

Selecting Projects Delivery Methods and Building Cohesive Teams

DBIA 2016 Rocky Mountain Regional Conference

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Learning Objectives

By the end of this presentation, you should be able to:

- Explain project delivery selection approaches for projects in transit, airports, highways, wastewater and buildings
- Describe how to promote integrated and cohesive teams on building design and construction projects
- Describe the types of DBIA Certification



Selecting Project Delivery Methods

**There is no single best
delivery method**

Selecting Project Delivery Methods

What is most important when selecting a project delivery method?

- Project Complexity
- Owner Characteristics
- Project Goals
- Market Characteristics
- Need for Innovation
- Procurement Constraints

Selecting Project Delivery Methods

Defining Project Goals

Schedule Goals

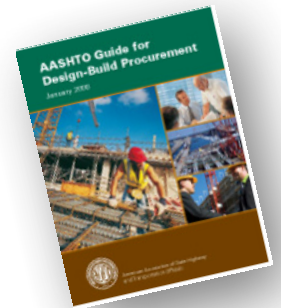
- Finish by a date certain
- Minimize project delivery time
- Accelerate start of project revenue

Quality Goals

Functional Goals

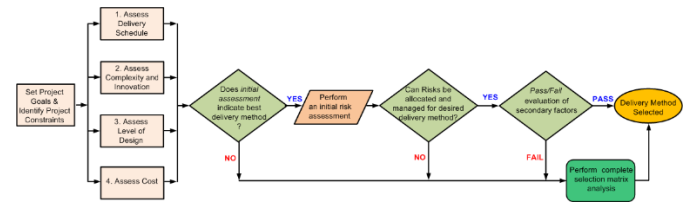
Cost/Budget Goals

- Minimize project cost
- Complete the project on budget
- Maximize the project scope within the project budget



Selecting Project Delivery Methods

- Owners need a formal method for selecting project delivery methods
- Process should align project goals with opportunities and constraints of delivery methods



Selecting Project Delivery Methods

Approach for Transit Projects

- TCRP 131 - Guidebook for the Evaluation of Project Delivery Methods
- Transit projects are unique due to long-term operations
- Guidebook focuses on
 - Project-level issues
 - Agency-level issues
 - Public policy/regulatory issues
 - Lifecycle issues



Selecting Project Delivery Methods

Approach for Airports

- ACRP Report 21 - Guidebook for Selecting Airport Capital Project Delivery Methods
- Airports are unique due to their on-going operations
- Guidebook focuses on
 - Project-level issues
 - Airport-level issues
 - Public policy/regulatory issues



Selecting Project Delivery Methods

Approach for Highways

- Project Delivery Selection Matrix
 - Colorado Department of Transportation
 - Next Generation Transportation Construction Management Pooled Fund Study

<http://www.colorado.edu/tcm>



U.S. Department
of Transportation
**Federal Highway
Administration**

Project Delivery Selection Matrix



CDOT ICAC			
CDOT	FHWA	ACEC	CCA

Pilot Projects

Delivery Decision Guide

How does it work?

- Create project description checklist
- Develop project goals and identify project constraints
- Evaluate the primary factors
 - 1. Delivery schedule
 - 2. Complexity and innovation
 - 3. Level of design
 - 4. Cost
 - 5. Initial project risk assessment
- Evaluate the secondary factors
 - 6. Staff experience / availability
 - 7. Level of oversight and control
 - 8. Competition and contractor experience



How does it work?

Evaluate Opportunities and Obstacles for Primary and Secondary Factors

1) Delivery Schedule

<u>DESIGN-BID-BUILD</u>	
Opportunities	Obstacles
▪	▪
▪	▪

<u>DESIGN-BUILD</u>	
Opportunities	Obstacles
▪	▪
▪	▪

<u>CM/GC</u>	
Opportunities	Obstacles
▪	▪
▪	▪

Delivery Schedule Summary

	DBB	DB	CM/GC
1. Delivery Schedule			

Key: ++ Most appropriate delivery method + Appropriate delivery method
 - Least appropriate delivery method X Fatal Flaw (discontinue evaluation of this method)
 NA Factor not applicable or not relevant to the selection of project delivery

Notes and Comments:

How does it work?

1) Delivery Schedule

Refer to
Checklists after
Workshop Team
has Exhausted
Project-Specific
Discussion

DESIGN-BID-BUILD	
Opportunities	Obstacles
<ul style="list-style-type: none"> <input type="checkbox"/> Schedule is more predictable and more manageable <input type="checkbox"/> Milestones can be easier to define <input type="checkbox"/> Projects can more easily be "shelved" <input type="checkbox"/> Shortest procurement period <input type="checkbox"/> Elements of design can be advanced prior to permitting, construction, etc. <input type="checkbox"/> Time to communicate/discuss design with stakeholders 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Requires time to perform a linear design-bid-construction process <input type="checkbox"/> Design and construction schedules can be unrealistic due to lack industry input <input type="checkbox"/> Errors in design lead to change orders and schedule delays <input type="checkbox"/> Lowbid selection may lead to potential delays and other adverse outcomes.

DESIGN-BUILD	
Opportunities	Obstacles
<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Potential to accelerate schedule through parallel design-build process <input type="checkbox"/> Shifting schedule risk to DB team <input type="checkbox"/> Encumbers construction funds more quickly <input type="checkbox"/> Industry input into design and schedule <input type="checkbox"/> Fewer chances for disputes between agency and design-builders <input type="checkbox"/> More efficient procurement of long-lead items <input type="checkbox"/> Ability to start construction before entire design, ROW, etc. is complete (i.e., phased design) 	<ul style="list-style-type: none"> <input type="checkbox"/> Request for proposal development and procurement can be lengthy <input type="checkbox"/> Undefined events or conditions found after procurement, but during design can impact schedule and cost <input type="checkbox"/> Time required to define technical requirements and expectations through RFP development can be lengthy <input type="checkbox"/> Time required to gain acceptance of quality program <input type="checkbox"/> Requires agency and stakeholder commitments to an expeditious review of design

CM/GC	
Opportunities	Obstacles
<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Ability to start construction before entire design, ROW, etc. is complete (i.e., phased design) <input type="checkbox"/> More efficient procurement of long-lead items <input type="checkbox"/> Early identification and resolution of design and construction issues (e.g., utility, ROW, and earthwork) <input type="checkbox"/> Can provide a shorter procurement schedule than DB <input type="checkbox"/> Team involvement for schedule optimization <input type="checkbox"/> Continuous constructability review and VE <input type="checkbox"/> Maintenance of Traffic improves with contractor inputs 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Potential for not reaching GMP and substantially delaying schedule <input checked="" type="checkbox"/> GMP negotiation can delay the schedule <input type="checkbox"/> Schedule-driven goals may drive up cost <input checked="" type="checkbox"/> Designer-contractor-agency disagreements can add delays <input type="checkbox"/> Strong agency management is required to control schedule

Delivery Selection Matrix Summary

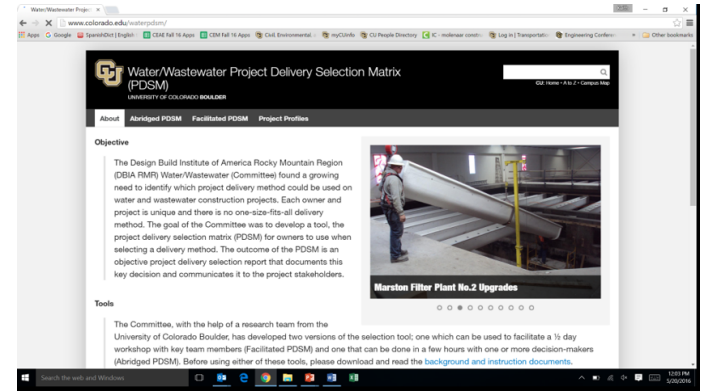
PROJECT DELIVERY METHOD OPPORTUNITY/OBSTACLE SUMMARY			
	DBB	DB	CMGC
Primary Evaluation Factors			
1. Delivery Schedule	X	++	-
2. Project Complexity & Innovation	NA	+	+
3. Level of Design	NA	++	+
4. Cost	NA	++	+
5. Perform Initial Risk Assessment	NA	Risks can be properly allocated	NA
Secondary Evaluation Factors			
6. Staff Experience/Availability (Owner)	NA	Pass	NA
7. Level of Oversight and Control	NA	Pass	NA
8. Competition and Contractor Experience	NA	Pass	NA

Selecting Project Delivery Methods

Approach for Water/Wastewater

- DBIA W/WW Committee
Project Delivery Selection Matrix
- Treatment Technologies make
W/WW projects unique
 - Facilitated PDSM
 - Abridged PDSM

<http://www.colorado.edu/waterpds>



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- **Describe how to promote integrated and cohesive teams on building design and construction projects**
- Describe the types of DBIA Certification



Maximizing Success on Integrated Projects: An Owner's Guide

An Overview of the research and Owner's Guide



Research Motivation

To improve owner delivery decisions by providing practical guidance based upon empirical evidence

1998 CII/Penn State Study of 351 projects

Metric	D-B vs. D-B-B	D-B vs. CM@R
Unit Cost	6.1% lower	4.5% lower
Construction Speed	12.0% faster	7.0% faster
Delivery Speed	33.5% faster	23.5% faster
Cost Growth	5.2% less	12.6% less
Schedule Growth	11.4% less	2.2% less

Research Motivation

To improve owner delivery decisions by providing practical guidance based upon empirical evidence

	1998 CII RT 133	2015 CPF-CII
<i>Question</i>	How do project delivery methods impact performance?	How does the level of integration impact project delivery success?
<i>Scope</i>	Delivery - DBB, CMR and DB	Delivery, procurement, contracting, behaviors and environment
<i>Findings</i>	<ul style="list-style-type: none">✓ DB was faster than DBB and CMR✓ Cost and schedule growth were highest for DBB	<ul style="list-style-type: none">✓ Combined contracts were faster than split contracts✓ Cost and quality were driven by procurement and contracting

Summary of Findings

- Delivery methods alone do not predict success
- Lines between delivery methods are blurred
- *Owners drive project success by selecting strategies that promote team integration and group cohesion*

Team Integration

- ✓ Reduced schedule growth
- ✓ Higher schedule intensity
- ✓ Cohesive teams

Team Cohesion

- ✓ Reduced cost growth
- ✓ Higher system quality
- ✓ Better turnover

Summary of Findings

Best performing delivery strategies maximize

1. Early involvement of the core team
2. Qualification-based team selection
3. Transparency in cost accounting

Early Involvement

- ✓ Faster delivery speed
- ✓ Faster construction speed
- ✓ Improves integration

QBS and Open Book

- ✓ Faster delivery speed
- ✓ Improves integration
- ✓ Improves cohesion

Data Set

204 Projects

Public: 127 (62%)

Private: 77 (38%)

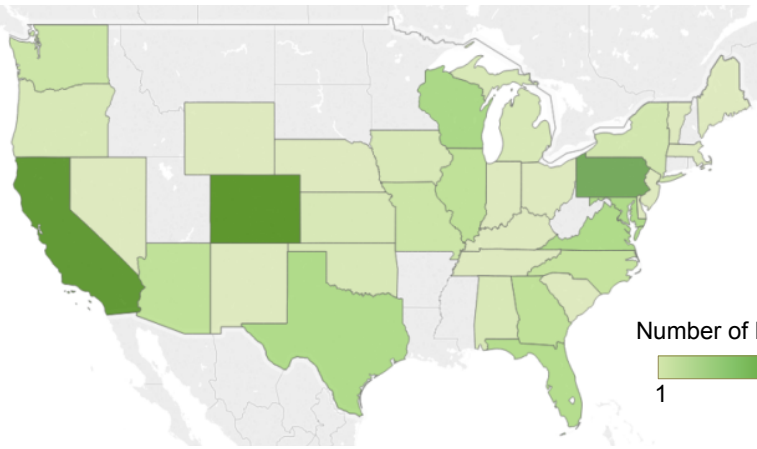
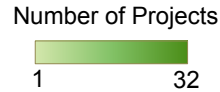
Completed: 2008 - 2013

Facility Types

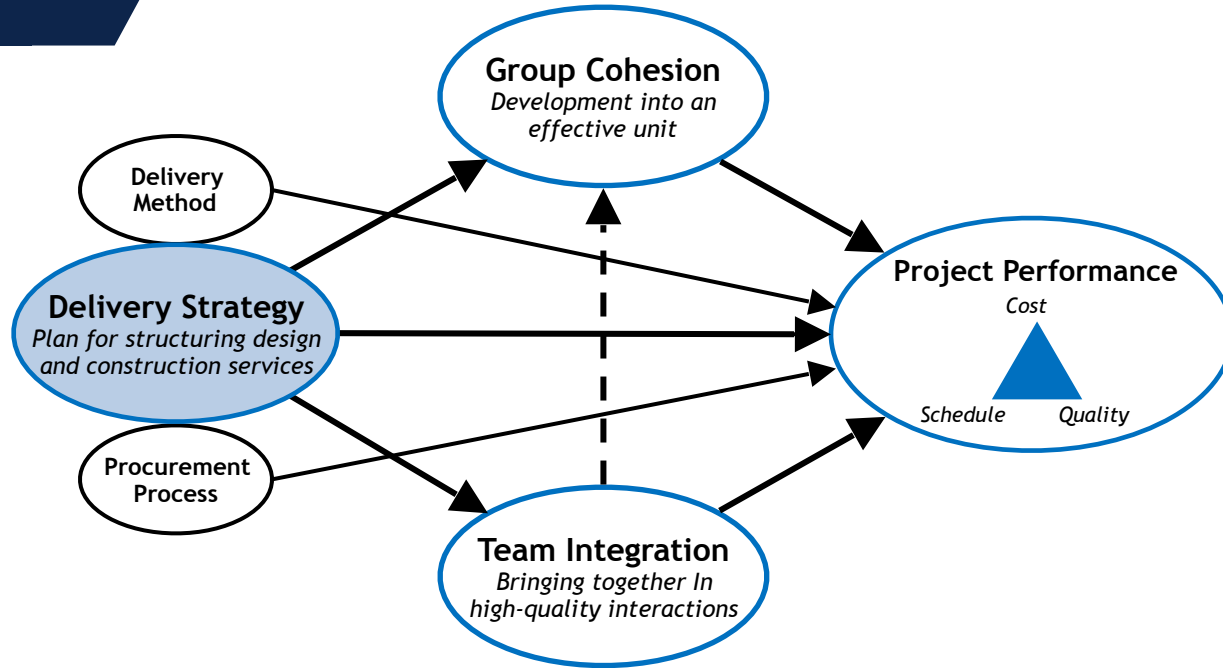
Educational	////	56	(27%)
Office	////	41	(20%)
Health Care	////	32	(16%)
Lodging	////	27	(13%)
Commercial	////	20	(10%)
Sports & Recreation	////	11	(5%)
Manufacturing	////	11	(5%)
Correctional	////	4	(2%)
Transportation	////	2	(1%)

Facility Sizes

(4%)	8	////	> 700,000 ft ²
(3%)	7	////	600,000 - 699,000 ft ²
(2%)	3	////	500,000 - 599,000 ft ²
(3%)	6	////	400,000 - 499,000 ft ²
(7%)	15	////	300,000 - 399,000 ft ²
(13%)	26	////	200,000 - 299,000 ft ²
(24%)	49	////	100,000 - 199,000 ft ²
(44%)	90	////	0 - 99,000 ft ²



Framework



Goal: Determine if team processes and behaviors have an impact on project performance

Team

Integration

Group Cohesion



Integration

Degree to which team members from separate organizations and disciplines are engaged in collaborative activities

- Participation in:
 - Joint Goal Setting
 - Cross Disciplinary design charrettes
 - BIM Execution Planning
- Increased sharing of information and analysis through BIM
- Increased team interaction through colocation

Higher levels of integration led to:

- Reduced *schedule growth*
- Enabled *more intense schedules*
- Led to *more cohesive teams*

Team

Integration

Group Cohesion



Group Cohesion

Degree to which team, as individuals, have shared, task commitment, group pride, and interpersonal alignment

- Commitment to shared goals
- High levels of team chemistry
- Communication is timely and effective

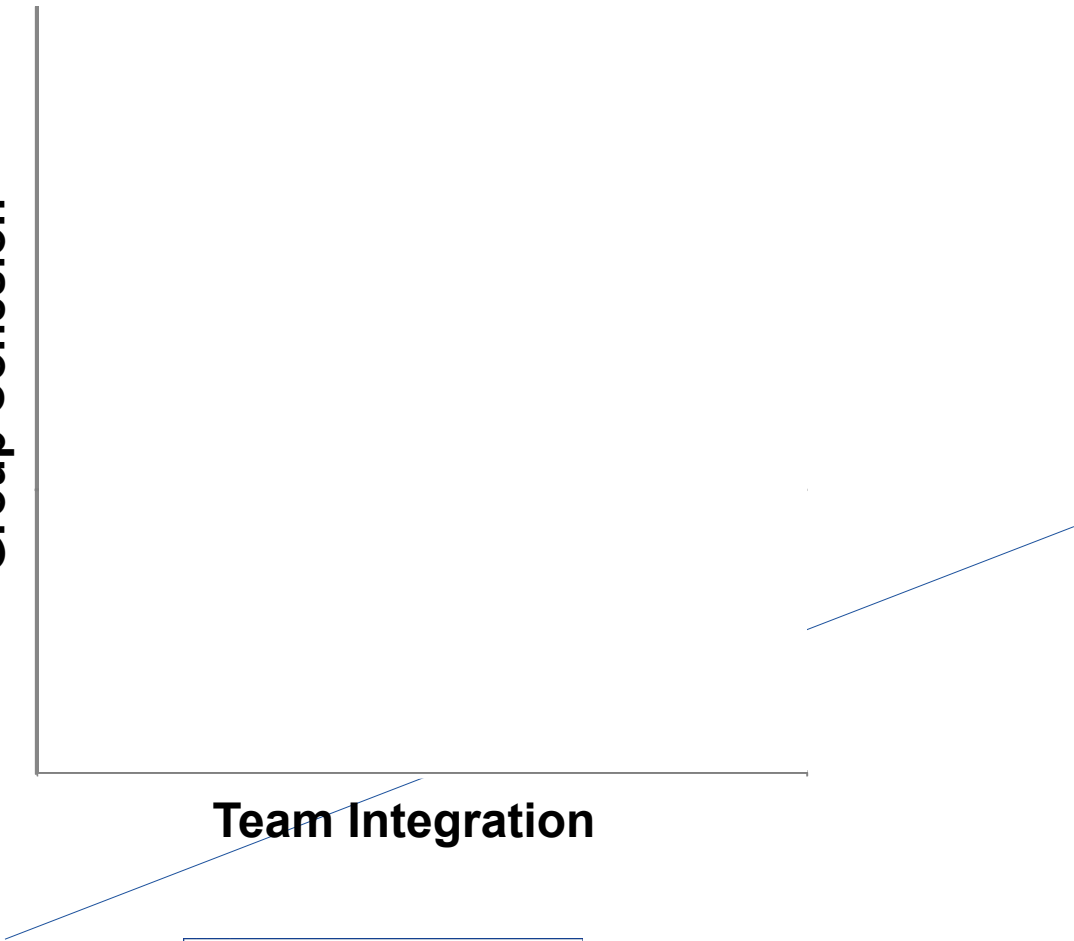
Higher group cohesiveness led to:

- Reduced **cost growth**
- Higher **system quality**
- Improved **turnover experience**

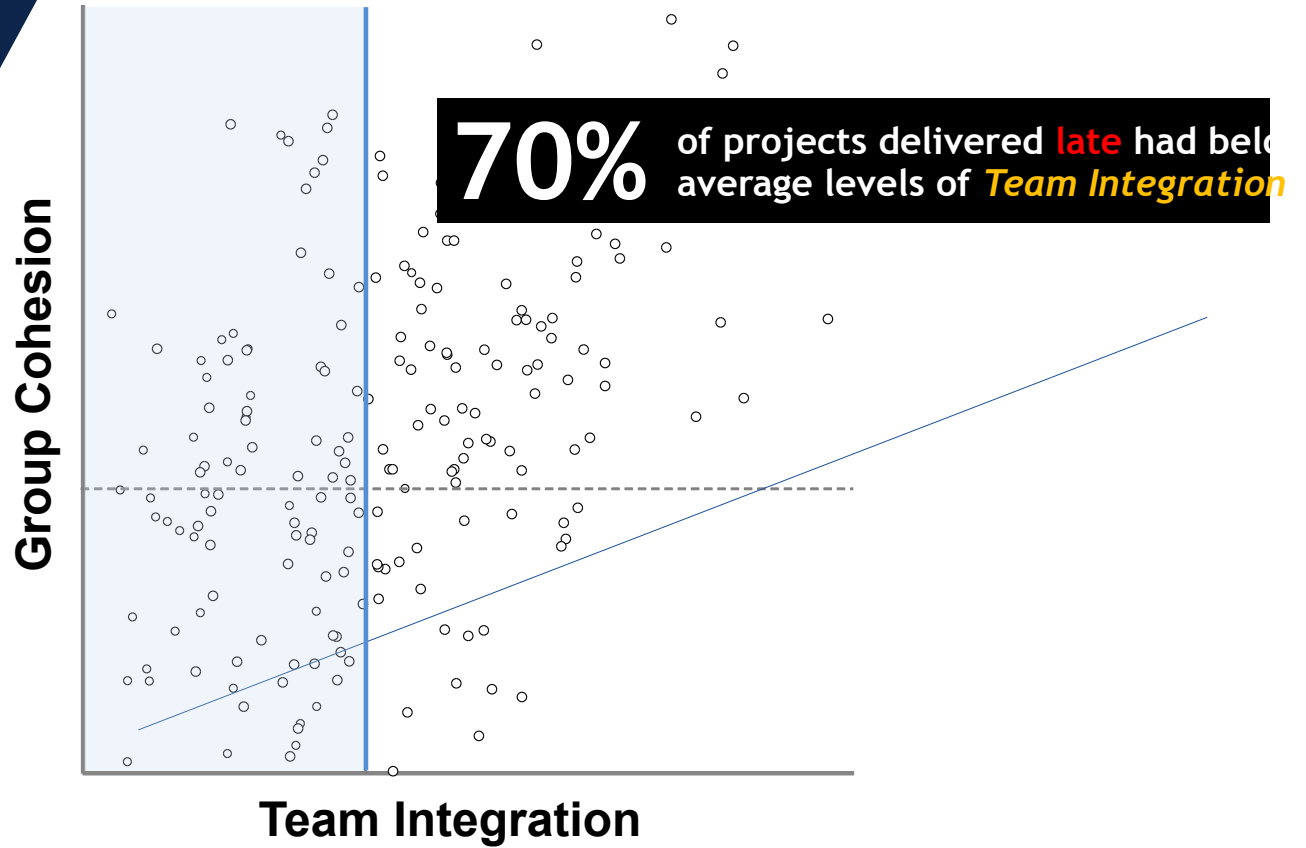
Factor Value

Group Cohesion

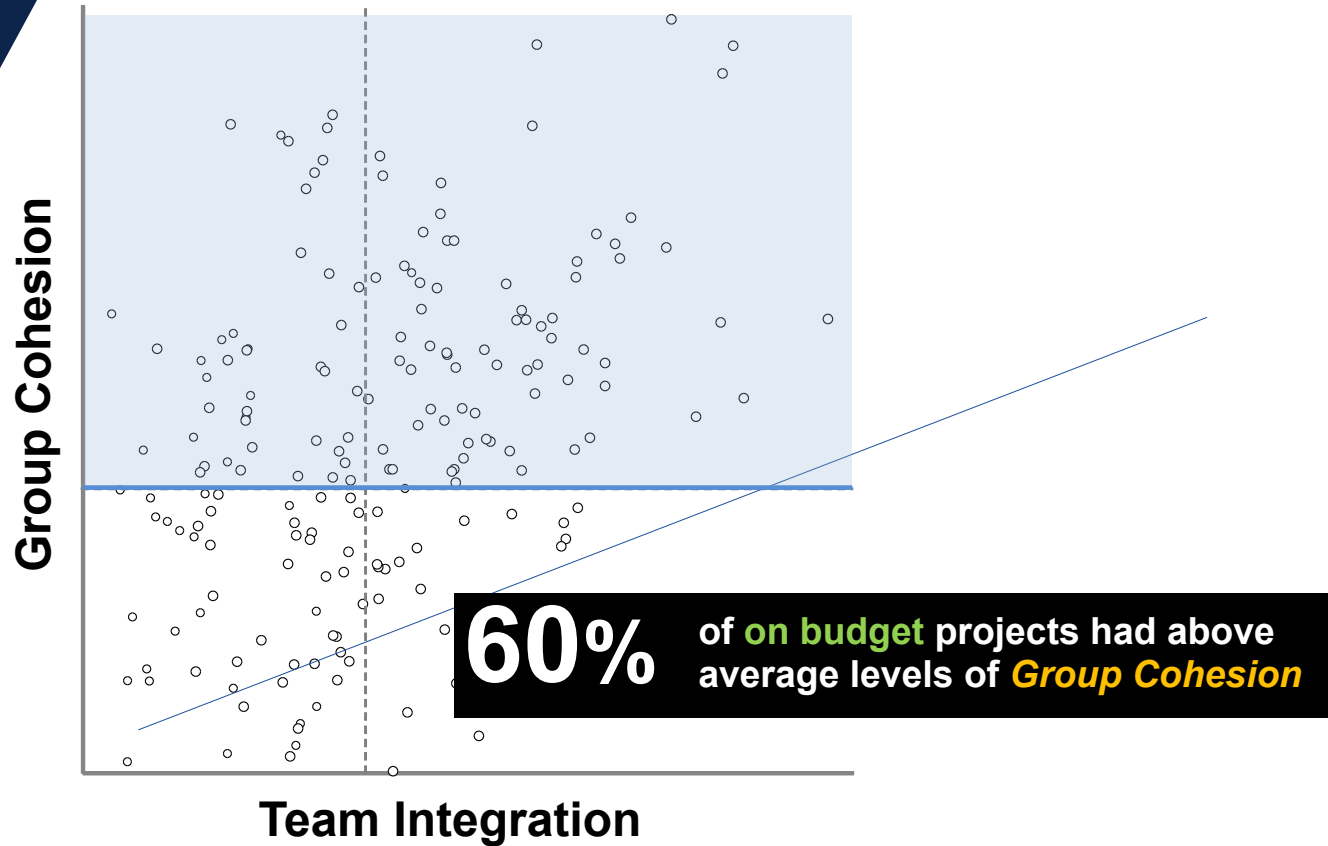
Team Integration



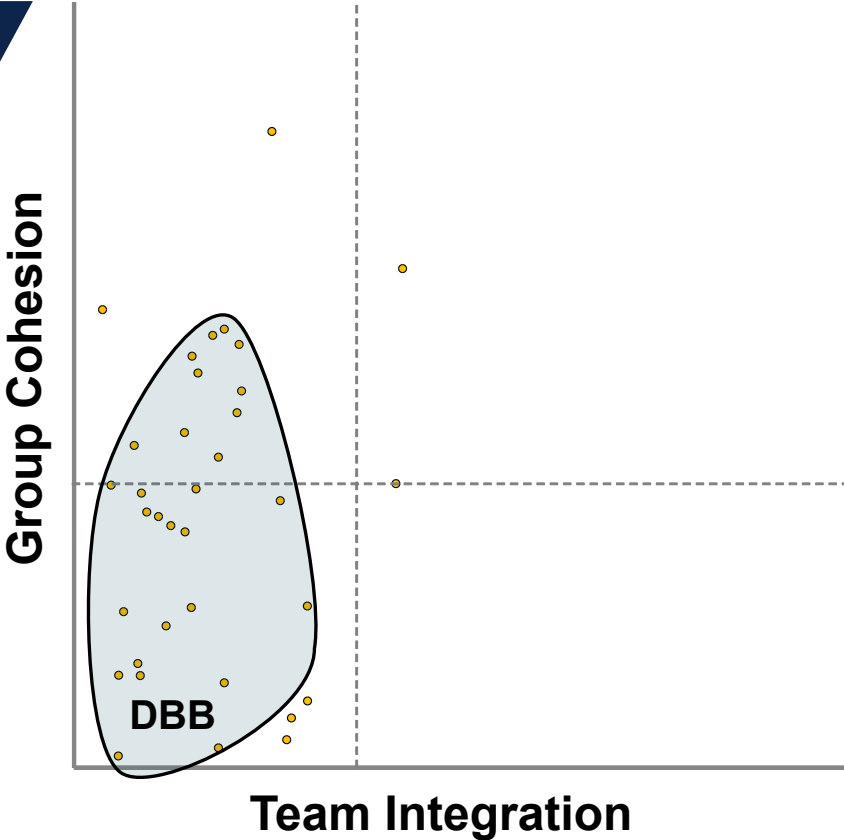
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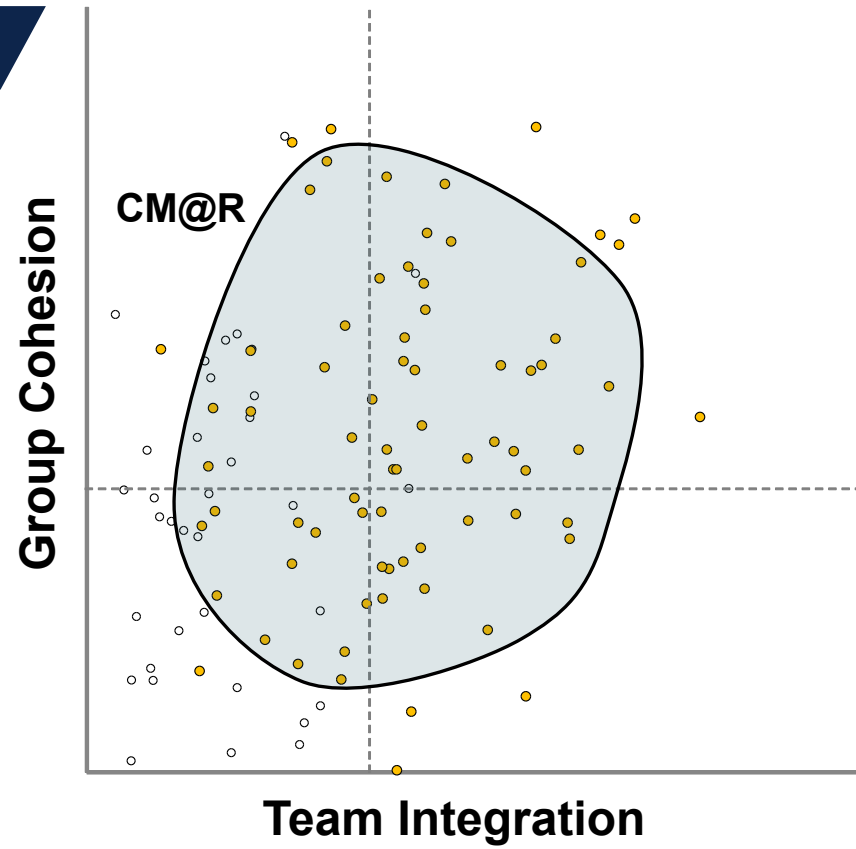
Factor Value



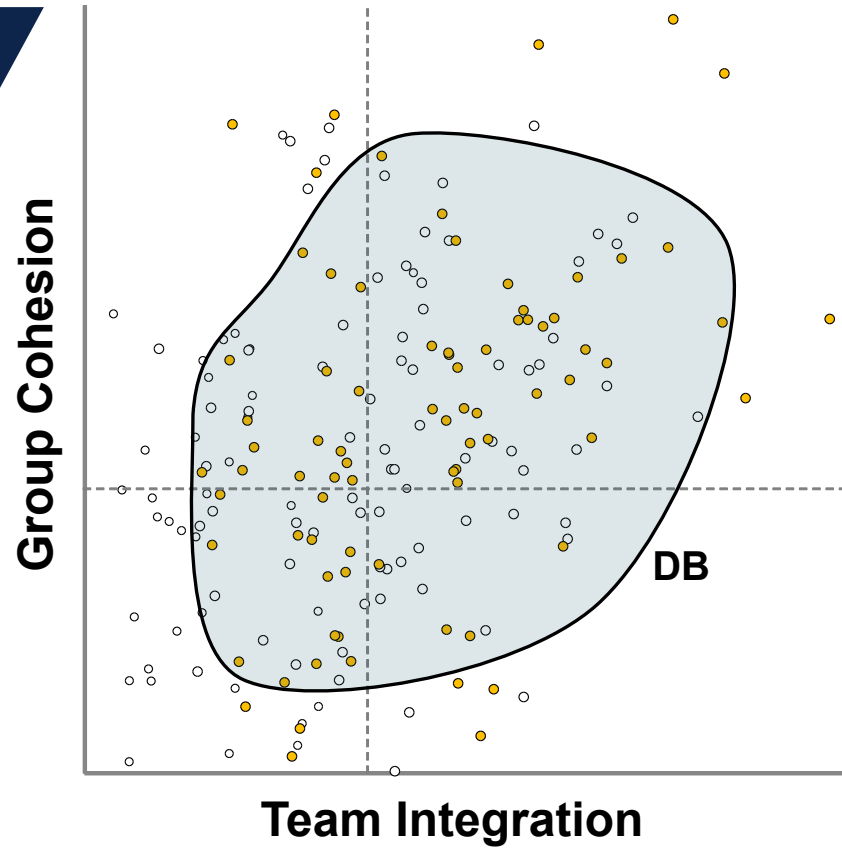
Delivery Method



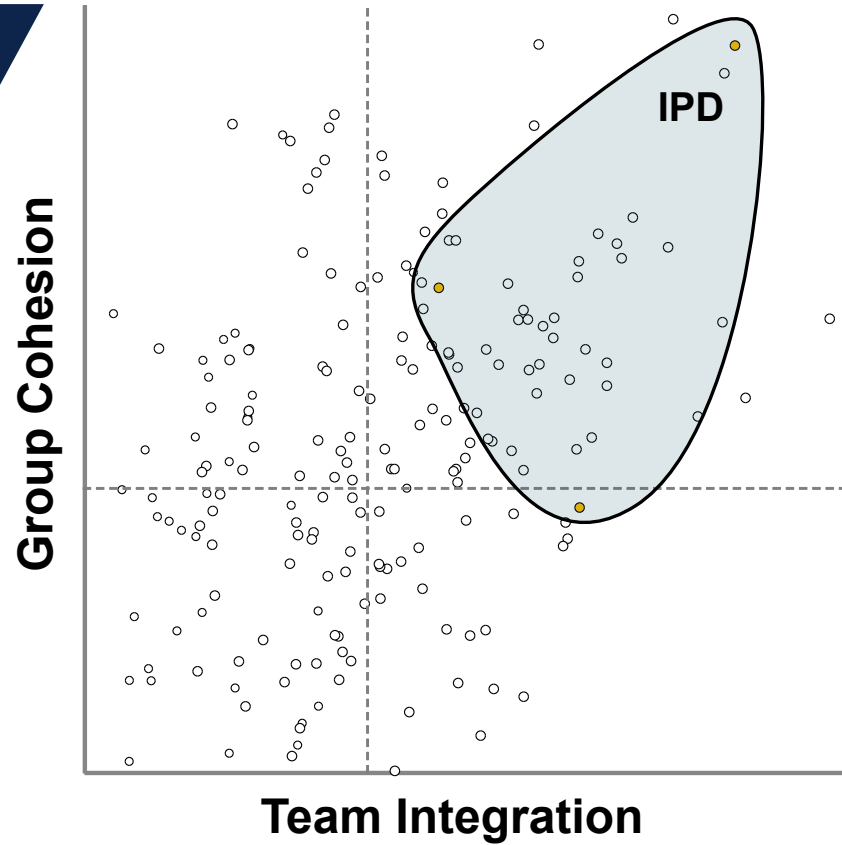
Delivery Method



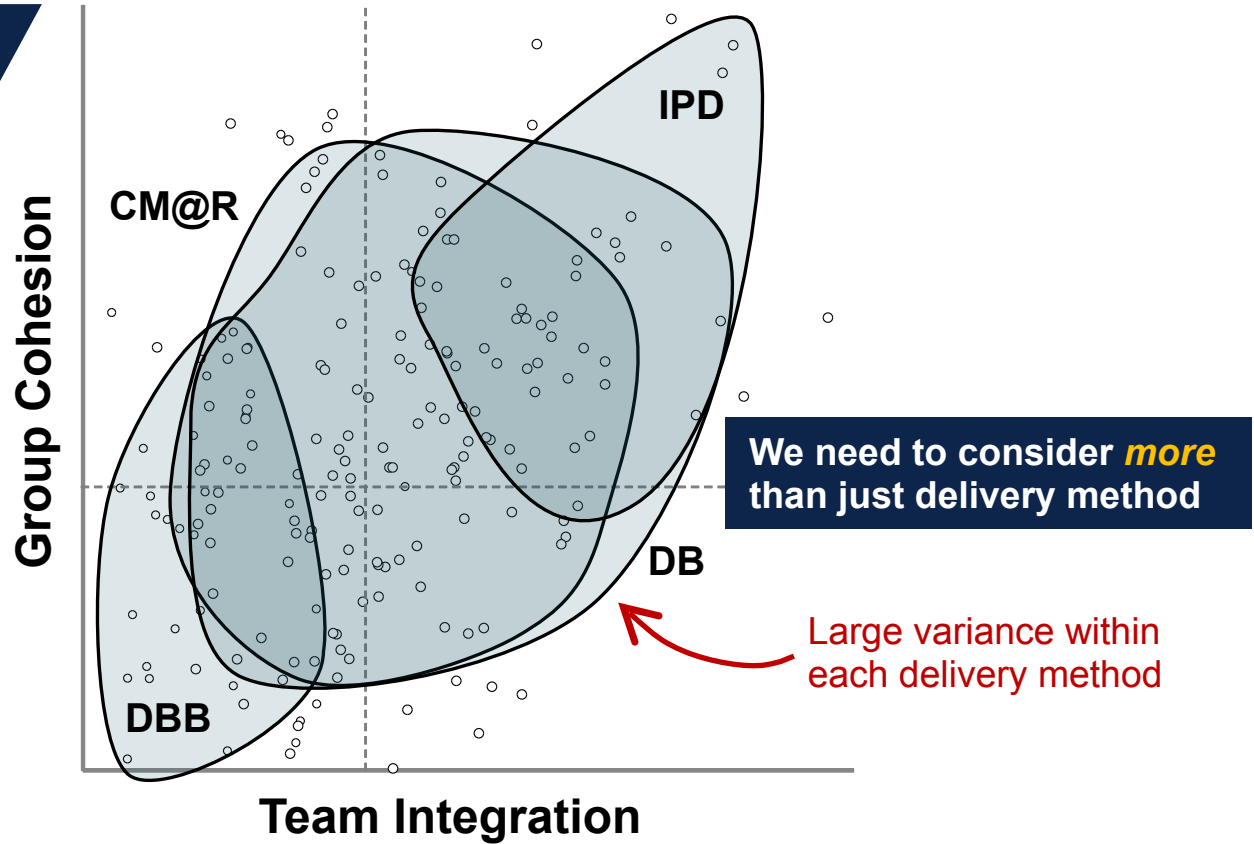
Delivery Method



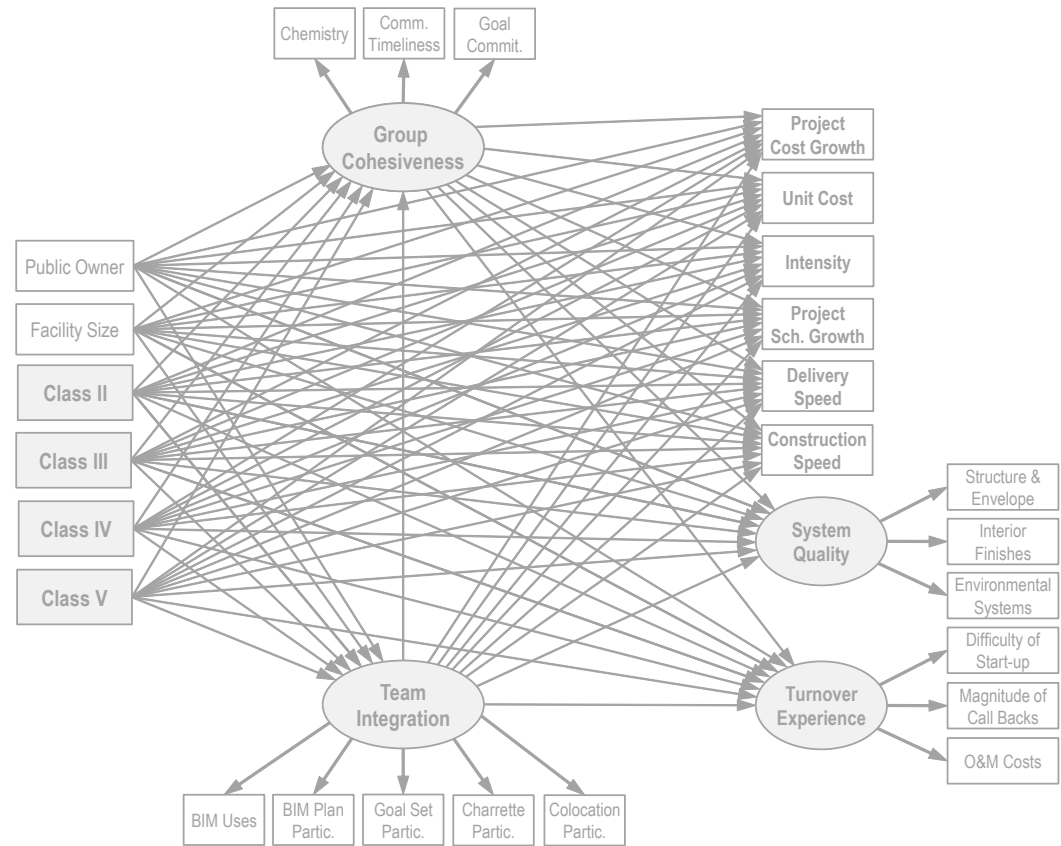
Delivery Method

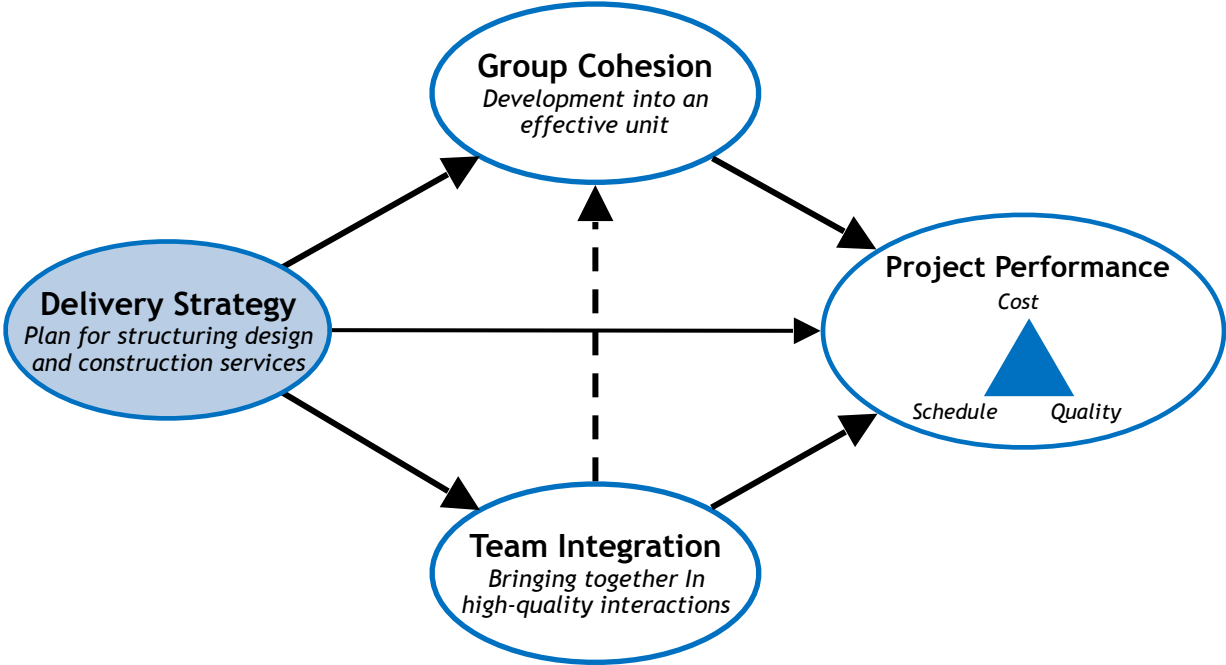


Delivery Method



How did we come to these findings?





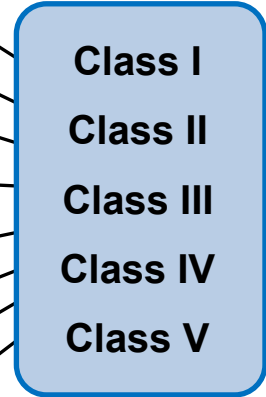
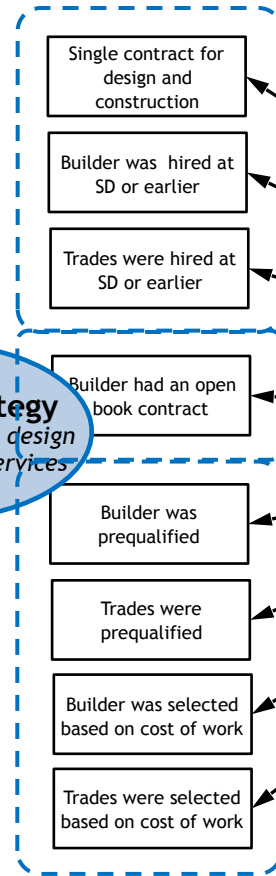
The Factors

Delivery Method

Payment Terms

Procurement Process

Delivery Strategy
Plan for structuring design and construction services



Measurements of the **project organization** that reflect the owner's delivery strategy

Timing of Involvement

Project Delivery Strategy

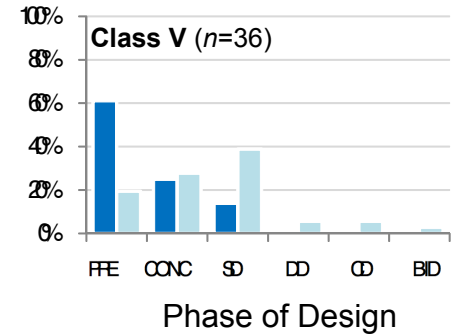
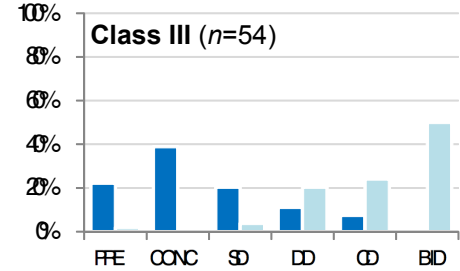
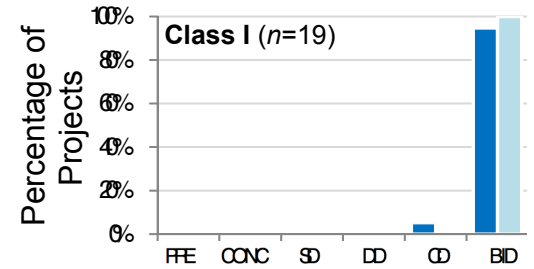
Early Involvement of the Builder and/or Trades

- Class I
- Class II
- Class III
- Class IV
- Class V

■ Primary Contractor / CM
■ Trade Contractors

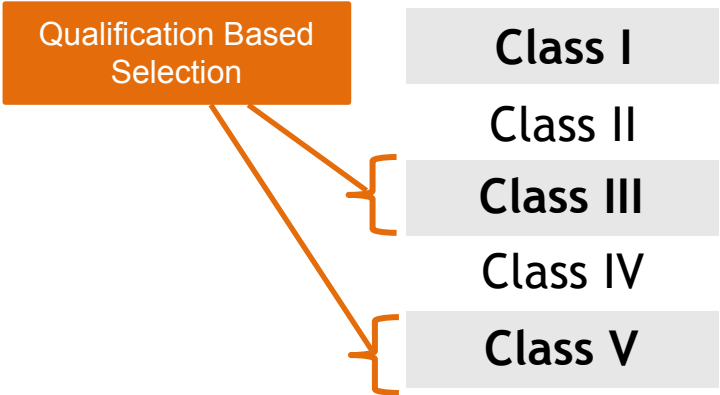
PRE = Pre-Design
 CONC = Conceptual Design
 SD = Schematic Design

DD = Design Development
 CD = Construction Documents
 BID = Bidding



Selection Criteria

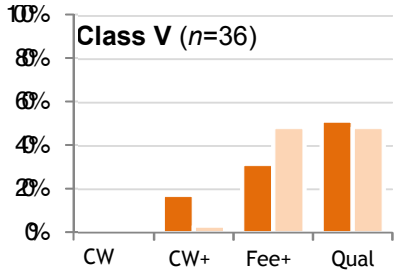
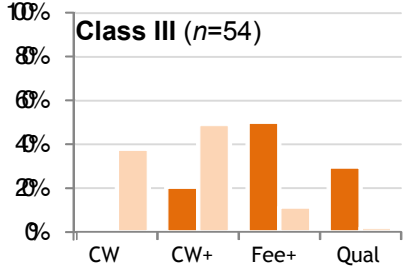
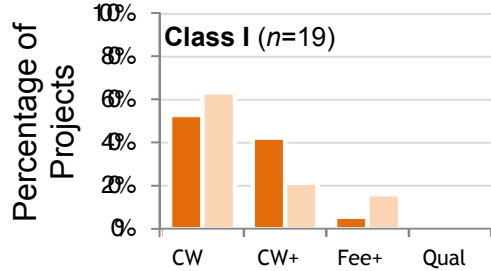
Project Delivery Strategy



■ Primary Contractor / CM
■ Trade Contractors

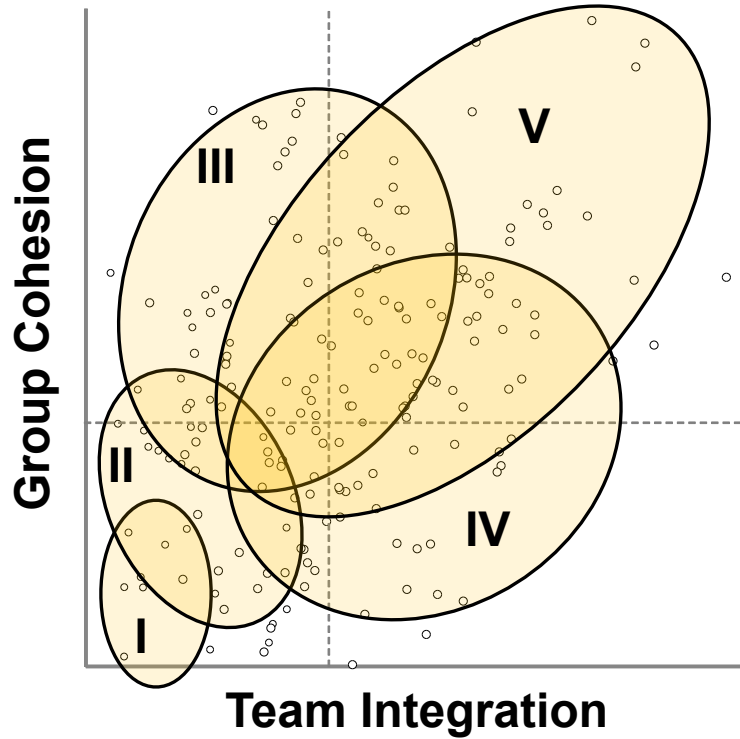
CW = Cost of Work only
 CW+ = Best Value with Cost of Work

FEE+ = Best Value with Fee
 QUAL = Qualifications only



Selection Criteria

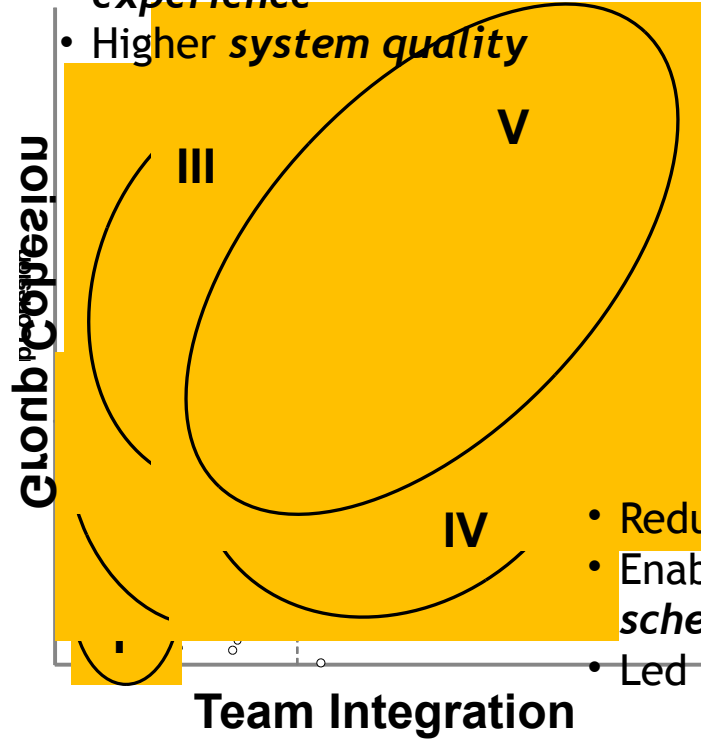
Delivery Strategy



The Owner's Guide

Pulling it all together

- Reduced *cost growth*
- Improved *turnover experience*
- Higher *system quality*



- Reduced *schedule growth*
- Enabled more *intense schedules*
- Led to *more group cohesion*

Maximizing Success in Integrated Projects

An Owner's Guide

[http://bim.psu.edu/
delivery](http://bim.psu.edu/delivery)

Sponsored by the Charles Pankow Foundation and
the Construction Industry Institute

Website: <http://bim.psu.edu/delivery>



The Owner's Guide

Pulling it all together

Selecting a delivery strategy

1. Define the projects delivery needs
 - Define project goals
2. Explore the delivery strategy options
 - Organizational considerations
 - Contract payment needs
 - Team assembly considerations
3. Design the optimal delivery strategy
 - Consider project constraints
 - Benchmark the results against the research

Owner Guide Forms

What you should remember?

- Best path to project success is through building a **TEAM** - integration / cohesion
- You influence team through project delivery decisions
 - *early involvement, open book, qualifications*
- Project Delivery needs to be developed as a **strategy**

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What is the Credential

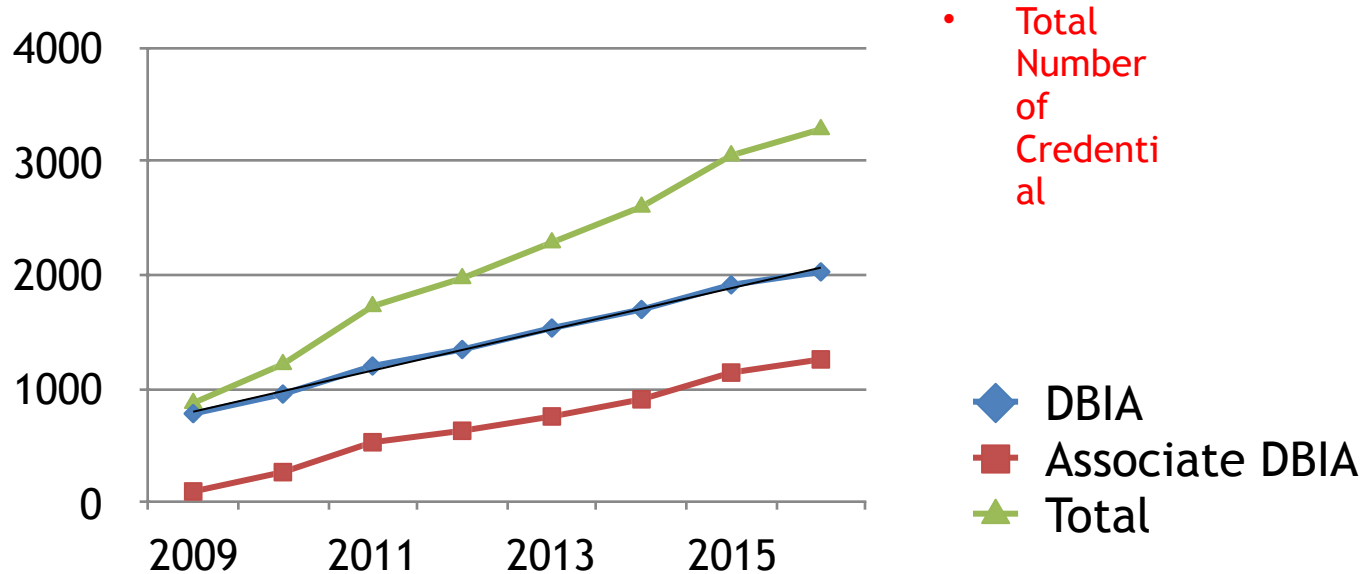
The Designated Design-Build Professional™ certification program is the premier credential for design-build professionals.

Through a combination of education, experience and testing, the DBIA certification program sets a recognized standard for design-build knowledge and expertise.

DBIA offers two types of Certification

- DBIA™
 - The DBIA™ certification requires from two to six years of hands-on experience of pre and post-award design-build.
- Assoc. DBIA™
 - The Assoc. DBIA™ certification does not require hands-on field experience, however it requires a different type of experience:
 - pre-award professionals (business development and acquisition/ procurement)
 - seasoned professionals new to design-build project delivery; and
 - emerging professionals (AEC industry college graduates)

Certified Design-Build Professionals



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