Week 3

Delivery and Contract Methods

457.307 Construction Planning and Management

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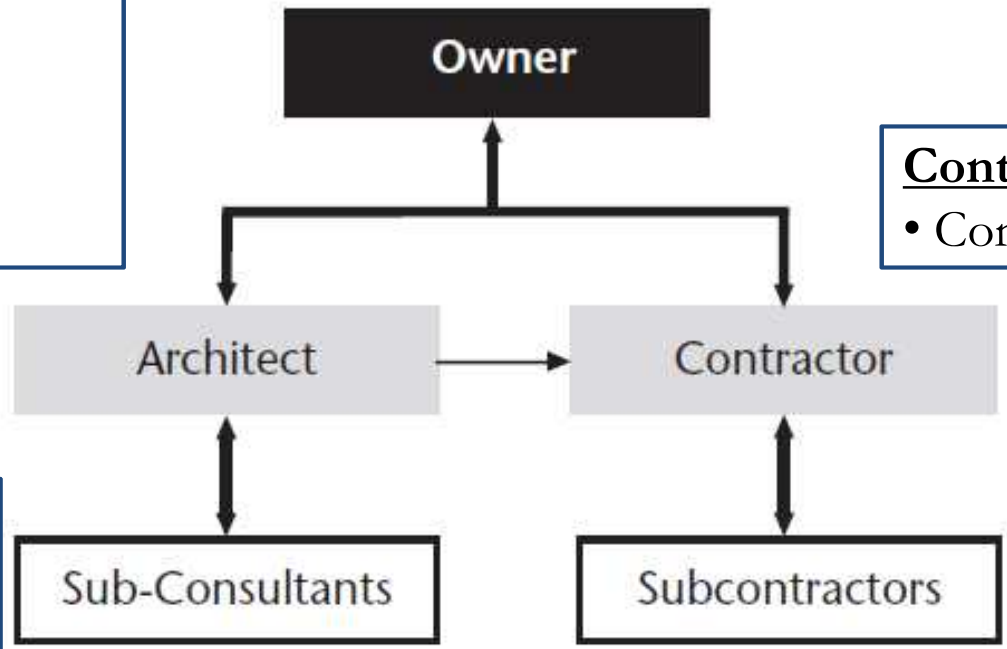
**Construction Documentation: Final design phase, Finalizing all drawings and specifications for building systems, site utilities, and construction components*

Design-Bid-Build

Contract for
- Feasibility studies
- Design
- Construction Documentation



Contract for
- Construction

Engineer
- Civil
- Environmental
- Structural
- Mechanical
- Electrical

Specialty Contractor
- Plumbing
- Electrical
- Roofing
- Plastering
- Others

No direct, formal relationship exists between the designer and the builder
Communicate only through the owner

Design-Bid-Build

- **Advantages**
  - Most owners, designers, and builders are familiar with this system
  - Good definition of construction activities
  - Separated responsibility for design and construction
  - Owners know the total project cost early
  - Price competition through bidding

Design-Bid-Build

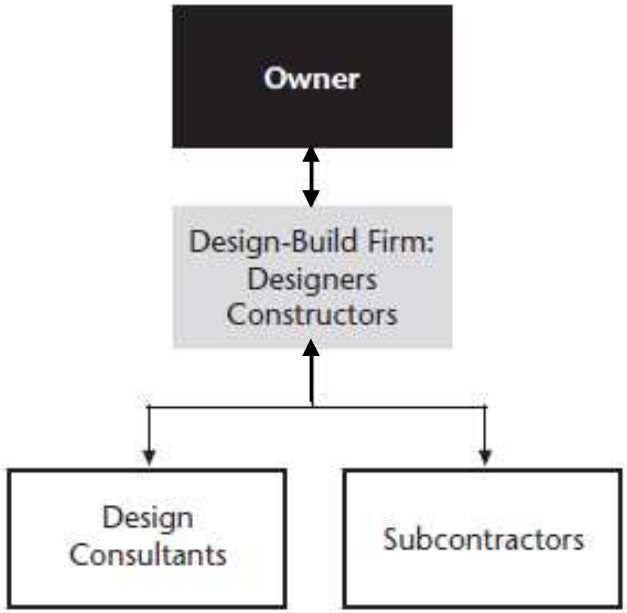
- **Disadvantages**
  - Lack of collaboration with contractors during design
    - Contractors have no input until they win bid
    - Discover design errors during construction
    - Difficult change management and huge rework
  - Takes longer than other delivery methods

Design- Build

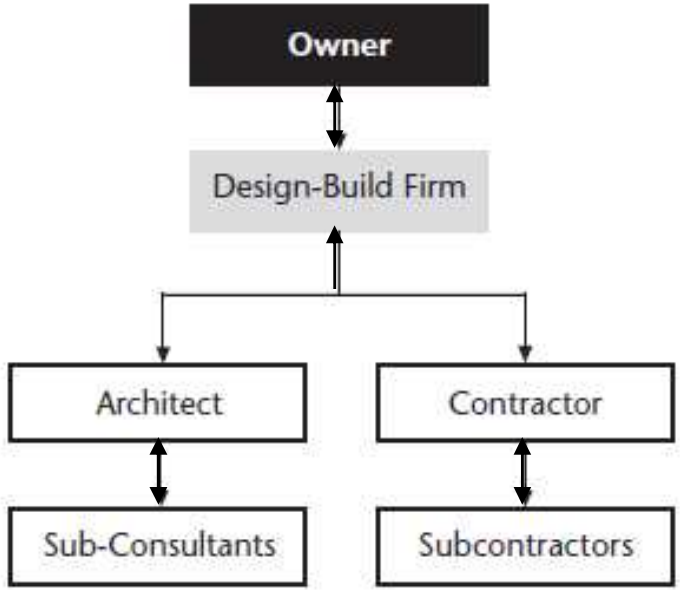
- Designer and contractor are either from the same firm or joint venture (consortium)

- **Single-source procurement for the owner**
  - A design-build firm provides both design and construction
  - Creates a non-adversarial relationship between designers and constructors
  - Three major types of arrangements

Design-Build

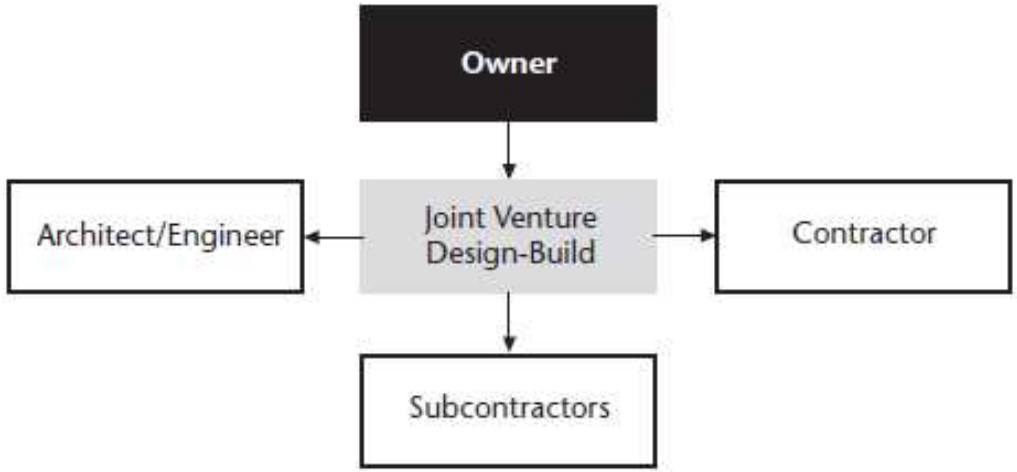


Includes and directly controls designers and constructers by Large design-build firm



Contracts out design and construction works by Developer firms

Design-Build



Joint-venture for
financing, resource, and
risk management

Design-Build

- **Advantages**
  - One firm has all design and construction responsibilities
  - Fast track
  - Good communication and better teamwork
  - Better change and risk management

Design-Build

- **Disadvantages**
  - Total project cost is not known before construction begins
  - Less owner input: Owner struggles to keep monitoring the progress
  - Possible conflicts between owners and firms

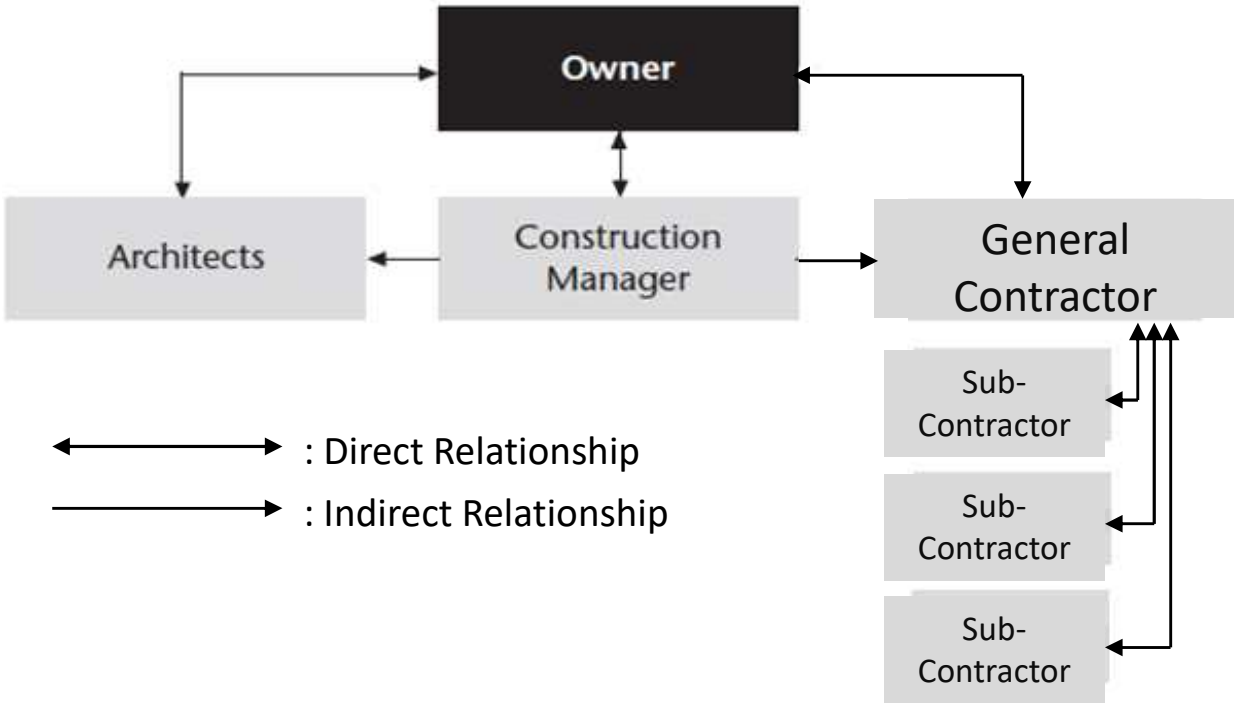
Construction Management

- **Applies contractor - based management systems early in the project**

- **CM delivery methods**
  - Agency CM (CM for Fee)
  - CM at Risk

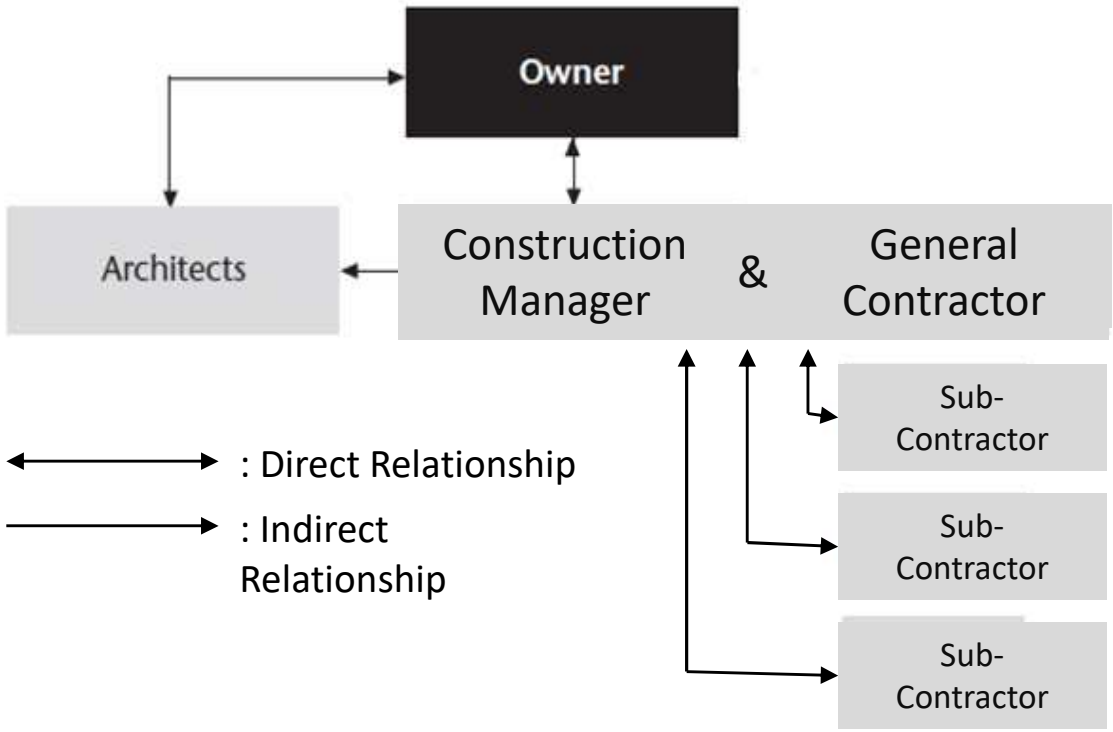
Agency CM

- **Agency CM (CM for Fee)**
  - CM as an owner's agent managing both A/E & GC
  - CM brings management tools
  - Best for an owner who has little or no CM expertise
  - e.g., 5%



CM at Risk

- **CM at Risk**
  - CM is involved in project planning, design, and construction of the project
  - CM provides the owner a maximum price for the project, considering the project's initial scope.



CM Project Delivery

- **Advantages**
  - Input of construction processes during design by CM
  - Good communication is established early among the owner, designer, and construction professional and continues through the completion of the project.
  - The implementation of changes is not as difficult as in the traditional method because of close communication.
  - Fast tracking: reduce the project duration

CM Project Delivery

- **Disadvantages**
  - Project success = CM capability
  - If any of the players become inflexible, uncooperative or uncommunicative, the advantages can quickly become disadvantages.
  - This arrangement requires high owner involvement and more sophisticated owner.

대가지불방식에 따른 분류

- **Specify how to compensate/pay the contractor for work completed**

- **Contract type**
  - Lump sum
  - Unit price
  - Cost plus fee
  - Guaranteed maximum price

Cost Plus a Fee

- **Characteristics**
  - Contractors work on the project and get reimbursed by the owner for costs, plus additional agreed-upon fees
  - Usually used when the scope of work is difficult to define
  - No fixed price
  - Working well with both CM and D-B
- **Cost and Fee**
  - Cost: Labor, material, equipment, subcontracts, and on-site overhead
  - Fee: Indirect overhead and profit (benefit/cost sharing) (e.g., Cost plus 5%)

GMP

- **Guaranteed maximum price (GMP)**
  - Hybrid of the lump-sum and cost plus
  - A guaranteed maximum price by the contractor
    - Contractor is reimbursed at cost with an agreed-upon fee up to the GMP (e.g., $100M)
    - Beyond the GMP, contractor is responsible for covering any additional costs (e.g., if actual = $110M, 100% cost)
    - Incentive clause specifies that contractor will receive additional profit for bringing the project under the GMP. (e.g., if actual = $90M, 60% incentive)

Week 3

Pre-Project Planning

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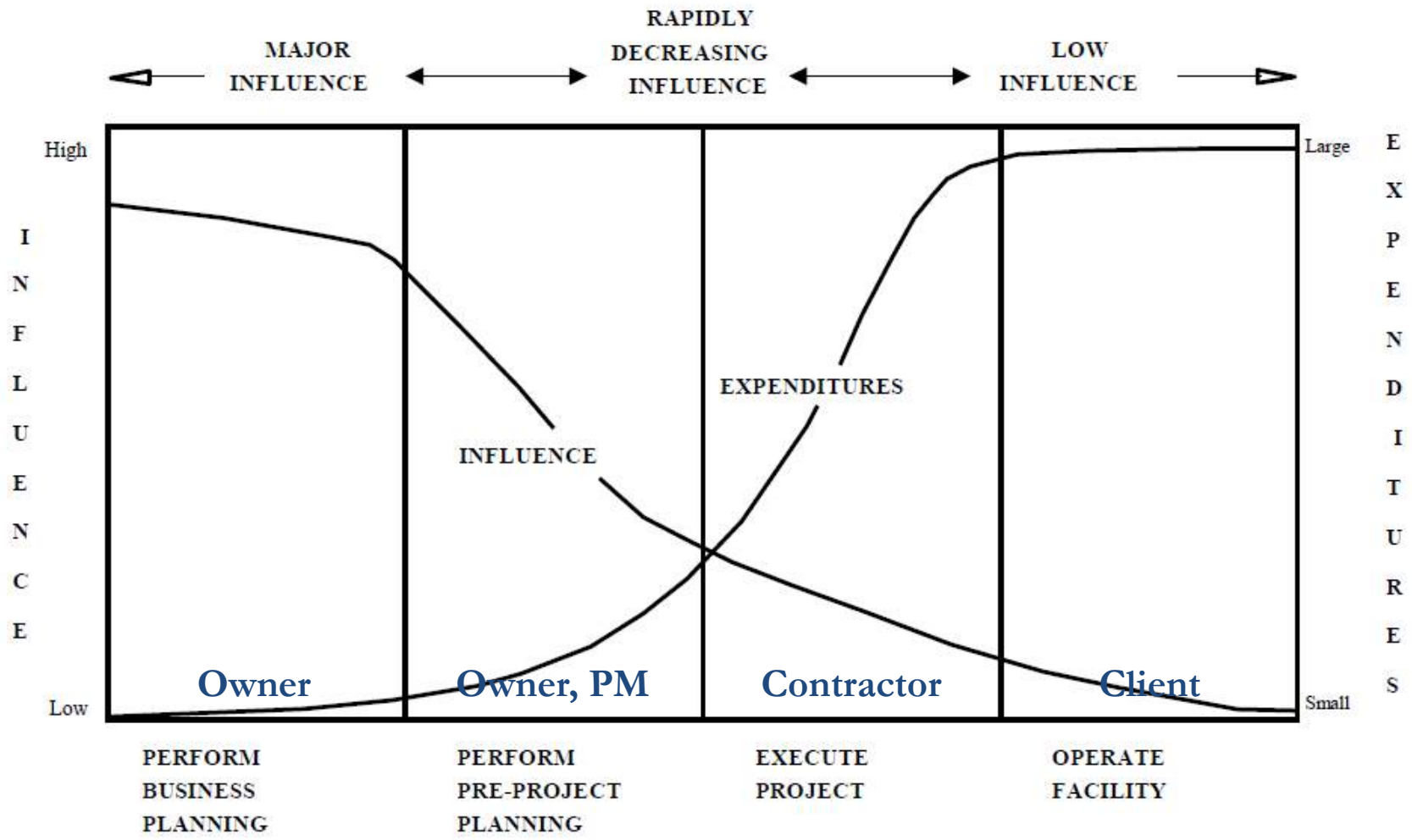
Pre-Project Planning (PMBOK Chapter 4 and Chapter 5)

- **"Process for developing sufficient strategy information with which owners can address risk and decide to commit resources to maximize the chance for a successful project."**

- **Simply,**
  - Performing the right project
  - Scoping the right "things" for a good design basis
  - Setting the stage for successful execution

Cost-Influence Diagram



"Influence" reflects a company's ability to affect the outcome of a project.
It is much easier to influence during the early project stages, when expenditures are relatively lower.

Pre-Project Planning

- **Key Beliefs**
  - Early PPP plays an essential role in producing high quality projects.
- **When PPP effort is:**

Cost

Effort	Avg.	Std. Dev.
High	-4%	7%
Medium	-2%	10%
Low	+16%	45%

Schedule

Effort	Avg.	Std. Dev.
High	-13%	17%
Medium	+8%	24%
Low	+26%	44%

Scope Changes

Effort	Avg.	Std. Dev.
High	3%	3%
Medium	2%	3%
Low	11%	13%

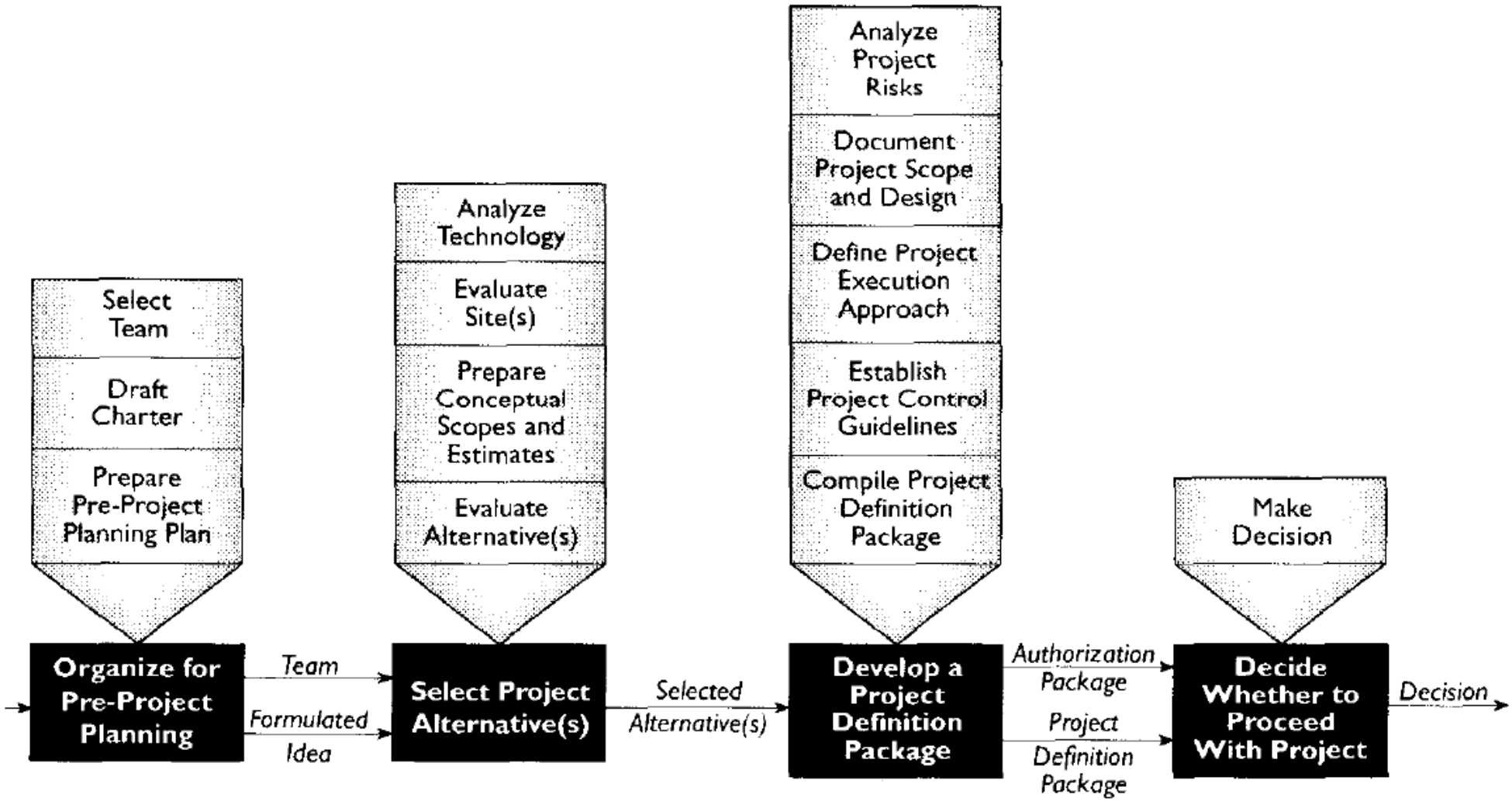
Pre-Project Planning

- **Reasons for Poor Early Planning**
  - Pressure to get product into the marketplace faster
  - Lack of engineering capability
  - Desire to limit engineering costs
  - Overly optimistic management
  - Not enough or wrong efforts

PPP whose responsibility?

Owner's Responsibility!

PPP Process


Select Team
Draft Charter
Prepare Pre-Project Planning Plan
Organize for Pre-Project Planning
Team
Formulated Idea
Analyze Technology
Evaluate Site(s)
Prepare Conceptual Scopes and Estimates
Evaluate Alternative(s)
Select Project Alternative(s)
Selected Alternative(s)
Analyze Project Risks
Document Project Scope and Design
Define Project Execution Approach
Establish Project Control Guidelines
Compile Project Definition Package
Develop a Project Definition Package
Authorization Package
Project Definition Package
Make Decision
Decide Whether to Proceed With Project
Decision

PPP Plan

Phase	%
PPP	5
Design	10
Procurement	20
Construction & Others	65

- **Budget**
  - Total conceptual estimated cost = $160 million
    - Cost for technology = $80 million
    - Other project cost = $80 million
  - Budget for PPP
    - 3-5% of total project budget
    - Since Go/No Go decision needs to be made in a complicated situation that has many alternatives, it had better put the maximum 5% for the PPP budget.
    - Therefore, budget for PPP = 5% * $160 million = $8 million

Select Project Alternatives

- **Analyze Technology**
  - Which technology is available for us? New or existing?
  - Needs and constraints of the technology in relation to objectives and problems of the project
  - Experience with processes?
  - Applications and market factors (common?)
  - Cost effective analysis
    - Maximize the net benefits
    - Minimize the amount of resources required
    - Maximize the level of service or other system performance measures
    - Life Cycle Cost Analysis (LCCA)

THINK PROS AND CONS FOR EACH

Example – Analyze Technology

- **Technology Alternative 1**
  - License the APEX™ process owned by Process Improvement Technology Systems (PITS), Inc.
  - Modify for use by adding other associated process technology in advanced development at ACL R&D
  - Research time: 3 months
  - Expected yield: 90%

- **Technology Alternative 2**
  - Develop all new technology process technology in-house
  - Research time: 6 -12 months
  - Expected yield: 95%
  - More expensive

What would be good criteria to compare alternatives?

Example – Analyze Technology

- **Best choice: Alternative 1 Customization**

TECHNOLOGY CONSIDERATION						
NO.	**TECHNOLOGY OBJECTIVES**	**WEIGHT**	**Tech 1 (PITS)**	**SCORE (PITS)**	**Tech 2 (New-in-house)**	**SCORE (New-in-house)**
1.	Cost	20	2	40	1	20
2.	Research Time and Pilot testing	15	2	30	1	15
3.	Efficiency	15	1	15	2	30
4.	Product Quality	10	1	10	2	20
5.	Environmental	5	1	5	2	10
6.	Up gradation	5	1	5	2	10
7.	Feasibility	5	2	10	1	5
8.	Ease of Operation	5	1	5	2	10
9.	Process flexibility	5	2	10	1	5
10.	Safety considerations	5	2	10	1	5
11.	Long-term competitive position	5	1	5	2	10
12.	Risk involved	5	2	10	1	5
	TOTAL SCORES	100		**155**		**145**

2: Best choice, 1: Second choice

Select Project Alternatives

- **Evaluate Sites**
  - Strengths and weaknesses of alternate locations to meet owner requirements and maximize benefits for the owner
  - Concurrent with Analyze Technology
  - Consideration
    - Overall economic choice (present + future)
    - Benefits standpoint (market)
    - Cost standpoint (raw materials, labor, utilities, supply, and distribution cost)
    - Initial investment standpoint (ROI)

THINK PROS AND CONS FOR EACH

Example – Evaluate Sites

- **Location Alternative 1: Texas**
  - Permit time: 9-12 months
  - No seismic sensitivity
  - No dock facilities (major market Southeast Asia)
  - Lower construction cost (lower labor cost)
  - Closer to feedstock/raw materials
  - Lower taxes
- **Location Alternative 2: California**
  - Permit time: 12-18 months
  - Seismic sensitive location
  - Coast with dock facilities (major market Southeast Asia)
  - Higher construction cost (higher labor cost)
  - More environmental restrictions
  - CEO's preference

What would be good criteria to compare alternatives?

Example – Evaluate Sites

- **Best choice: Alternative 1 Texas**

LOCATION CONSIDERATION						
NO.	**LOCATION FACTOR**	**WEIGHT**	**TX**	**SCORE**	**CA**	**SCORE**
1.	Permit time requirement	20	2	40	1	20
2.	Distribution	20	1	20	2	40
3.	General construction cost	15	2	30	1	15
4.	Lowest labor cost	10	2	20	1	10
5.	Feedstock supply	8	2	16	1	8
6.	Close to raw material supply	5	2	10	1	5
7.	Land availability	5	2	10	1	5
8.	Taxes	5	2	10	1	5
9.	Environmental restriction	5	2	10	1	5
10.	Building codes for seismic zones	5	2	10	1	5
11.	CEO's preference	2	1	2	2	4
	TOTAL	100		**178**		**122**

2: Best choice, 1: Second choice

Example – Evaluate Alternatives

- **Technology Alternative 1 (APEX™): Best Choice**
  - Proven technology, with some modification requirement
  - Lower cost
  - Safer
  - More flexible
- **Site Texas: Best Choice**
  - Lower construction cost
  - Lower green-field establishment permits
  - Good resources from Texas regions
  - Efficient layout
  - Preliminary findings suggest minimum impact of wetlands
  - Transportation infrastructure growth in Texas
  - Lower land cost and property taxes

Group Assignment Exercise

- ***Write a project scope overview on your selected project.***
- ***Develop a list of owner's project objectives for your project.***

Project Characteristics	Project Management Objectives	Detailed PM Objectives	Goal	Stretch Goal	How to Conduct or Behave?

- ***Develop a list of key stakeholders for your selected project.***
  - ***Project Delivery Team***
  - ***Major Stakeholder***