

CMPE 490

Design Principles in Engineering & Computer Engineering

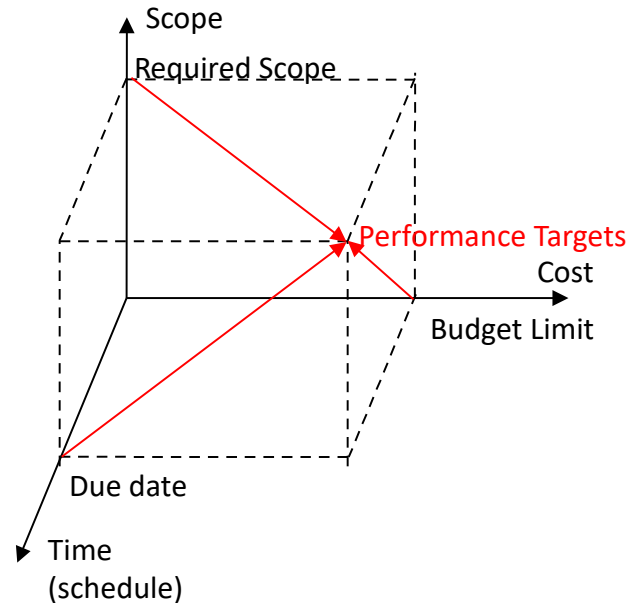
Managing Projects/Your CMPE Project

Three Goals of Project Management

Performance of a project measured by 3 criteria:

1. Scope
2. Cost
3. Time

Managing the tradeoffs among the three project goals (cost, scope, time) is the primary role of the project manager.



Overdetermined project: has a fixed budget, fixed delivery time, and fixed specifications (all three goals fixed). In reality, projects must have some flexibility to allow for chance events. If project overdetermined, there is no allowance for any such events.

Uncertainty

1. All projects are always carried out under conditions of uncertainty
 - Well tested software routines may not perform when integrated
 - Side effects of a drug may surface out late in product development
 - ...
2. Effective project management requires an ability to deal with uncertainty
3. Projects are complex, include interfaces, interdependencies, and assumptions, which may turn out to be wrong
 - People add to the uncertainty

Uncertainties Encountered in Project Management

- Time required to complete a project
- Availability and cost of key resources
- Timing of solutions to technological problems
- Macroeconomic variables
- The whims of clients
- Actions taken by competitors

Uncertainties Encountered in Project Management -- Example

You are the project manager of a team of software specialists working on a project to produce a piece of application software in the field of project management. Give some examples of things that might go wrong on such a project and the sorts of trade-offs you might have to make.

Some of the things that might go wrong would include:

- The project could be delayed ... and the project manager could respond by contracting out, at a higher cost, some of the code writing to shorten the duration of that activity.
- The project could exceed its budget ... and the project manager could respond by negotiating for the removal of some of the less-important program capabilities, that is, reducing the scope.

Managing Risk

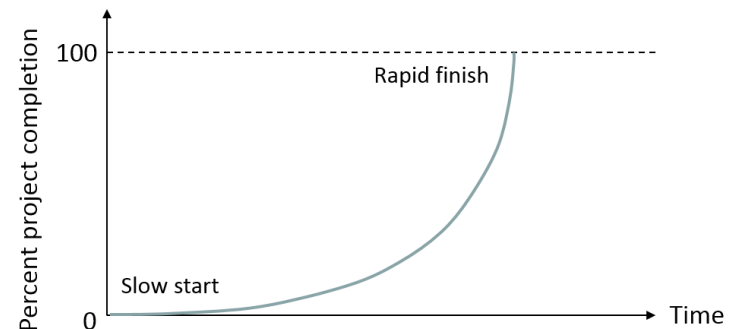
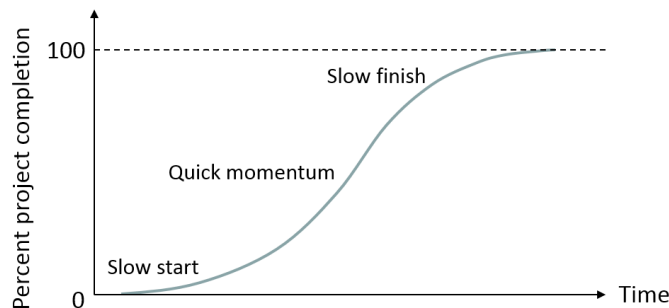
- The first step in managing risk is to identify potentially uncertain events and likelihood of occurrence: called risk analysis
- Different organizations approach this differently
 - some organizations keep lists of risks
 - every organization should have its risk management policy
 - every project should have a B-plan
- The essence of risk analysis is to make assumptions about key risk parameters and to use models (e.g., Monte Carlo simulations) to evaluate the desirability of certain managerial decisions

Fourth Project Goal

- There is a relationship between uncertainty and the three traditional project goals
- Therefore, we'll adopt the view that managing uncertainty is a fourth goal of project management
- Thus, the primary role of the project manager is to effectively manage the trade-offs between **cost, time, scope, and risk**

The Life Cycle of Projects

- All organisms have a life cycle, they are born, grow, decline, and die
 - So do projects
- Some projects follow an S-shaped curve
 - They start slowly, develop momentum, and then finish slowly
- Other project follow a J-shaped curve
 - They start slowly , proceed slowly, and then finish rapidly
- Resource allocations for the 2 types of projects are very different!



Selecting Projects To Meet Organizational Objectives

- Project selection is a process of evaluating projects and choosing them so firm objectives are met
- Ensure that several conditions are considered
 1. Is the project potentially profitable?
 2. Is the project required (e.g., a mandate)?
 3. Does the firm have the skills to complete the project?
 4. Does the project involve building strategic competencies consistent with strategic plan?
 5. Does it have capacity to carry out the project on schedule?
 6. Can the (R&D) project be economically successful?

Selection Methods

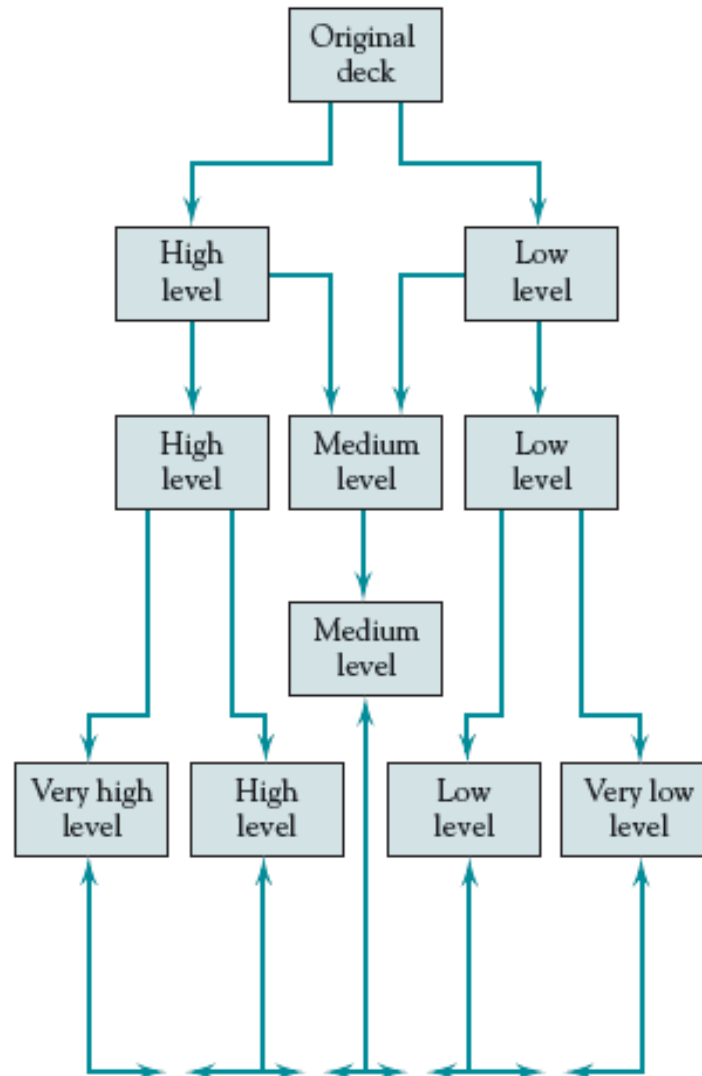
- Many different methods for selecting projects to meet organizational objectives
- May be grouped into two fundamental types
 1. Nonnumeric: does not use numbers for evaluation
 2. Numeric: uses numbers for evaluation

Nonnumeric Selection Methods

- The necessity for continued operation
- Comparative benefits
 - Rank-order the projects
 - Rank-ordering a small number of projects is not difficult
 - When the number of projects exceeds 15 or 20, the difficulty of ordering the group rises rapidly
 - A Q-sort is a convenient way to handle the task

The Q-sort Method

Assume a deck of cards with the name and description of one project on each card...



Numeric Selection Methods

- Financial assessment methods
 1. Payback period
 2. Discounted cash flow
- Scoring methods
 1. Unweighted 0-1 factor method
 2. Weighted factor scoring method

Payback Period

$$\frac{\text{Initial fixed investment}}{\text{Annual net cash inflows}}$$

Discounted Cash Flow

Discounted cash flow analysis is a method of valuing a project using the concept of the time value of money. All future cash flows are estimated and discounted by using cost of capital to give their net present values (NPVs).

$$NPV = I_0 + \sum_{t=1}^n \frac{F_t}{(1+r)^t}$$

where

I_0 = the initial investement (= outflow, hence a negative number)

F_t = the net cash flow in period t

r = the discount rate

If NPV is positive, then the project may be accepted because it earns more than the required rate of return.

Discounted Cash Flow -- Example

A four-year financial project is forecast to have net cash inflows of \$20'000; \$25'000; \$30'000; and \$50'000 in the next four years. It will cost \$75'000 to implement the project, payable at the beginning of the project. If the required rate of return is 0.2, conduct a discounted cash flow calculation to determine the NPV.

1st year NPV: $20'000/1.2 = \$16'667$

2nd year NPV: $25'000/1.2^2 = \$17'361$

3rd year NPV: $30'000/1.2^3 = \$17'361$

4th year NPV: $50'000/1.2^4 = \$24'113$

Total: \$75'502

Initial investment: \$75'000

Hence a gain of \$502

The Weighted Scoring Model

$$S_i = \sum_{j=1}^n s_{ij} w_j$$

where

S_i = The total score of the i^{th} project

s_{ij} = The score of the i^{th} project on the j^{th} criterion

w_j = The weight or importance of the j^{th} criterion

Weighted scoring model allows introducing nonmonetary and even qualitative elements into selection criteria. Also allows long-run benefits and risks to be considered. Might be an advantage as compared to NPV method!

The Weighted Scoring Model -Example

A company has established a project team to identify a location for a new manufacturing facility. Use a weighted scoring model to analyze three candidate locations (A, B, C) for setting up the new factory. The relative weights for each criterion are shown in the following table. A score of 1 represents unfavorable, 2 satisfactory, and 3 favorable.

		Location		
	Weight	A	B	C
Labor costs	20	1	2	3
Labor productivity	20	2	3	1
Labor supply	10	2	1	3
Union relations	10	3	3	2
Material supply	10	2	1	1
Transport costs	25	1	2	3
Infrastructure	5	2	2	2

Score Location A = 165

Score Location B = 210

Score Location C = 225 ← most favorable

Project Portfolio Process (PPP)

- Projects are often subdivisions of other programs
- Long-run success is determined by the organization's portfolio of projects
- A proper mix of project categories can help the company's long-term competitive position
- The project portfolio may need to be readjusted to respond to changes that may occur during the lifetime of a project
- Hence the PPP is a means for monitoring and controlling the organization's strategic projects
 - Shut down projects before completion?
 - Initiate another one that supports the goals better?
 - ...

Categories of Projects

- **Derivative projects:** those that are only incrementally different from existing offerings
- **Platform projects:** major departures from existing offerings
 - The next generation
- **Breakthrough projects:** involving a newer technology
 - Possibly a “disruptive” technology
- **R&D projects:** “blue sky” or visionary endeavors