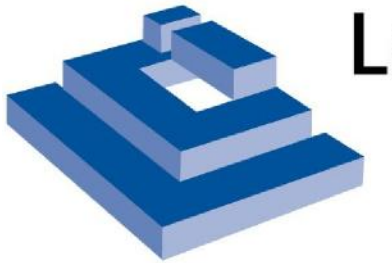
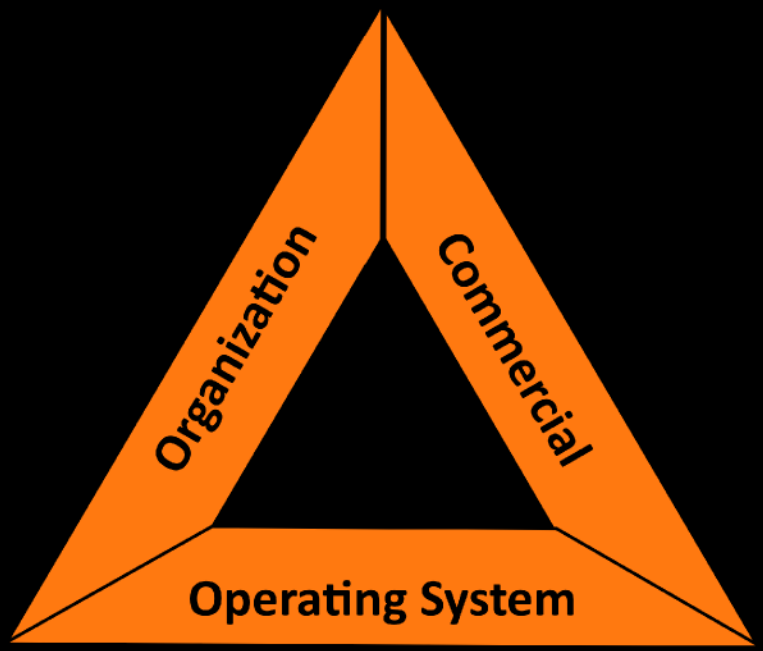


# Lean Construction Institute

Building Knowledge in Design and Construction

# Lean Construction as Countermeasure

Will Lichtig Gregory A. Howell, P. E.
Boldt Construction Lean Construction Institute

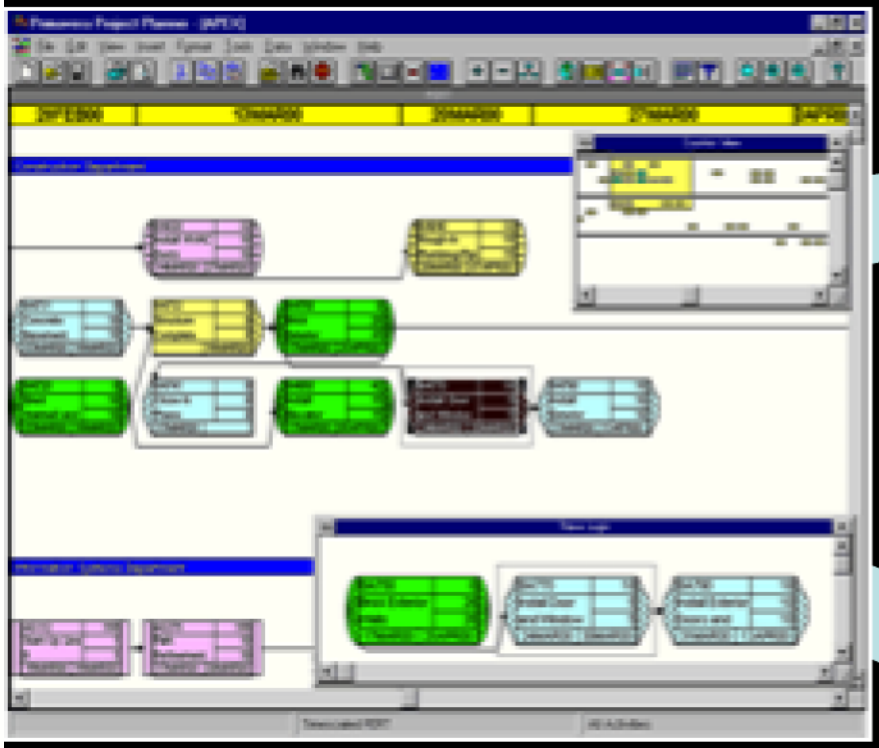

Organization
Commercial
Operating System

# Traditional project management:
## A coherent common sense

| Organization | Operating System | Commercial |
|---|---|---|
| Command & Control | Activity Centered (CPM) | Transactional |

# Current Operating System: How are projects managed today

- Determine client requirements including quality, time and budget limits. Design to meet them.
- Break project into activities, estimating duration and resource requirements for each activity and placing them in a logical order with CPM
- Assign or contract each activity, give start notice and monitor safety, quality, time and cost standards. Act on negative variance from standards
- Coordinate with master schedule and weekly meetings
- Reduce cost by productivity improvement
- Reduce duration by speeding each piece or changing logic
- Improve quality and safety with inspection and enforcement



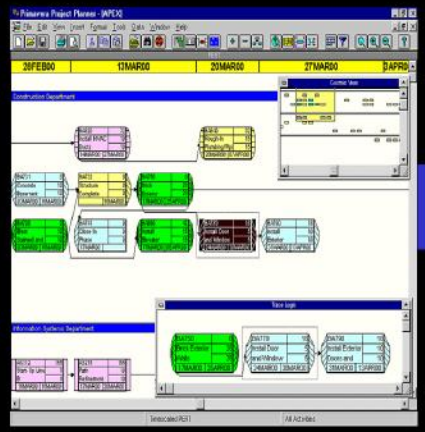
# Research Finding from early 1990's

54 %

% of Tasks Completed
on
Foreman Weekly Work Plan

# Last Planner® – Predictable workflow & rapid learning

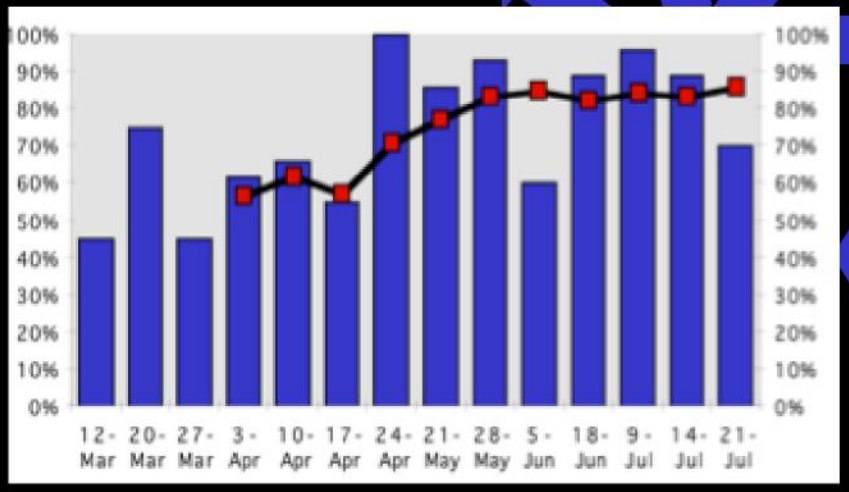


Master Schedule

Pull Planning

| Criteria | | | | Inputs | | Resources | | |
|---|---|---|---|---|---|---|---|---|
| Contract | Design | Submittals | RFI's | Material | Prereq | Equipment | Labor | Weather |
| X | X | X | X | X | Concrete at E-10 must be up to streng | | | |
| | Possible delay caused by oversized footing. | | | | | | | |
| X | X | X | X | X | X | X | X | X |
| X | X | X | X | X | X | X | X | X |
| X | X | X | X | X | X | X | X | X |
| X | X | X | X | X | X | X | X | X |
| X | X | X | X | X | X | X | X | X |
| X | X | X | X | X | X | X | X | X |
| X | X | X | X | X | X | X | X | X |
| X | X | X | X | X | X | X | X | X |

Lookahead Plan & Constraint Analysis




Percent Plan Complete

**1 WEEK PLAN**

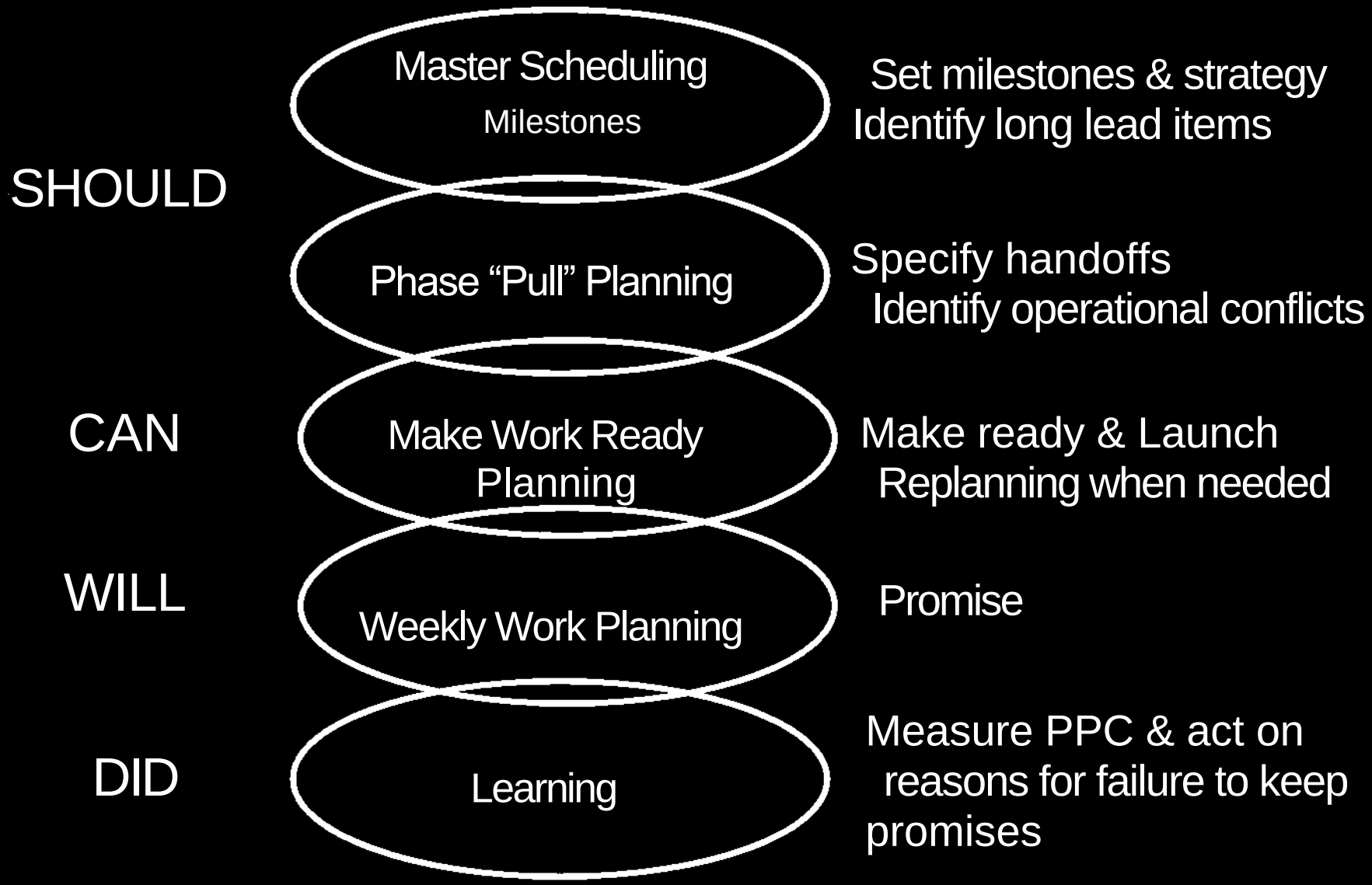
**PROJECT: Pilot** **FOREMAN: PHILLIP**

**ACTIVITY** **DATE: 9/20/96**

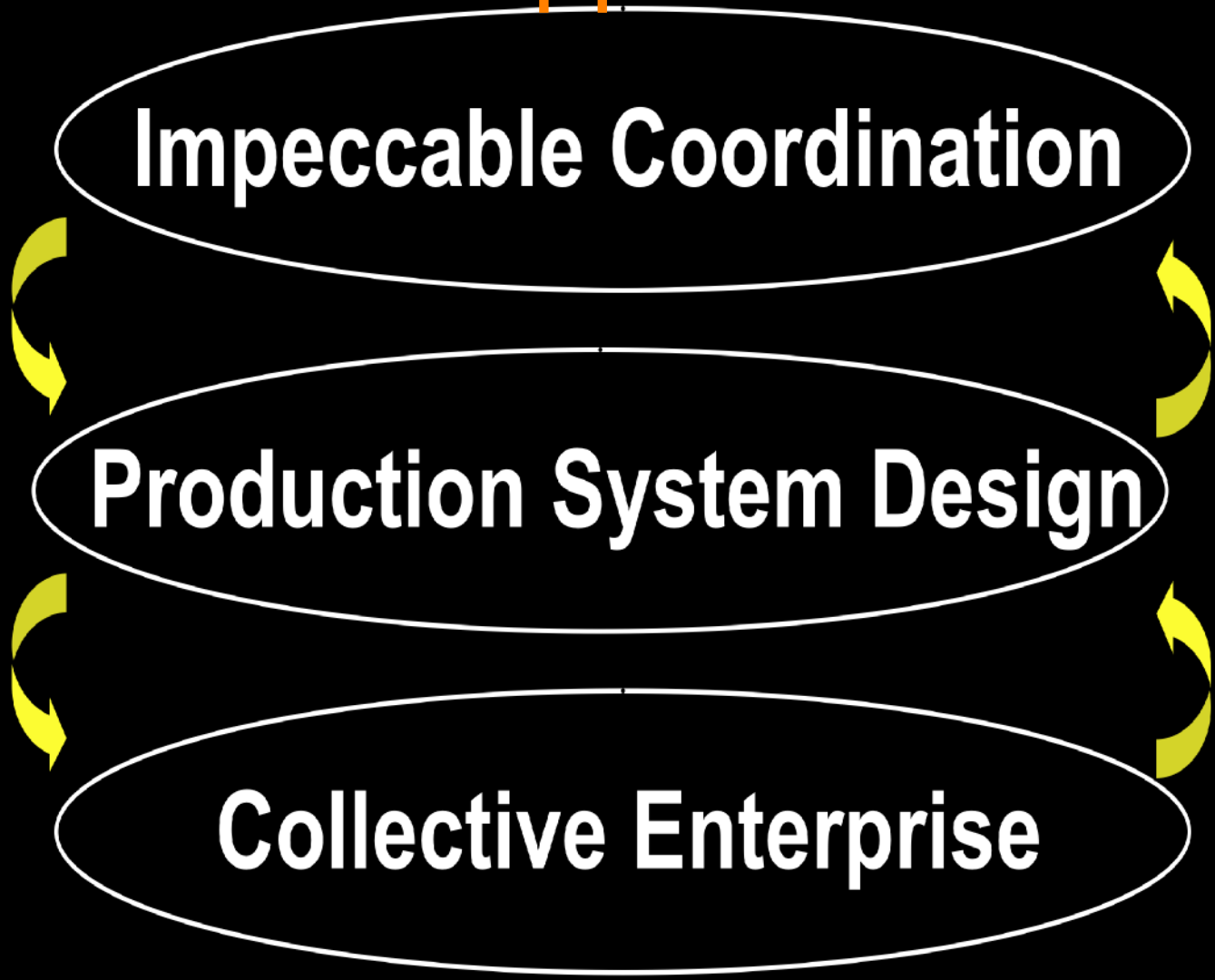
| | Est | Act | Mon | Tu | Wed | Thurs | Fri | Sat | Sun | PPC | REASON FOR VARIANCES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Gas/F.O. hangers O/H "K" (48 hangers) | | | xxxx Sylvano, Modesto, Terry | xxxx | | | | | | No | Owner stopped work (changing elevations) |
| Gas/F.O. risers to O/H "K" (3 risers) | | | | | xxxx Sylvano, Mdesto, Terry | xxxx | xxxx | xxxx | | No | Same as above-worked on backlog & boiler blowdown |
| 36" cond water "K" 42" 2-45 deg 1-90 deg | | | xxxx Charlie, Rick, Ben | xxxx | xxxx | | | | | Yes | |
| Chiller risers (2 chillers wk.) | | | | | | xxxx Charlie, Rick, Ben | xxxx | xxxx | | No | Matl from shop rcvd late Thurs. Grooved couplings shipped late. |
| Hang H/W O/H "J" (240'-14") | | | xxxx Mark M., Mike | xxxx | xxxx | xxxx | xxxx | xxxx | | Yes | |
| Cooling Tower 10" tie-ins (steel) (2 towers per day) | | | xxxx Steve, Chris, Mark W. | xxxx | xxxx | xxxx | xxxx | xxxx | | Yes | |
| Weld out CHW pump headers "J" mezz. (18) | | | xxxx Luke | xxxx | xxxx | xxxx | xxxx | xxxx | | Yes | |
| Weld out cooling towers (12 towers) | | | xxxx Jeff | xxxx | xxxx | xxxx | xxxx | xxxx | | No | Eye injury. Lost 2 days welding time |
| F.R.P. tie-in to E.T. (9 towers) 50% | | | xxxx Firt, Packy, Tom | xxxx | xxxx | xxxx | xxxx | xxxx | | Yes | |
| **WORKABLE BACKLOG** Boiler blowdown-gas vents -rupture disks | | | | | | | | | | | |

Weekly Work Planning

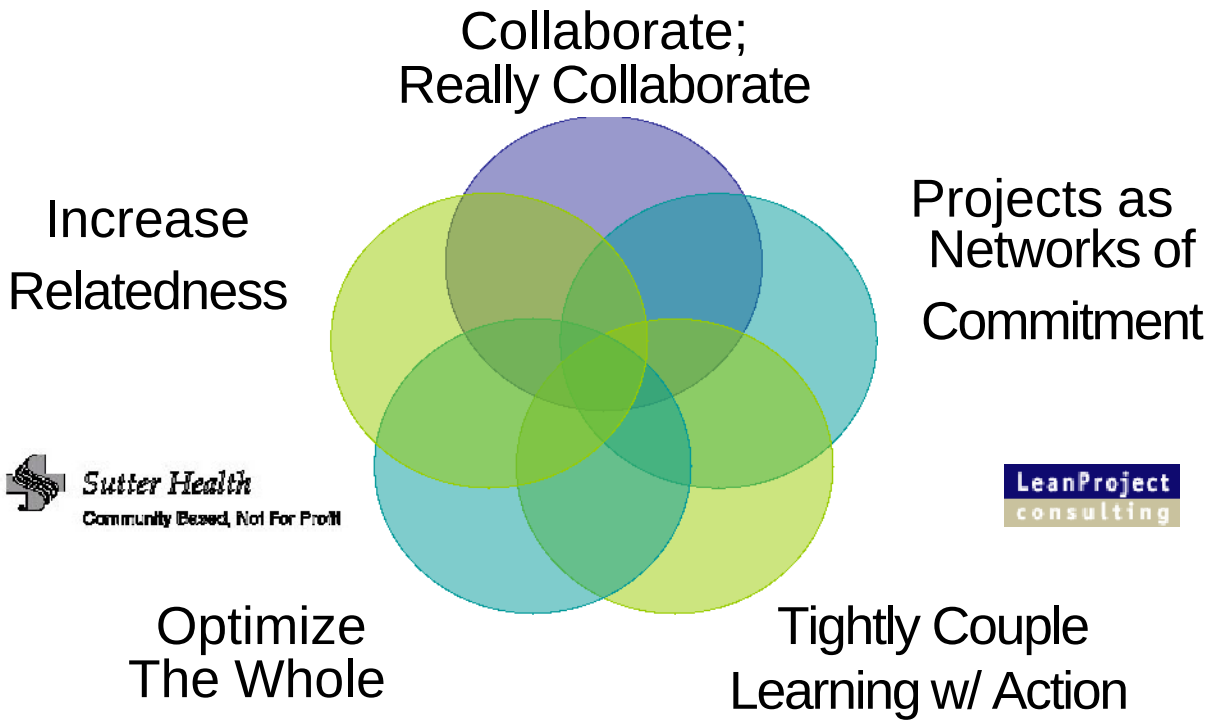
# The Last Planner® System of Production Control
# 5 - Connected Conversations



# Three Opportunities



# Five Big Ideas



# Replacing the old coherent common sense with the new

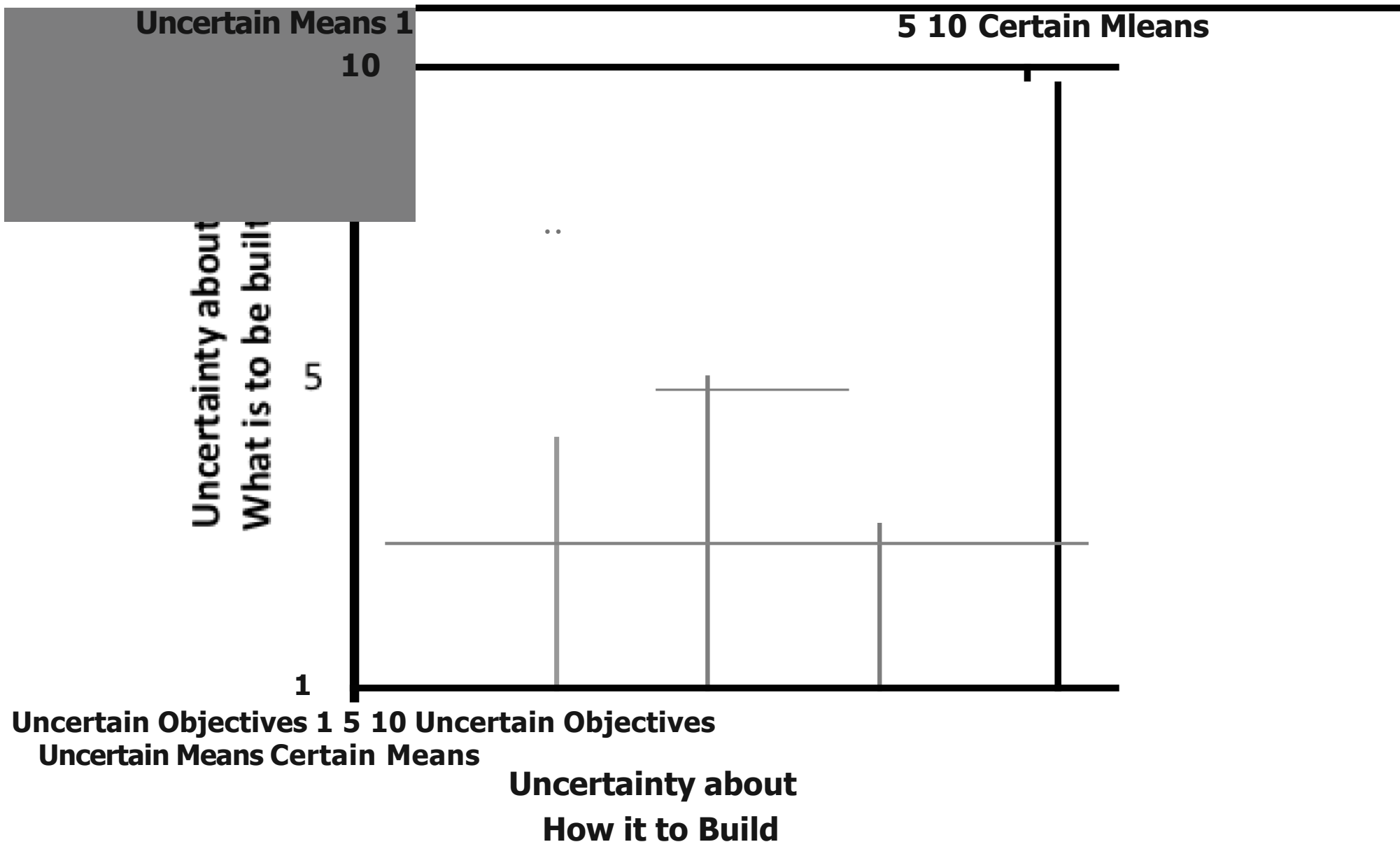

Command & Control

Activity Centered (CPM)

Transactional

Collaborative Flow Centered Relational **(Lean)**

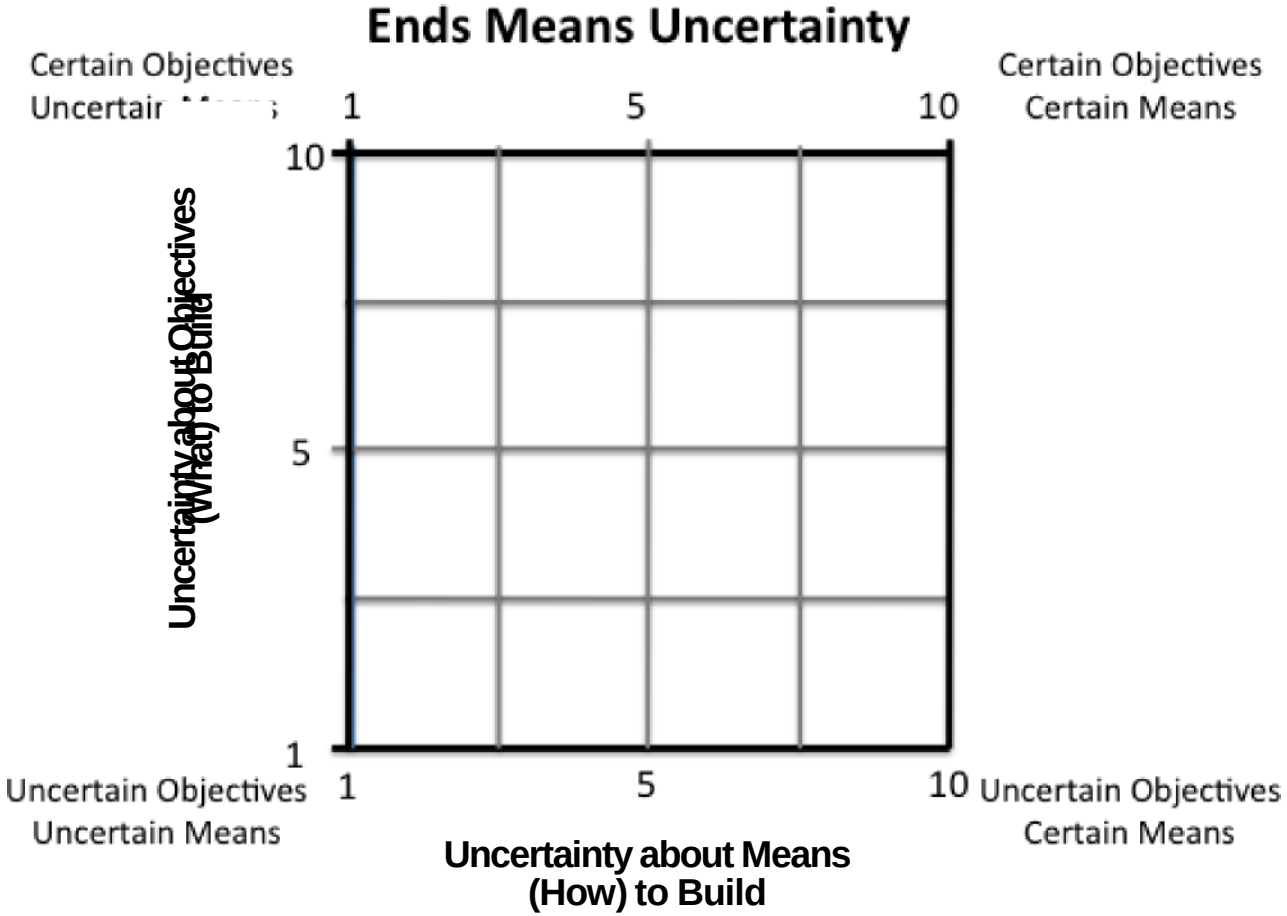
# Ends Means Uncertainty



# Assessment of Uncertainty on Most Recent Project

Mark a "T" for where you thought the project was at the start of construction and an "R" for where you later realized it was.

Use an X if your assessment did not change.



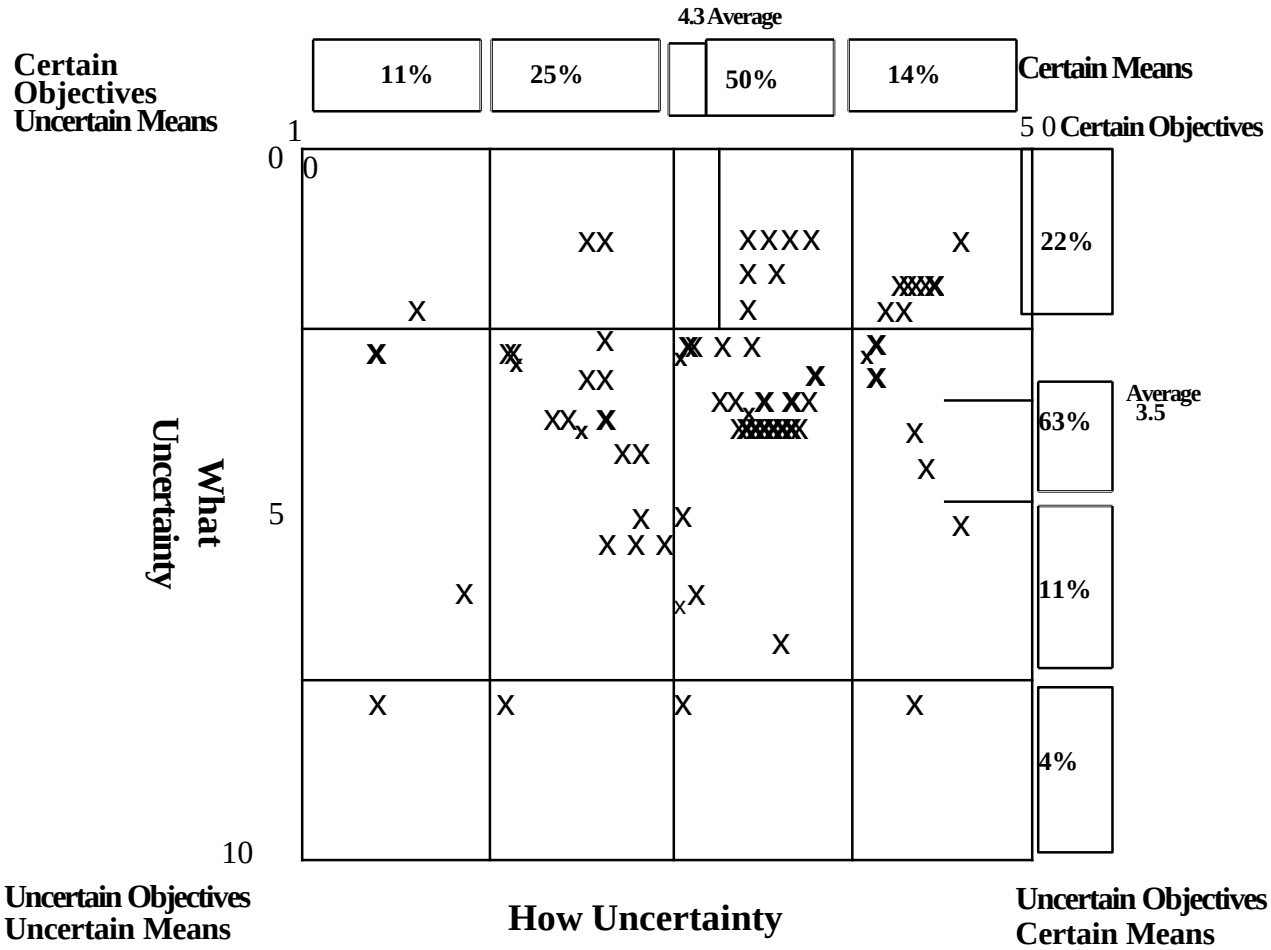

About you:
Owner ___
Designer ___
Contractor

___

Or–

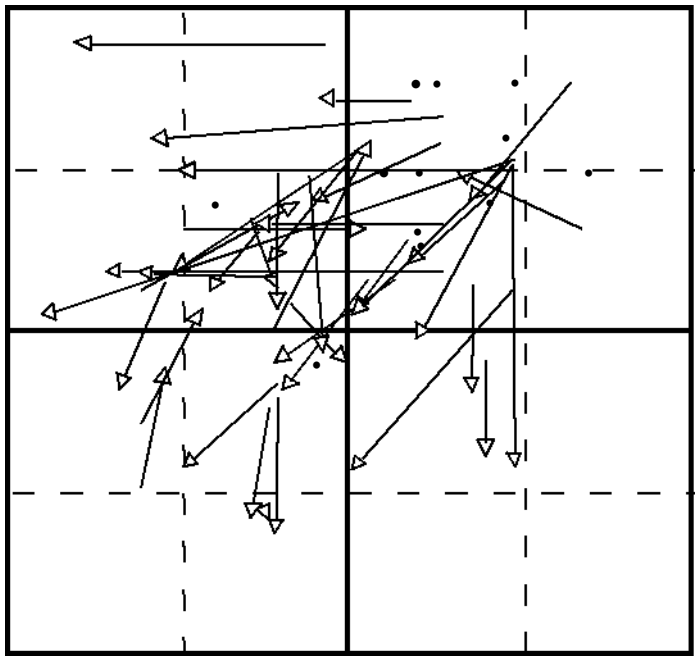
About management of the project:
Traditional [__] Basic Lean Construction (LPS) [___]
Advanced Lean Construction LPS & IPD

Really advanced Lean Construction: LPS, IPD, TVD, Set Based Design [___]
Was BIM used? Y N




**Assessment of Uncertainty at the Start of Construction**

Certain Objectives Certain Objectives
Uncertain Means Certain Means



Tails of arrows show assessment at beginning of the project and arrow heads mark later assessment. Unchanged assessments marked with " "

Uncertain Objectives

What Uncertainty

Uncertain Objectives
Uncertain Means

How Uncertainty

Certain Means

Assessment of Uncertainty on Recent Project

**Table 1,1,4gc Assessment Matrix**

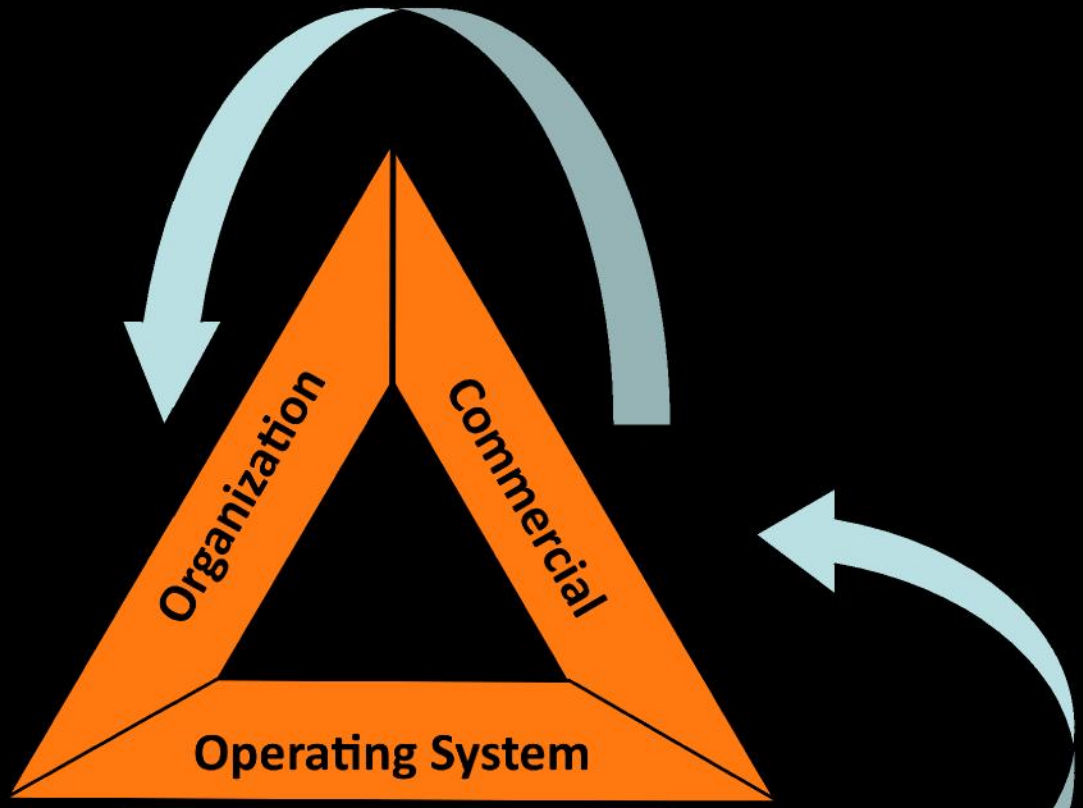
| | | | | | | |
|---|---|---|---|---|---|---|
| Probability | Certain | M | II | H | H | |
| | Likely | M | H | H | H | H |
| | Pos.sible | | 14 | | | |
| | Unlikely | | L | M | | |
| | Rare | L | L | L | *M* | NI |
| | | Low | Minor | 'Moderate | Major | Catastrophic |
| | | Severity | | | | |

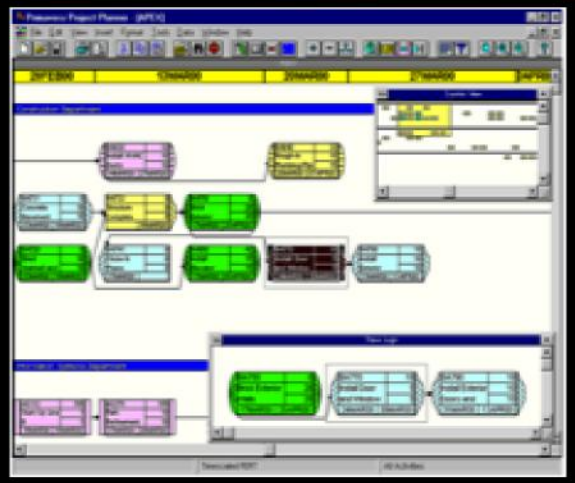
Key: L=Legr, M=Moderate; H=High; E=Extremely High

Lean & Alliancing, IPD, IFOA


# A New and Coherent Way to Manage Work in Projects

An activity-centered operating system designed to optimize the project by optimizing each activity and their relationship.



Developed Circa 1960

# Strategy: Flow-Centered

Operating system designed to optimize the project not the piece