SELECTING THE BEST PROJECT DELIVERY METHOD USING THE ANALYTICAL HIERARCHY PROCESS (AHP)

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1. INTRODUCTION

- **Selecting a Project Delivery Method (PDM) is a critical task**
- **To assist owners for the best selection, AHP is used**
- **AHP is a multi-criteria decision making tool**

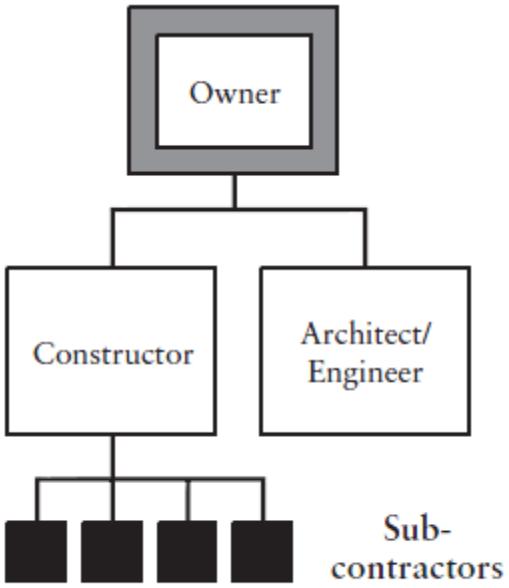
2. PROJECT DELIVERY METHOD

- **Traditional Method**
  - Design-Bid-Build (DBB)
  - Construction Manager (CM)
  - Construction Manager at Risk (CMR)

- **Innovative Method**
  - Design-Build (DB)
  - Cost-Plus-Time (A+B)
  - Warranty

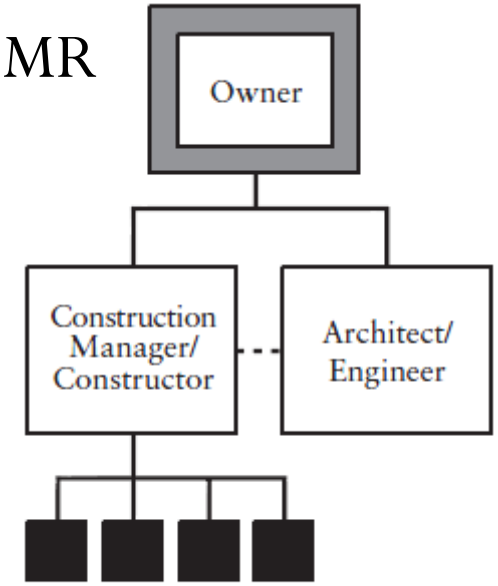
Traditional PDM cont'

1) DBB



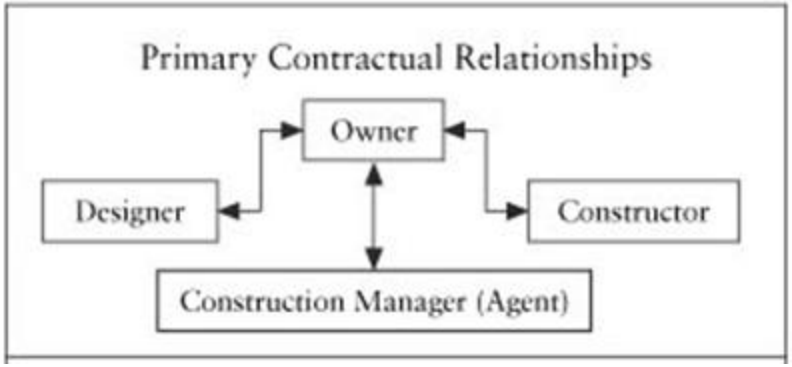
Design-Bid-Build

3) CMR



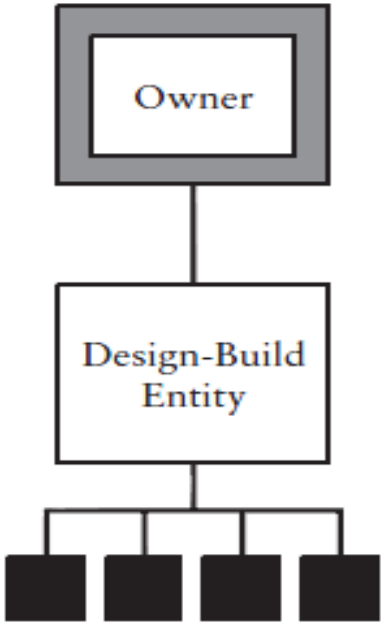
CM At Risk

2) CM



Innovative PDM cont'

1) DB



Design-Build

2) A+B

3) Warranty

3. FACTORS AFFECTING PDM SELECT.

- Selection of PDM depends on **several factors**
- Selection should be based on **owner's objectives** for that project
- Each decision maker has **different criteria** and factors that may influence the selection accordingly

3. FACTORS Cont'

Factor Number	Selection Factor	Factor Description for Comparing PDCS	Factor Action Statement
Cost-related factors			
1	Completion within original budget is critical to project success.	Project delivery and contract strategy facilitate control of cost growth.	Control cost growth.
2	Minimal cost is critical to project success.	Project delivery and contract strategy ensure lowest reasonable cost.	Ensure lowest cost.
3	Owner's cash flow for the project is constrained.	Project delivery and contract strategy delay or minimize rate of expenditures.	Delay or minimize expenditure rate.
4	Owner critically requires early (and reliable) cost figures to facilitate financial planning and business decisions.	Project delivery and contract strategy facilitate accurate early cost estimates.	Facilitate early cost estimates.
5	Owner assumes minimal financial risk on the project.	Project delivery and contract strategy reduce risks or transfer a high level of cost and schedule risks to the contractor(s).	Reduce risks or transfer risks to contractor(s).

3. FACTORS Cont'

Schedule-related factors			
6	Completion within schedule is highly critical to project success.	Project delivery and contract strategy facilitate control of time growth.	Control time growth.
7	Early completion is critical to project success.	Project delivery and contract strategy ensure shortest reasonable schedule.	Ensure shortest schedule.
8	Early procurement of long-lead equipment and/or materials is critical to project success.	Project delivery and contract strategy promote early design and purchase of long-lead equipment or materials.	Promote early procurement.

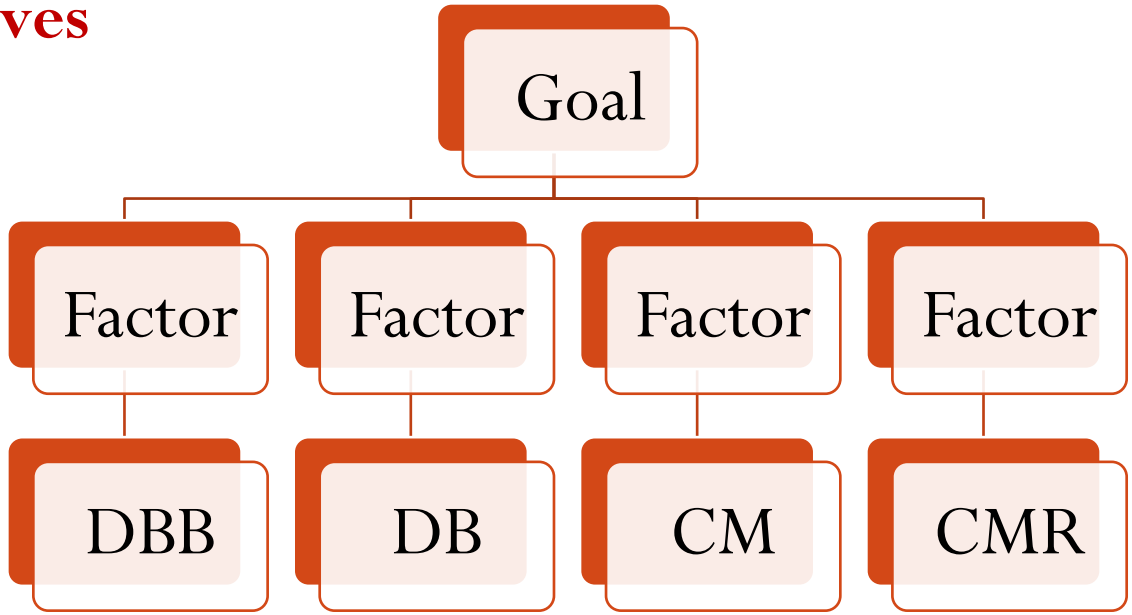
3. FACTORS Cont'

Factor Number	Selection Factor	Factor Description for Comparing PDCS	Factor Action Statement
Other factors (continued)			
18	Project features are not well-defined at award of design and/or construction contract.	Project delivery and contract strategy efficiently utilize poorly defined project scope prior to award of design and/ or construction.	Efficiently utilize poorly defined scope.
19	Owner prefers minimal number of parties to be accountable for project performance.	Project delivery and contract strategy minimize the number of parties under contract directly with the owner.	Minimize number of contracted parties.
20	Project design/engineering or construction is complex, innovative, or non-standard.	Project delivery and contract strategy facilitate efficient coordination and management of non-standard project design/engineering and/or construction.	Efficiently coordinate project complexity or innovation.

4. AHP PROCESS

- **Mathematical tool** used for ranking alternatives based on the decision maker objectives and requirements

- Uses a hierarchy model that comprise **Goal**, **Factors**, **Alternatives**



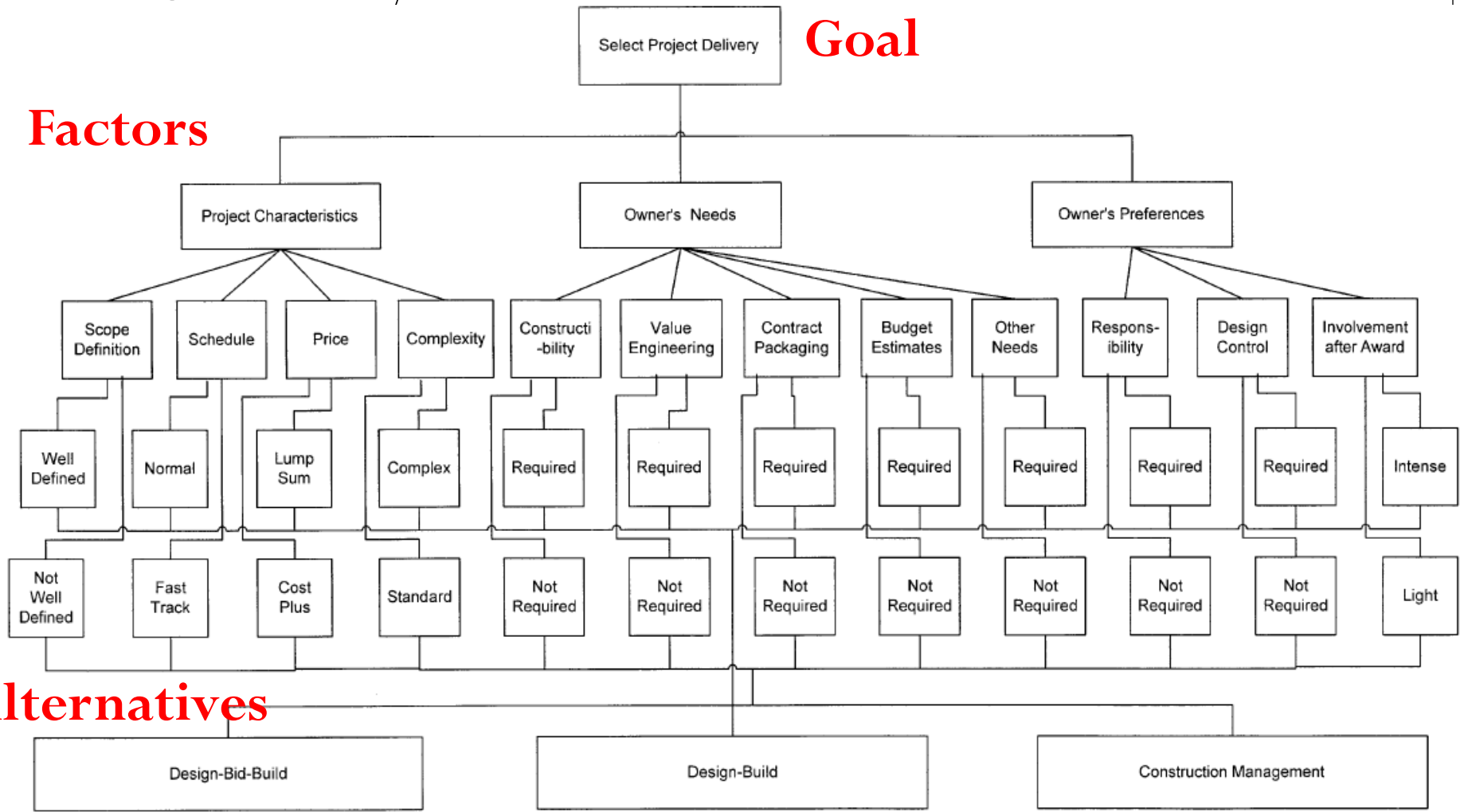
4. AHP Cont'

- AHP consists of six parts

1. Define the **Goal**
2. Identify the **Factors**
3. Identify the **Alternatives**
4. The use of a **decision maker knowledge**
5. **Pairwise matrix comparison**
6. **Analysis of the results**

5. AHP APPLICATIONS

- Case study



5. AHP APPLICATIONS

- Decision maker knowledge

The AHP comparison scale (based Ref. [4])

Weight	Definition
1	Equal importance
3	Weak importance of one over another
5	Essential or strong importance
7	Very strong importance
9	Absolute importance
2, 4, 6, 8	Intermediate values between the two adjacent judgements
Reciprocals of above	If factor *i* has one of the above numbers assigned to it when compared to factor *j*, then *j* has the reciprocal value when compared with *i*

5. AHP APPLICATIONS

- Pairwise comparison matrix is generated

Pair-wise comparisons for the elements at the second level of the hierarchy with respect to the goal at the first level[a]

	PC	ON	OP	Priorities
PC	1	4	6	0.556
ON	1/4	1	3	0.380
OP	1/6	1/3	1	0.064

[a] PC, project characteristics; ON, owner needs; OP, owner preferences.

5. AHP APPLICATIONS

- The same matrix is generated for the sub-factors

Pair-wise comparisons with respect to the project characteristics

	Scope	Schedule	Price	Complexity	Priorities
Scope	1	4	5	1/4	0.316
Schedule	1/4	1	2	1/6	0.111
Price	1/5	1/2	1	1/7	0.072
Complexity	4	6	7	1	0.500

5. AHP APPLICATIONS

- Calculations are done for all factors and sub-factors
- Software may be used

	Final priorities
DBB	0.27
DB	0.39
CM	0.34

6. CONCLUSION

- AHP is powerful tool for decision making problems
- Simple to use
- Selection could vary due to owners point of views

THANKS FOR YOUR KIND ATTENTION

QUESTIONS