Lean Construction Institute
Immersive Education Program

Target Value Delivery Module 4: Modeling for Predicable Outcomes

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LCI Course:
Target Value Delivery Module 4:
Modeling for Predicable Outcomes
4 CEU

Sign the sign-in sheet for credit

Approved Continuing Education

TVD Modules

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Module 1: Learning the Fundamentals

- Gain insight into how implementing TVD approaches improves project outcomes through an overview of the phases and key components of TVD.

Module 2: Setting the Stage for Success

- Discover how creating early alignment and understanding of the owner's Business Case, Value Statements and Conditions of Satisfaction will lead to successful outcomes and how these foundations become the anchor for future decisions.

Module 3: Organizing for Flow and Efficiency

- Discover how teams can be challenged with maintaining effective processes and engagement through creating a cross-functional work cluster organization as a highly effective means of driving innovation and productivity through concurrent work.

Module 4: Modeling for Predictable Outcomes

- Experience a framework for predictive cost modeling, target setting and rapid innovation capture in collaborative TVD environments.

Learning Objectives

Understand the Validation Phase of TVD and how to define or determine when validation is complete.

Discover the process of selecting and analyzing a benchmark project to be able to draw useful ‘should be able to do’ insights and establish first pass targets.

Learn how to establish a process for the continuous visible evolution of the current state cost prediction and ‘what if’ scenarios measured against desired targets.

Understand the importance and various processes for establishing and measuring against a team target cost, breaking cost into useful components, the role of incentives and effective team management of risk and opportunity.

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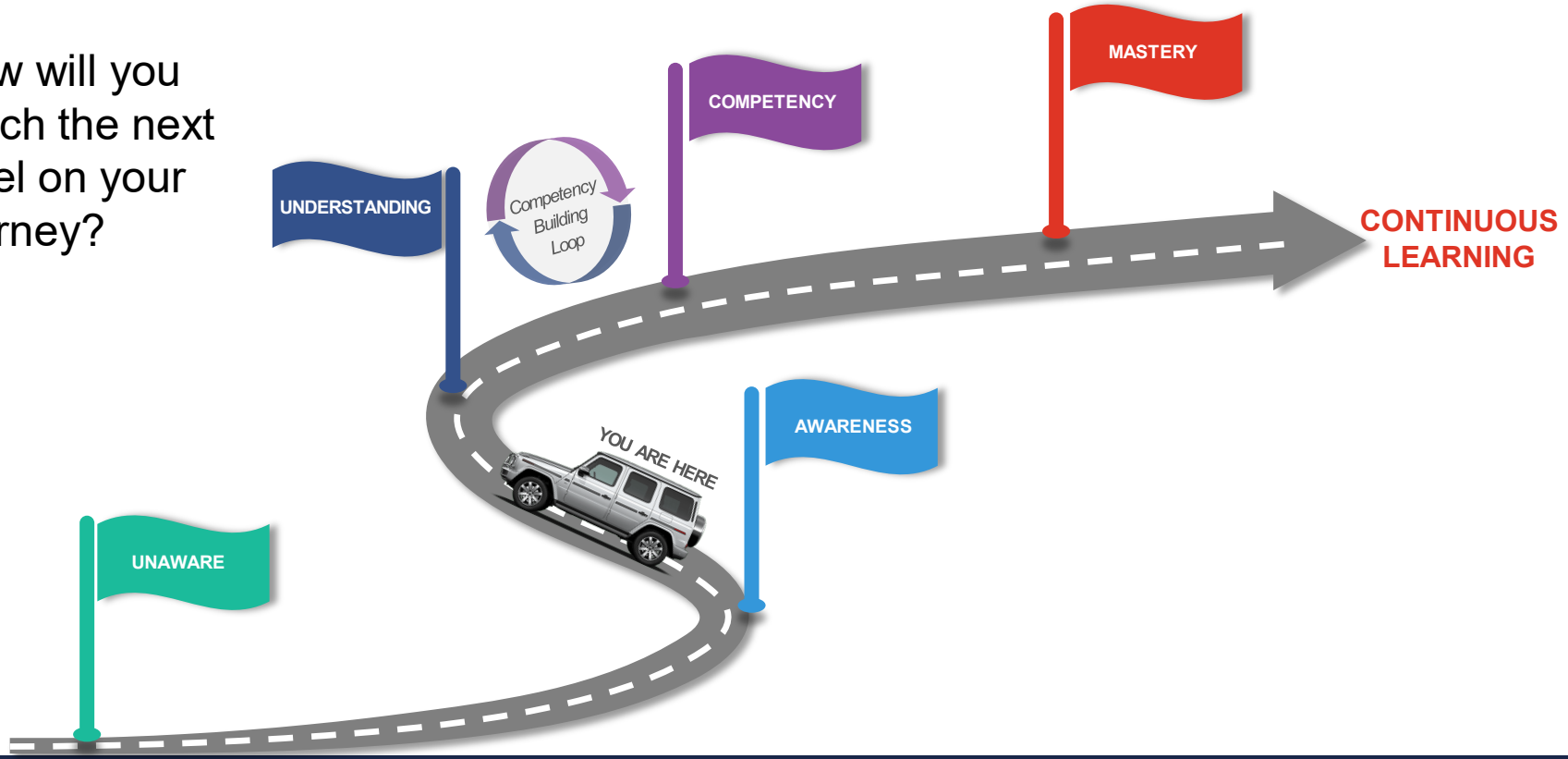
Lean Journey to Mastery

How will you reach the next level on your journey?



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Project Elements

Lean teams organize in a structure that leads to improved coordination, outcomes and shared leadership.

Lean can be implemented regardless of commercial terms: Design-Bid-Build, Design-Build or Integrated Project Delivery. The degree of implementation varies with the terms.

A Lean Operating System is a organized implementation of Lean Principles and Tools combined to allow a team to operate in unison to create flow.

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Six Tenets of Lean Construction

1. Respect for people
2. Optimize the Whole
3. Generate Value
4. Eliminate Waste
5. Focus on Flow
6. Continuous Improvement

Target Value Delivery

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12:00 PM – Class Begins

2:30 PM – Break 15 minutes

5:00 PM – Class Adjourns

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Rules of Engagement

- This is a safe zone
- Everyone has equal status
- Speak up and share your ideas
- Actively listen to others
- One conversation at a time
- Use E.L.M.O.
- Silence phones
- Be focused and engaged
- Stay on time
- Have fun!

References

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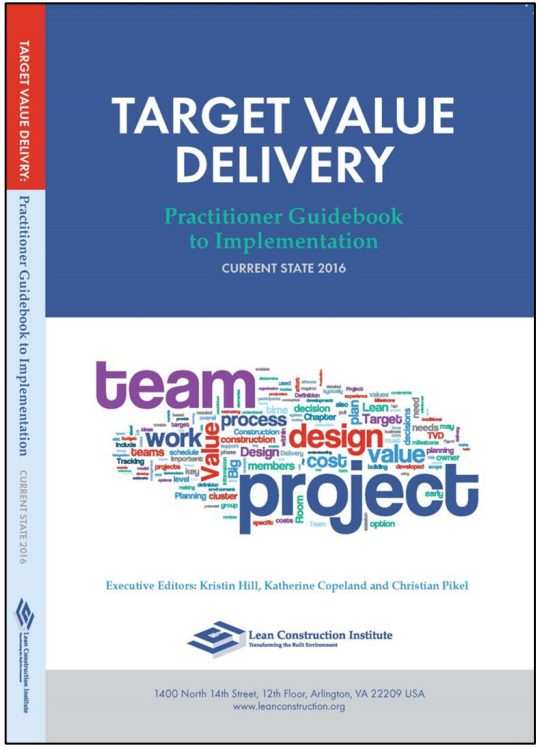

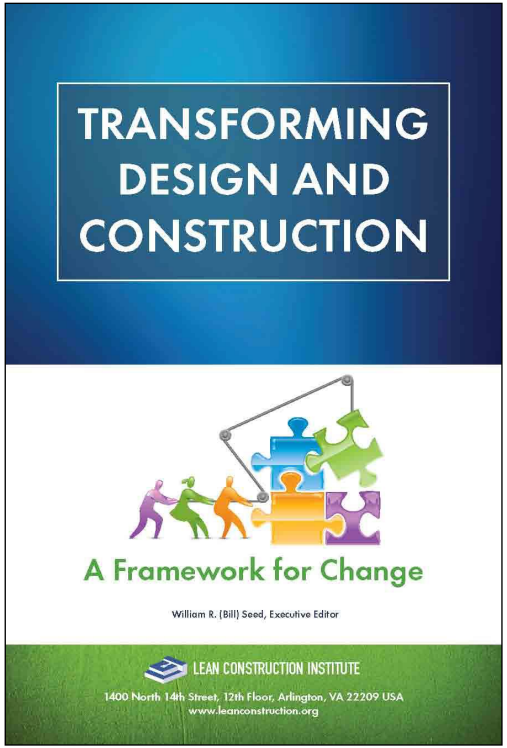

Introduction / Ice Breaker

Introduction: Who you are, What you do, What do your hope to gain from the day?

Discuss challenges creating, maintaining and effectively using cost models in TVD teams.

15 MINUTES

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TVD Definition

A disciplined management practice to be used *throughout* the project to ensure:

- The facility meets the operational and performance *needs and values* of the users.
- The project is delivered within the *allowable budget*, *schedule*, and *intended scope.*
- That *innovation* is promoted throughout the process to *increase value* and eliminate waste.

13

Target Value Delivery (TVD)

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Target Value Delivery encompasses

Target Value Design

AND

Target Value Production (Construction).

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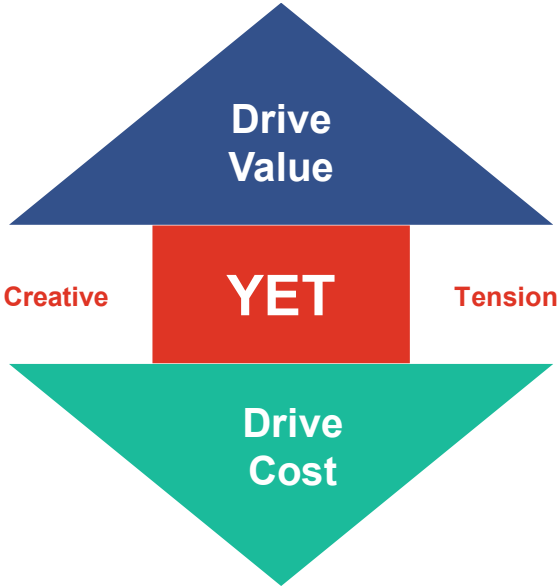
Application

Target Value Delivery is to be applied holistically to obtain maximum value.

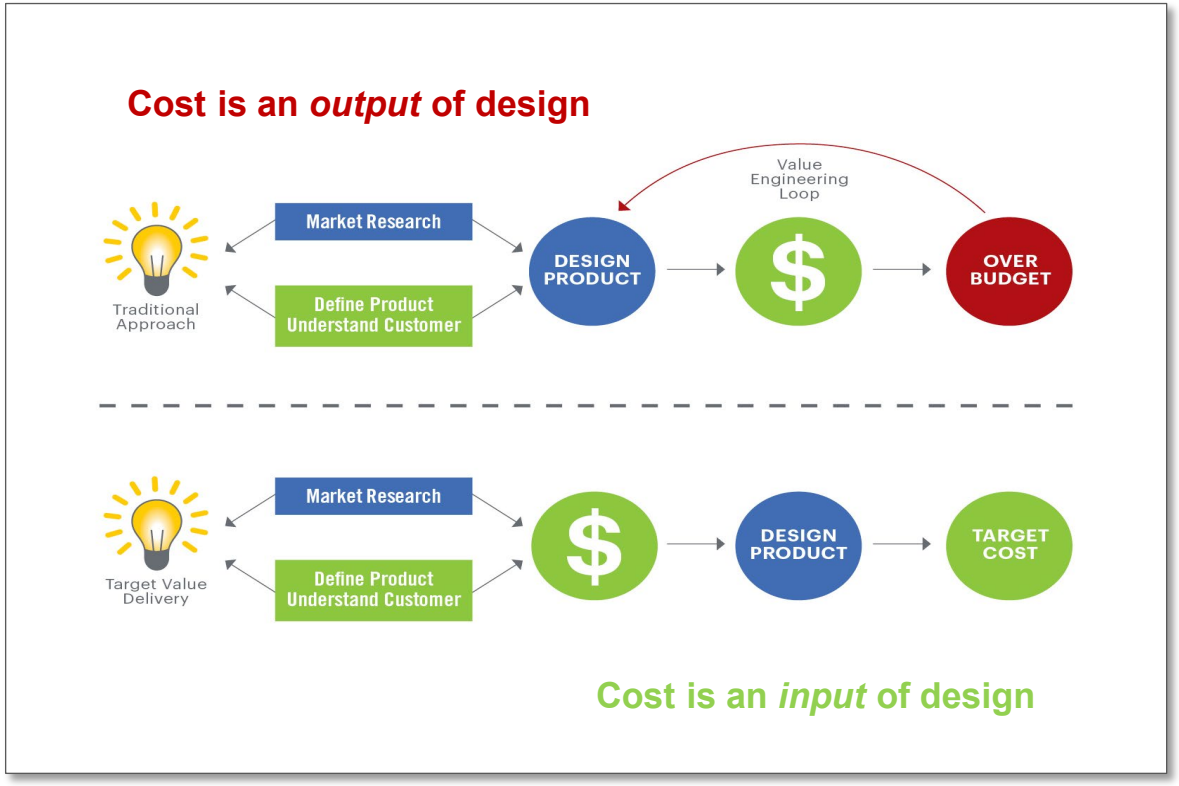
Regardless of the project delivery framework, the owner, designers, builders, and key trades must be fully engaged from the onset.

It generates a creative tension between driving up quality YET driving cost down.



Traditional vs. Target Value Delivery

The goal of TVD is to minimize the waste produced by the design, estimate and redesign cycle(s) of the traditional value engineering approach.



Courtesy of HKS Architects

TVD Phases Overview

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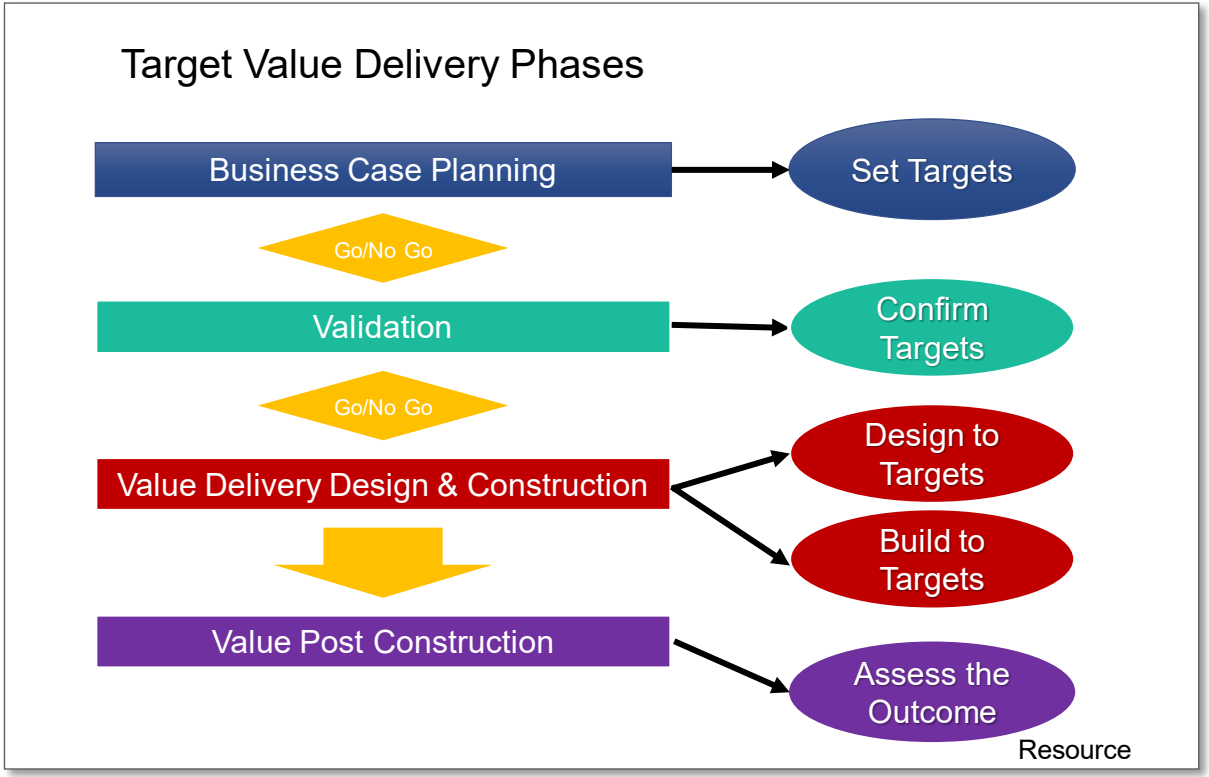
- This graphic depicts the relationship between the TVD Phases and the Targets.
- Targets may include cost, time and quality as defined by the Value Definition.



Target Value Delivery (TVD) Overview

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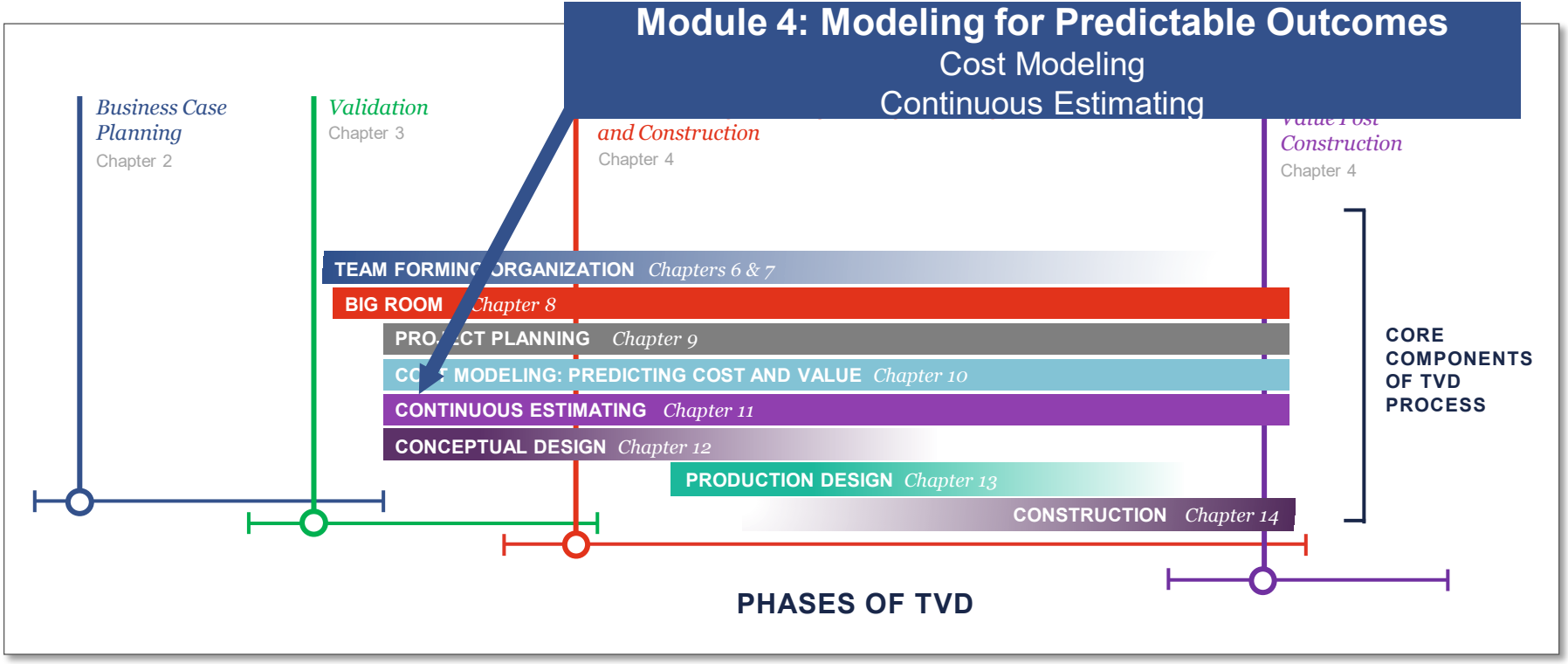

Cost Modeling

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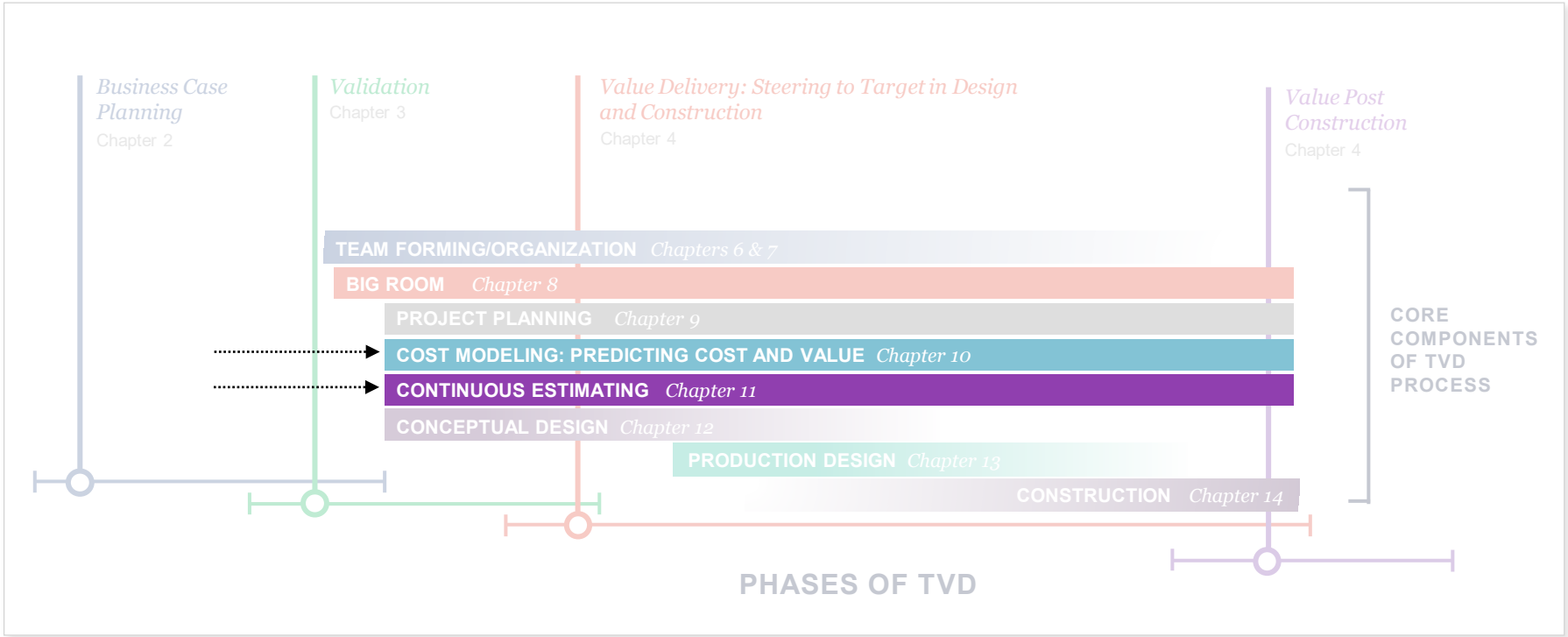
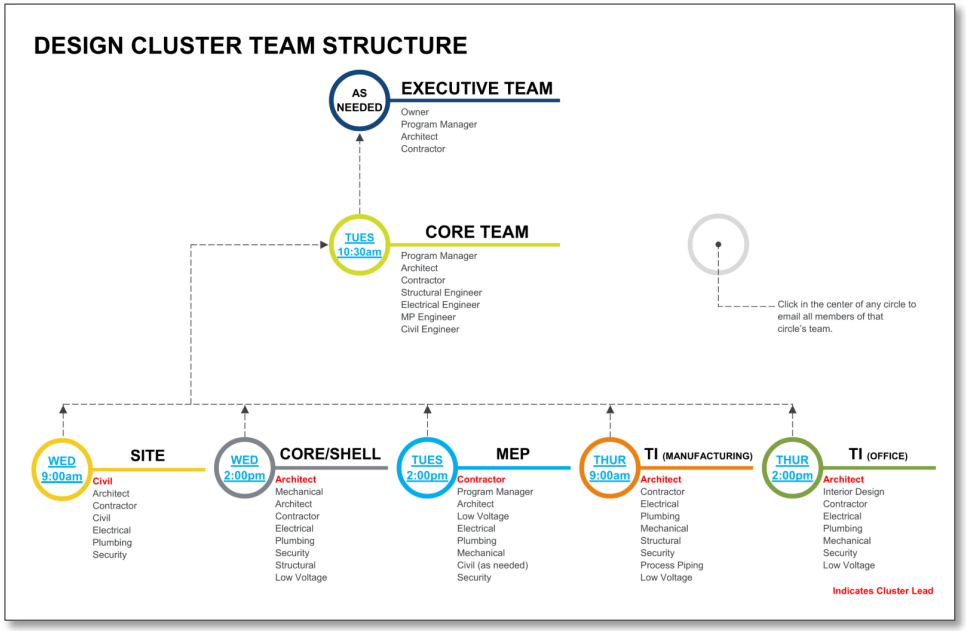


Current State for this Module

- Module 2
  - Business Case Established
  - Value Defined
  - Conditions of Satisfaction Established
- Module 3
  - Team Kick Off
  - Work Cluster Organization Defined
  - Decision Making Protocol Established



Resource

Work Cluster Organization

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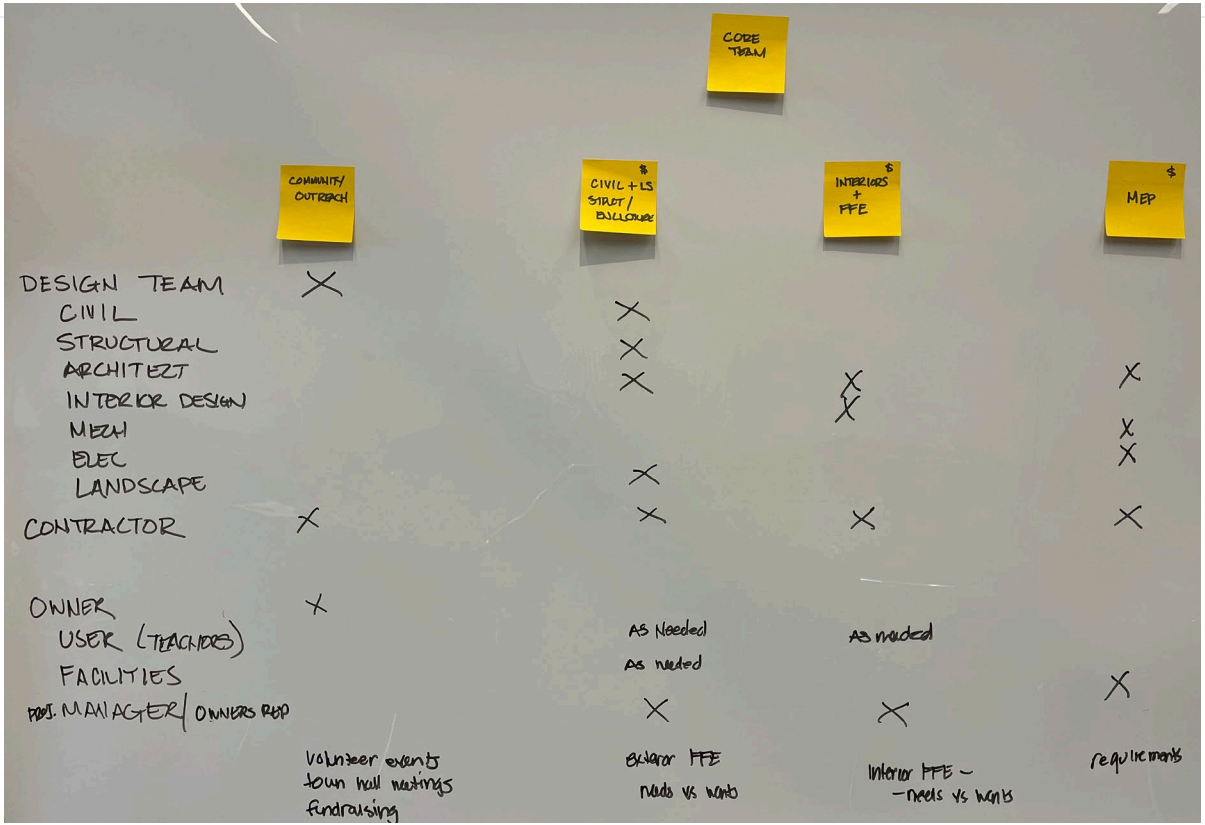
Review Cluster Structure and Program Features Established in Previous Module

Cluster Organization



Resource

Programmatic Considerations

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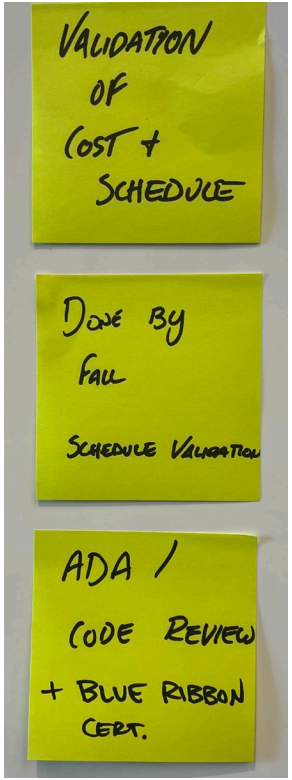

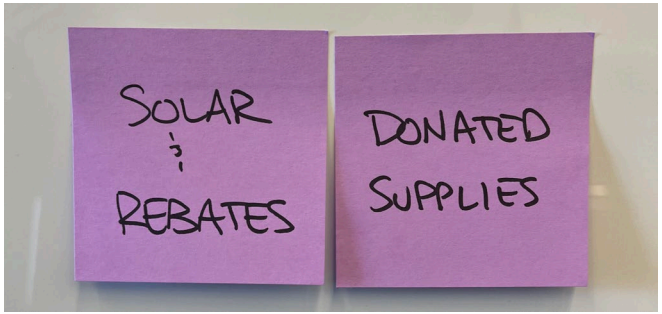

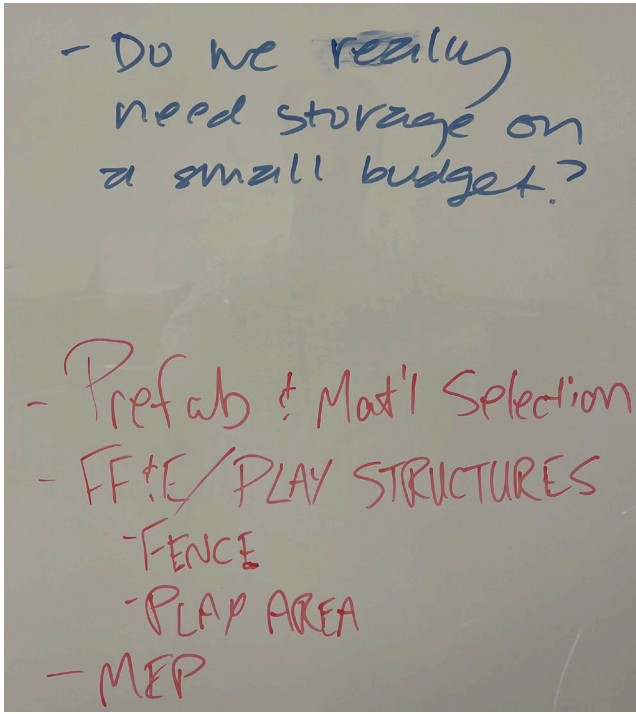

Resource

Team Begins Validation Phase

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Project Club House

- LCI has decided to partner with a national non-profit to build a clubhouse that will be donated to a local elementary school.
- We have committed to building (1) Play/Learn Clubhouse this year utilizing lean principles with our LCI members.
- They have identified an elementary school (Pre-k thru 2nd grade, kids aged 4-8 years old) in an underserved community as the recipient of the clubhouse.
- LCI has raised $55,000.00 to go towards the clubhouse
- The LCI would like to cover the material and labor cost of building the clubhouse and be able to completely furnish it. It would be nice to provide playsets such as a kitchen playset, etc. if savings allow

28

Validation Phase

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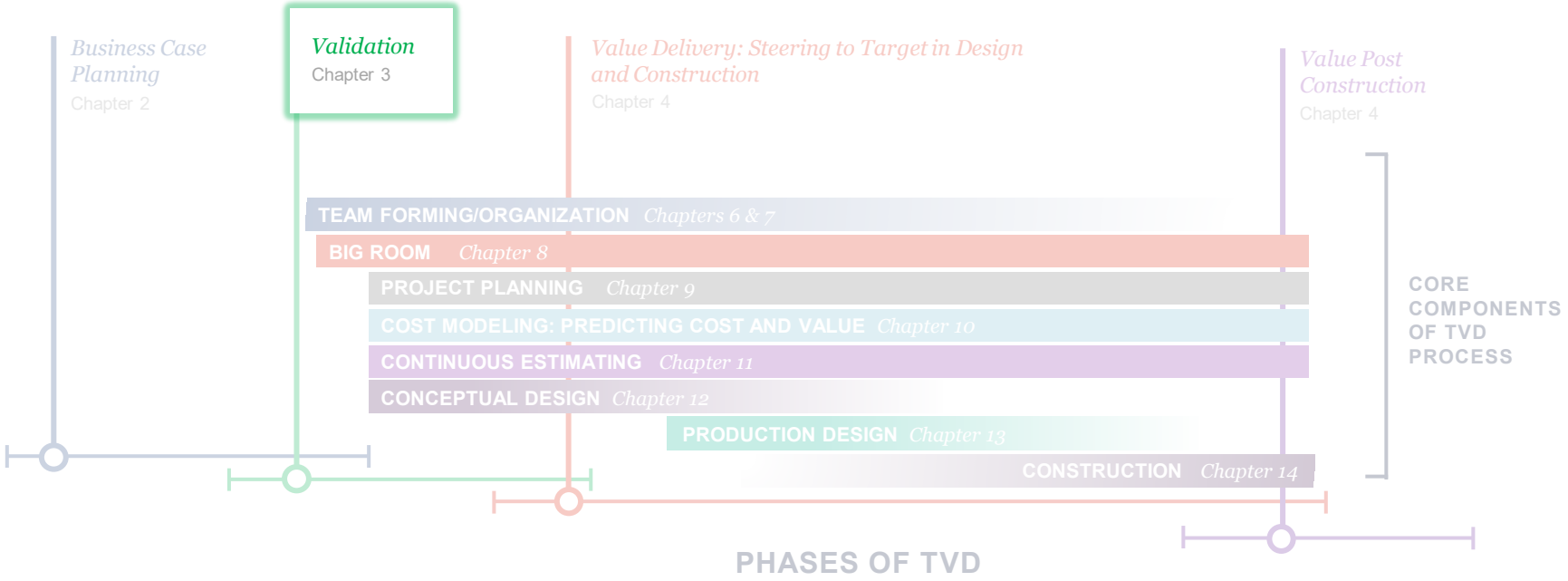

Image courtesy of InsideOut Consulting & Southland Industries

Validation Phase

- The project team determines whether the project is viable based on the outputs of the ***Business Case*** Phase.

Output is team understanding and alignment:

- Sufficient Scope and Performance Definition
- **Team Confidence** to Meet Owner NEEDs while
  Expected Cost <= Allowable Cost
- Confirmed Value Definition & Conditions of Satisfaction
- Set Target Cost (In Some Cases)

Validation Approach and Detail

- The validation phase duration, intensity and approach will differ for projects based on (among other factors):
  - Is the project more prototypical or more novel?
  - Are programmatic requirements likely to change (e.g. emerging technologies)
  - Knowledge of and volatility of market and supply chain conditions

TVD Cost Terminology

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Allowable Cost

The amount the owner is willing to spend for the total project.

Business Case Planning Phase

≥

Expected Cost

The best estimate that the team projects the project will cost

Validation Phase

≥

Target Cost

The team goal for the total project.

Validation Phase

≥

Actual Cost

The final cost at the end of the project.

Value Delivery Phase

Expected Cost = Current Working Estimate

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- While an Expected Cost snapshot is part of the validation deliverable, our Cost Model is always changing.
- It is critical that every TVD team member can clearly understand:

Where do we need to get?

(Allowable then Target)

Where are we?

(Current Expected Cost)

How do we get there?

(Value Descision, Risk, Opportunity, Innovation)

TVD Cost Terminology

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Terminology may be project or contract specific.

Teams should align on language and meaning – a project specific glossary could be a validation phase artifact.

Cost Model vs Estimate

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- Estimate: calculates our best prediction of cost based on a set of conditions
- Cost Model: frequently updated framework which calculates possible outcomes based on variable conditions
- Estimation: methods used to inform an estimate or cost model

Conceptual Estimator

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Noun. [es-ti-may-ter]

Someone who does precision guesswork based on unreliable data provided by those with questionable knowledge.

See also – Wizard, Magician

Continuous Estimating

The effort of regular, frequent updating of the estimate (cost model), while also tracking variance over time and potential decision paths.

- Integrates the cost professional for on-going cost input into the design development and decision-making process.
- Cost professionals understand the potential ramifications of cost model from collaborative conversations, not highly developed deliverables.

Validation Estimating

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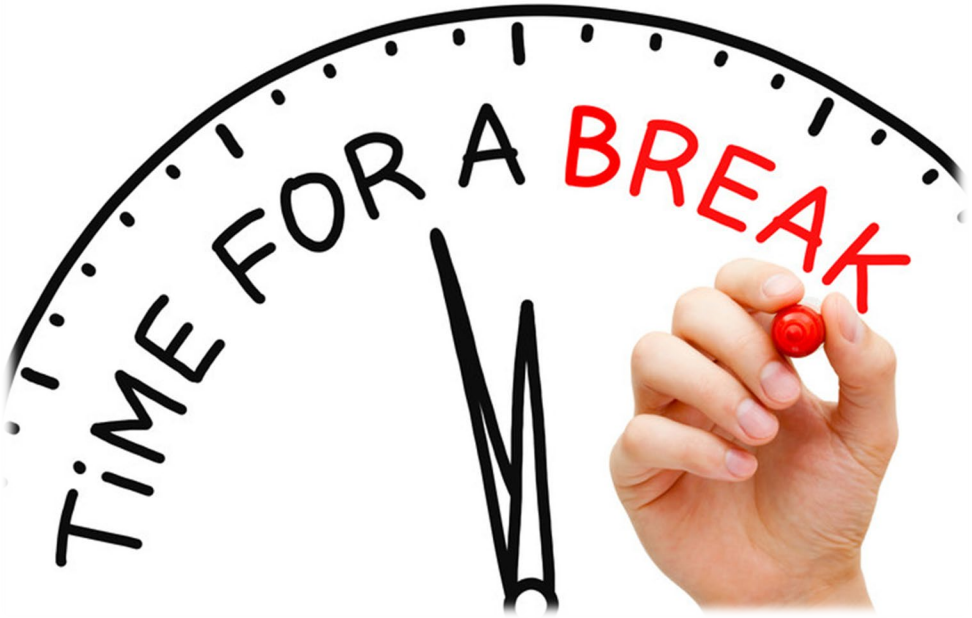
1. Cost Benchmarking
2. Conceptual
3. Production

Conceptual Estimating

- Goal is to provide cost information before the team moves forward with decisions based:
    - conversation, sketches, and conceptual information.

- Use historic information and parametric analysis.

- Convert cost data into usable information for the design team.
- Gain just enough detail to inform team decisions.
- Comparative cost analysis for **Set-based Design**.

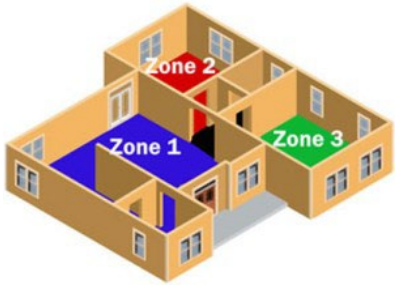


15 Minute Break

41

Parametric Methods

- Use statistical relationship in historical data and variables to calculate and estimate for activity parameters.
  - Go beyond $/SF
  - Decide on meaningful (and obtainable) cost driving parameters, for example:
    - Watts/SF, Watts/Fixture, $/Fixture
    - CFM/SF, $/CFM
    - SF Skin/SF by type,
    - SF/Zone, $/LF, etc.



3 Zones
1,800 SF
600 sf/zone

Parametric Example

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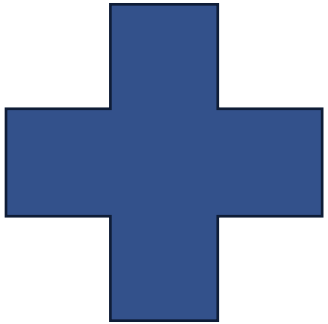
- Square foot of building skin to floor square footage.

480 SF : 100 SF

4.8 Skin SF / Fl SF



648 SF : 100 SF

6.4 Skin SF / Fl SF

600 SF : 100 SF

6 Skin SF / Fl SF

Parametric Example

- Skin Makeup, 600 SF Skin

Material	%	SF	$/SF	Total
Stone Detail	5%	30	$35	1,050
Glazing	20%	120	$45	5,400
Siding	75%	450	$15	6,750
				13,200

Benchmark

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bench·mark

/ˈben(t)SHˌmärk/

noun

1. a standard or point of reference against which things may be compared or assessed.
   "a benchmark case"

Benchmark Comparison Process

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- Select benchmark project(s)
- Normalize – time, location, program
- Is normalized total costs within reasonable range of allowable?
- Align cost breakdown to component work cluster structure

Benchmark Comparison Process

- Per cluster % of Total Cost
- Establish initial cluster validation targets based on:
- Allowable Cost X Cluster % of Total Cost
- By clusters:
  - Analysis/validation
  - conceptual estimating and
  - parameter establishment

Benchmark Example

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1

Reference Project	Benchmark Project
Final Total Cost	9,587,265
2 Final Square Feet	21,284
Beds	60
Completion	January-15

3

Project Normalizing & Code Factors		
Sitework	$	(660,750)
Outpatient Building	$	(602,752)
Renovations Area	$	(239,681)
AHCA/Florida Building	$	-
Bathroom Doors	$	(45,000)
Impact Glass	$	(40,000)
Impact AHU Screen	$	(25,000)
Generator	$	(45,000)
Quic		(60,500)
		(577)
		(73)
Infor		(4,530)
Landscape/		(22,994)
Fabric Canopies		(14,519)
Activity Yard Fence	$	(30,005)

Programmatic Adjustments

4

Adjusted Project Cost	$	6,737,568
Cost Per SF	$	316.56
Cost Per Bed	$	112,293
SF / Bed		354.73

Target Project	Our Project
Program Square Feet	18,365
Beds	44
Completion (Projected)	February-16
SF / Bed	417

5

Adjustment Factor	
Location F	1.60%
Date Facto	3.00%
SF Density	-18%
SF Density Factor	0.00%
Team / ILPD Factor	0.00%
Sum of % Factors	4.60%

Inflation & Geography

7

Normalizing Scope/Program Factors		
Sitework	$	782,716
Activity Yards	$	-
Permit/Municipal F		675,000
Emergency A		160,000
		-
Land Costs		

Site & Permitting

8

Interior Renovations?	$	150,000
Activity Yard Fence?	$	9,600
Site Concrete	$	27,682
High Parapet Screen	$	50,000
Masonry Veneer	$	275,953
Landscape/Irrigation	$	125,000
Metal Canopies	$	40,600
Shower Enclosure	$	-
Entrance Canopies	$	50,967
Ambulance Canopy	$	54,000
Professional Fees		
FF&E	$	403,924
Information Systems	$	187,000
Project Target Cost	**$**	**9,073,407**
PTC Total $/Bed	**$**	**206,214**

		Normalized Benchmark Project Cost	%	Our Project Allowable Cost	
	Total	9,098,822		11,500,000	
Cluster					
CSA		2,300,155	25%	2,907,166	Initial Cluster Validation Targets
Systems		3,951,322	43%	4,994,075	
Interiors		980,000	11%	1,238,622	
FF&E		658,000	7%	831,646	
IS/IT		355,024	4%	448,715	
Process Equipment		854,321	9%	1,079,776	

Component Breakdowns from Normalized Benchmark Establish Initial Cluster targets for Validation

Novel Projects Benchmark

- Single project comparison not available
- Assemble benchmark analysis from component level comparison to projects
- Still preserve 1:1 comparison rather than averages
- Select most similar performing project at system level

Benchmark & Cluster Targets

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For your team:

- ❑ Project selection & reason
- ❑ Normalization
- ❑ Establish cluster ’buckets’
- ❑ Identify 1-2 cost driving metrics and their value

20 MINUTES

Establish Cluster Validation Targets

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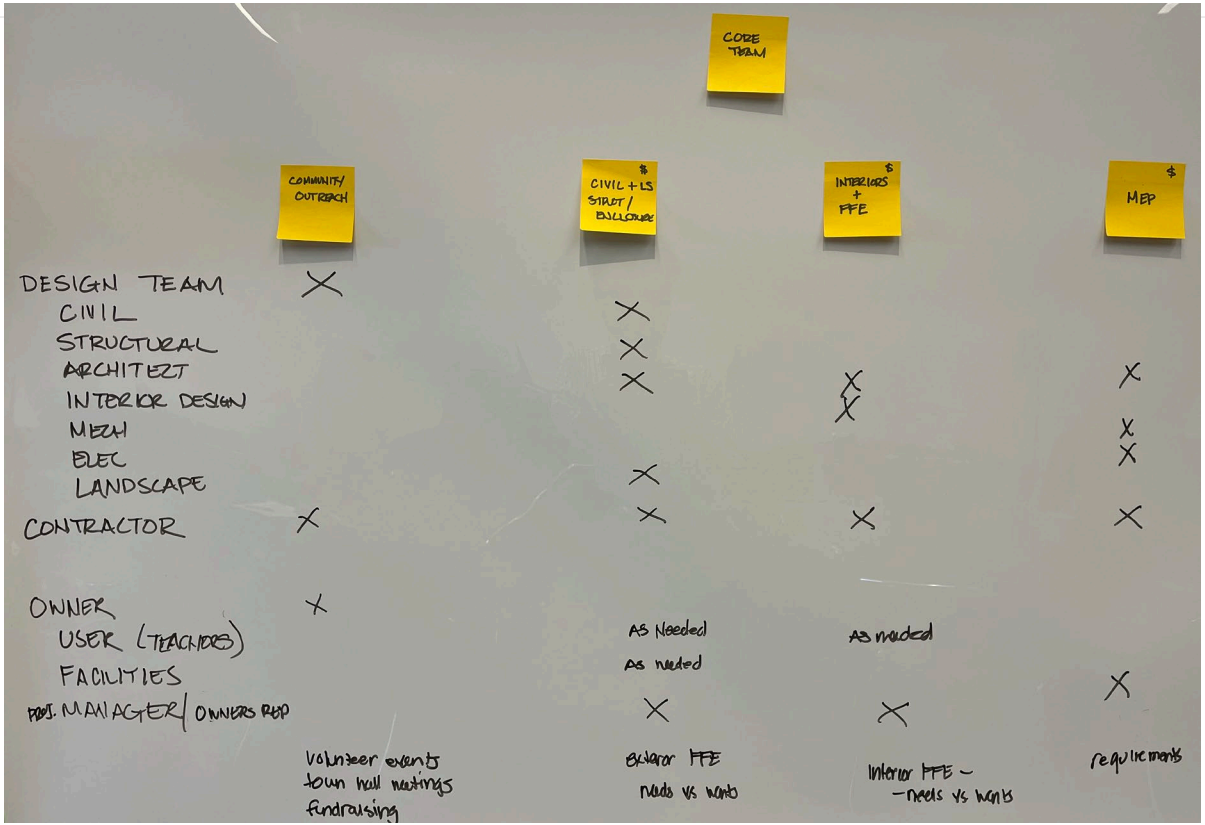
For your team:

- ❑ Total Normalized Cost
- ❑ % Breakdown of Component Clusters
- ❑ Establish 1st $ Value of Cluster Target

10 MINUTES

Cluster Organization



Resource

Programmatic Considerations

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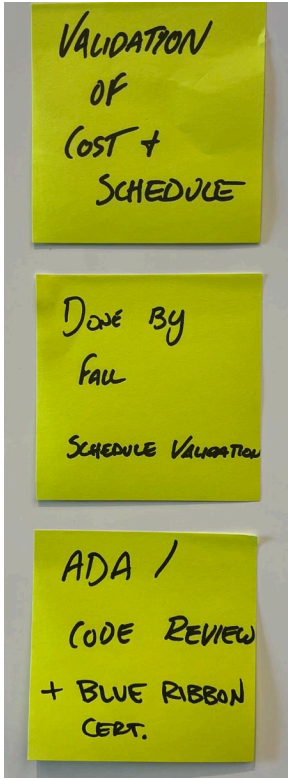
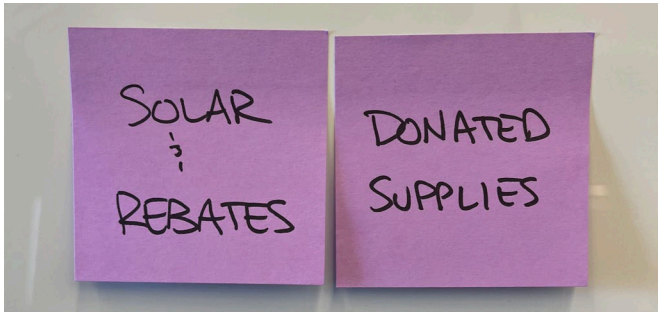
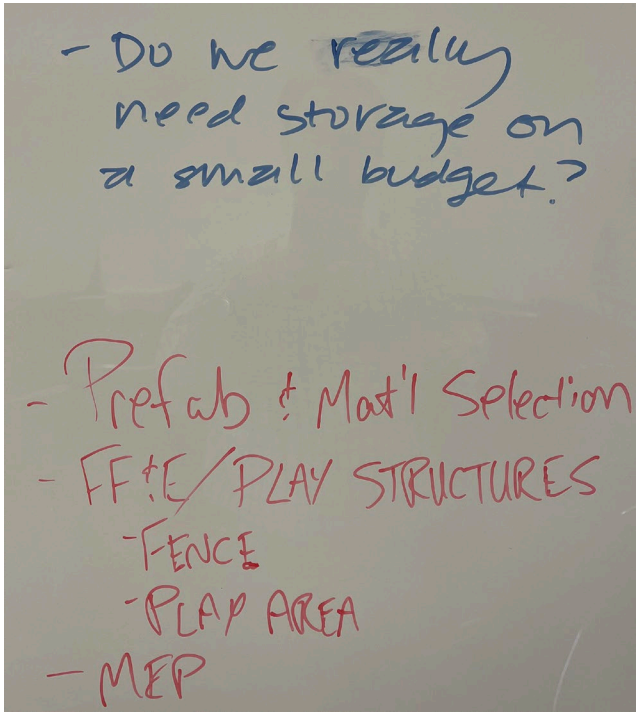






Resource

Project Cost Model Features

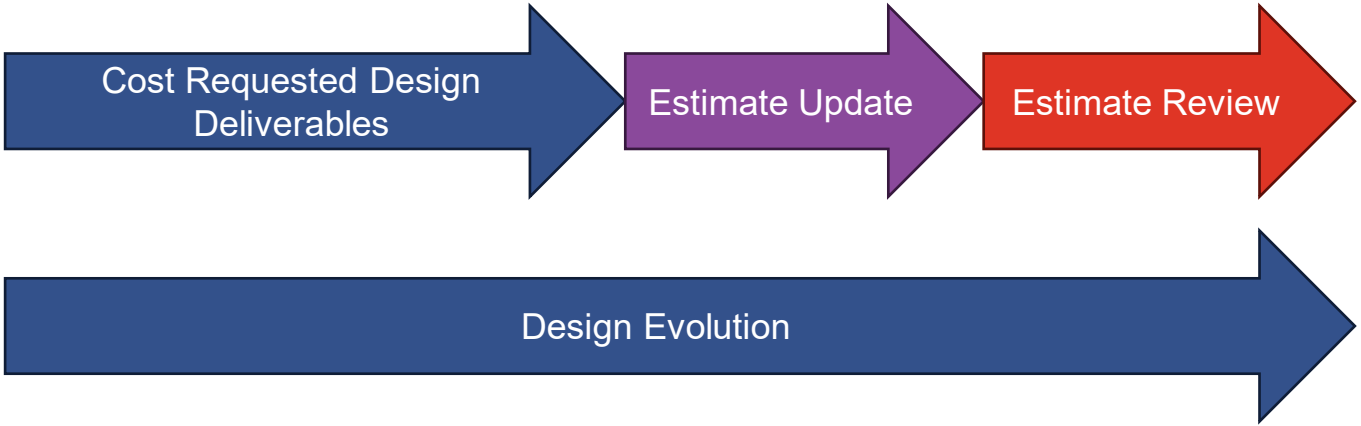
- Collaborative and Asynchronously Updated
- Consistently used in Work Clusters to inform/update Design Options
- Consistently used in Work Clusters to inform/update Risk & Opportunity
- Summarizes current state:
  - Working Estimate
  - Risk, Opportunity &
  - Value Decisions compared to Allowable Cost/Target

Estimate Work Cycles

- Holistic estimate updates at team negotiated milestones
- Updates incorporate:
  - Current state of design (production estimate)
  - Risk/Opportunity/TVD Items (conceptual estimate)

- Ensure update does not fall behind design as to be out of date when published

Estimate Work Cycles Risk



TVD Continuous Estimating Model

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Cost Model Features

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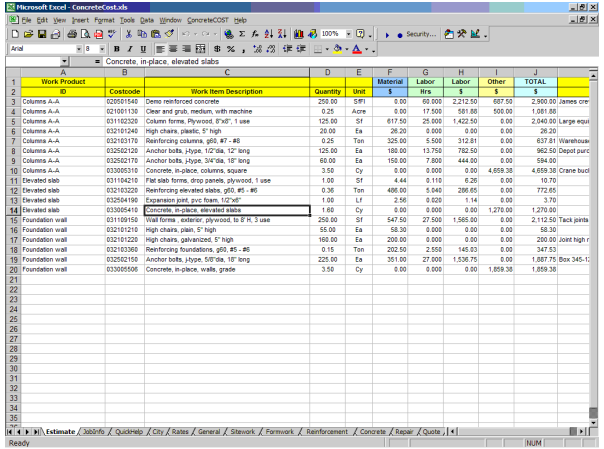
Last Estimate



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- Assumption Changes (Cluster Input)
- Risks/Opportunities
- Pending Value Decisions
- Etc.

= Current State

Cost Model Examples

Cost Model Examples

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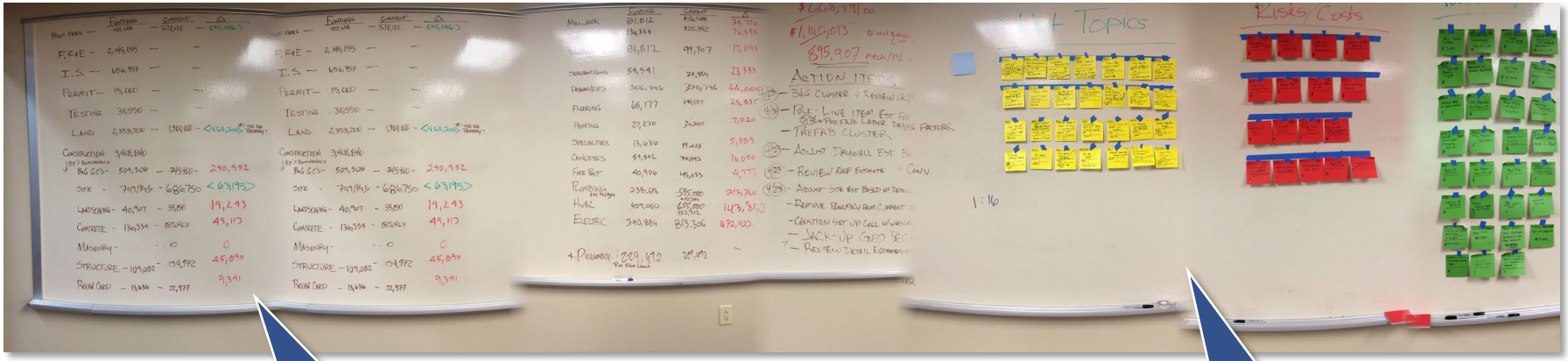

Cluster Targets & Current State

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TVD Items, Risks & Opportunities

Cost Model Examples

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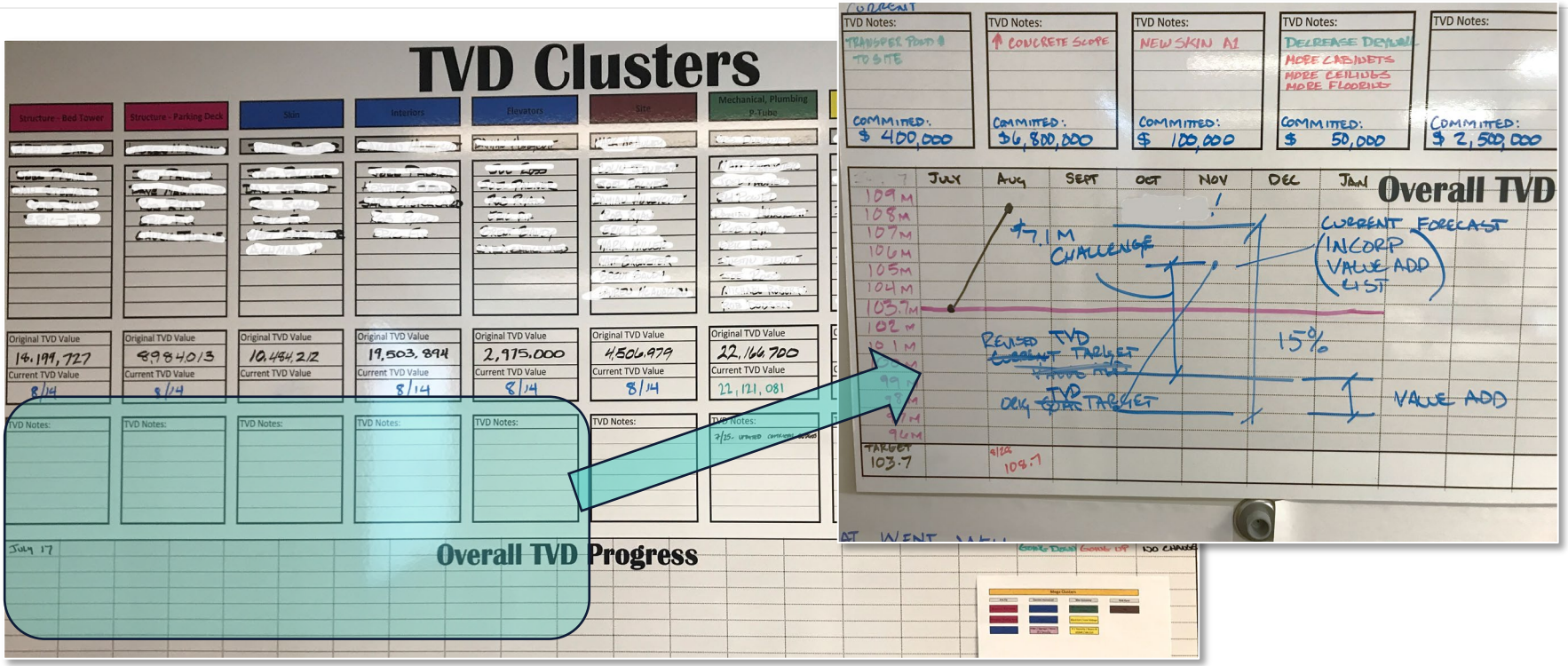

Cost Model Examples

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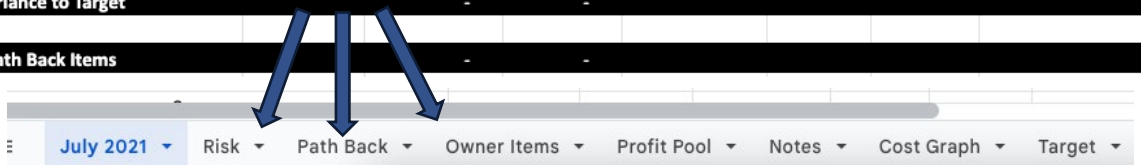
Team Member	PTC Consensus	06-2013 Estimate	07-2013 Estimate	Monthly Delta	Transfer To:	Transfer From:	Description
General Contractor (GC)		4,346,325	1,410,838	(2,935,487)			
AE (ARC)		199,000	182,600	(16,400)			
Interiors (ID)		65,915	61,685	(4,230)			
Framing & Drywall (Drywall)		5,200	387,763	382,563			
Mechanical (M)		-	1,154,192	1,154,192			
Electrical (EC)		27,409	1,178,175	1,150,766			
Owner Partner Items (UHS-P)			-	-			
Brandt (Precon)		67,392	48,314	(19,078)			
Risk Mitigation (RM)		-	123,365	123,365			50% to Profit Pool
Total (less Profit)	-	4,711,241	4,546,932	(164,309)			
Profit Pool (PP)	-	-	179,309	179,309			
Owner Non-Partner Items (UHS-NP)	-	2,778,939	2,763,939	(15,000)			Land, CON, FF&E, Systems
Grand Total Project Cost	-	7,490,180	7,490,180	-			
Target Budget @ XX Per Bed	7,490,180			-			
Variance to Target		-	-				
Path Back Items		-	-				



Cost Model Examples

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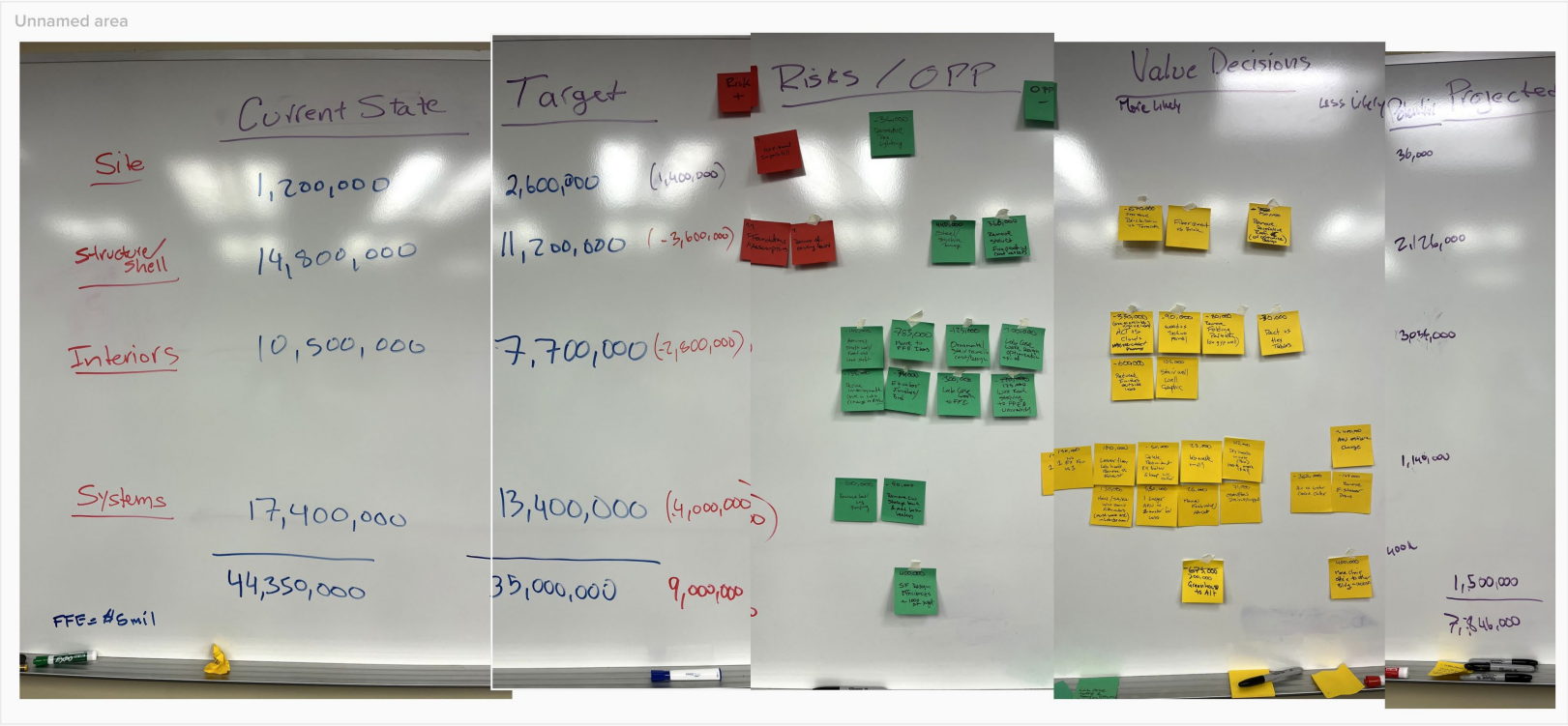

Cost Model Exercise

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Develop the following for your team:

- ❑ Establish a team cost model framework including:
- ❑ Current State | Value Tracker | Risk | Opportunity
- ❑ Brainstorm Value Items for Decision & Log
- ❑ Brainstorm Risk & Opportunity & Log

20 MINUTES

Targets & Incentives Examples

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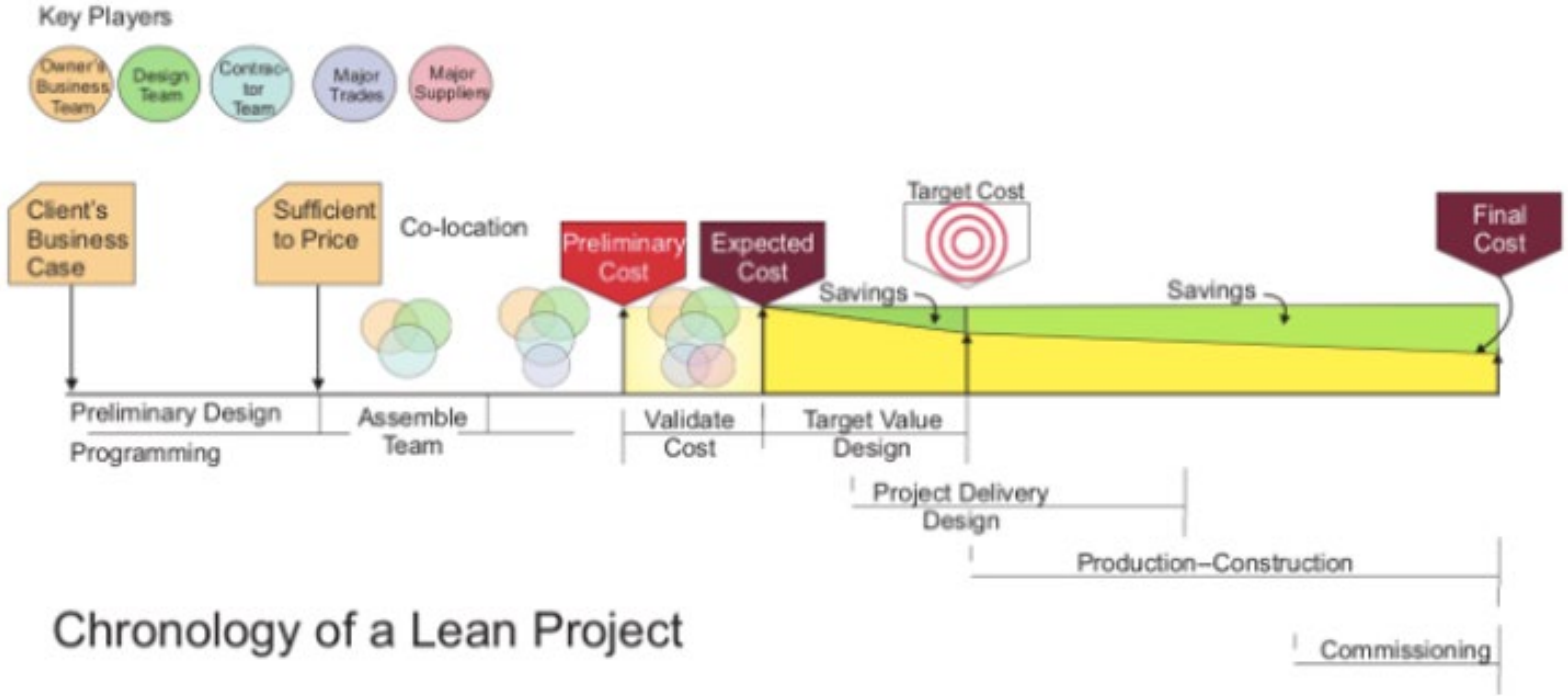
Validation Tactics and Setting Targets



Chronology of a Lean Project

Non-Cost Incentives

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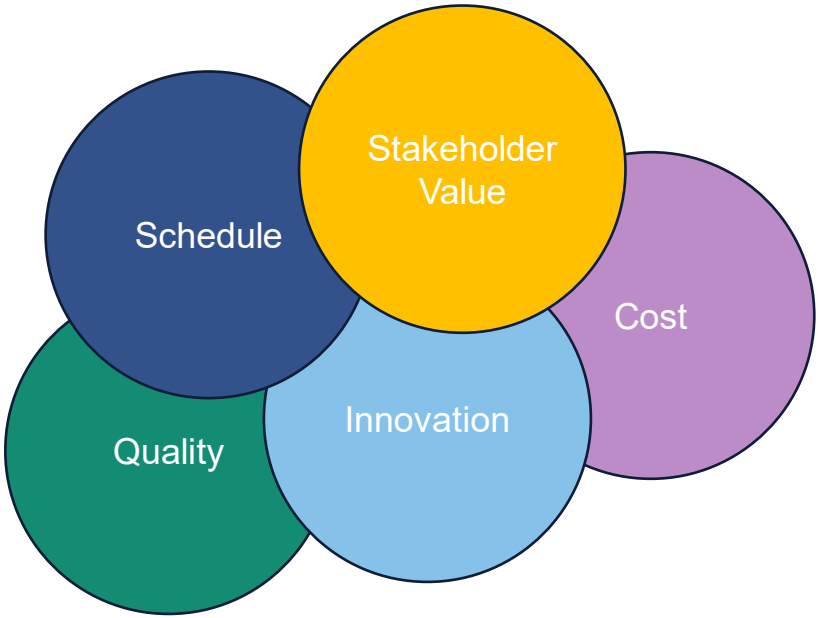

1. ED HCAHPS scores during the first 12 months show an average Cleanliness of the Emergency Department Environment at a rating of 82 or higher (approx. 15 % above National Average at this time) [8% of Enhanced portion of the Profit Pool]
2. ED HCAHPS scores during the first 12 months show an average Quietness of Emergency Department Environment at a rating of 67 or higher (approx. 15 % above National Average at this time) [8% of Enhanced portion of the Profit Pool]
3. Hospital Acquired Infections (HAIs - Emergency Department specific) during the first 12 months rate an average of:
    a. 0.045 or less per 1,000 APD for MRSA infections (approx. 10% under National Average at this time).
    b. 0.81 or less per 1,000 APD for Clostridium Difficile (approx. 10% under the CDC NHSN SIR at this time).
    c. 0.045 or less per 1,000 APD for Multiple Drug Resistant Organisms., i.e., VRE & CRE (approx. 10% under National Average at this time).

    HAI's will be measured utilizing Standardized Infection Ratios (SIR's) and rates for MDROs. [8% of the Enhanced portion of the Profit Pool]
4. Hospital Capital costs related to design or construction modifications or omissions are zero after 12 months. Any modifications or omissions discovered may be paid out of this portion of the incentive up to the 8%. [8% of Enhanced portion of the Profit Pool]
5. Patient falls during the first 12 months are an average of 2.15 or less (10% lower than the UHS Benchmark of 2.39/1,000 APD). [8% of Enhanced portion of the Profit Pool]
6. Design reduces normal post-construction maintenance costs for Emergency Department. [8% of Enhanced portion of the Profit Pool]

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Managed Risk vs Contingency

- More transparent and specific
- Risk log is Dynamic and Continuously Updated
- Risk items ranked by % likelihood (event) and $ magnitude impact (effect)
- Risk $ are included in a negotiated target
- Contingency as % of cost typically reserved for owner funding

"Hidden contingency is a barrier to exposing opportunities for improvement"

- Douglas Lee

Risk / Opportunity Log Features

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- Collaboratively Updated
- Consistently used in Work Clusters
- Prioritized by team assigned likelihood & impact

Risk Log Examples

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Risk Item	Release Date	Cluster	Champion	Item	Risk Area of Impact				Impact Magnitude	Occurrence Probability	Contingency Spend	Mitigation Strategy/ Plan Status	Notes
					Cost	Safety	Operations	Schedule					

Date Risk Item Resolved

Categorization

Prioritization

Risk Mitigation

As the team develops Risk Identification & Mitigation habits it is important to be consistent and clear with:

- Risk events which may occur and cause unplanned/wanted impacts.
  - Estimate the % likelihood of event occurrence and the team's ability to reduce
- Risk impacts/effects which occur IF the event happens
  - Estimate the $ magnitude of impact and the team’s ability to reduce
- Evaluate if the cost of likelihood or magnitude reduction are worth it

Risk Log

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PCO	COR	Status		Origin Date	Potential Change Order/Risk Item	Lead	Date Item is Realized or Anticipated	Risk (1-5)	Original Estimate	Revised Estimate	Factored Est $	COR Approximate	COR Pending	Approved	Funding Source
248	9	Closed	BLDG	3/16/16	Doors/Frames/Hardware Scope Changes							$ -	$ -	$ -	
138	4	Closed	BLDG	9/28/15	Recognize $83K of Path Back in Architectural Design Services	Ray L.	10/2/15	5	$ -	$ -	$ -	$ -	$ -	$ -	
139	4	Closed	BLDG	10/13/15	OCIP Premium Savings	Ray L.	10/13/15	5	$ -	$ -	$ -	$ -	$ -	$ -	
140		Closed	BLDG	10/15/15	Transfer Design Contingency to SR for Storm Drain Easements from Survey Vendor	Ray L.	10/15/15	5	$ -	$ -	$ -	$ -	$ -	$ -	
141	4	Closed	BLDG	10/15/15	Transfer budget to Precision Concrete from KHS&S to cover overrun	Ray L.	10/15/15	5	$ -	$ -	$ -	$ -	$ -	$ -	
142	4	Closed	BLDG	10/15/15	Transfer Overhead Doors overrun from Operable Partitions	Ray L.	10/15/15	5	$ -	$ -	$ -	$ -	$ -	$ -	
143	4	Closed	BLDG	10/15/15	Transfer Rubbish Removal from Turner to SR	Ray L.	10/15/15	5	$ -	$ -	$ -	$ -	$ -	$ -	
145	TBD	Closed	BLDG	10/27/15	4 Additional OH Lights in ED	Ray L.	10/27/15	5	$ 30,000	$ -	$ -	$ -	$ -	$ -	
146	4	Closed	BLDG	10/27/15	Transfer Mechanical, Electrical, and P-Tube budget to SR Interior/Exterior Caulking	Ray L.	10/27/15	5	$ -	$ -	$ -	$ -	$ -	$ -	
147	4	Closed	BLDG	11/4/15	Transfer Kitchen Equipment Budget to Anning-Johnson to provide Kitchen Hood Supports	Ray L.	11/4/2015	5	$ -	$ -	$ -	$ -	$ -	$ -	
148	TBD	Closed	BLDG	11/10/15	Rework - Panel changes due to incorrect slab edge location.	Joe G.	11/4/2015	5	$ 11,553	$ -	$ -	$ -	$ -	$ -	
149	4	Closed	BLDG	11/12/15	Transfer from Tile to cover Flooring buyout overrun	Joe G.	12/10/2015	5	$ -	$ -	$ -	$ -	$ -	$ -	
151	TBD	Closed	BLDG	11/12/15	Exterior Color Selection for EIFS	Joe G.	12/10/2015	5	$ 76,000	$ -	$ -	$ -	$ -	$ -	
152	TBD	Closed	BLDG	11/12/15	Productivity Loss Due to Impact in Receiving Permit from City of Henderson	Danny B.	12/10/2015	0	$ 100,000	$ -	$ -	$ -	$ -	$ -	
153	4	Closed	BLDG	11/12/15	Transfer OR Ceiling budget to create an OR Ceiling Support budget under SR	Ray L.	12/10/2015	5	$ -	$ -	$ -	$ -	$ -	$ -	
154	5	Closed	BLDG	11/19/15	Transfer NV Energy budget from Penta to SR/On-Site for $750K.				$ -	$ -	$ -	$ -	$ -	$ -	

Risk Matrix

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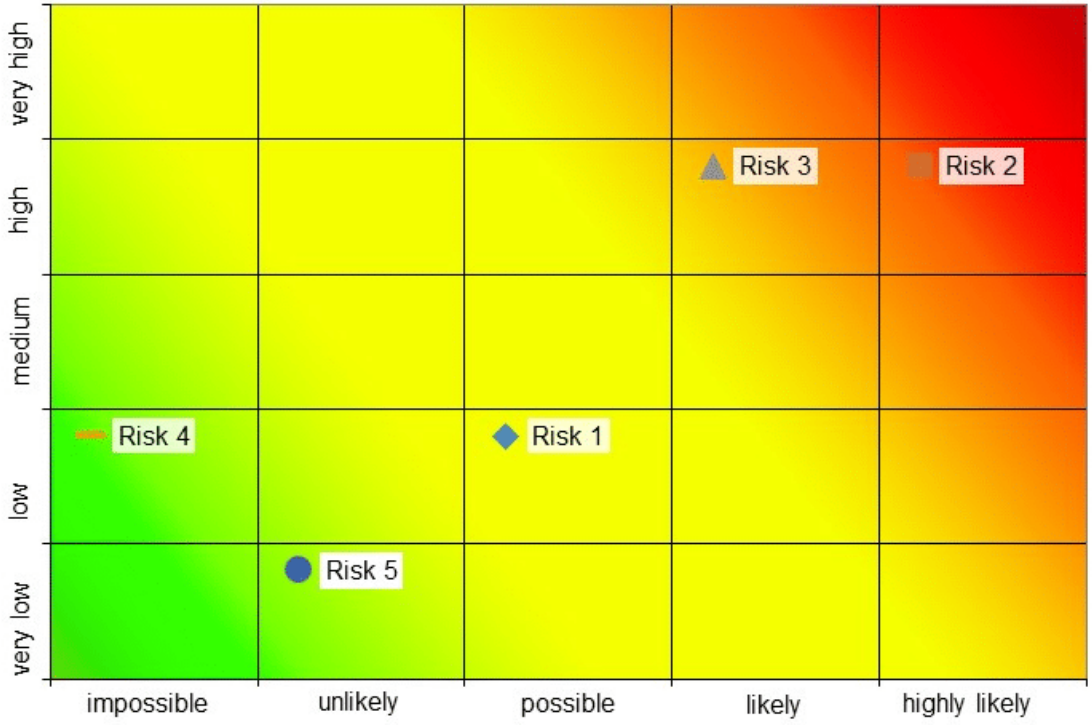
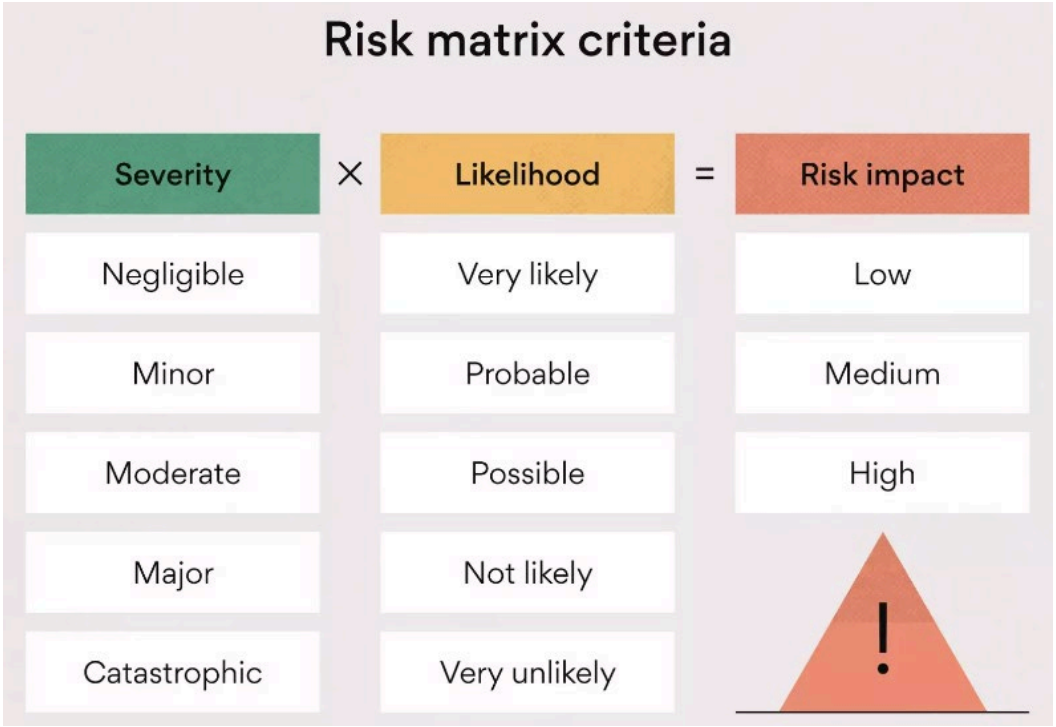


Risk Matrix



Identify and Exploit Opportunities

A lean team should be developing strategies for delivering owner value at less cost or more value for the same cost.

- Opportunity identification can occur at any time in the project and in ‘innovation’ brainstorming sessions.
- Some opportunities may be scope rightsizing (as long as it does not reduce owner value)
- Opportunities should be prioritized by estimating Potential Impact ($/Time/Value) vs Effort

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Value Add vs Value Engineering

- A TVD process seeks to be a ‘Value Additive’ process

- Team must know how to negotiate owner needs vs wants based on:
    - Business Case/Constraints
    - Value Definition
    - Conditions of Satisfaction

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Value Add vs Value Engineering

- TVD teams should not commit scope to the project unless there is a path for paying for the item.

- Payment paths are typically:

  - Owner funds (contingency or reduction in other team cost)
  - Team manage risk mitigation fund
  - Offset in other cluster managed cost/scope
  - Team profit (in IOFA/IPD projects)

Value Add vs Value Engineering

When teams fail to negotiate items proactively, the TVD process is likely to break down resulting in:

- Required value engineering
  - Design rework typically at a time when the team should be planning for construction
- Retroactive additional funding requests (unhappy owners)
- Profit pool erosion (unhappy team)
- End of project disputes (unhappy everyone)

Production Estimating

- Most traditional form of estimating.
- Driven by what has been documented in the design phase and confirms estimates developed during earlier conceptual stages.
- Counting of quantities from documented design and applying ‘book’ labor and material values to quantities.

Learning Objectives

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Understand the Validation Phase of TVD and how to define or determine when validation is complete.

Discover the process of selecting and analyzing a benchmark project to be able to draw useful ‘should be able to do’ insights and establish first pass targets.

Learn how to establish a process for the continuous visible evolution of the current state cost prediction and ‘what if’ scenarios measured against desired targets.

Understand the importance and various processes for establishing and measuring against a team target cost, breaking cost into useful components, the role of incentives and effective team management of risk and opportunity.

Discussion Question

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What new actions or ideas that you learned today can you take back to your project?

Questions?

Conduct Plus/Delta

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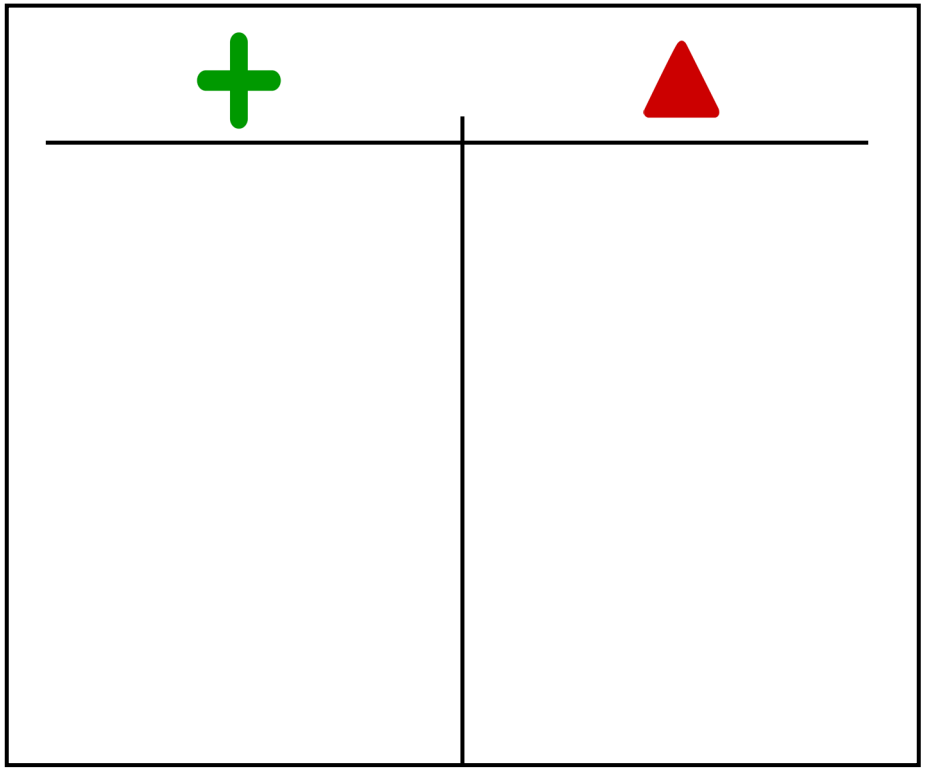
Plus: What produced *value* during the session?

Delta: What could we *change to improve* the process or outcome?



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