2021 Introduction to Lean Project Delivery

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- 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.
- If you feel ill at any time, please leave the conference and return to your room/consult a physician as necessary.

David MacNeel, On Point Lean Consulting

Lauren Simone, W.M. Jordan

October 19, 2021

Instructor Introductions

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Dave MacNeel

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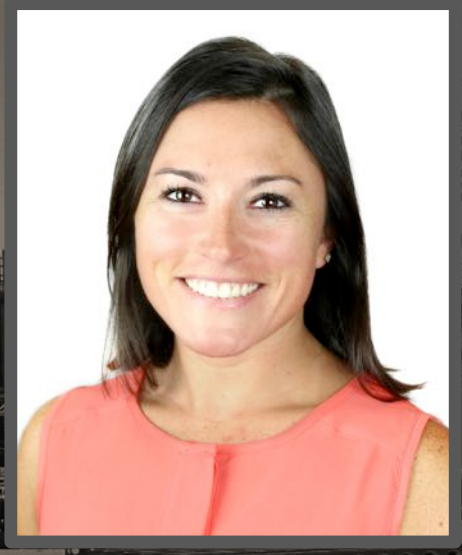
On Point Lean

Lauren Simone



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W.M. Jordan COMPANY

Course Description

This course will introduce lean project delivery as an operating system relative to the design and construction industry.

Participants will learn the key principles that are foundational to lean and be introduced to collaborative tools and approaches to eliminate/reduce waste from their projects.

This course includes a hands-on learning simulation.

Learning Objectives




01.

At the end of this presentation, participants will know the definition of Lean and the principles associated with a Lean operating system.

02.

At the end of this presentation, participants will be able to identify the principles and tools relevant to Lean Design and construction processes.

03.

At the end of this presentation, participants will be able to recognize various types of waste in design and construction and identify tools to reduce, minimize and/or eliminate waste.

04.

At the end of this presentation, participants will understand ways to increase collaboration and communication on projects through application of structured planning systems and processes.

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Learning Objectives

Define Lean and the principles associated with a Lean operating system.

Identify the principles and tools relevant to Lean design and construction processes.

Recognize various types of waste in design and construction and apply tools to reduce, minimize and/or eliminate waste.

Increase collaboration and communication on projects through application of structured planning systems and processes.

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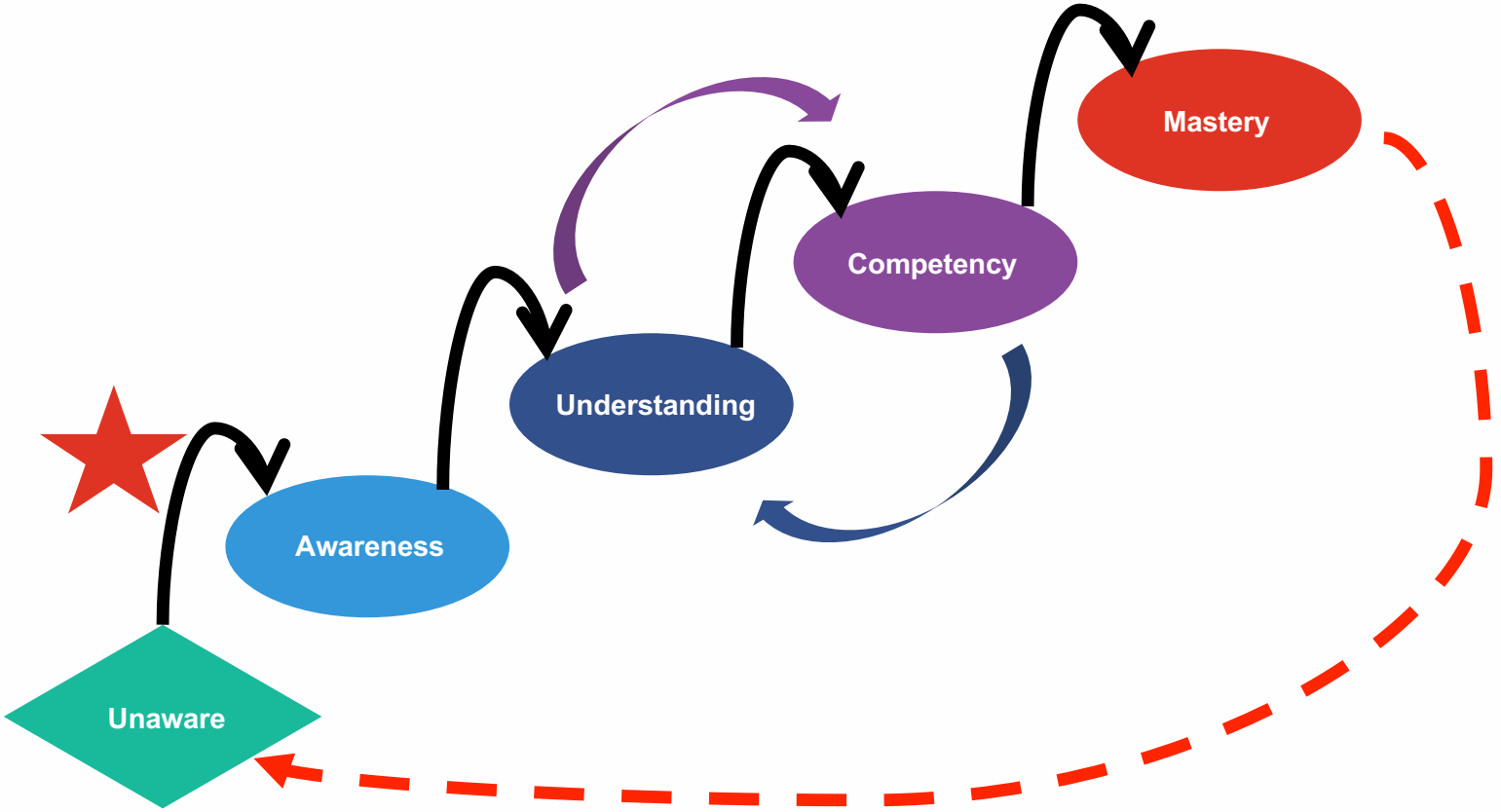
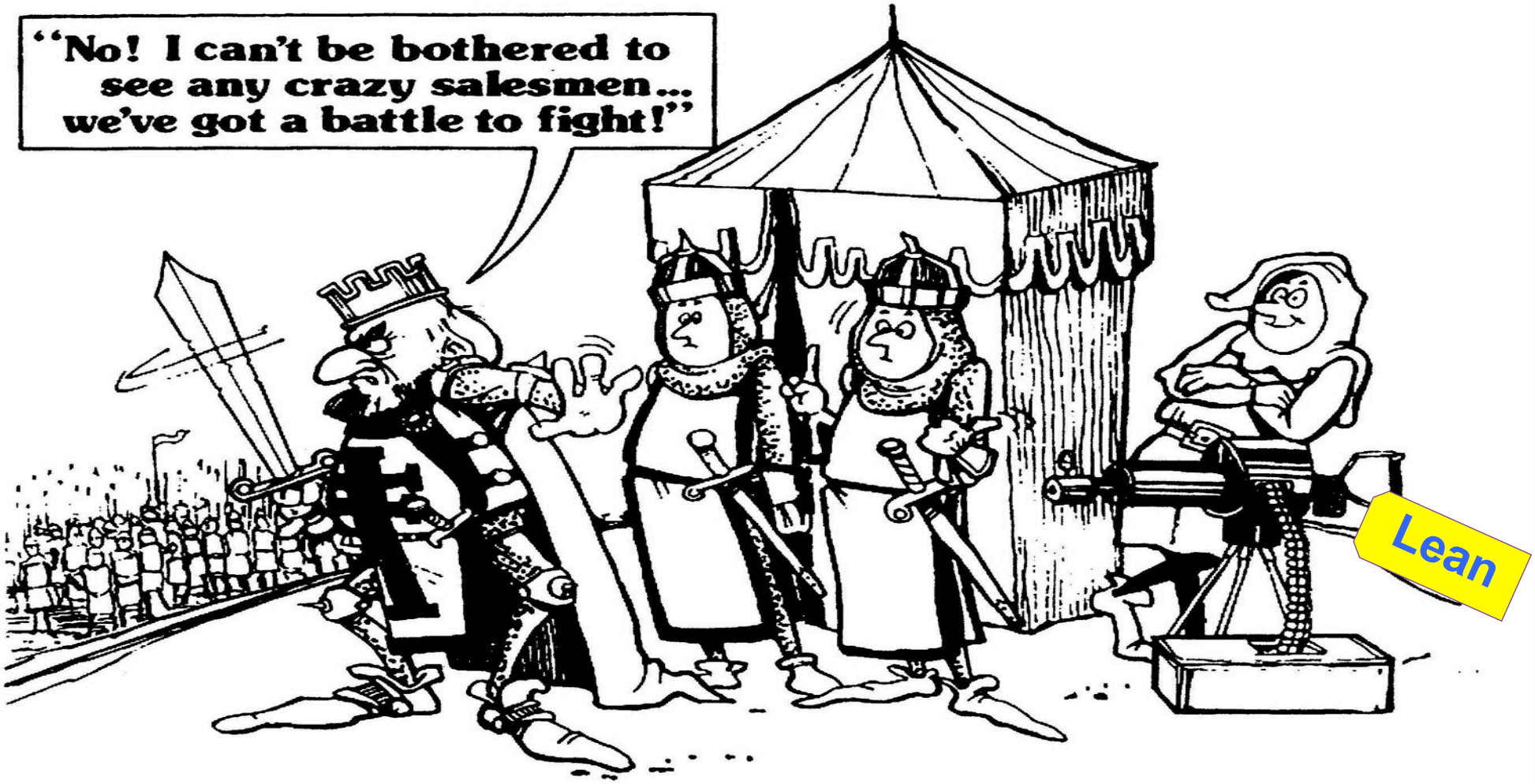
Lean Journey to Mastery





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Definitions

Lean:

Culture of respect and continuous improvement aimed at creating more value for the customer while identifying and eliminating waste.

Lean Project Delivery:

An organized implementation of Lean principles and tools combined to allow a team to operate in unison to create flow.

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Origins of Lean

- **Scientific Management** 1880-1930
- **Assembly Lines** 1903-1914

- **World War II** 1939-1945
- **Lean Manufacturing** 1945 - present

Toyota Production System (TPS)

Ford

TOYOTA

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Meals Per Hour Video

- Super Storm Sandy

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Two Non-Negotiables

- Respect for people
- Continuous improvement

Marriott
HOTELS • RESORTS • SUITES

TOYOTA

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Traditional Delivery Outcomes…

- Risk is high
- ~70% 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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Discussion Question

What are your **dissatisfactions** with the way projects are currently designed and constructed?

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Lean Construction Background

- Early 1990's: Glenn Ballard & Greg Howell focused on construction reliability & planning

- Surveyed ~475 Superintendents and foremen and asked, **"What do you intend to complete next week?"**

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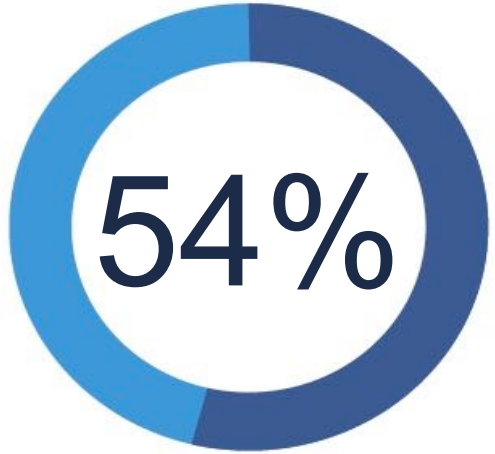
Brief History : Lean in Design & Construction



Discovery: on average, only 54% of planned work was completed by the end of the week.

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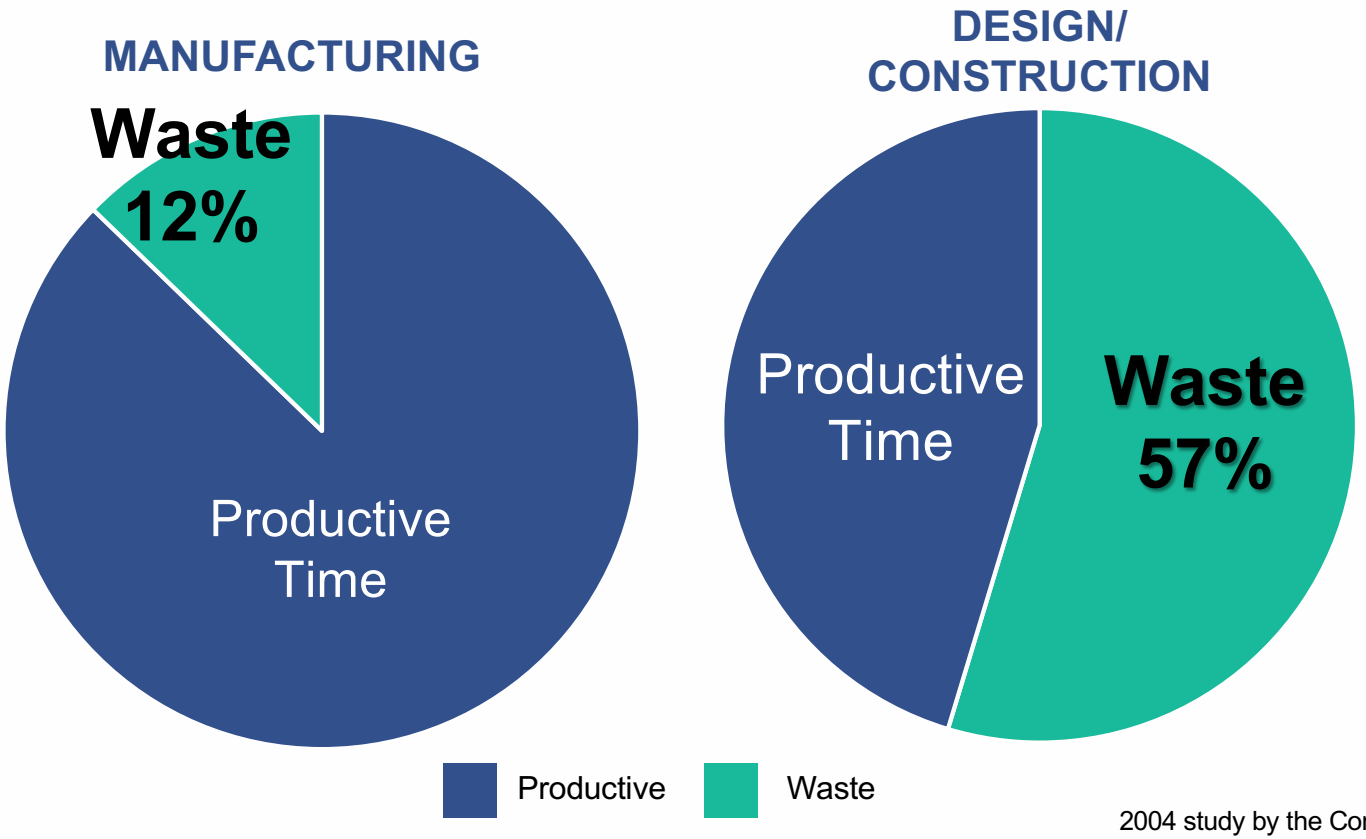
The Opportunity…



2004 study by the Construction Industry Institute

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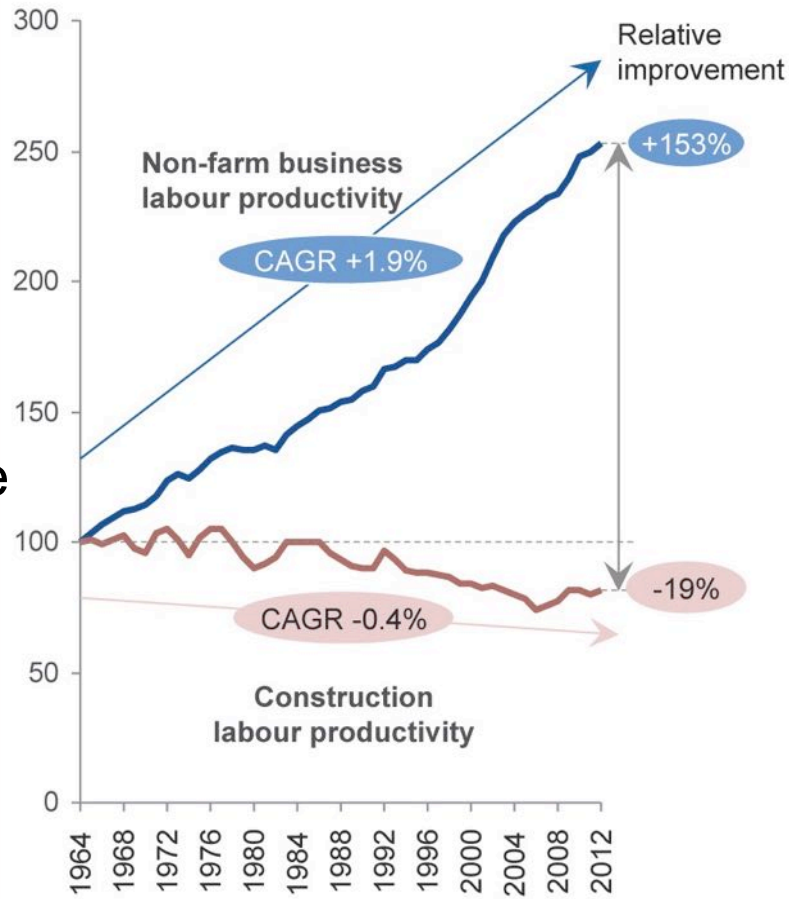
Why Lean?

- Construction productivity is declining
- Construction costs are skyrocketing
- Injuries are too high
- Traditional planning systems are unable to produce predictable workflows
- Workflow reliability directly affects speed and cost of projects



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Lean Project Delivery Enables

- Risk to be collaboratively managed
- Projects to be delivered on time
- Projects to be delivered within the budget
- Less waste and rework
- Team-wide reliability
- Higher customer satisfaction
- Fair profits for providers

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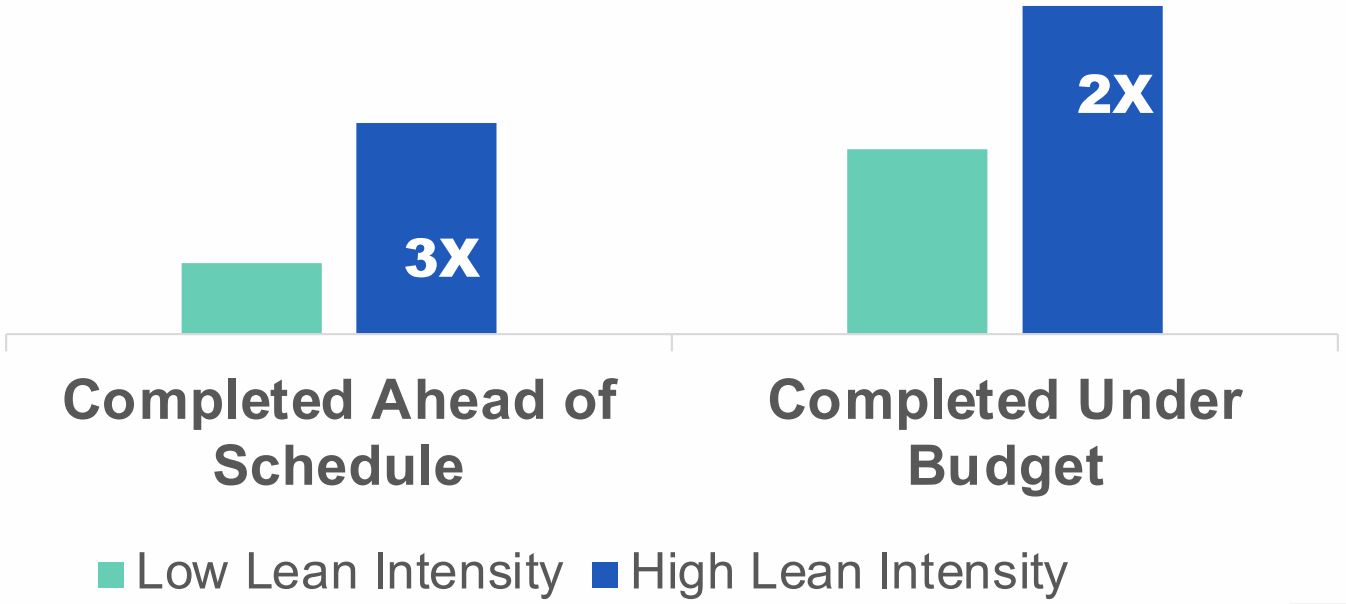
Correlation of Lean

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



DODGE DATA & ANALYTICS

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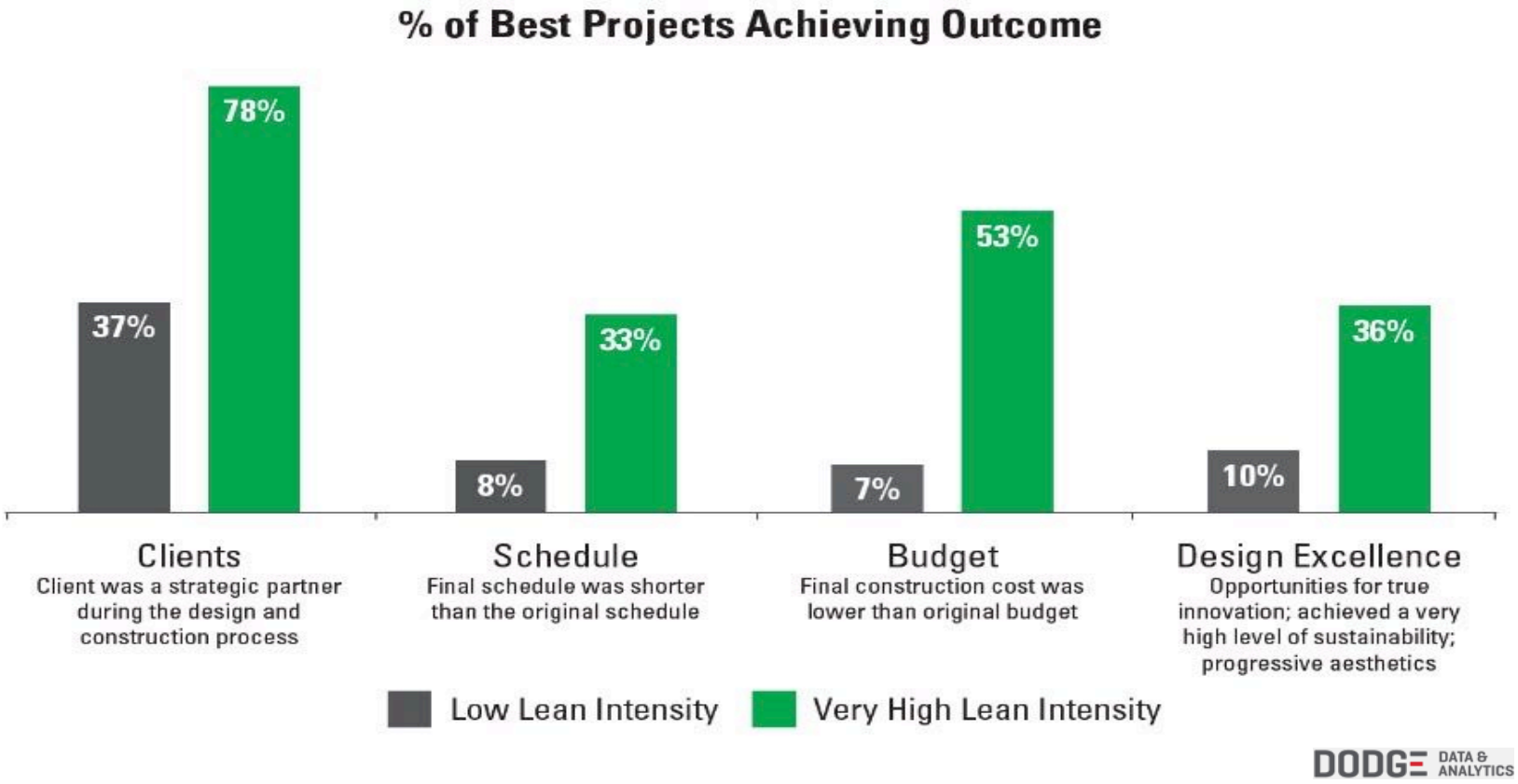
Correlation of Lean



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"Lean processes bring about improvements not only in cost and delivery but also in ***quality and safety.***"

– *WORLD ECONOMIC FORUM'S SHAPING THE FUTURE OF CONSTRUCTION: A BREAKTHROUGH IN MINDSET AND TECHNOLOGY (PG. 31).*


Thyssen-Krupp Steel Mill – Mt Vernon, AL (2009)
Results: Lean vs Traditional
• Duration: 6 months vs 9 months
• Productivity: 12% fewer labor hours
• Overtime: 17% vs 35%
• Peak labor: 270 Lean vs 420 Traditional
• Total Cost: 17% Less ($30MM vs $35MM)
See www.onpointlean.com/case-study/
BAKER
CONCRETE CONSTRUCTION

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Goals of Lean Design & Construction

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.

Photo Courtesy of On Point Lean

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Plan – Do – Check - Act (PDCA)

The Deming Cycle

Improve the System

Predict

Study the Results

Take Action, Try it Out

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Benefits of Lean

1. **Safer work environment: fewer incidents & injuries**
2. **Increased cost & schedule certainty**
3. **Increased productivity**
4. **High stakeholder satisfaction**
5. **Less stress on participants**

Photo Courtesy of WM Jordan

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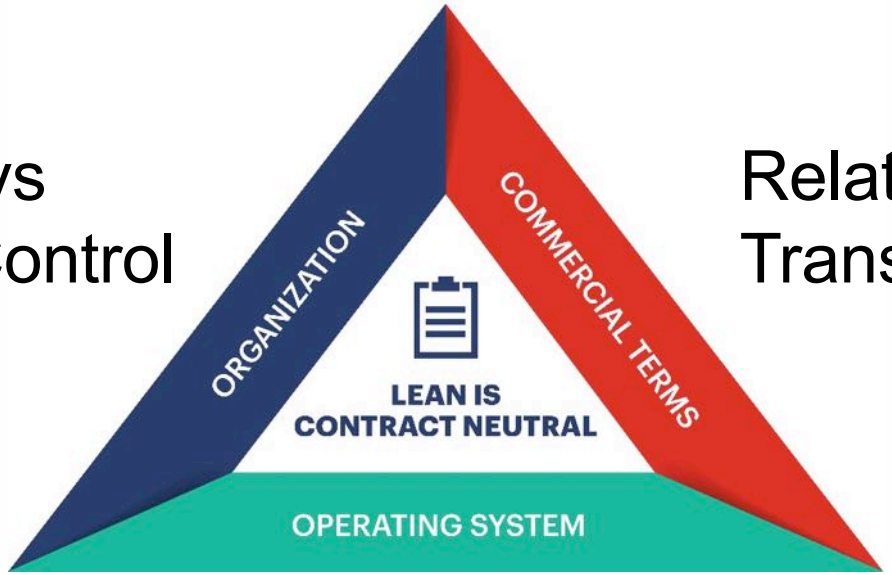
Project Elements: Lean vs Traditional

Collaboration vs
Command & Control



Relational vs
Transactional

Reliability Focus (Flow) vs CPM Scheduling (Push)

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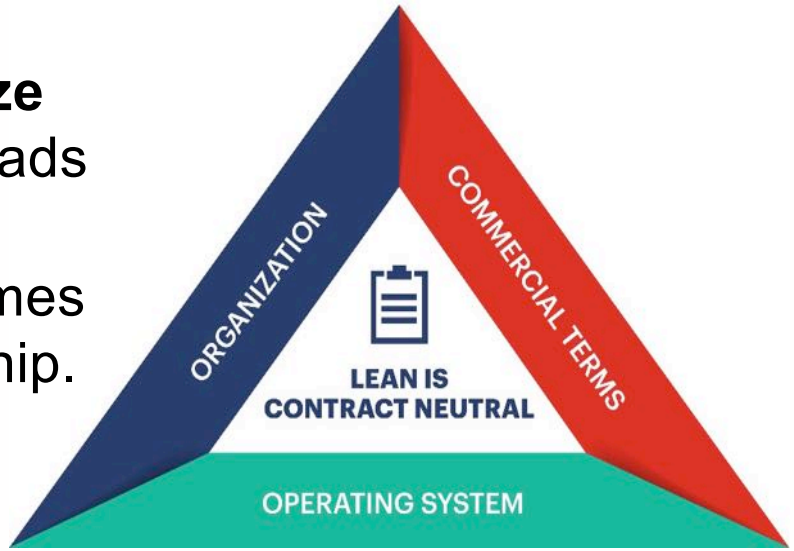
Project Elements

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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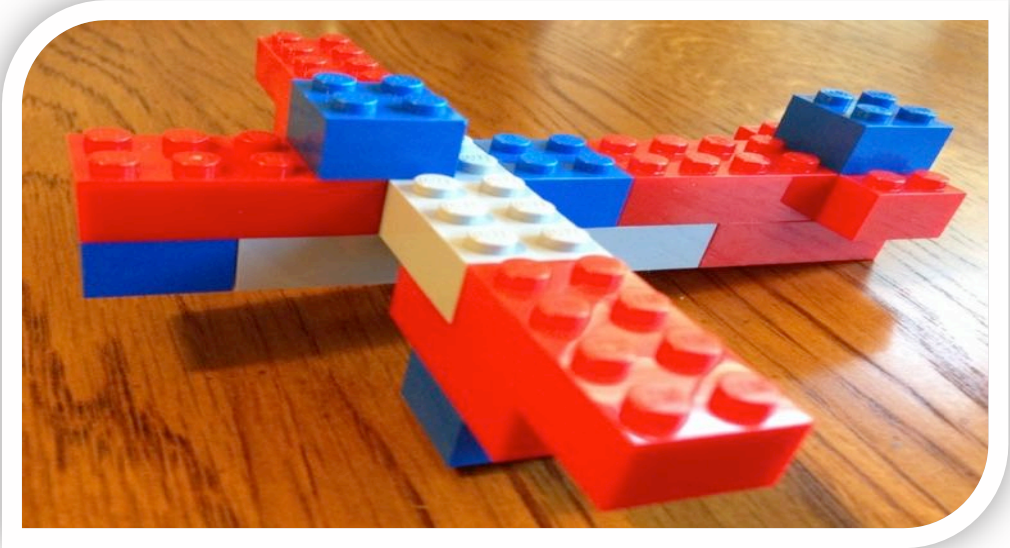
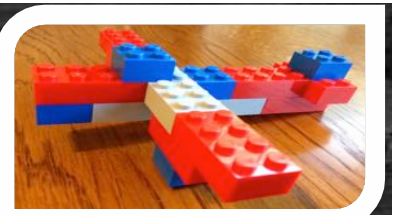
Production System Design Exercise

The Airplane Game



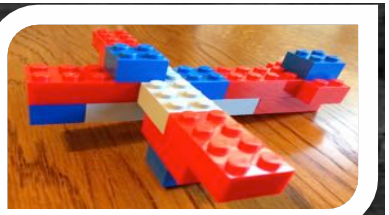
Airplane Simulation Debrief



Discuss and answer the following questions:

1. What are the key points/lessons?
2. What did we do (or change) to get so much better?
3. How might these Key Points and Lessons apply to your work?

Airplane Game Lessons



- Release work from one party to the next by **pull** instead of push (1 piece flow)
- **Minimize batch sizes** to reduce cycle time
- Make **everyone responsible** for QC
- **Balance the workload** between trades
- Encourage and enable performers to **collaborate** with one another to maintain steady workflow

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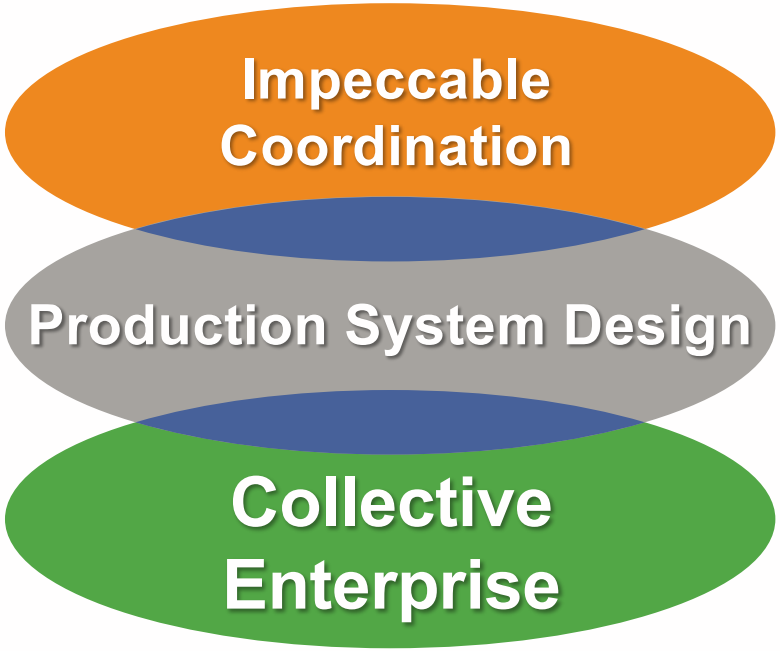
A Coherent Way to Manage Work in Projects

Three Connected Opportunities



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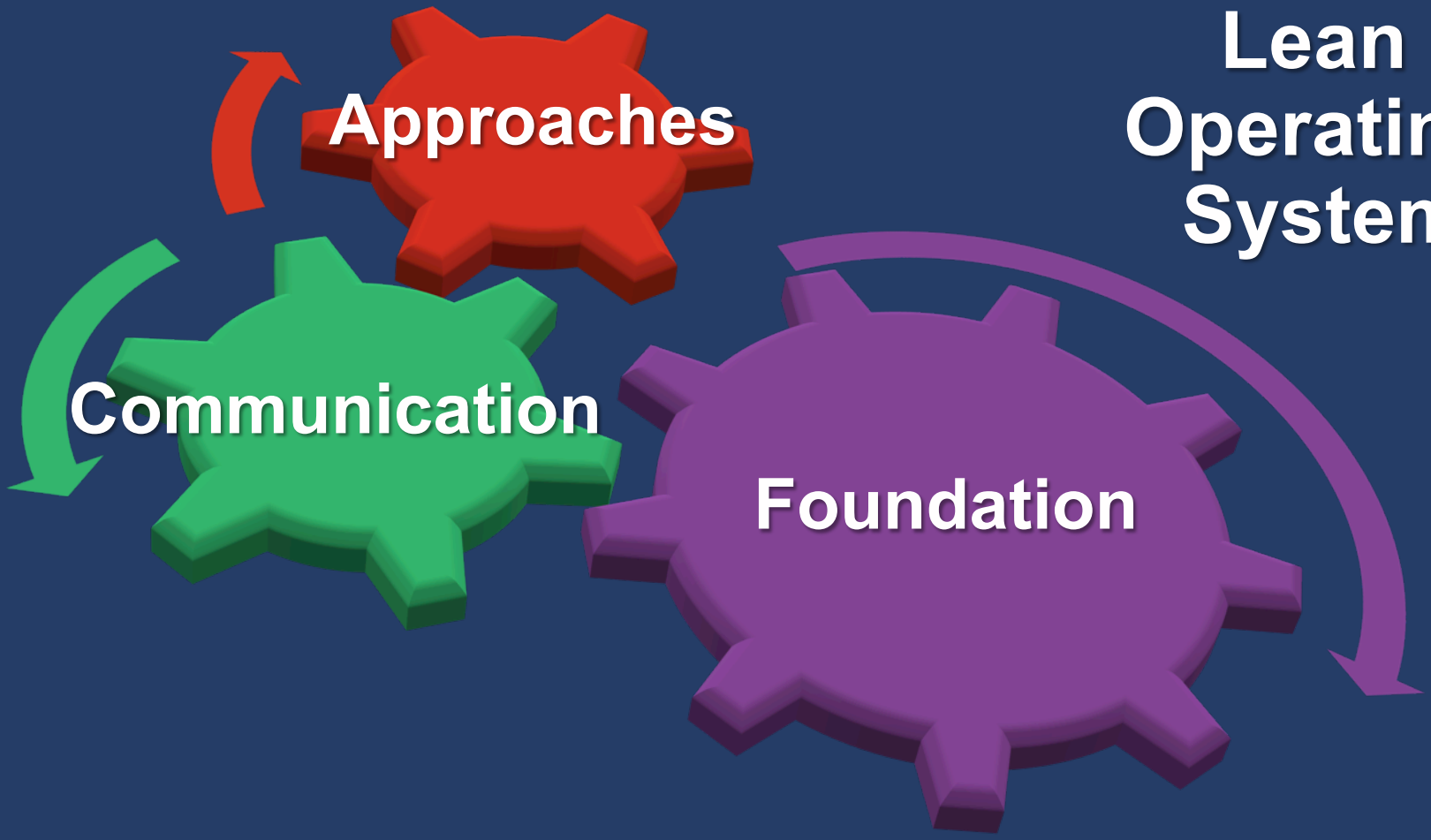
Lean Operating System



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Lean Operating System

- **Lean Foundation**
  - **Six Tenets of Lean**
  - **8 Wastes**
  - **PDCA Cycle**
- Communication
- Approaches

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Six Tenets of Lean

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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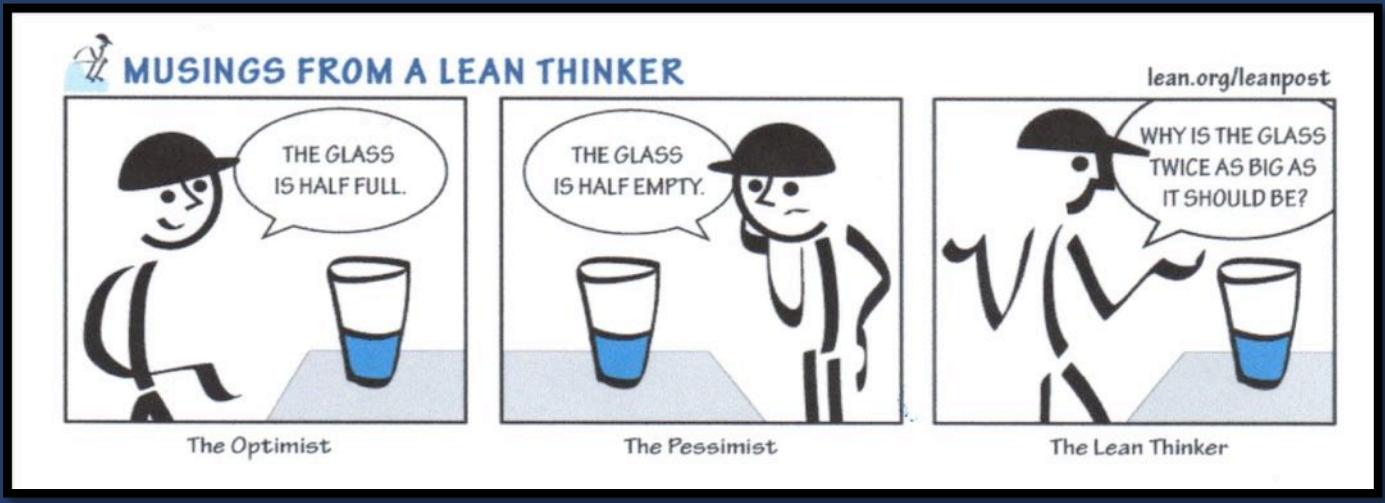
Optimize the Whole …*not the parts*

Value optimization encourages looking beyond the local and individual efforts to study the overall outcome to determine where value is added or waste can be eliminated



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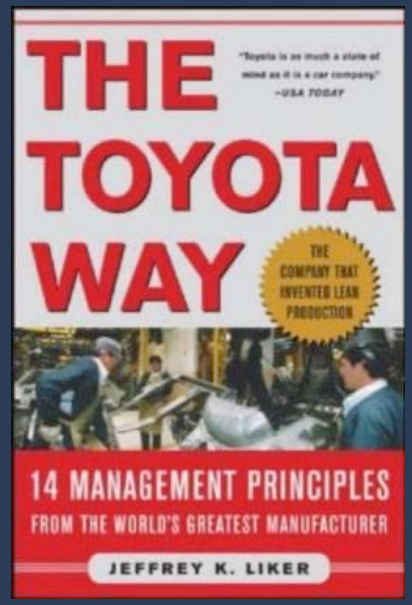
Generating Value

”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



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The 7 Deadly Wastes – Taichi Ohno, Toyota

T ransportation - Unnecessary movement of “things”

I nventory - Excess materials

M otion - Unnecessary movement by people

W aiting - Workers waiting for work OR Work waiting for workers

O ver-production - Producing more than is needed

O ver-processing - Spending more time or expense required

D efects – Rework due to poor quality or out-of-sequence work

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The 8th Waste: Talent

T ransportation - Unnecessary movement of “things”

I nventory - Excess materials

M otion - Unnecessary movement by people

T alent – underutilizing the creativity and skills of the team

W aiting - Workers waiting for work OR Work waiting for workers

O ver-production - Producing more than is needed

O ver-processing - Spending more time or expense required

D efects – Rework due to poor quality or out-of-sequence work

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Continuous Improvement (PDCA)

Leaders must create an environment where experimentation is encouraged and small, manageable failure is acceptable if the goal is to improve continuously.

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Lean Operating System

- Lean Foundation
- **Collaborative Communication**
  - Project as a promise
  - Conditions of Satisfaction
- Approaches

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Project is a Promise

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

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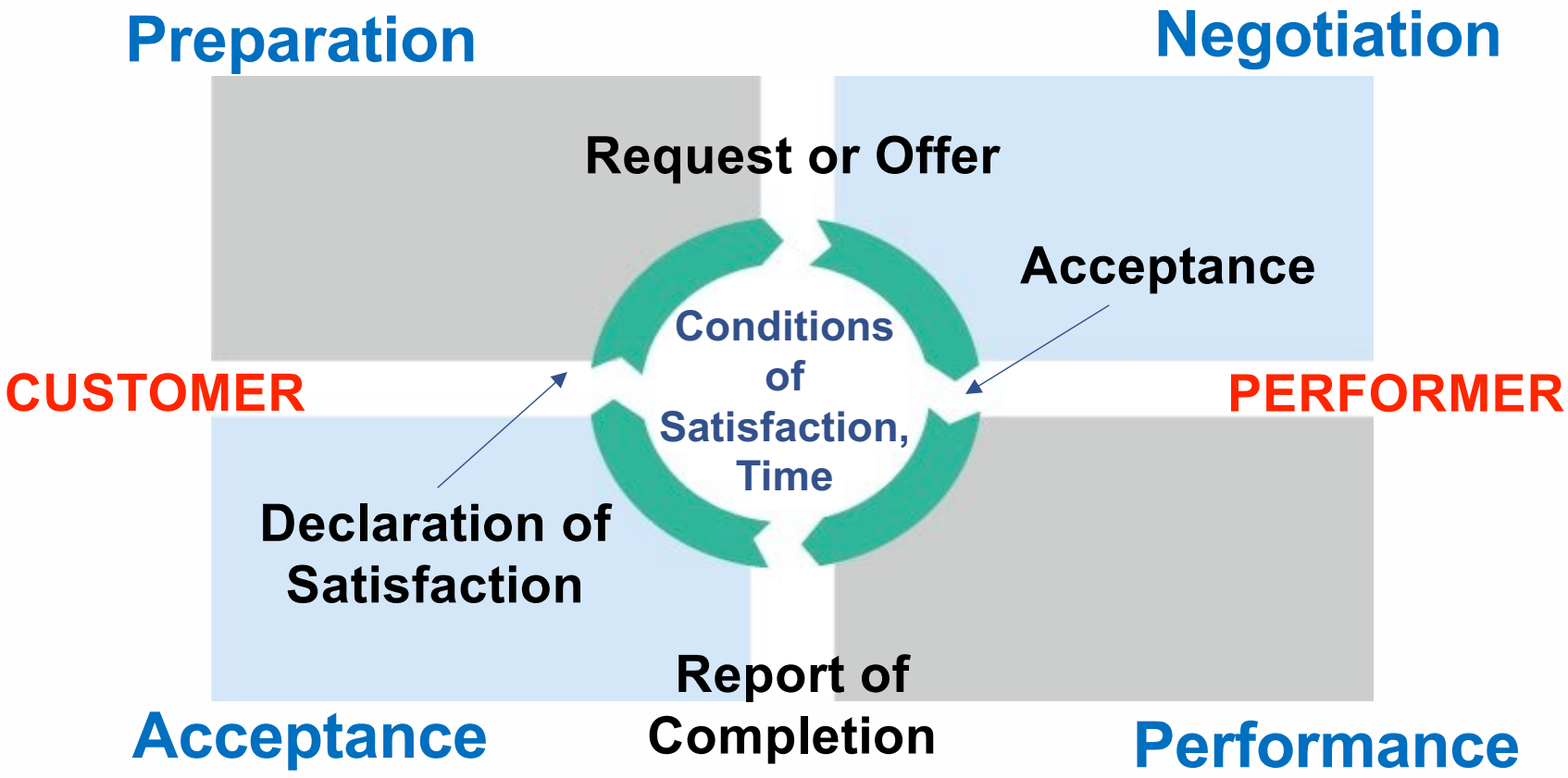
Basic Action Workflow



Credit: Dr. Fernando Flores

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Project Conditions of Satisfaction (PCoS):

- Part of language act of making a promise (Basic Action Workflow)
- Are developed by the team
- Measureable 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

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Lean Operating System

- Lean Foundation
- Collaborative Communication
- **Approaches:**
  - Integrated Project Delivery (IPD)
  - Team Organization
  - Big Rooms
  - Target Value Delivery (TVD)
  - 5S Implementation
  - Last Planner System® (LPS)
  - Other tools

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Integrated Project Delivery (IPD)

- Contract form – IFOA / Consensus Docs
  - Think “JV“ between O/A/C/Key Trades
- Cost Plus
- Shared Risk/Reward
- Conditions of Satisfaction (CoS)
- Combats the downfalls of traditional D-B-B

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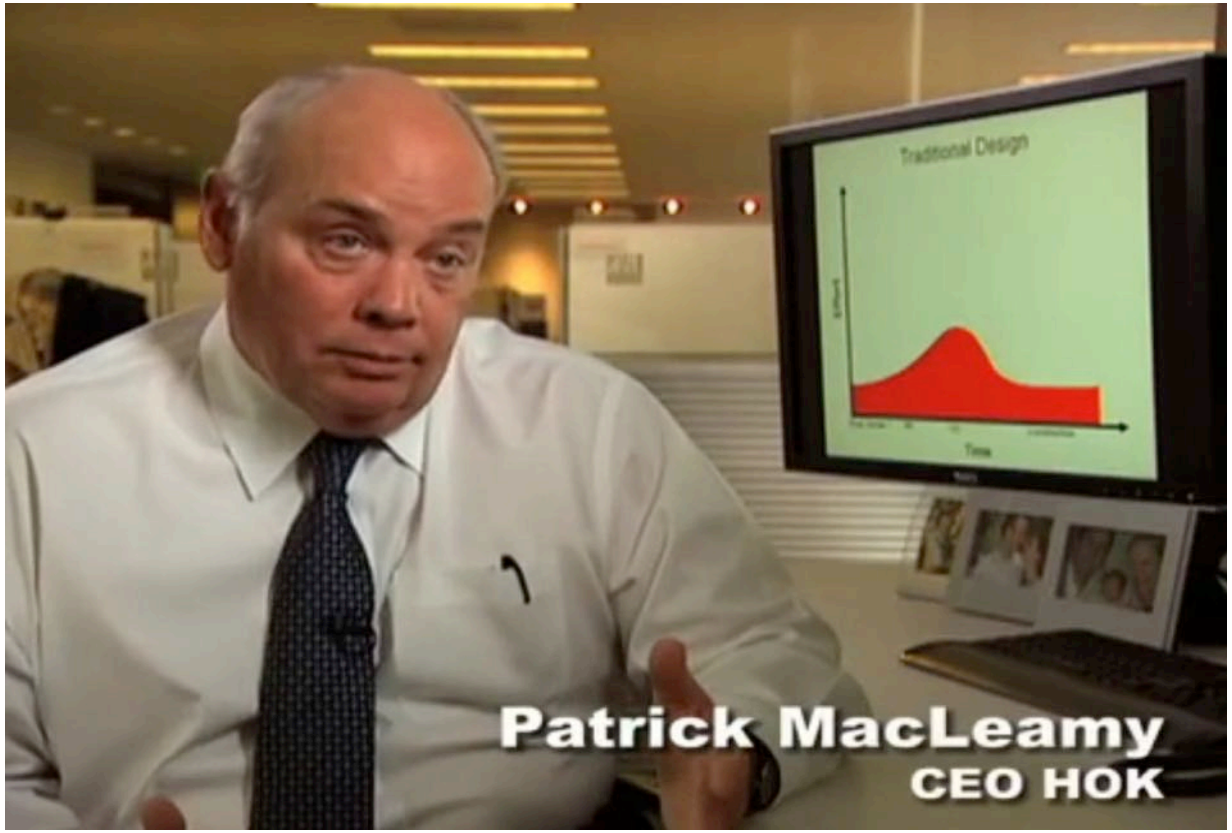
MacLeamy Curve Video



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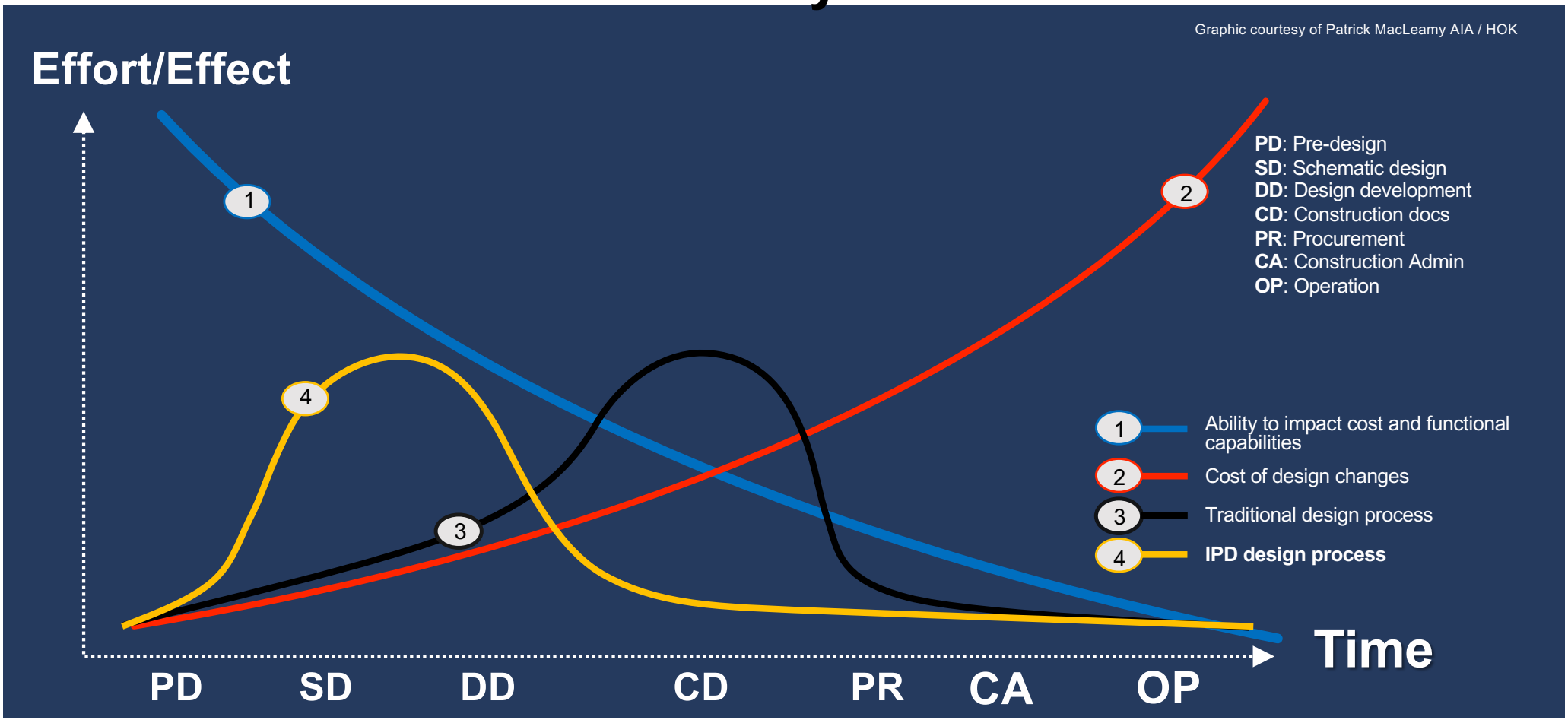
The MacLeamy Curve

Graphic courtesy of Patrick MacLeamy AIA / HOK



IPD Work Cluster Organization

Executive/Senior Management:
- Not involved in day-to-day of team
- Resolve conflicts

Core Team:
- Day-to-day leaders of the team

Work Cluster Leader:
- Coordination between work cluster & core team

Work Clusters:
- System oriented
- Cross discipline
- Stakeholder representation
- Form as needed

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Big Room

- Speed communication
- Improve decision-making
- Reduce ‘siloed’ thinking
- **Rapidly Advance work**

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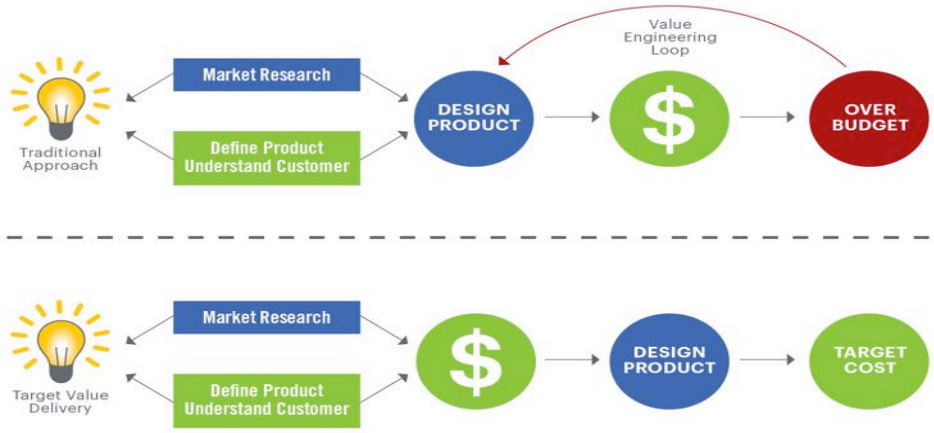
Traditional vs. Target Value Delivery

The goal of TVD:
Minimize the waste inherent in the design-estimate-redesign cycle(s) of the traditional approach.

Traditional: Cost is an *OUTPUT* of design



TVD: Cost is an *INPUT* of design

Graphic Courtesy of HKS Architects

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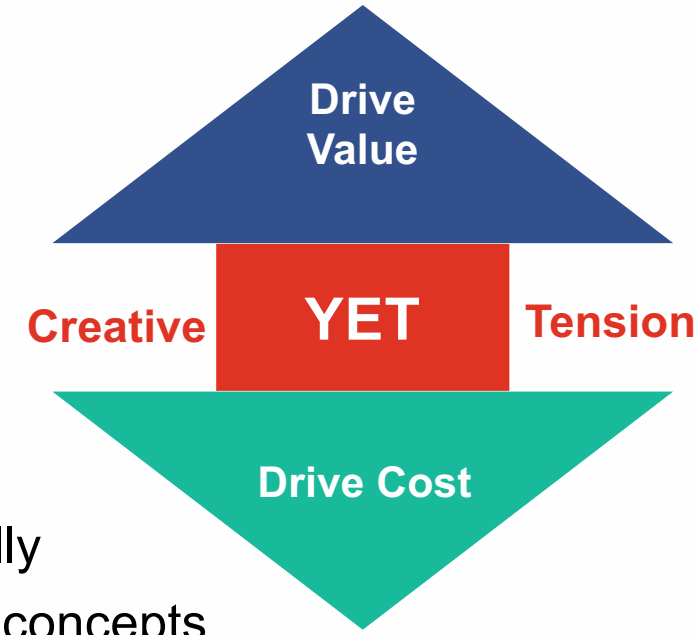
Traditional Delivery vs Target Value Delivery

Traditional Delivery:

- Work performed in silos – low visibility
- Early commitment to design solutions
- “Finish your work before I start mine” mentality



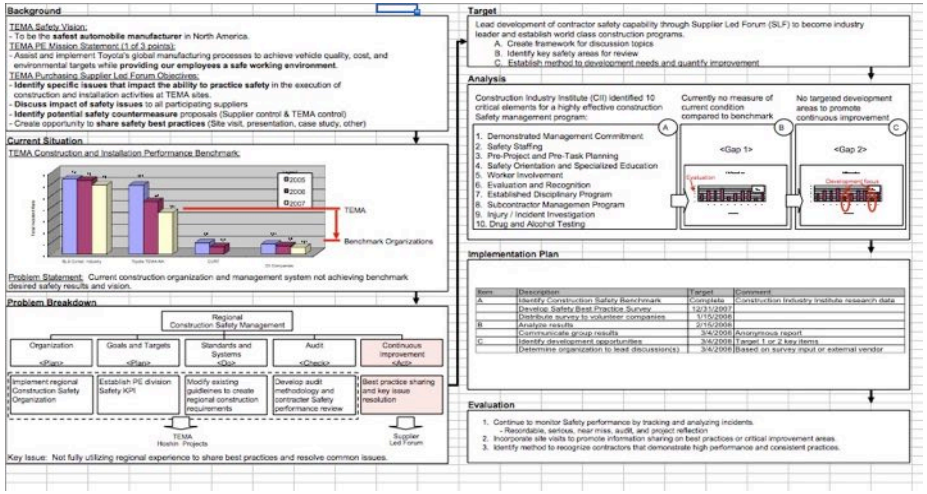
Target Value Delivery:

- Information is shared early and often
- Sets of solutions are carried and optimized holistically
- Continuous estimating and cost modeling based on concepts

A3 Thinking

(A3 = 11 x 17 paper size)

- Pioneered by Toyota
- Disciplined and highly collaborative approach to Plan-Do-Check-Act
- **A3** Applications:
  - Problem Solving
  - Policy Deployment
  - Reporting
  - Capturing Decisions



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Choosing by Advantages (CBA)

A **sound** decision-making system for determining the **best decision** by looking at the **importance of the advantages** of each alternative.

Choosing By Advantages Study of: Heating Hot Water System		Alternative 1 Central Plant Heating Hot Water System		Alternative 2 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				

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Prototyping - Production Preparation Process (3P)

- **Mock-up**
- **Clarifies requirements**
- **Gains agreement**

Photos Courtesy of Cone Health

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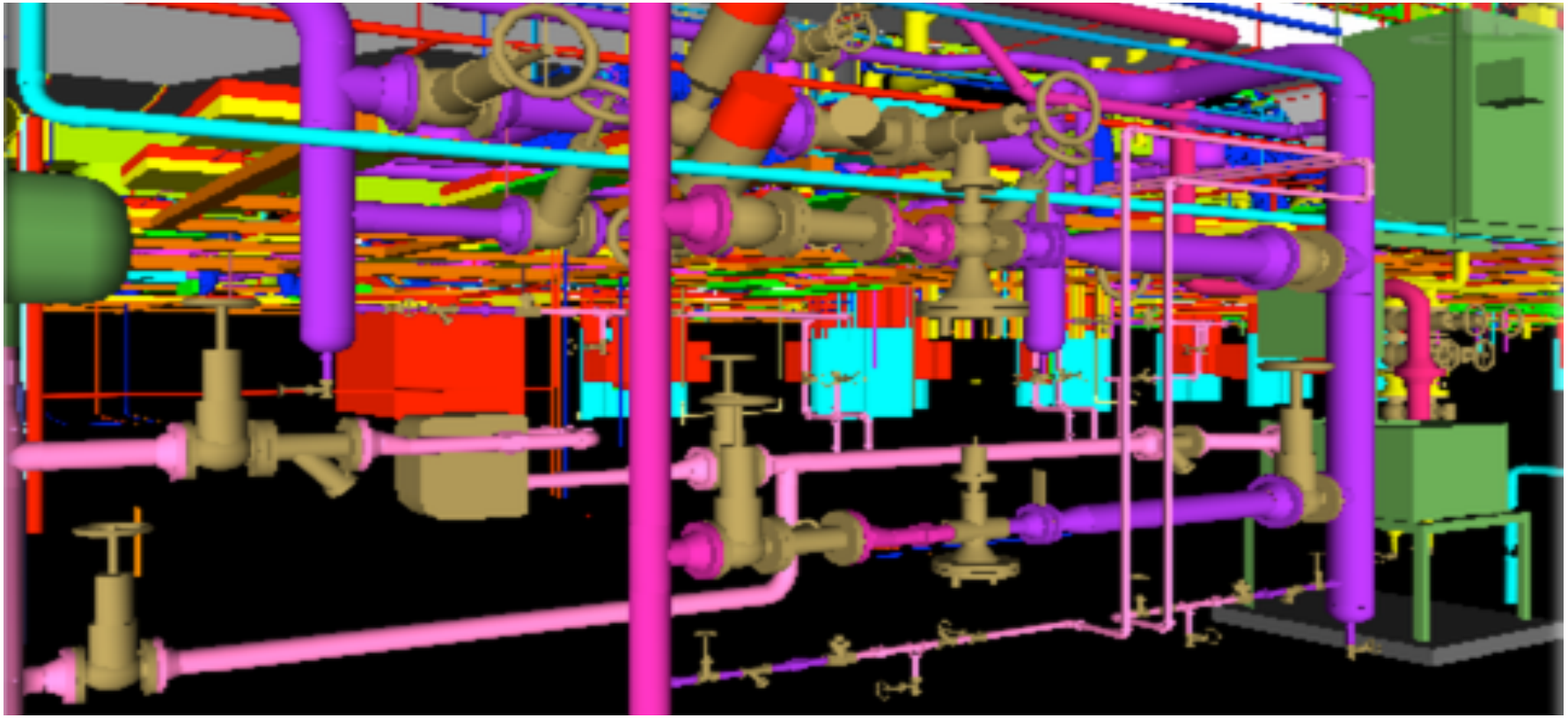
Building Information Modeling (BIM) & Virtual Reality



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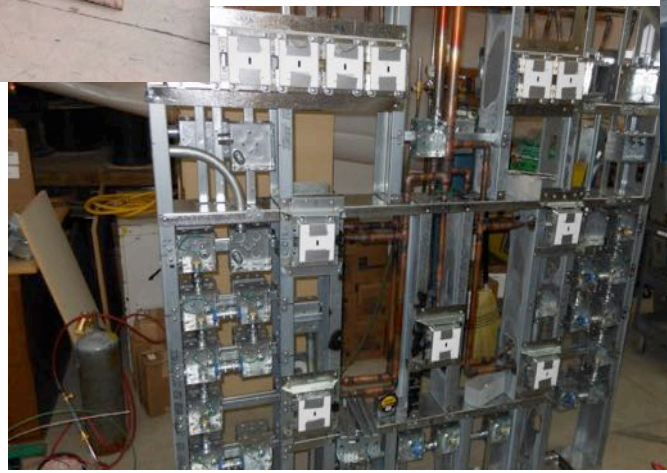
Prefabrication – Headwalls, Plumbing, Bathrooms



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Last Planner System®
Reliability, Flow, Dependency & Variation

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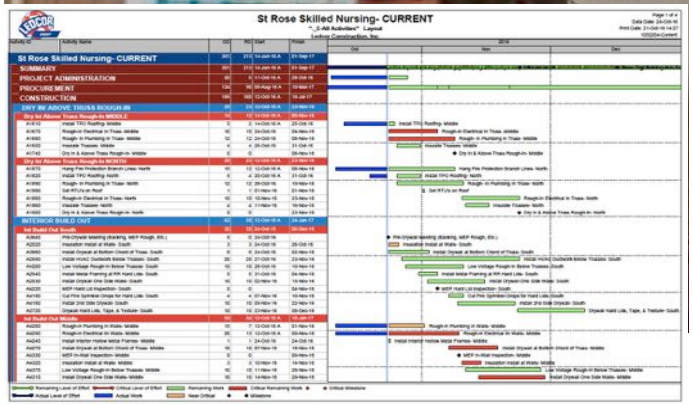
Last Planner System® – 5 Connected Conversations



MILESTONE
Planning
Set Milestones

PHASE PULL
Planning
Specify Handoffs

LOOKAHEAD
Planning
Make Work Ready

WEEKLY WORK
Planning

LEARNING & IMPROVING

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Make-Ready Planning (6 weeks+)

"Pinging the water" for Icebergs

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Make Ready Example
1950 vs 2013 Pit Stops

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Last Planner® System – 5 Connected Conversations

LEARN

SHOULD — **MILESTONE** Planning — **Set Milestones**

CAN — **PHASE PULL** Planning — **Specify Handoffs**

WILL — **LOOKAHEAD** Planning — **Make Work Ready**

DID — **WEEKLY WORK** Planning — **Make Promises**

LEARNING & IMPROVING — **Percent Plan Complete & Variances**

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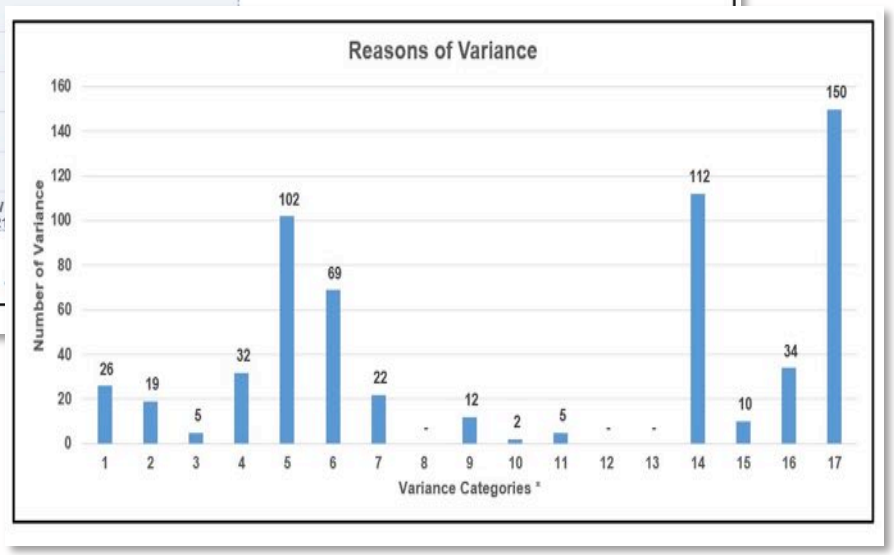
Percent Plan Complete (PPC) & Variances



(*) Variance Categories	
1	Coordination
2	Engineering / Design
3	Owner's Decision
4	Weather
5	Prerequisite Work
6	Labor
7	Materials
8	Contracts/Change Orders
9	Submittals
10	Approvals
11	Equipment
12	RFIs
13	Overtime (OT) Approval
14	Site Conditions
15	Inspections
16	Other
17	Covid-19

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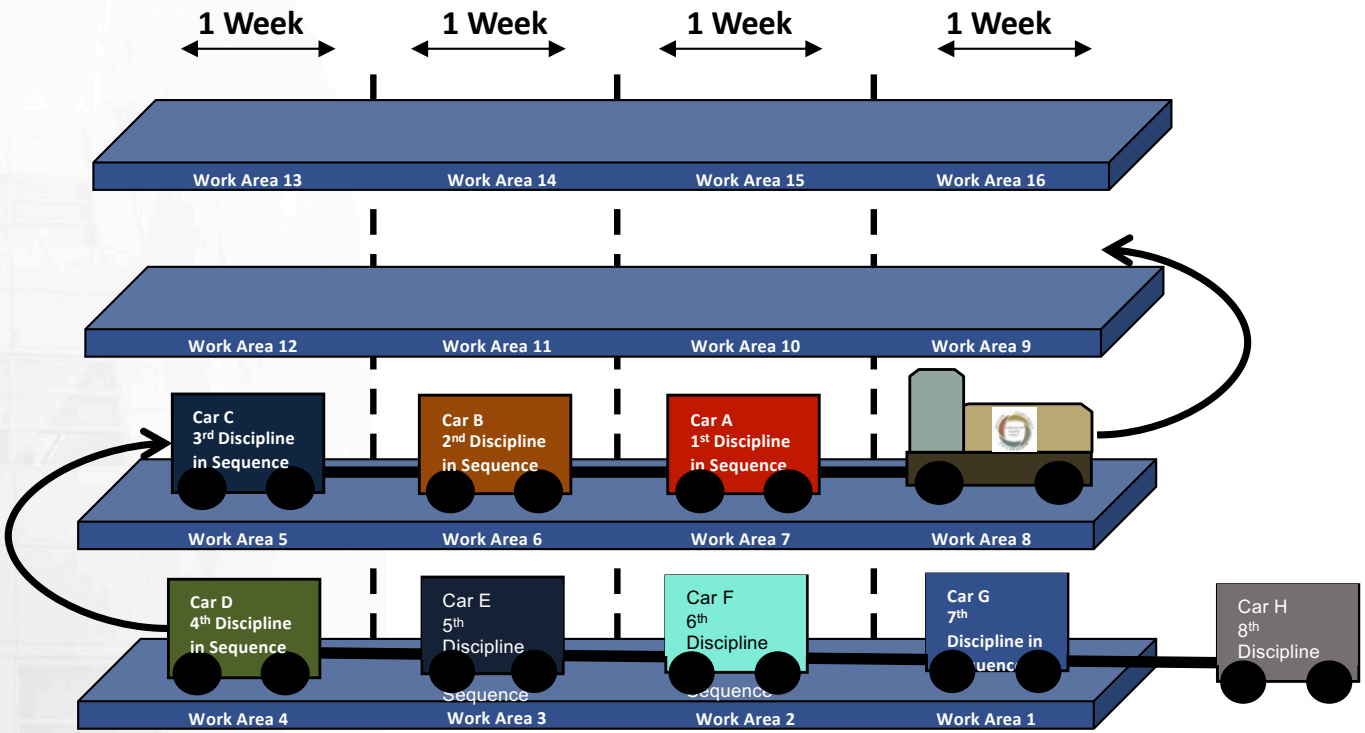
5S: A Starting Point with Lean

- **S**ORT
- **S**TRAIGHTEN
- **S**HINE
- **S**TANDARDIZE
- **S**USTAIN

A disciplined approach to **maintaining order** in the workplace, using **visual controls** to eliminate waste.

Takt Planning



BOLD THINKING

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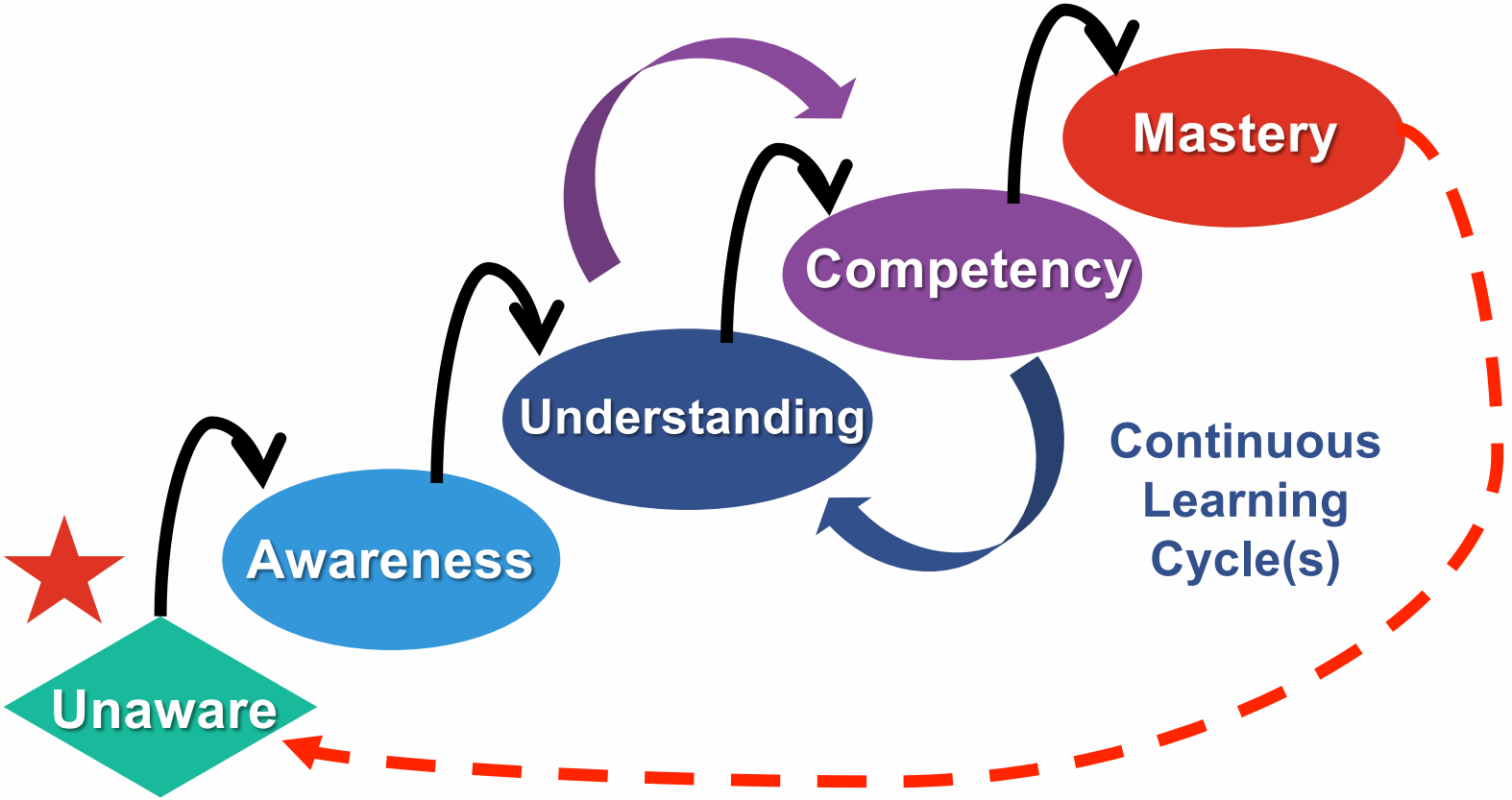
Lean Journey to Mastery



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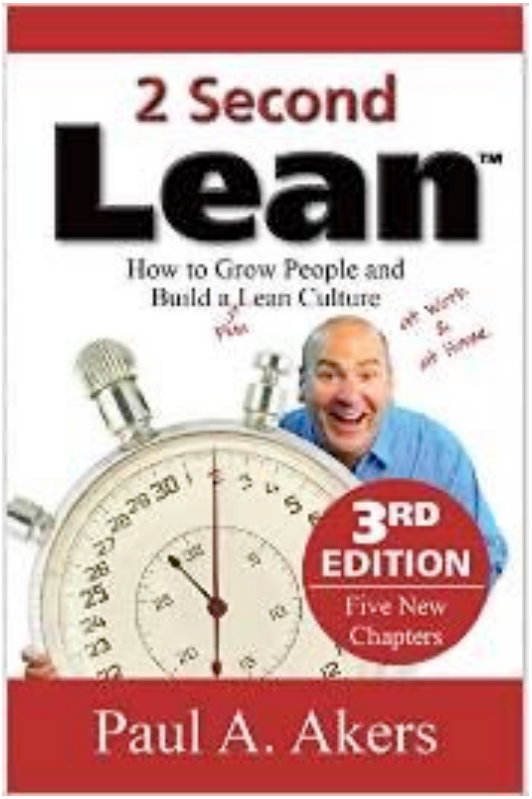
Paul Akers: 3 Keys to Lean Video



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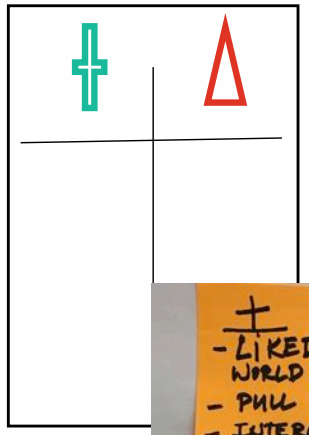
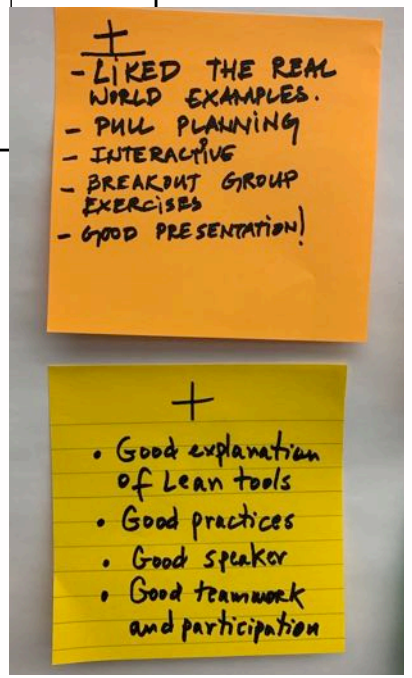
Conduct Plus/Delta

Capture on a flip chart or white board, or use **Sticky Notes**

Plus: What produced <u>value</u> during the session?
"I LIKED…"

Delta: What could we <u>change to improve</u> the process or outcome?
"I WISH…"

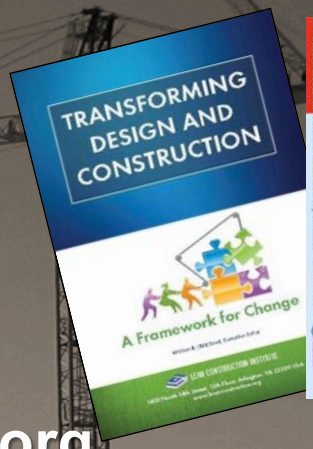


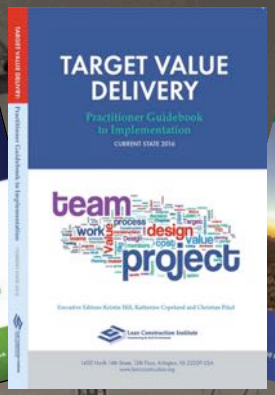


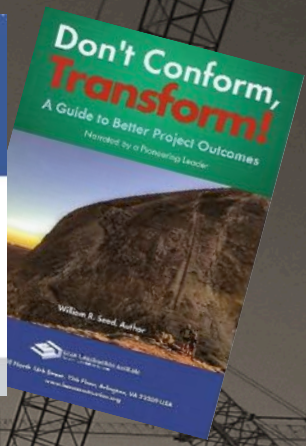
Questions?

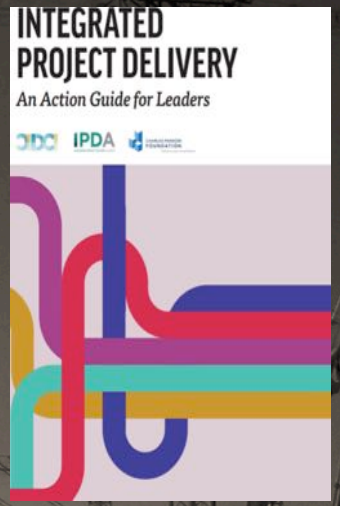
Additional Resources

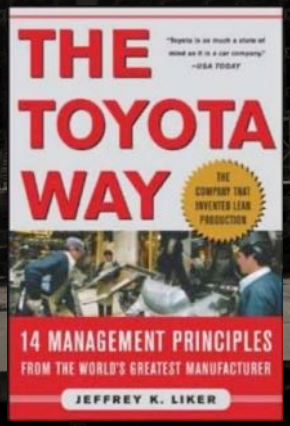
www.LeanConstruction.org

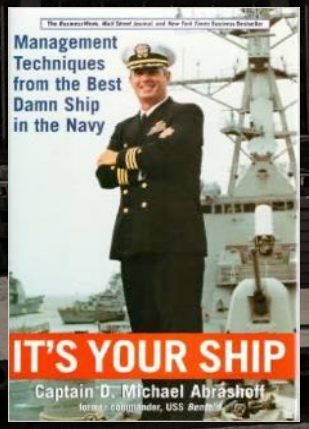


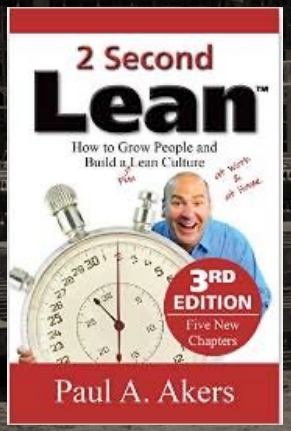


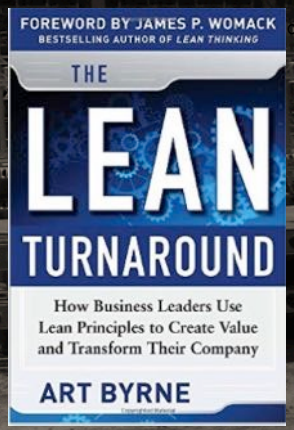


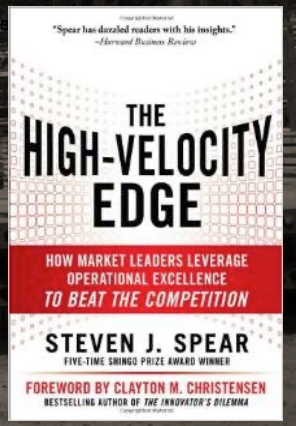












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This concludes The American Institute of Architects
Continuing Education Systems Course

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