Advanced Engineering Projects Management

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Text Book

• Project Management for Construction, Chris Hendrickson.
• Other Text Books:


Grading

- Attendance  5%
- Term Project  20%
- Midterm Exam  25%
- Final Exam  50%
Course outline

• 1. What is project management?
• 2. Project Financing
• 3. Project Planning
• 4. Result Based Contract Management
• 5. Modern Project Procurement
• 6. Projects Overheads
• 7. Cost Estimation
• 8. Decision Making
  • Decision Making Criteria
  • Certainty Problem
  • Risk Problem
  • Uncertainty Problem
• 9. Decision Tree
• **Course Goals:**
• The course is intended to give the student the knowledge and understanding of the trends in Modern Construction Management,
• The relationship between the owner, the contractor and the consultants, the types of engineering projects,
• Construction pricing and contracting, Costs Associated with Constructed Facilities
• Decision theory and its applications
WHAT is PROJECT MANAGEMENT?

1. Project management:
   is the **art** of directing and coordinating human and material resources throughout the life of a project by using modern management **techniques** to achieve predetermined **objectives** of scope, cost, time and quality.
2. Project management: 
is distinguished from the general 
management of corporations by the mission-oriented nature of a project.

3. A project organization will generally be terminated when the mission is accomplished.

4. The general management of business and industrial corporations assumes a broader outlook with greater continuity of operations.
Project Management Framework

Figure 2-1: Basic Ingredients in Project Management
Functions of Project Management

1. Specification of project objectives and plans including definition of scope, budgeting, scheduling, setting performance requirements, and selecting project participants.

2. Maximization of efficient resource utilization through procurement of labor, materials and equipment according to the prescribed schedule and plan.
Functions of Project Management

3. Implementation of various operations through proper coordination and control of planning, design, estimating, contracting and construction in the entire process.

4. Development of effective communications and mechanisms for resolving conflicts among the various participants.
Project Manager Knowledge Areas

1. Project integration management to ensure that the various project elements are effectively coordinated.

2. Project scope management to ensure that all the work required (and only the required work) is included.

3. Project time management to provide an effective project schedule.
Project Manager Knowledge Areas

4. Project **cost management** to identify needed resources and maintain budget control.

5. Project **quality management** to ensure functional requirements are met.

6. Project **human resource management** to development and effectively employ project personnel.
Project Manager Knowledge Areas

7. Project **communications management** to ensure effective internal and external communications.

8. Project **risk management** to analyze and mitigate potential risks.

9. Project **procurement management** to obtain necessary resources from external sources.
Trends in Modern Management

Major developments in management reflect the acceptance to various degrees of the following elements:

(1) The management **process** approach,
(2) The management **science and decision support** approach,
(3) The **behavioral science** approach for human resource development, and
(4) **Sustainable competitive advantage**.
• These **four approaches** complement each other in current practice, and
• provide a useful groundwork for project management.
1. Management Process Approach

- Systematic study of management by identifying management functions in an organization.

- Main Functions are:
  - Planning,
  - Organizing, and
  - Controlling
2. Management science and decision support approach

Contributes to the development of a body of **quantitative methods** designed to aid managers in making complex decisions related to operations and production.

In decision support systems, emphasis is placed on providing managers with relevant information.
2. Management science and decision support approach

- In management science, a great deal of attention is given to defining objectives and constraints, and

- Constructing mathematical analysis models in solving complex problems of inventory, materials and production control, among others.
2. Management science and decision support approach

- A topic of major interest in management science is the **maximization of profit**.
- The **optimization** or sub-optimization is often achieved by the use of *Operations Research Techniques*, such as:
  - linear programming,
  - queuing theory and
  - Monte Carlo simulation.
3. Behavioral science approach

- Getting things done through the actions of people.
  - Human Factors
  - Needs,
  - drives,
  - motivation,
  - leadership,
  - personality,
  - behavior, and work groups.
4. Sustainable Competitive Advantage

- Stem mainly from Good management strategy
- **Strategy**: is creating fit among a company's activities
- The success of a strategy depends on doing many things well - not just a few
- The successful firms must improve and align the many processes underway to their strategic vision.
Strategic positioning in this fashion requires:

✔ Creating a unique and valuable position.

✔ Making trade-offs compared to competitors

✔ Creating a "fit" among a company's activities
Strategic Planning and Project Programming

• The programming of capital projects is shaped by the strategic plan of an organization which is influenced by market demands and resources constraints.

• The programming process associated with planning and feasibility studies sets the priorities and timing for initiating various projects to meet the overall objectives of the organizations.
Effects of Project Risks on Organization

In recent years, the concept of "risk sharing/risk assignment" contracts has gained acceptance.

The willingness of a participant to accept risks often reflects the professional competence of that participant as well as its propensity to risk.
Effects of Project Risks on Organization

Risk Classification

1. Socioeconomic factors
   - Environmental protection
   - Public safety regulation
   - Economic instability
   - Exchange rate fluctuation
Effects of Project Risks on Organization

2. Organizational relationships
   • Contractual relations
   • Attitudes of participants
   • Communication

3. Technological problems
   • Design assumptions
   • Site conditions
   • Construction procedures
   • Construction occupational safety
• 1. Environmental protection movement has contributed to the uncertainty for construction because of the inability to know what will be required and how long it will take to obtain approval from the regulatory agencies.

• Public safety regulations have similar effects, which have been most noticeable in the energy field involving nuclear power plants and coal mining.
• Economic conditions of the past decade have further reinforced the climate of uncertainty with high inflation and interest rates. The deregulation of financial institutions has also generated unanticipated problems related to the financing of construction.
Integration of organizations.

A single or joint venture consisting of a number of organizations with a single command undertakes both design and construction functions. Two extremes may be cited as examples:

- **Owner-builder operation** in which all work will be handled in house by force account.

- **Turnkey** operation in which all work is contracted to a vendor which is responsible for delivering the completed project.