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Immersive Education Program

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Health precautions to keep everyone as safe as possible at Congress:

- Wear masks at all times in indoor events.
- Complete your daily health screening on your phone and bring it with you when you enter the center each day.
- Practice social distancing to the extent possible. Seating at plenary sessions is structured to help with this.
- If you feel ill at any time, please leave the conference and return to your room/consult a physician as necessary.
- Ultimately, our collective health and safety at Congress is up to all of us. Thanks for your support!

Table Set Up

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Please move to a table where you do not know anyone.

Sit 5-6 at a table.

Introduce yourself to others at your table.
Choose a **Facilitator** to todays presentation
Also, choose a **timekeeper**.

5 Min

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Introduction to Lean in the Design Phase

Michael Williams, Principal Stantec Architecture

Dave Hagan, Executive Director of Continuous Improvement Devenney Group Ltd. Architects

19 October 2021

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LCI Course:
Introduction to Lean in the Design Phase
4 CEU

Sign the sign-in sheet for credit

AIA Approved Continuing Education

Learning Objectives

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Learn key definitions of Lean, review foundational goals and benefits, recognize key components and discover the Eight Wastes.

Learn how to connect people through collaborative communication by understanding the Lean mindset, and identifying keys to developing a high-performing team.

Learn how to connect principles and practices by discovering the benefits of key Lean approaches: Big Room, Target Value Delivery and Collaborative Planning.

Discover set-based design practices, understand the impact of sound decision-making, and the relationship to optimizing outcomes.

Agenda

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1:00 PM – Introductions

1:10 PM – Set Up

1:45 PM – Lean

2:15 PM – Lean Operating System

3:05 PM – People

3:30 PM – Practices

3:50 PM – Target Value Delivery

4:15 PM – Other Tools

4:45 PM – Final Report Out

5:00 PM – Adjourn

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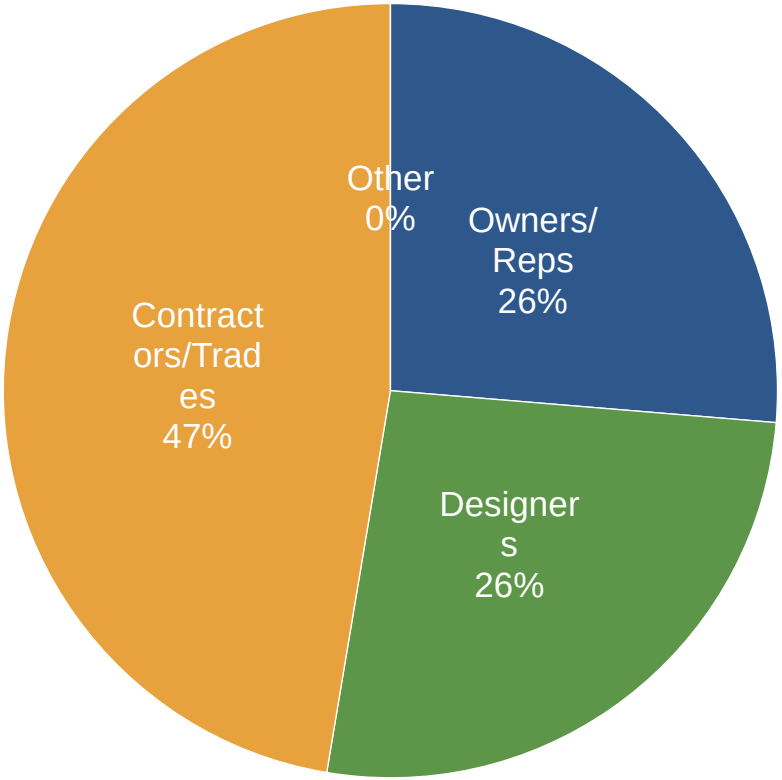
Who's Here Today?

This is a great mix of the key members of a typical Design Phase for a given Project



Set Up

Lean Journey to Mastery

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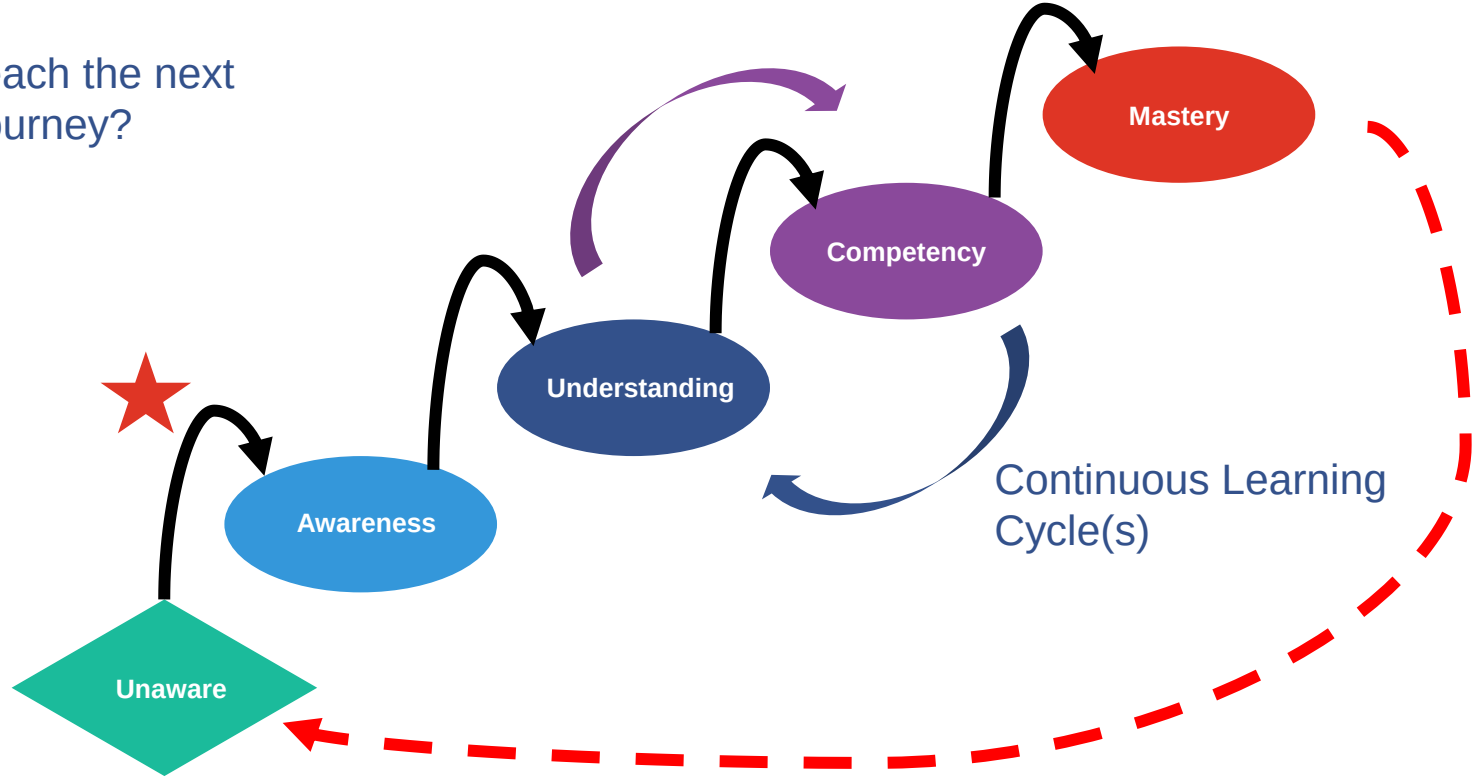
How will you reach the next level on your journey?



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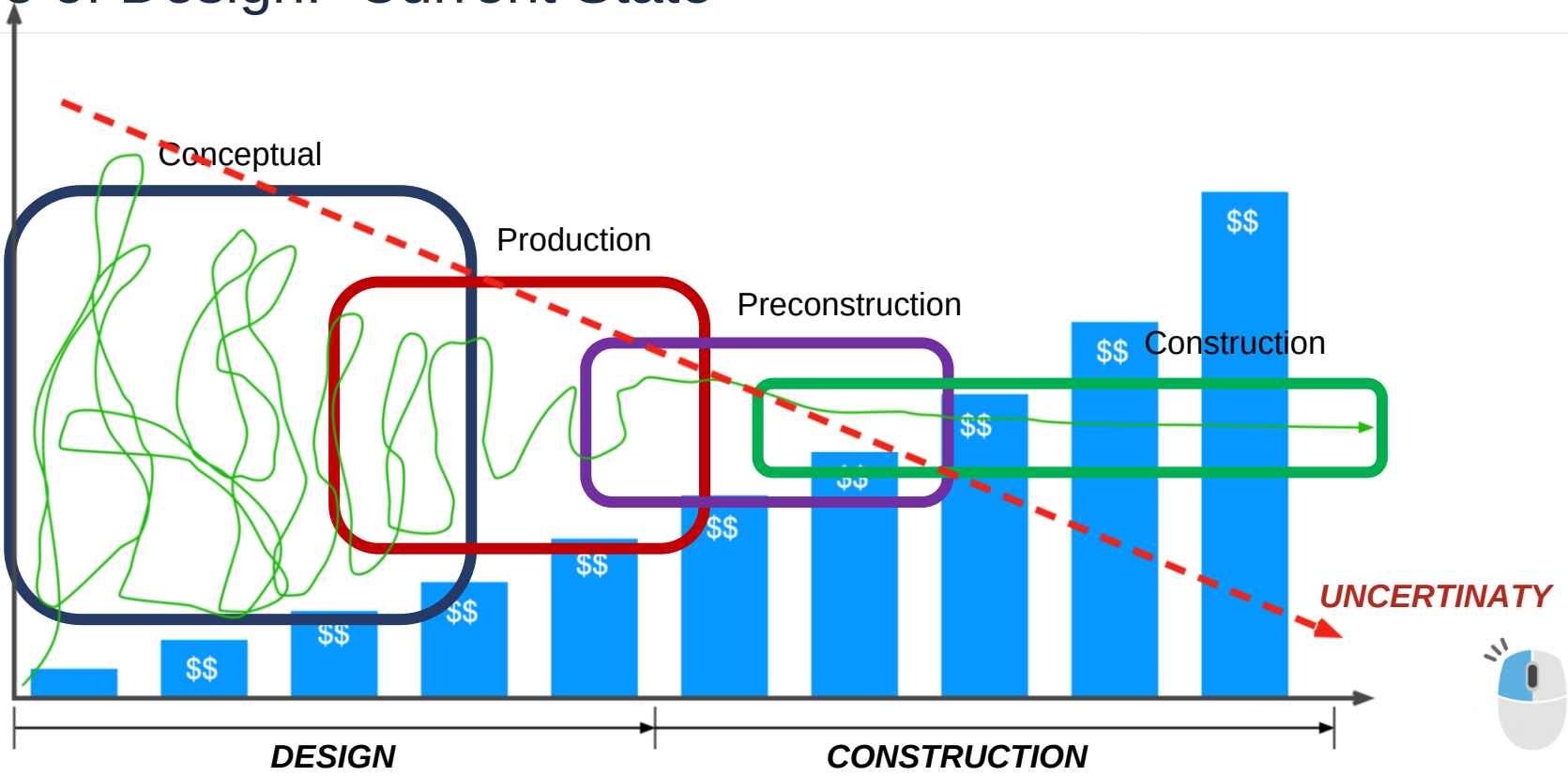
Nature of Design: Current State



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Challenges in Design

By nature – Design is **complex**

It often involves **thousands of decisions**

Sometimes over a period of **many years**

With **numerous interdependencies**

Under **highly uncertain environments**

Reference: Freire, J., & Alarcon, L. F. (2002). Achieving Lean Design Process: Improvement Methodology. Journal of Construction Engineering and Management

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Challenges in Design

Design can involve a large number of participants

Include many decision makers

Require trade-offs between competing criteria

Be based on inadequate (or incomplete) information

with intense budget and schedule constraints

Reference: Freire, J., & Alarcon, L. F. (2002). Achieving Lean Design Process: Improvement Methodology. Journal of Construction Engineering and Management

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Traditional Delivery Outcomes…

Risk is high.

72% of projects are delivered late.

73% of projects are over budget.

Rework and waste is high.

Teamwork is unreliable.

Customers are not satisfied.

Profit margins are shrinking.

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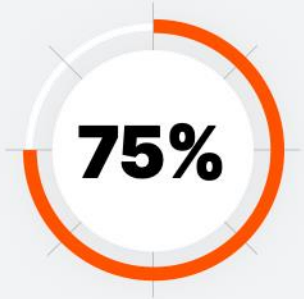
The Reality…



of projects delivered **late**, **over budget**, or **both**

69
DAYS

Project delivery averaged **69 days late**

Costs **increased 15%** due to changes in budget and schedule

Research Survey Conducted by IDC

PROCORE

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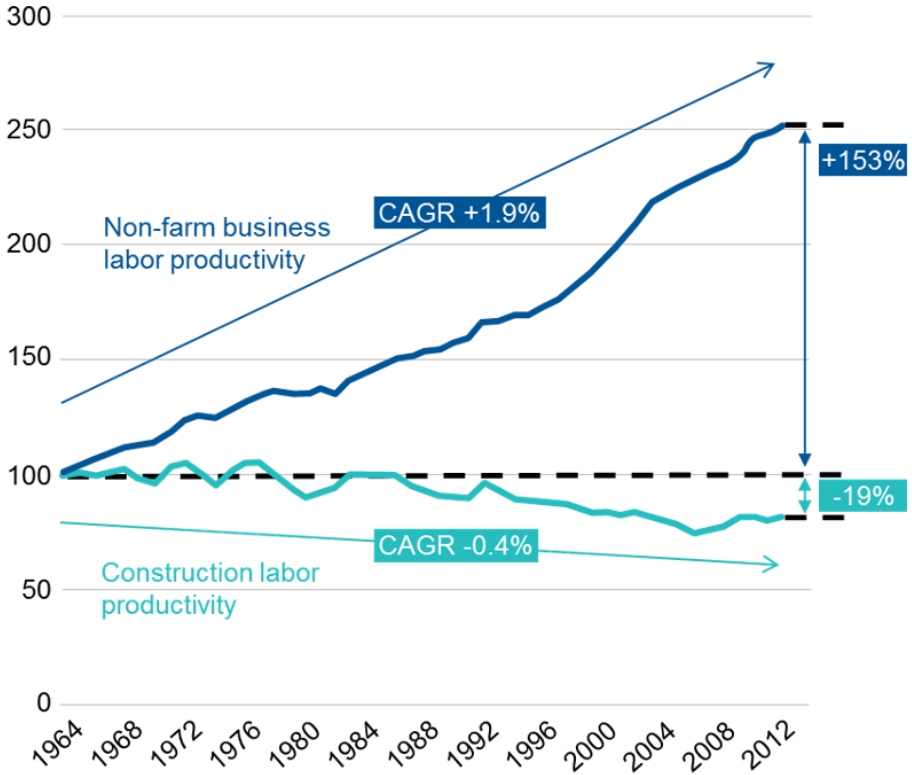
The Reality…

Construction Industry labor productivity has decreased 19% overall since 1964 while all other tracked industries have increased productivity an average of 153%.



The Opportunity…

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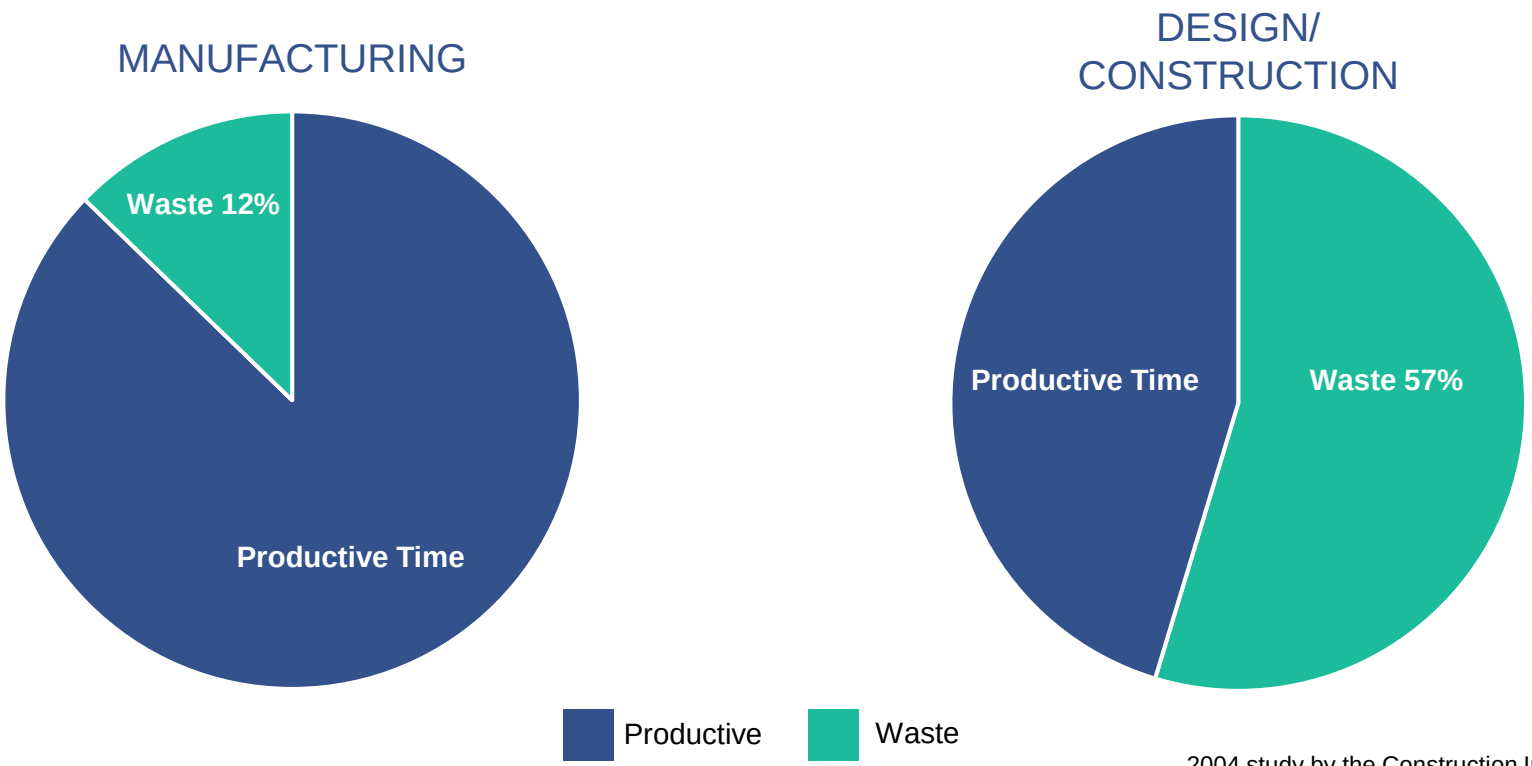

2004 study by the Construction Industry Institute

Discussion Question: Box #2

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What are ***your*** dissatisfactions with the way projects are currently delivered?

Individually list at least 3 dissatisfactions on a post-it note. Table facilitator to allow for 8 minutes for discussion and then create a list of the 3 that have consensus in Box #2

CREATE ANSWERS 8 MINUTES:
REPORT OUT 2 MINUTES

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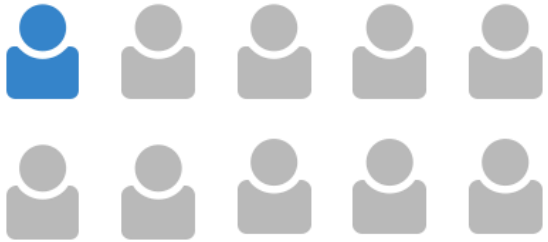
Owner Dissatisfaction

less than one in ten owners (9% to be exact) believe they are achieving a high level of excellence in total project performance.

9%



2018 CURT Owner Study
Continuum Advisory Group

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Excellence

OWNERS

WHAT SETS HIGH EXCELLENCE A/E/C PARTNERS APART?

- Integrity
- honesty regarding team-member experience
- Long term partnerships
- Understanding the customer (end user) needs and striving to meet them.
- Proactive problem solving
- Transparency when something goes off the rails
- Knowledge of owner systems/processes/facilities - not having to repeat the learning curve
- Listening and reacting appropriately.
- Other

A/E/C PARTNERS

WHAT SETS HIGH EXCELLENCE OWNER CLIENTS APART?

- Strong culture and values.
- Trust is instantly there
- Transparency
- Shared success mindset (“we/the team” not “us and them”
- Rapid decision making capability
- The right attitude - trusting that your A/E/C partners are the experts in what they do
- Experience

2018 CURT Owner Study
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Dissatisfaction

IF YOU COULD CHANGE ONE THING ABOUT YOUR PROJECT PARTNERS, WHAT WOULD IT BE?

WHAT OWNERS WANT TO CHANGE ABOUT THEIR CONTRACTORS			WHAT AEC'S WANT TO CHANGE ABOUT THEIR OWNERS		
1.	Trust and Transparency	22%	1.	Contracting Approach	46%
2	Alignment	17%	2	Collaboration	38%
3.	Innovation	17%	3.	Other	16%
4.	Contracting Approach	17%			
5.	Relationships	17%			
6.	Other	10%			

2018 CURT Owner Study
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Overcoming Industry Inertia

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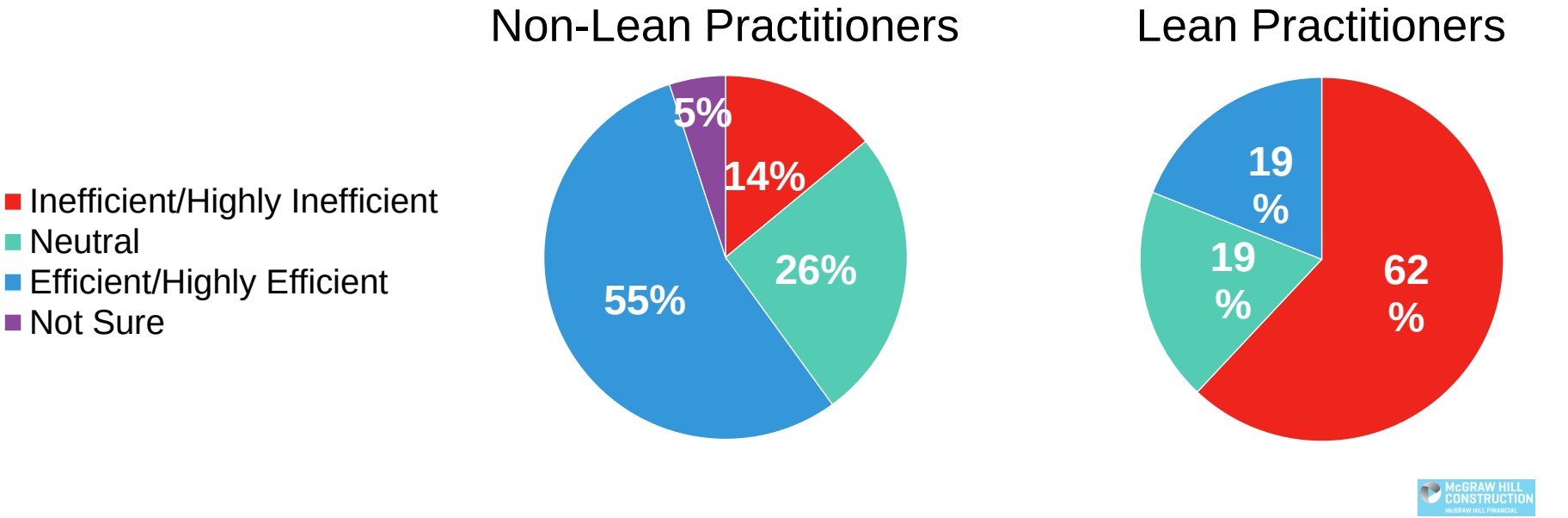
Efficiency of Construction Processes in the Industry
(By Level of Lean Engagement)



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Let’s try something new…..

The Ah Ha Moment

We are now in a world where the risk of trying something new is actually much lower than the cost of sticking to what has worked in the past.

Bill Taylor, Fast Company

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Change

Customer defines ***Quality*** from actual experience with the product or service.

Create efficient processes ***back from the customer*** to the creation of the product or service.

Scientifically approach process. ***Theory-Question-Improve***

Workers, given the opportunity, will change and improve the processes.

Steve Jobs in 1993 as CEO of NeXT Computer

Lean

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Definition of Lean

What is Lean?

A *management system* and *culture of respect* designed as a way we work by *adding value for our customers* and *eliminating waste*, where *every person associated with the delivery of the good or service is empowered to improve their processes*.

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Definition

What is Lean Project Delivery?

A structured application of the *Lean philosophy* facilitated with specific *tools* and *processes* to enhance and align the *flow* of information and *eliminate the waste* inherent in the legacy project delivery system.

Lean Project Delivery Enables

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Risk to be collaboratively managed.


Projects to be delivered on time.


Projects to be delivered within the budget.


Minimizing waste and rework.


Team-wide reliability.


Higher customer satisfaction.


Fair profits for providers.

Goals of Lean Design & Construction

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1. Achieve reliable workflow
2. Maximize value to the customer
3. Minimize waste
4. Optimize the whole, not the parts
5. Develop a discipline of learning and continuous improvement.

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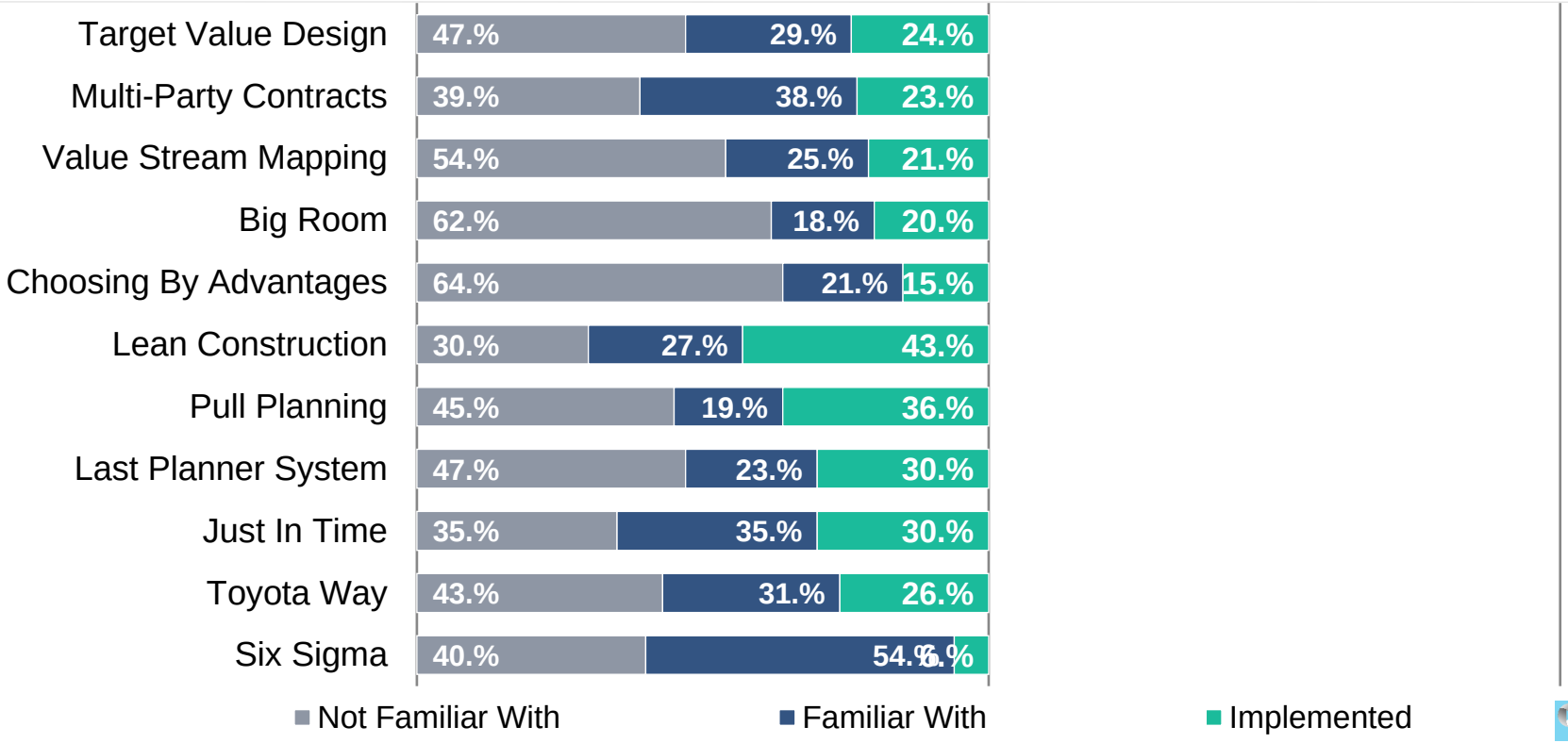
Industry Awareness



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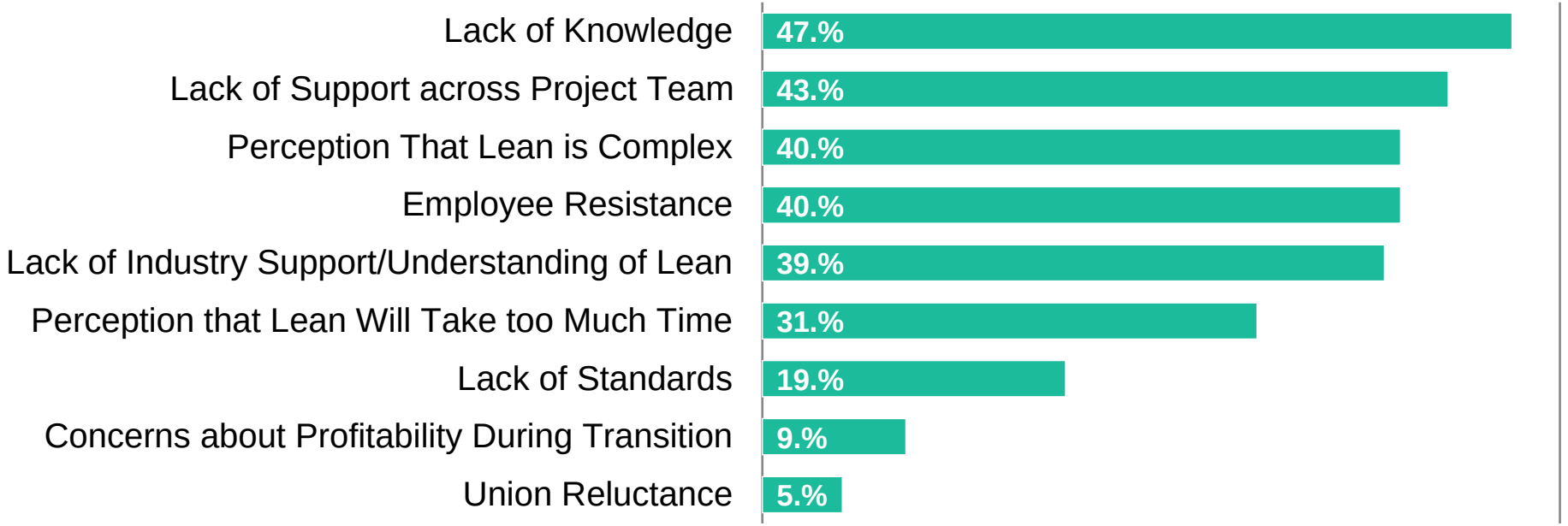
Challenges

Top Challenges Faced in the Implementation of a Lean Approach



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Do Lean Practices Help?

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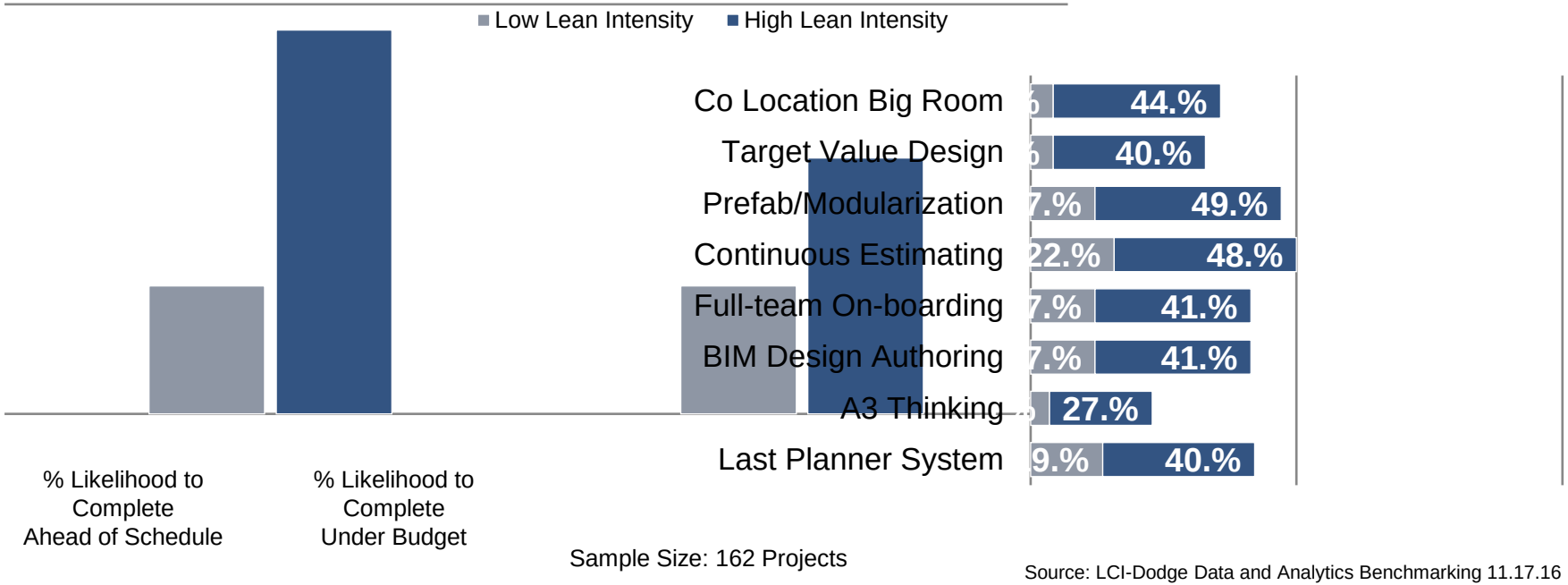
Correlation of lean intensity to outcomes (% likelihood on best projects)



Sample Size: 162 Projects

Source: LCI-Dodge Data and Analytics Benchmarking 11.17.16

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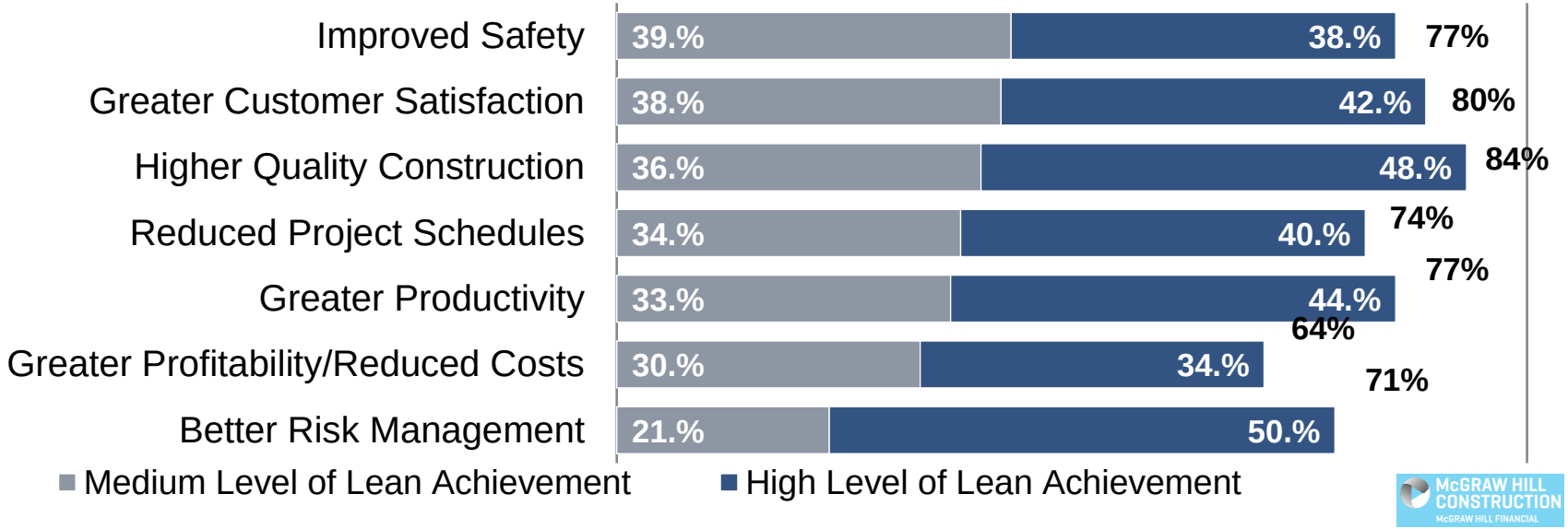
If You Use it…. You Will Improve

Results from implementing Lean practices.



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Discussion Question: Box #3

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Individually list what 3 things would you change to create better project outcomes and a more sustainable Design and Construction industry?

Table facilitator to allow for 8 minutes for discussion and then create a list of the 3 that have consensus in Box #3

CREATE ANSWERS 8 MINUTES:
REPORT OUT 2 MINUTES

Lean as an Operating System

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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 an organized implementation of Lean Principles and Tools combined to allow a team to operate in unison to create flow.

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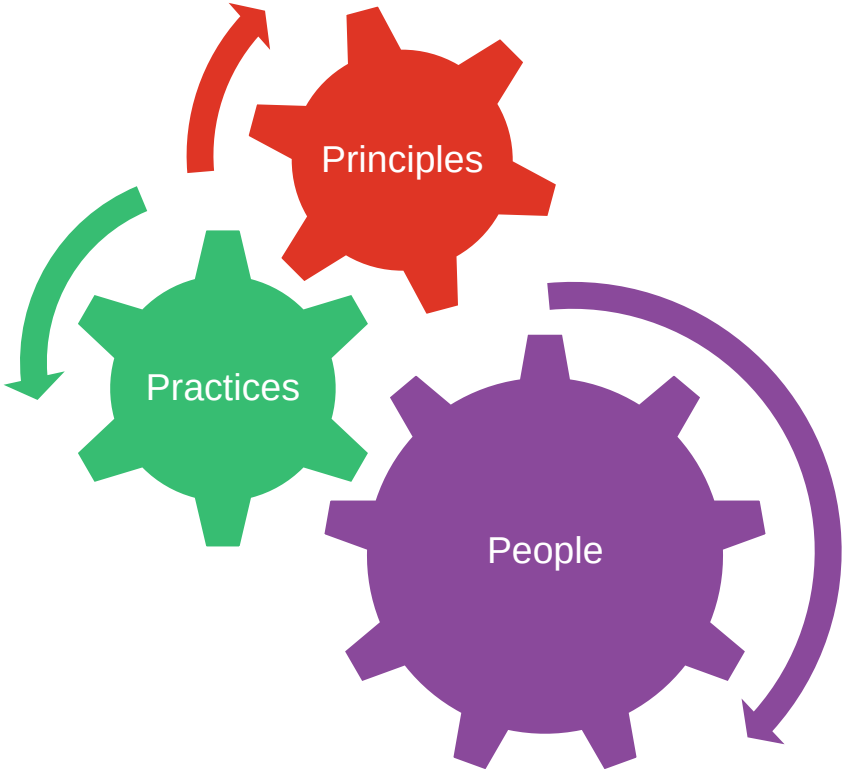
Lean Operating System

Components Include:

- Principles
- People
- Practices



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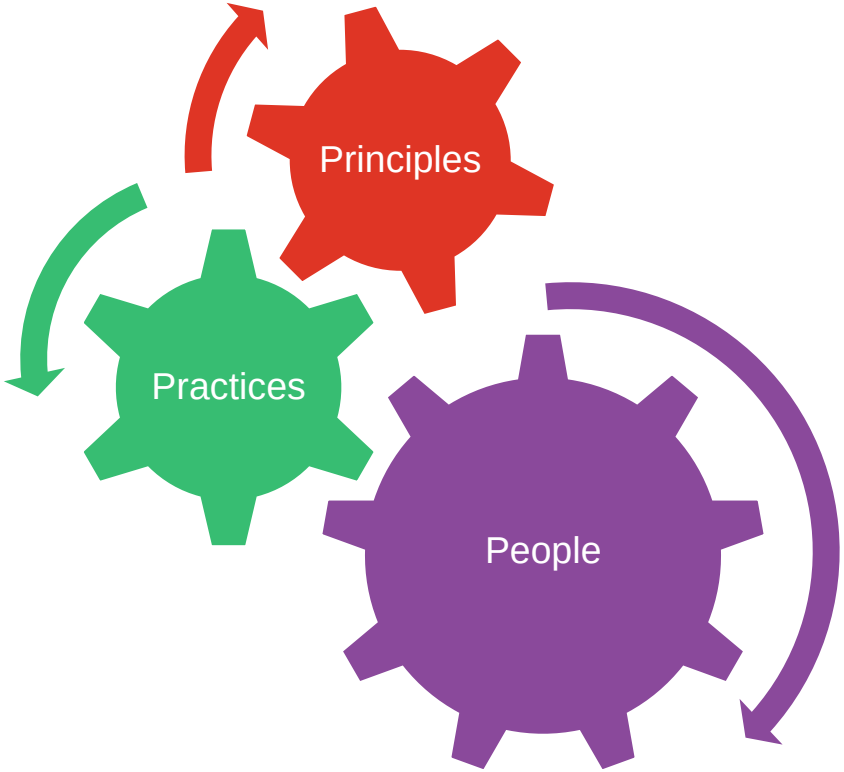
Lean Operating System

Principles

- LCI Six Tenets
- Creating uniform flow
- Continuous Improvement



Six Tenets of Lean

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

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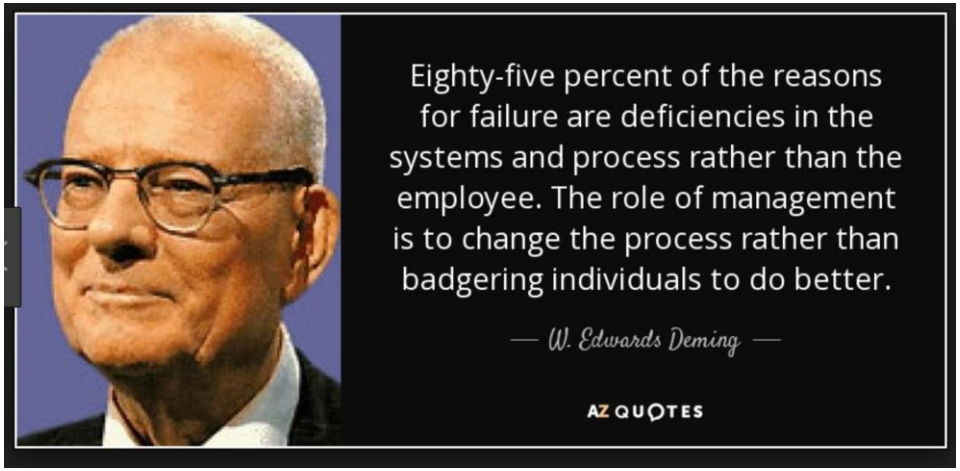
Respect for People



1 RESPECT FOR PEOPLE

People transform ideas and materials into value. People are essential to Lean project delivery so they must collaborate within and across teams using foundational Lean principles with the goal of optimizing overall value.

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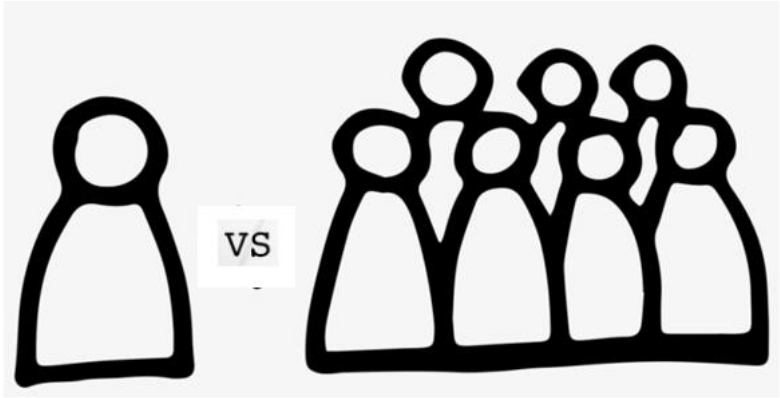
Optimize the Whole



OPTIMIZE HERE

2 OPTIMIZE THE WHOLE

Lean approaches focus on optimizing the whole of the project. Looking beyond the local and individual efforts to study the overall outcome to determine where value is added and waste can be eliminated.

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Generate Value

3 GENERATE VALUE

Team members have the ability to understand and refine the definition of value from the customers' point of view, and this definition becomes increasingly clear through the life of the project.

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Generating Value

If it is not something the client is willing to pay for, it is non-value added. Everything else is waste, and therefore should be eliminated, simplified or reduced.

— “The Toyota Way” by J. Liker

Eight Types of Waste

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Waste is any activity that requires time or resources but does not create value for the customer.

- Over/Under Production
- Waiting
- Unnecessary Transportation
- Over Processing
- Excess Inventory
- Unnecessary Motion
- Defects
- Unused Creativity of Team Members
  (Not listening/Not speaking up)

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Focus on Flow

5 FOCUS ON FLOW

Project team members collaboratively find ways to eliminate steps that have no value which shortens the process, all while focusing on flow efficiency.

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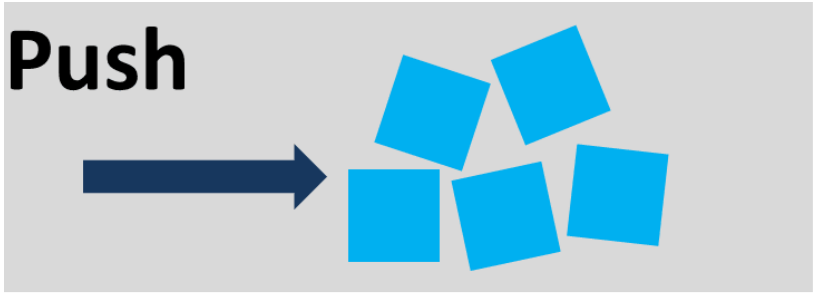
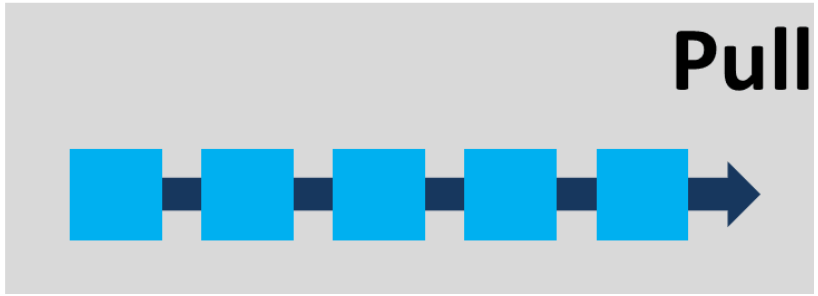
Focus on Flow





5 FOCUS ON FLOW

Project team members collaboratively find ways to eliminate steps that have no value which shortens the process, all while focusing on flow efficiency.

Flow and Smaller Batch Sizes

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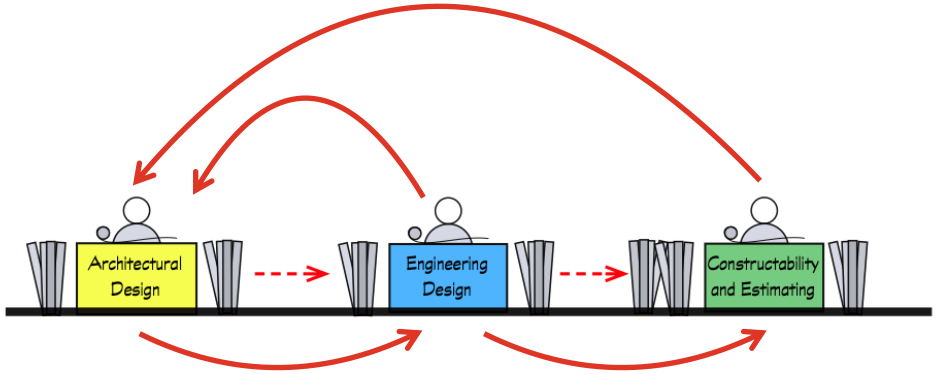
Design Coordination or re-design to reduce costs.



You do your work before I do mine.

Typical Design Process	1	2	3	4	5	6	7	8	9
Architectural Design									
Engineering Design									
Constructability/Estimating									

Waiting

Smaller Batch Sizes

Lean, Collaborative Design	1	2	3	4	5	6	7	8	9
Architectural Design									
Engineering Design									
Constructability/Estimating									

Less waiting

Continuous Improvement (PDCA or PDSA)

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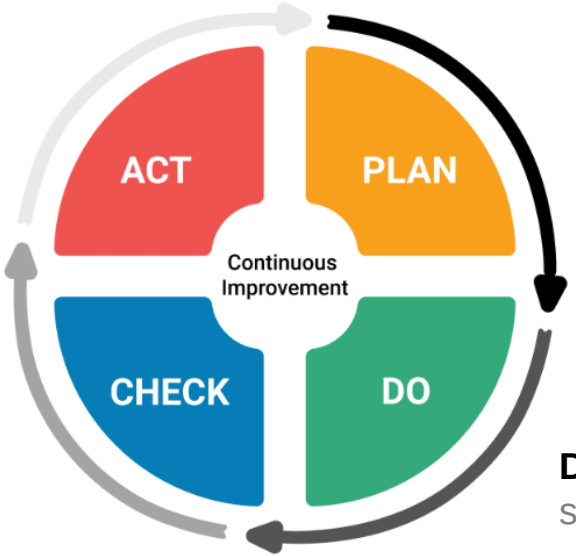
Act (Adjust) – take action based on the learning.



Plan (Predict) – identify the opportunity and plan a change based on a hypothesis

Check (Study) – review the outcome, analyze the results, identify what was learned

Do – test the change at a small scale

Lean thinking demands a mindset of continuous improvement.

Discussion Question: Box #4

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Discuss the following question:

- Why are project outcomes not predictable (cost/schedule)?

Table facilitator to allow for 8 minutes for discussion and then create a list of the 3 that have consensus in Box #4

TOTAL TIME 15 MINUTES:

Break

9:40

People

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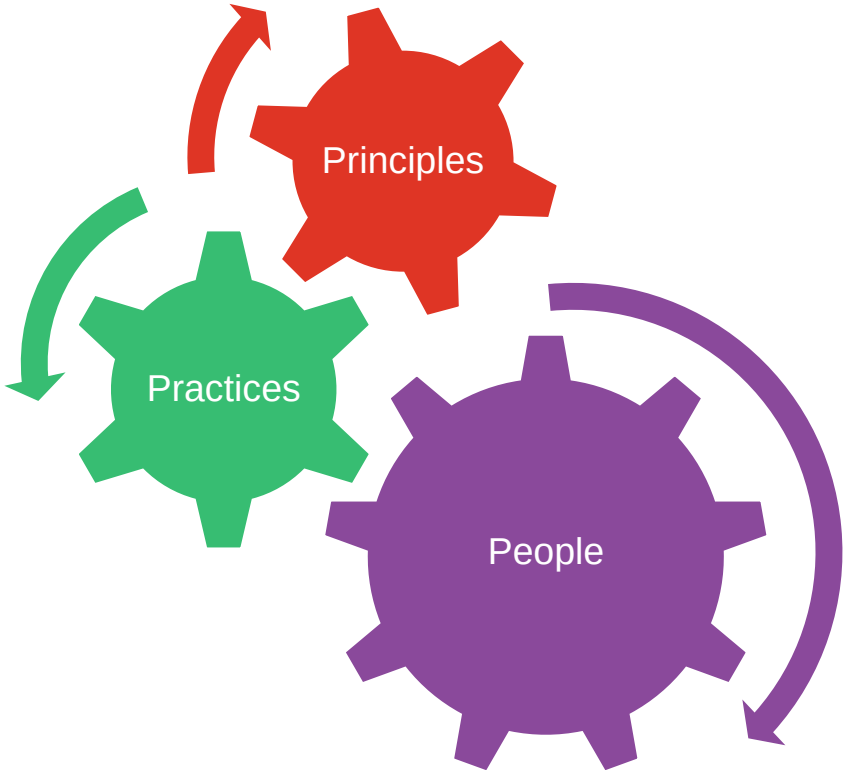
Lean Operating System

People

- High Performing Team
- Project as a Promise
- Trust
- Conditions of Satisfaction
- Respect



Characteristics of High Performing Teams

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1. A high performing team is built on a strong foundation of trust and transparency among all members.

2. There is a culture of respect that enables members to effectively delivery against CoS.

3. High performing teams break down barriers through innovation and continuous improvement.

4. They break down traditional silos to maximize skills and optimize performance.

Project is a Promise

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A project is a very big promise delivered by people in an ever changing network of promises.

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Trust

Challenge: Systematic Lack of Trust

CREDIBILITY RELIABILITY INTIMACY

$$\text{TRUST QUOTIENT} \rightarrow TQ = \frac{C + R + I}{S}$$

SELF-ORIENTATION

For Example:

Mother Teresa
TQ: 1,000

VS

Vladimir Putin
TQ: 10

Permission of Curt F. Dale Seminar

Conditions of Satisfaction (CoS):

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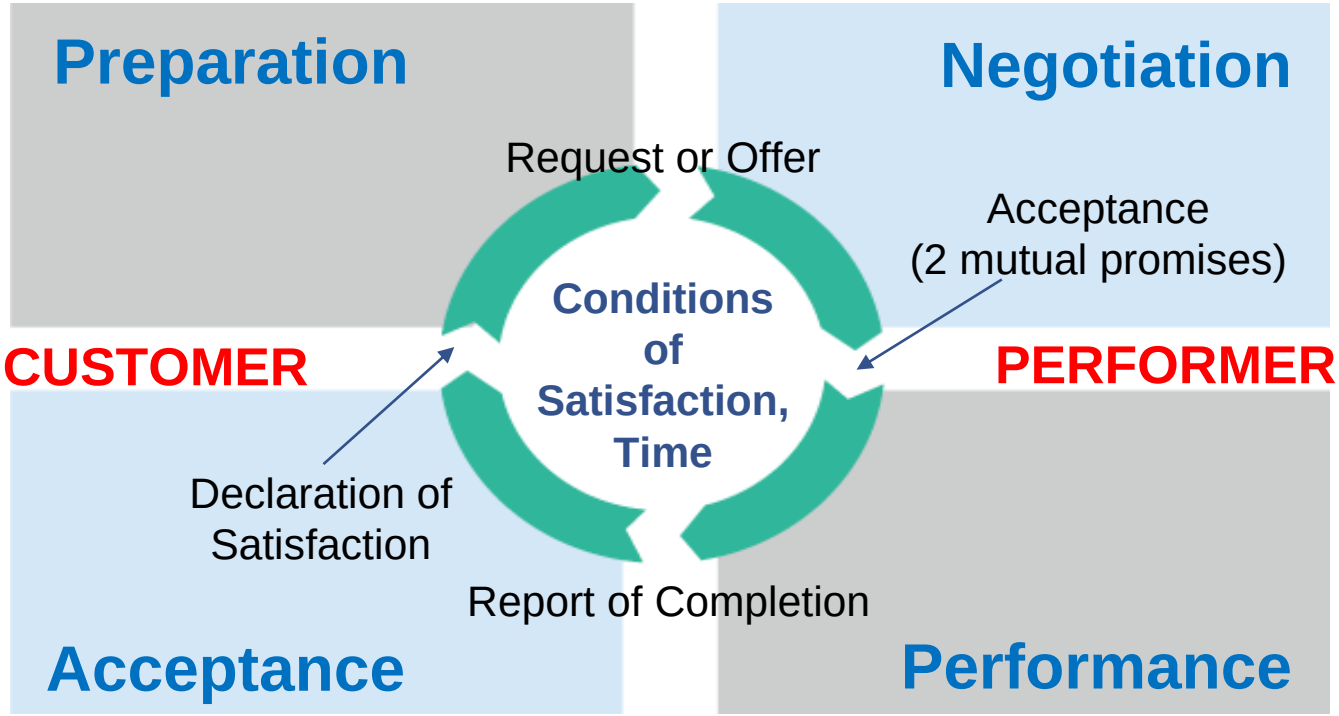
- Part of language act of making a promise (Basic Action Workflow)
- Are developed by the team
- ***Measurable*** statements that inform a project team about which tests a project must pass to be accepted as a success
- Inform the decision-making process of the team

Basic Action Workflow



Credit: Dr. Fernando Flores

Conditions of Satisfaction (CoS)

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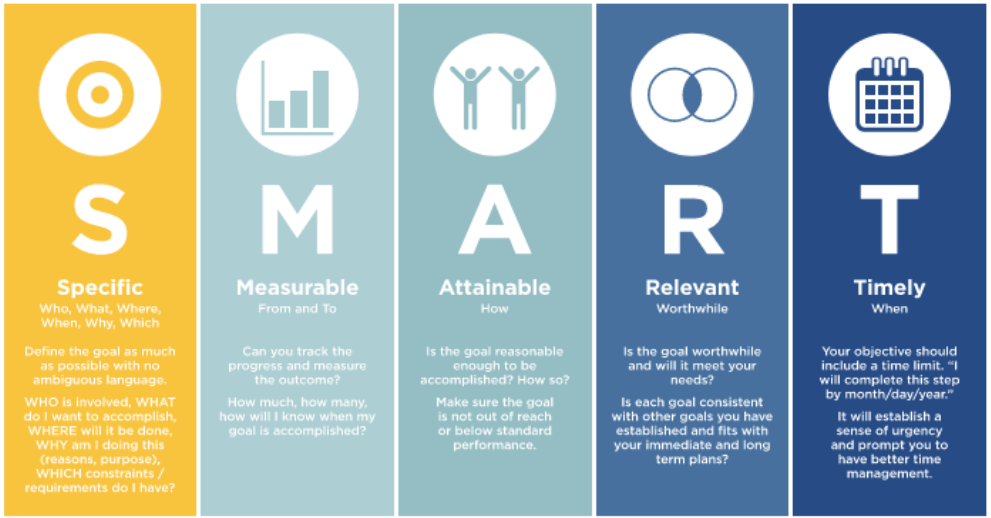
Criteria by which the project will be considered a success established by ALL of the stakeholders or “Customers”

This criteria creates the Conditions Of Satisfaction for the project and is the foundation of the“Customer’s” **VALUE PROPOSITION**



SMART Conditions of Satisfaction

CoS Example

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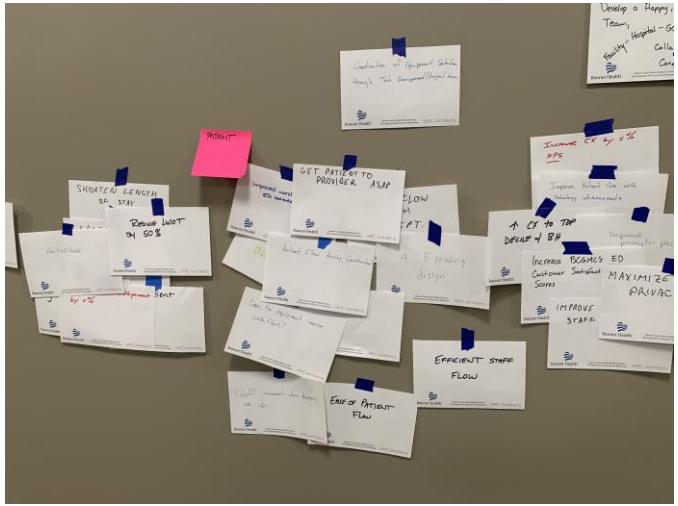
- Gather criteria from all stakeholders.
- Assemble into clear statements of value.
- Use as the basis for decisions and guiding the process.



CONDITIONS OF SATISFACTION

1. IMPROVE THE PATIENT SATISFACTION SURVEY SCORE BY __%.
2. IMPROVE THE AVERAGE DOOR TO DISCHARGE TIME BY __ MINUTES.
3. DECREASE THE NUMBER OF FALLS FOR THE EMERGENCY DEPARTMENT BY __%.
4. UTILIZE THE LAST PLANNER SYSTEM TO TRACK AND MANAGE CONSTRAINTS WITH A 75% OR GREATER PPC.
5. BIM COORDINATION TO BE DONE THROUGH CONSTRUCTION DOCUMENT DEVELOPMENT.
6. EXCELLENCE IN SAFETY: 95% EXCELLENT RATINGS AND ZERO LOST TIME INCIDENTS.
7. EXCELLENCE IN HOUSEKEEPING: 90% EXCELLENT RATING OR HIGHER.
8. INNOVATION BY PREFABRICATION
9. ALL TEAM MEMBERS WILL GO THROUGH ONBOARDING.

TEAM FUSION

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CoS Example

"A target goal developed as a reflection of the customer's values, where the customer is not necessarily only the client"

1. **Create New Industry Standards for Las Vegas**

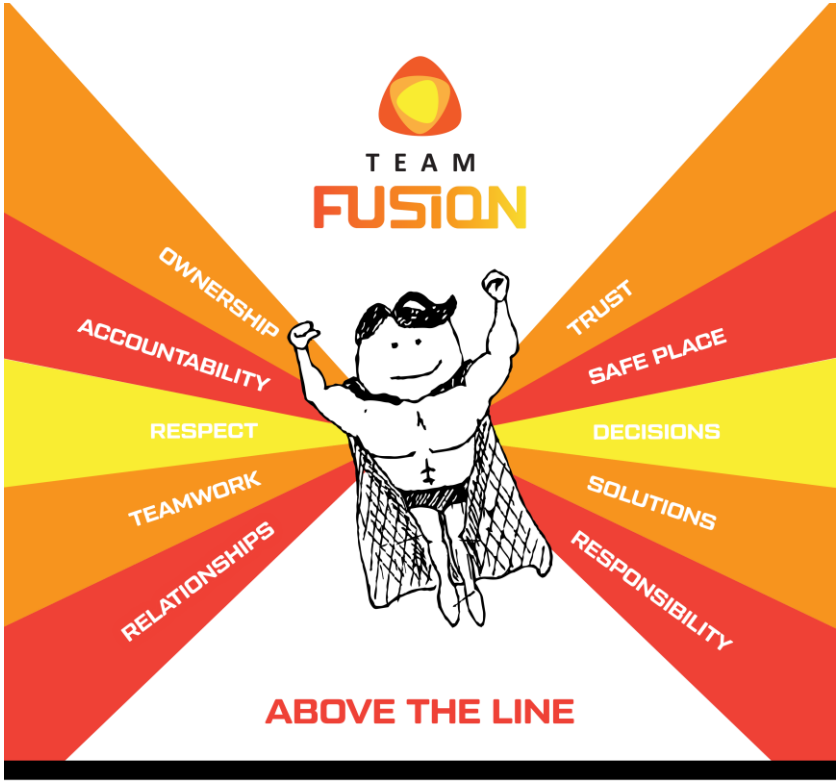
Definition:

- All team members have fun.
- High safety standards.
- Utilize the Last Planner System-High level of Plan Percentage Complete (PPC).
- Increased production rates.
- Engage more owners in the IPD/Lean delivery process.
- Full buy in and cooperation from all levels of field personnel in the IPD process.
- Draw Once/Build Once

Measurements:

- Team surveys have a __90__% positive response.
- _0_ Lost Day Cases
- PPC Level to be __90__% or higher.
- Net production rates _6__% lower than PCE hours.
- During or after the project at least one owner in the LV market contracts with a team to deliver a project utilizing IPD/Lean delivery.
- No rework unless value added.
    - No material design chgs after plan check approval.
    - No design chgs due to lack of coordination.
    - No construction chgs due to lack of coordination.
    - 100% coordinated scope and properly sequenced scope.
    - No repair or replacement due to poor quality or damage.

Respect



BELOW THE LINE

TITLES		DENY
BLAME		LYING
CONFUSION		EXCUSES
"CYA"		IGNORE
SECRETS		FAULT

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Respect

ENOUGH
LET'S
MOVE
ON

Discussion Question: Box #5

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Propose solutions or ways to mitigate one of the 3 top reasons listed in Box #4

Pick one of the proposed reasons in Box #4 and propose 3 actionable solutions to report out. Place tags for the top 3 in Box #5
Discuss for 8 minutes.

TOTAL TIME 10 MINUTES:

Practices

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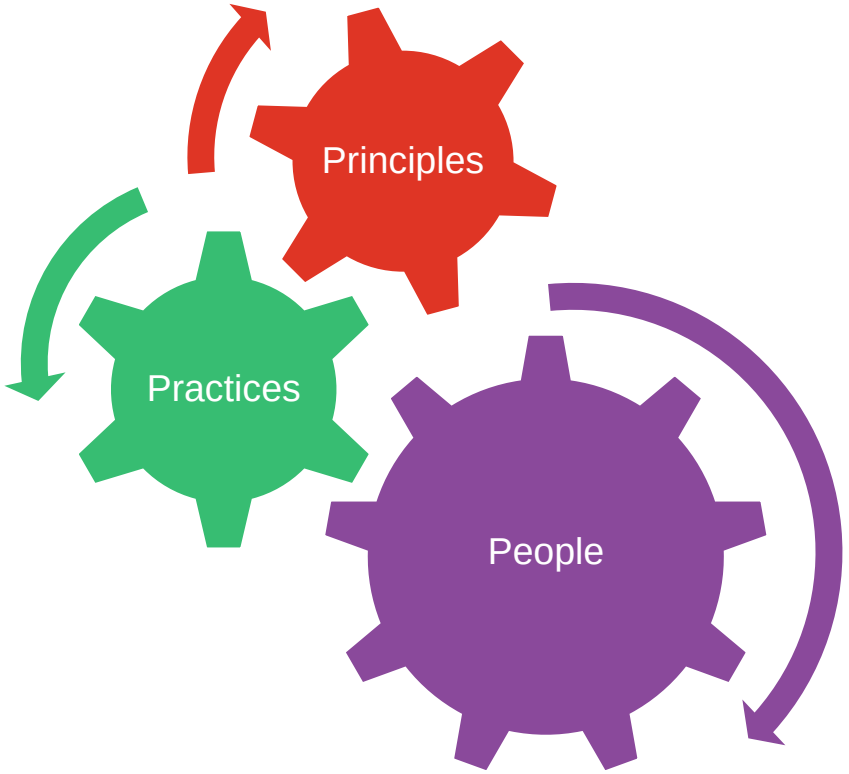
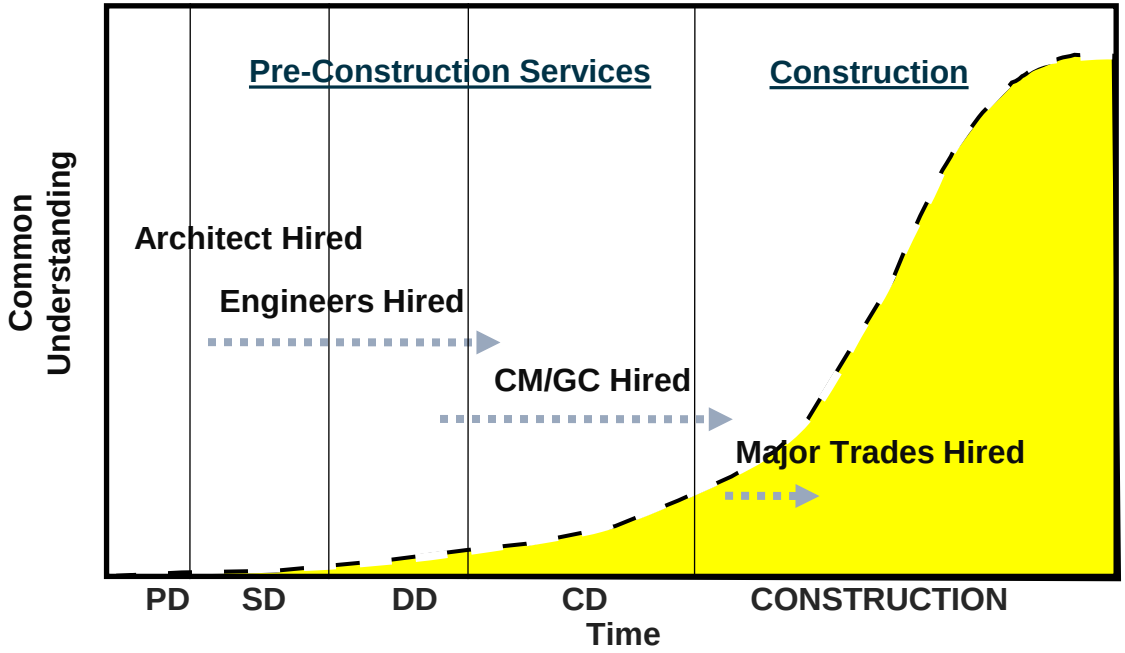
Lean Operating System

Practices

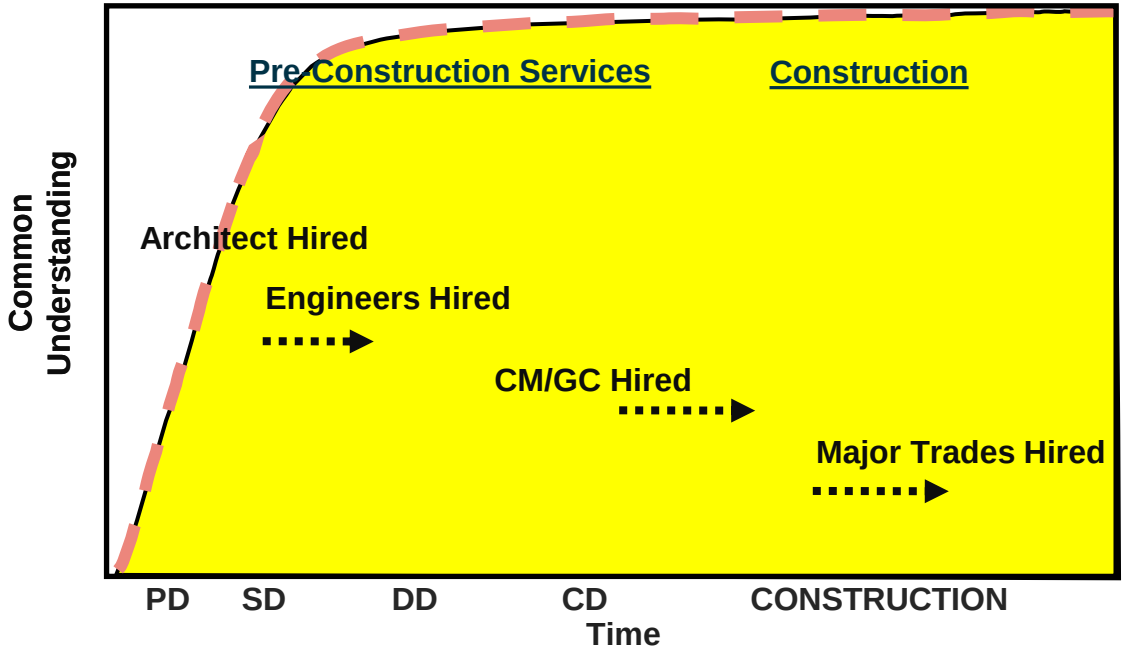
- Team Organization
- Big Room Mindset
- Collaborative Planning
- Target Value Delivery



Traditional Project Delivery



Integrated Project Delivery



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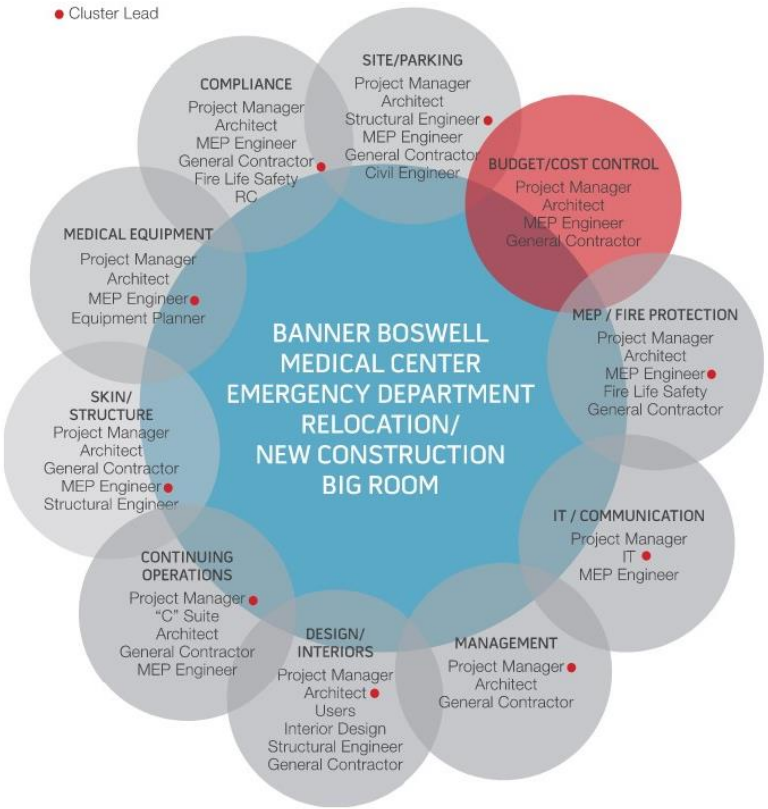
Team Organization - Cluster Groups

Work Clusters:

- Distinct portions of the work
- Cluster led by a “Champion”
- Cross discipline(Trades, Designers, Owner/Stakeholders)
- Meet 1-2 times a week
- Work collaboratively (BIM & Lean Tools)
- Report out weekly

Management:

- Not involved in day-to-day of team
- Resolve conflicts
- Make Decisions



Big Room

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Bringing **key individuals together**
to speed up
communication and **decision-making** and to
reduce silo-ed thinking

Big Room is a commitment to a project, the team, and to working together!

Big Room is……

- A verb… not a noun
- Mindset of intense focus on advancing work.
- A place that enables cross-functional team collaboration.
- The collaborative behavior of a team and the work they are producing.

Big Room

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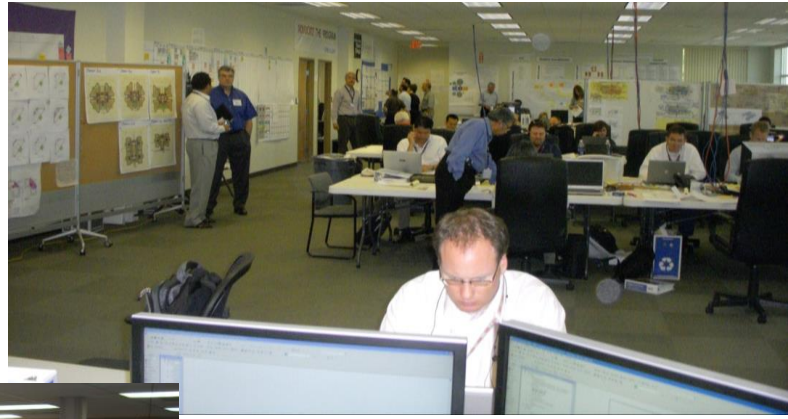
Small Project
1X Weekly
Big Room



Large Project
100% Co-location
Big Room

Medium Project
2X Weekly
Big Room

Last Planner System® in Design

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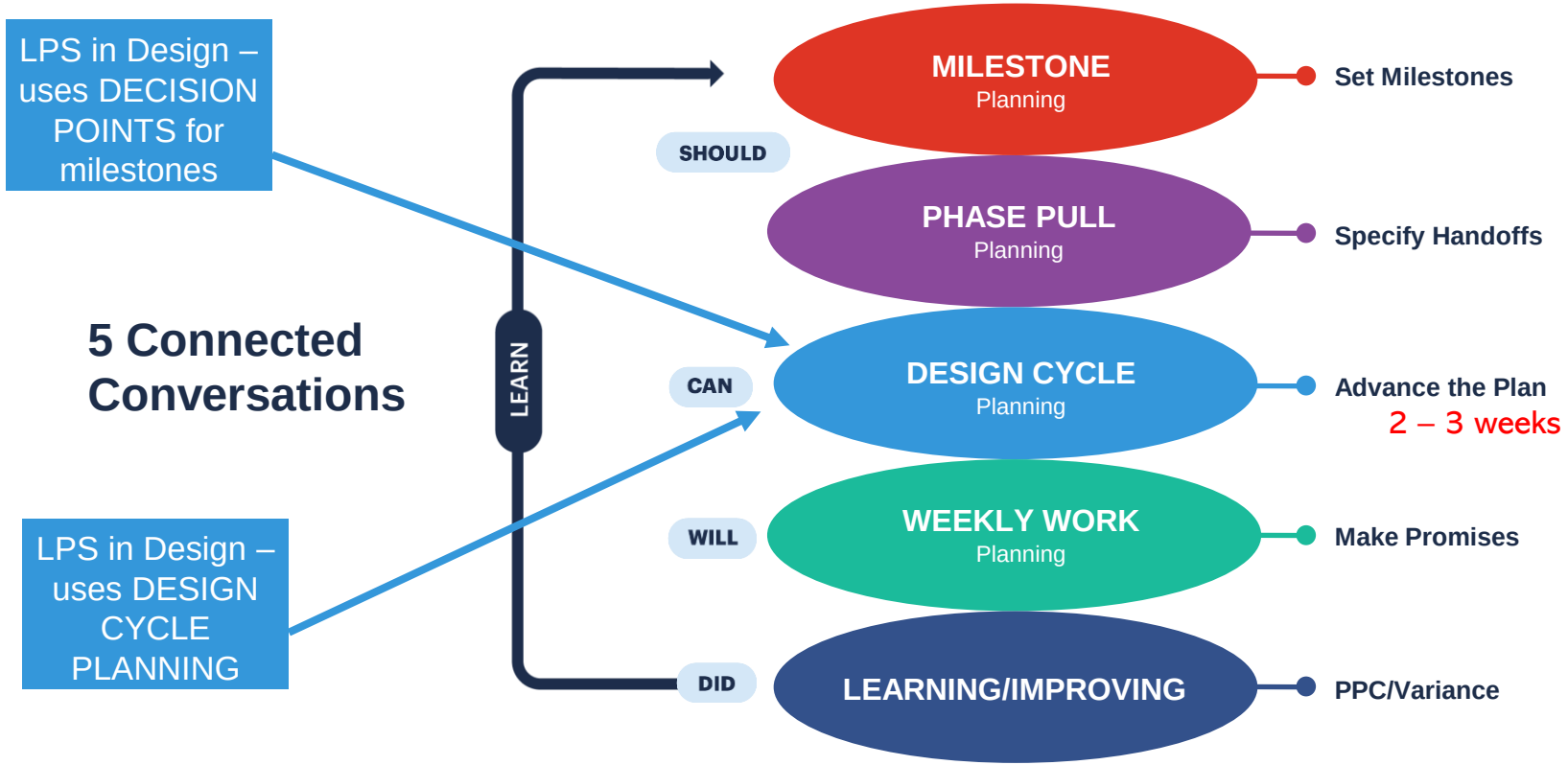

Last Planner System®:

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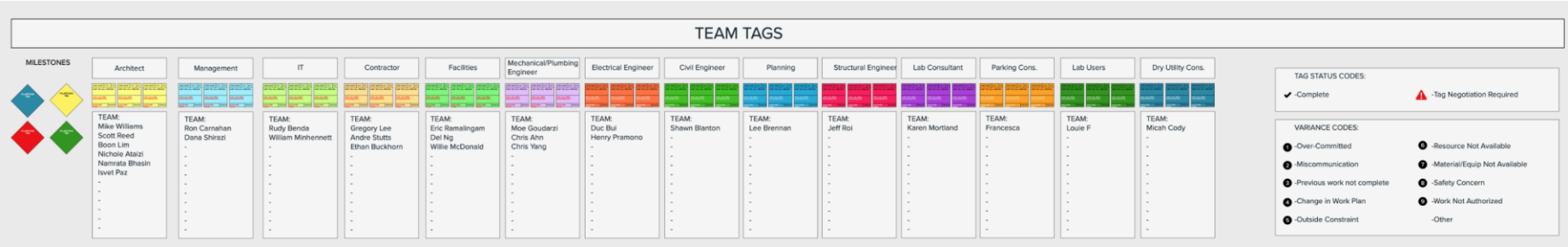
LPS in Design focuses on the transfer of information or “release of information”.

Typical project delivery (SD, DD, CD etc.) should not be used as a basis for LPS in Design.

LPS in Design is a person to person (not driven by the Project Managers) exchange of information.

YOUR NAME	# DAYS	DATE
WHAT YOU WILL PROVIDE		
WHAT YOU NEED		
PROVIDER NAME	VARIANCE	



Milestone Planning Example

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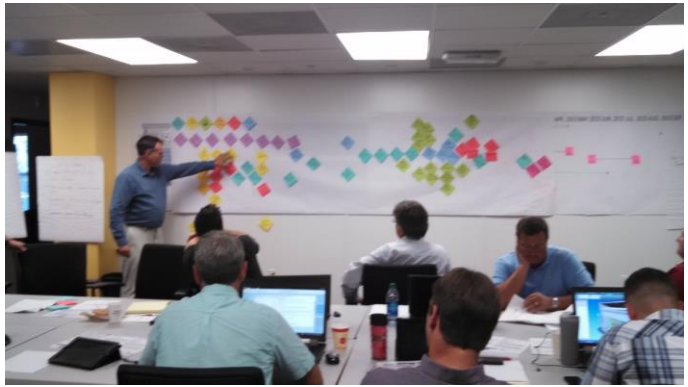
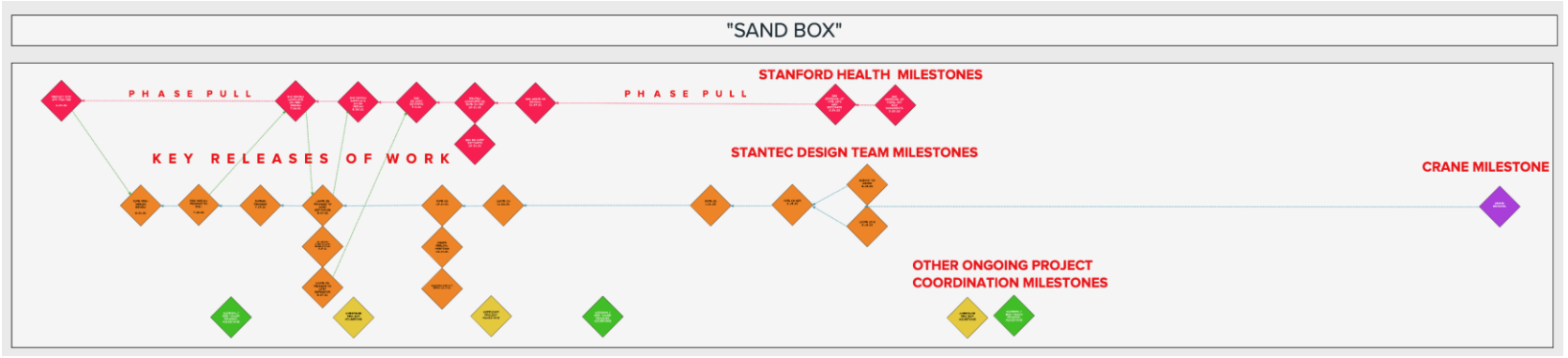
Milestones should represent decision points and large transfers of information…. not drawing sets!

Milestone planning should be used to work out the logic in a design delivery.





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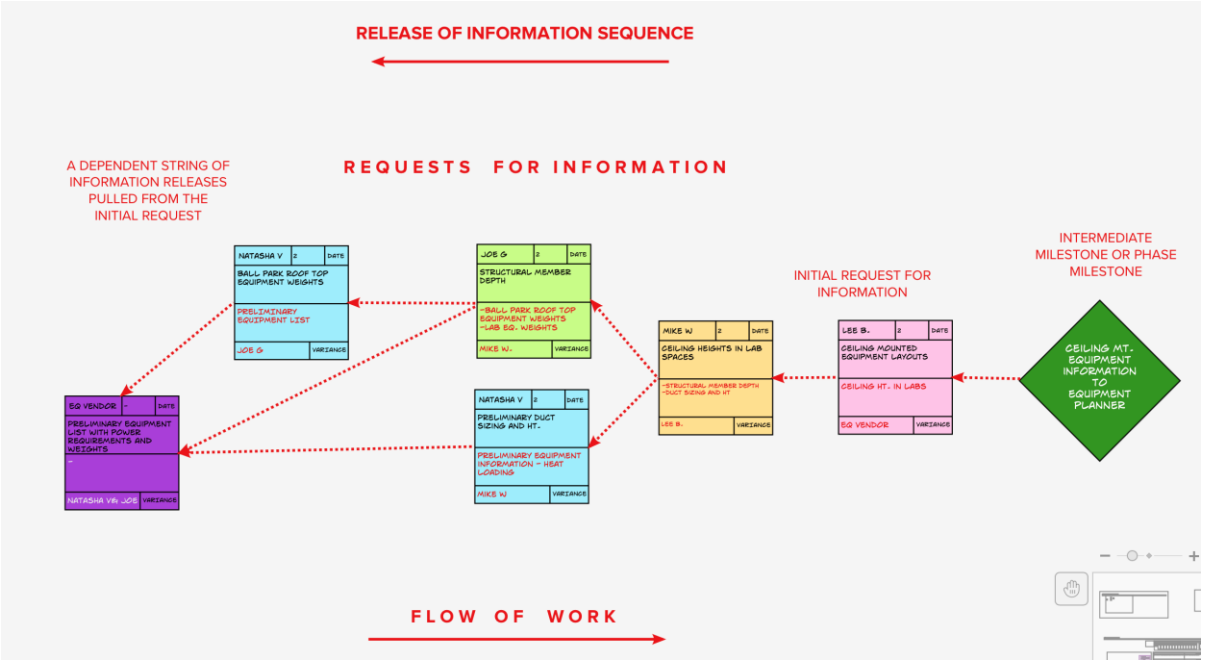
Pull-Creating Flow

Requests for information are “pulled” from a milestone to the left. Information is released in a flow to the right.



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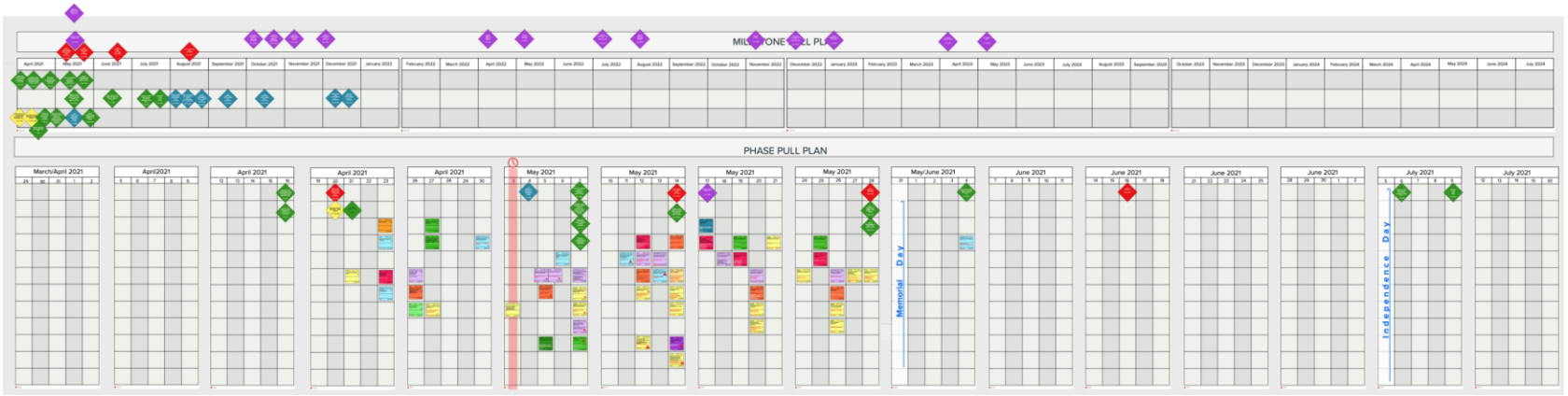
Putting It Together

Weekly (or more frequent) planning sessions.

2 to 4 week “look ahead” planning is typical.



Target Value Delivery

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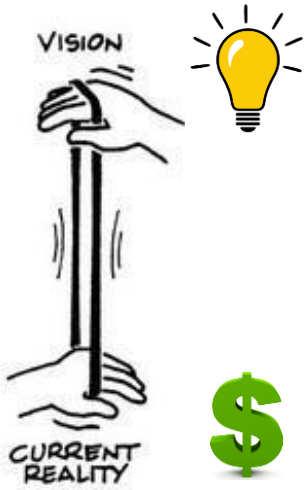
Target Value Delivery

It is an application of Taiichi Ohno's practice of
self-imposing necessity as a means for continuous improvement (Ballard, 2009)



Creative Tension

Target Value Delivery

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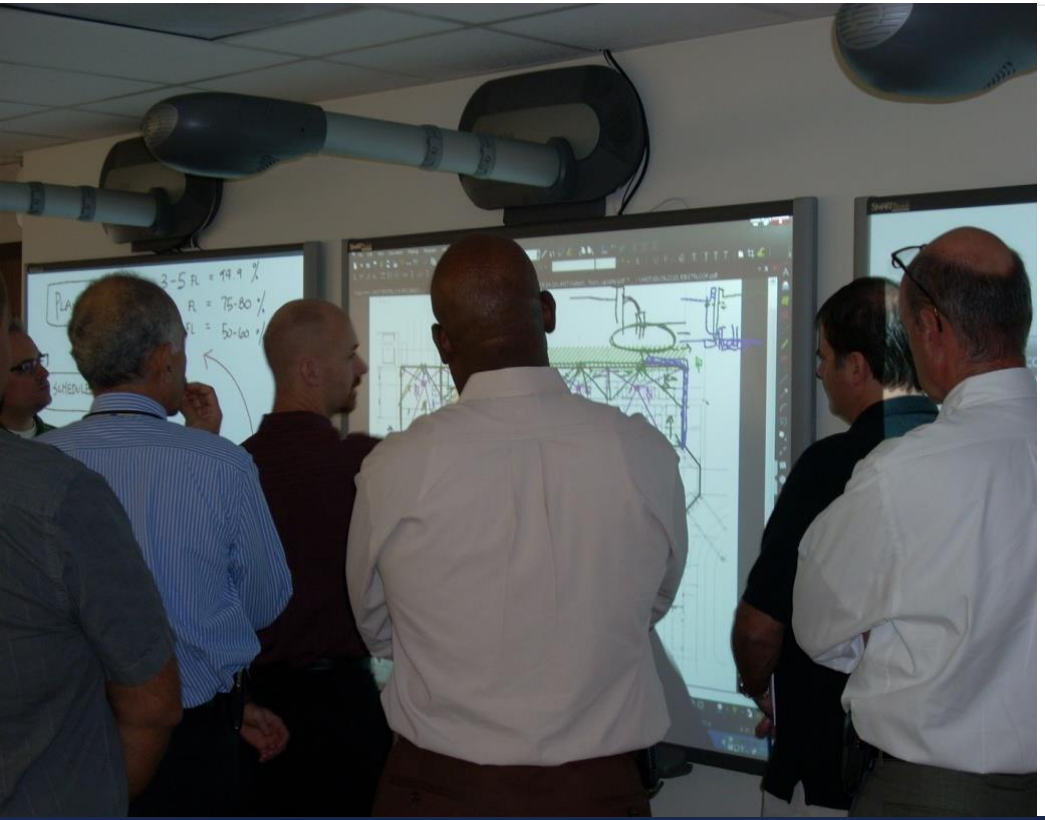

Traditionally:

- Cost is an output of design
- Finish your work before I start mine mentality
- Early commitment to design solutions in silos
- Design then determine cost, then rework

Target Value Delivery:

- Cost is an input to design
- Information is shared early and often
- Sets of solutions are carried and optimized based on the whole
- Continuous estimating and cost modeling based on concepts

Traditional vs. Target Value Delivery

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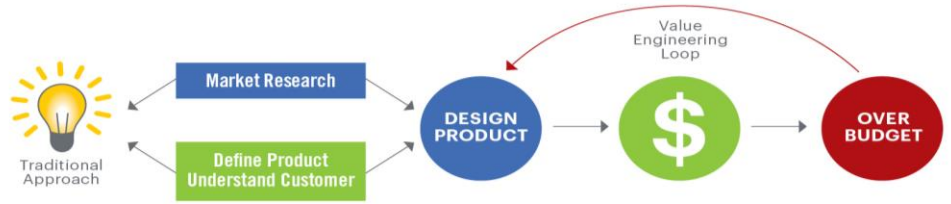
The goal of TVD is to minimize the waste produced by the design-estimate-redesign cycle(s) of the traditional value engineering approach.

Design to an estimate rather than estimate a design.

Cost is an *output* of design



Cost is an *input* of design

Courtesy of HKS Architects

TVD & Cost Modeling

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- Model of the cost components & systems of a project.
- Derived from a market analysis.
- Create benchmarks based on quality levels.
- Cost Model must be in a format that is “consumable” by designers.
- Structured to allow the costs to be continually updated.
- Provides the team with a constantly up to date cost model.
- Should allow for projecting ‘what-if’ scenarios based on value decisions that have yet to be made.

Cost Model (Simple Approach)

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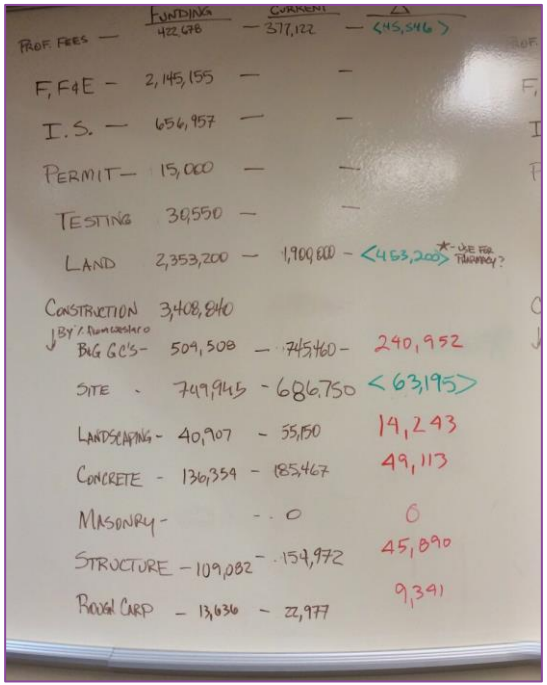
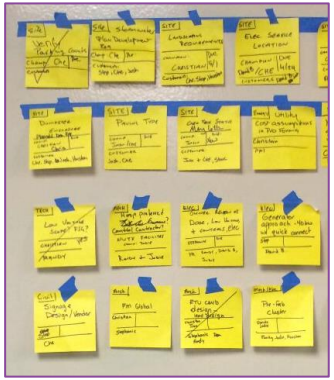


CWE/ Cost Model Tracking

Risk

Path Back



Hot Topics

Discussion Question: Box #6

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List 3 ways or processes to implement ONE of the 3 solutions listed in box #5

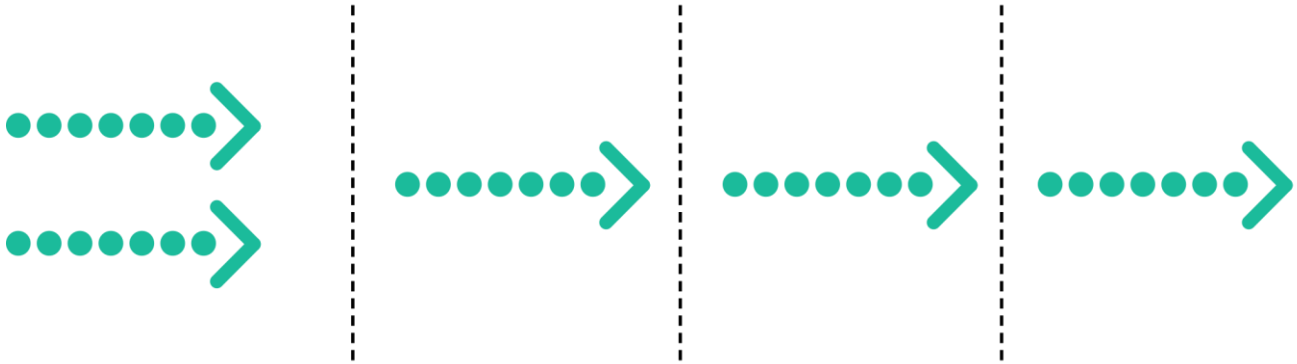
As a group choose one of the 3 items in Box #5. Each person at the table suggest 1 or 2 possible ways to implement the chosen solution from Box #5. Then, as a group gain consensus on the top 2 or 3 and post in Box #6

TOTAL TIME 15 MINUTES:

Other Tools

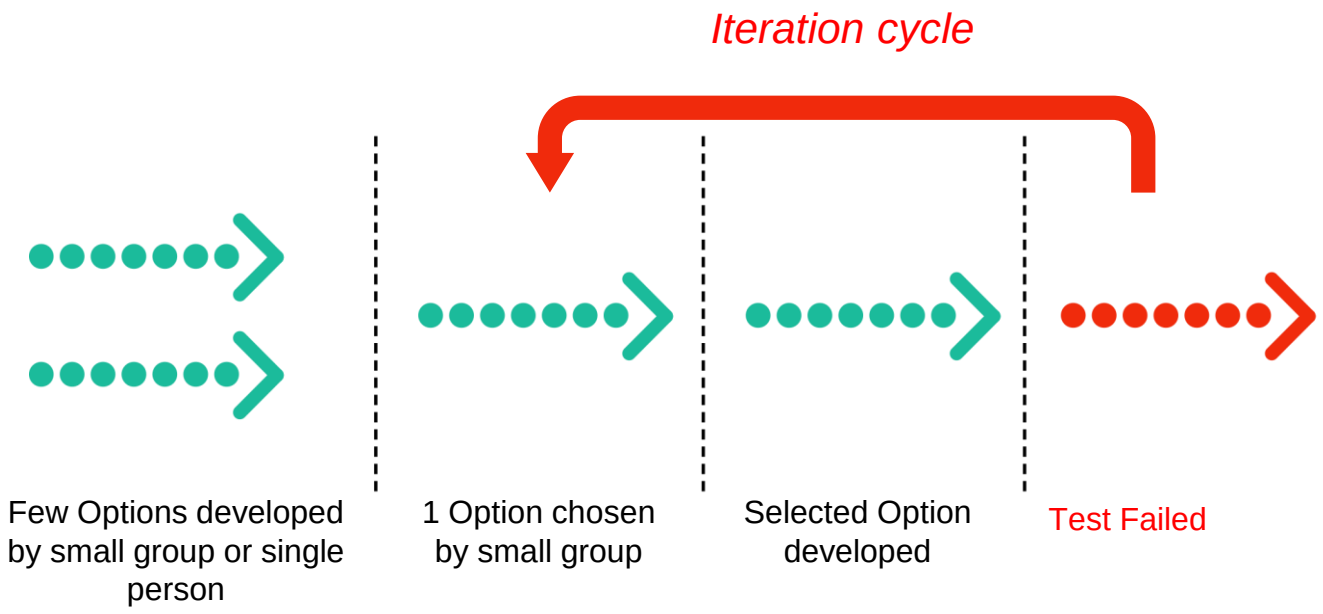
Set Based Design

Point-Based Concurrent Design



Set Based Design

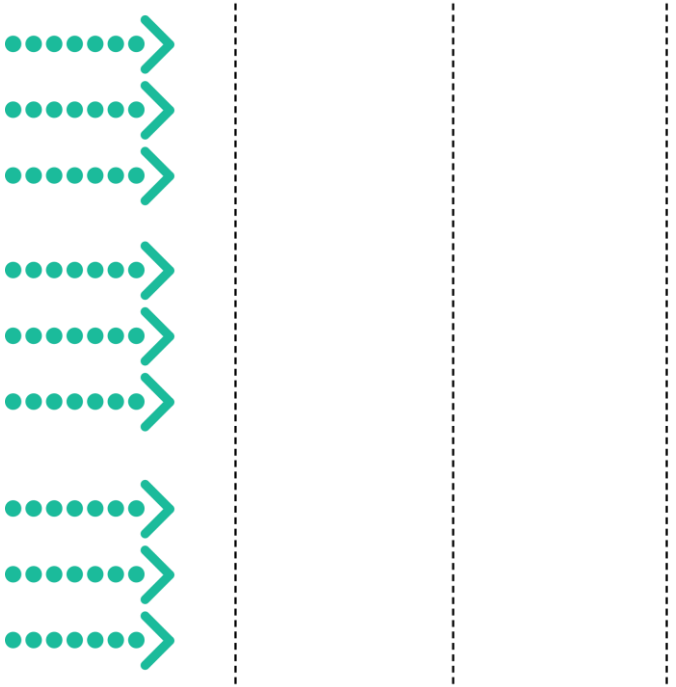
Point-Based Concurrent Design



Set Based Design

Set-Based Concurrent Design

Many Options developed by diverse group.



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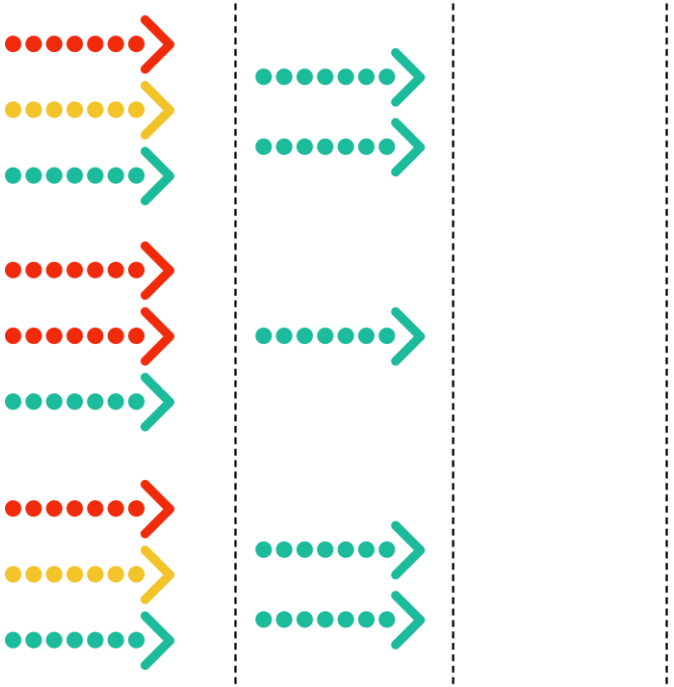
Set Based Design

Set-Based Concurrent Design

Many Options developed by diverse group.

Options evaluated against threats and each other. Eliminate weak-add knowledge-combine and move forward.



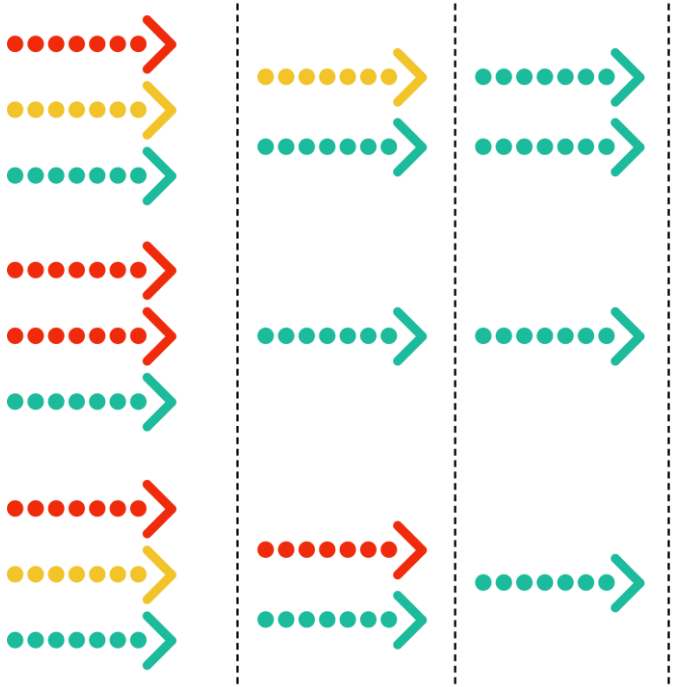
Set Based Design

Set-Based Concurrent Design

Many Options developed by diverse group.

Options evaluated against threats and each other. Eliminate weak-add knowledge-combine and move forward.

Options continually evaluated and narrowed.



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Set Based Design

Set-Based Concurrent Design

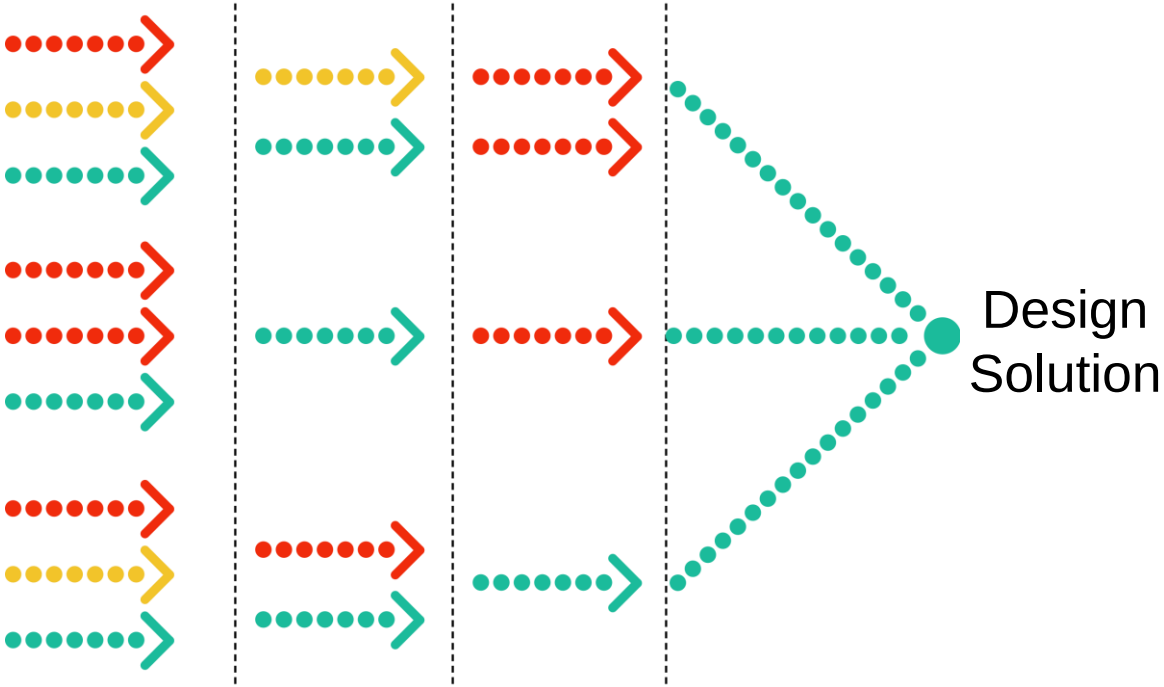
Many Options developed by diverse group.

Options evaluated against threats and each other. Eliminate weak-add knowledge-combine and move forward.

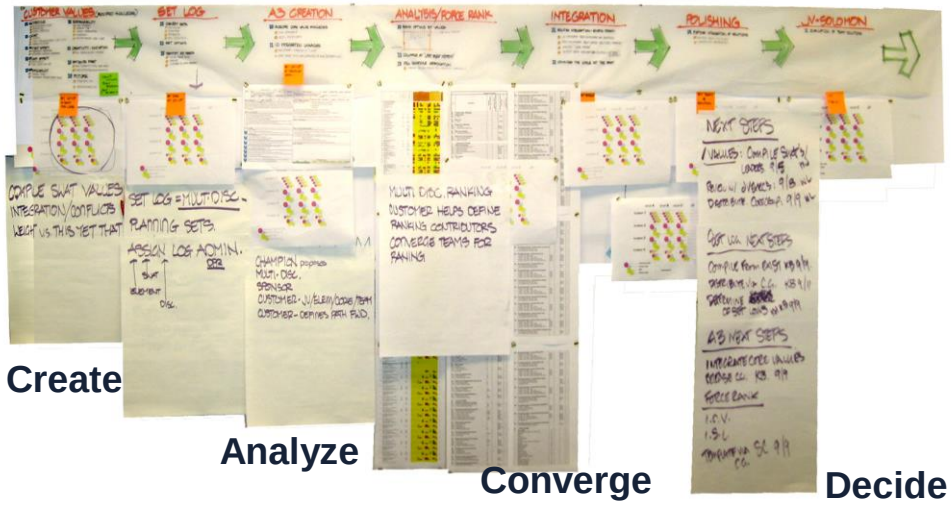
Options continually evaluated and narrowed.

Final option selected.

No Iterations!



Set-Based Example



From CPR Program

Prototyping

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Prototyping is creating a demo of what is being designed or built. It is essential for clarifying required information. A prototype is generally a mock-up of what you intend to build.

Images Courtesy of Stantec Architecture

P3 Prototyping

Image courtesy of McGough Construction – St. Paul, MN

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A3 Thinking Structure

Title: Describes the problem	Collaborators: List
Background: Provides the context	**Proposal/Recommendation** Propose countermeasure(s)
Current State Describes what is currently known	**Implementation Plan:** Indicates the actions/outcomes, time table and responsibilities
Future/Target State: Identifies the desired outcome	
Analysis: Analyze the situation for root cause creating the gap between current condition and target condition	**Follow-up** Creates a follow-up / review process

Collaborative Decision-Making CBA

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Choosing by Advantage:

A decision-making system developed by Jim Suhr for determining the best decision by looking at the advantages of each option.

Choosing By Advantages Study of: Heating Hot Water System					
		Alternative 1		Alternative 2	
		Central Plant Heating Hot Water System		Distributed Heating Hot Water	
Factor: Square feet of Mechanical Space Required					
Criteria:	Attribute	3200 square feet		5100 sq ft required/17 rooms	
	Advantage	1300 Sq Ft.	2		
Factor: Access for Maintenance					
Criteria:	Attribute	Outside secure perimeter		Inside secure perimeter	
	Advantage	Outside rather than in	4		
Factor: Quantity of Boilers & Standby					
Criteria:	Attribute	3 duty plus 1 standby		20 duty +7 Standby	
	Advantage	Less total boilers	5		
Factor: Ability to do Boiler Stack Heat Recovery					
Criteria:	Attribute	10% increase in boiler efficeincy		Not required	
	Advantage	Reduction X therms	8		
Factor: Pumping Energy					
Criteria:	Attribute	More required due to long distribution runs		Less required due to shorter piping runs	
	Advantage			500,000 KwH per year	10
Factor: Construction Schedule					
Criteria:	Attribute	Longer due to site distribution		Shorter - no site distribution required	
	Advantage			2 weeks	1
	Total Importance		19		11
	Capital Cost				

Collaborative Decision-Making CBA

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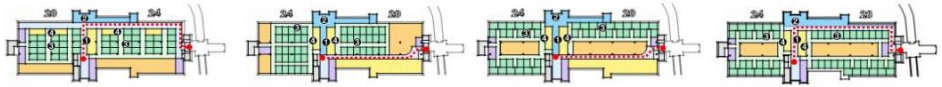
Choosing by Advantages

4/7/2015 **Rady Children's MOB - Planning Options**
Attendees



Ranking	Advantages	Set 1 - Columns	Set 2 - Rows	Set 3 - Clusters	Set 4 - Alternate	Notes
	Consistant wayfinding with Ortho level 3					This does not consider internal layout
	Most contiguous exam rooms within main clinic area					"Island" space is non-contiguous
	Island space for isolated functions (ie Staff or Special)					Benefit TBD
	Better interinal traffic control to Chekout					Set 1 requires several check-out points
	Easy access to support space from exam rooms					
	Fewest steps to exam room (for patients)					Considered from clinic entry point
	Acoustics for patients					TBD
	Acoustics for staff					More isolated is better for this factor
	Daylighting for patients					Access to windows
	Daylighting for staff					Access to windows
	Most exam room potential					Assumes Island space for other function
		0	0	0	0	

94

Discussion Question: Box #7

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List one take-away from today's discussion that you can implement on your current project.

Each person make a tag for the one thing they can implement in Box #7. Table facilitator to allow for 5 minutes for each table to finish.

Each person will put their tag in Box #7 and we will discuss as a group

TOTAL TIME 10 MINUTES:

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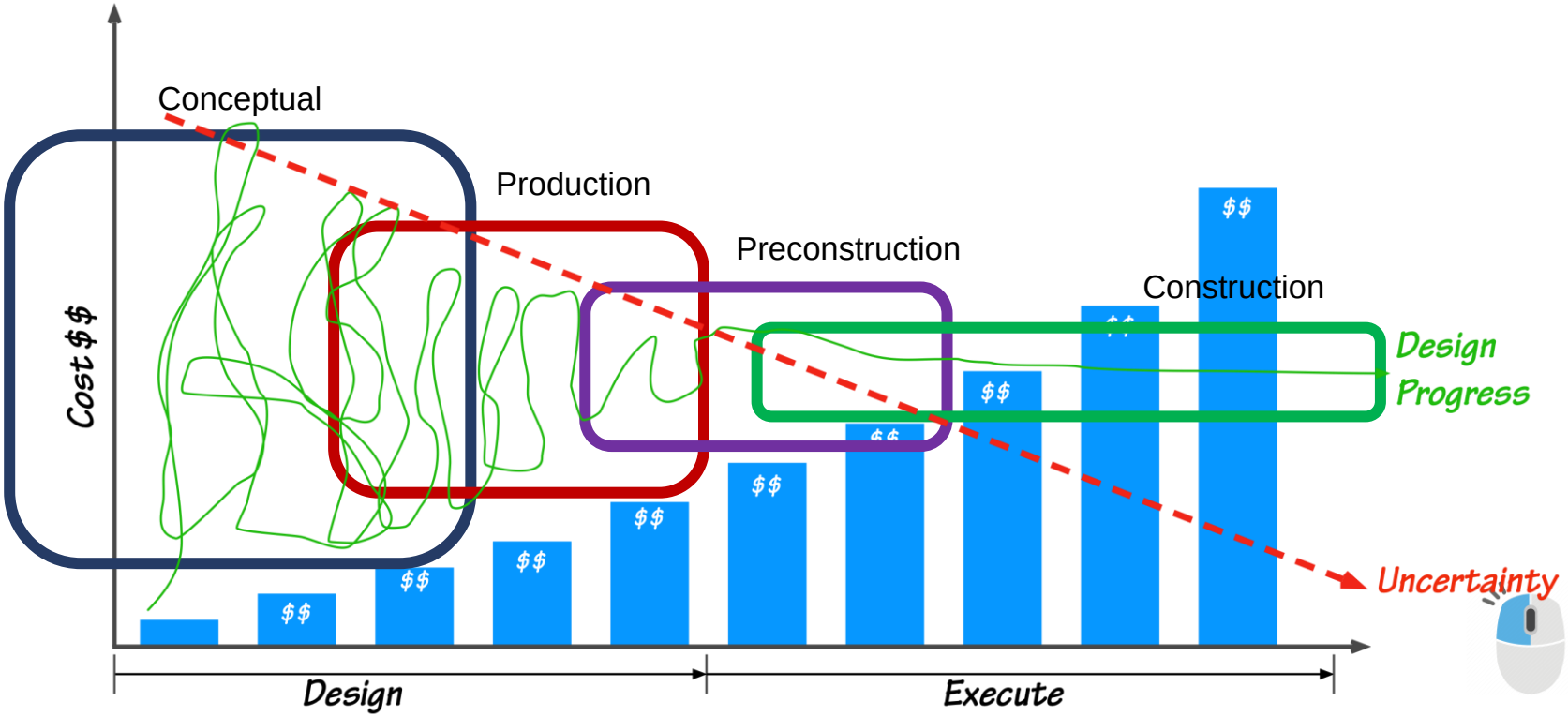
Nature of Design: Current State



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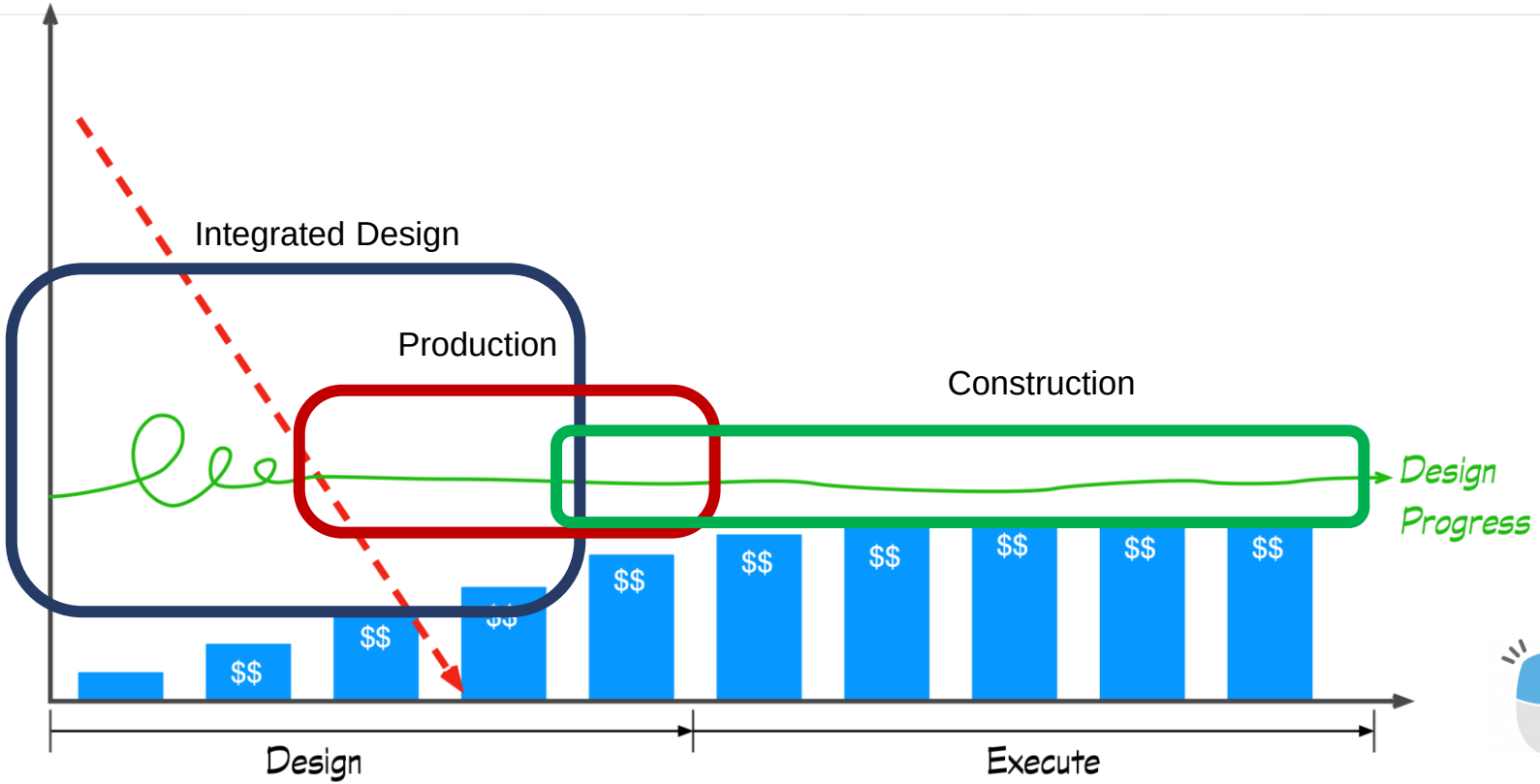
Integrated Lean Project Approach



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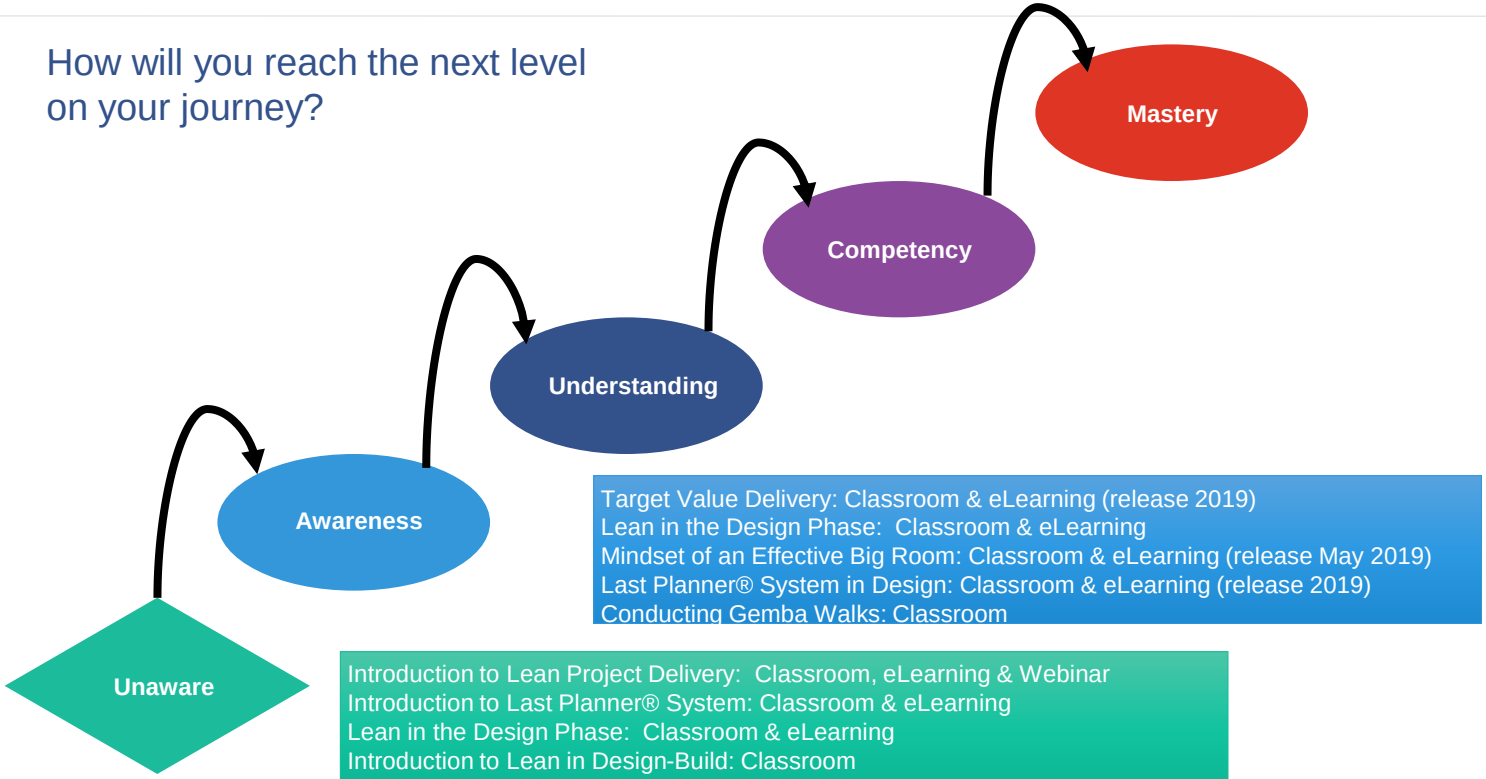
Learn More

How will you reach the next level on your journey?



References & Learning Opportunities

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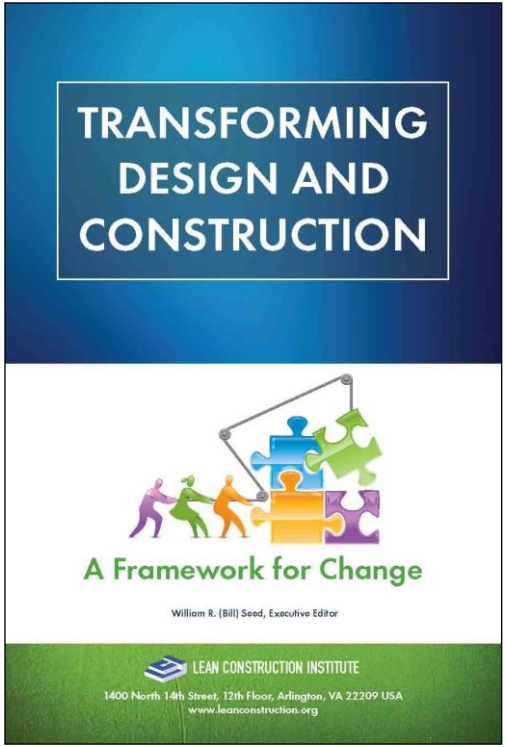

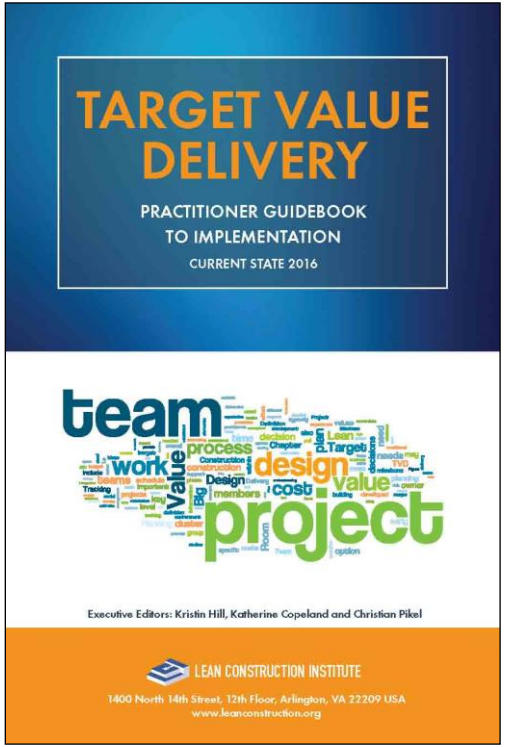

Events:
- Local Community of Practice
- Congress
- Design Forum

LCI Education Courses:
- Introduction to Lean Project Delivery
- Introduction to Last Planner® System
- Mindset of Effective Big Room
- Target Value Delivery

LCI E-Learning Courses:
- Introduction to LP® S

www.LeanConstruction.org

Plus/Delta

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What went well?

What could be better?
Ideas for how?

This concludes The American Institute of Architects Continuing Education Systems Course

Lean Construction Institute info@leanconstruction.org