

2018

Project Delivery Symposium: Delivering the future

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Haahtela Group, Partner



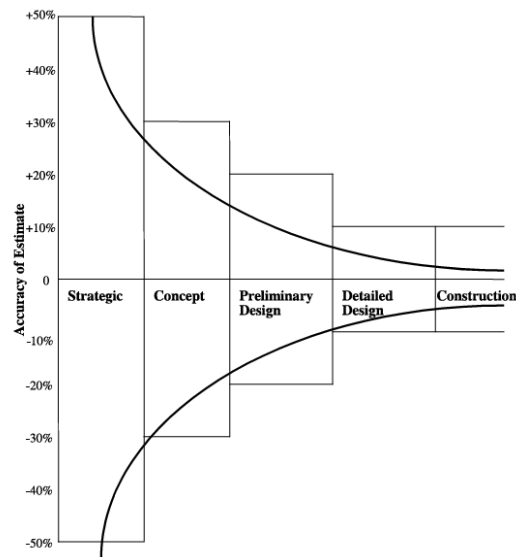
Project Delivery

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Large variety of building costs

The Literature on cost:

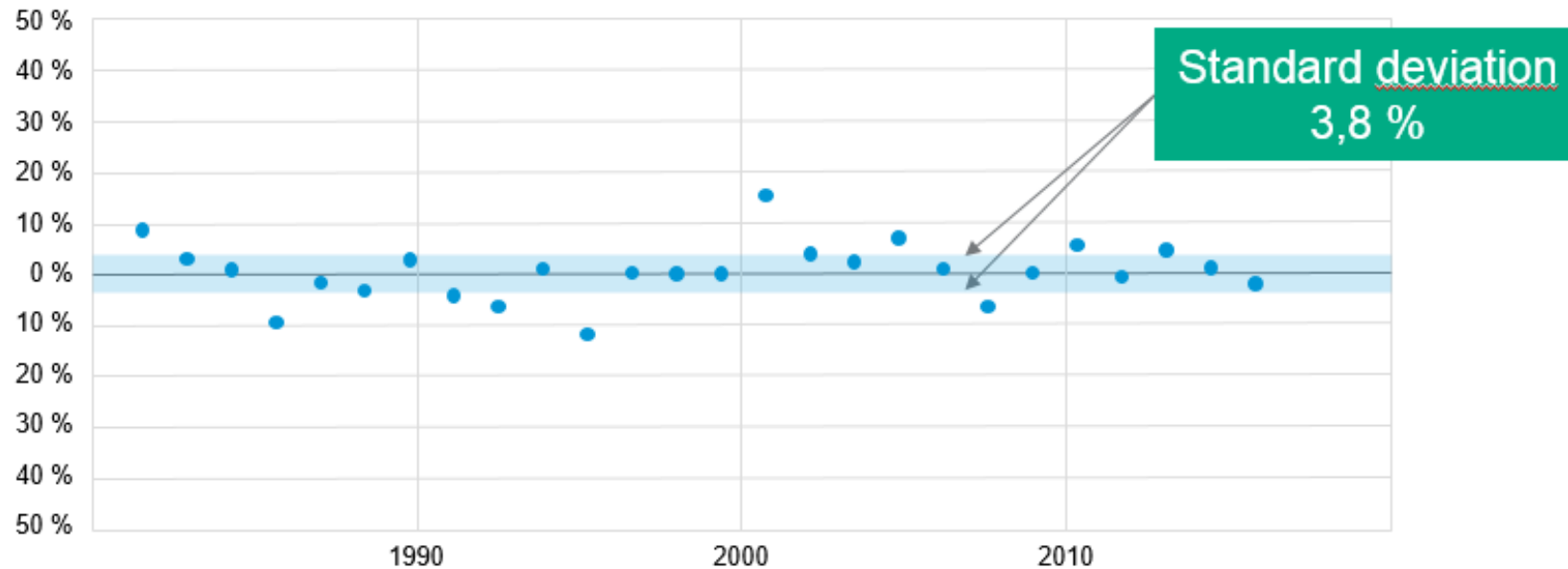
At stage prior design, almost nothing is likely to be known about the building except its general size, and therefore it is pointless to go into detail about cost before any designing has been done. The accuracy is $\pm 30\%$.



However, Estimates Prior Design (conceptual estimates) accuracy are proved to be within a standard deviation of $\pm 4\%$

Target Value Delivery in Haahtela Production

Accuracy of budget before start of design versus completed costs

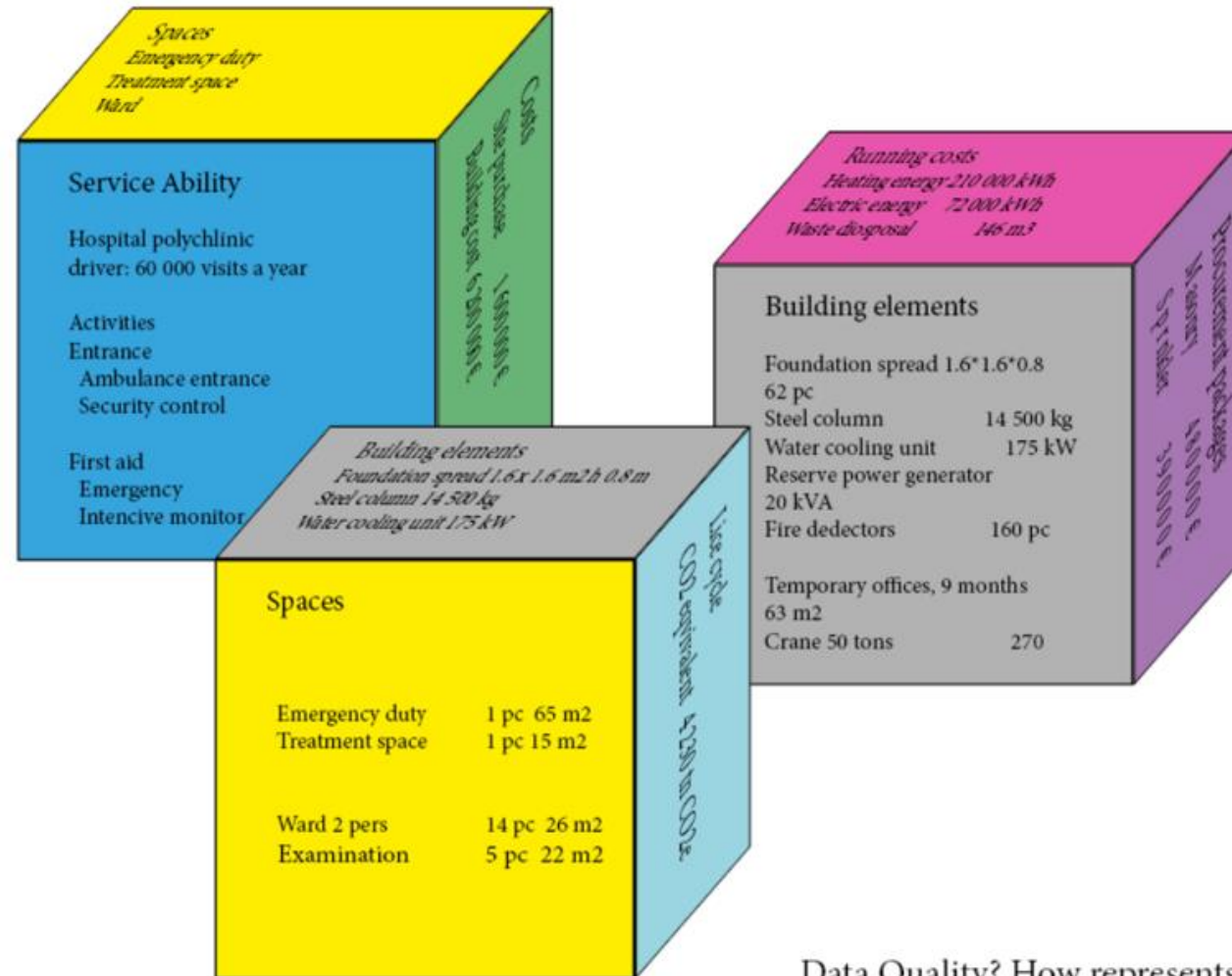


Estimate accuracy might be in some degree a misleading conceptualization.
Goal and steering to the goal. Information Modeling.

Nature of a construction project

- A construction project can be studied
 - as value for the owner's/user's business (as valued)
 - as designing a building object (as designed) and
 - as processes in the building site (as built).
- Since business value, an object and construction processes are quite unequal viewpoints, steering should be considered from each perspectives and, in addition, steering should cover all the perspectives as whole.

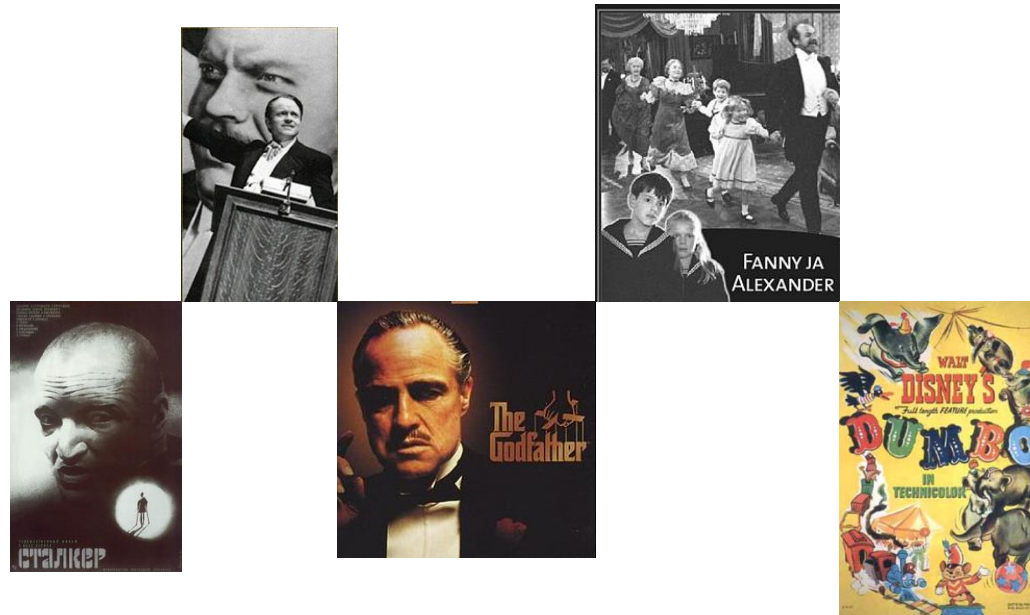
Language transformations



Data Quality? How represents? Accurant?
Complete?

Complexity

- Programming is a result of decisions of multiple stakeholders. Spatial needs competing for the same money than daily operations (salaries...)
- At the start of design building as an object is unknown (massing, locations of the activities, number of floors...)
- Wicked or inductive problem. For simple questions there are no right answers.



Complexity

Complexity that cannot be avoided; essential complexity.

Essential complexity raises from the problem itself. In programming there are multiple decision makers, wishes and wants. Eliminating complexity would lead loosing value.

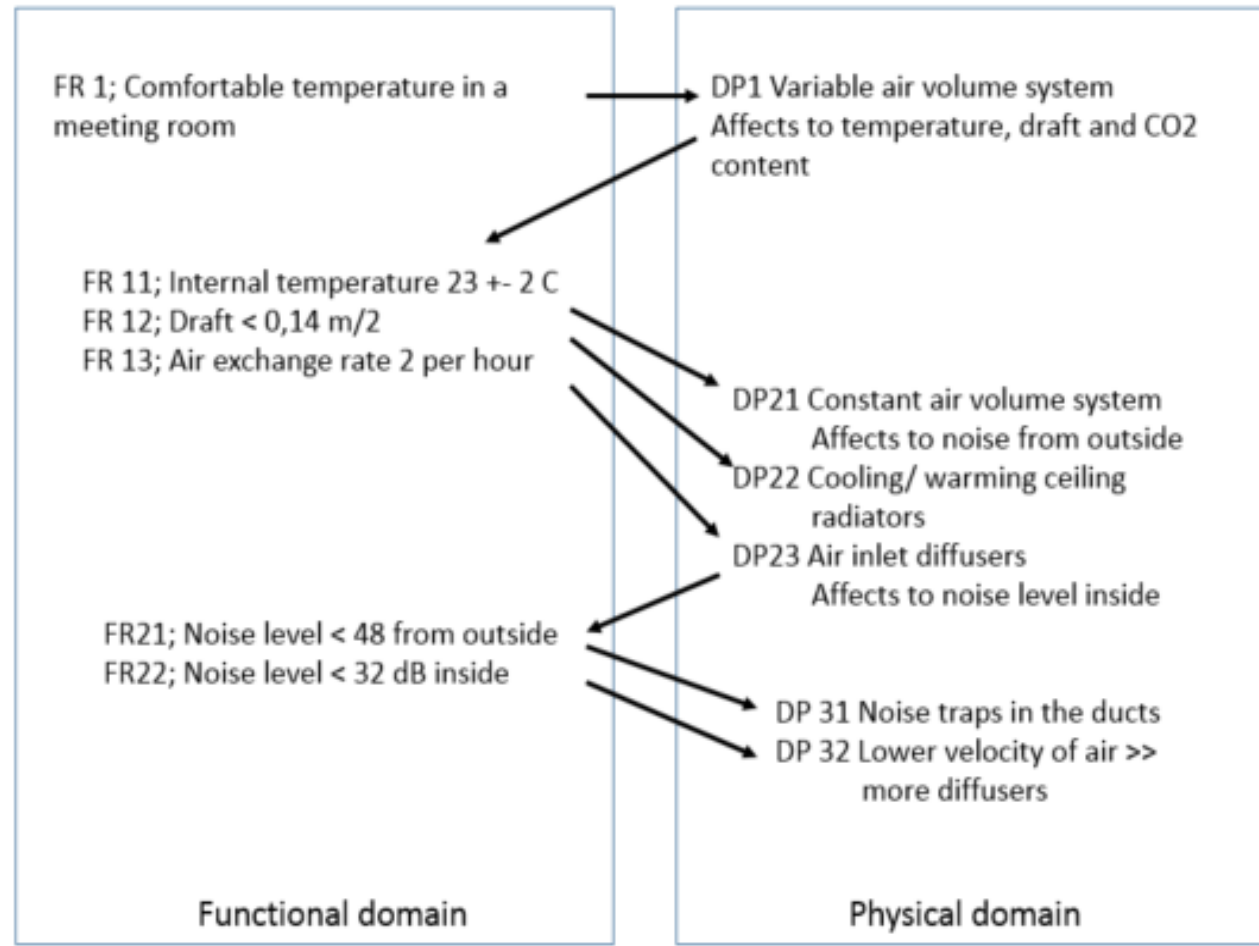
Complexity that should be avoided

If we ask “do we need to invest in an activity?” simultaneously with a question “where would it be located in a plan?”, there are limitless possible alternatives. If we answer “no” to a first question, there is no alternatives left.

Mixing programming and design causes unnecessary complexity. Need should be stated in a solution neutral environment.

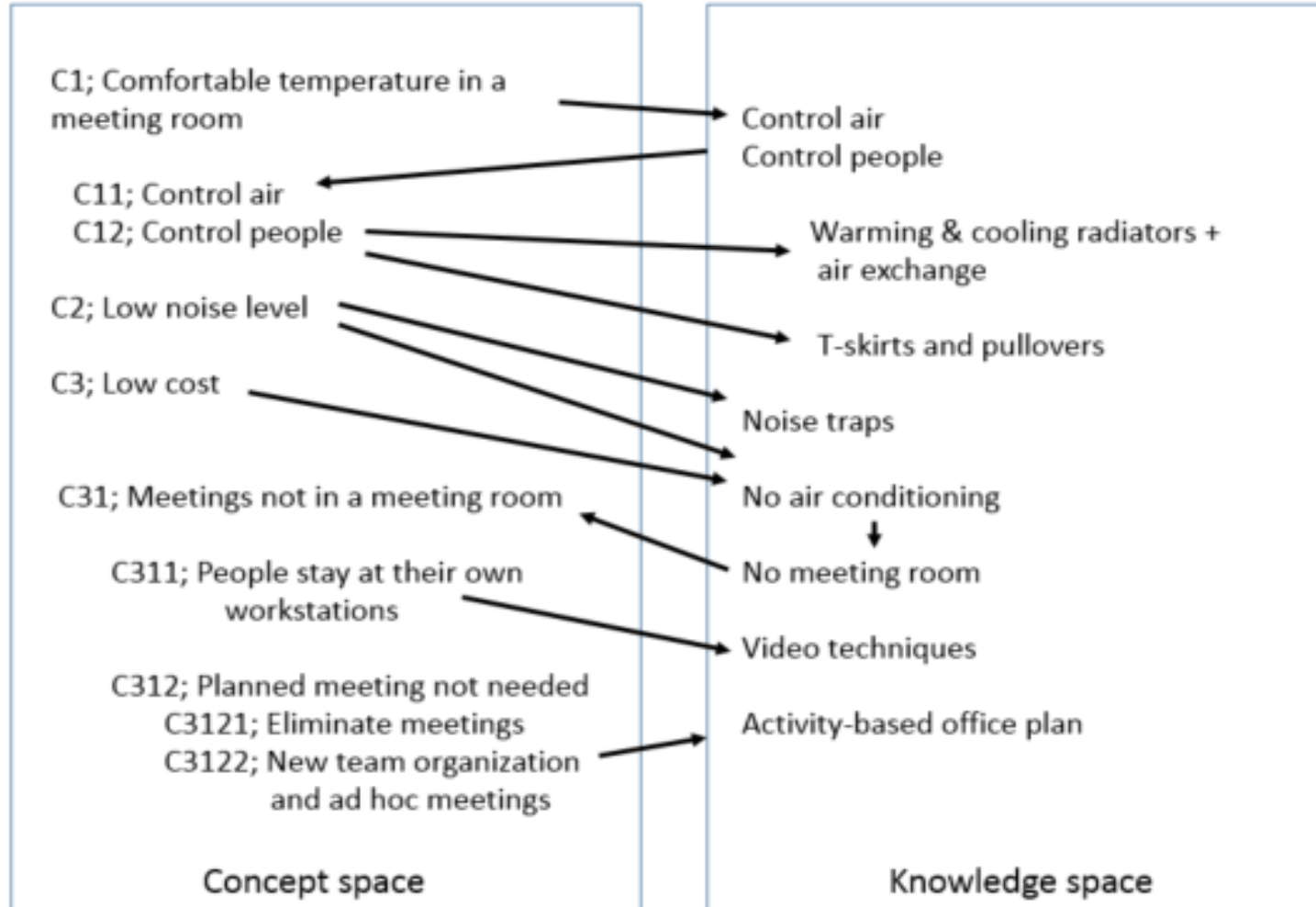
Axiomatic Design (Nam Suh)

Reducing complexity



C-K Theory (Hatchuel)

Bearing Complexity



Programming. Wicked Problem. Commitment.

Wicked problem does not have a stopping rule. When is it ready?

Commitment making is a crucial part of production

Project management also require purpose (Simon 1996). Steering the complex systems can be understood as complexity management added with goal and purposeful behavior. Goal can normally be derived from customer's strategy (Pennanen 2004). The result of business is a satisfied customer, conceptualization of production must incorporate the customer. Goal(s) should be specific, realistic and measurable.

Programming. Wicked Problem. Commitment.

Affective commitment making

- Support and stimulate strategic and operative managers to participate in decision making
- Decentralize the decision making to the levels where responsibilities are met
- Be transparent in terms of information handling. Decisions made by one affect to others possibility to make decisions
- Tread all information equitably, regardless of its origin

Target Costing

- Target cost
 - Outline the product's concept and mission
 - Generate specifications for the product's performance
 - Define product target cost
- Design
 - Design to the targets (mission, performance, cost)
- Project management also require purpose (Simon 1996). Steering the complex systems can be understood as complexity management added with goal and purposeful behavior. Goal can normally be derived from customer's strategy (Pennanen 2004). The result of business is a satisfied customer, conceptualization of production must incorporate the customer. Goal(s) should be specific, realistic and measurable.

Dialogue, business vs. construction

- **Allowable cost**

- a cost that the customer is willing to pay to get facility with defined performance
- Defined by customer (business plan, ROI, maximum funding)

- **Expected cost**

- a cost if the facility were provided at the current best practices
- Defined by the project team (Project/ construction managers, designers, facility planners...)

In the literature there are two types of target cost (Tanaka 1989). They should be defined before start of design

Project Level Target Cost

- Handles customer demands

Component Level Target Cost

- Assigns target cost to the systems
- Enables rapid estimation

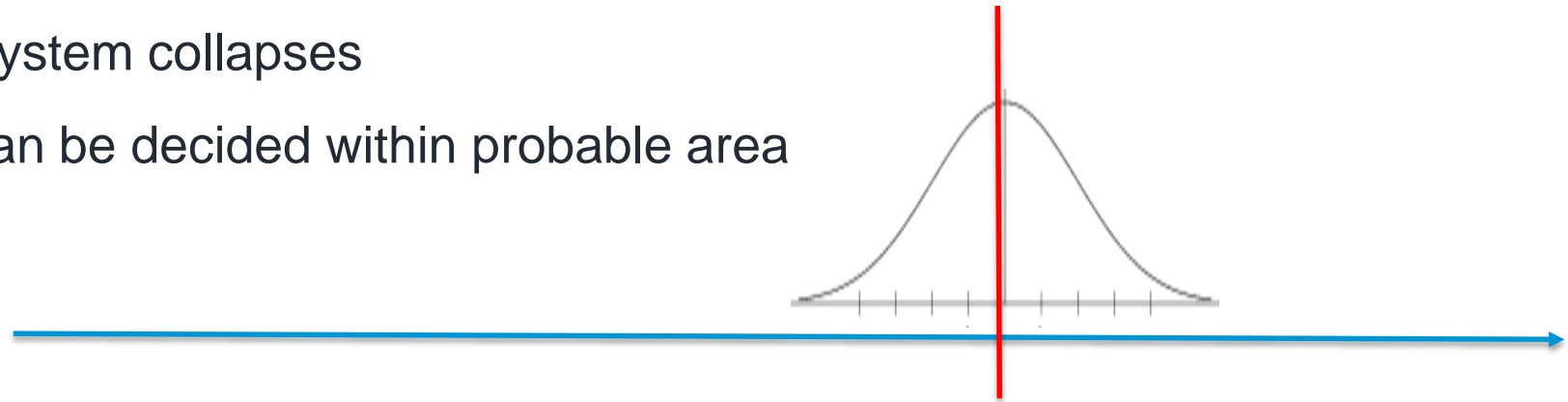
Rapid Estimates

Dialogue, Bim prior design vs. Bim

- Present BIMs do not support strategic decision making (fast feedback)
- As CAD BIMs start from 0% content of quantities,
- BIM prior design starts from 100% content of quantities
- BIM prior design simulates design process.

Project Level Target Costing

- Measurable Quality can be expressed in project definition
- Modeling (TAKU® in Haahtela)
- Target Cost (steering range) has to be defined within the probable area
- Otherwise the system collapses
- Steering area can be decided within probable area



300 000 €

300 000 000 €



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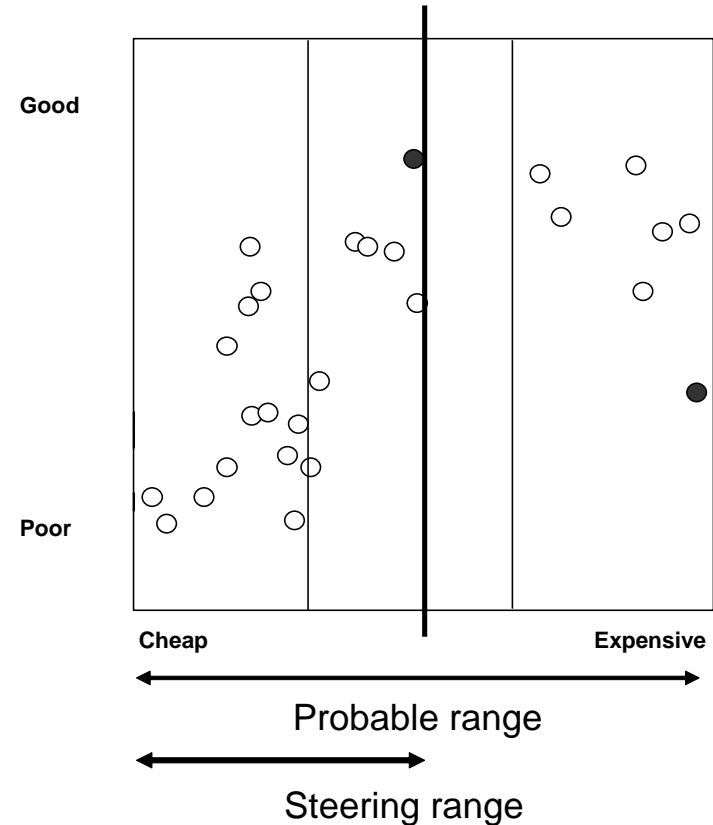
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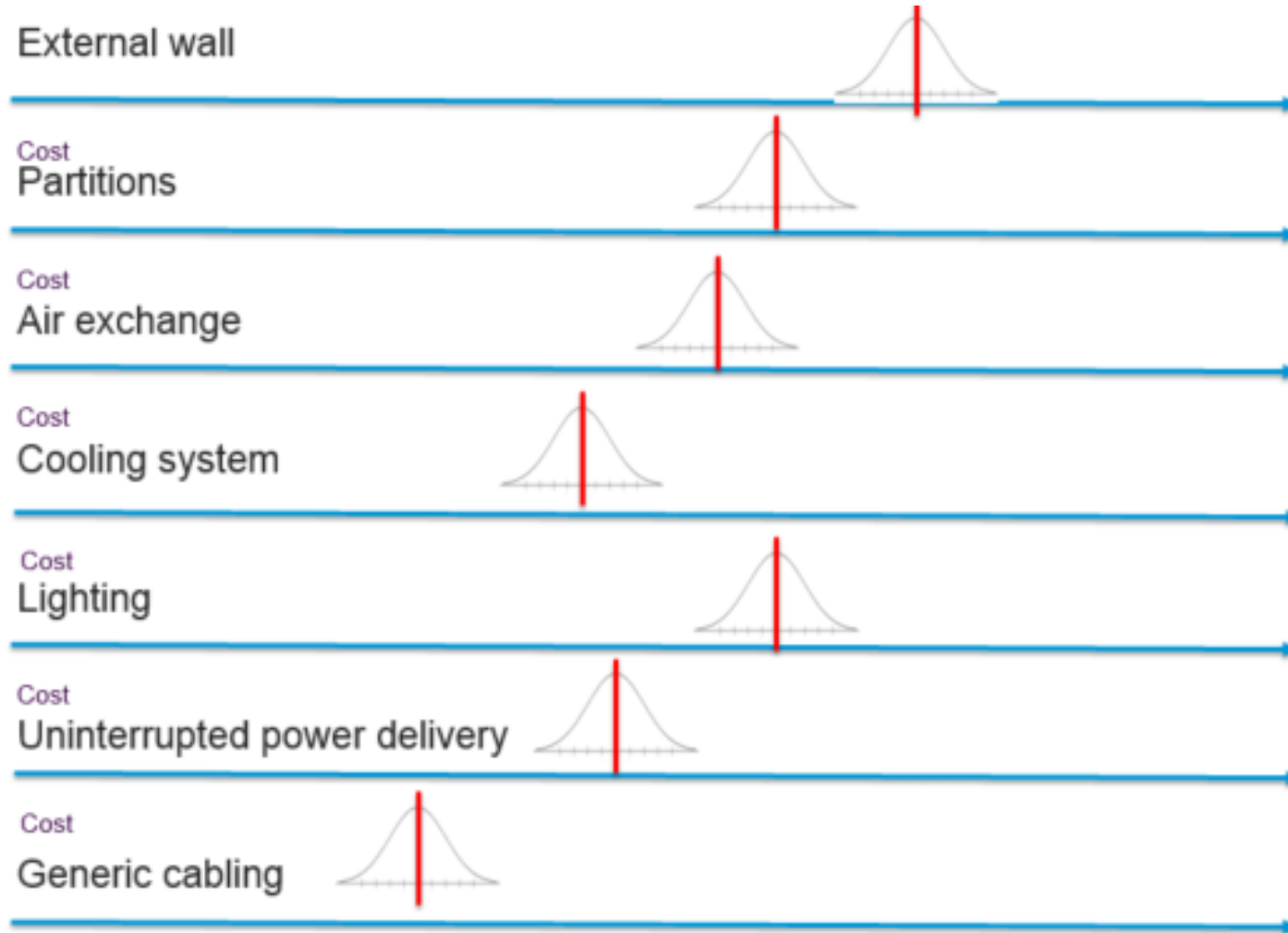
12.8.
2015

Project Level Target Costing

- Measurable Quality of the Project can be expressed in project definition
- Basis of Steering the Customer
- Iteration
- Complexity management
- Complex social systems



Component level target costing

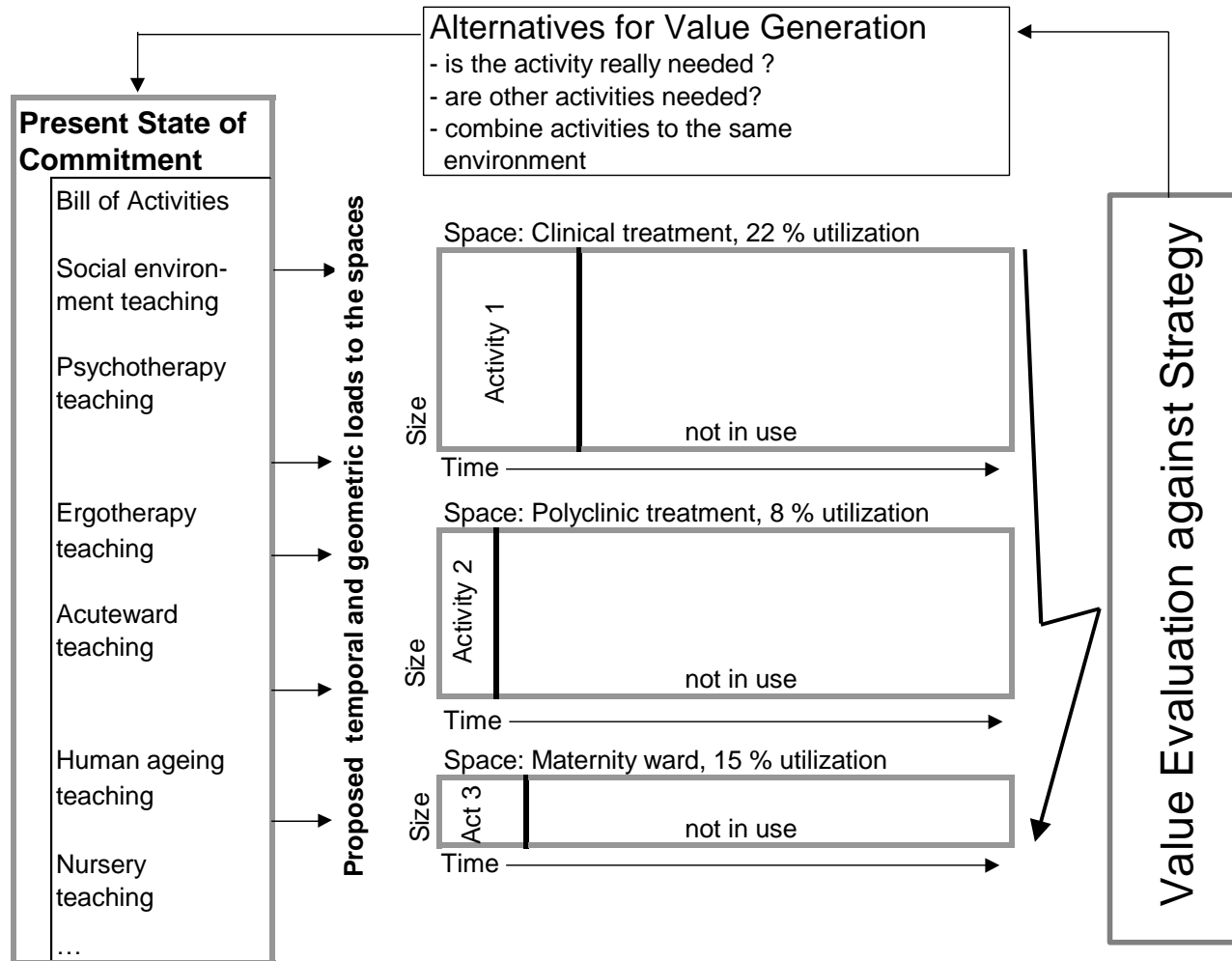


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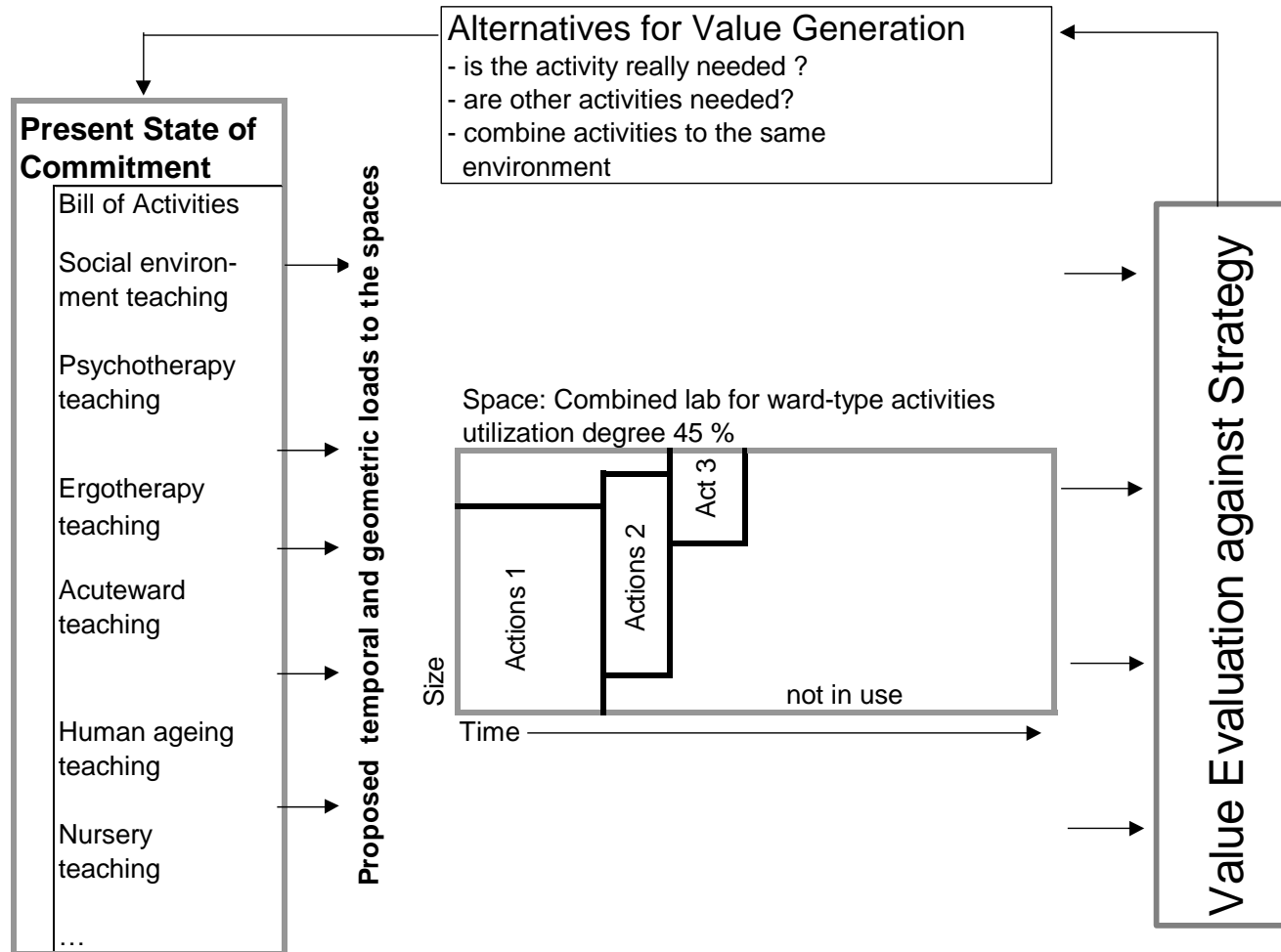
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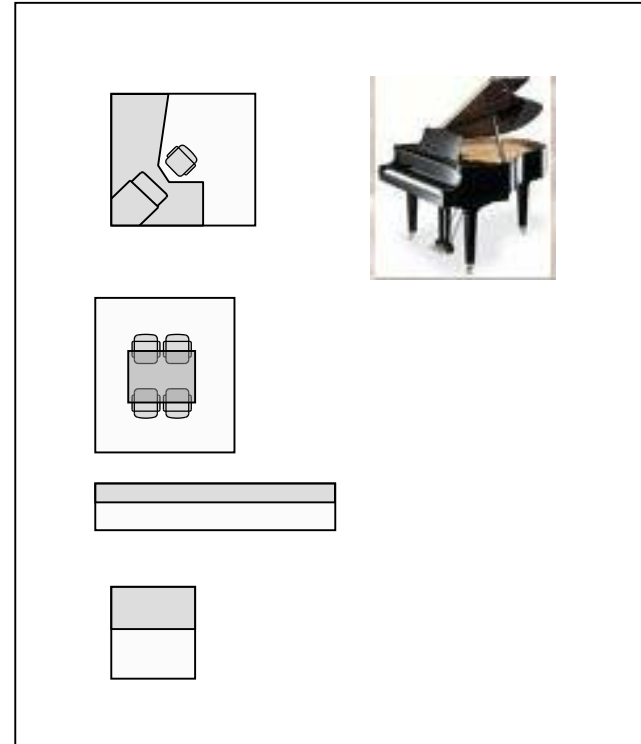
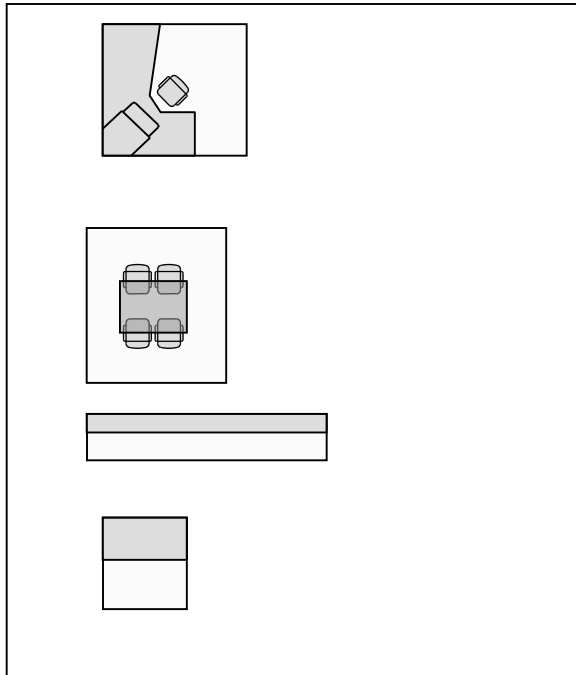
Flow concept; Activity Modeling



Activity Modeling



Transformation concept



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Project Level Target Cost, Feedback

Haahtela

TAKU®

v. 10b262e

Settings

?

i

Logout

TILAMITOITUS

San Francisco

ARIN KOHDE

Show

New build price

Sizing

Circulation, Facility serv... (4)

Create

Activities

Preferences

Design model

Land

Reference level

Description

m² in total

€/m²

€

▶ Non-territorial office

10 104,0

2 217,0

22 398 289,0

▶ Surgical and other procedures unit

1 493,5

3 150,0

4 703 902,0

▶ Car park

2 805,0

987,0

2 769 606,0

▶ Common functions

1 697,5

1 591,0

2 701 599,0

▶ Structures

1 604,4

Spaces

966 pcs

Net area

15,542 rom²

Usable area

16,100 usm²

Gross area

17,704 grm²


















Square meter price

2,023 €/usm²

Total price

32,573,396 €

Transparency, Dialogue, Flow

ACTIVITIES				
Description		Quantity	Driver	Co-driver
▼ Non-territorial office			600 persons	1 not in use
▶ Composing			210 persons	10 % work out...
▶ Organizing			60 persons	25 % work out...
▶ Researching			90 persons	5 % work out...
▶ Mobile work			30 persons	60 % work out...
▶ Processing			210 persons	7 % work out...
▶ Customer service			180 visitors/day	600 workstations
▶ Personnel activities			600 persons	60 pers./servic...
▼ Surgical and other procedures unit			2 500 procedures...	250 shifts (8 h) ...
▶ Procedures			15 procedures...	2 h/procedur...
▶ Registration and preparation			15 procedures...	80 % patients ...
▶ Discharging			11 outpatients...	3 h monitori...
▶ Knowledge work			47 pers./shift (...)	250 shifts (8 h) ...
▶ Institutional service			15 procedures...	1 not in use
▶ Personnel activities			47 pers./shift (...)	250 shifts per y...
▼ Car park			100 cars	1 not in use
▶ Car storage			100 cars	1 levels



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Transparency, Dialogue

► Non-territorial office				10 104,0	2 217,0	22 398 289,0
▼ Surgical and other procedures unit				1 493,5	3 150,0	4 703 902,0
▼ Leikkausosasto				1 493,5	3 150,0	4 703 902,0
▼ Toimenpidetilat	1		640,4	640,4	3 791,0	2 427 662,0
Shower room	3	9,3	28,0	28,0	4 554,0	127 464,0
Treatment room	2	15,5	30,9	30,9	3 973,0	122 845,0
Operating room	2	38,3	76,6	76,6	5 022,0	384 879,0
Operating room	3	46,1	138,2	138,2	5 886,0	813 695,0
Operating room	1	56,8	56,8	56,8	5 743,0	326 185,0
Waiting area	1	8,2	8,2	8,2	3 980,0	32 714,0
Workspace	1	9,9	9,9	9,9	3 374,0	33 404,0
Storage room	1	75,8	75,8	75,8	1 353,0	102 569,0
Storage bay (instruments a...	5	4,3	21,6	21,6	2 428,0	52 454,0



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Component Level Target Cost

Haahtela TAKU®			
BUILDING ELEMENTS San Francisco			
Sizing Sizing Sarake All (5)			
Description	Quantity	Unit price	Total price
▼ Building element			15 099 827
▶ Site			494 015
▶ Frame			4 350 089
▶ Enclosure			3 462 079
▶ Space			6 793 644
▶ Module			0
▼ Building services element			8 540 648
▶ Heat			1 111 952
▶ Water			648 410
▶ Air			1 736 923
▶ Pipe			352 648
▶ Electrical			2 313 353
▶ Data			1 674 494



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Component Level Target Cost

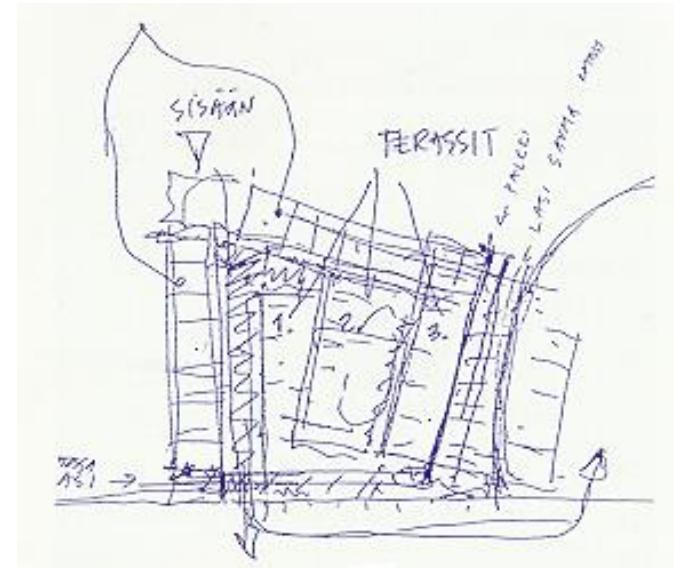
▼ Column				644 935
Pilari				644 935
Steel column, 20 kg/m, tot. 168 m	3 364 kg	3,58		12 041
Steel column, 134.64 kg/m, tot. 1637 m	220 366 kg	2,87		632 894

▼ Heating				879 585
Tuoterakenne				879 585
Heat generation, district heating	1 pcs	47 481		47 481
Heating terminal unit	1 016 pcs	397		403 783
Heating piping	8 447 m	51		428 321

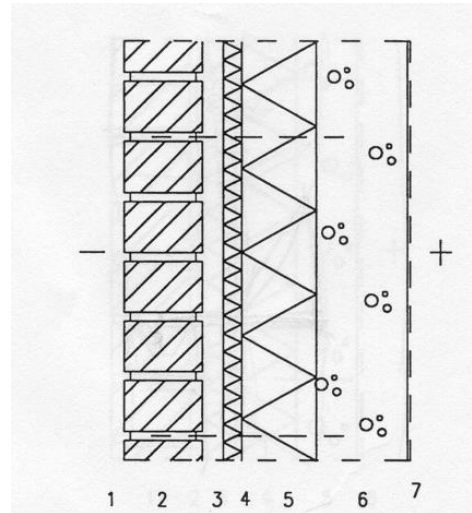
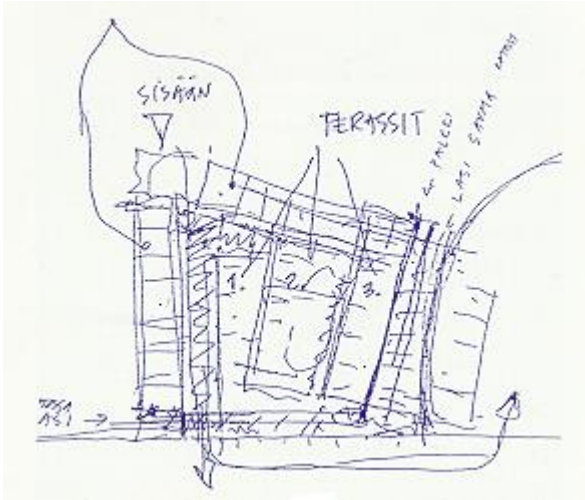
Description	Quantity	Unit price	Total price
Panel radiator, 400 W	55 pcs	217 €/pcs	11 959 €
Panel radiator, 450 W	8 pcs	174 €/pcs	1 388 €
Panel radiator, 400 W	108 pcs	166 €/pcs	17 931 €
Panel radiator, 300 W	11 pcs	166 €/pcs	1 826 €
Fan coil unit, wall mounted, heati...	2 pcs	1 464 €/pcs	2 928 €

Decomposition of Design

- Design starts with solving connections of customer's activities and massing the building in its urban environment
- Components, like cooling beams, cooling units, switchboards and suspended ceilings are not under design.
- Designing for the customer.



Dialogue, business vs. construction



Designing for production and contractors



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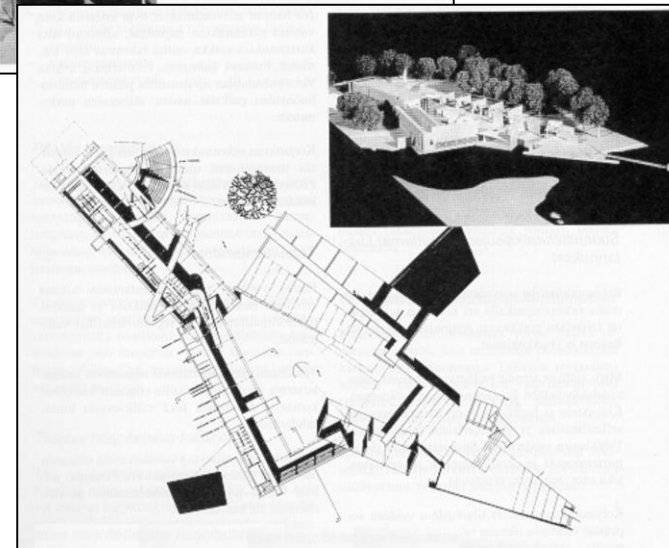
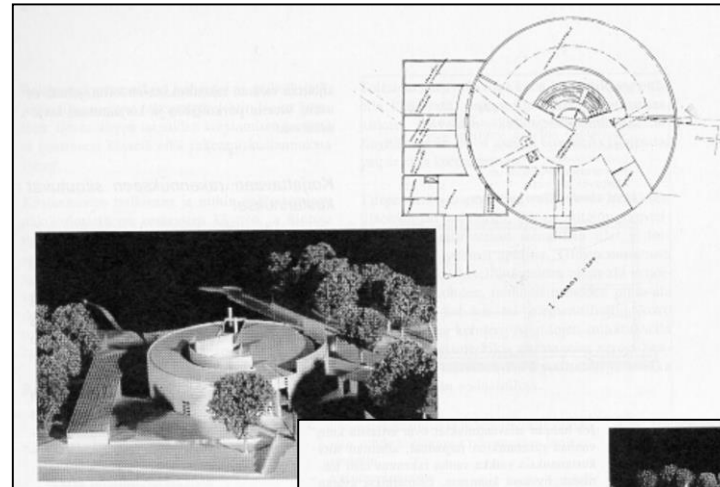
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What is real or right? Defending Champion

Defending Champion is right until it is proved to be wrong. Diversity of design and control.

Scope of the elements		Unit price (€)
...		
Piling, 30 * 30	5300 m	30
...		
Foundation bases		
- framework	1630 m2	25
- reinforcing	65000 kg	2
- concretework	820 m3	120
...		
Beams		
- steelbeam, 90 kg/m	36500 kg	2
...		
Slabs		
hollow core slabs 400	19915 m2	80
...		
Cooling apparatus	800 kW	300
Taps	430 pc	800
Air inlet fans (4 m3/s)	13 pc	+20000
...		
Luminaires		
Switchboards		
...		



External wall

Cost
Partitions

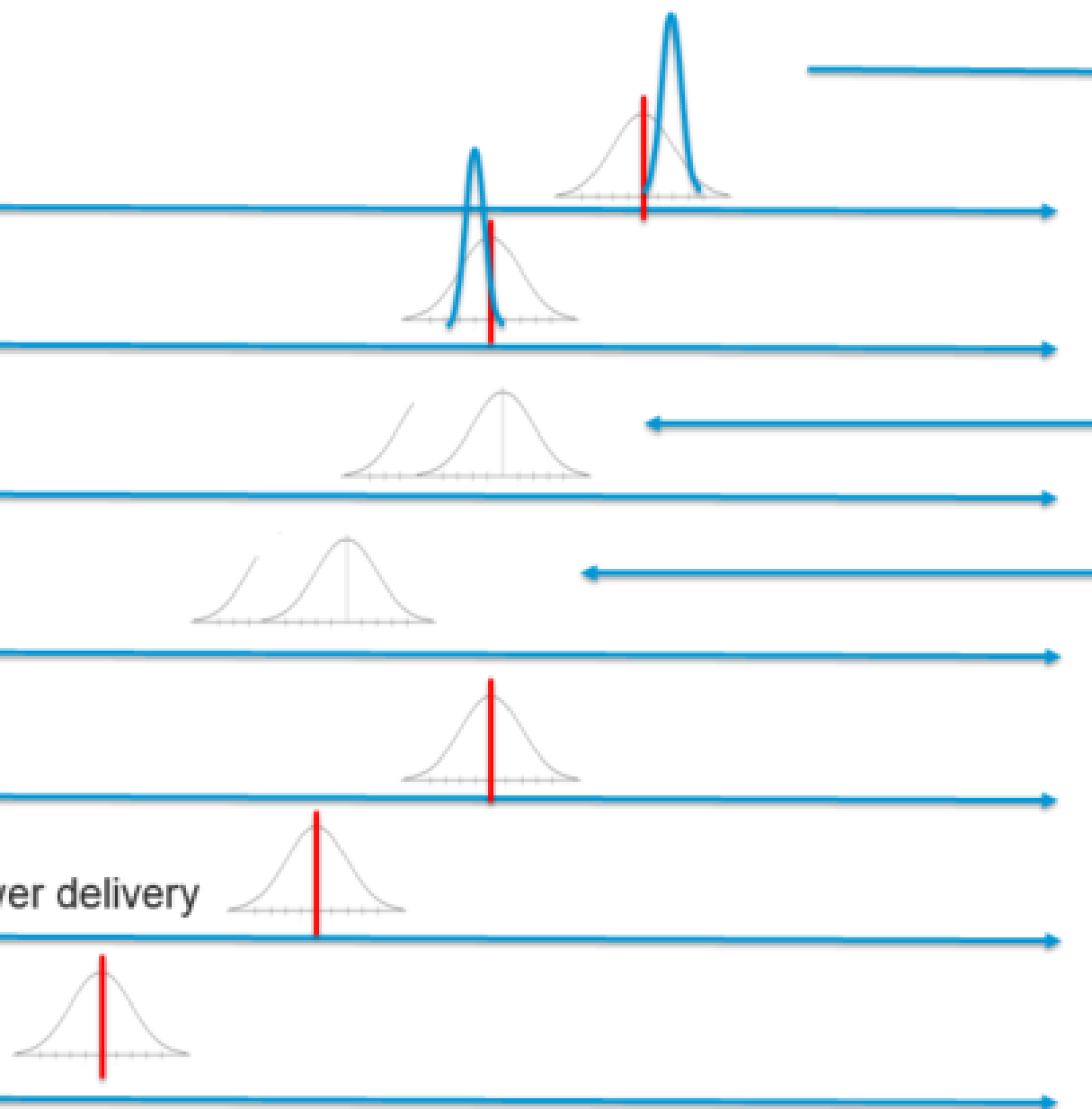
Cost
Air exchange

Cost
Cooling system

Cost
Lighting

Cost
Uninterrupted power delivery

Cost
Generic cabling



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The new Childrens's Hospital in Helsinki



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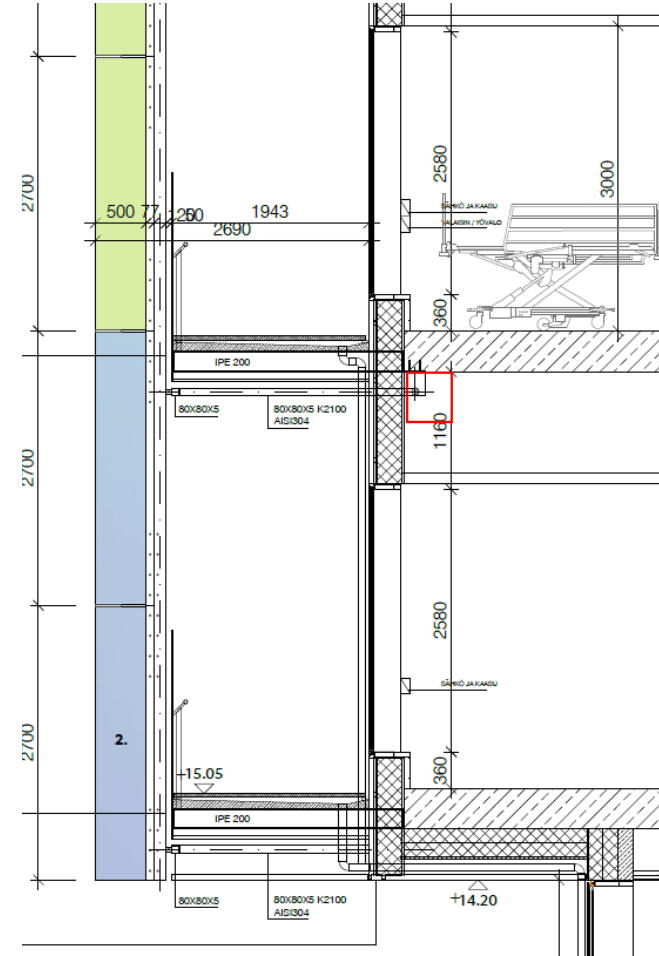
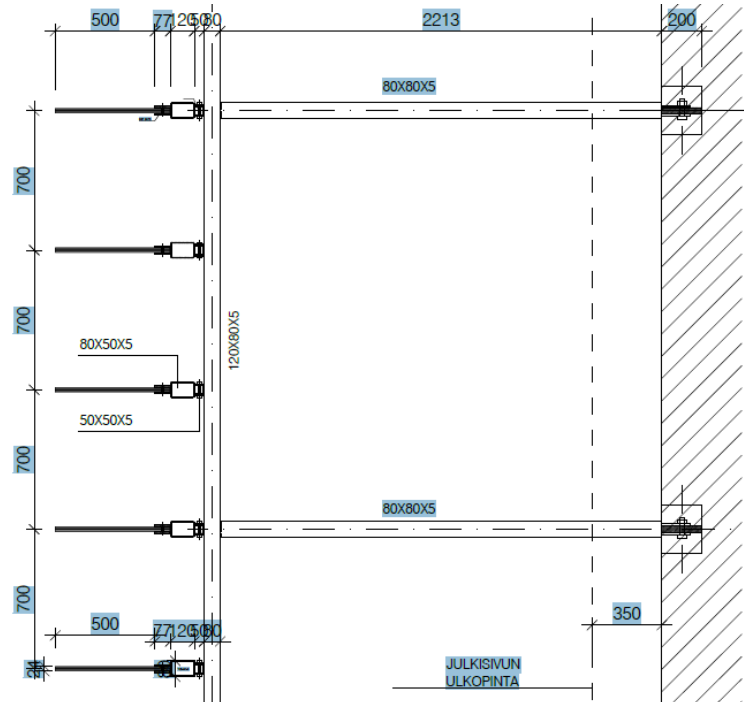
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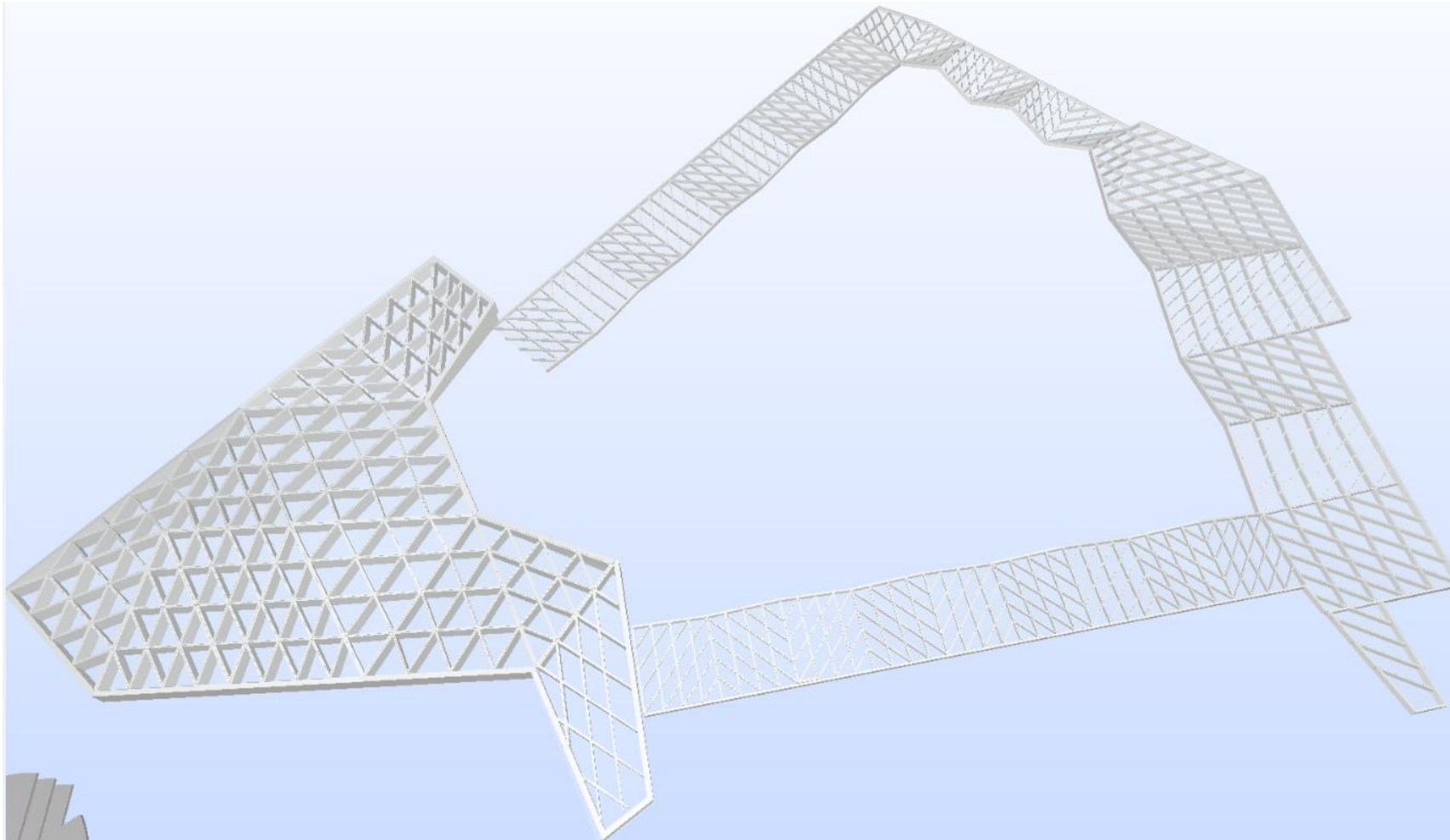
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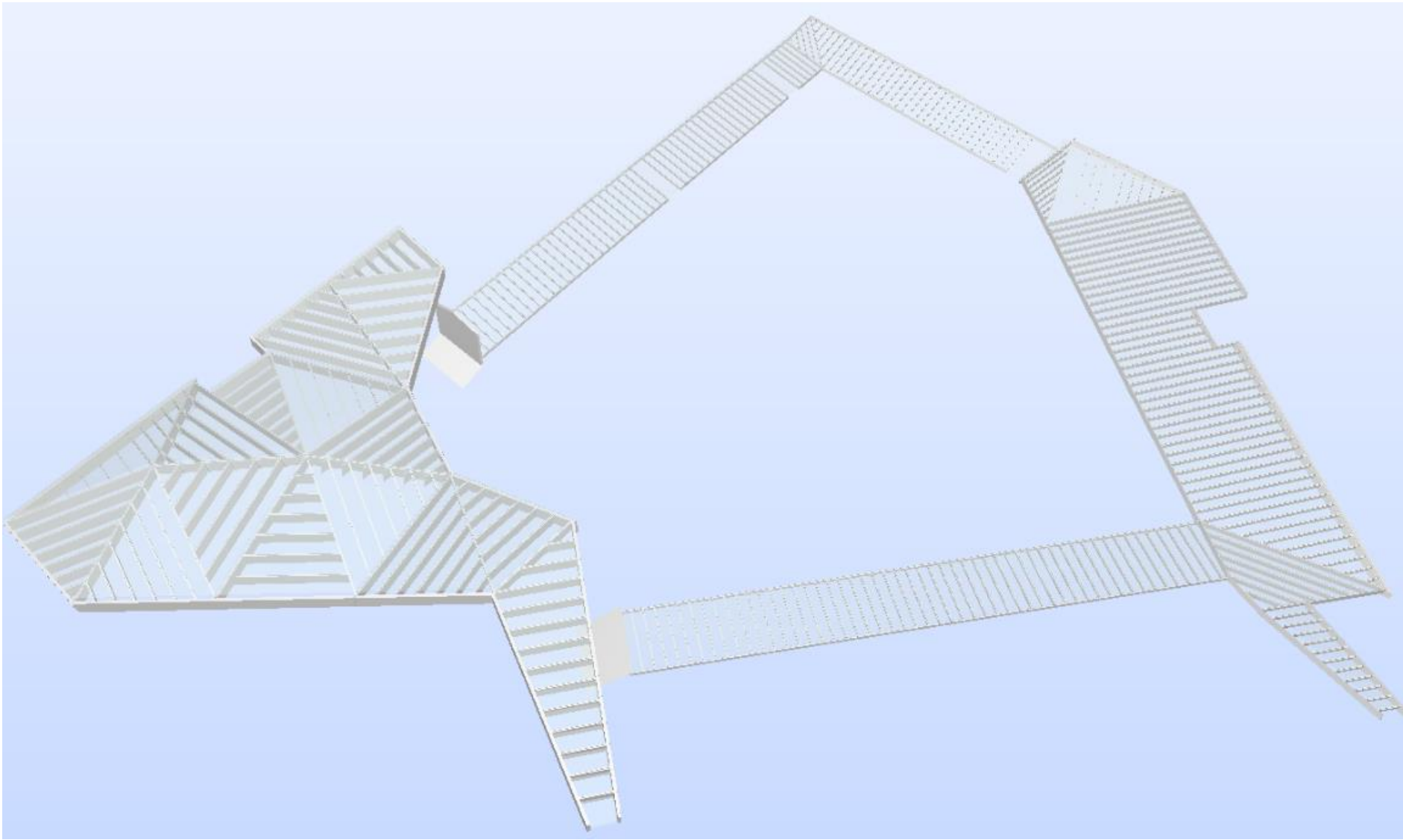
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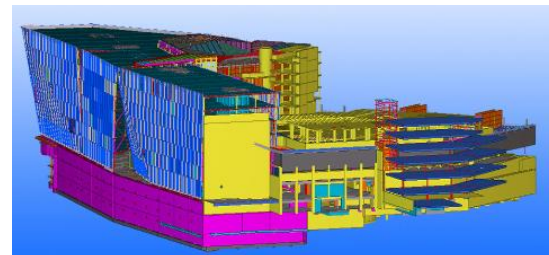
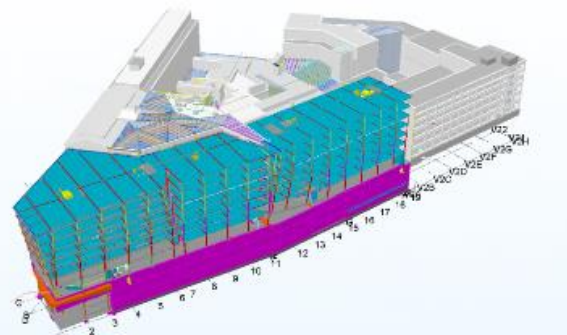
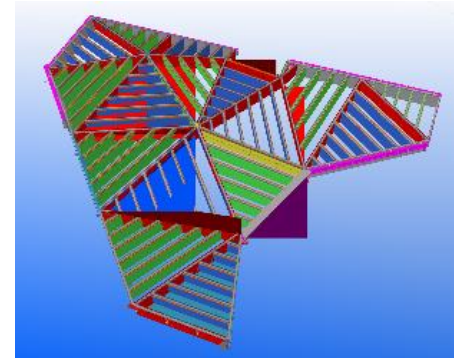
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Project and construction management
Haahtela- Group

Architecture
JKMM Architects

- OP- headquarters rehabilitation and extension 1 / 2016
- Construction is completed
 - In Target Cost (250 million euros) and time schedule
 - Nominated Tekla Total BIM Qlobal winner 2014
 - Finalist in Finlandia Prize for Architecture 2015



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The exciting and innovative buildings opening in 2018

By Jonathan Glancey

29 December 2017

Jonathan Glancey rounds up the beautiful architecture coming to a city near you in 2018.

Start the gallery >



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Amos Rex Museum, Helsinki by JKMM

Amos Anderson (1878-1961) was a Finnish Member of Parliament, proprietor of the Swedish-language



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2018

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Maximizing Success on Integrated Projects: An Owner's Guide

An Overview of the Research and Owner's Guide



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Maximizing Success on Integrated Projects: An Owner's Guide

Greg Gidez (co-chair), *Hensel Phelps Construction Co.*

Mark Konchar (co-chair), *Balfour Beatty Construction*

Howard W. Ashcraft, Esq., *Hanson Bridgett LLP*

Spencer Brott, *Trammell Crow Real Estate Services*

Bill Dean, *M.C. Dean, Inc.*

Tom Dyze, *Walbridge*

Matthew Ellis, *US Army Corps of Engineers*

Behzad Esmaeili, *University of Nebraska-Lincoln*

Bryan Franz, *University of Florida*

Diana Hoag, *Xcel Group, LLC*

Mike Kenig, *Holder Construction*

Robert Leicht, *Penn State University*

Russell Manning, *Department of Defense*

John Messner, *Penn State University*

John Miller, *Barchan Foundation, Inc.*

Keith Molenaar, *Univ. of Colorado*

Brendan Robinson, *U.S. Architect of the Capitol*

Victor Sanvido, *Southland Industries*

Ronald Smith, *Kaiser Permanente*

David P. Thorman, *Former California State Architect*

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

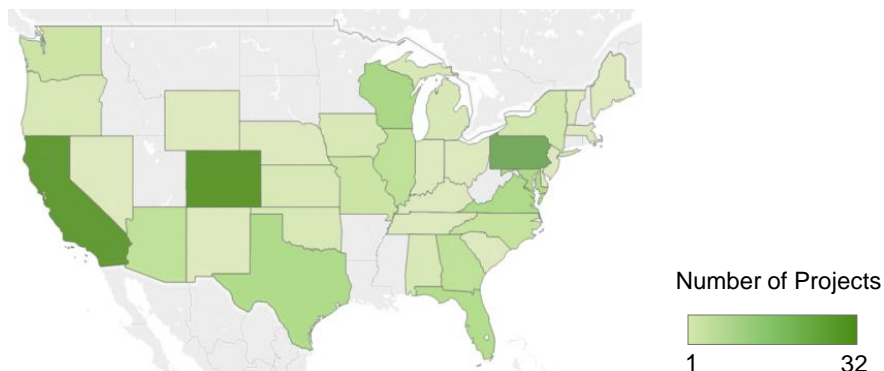
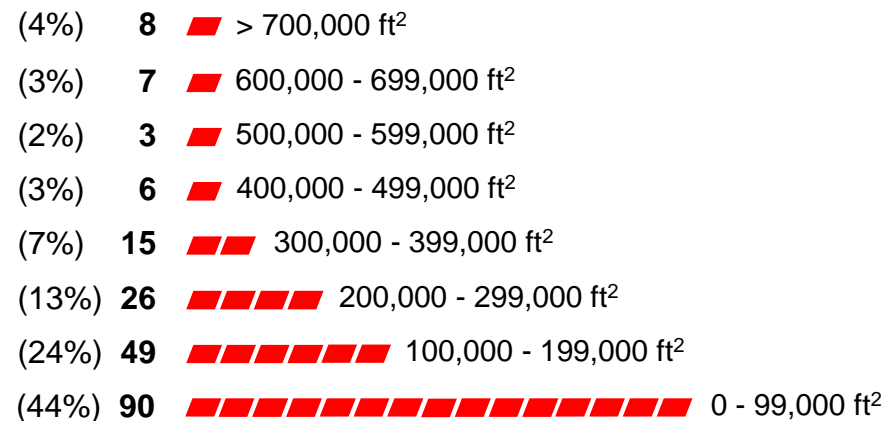
Research Motivation

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

	1998 CII	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

Project Data Characteristics

Facility Sizes



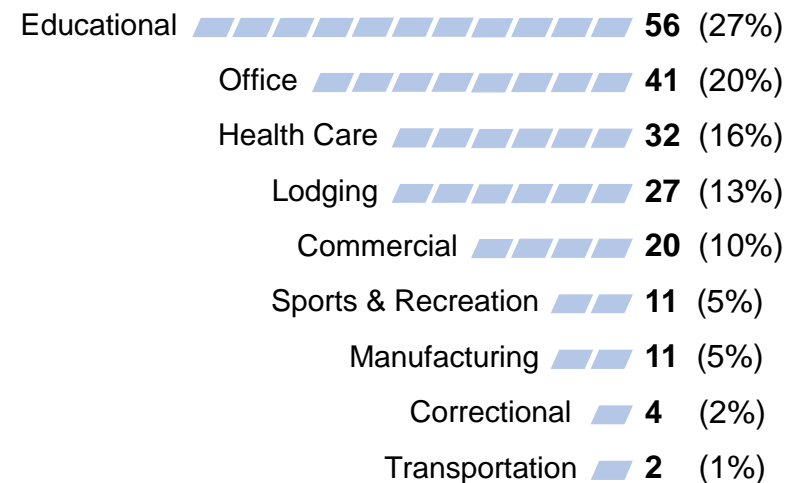
204 Projects

Public: 127 (62%)

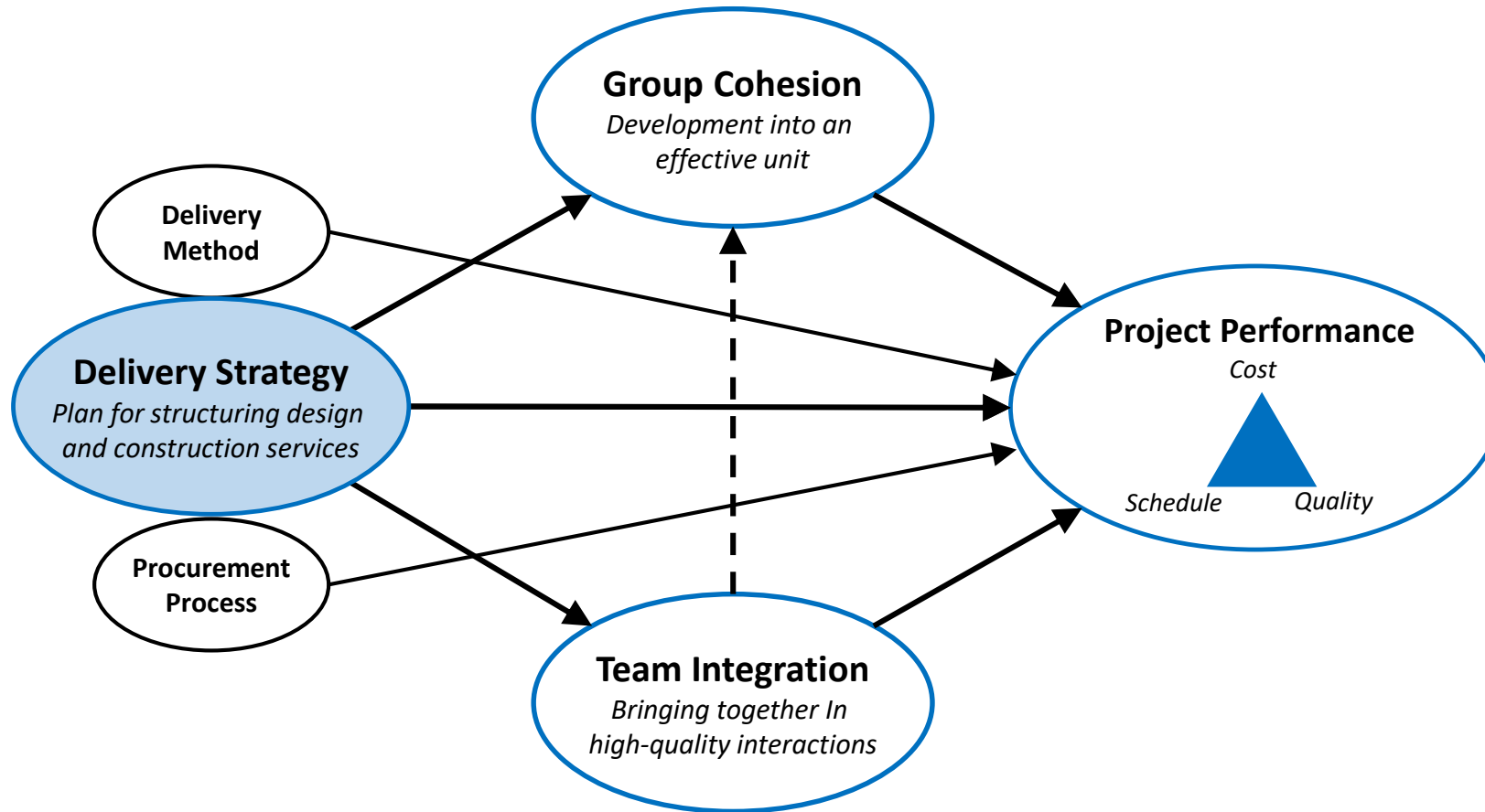
Private: 77 (38%)

Completed: 2008 - 2013

Facility Types



Framework



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

Team

Integration

Group Cohesion

Integration



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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***



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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:

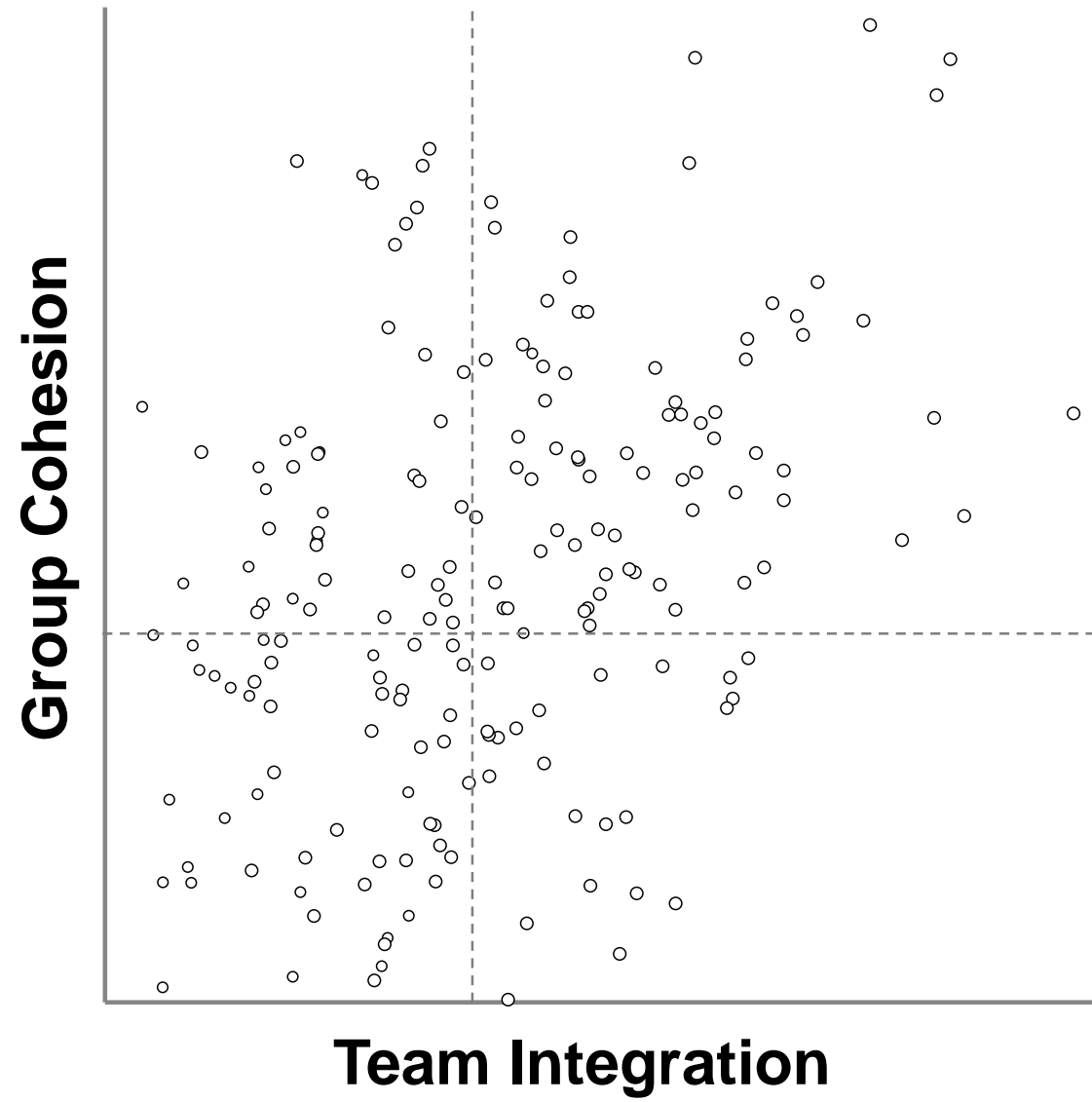
- Reduced **cost growth**
- Higher **system quality**
- Improved **turnover experience**



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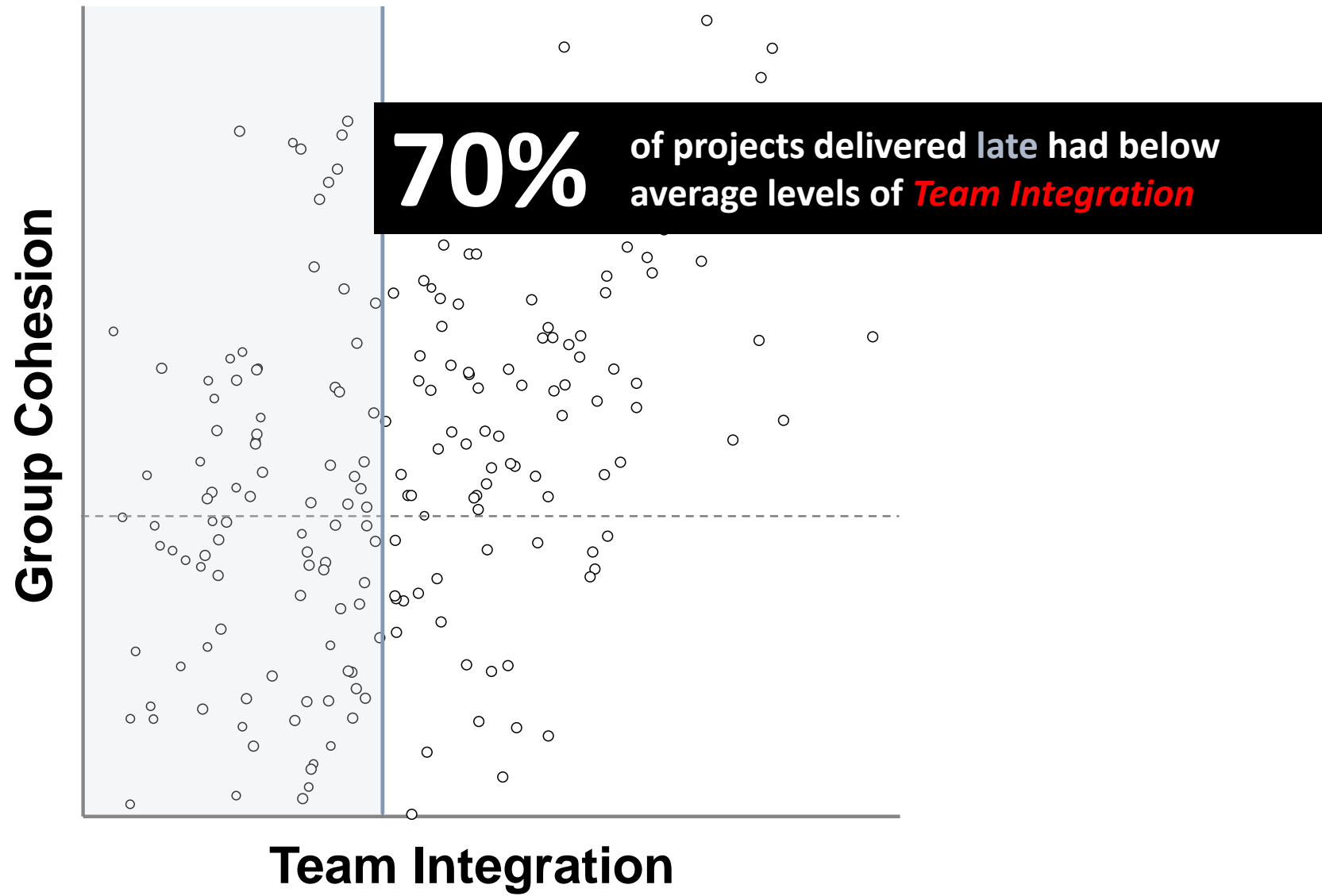
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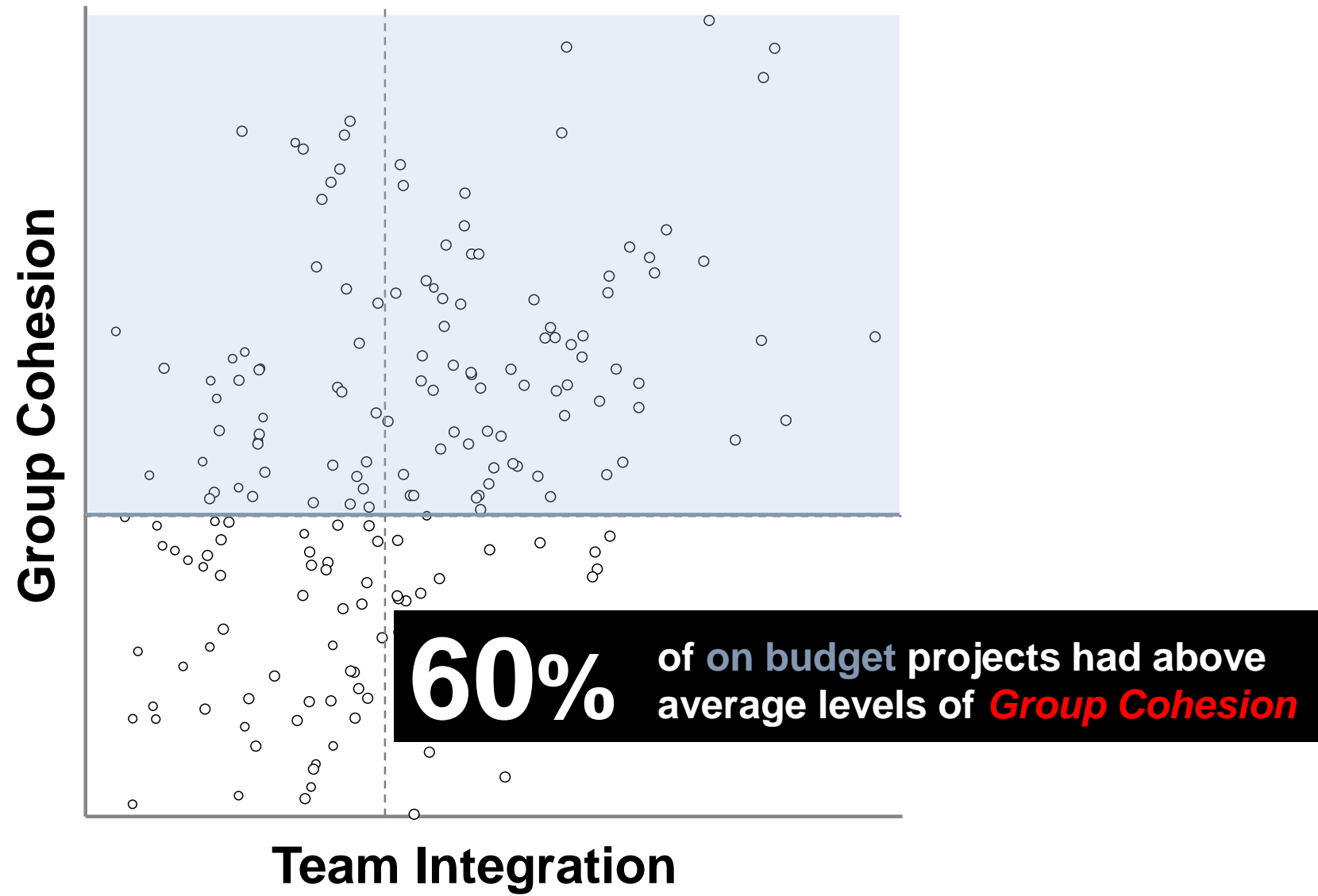
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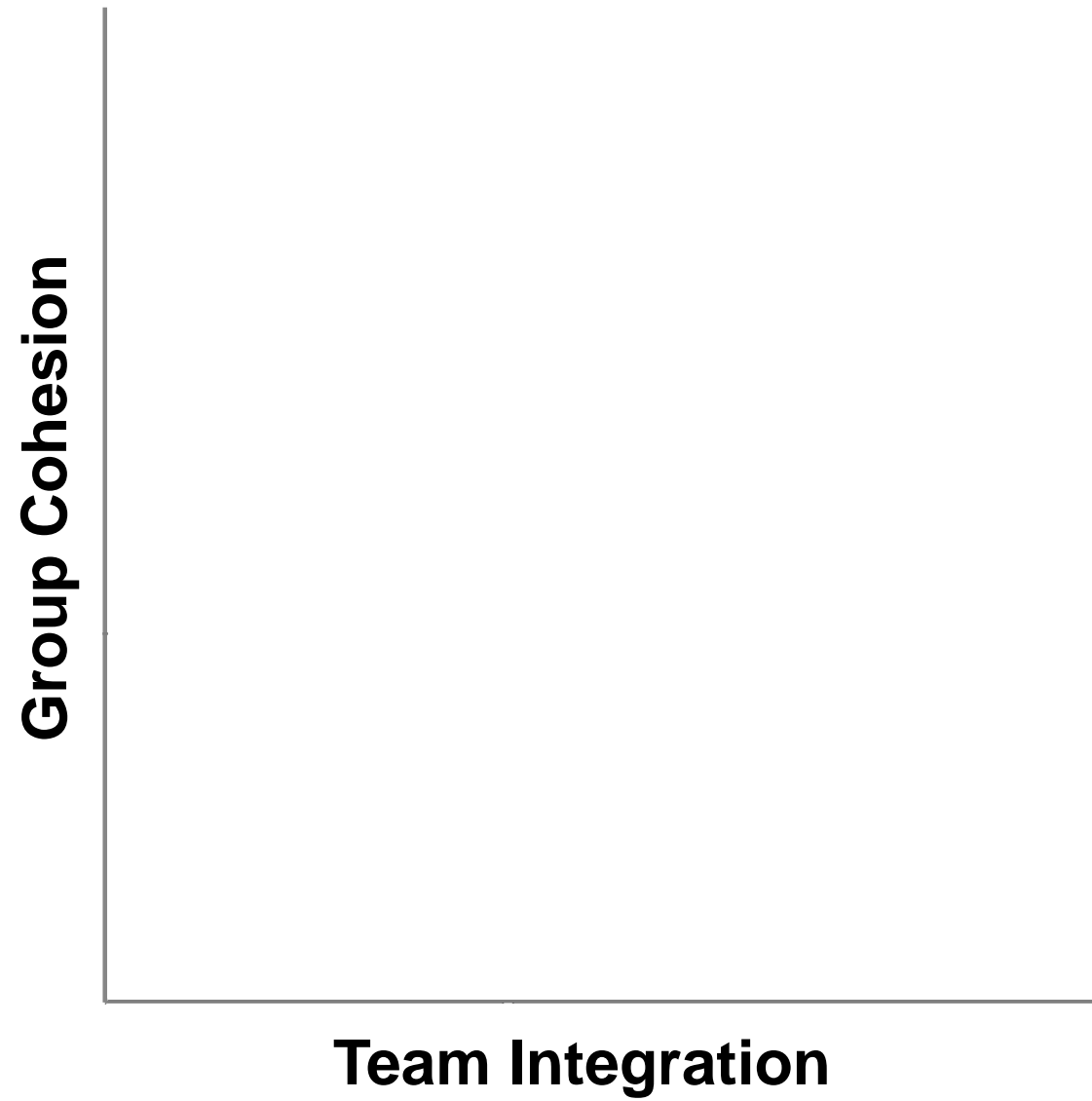
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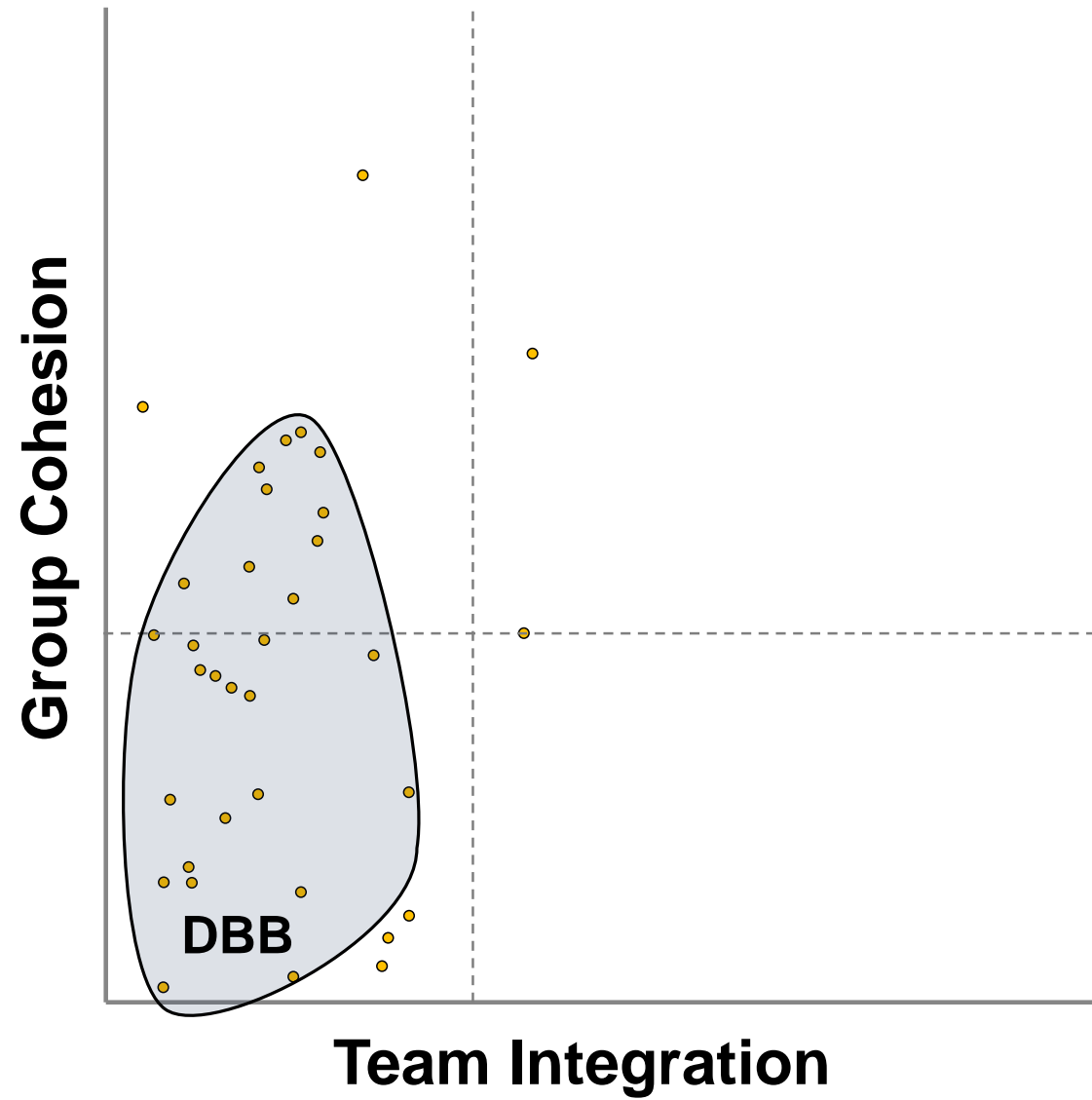
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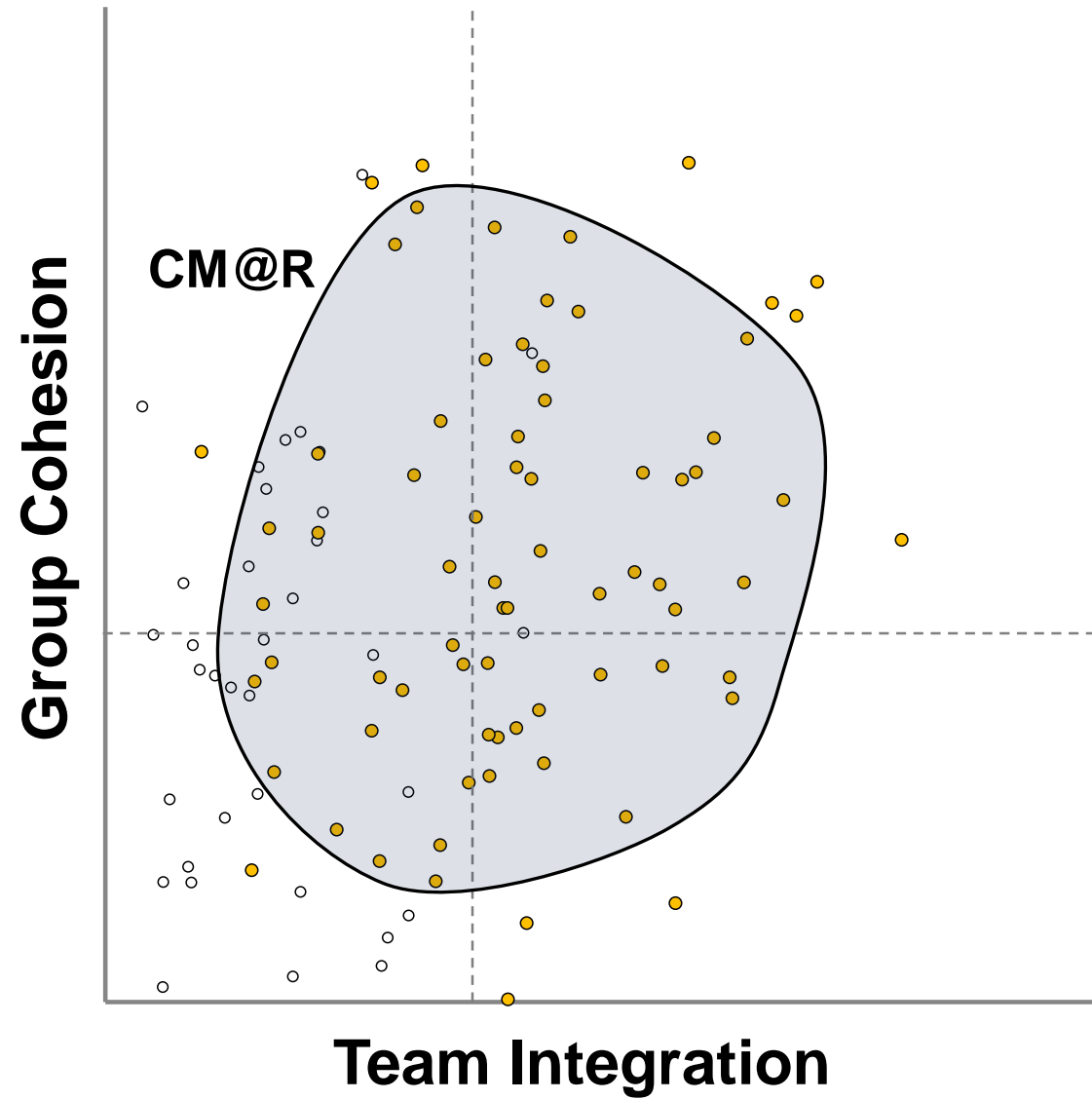
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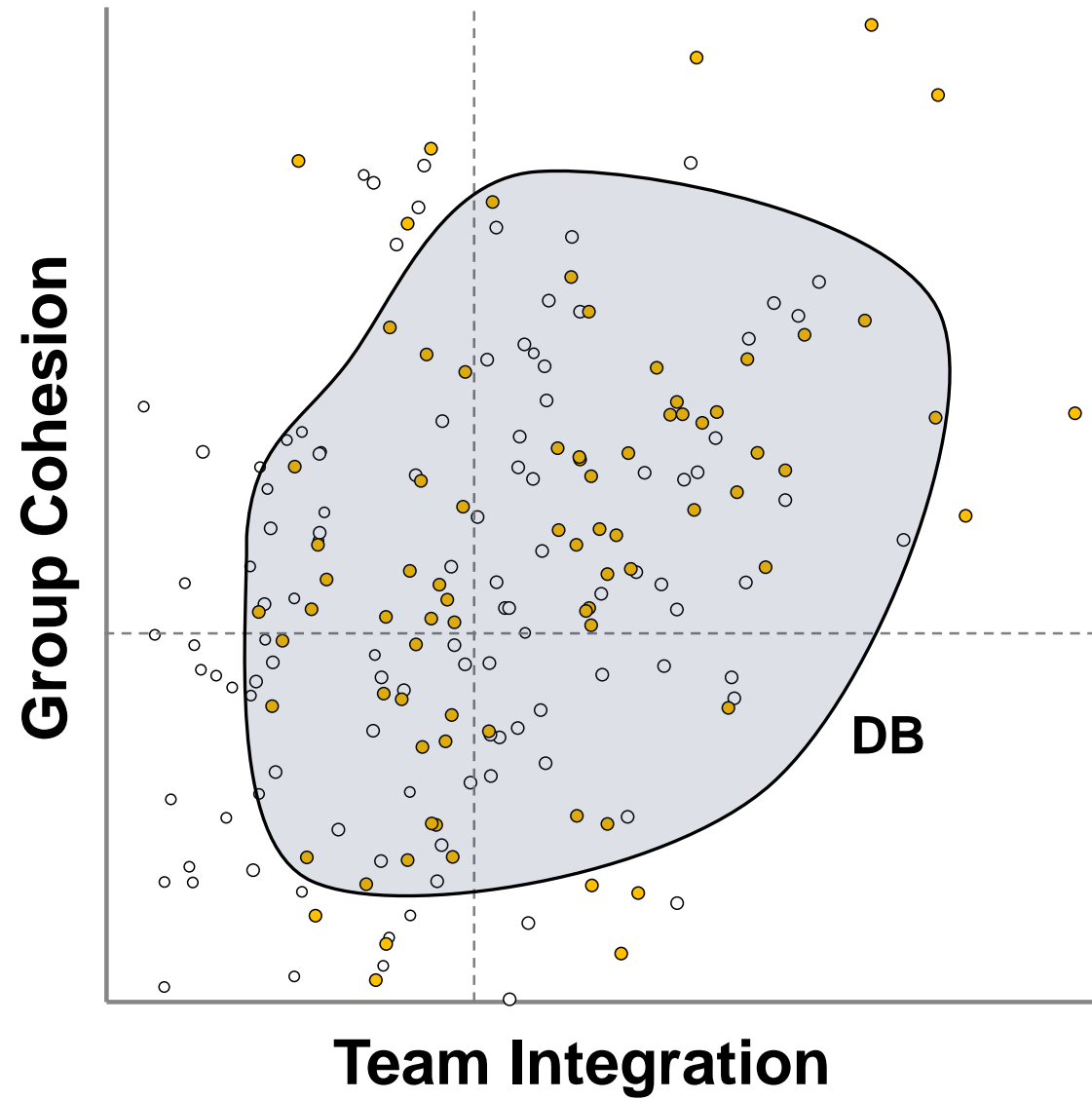
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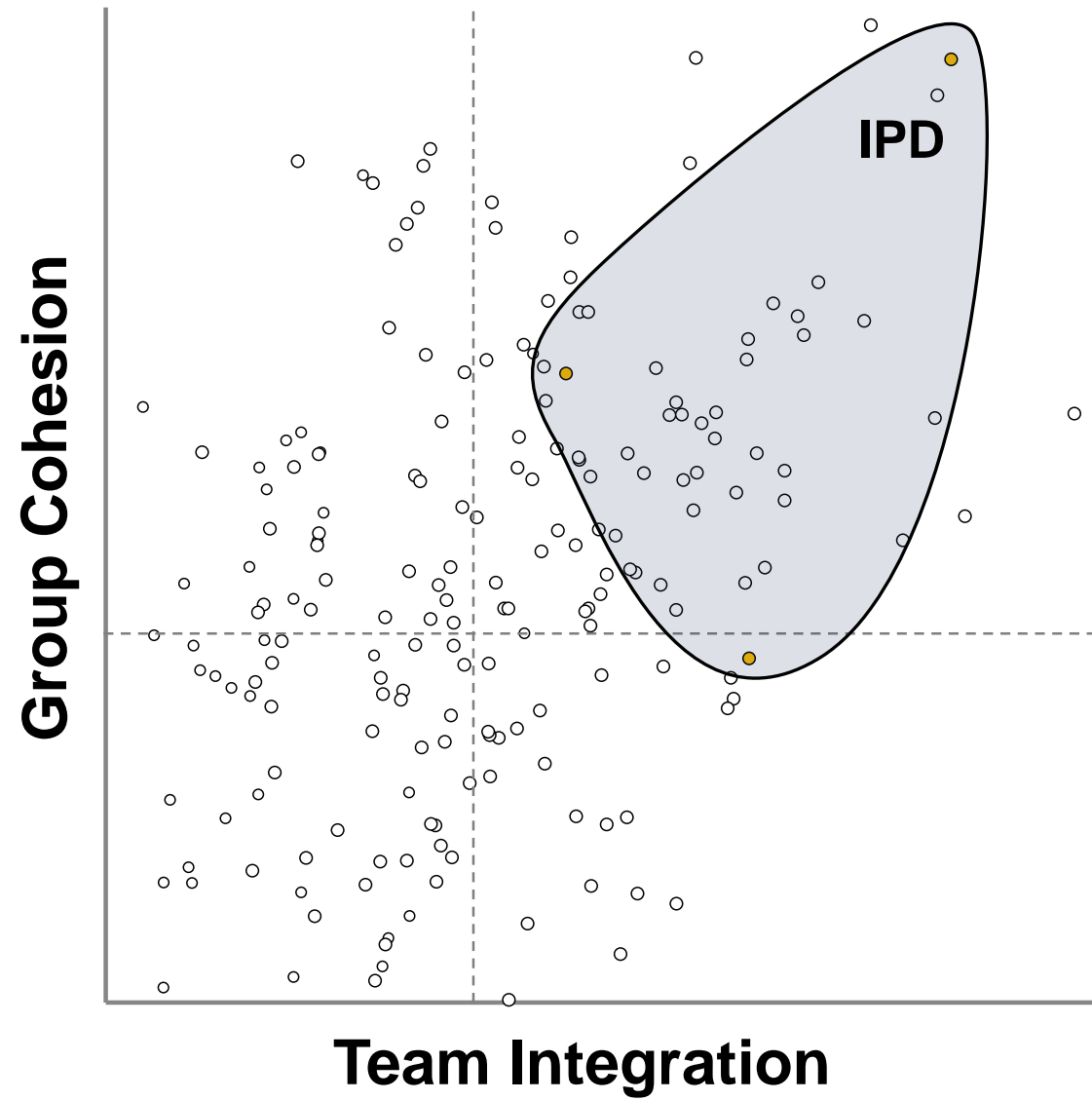
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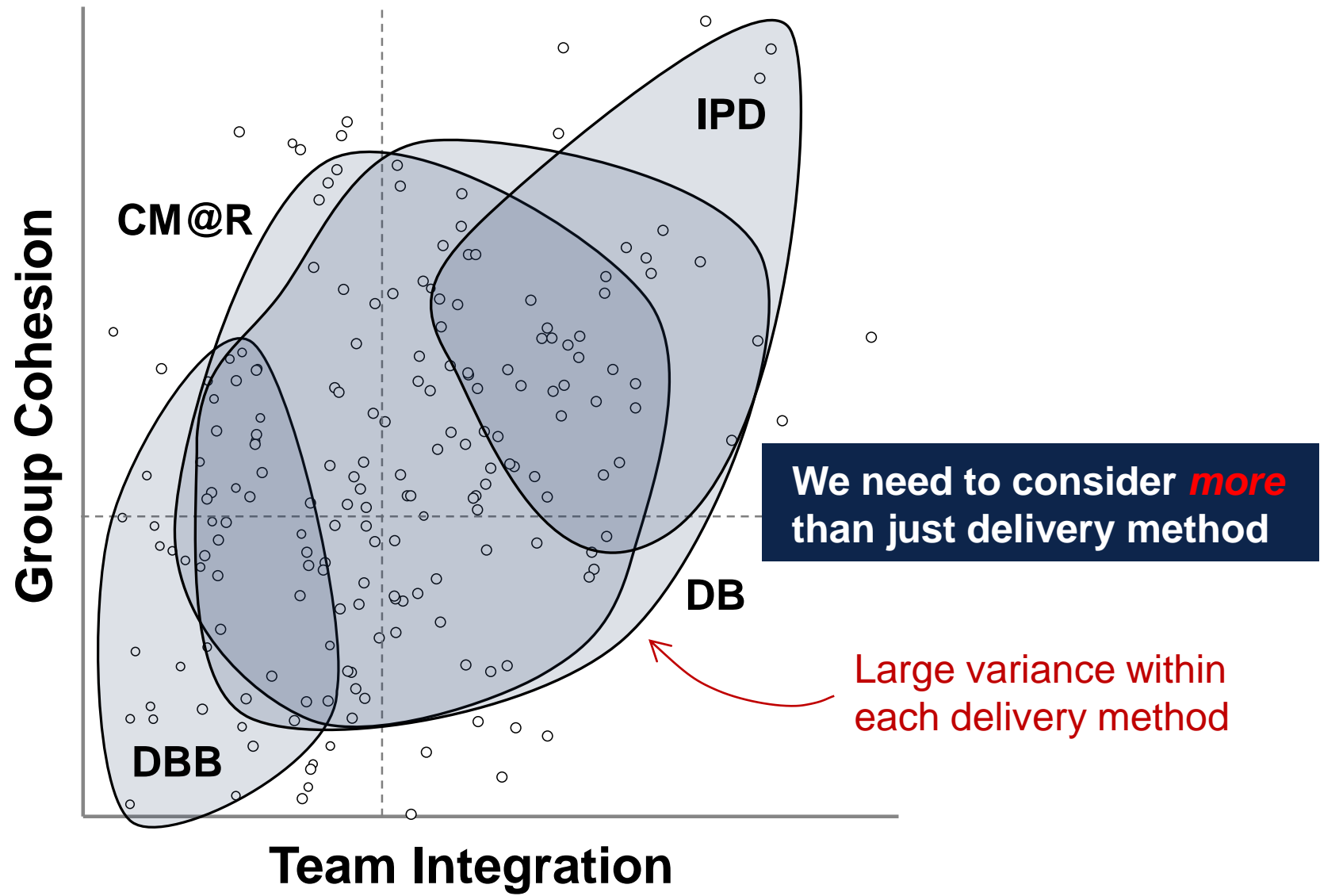
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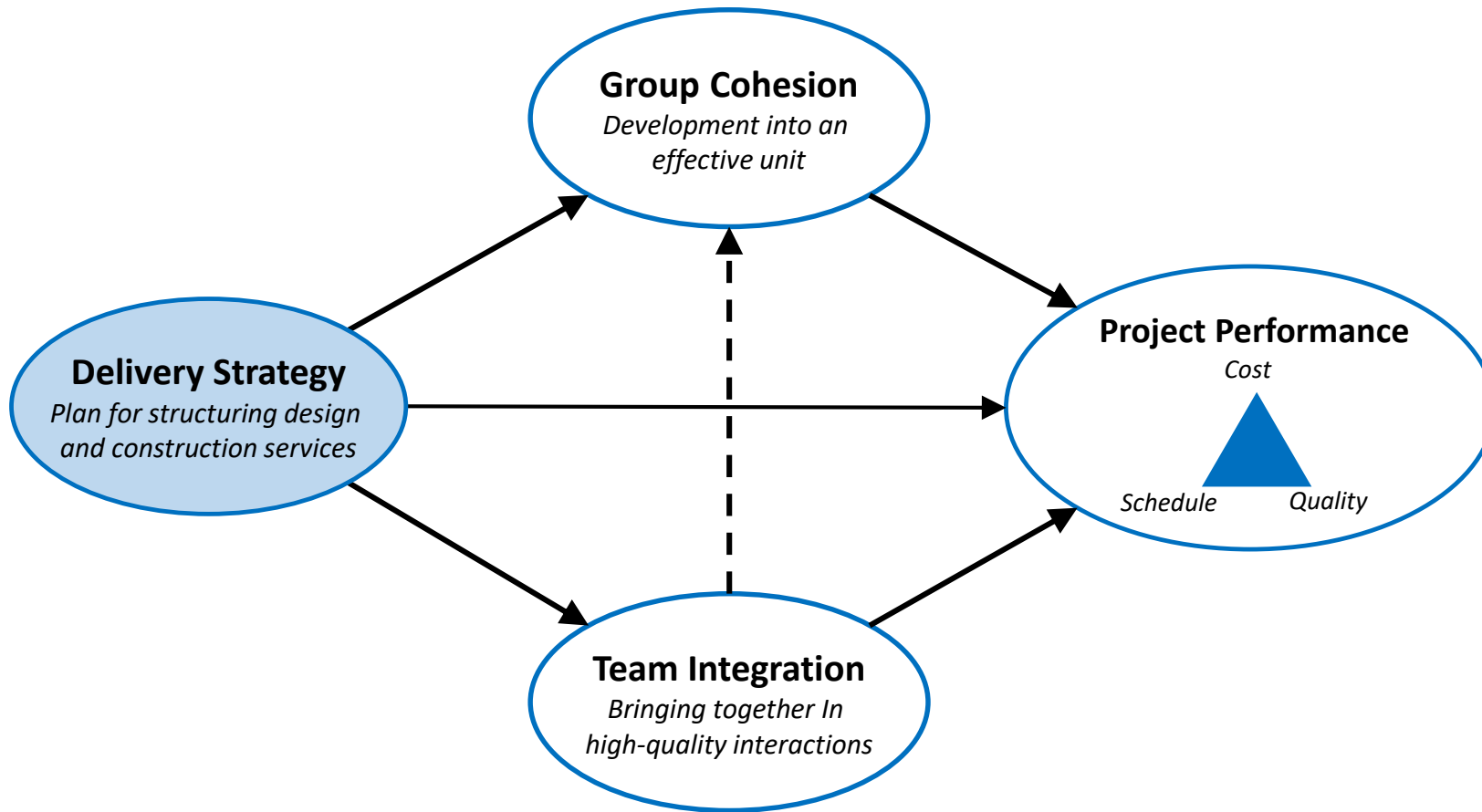


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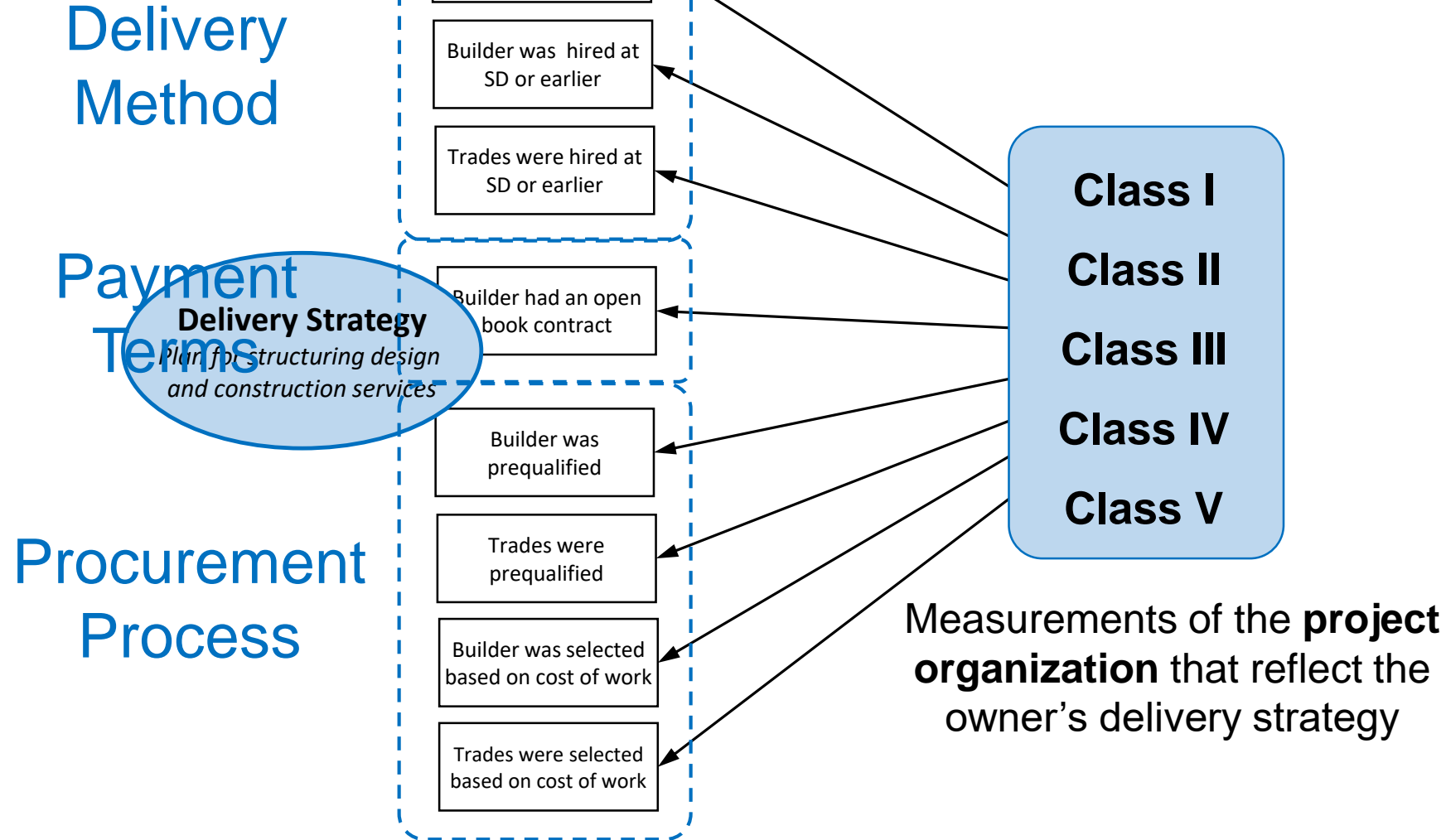




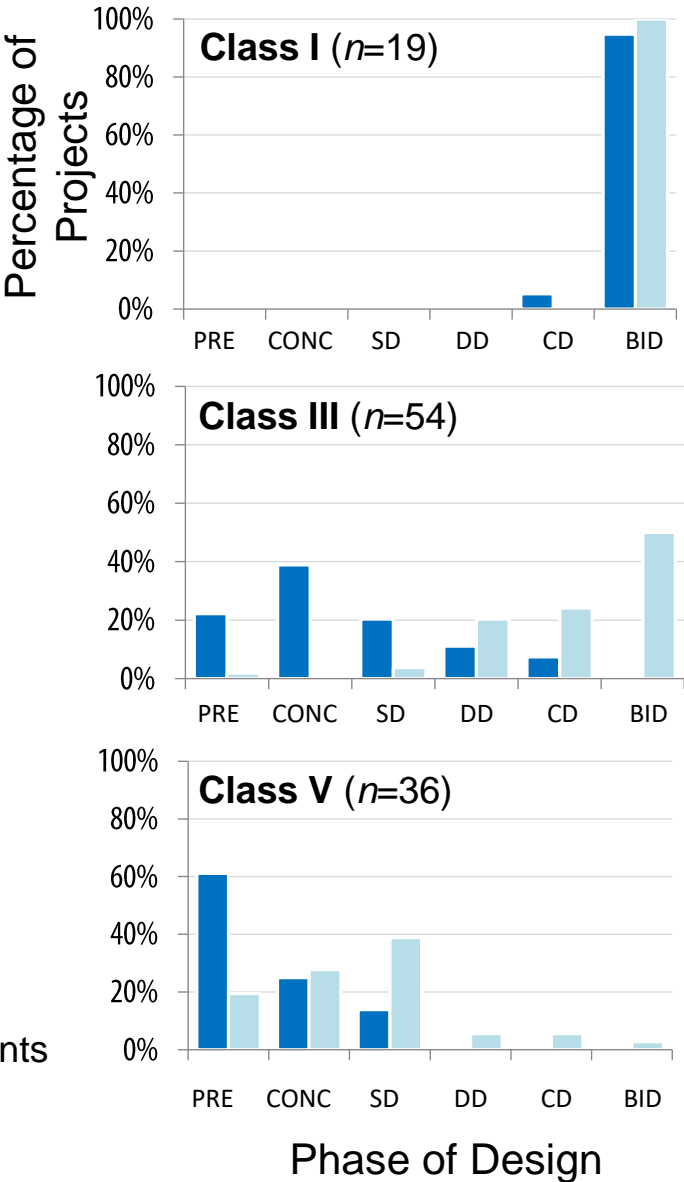
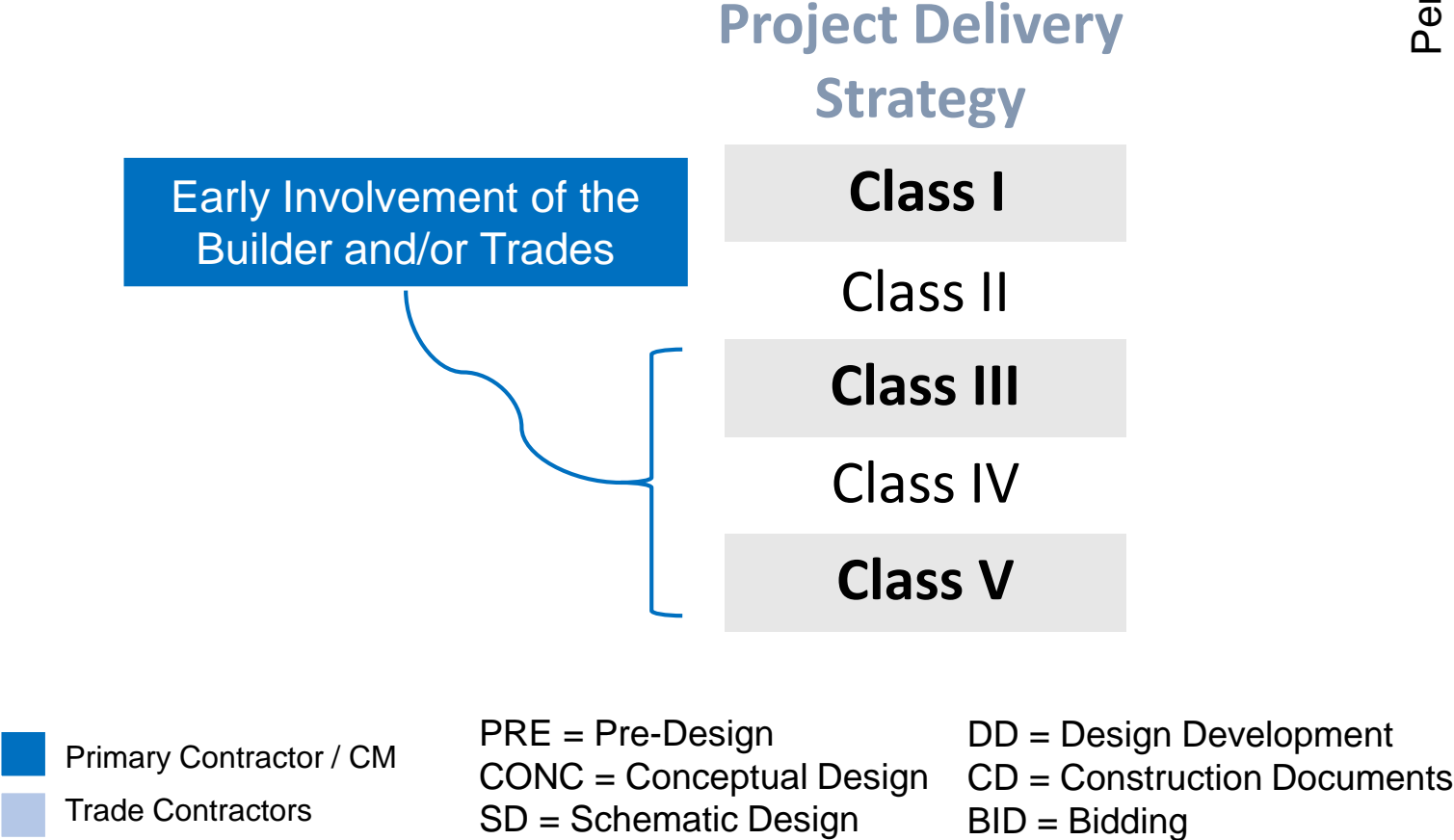
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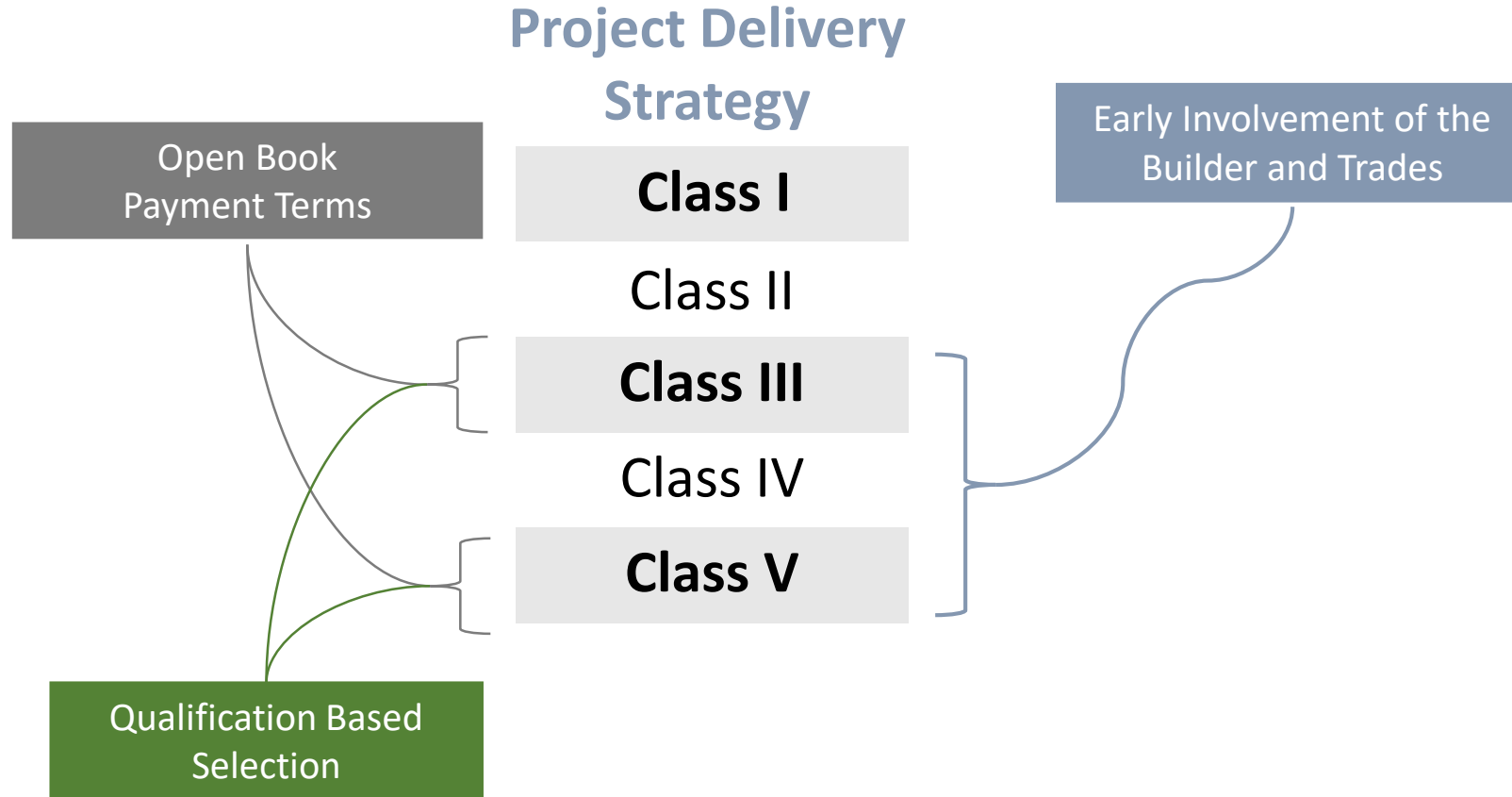
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Timing of Involvement



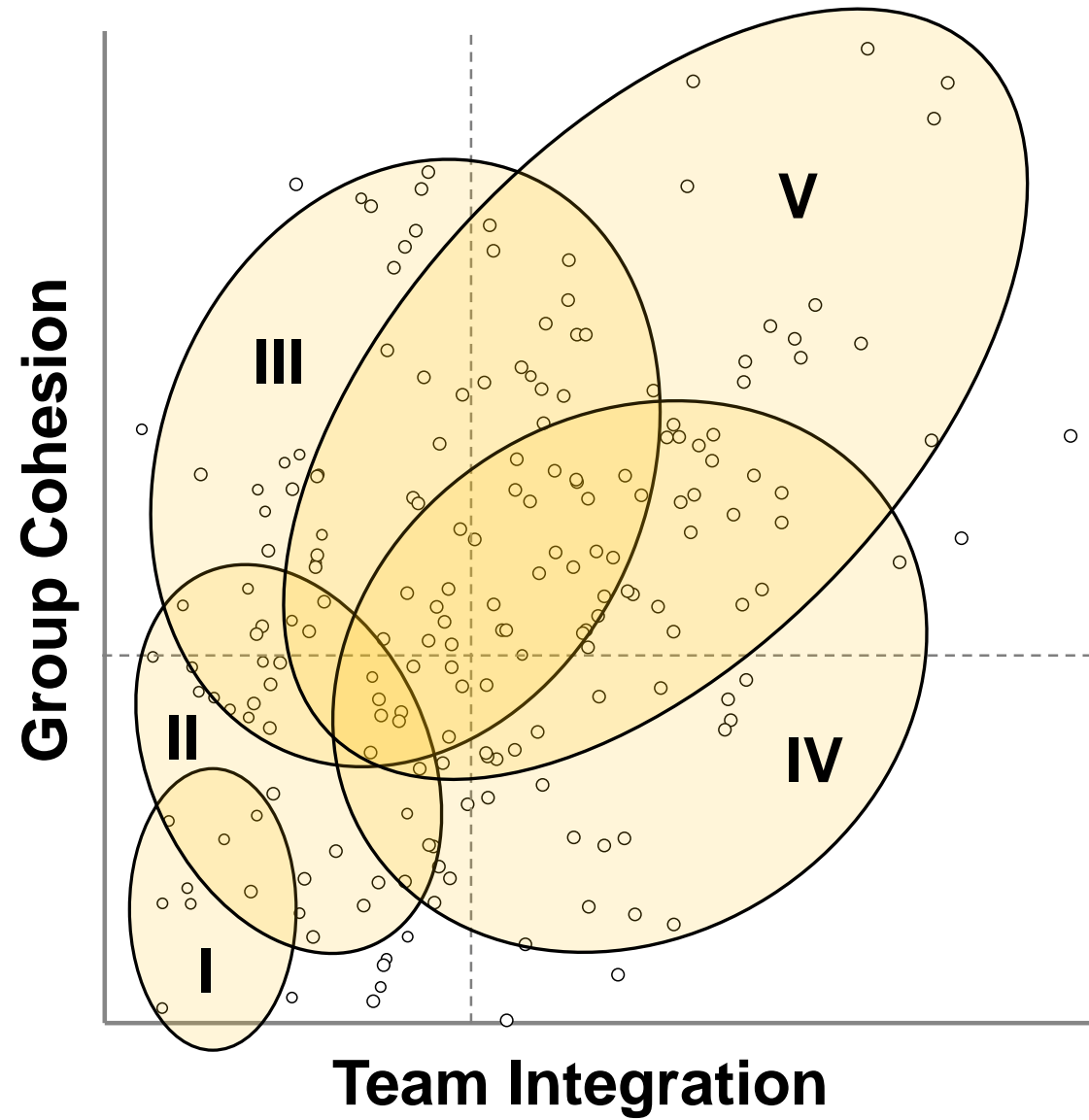
Underlying Themes



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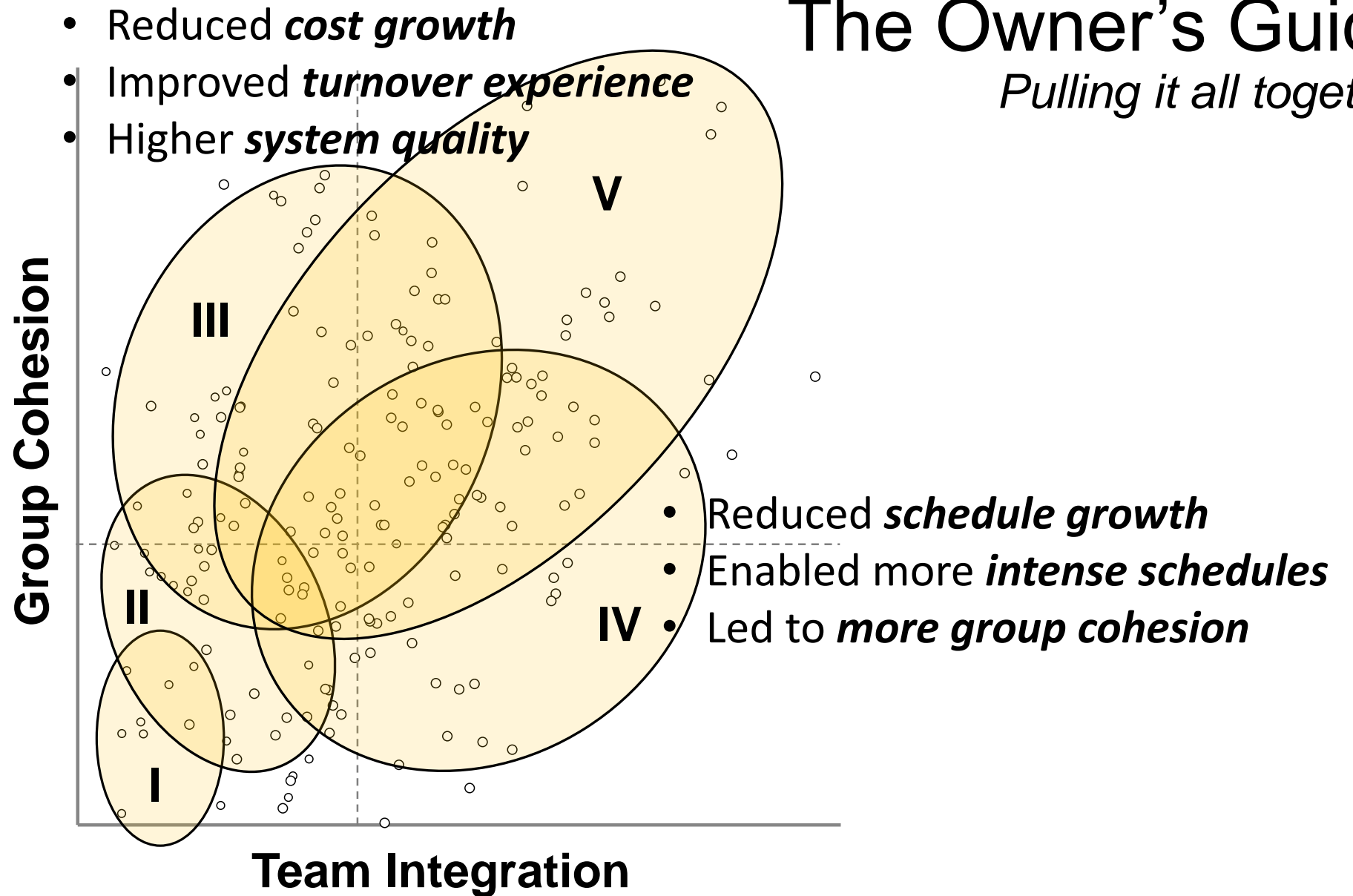
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The Owner's Guide

Pulling it all together



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Maximizing Success in Integrated Projects

An Owner's Guide



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

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Lean Construction Institute
Transforming the Built Environment

Why Projects Excel? Great Design Enabled by Lean



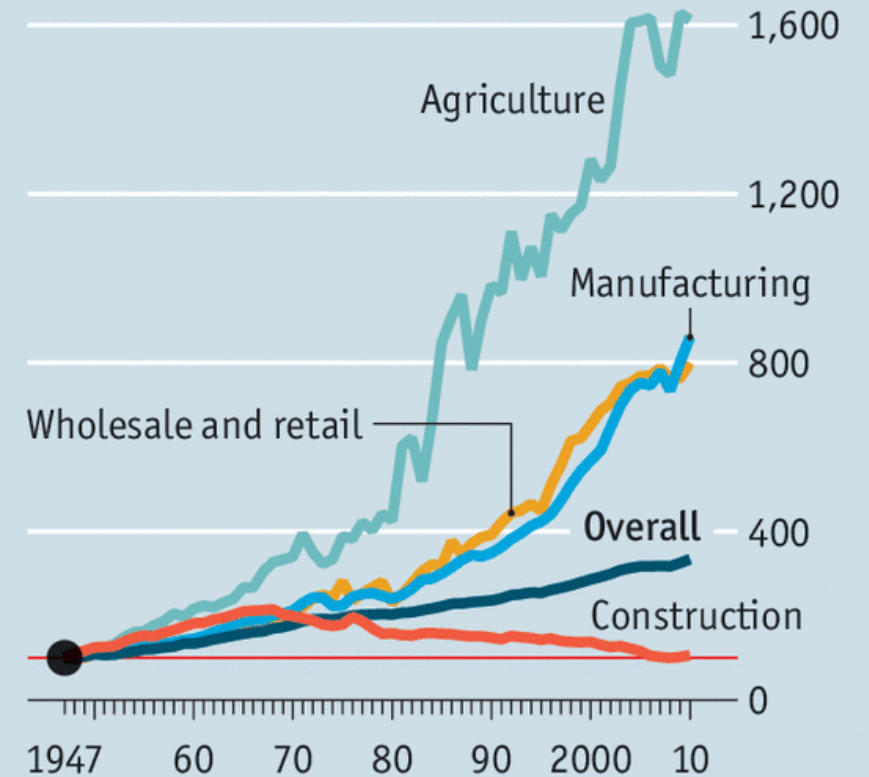
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Unlearning by doing

United States, gross value-added*
Per hour worked, 1947=100

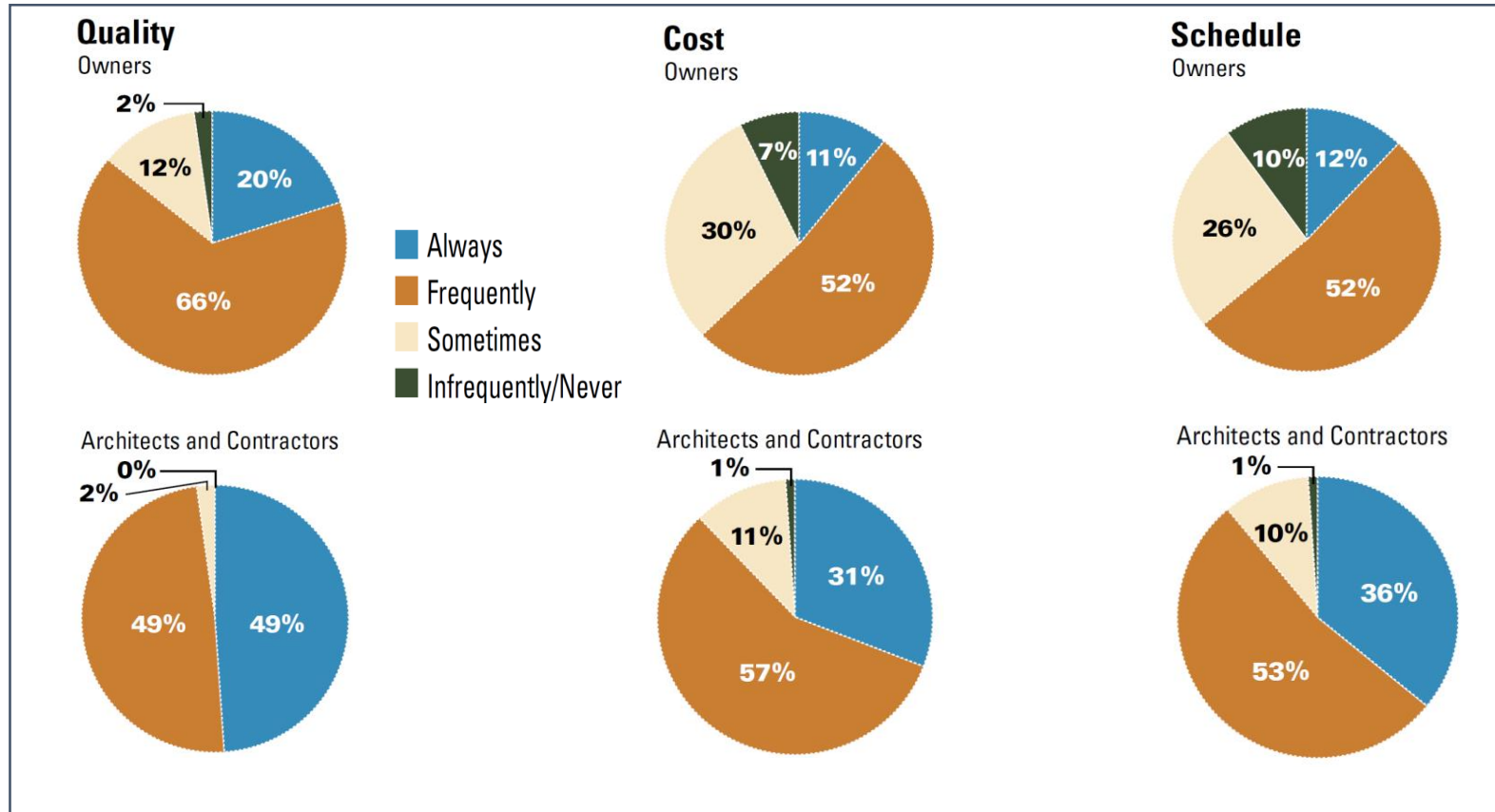


Source: McKinsey Global Institute

*At constant prices

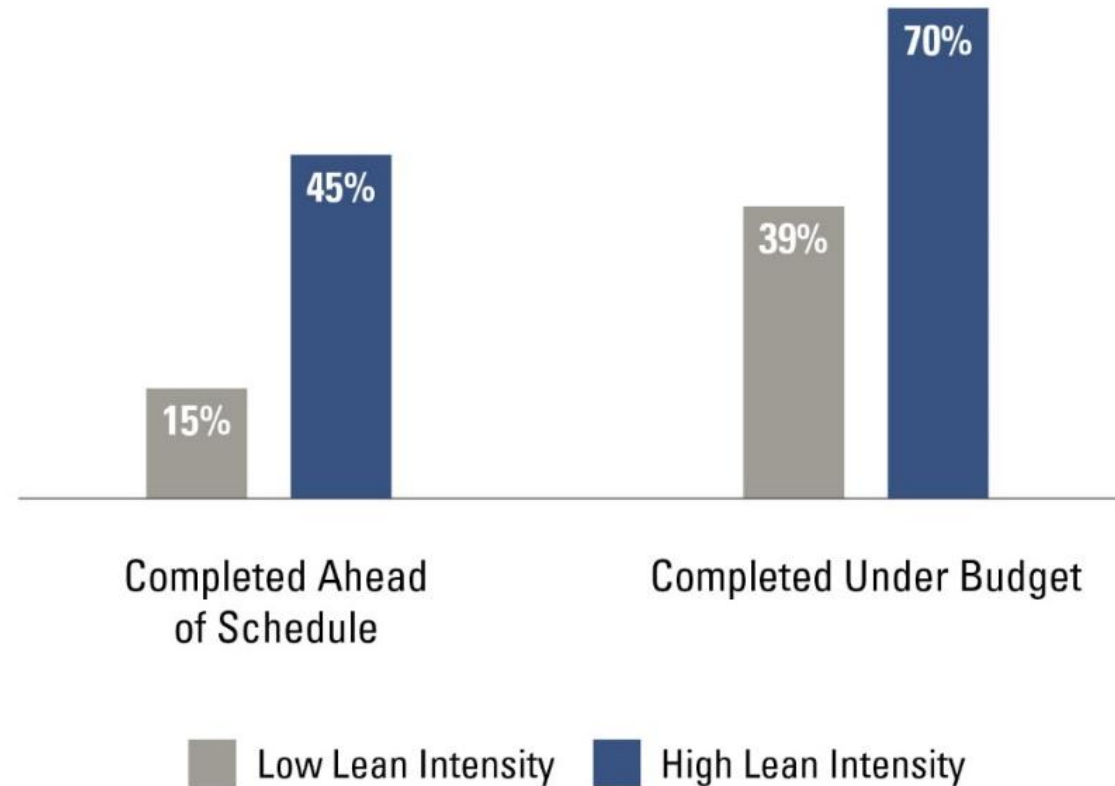
Economist.com

Stakeholder Satisfaction



Business Case for Lean! (2016 - Owners)

% of **BEST** Projects Achieving Outcome



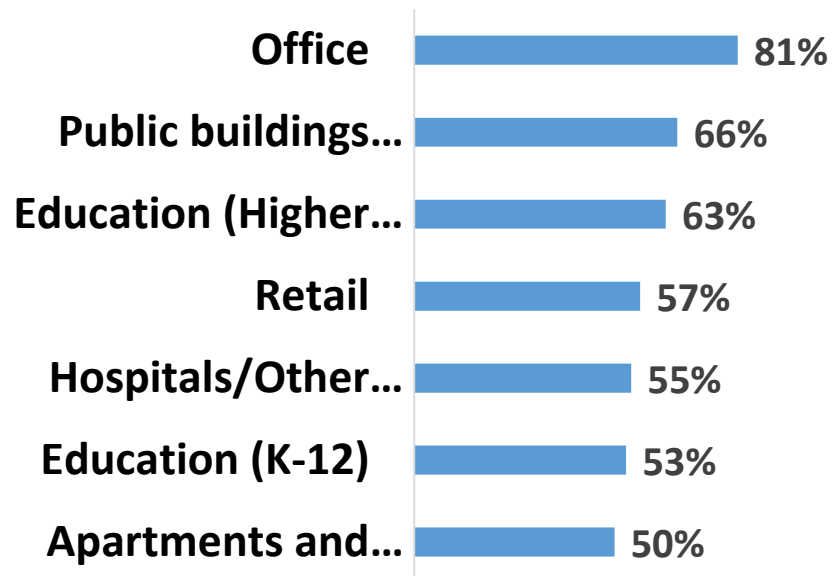
Common Project Myths...

1. Delivery matters less than choosing the right people – behaviors can't be dictated by a contract
2. IPD contracts are too complicated, Lean tools are too rigid
3. IPD only works on large complex healthcare projects – Teams new to IPD and lean are at a disadvantage
4. Owners aren't getting best value – or – Owners are getting value but the team is not making profit
5. IPD and IPD-lite are essentially the same; financial incentives and release of liability are no big deal

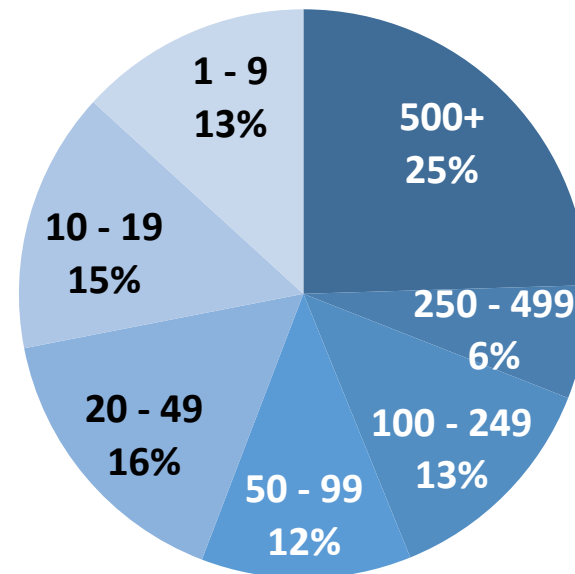
Research Overview (2017 - Designers)

Sample Size (n): 310 Designers/ 620 projects

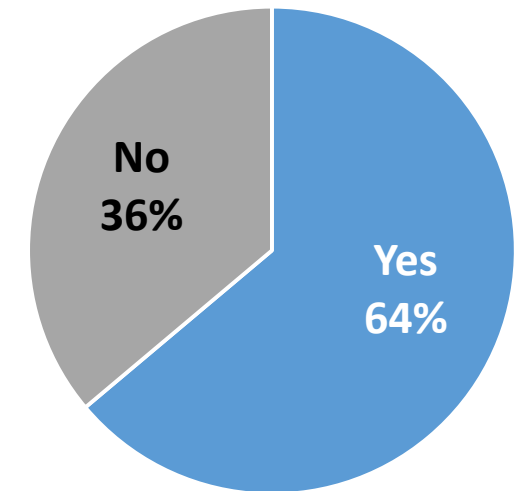
Respondents' Portfolio



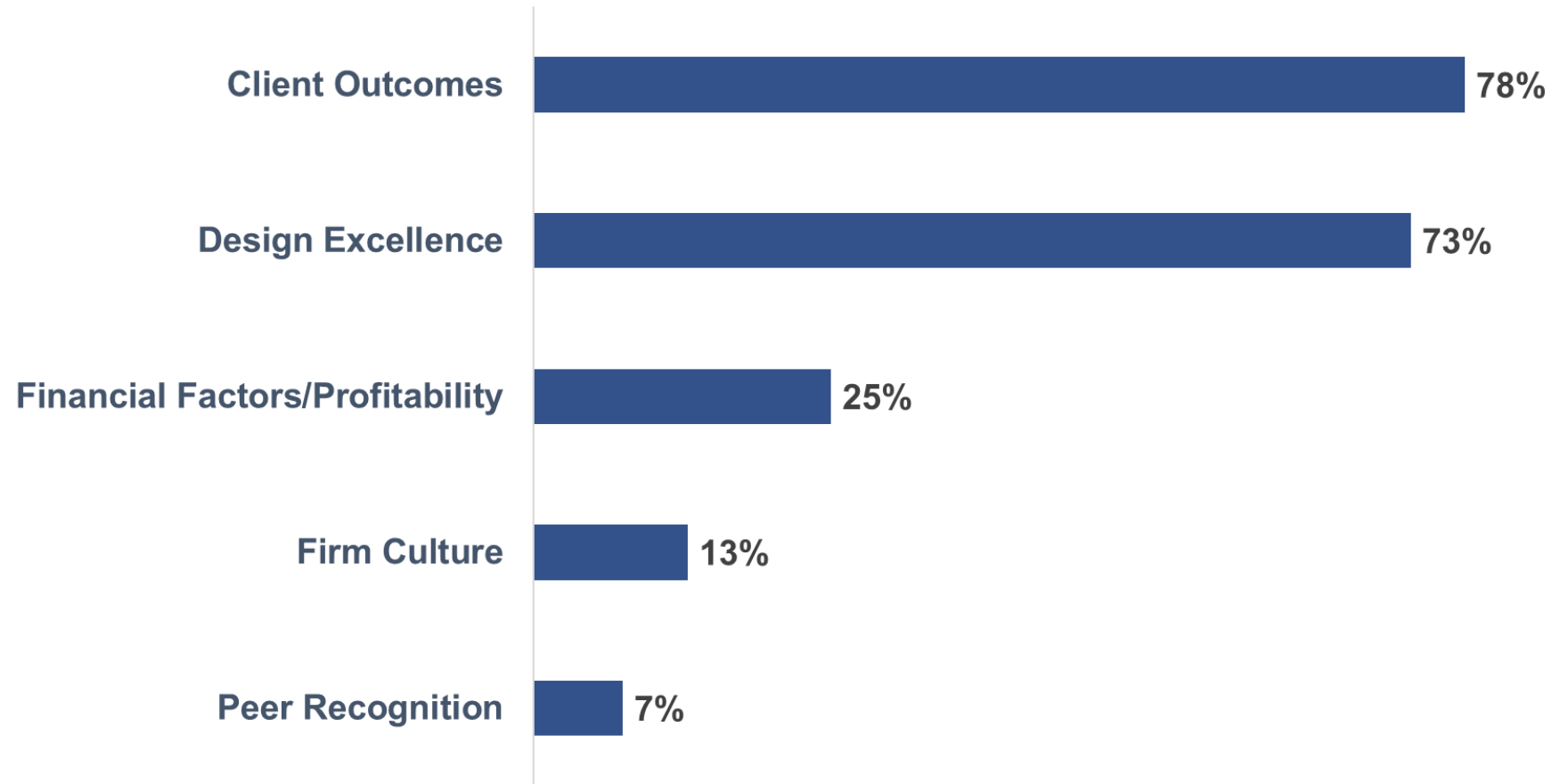
Size of Firm



Familiarity with Lean

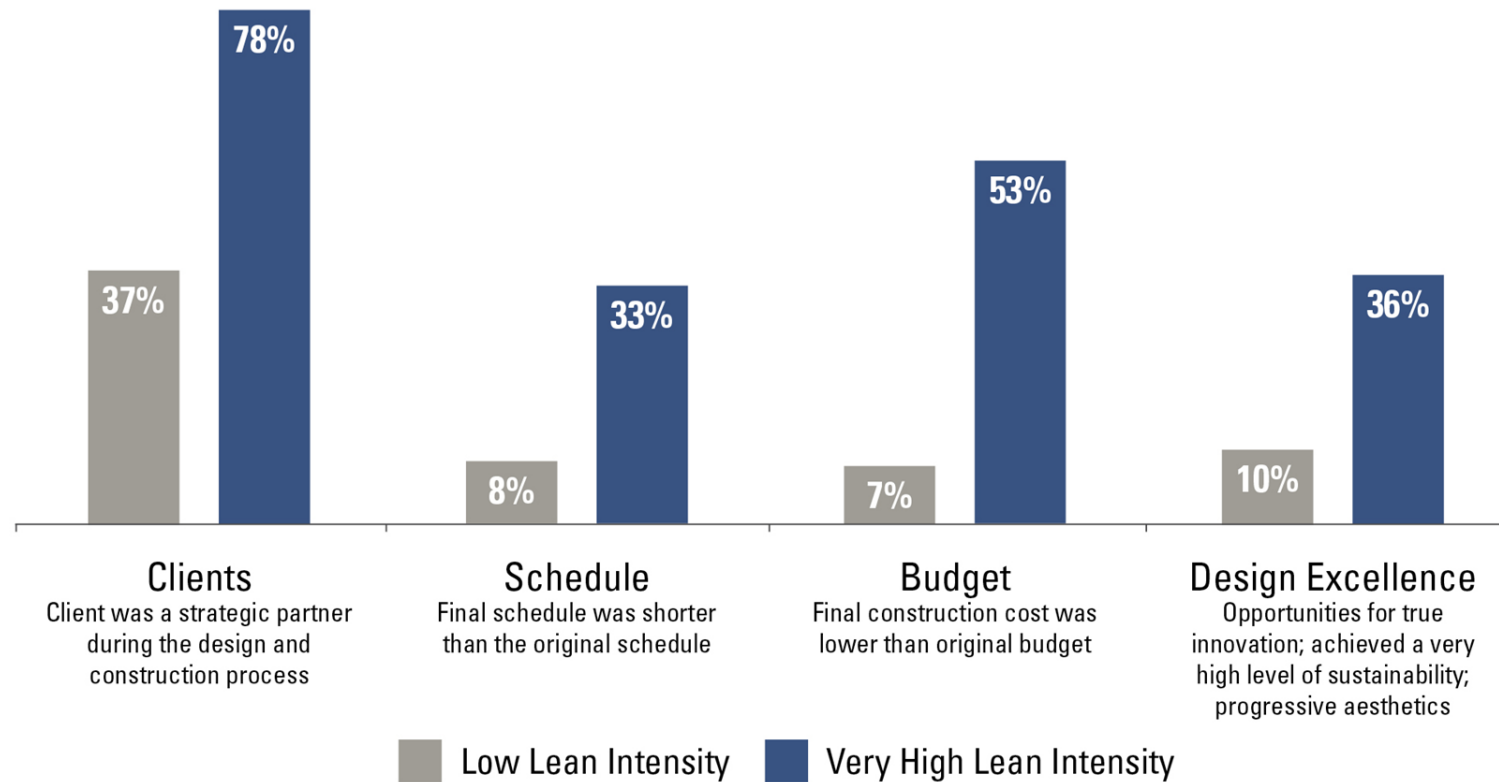


What is most important to Designers?



Great Design Enabled by Lean. (2017 – Designers)

% of **BEST** Projects Achieving Outcome



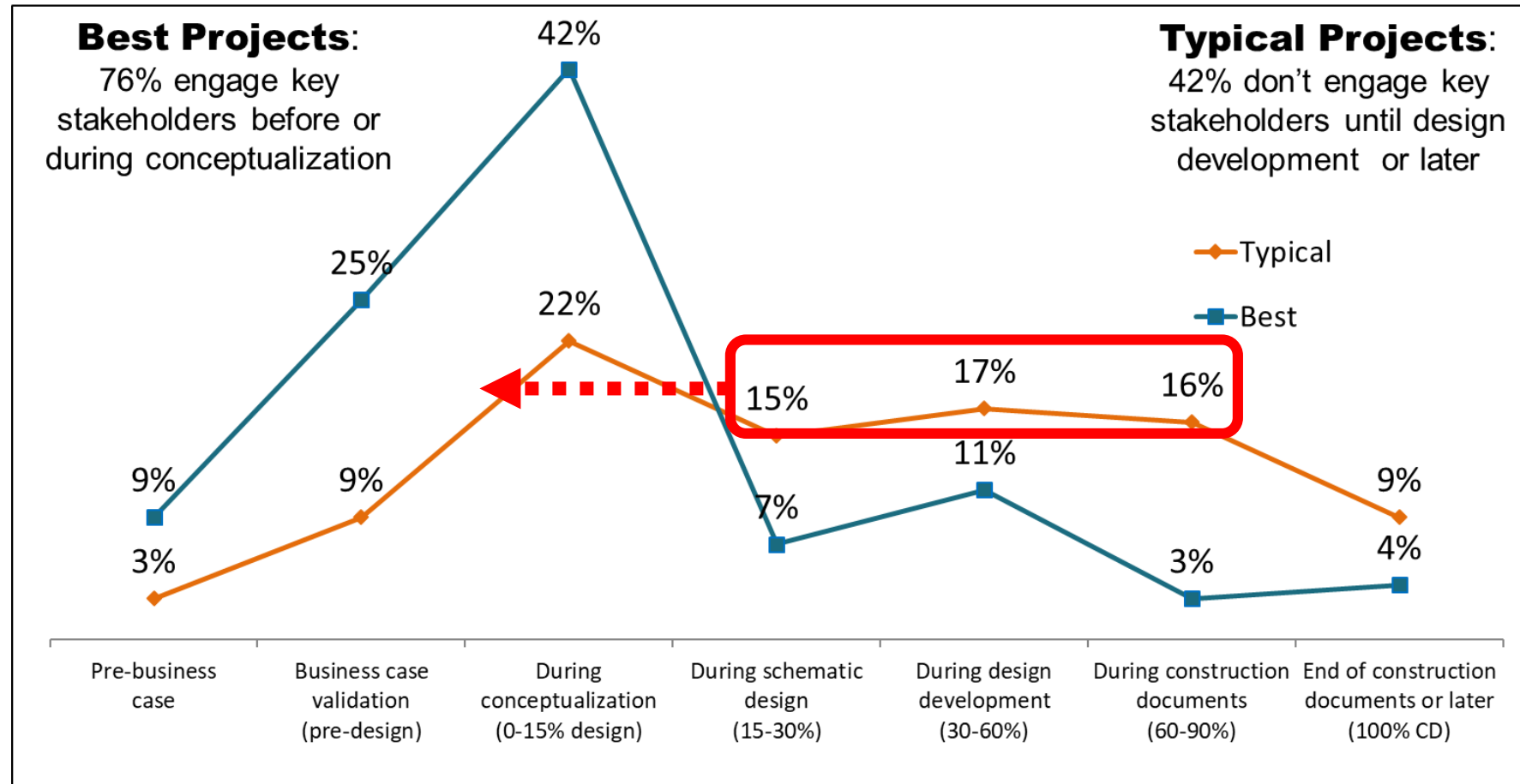
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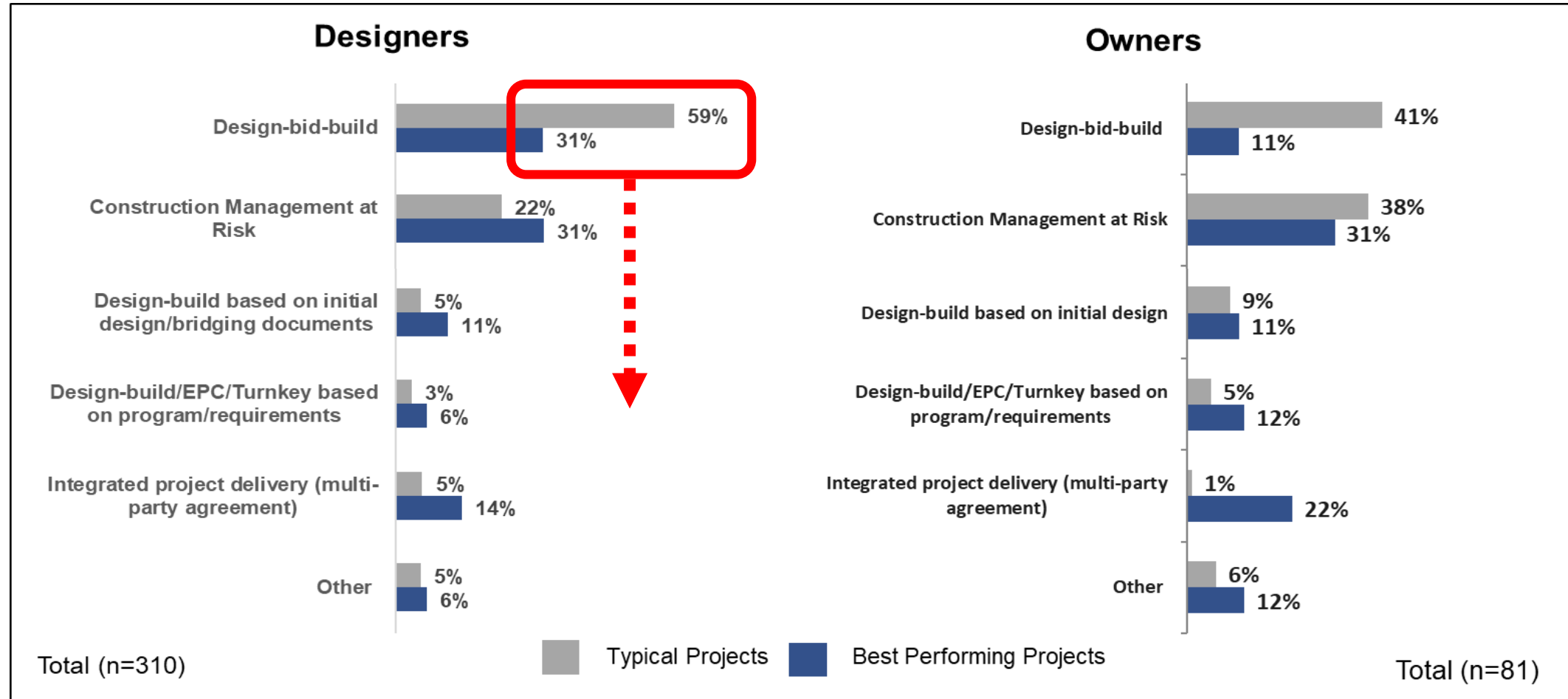
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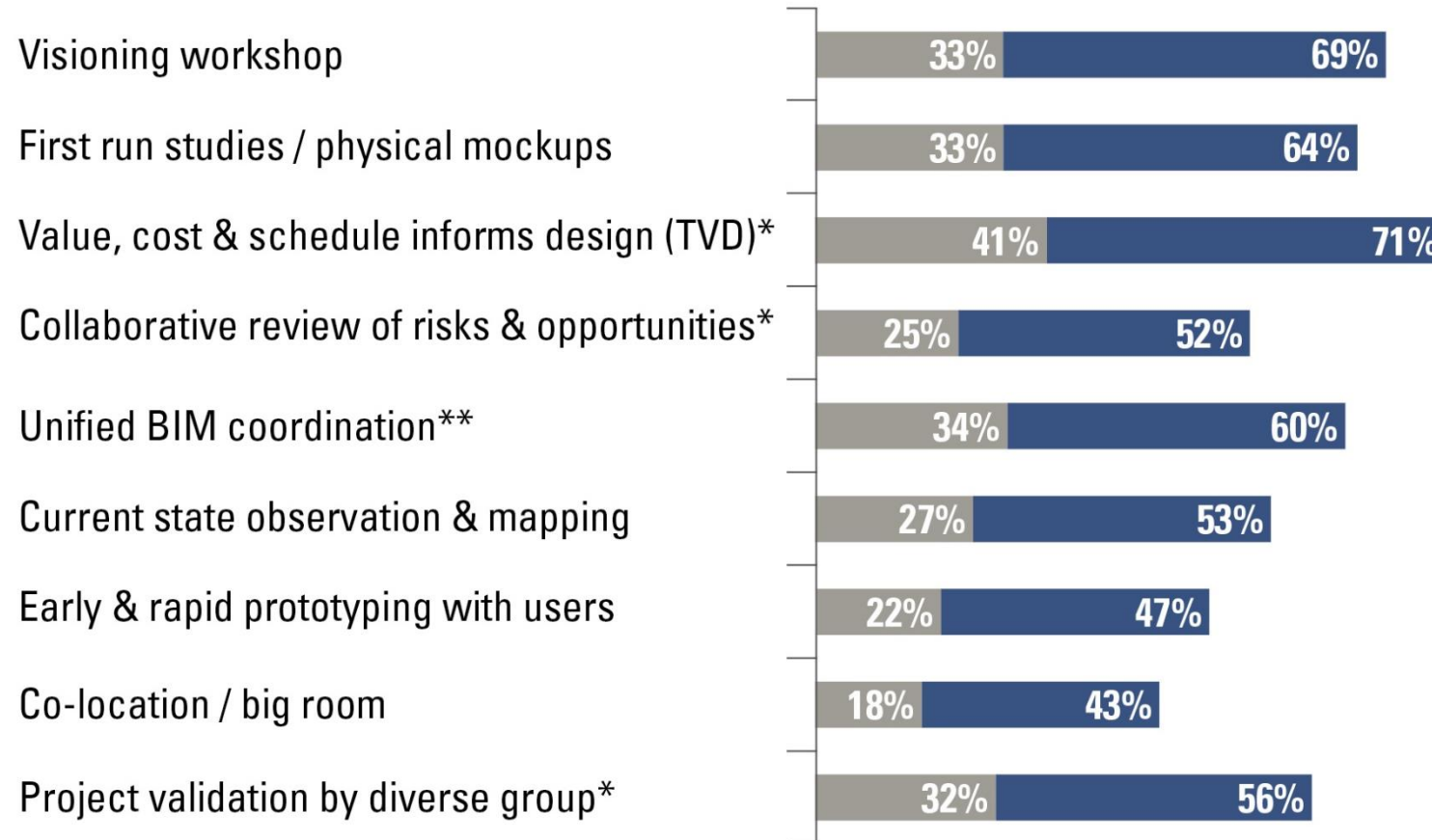
Organization Structure Choices (Owners)



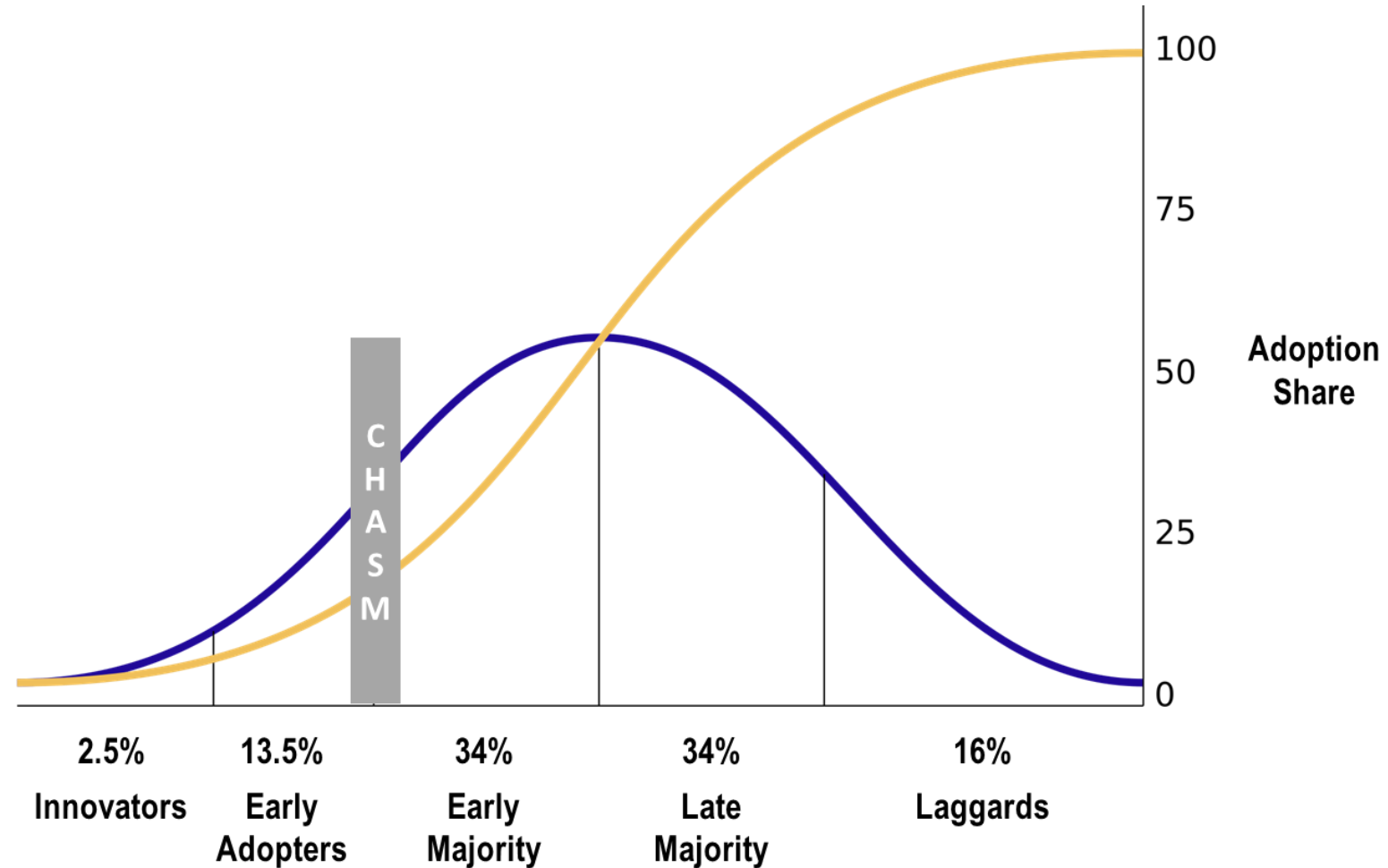
Commercial System Choices



Operating System Choices (Designers)



How do we speed industry transformation?



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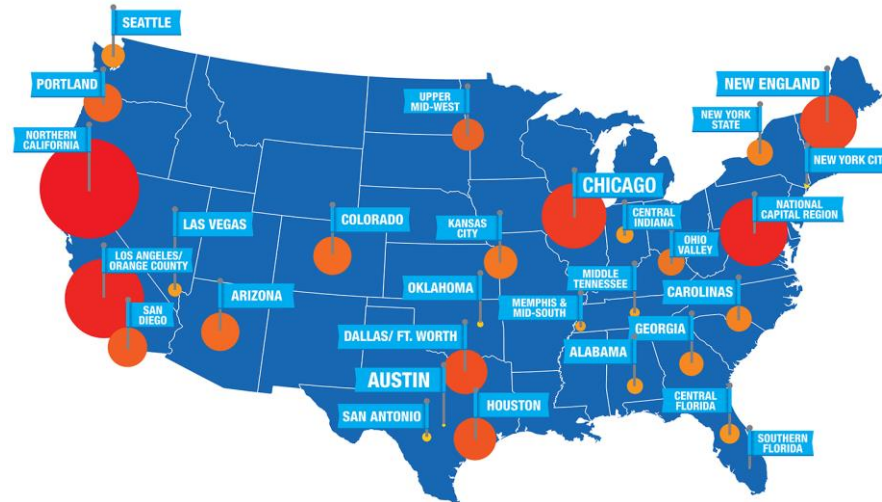
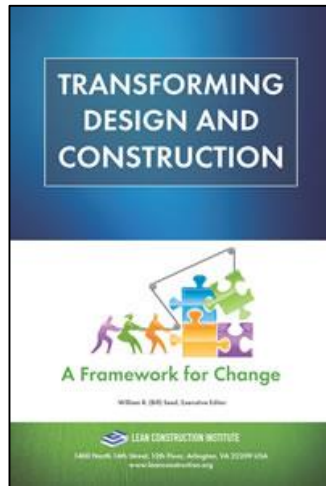
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