GE404 Engineering Management

Topic1. INTRODUCTION

GE404 Course Topics Covered

1) Introduction
   - Introduction for project management objectives.
   - Project Participants and Project Life Cycle.
2) Contractual and organizational approaches
3) Projects Planning
   - Processes, and Bar (Gantt) Chart
4) Network Model
   - Scheduling using activity-on-node, precedence methods and time Scaled.
5) Resource leveling and allocation.
6) Project time-cost trade-off.
7) Financial Management: Cashflow Forecasting
8) Project time and cost control
9) Analysis of Scheduling Delay

GE404 Course Learning Objectives

Students completing this course successfully will be able to:

a) Using bar chart technique to formulate a complete plan for a project.

b) Apply activity-on-node network, and precedence diagram to schedule a project.

c) Level and allocate project resources.

d) Shorten project duration.

e) Monitor an engineering project for purpose of time and cost control.

f) Use computer software for preparing project schedules

g) Understand principles of project organization and contractual relationships including definition of professional responsibilities of project participants.

GE404 Textbook(s) and/or Other Required Material

1) Project Management with CPM, PERT, and Precedence Diagramming, 3rd Edition, by Moder J., Phillips, C., and Davis, E.

2) Construction Planning and Scheduling (4th Edition) by Jimmie W. Hinze, February 28, 2011

3) Course lectures are also found on the following website:

http://faculty.ksu.edu.sa/algahtani & **LMS** (**Blackboard**)

GE404 Grade Distribution

Mid-term Exams	**40 %**
Assignments and Quizzes	**10 %**
Final Examination	**50 %**

What is a Project?

- "A Project is :
  - a <u>temporary</u> endeavor undertaken to create a <u>unique</u> product or service or result. (PMI)
  - a <u>one-shot</u>, <u>time-limited</u>, goal-directed, major undertaking requiring the commitment of varied skills and resources. (PMI)
  - A Combination of human and non-human <u>resources</u> pooled together to achieve a specific purpose and deliverables.

Project Characteristics

- Temporary (start, end, project team)
- Unique (Product, Service or Result)
- Completed (objectives, acceptance& Satisfaction)
- Progressive Elaboration
- Project variables and parameters (nature, size, budget, resources, complexity)
- Project Categories (small, medium, large)
  - Source (PMI,2004)

Project Examples

❑ ***Construction projects*** of various types as:

Building projects (Residential as non residential), and Construction projects (dams, tunnels, and bridges, power plants and refineries)

❑***Engineering Projects:***

Product Development, Manufacturing, |construction, Design Engineering, Industrial Engineering, technology, production, or any other field that employs personnel who perform an engineering function.

❑ ***Research and development projects*** such as the Stealth fighter plan.

❑ ***Software Development projects*** such as the university registration computer program.
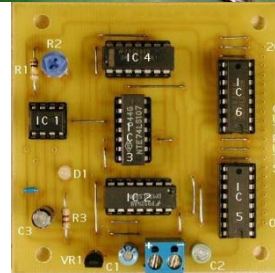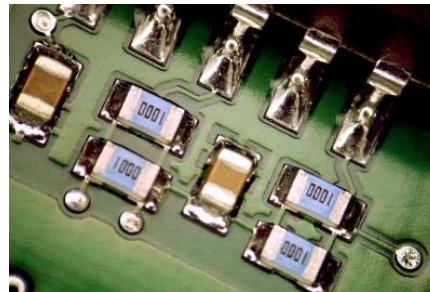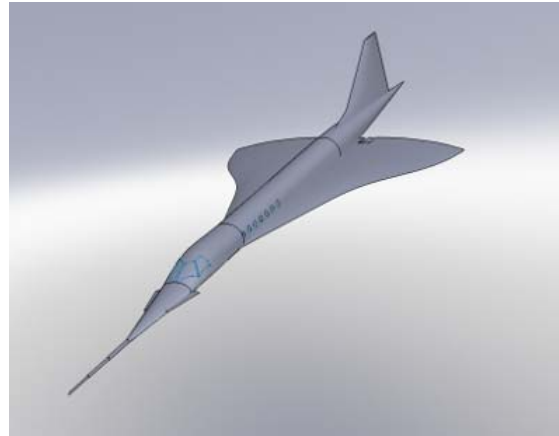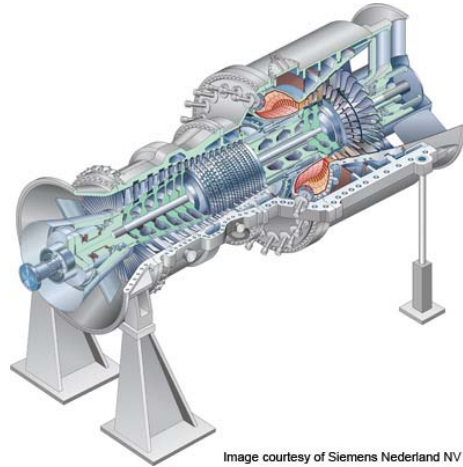
Examples of Projects

Examples of Projects

Examples of Projects

Image courtesy of Siemens Nederland NV
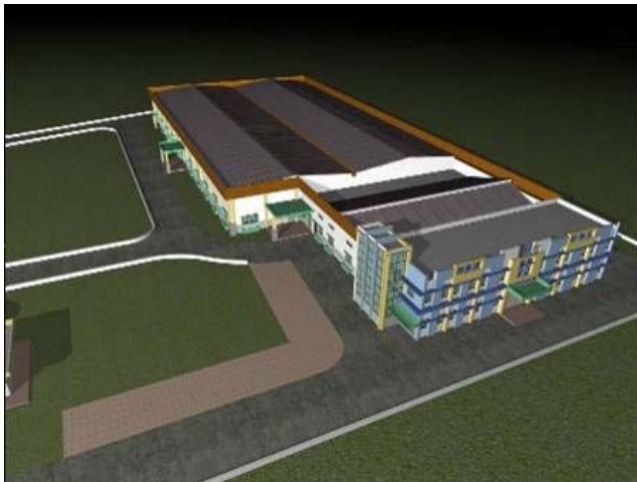
What is Management?
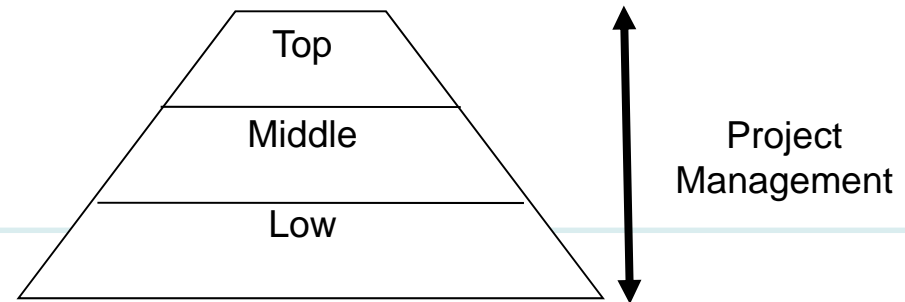
- **Management** is a process concerned with the attainment of objectives.
- **Levels of Management**

Top

Middle

Low

Project Management

- Figure below shows the involvement % of the different levels of management for:
  - (Planning *vs.* controlling)
  - (conceptual *vs.* technical)

Planning

Control

Conceptual

Technical

Top Management   Middle Management   Low Management
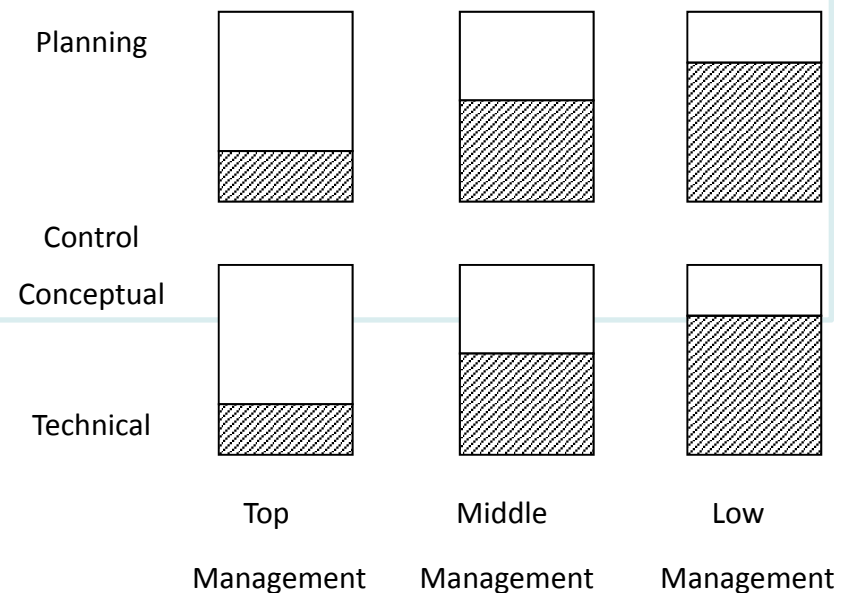
Management Functions

- Planning
  - What are we aiming for and why?

- Organizing
  - What's involved and why?

- Motivation
  - What motivates people to do their best work?

- Directing
  - Who decides what and when?

- Control
  - Who judges results and by what standards?

Planning

- **What are we aiming for and why?**
  - Develop project objectives, goals, and strategies.
  - Develop project work breakdown structure.
  - Develop precedence diagrams to establish logical relationship of project activities and milestones.
  - Develop time-based schedule for the project based on the time precedence diagram.
  - Plan for the resource support of the project.

Organizing

- **What is involved and why?**

  - Establish organizational structure for the team.

  - Identify and assign project roles to members of the project team.

  - Define project management policies, procedures, and techniques.

  - Prepare project management charter and other delegation instruments.

  - Establish standards for authority, responsibility and accountability of the project team.

Motivation

- **What motivates people to do their best work?**
  - Determine project team member needs.
  - Assess factors that motivate people to do their best work.
  - Provide appropriate counseling and mentoring as required.
  - Establish rewards program for project team members.
  - Conduct initial study of impact of motivation on productivity.

Directing

- **Who decides what and when?**
  - Establish "limits" of authority for decision making for the allocation of project resources.

  - Develop leadership style.

  - Enhance interpersonal skills.

  - Prepare plan for increasing participative management techniques in managing the project team.

  - Develop consensus decision making techniques for the project team.
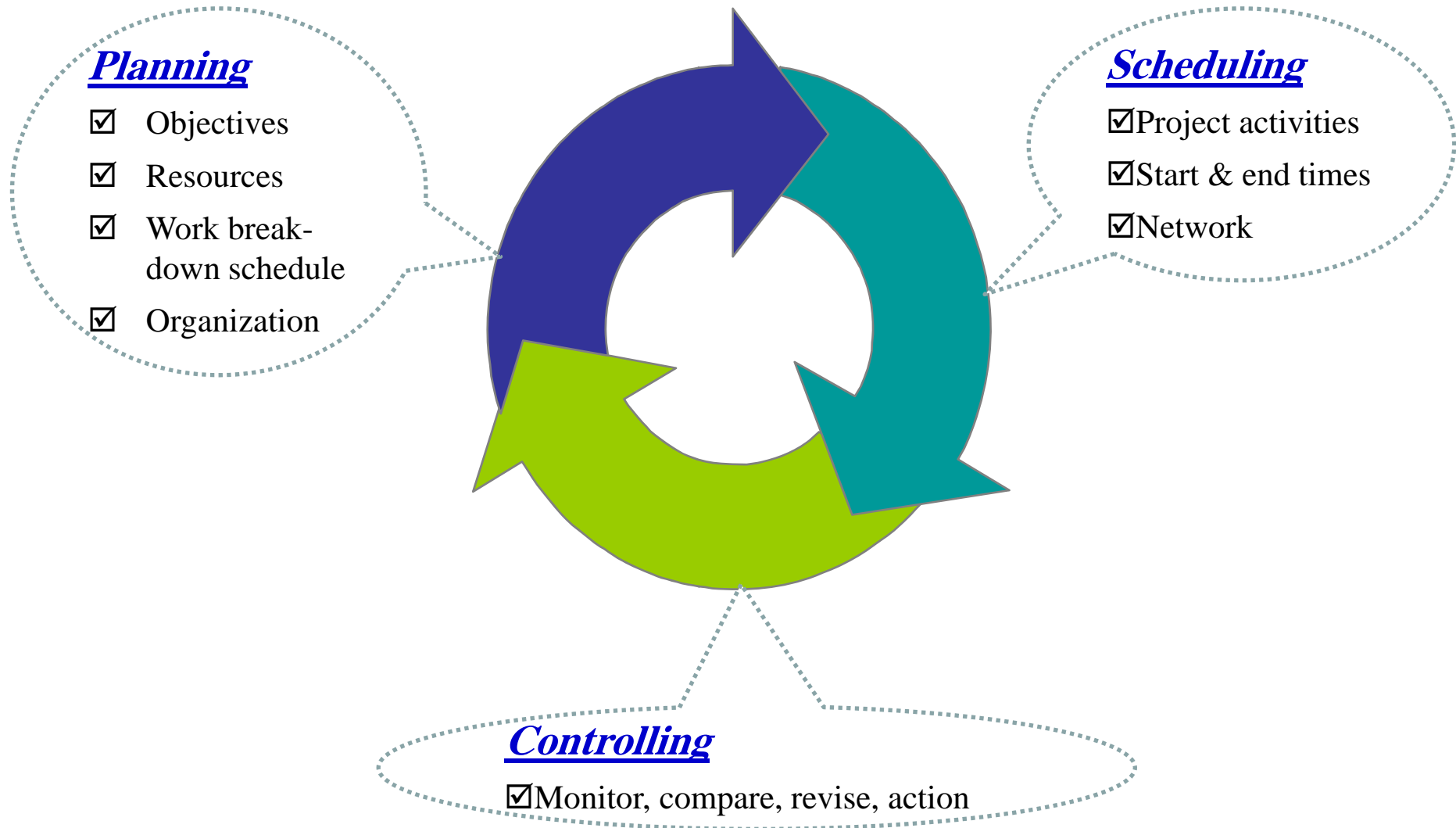
Control

- **Who judges results and by what standards?**
  - Establish cost, schedule, and technique performance standards for project.
  - Prepare plans for means to evaluate project progress.
  - Establish a project management information system for the project.
  - Prepare project review strategy.
  - Evaluate project progress.

What is Project Management?

- **Project Management** is defined as the application of knowledge, skills, tools, and techniques *(as optimization)* to project activities to meet project requirements *(scheduling and resourcing)*. (PMI, 2004)

- **Project Management** involves planning, organizing, staffing, directing, and controlling to achieve an objective **with constraints on**
  - **Time**
  - **Cost**
  - **Performance of the end product**

Project Management main Function Activities

Planning
- ☑ Objectives
- ☑ Resources
- ☑ Work break-down schedule
- ☑ Organization

Scheduling
- ☑ Project activities
- ☑ Start & end times
- ☑ Network

Controlling
- ☑ Monitor, compare, revise, action

Project Management main Function Activities

Planning the Project

Time
Cost
Performance
Set the goals

Define the project

Develop work breakdown schedule

Identify team/resources

Time/cost estimates
Budgets
Engineering diagrams
Cash flow charts
Material availability details

Scheduling the Project

Sequence activities

Assign people

Adams
Smith
Jones

1.1
1.2
2.0
2.1
2.11

Schedule deliverables

June
S M T W T F S
1 2 3 4 5 6
7 8 9 10 11 12 13

Schedule resources

Budgets
Delayed activities report
Slack activities report

CPM/PERT
Gantt charts
Milestone charts
Cash flow schedules

Controlling the Project

Revise and change plans

1.1
1.2
2.0
2.1
2.11

Monitor resources, costs, quality

Adams
Smith
Jones

Shift resources

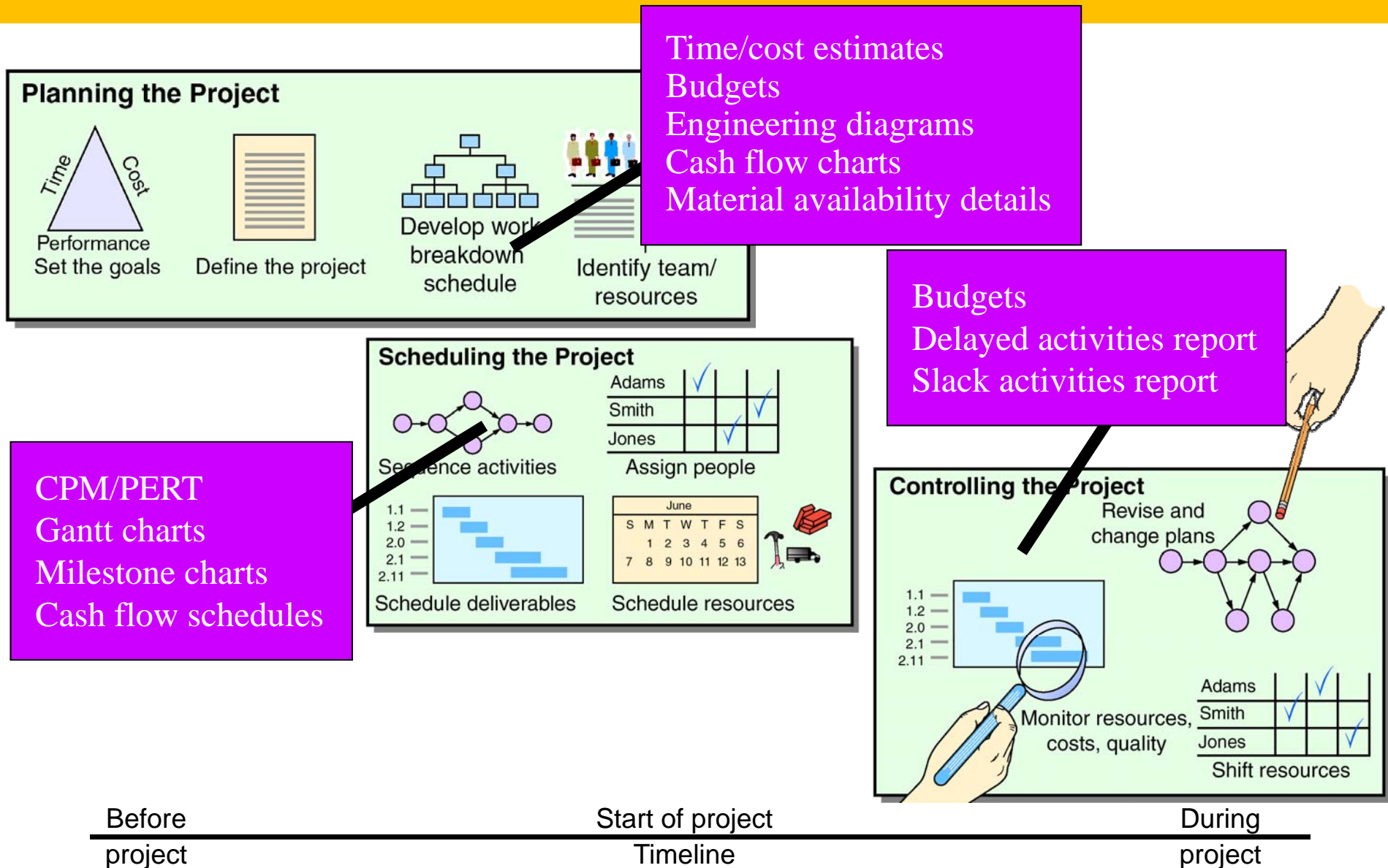| Before project	Start of project	During project

Timeline

Figure 3.1 (from Heizer/Render –Operation Management

Project Stakeholders

- Project sponsor
- Project Owner
- Project manager
- Customer/user
- Functional managers
- Performing organization
- Project team members
- Project management team
- Internal and external contractors, suppliers and vendors
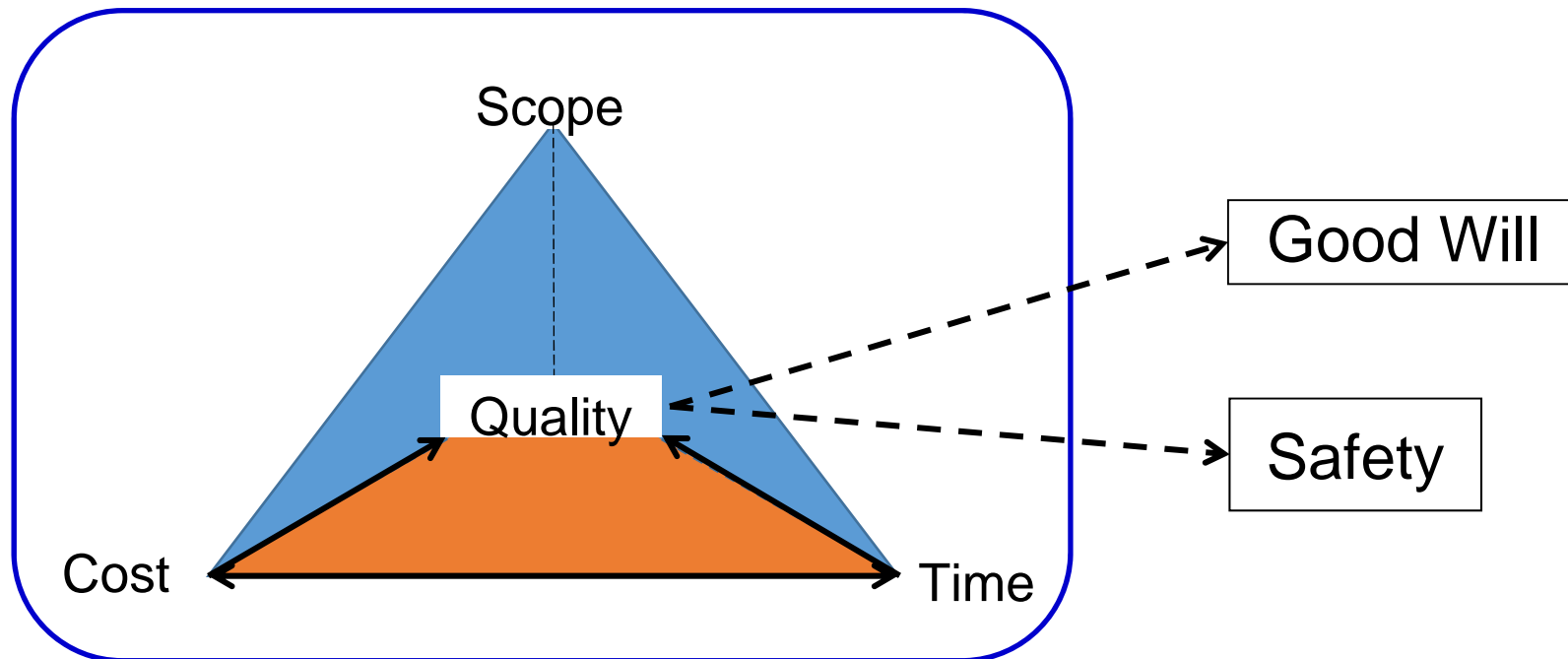- Government agencies and media

Project Common Resources

The main resources are (3M)

- Manpower (People)
- Money
- Materials And Machines.

Project Objective Key Factors

The objective Key factors affecting and varying the project are:
- Scope
- Cost
- Time, and
- Quality **(affected by balancing the above three factors)**

Assessing Project Success

➢ *Within Schedule*

➢ *Within Budget*

➢ *Meeting Spec requirements*

❖ *With minimal or agreed upon scope changes*

❖ *Without disturbing workflow of organization*

o *Acceptance by customer and or user*

o *Customer Satisfaction*

❑ *Without negatively affecting corporate culture*