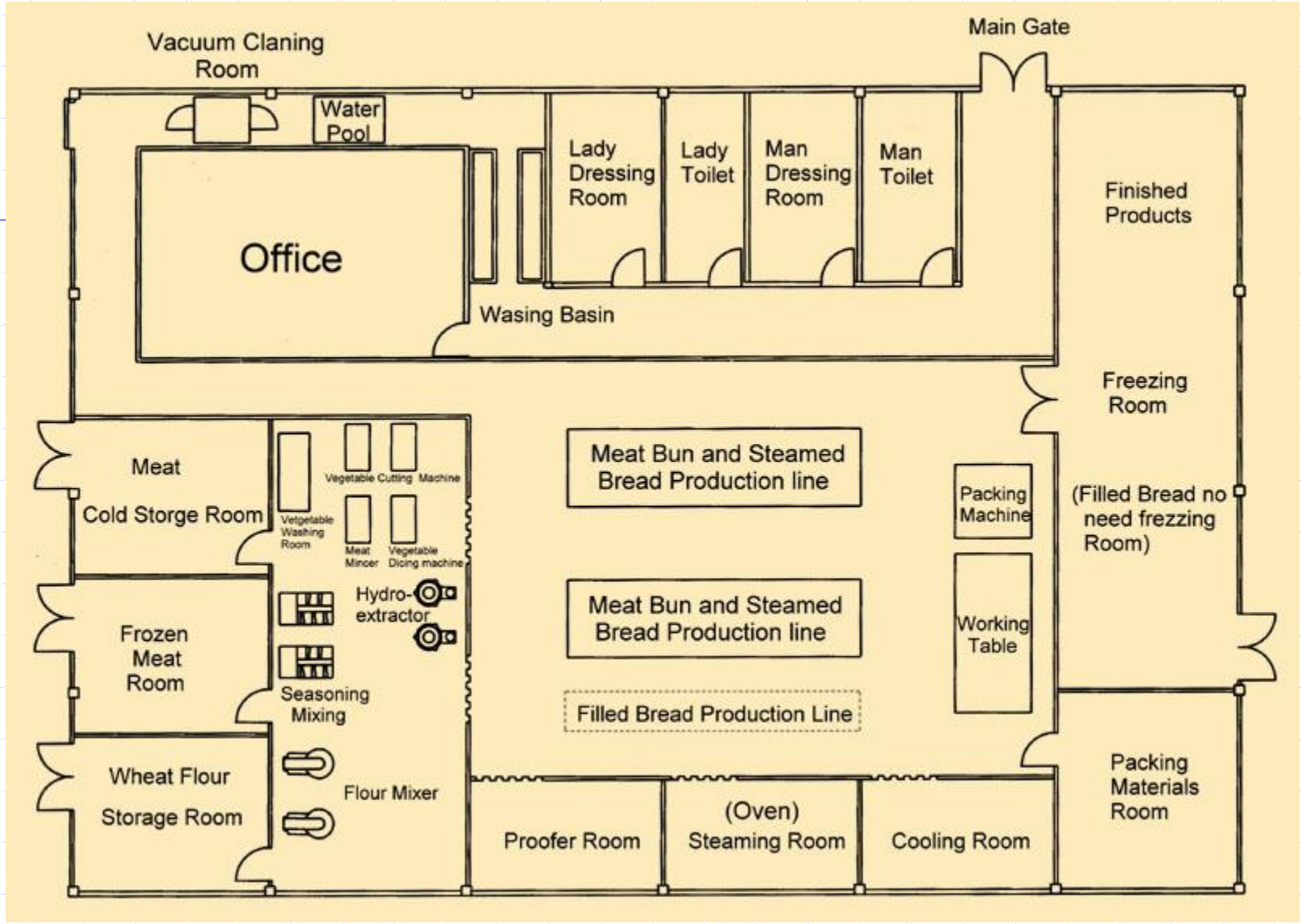
- A long-term process that can lead to better, more proactive delivery of services from a facility management organization to its stakeholders.

Manufacturing Complex in Dongguan, China

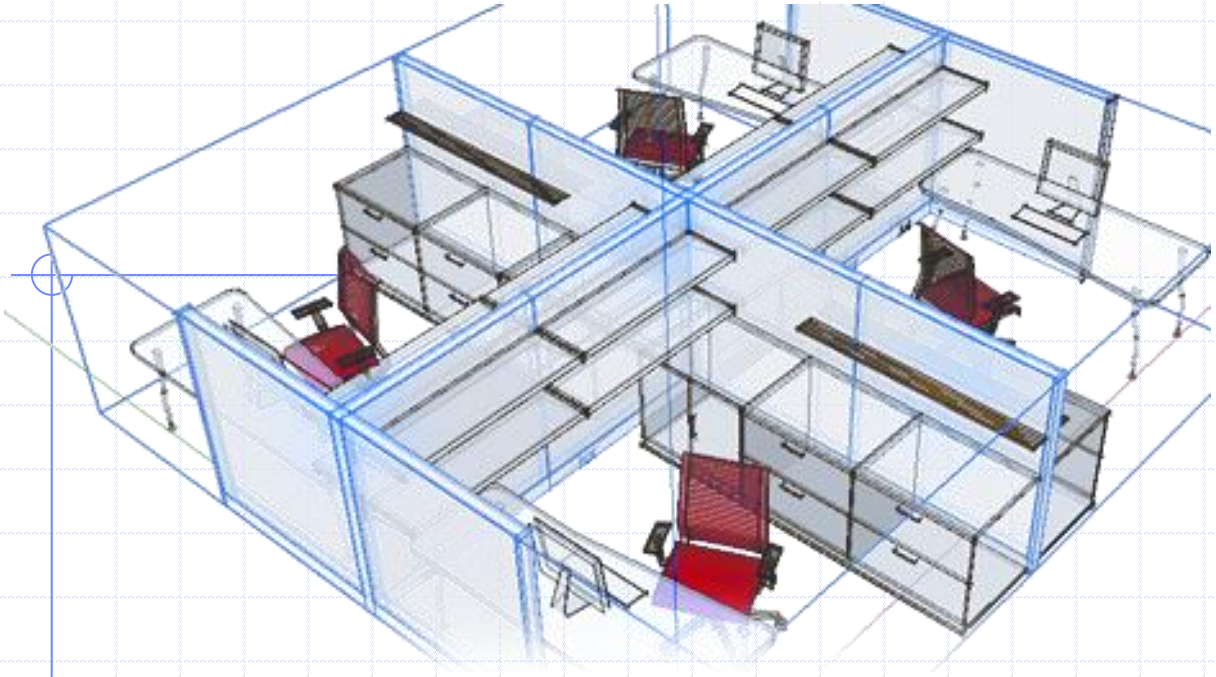
Factory Area: 238,000 square feet
Production Space: 210,000 square feet
Warehouse: 90,000 square feet



Manufacturing Complex



Manufacturing Facility layout (Food industry)



Office Layout

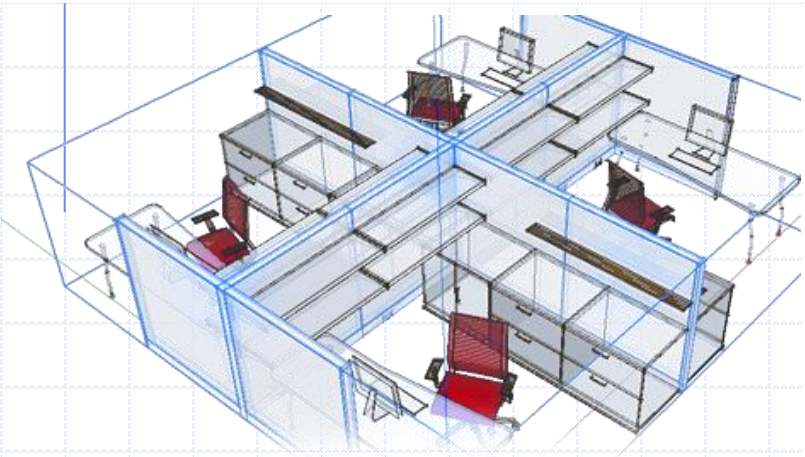
Parking Layout

Facilities Planning Defined (contd.)

- *Facilities planning* determines how an activity's tangible fixed assets best support achieving the activity's objective.

- Examples:
  - Manufacturing facility: how the manufacturing facility best support production
  - Airport: how the airport facility supports the passenger-airport interface
  - Hospital: how the hospital facility supports providing medical care to patients

Fixed Tangible Assets

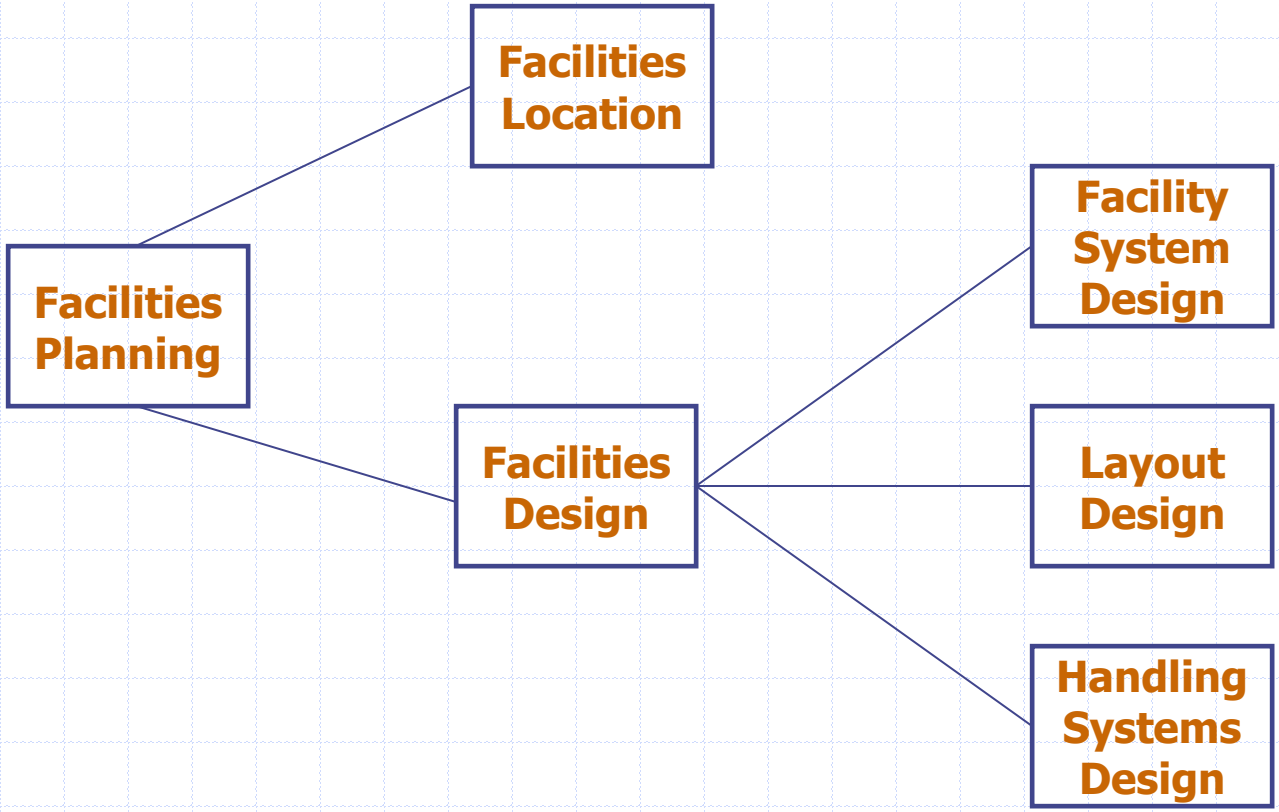


Facilities Planning Hierarchy

- Facilities planning:
  - Facilities location
  - Facilities design
    - Facilities systems design
    - Layout design
    - Handling systems design

- Facilities planning combines the efforts to determine location of a facility and design of it

Facilities Planning Hierarchy (contd.)

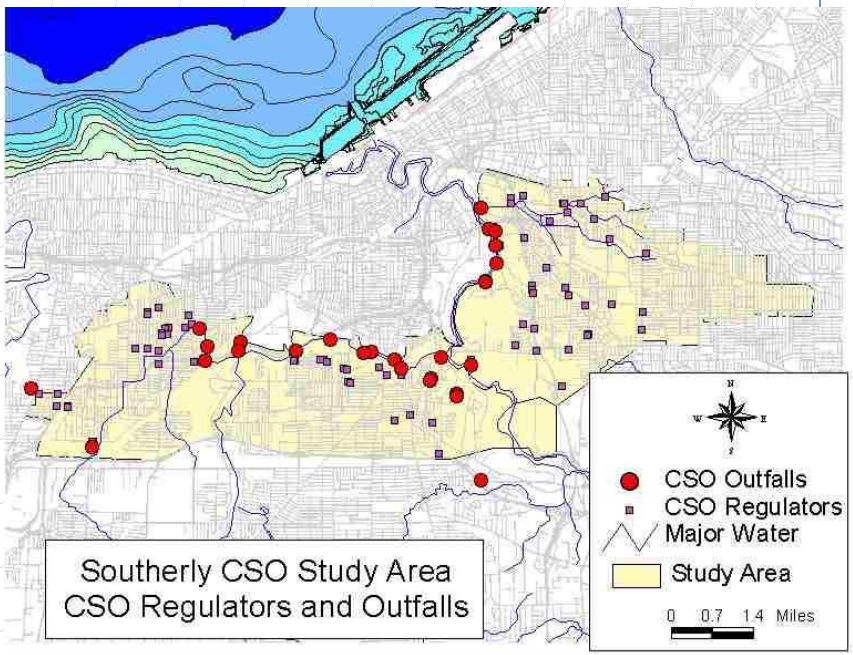


Facilities Planning Hierarchy (contd.)

Facilities location: placement with respect to customer, suppliers, and other facilities with which it interfaces.

Influences of Plant location:

- Proximity to raw material
- Markets
- Transportation systems
- Economic development programs (financial incentives)
- Environmental consideration
- Climate
- President's home town
- Etc.



Facilities Planning Hierarchy (contd.)

- Facilities design: consists of the facility systems, the layout, and the handling system
  - Facility system – structural systems, the atmospheric systems, the enclosure system, the lighting/electrical/communication systems, the life safety system and the sanitation system.
  - Layout – consists of all equipment, machinery, and furnishings within the building envelope.
  - Handling system – consists of the mechanisms needed to satisfy the required facility interactions.

    Material handling is very important to the facility design activity. The choice of material handling equipment will greatly effect the appropriateness of the facility design.

Facilities Planning Hierarchy (contd.)

- Which comes first, *the material handling system* or the *facility layout*?

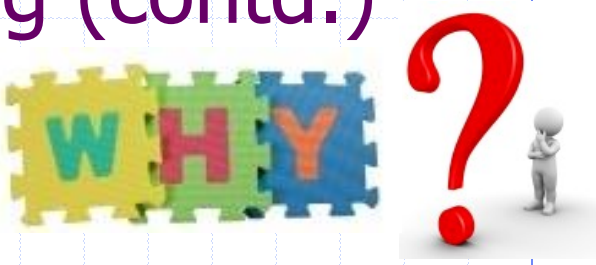
- BOTH! The layout and the handling system should be designed simultaneously

Significant of Facilities Planning

1. The size of investment in new facilities each year.
   - 8% of gross national product (GNP) in USA has been spent annually on new facilities.

2. Economic considerations
   - One of the most effective methods for increasing plant productivity and reducing cost is to reduce or eliminate all activities that are unnecessary or wasteful.
   - A facilities design should accomplish this goal in terms of material handling, personnel and equipment utilization, reduced inventories, and increased quality.

Significant of Facilities Planning (contd.)



3. Employee health and safety
   - Occupational Safety and Health Act: redesign facilities to consider health and safety and to eliminate possible hazardous conditions

4. Energy conservation
   - Energy has become an important and expensive raw material

5. Community considerations:
   - Fire protection, security, air pollution, noise, and the ADA (Americans with Disabilities Act) of 1989

Objectives of Facilities Planning

- Improve customer satisfaction by being easy to do business with, conforming to customer promises, and responding to customer needs.
- Increase return on assets (ROA) by maximizing inventory turns, minimizing obsolete inventory, maximizing employee participation, and maximizing continuous improvement.
- Maximize speed for quick customer response.
- Reduced costs and grow the supply chain profitability

Objectives of Facilities Planning (contd.)

- Integrate the supply chain through partnership and communication.
- Support the organization's vision through improved material handling, material control, and good housekeeping.
- Effectively utilize people, equipment, space, and energy.
- Maximize return on investment (ROI) on all capital expenditures
- Be adaptable and promote ease of maintenance.
- Provide for employee safety and job satisfaction.

Main Features of Successful Facilities Plan

- Flexibility:
  - Flexible facilities are able to handle a variety of requirements without being altered
- Modularity:
  - Modular facilities include systems that cooperate efficiently over a wide range of operating rates
- Upgradeability
  - Upgraded facilities easily incorporate advances in equipment systems and technology

Main Features of Successful Facilities Plan (contd.)

- Adaptability:
  - Considering the
    - Calendar
    - Cycles
    - Peaks
- Selective operability
  - Understanding how each facility segment operates
  - Allows contingency plans to be put in place

Facilities Planning Process

- Must start at the beginning of the project
- Even though facilities planning is not an exact science, it can be approached in an organized, systematic way.
- Types and Sources of Manufacturing Facilities Design Projects
  - New facility -
  - New product -
  - Design changes - of the product
  - Cost reduction - better layout for better productivity and cost reduction (Lean Thinking)

Facilities Planning Process

By applying the engineering design approach, a systematic approach can be developed

1. Define the problem
   - Define (or redefine) the objective of the facility (products and productivity levels)
   - Specify the primary and support activities to be performed in accomplishing the objective
2. Analyze the problem
   - Determine the interrelationships among all activities
3. Determine the space requirements for all activities
   - Generate alternative facilities plans

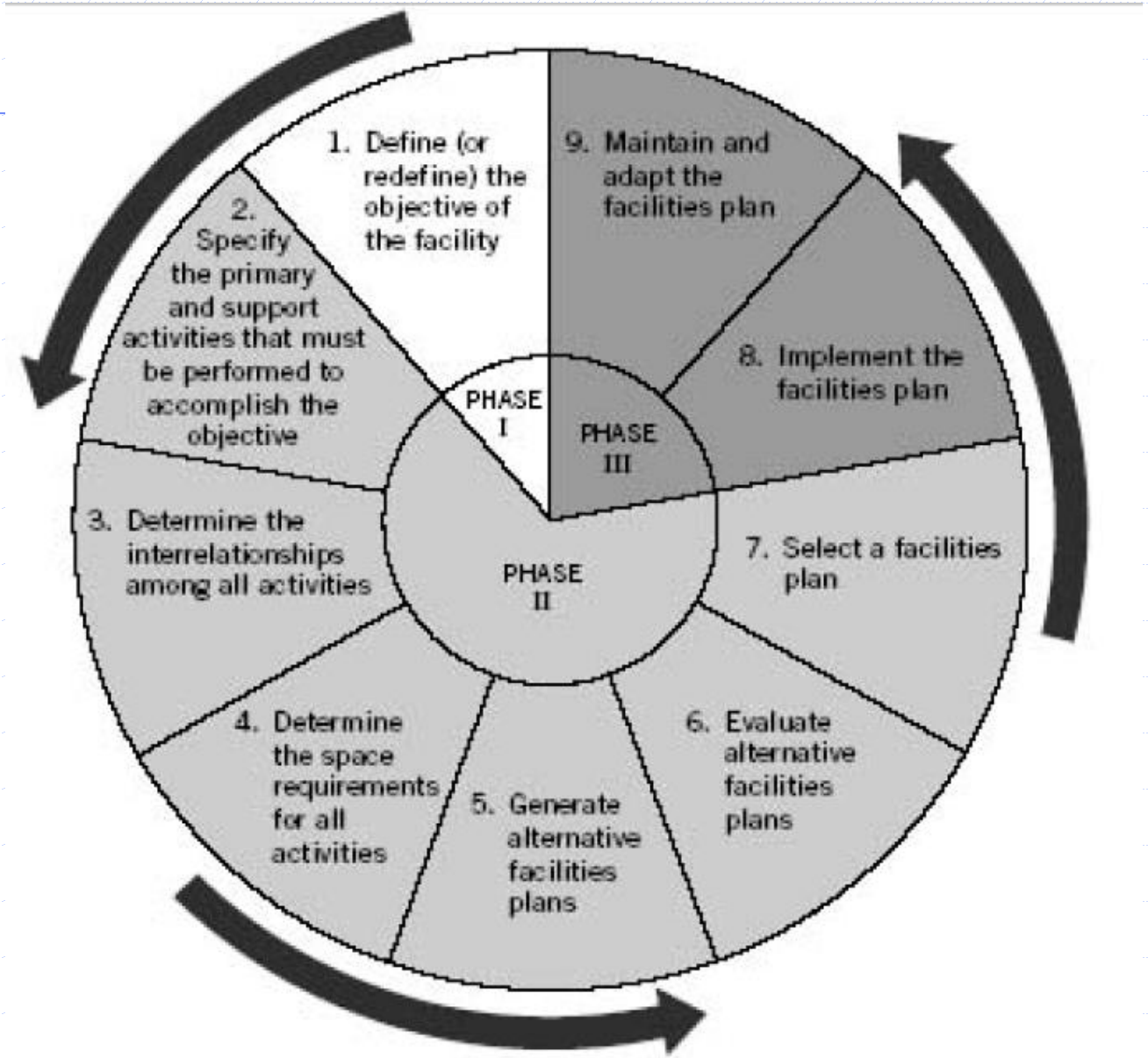
Facilities planning process

4. Evaluate the alternatives
   - Evaluate alternative facilities plans on the basis of accepted criteria.

5. Select the preferred design
   - Select a facilities plan

6. Implement the design
   - Implement the facilities plan
   - Maintain and adapt the facilities plan
   - Redefine the objective of the facility

Facilities Planning Process



Lean Thinking and Lean Manufacturing

- *Lean manufacturing* - a concept by which all people work together to eliminate waste
  - Overproduction
  - Waiting
  - Transportation
  - Processing
  - Inventory
  - Motion
  - Rework
  - Poor people utilization

The 7 Wastes

MUDA is the Japanese word for WASTE.

Seek it out and get rid!

Overproduction

To produce sooner, faster or in greater quantities than customer demand.

An 8th waste is the wasted potential of people

Inventory

Raw material, work in progress or finished goods which is not having value added to it.

Waiting

People or parts that wait for a work cycle to be completed.

Motion

Unnecessary movement of people, parts or machines within a process.

Transportation

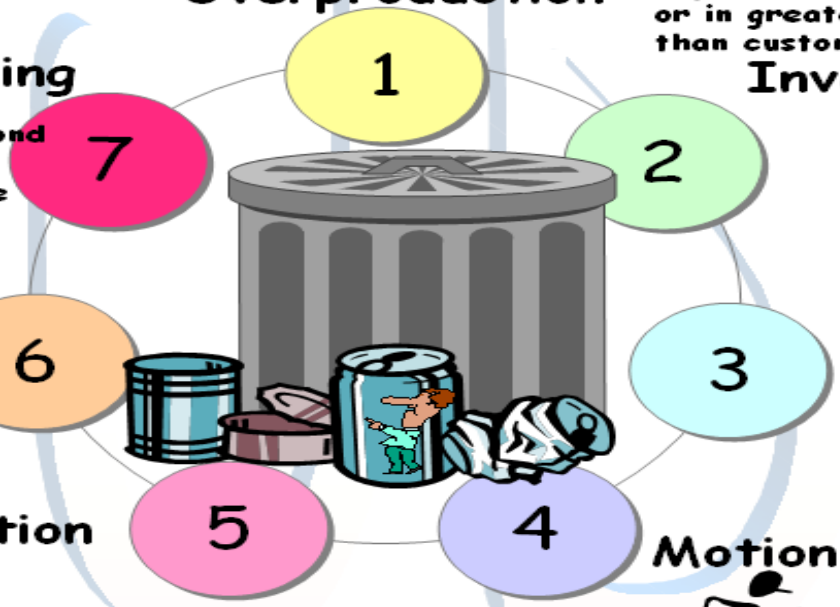
Unnecessary movement of people or parts between processes.

Rework

Non right first time. Repetition or correction of a process.

Over Processing

Processing beyond the standard required by the customer.



The Seven Types of Wastes

The Waste	Definition
Over Production	Producing more than needed or Producing faster than needed (need storage place, can be damaged, lost, no sale)
Over processing	Effort Which Adds No Value to a Product or Service. (Customers not welling to pay for these efforts)
Inventory	Any Supply in Excess. (money tied up in inventory, holding costs, may damage or lost)
Waiting	Idle Time, including man wait time and machine wait time.
Motion	Any Movement of People Which Does Not Contribute Added Value to the Product or Service.
Transportation	Any Material Movement That Does Not Directly Support a Lean Manufacturing System, or achieve direct value. (a risk of damaged, lost, delayed, Also need assets to move such as equipments and/or workers).
Rework	Repair of a Product or Service To Fulfill Customer requirements (rework costs, rescheduling production)

Other Types of Wastes

The Waste	Definition
Breakdown	Poor maintenance
Lake of skill	Unskilled workers
Unsafe work	Causes lost work hours
Poor information	Poor Information system, poor communication
Loss of Material	If expensive
Unused Capacity	(unused spaces, unused machines)

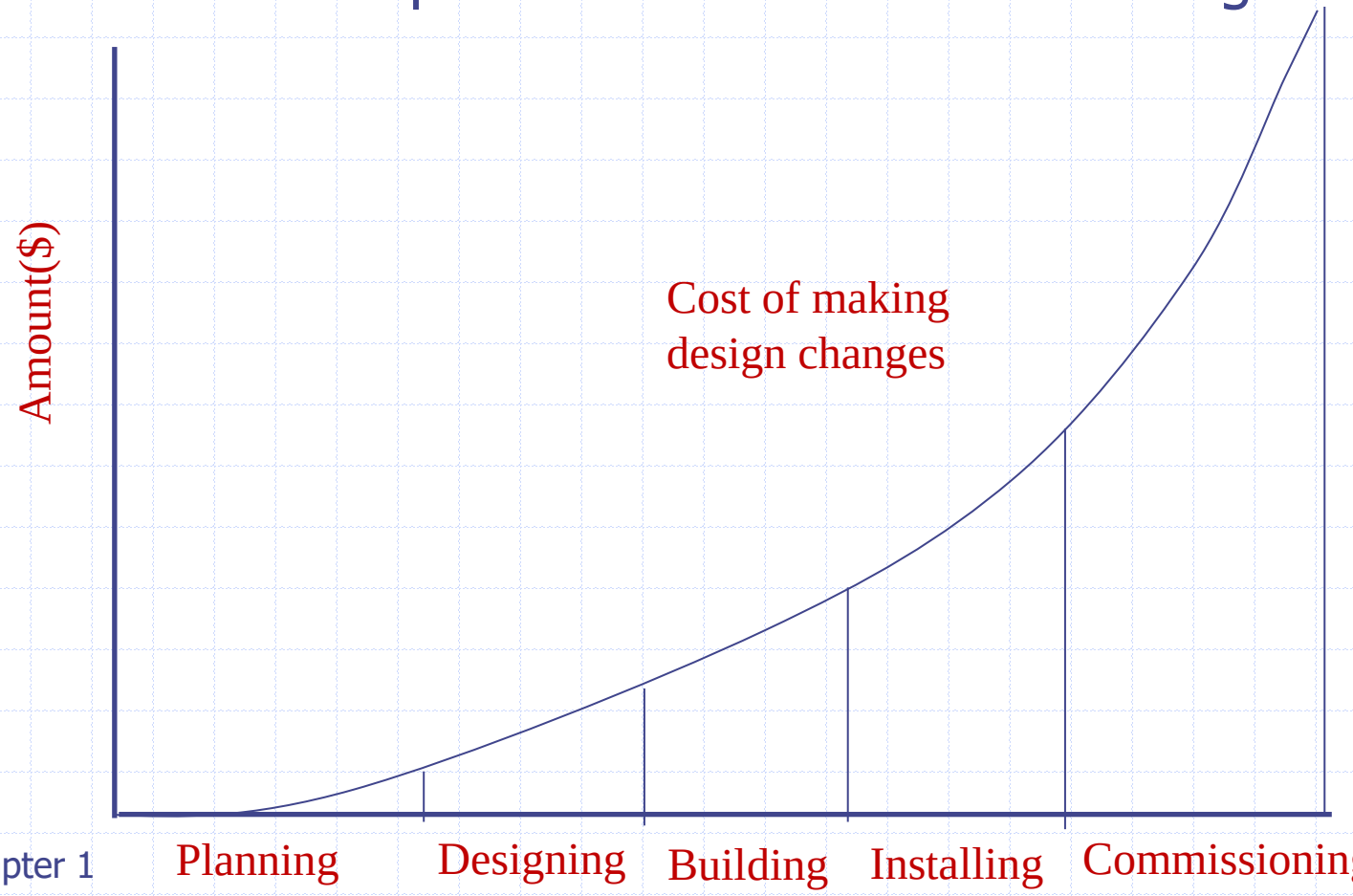
Strategic Facilities Planning

- Facilities planning is a strategic process
  - Must be an integrated part of overall corporate strategy
  - Every element of the organization must support the objectives of the firm.

- Previously, strategies was restricted to marketing and finance without clear understanding of the impact on manufacturing or on support functions such as material handling, information system, facilities, etc.

Cost of design changes during a project

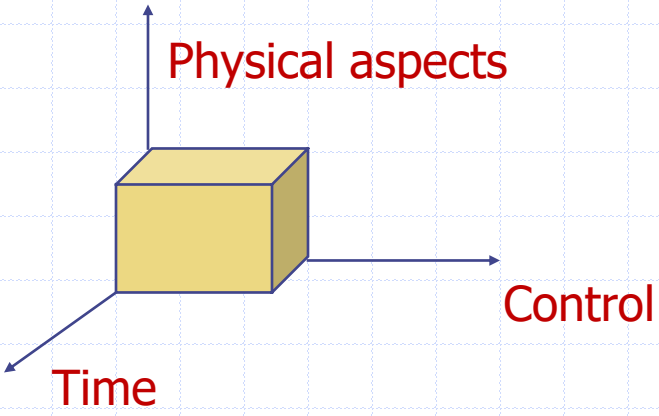
- Planning is a vital process
- Where in the process should we make changes?



Developing Facilities Planning Strategies

- The facilities planning process can be improved in three potential dimensions:
  - Physical aspects: building, equipment, and people
  - Control: material control, space control, productivity measures
  - Time: for planning (sufficient lead time is needed to do it right)

- The objective is to improve on these three levels



Developing Facilities Planning Strategies

- Facilities planning should also be well defined as to how each function fits, interacts and integrate
- Customer satisfaction
- Team work: everyone involved
- Should not accept information delays (true partnership)
- Facilities planner should be proactive, and participate in the decision making that create the needs.
- Continuous improvement

Sources Of Information For Manufacturing Facilities Design

- Product and process design
- Marketing
- Management policy

- Product design
  - blueprints
  - bill of material (part list)
    - indented BOM
    - buyouts/fabricate
  - assembly drawings
    - Part and assembly drawings are especially helpful in visualization of how parts will fit together
  - model shop samples (prototypes)
- Relationship between FD and product design is important

Sources Of Information For Manufacturing Facilities Design

- Marketing
  - Volume, how many can we sell?
  - Seasonality, summer or winter product
  - Selling price
  - Replacement parts, older products

Sources Of Information For Manufacturing Facilities Design

- Management policy - refers to the upper-level employees
  - inventory policy (Just in Time, Kanban, WIP)
  - lean thinking
  - investment policy (ROI)
  - startup schedule
  - make or buy decision
  - feasibility studies (what product or process proposal is the most profitable for the company