

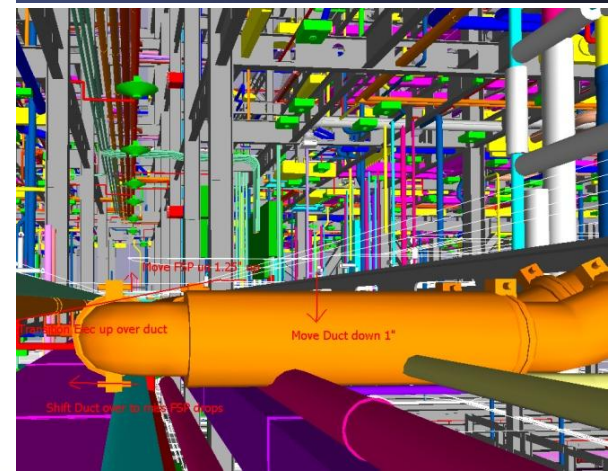
Design Management – A Lean Approach



Faster Forward – Technology in Architectural Practice November 17, 2011

Bruce Cousins, AIA

- 30 + yrs. Architect & Technology Consultant, M Arch. UC Berkeley
- 2.5 Years Sr. Mgr. Virtual Design and Construction, Top 300 General Contractor
- \$0.75B in Virtual Design and Construction (VDC)
- 41 construction professionals managing projects using virtual building models
- Used VDC at all operational levels as extension of employee skill set



Learning Objectives

1. 3D Building Information Modeling technology is changing the way Architects design and deliver a project.
2. Combining the “Lean” Process with BIM technology works to facilitate a collaborative design process.
3. New Roles and Responsibilities are evolving for Architects to lead and or collaborate with all project stakeholders throughout design and construction process.
4. The fundamental building blocks of the Lean Process that can be applied to managing the design process?
Design Management, Target Value Design, Set Based Design,
Rapid Prototyping, Co-Location, Shared risk & reward.
5. Path Forward for Lean, BIM and IPD projects?

Resetting the Operating System

INTRODUCTION

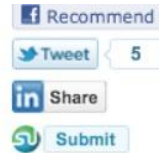


What is Not Working?

CALATRAVA'S EXIT

Denver officials grapple with DIA designs after Santiago Calatrava's exit

By Eric Gorski
The Denver Post



POSTED: 09/25/2011 01:00:00 AM MDT
UPDATED: 09/25/2011 09:21:36 AM MDT



Spanish architect Santiago Calatrava is shown with a model of the rail bridge he designed to span Peña Boulevard in July 2010. The bridge was eliminated from plans after the cost of the Denver International Airport South Terminal project was reduced by \$150 million to \$500 million. (THE DENVER POST | RJ SANGOSTI)

Calatrava has prepared a reduced design for South Terminal to save money, Day said. "He said '**Don't tell me what to cut. Tell me your budget.**'"

The result is a new design for the hotel-train-station-plaza complex that **is 25 percent reduced in area, and 30 percent reduced in volume,** from the original design, she said.

Financial Constraints, unnecessary time delays, deep divisions between the design team and the Program Managers.
Robertina Calatrava - Letter

What is Not Working?

- ✓ Unrealistic design & production schedules
- ✓ Incomplete documents push decisions downstream
- ✓ Lack of management discipline overwhelms even the most dedicated project team
- ✓ Lack of Accountability within the Team
- ✓ Quality suffers, employees work long hours to meet impossible deadlines
- ✓ Silos of work do not allow transparency & teamwork
- ✓ Lack of Coordinated Documents
- ✓ Frequent Rework to meet project goals

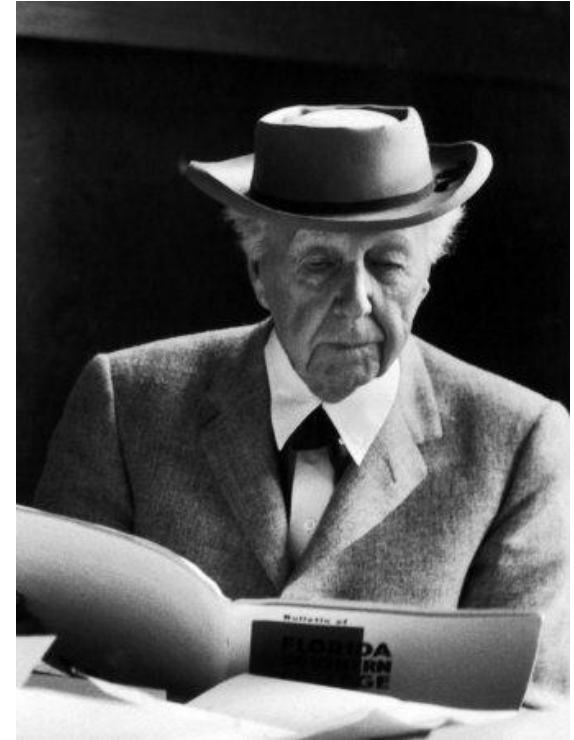
Master Builder Era



HH Richardson



Le Corbusier



FLW

The Virtual Building Era



Morphosis



Gehry Technologies



Ghafari Associates

The Virtual Building Era

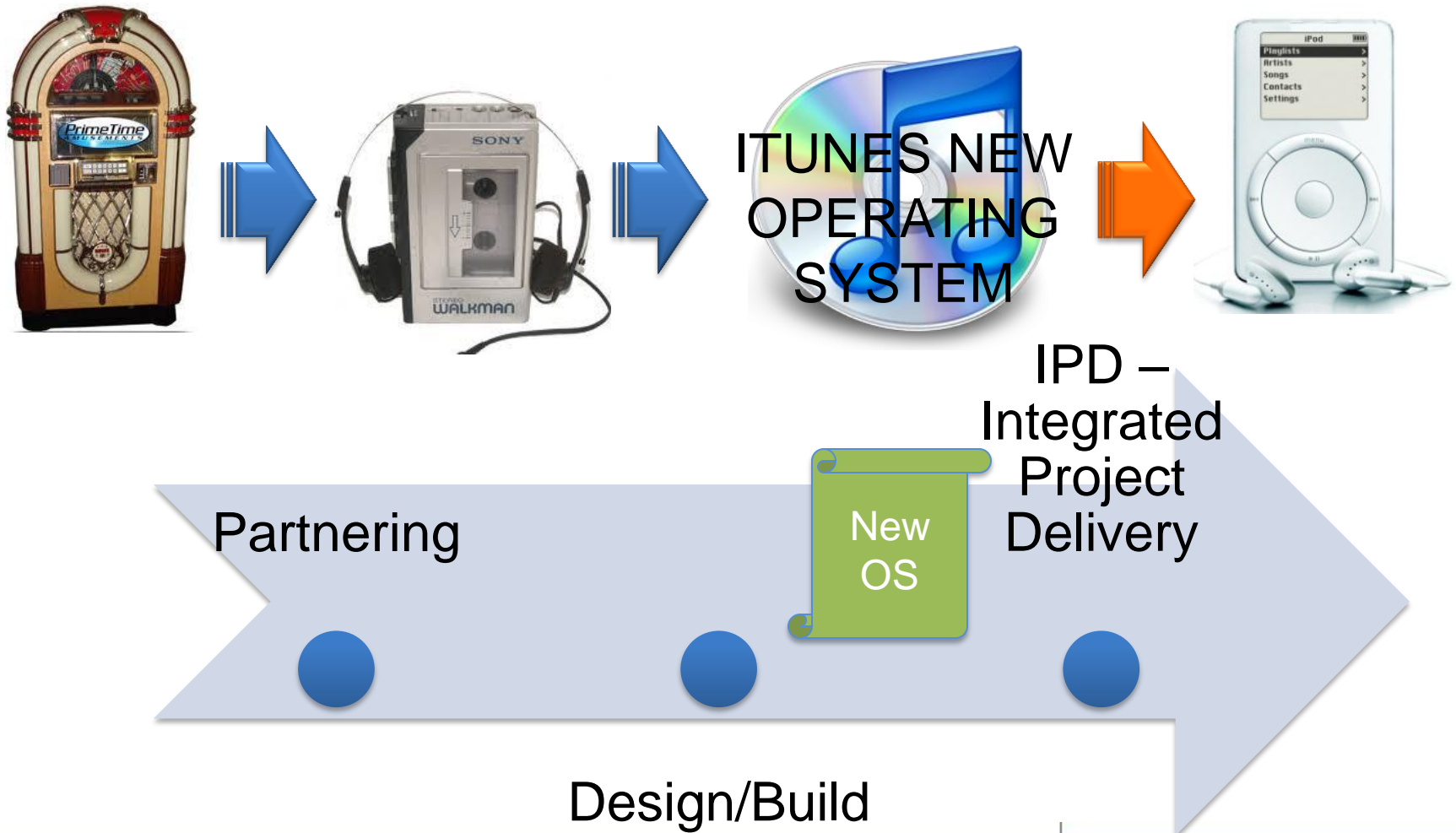
VDC-BIM Technology encourages & enhances collaborative design relationships... signaling the end of an era of America's construction industry that has been risk averse, conservative and confrontational...

NO ONE KNOWS AS MUCH AS EVERYONE

Tradition Yields to Collaboration...

- ✓ Team agrees **change is desired** to the conventional design process
- ✓ Team members **promise** each other that they will work cooperatively to provide the most value to the Client
- ✓ They will commit to **redesign the design process**
- ✓ Share **risk & reward** – put profits at risk
- ✓ The Project Team become its own **“company”**
- ✓ Create a **learning environment**
- ✓ **Everyone feels Vulnerable**

Response to Traditional OS Breakdowns



Virtual Design & Construction the Dashboard for LEAN Processes



The “New” Operating System

MANAGING DESIGN IN A COLLABORATIVE PROJECT ENVIRONMENT

Beginning the Lean Journey...



By Nadine M. Post

Sutter Health Unlocks the Door to **A New Process**

Team contract, with shared risk and reward, fosters "all-for-one, one-for-all" spirit

In Sutter's brave new world of **lean construction**, the traditional "command and control" mentality of project management is gone. Gone are most lump sum, low-bid contracts. Gone are guaranteed maximum prices. Gone are inflated bids to cover risk. Gone are the adversaries. Gone are most requests for information. And, so far, gone are costly claims." — Nadine Post, Engineering News

Meet or Exceed the Clients Expectations?

- Ideas - Fresh Thinking
- Iconic Imageable Forms
- Predictable Outcomes
- Meet the Project End Users Needs

Value is what a Client wants.

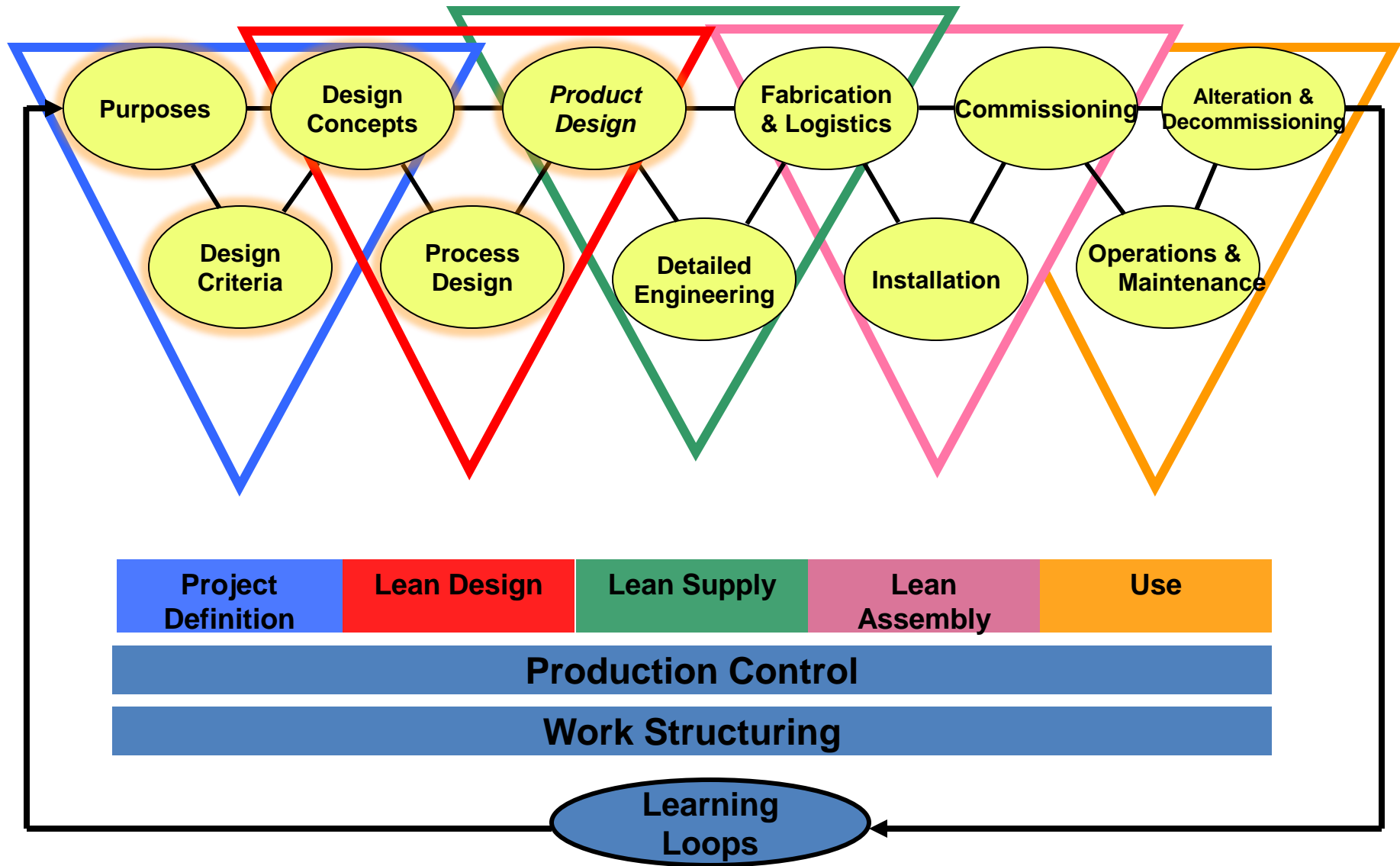
Design is Messy & Not Sequential



VS

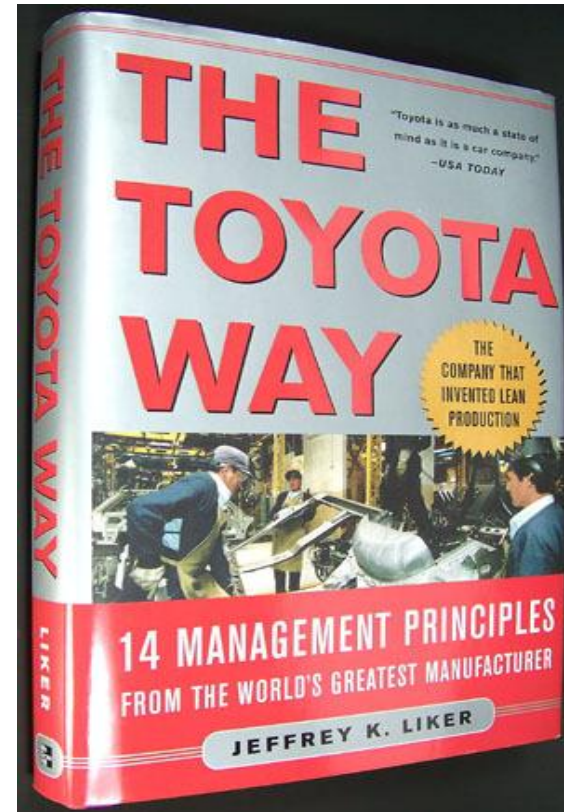
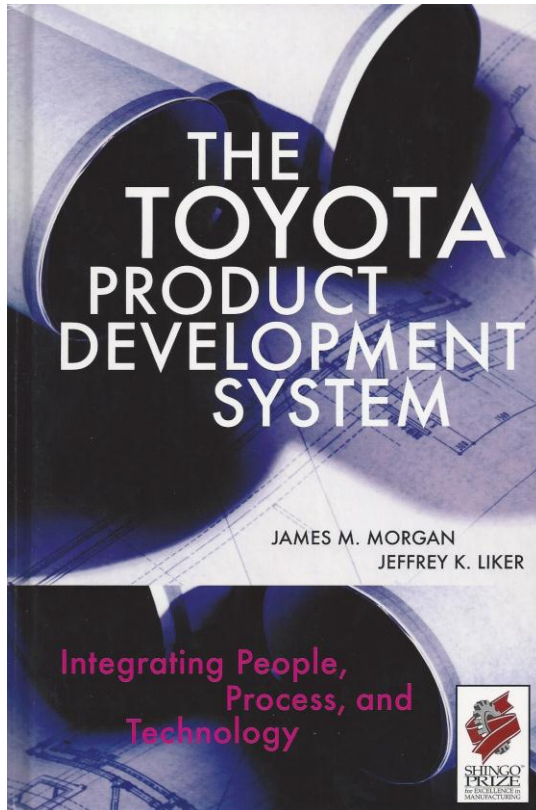


A new design management paradigm must acknowledge this fundamental essence of design thinking. A Lean management approach acknowledges the essence design thinking is fuzzy, iterative, non sequential ...



Lean Management

The OS for Successful Project Delivery



“Anything that does not add value is waste.”

Waste...In Planning & Design

- Lack of Accurate Owner Program
- Early Starts without complete info
- Discovery of the unknown – Lack of Sequence
- Waiting – Owner and other Review
- Predetermined design solutions that need rework to fit
- Lack of Direct Access to Supply Chain – Means & Methods

Source: The Toyota Product Development System

Waste...In Construction

- Overproduction
- Waiting
- Unnecessary transport or conveyance
- Over processing or incorrect processing
- Excess inventory
- Unnecessary movement
- Defects
- Unused employee creativity

Source: The Toyota Way

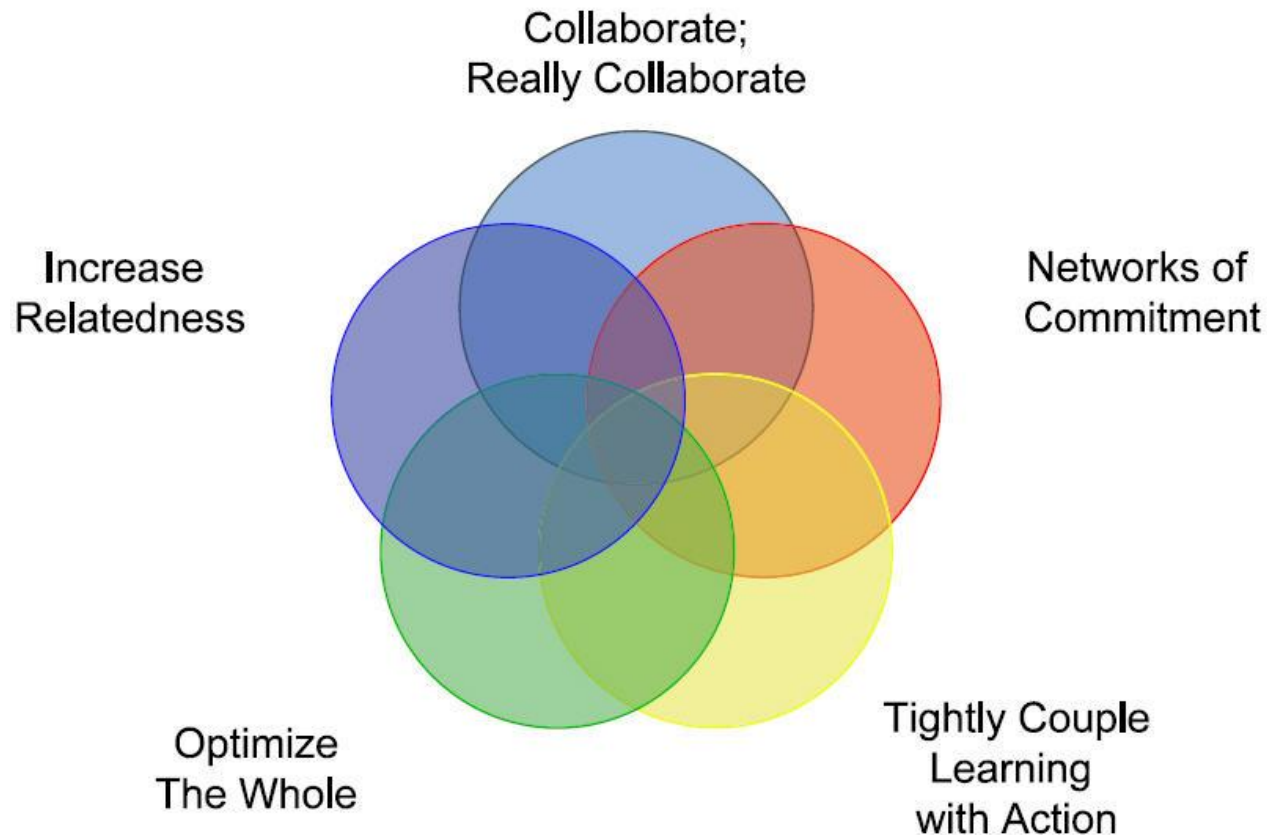
BIM Technology's Contribution to Design Management

- *A 3D Picture is worth a Thousand Words or 2D Drawings*
- *Transforms ego-based conflict into fact-based conversations*
- *Increases the Speed of the Design Process Work Flow with less risk of missing key design issues*
- *Enables effective low cost Rapid Prototyping & Simulation of building performance*

Levit, Raymond & John Kunz, ***Design Your Project Organization as Engineers Design Bridges*** – CIFE Working Paper #73

Integrated VDC-BIM & Lean

FIVE BIG IDEAS OF LEAN PROJECT DELIVERY



Key Concepts

COLLABORATIVE WORKFLOW & DESIGN MANAGEMENT

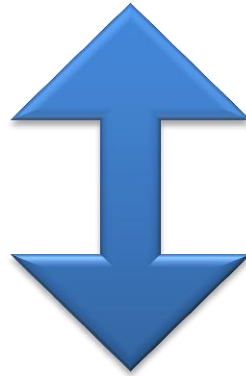
Design Management

CURRENT STATE

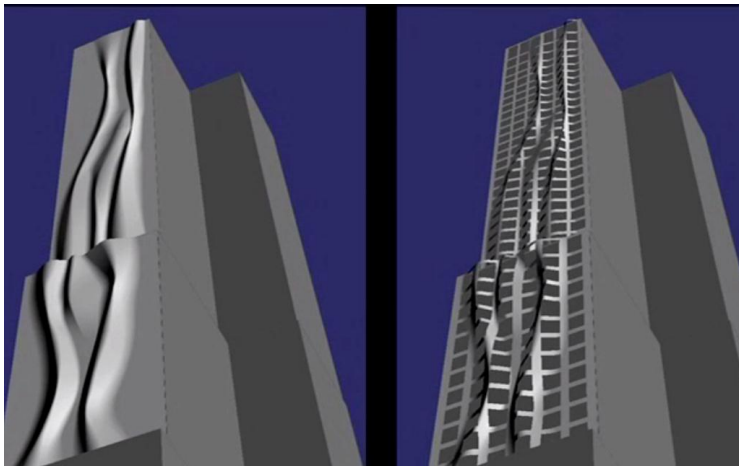
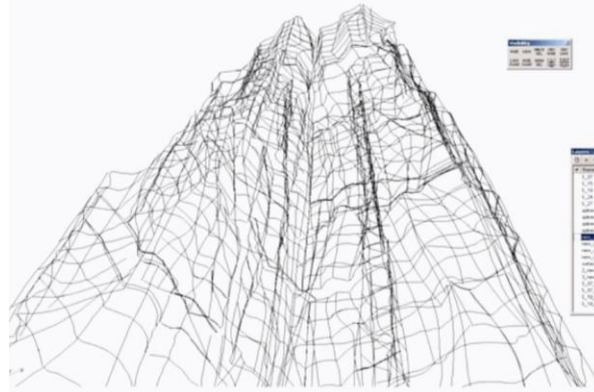
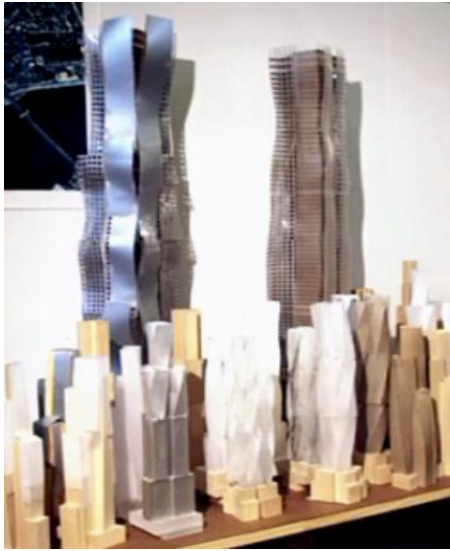
- Conventional Views – Design **cannot** be measured & understood
- Scope Budgets are a moving target
- Lack of design process transparency is expected
- Rework and back tracking are inevitable
- Direct participation in supply chain will be done later
- Undisciplined & non existent design management
- 3D Models used primarily for presentations
- Lack of Timely Owner Decisions

Continuum of Design Management

Design projects are unique & therefore
cannot be planned or managed



Design is understandable and
measurable...therefore can be managed



Translations from Model to Building

Michael Kilkelly, Gehry Partners

KA Connect podcast 5/30/11

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TAP Faster Forward 2011



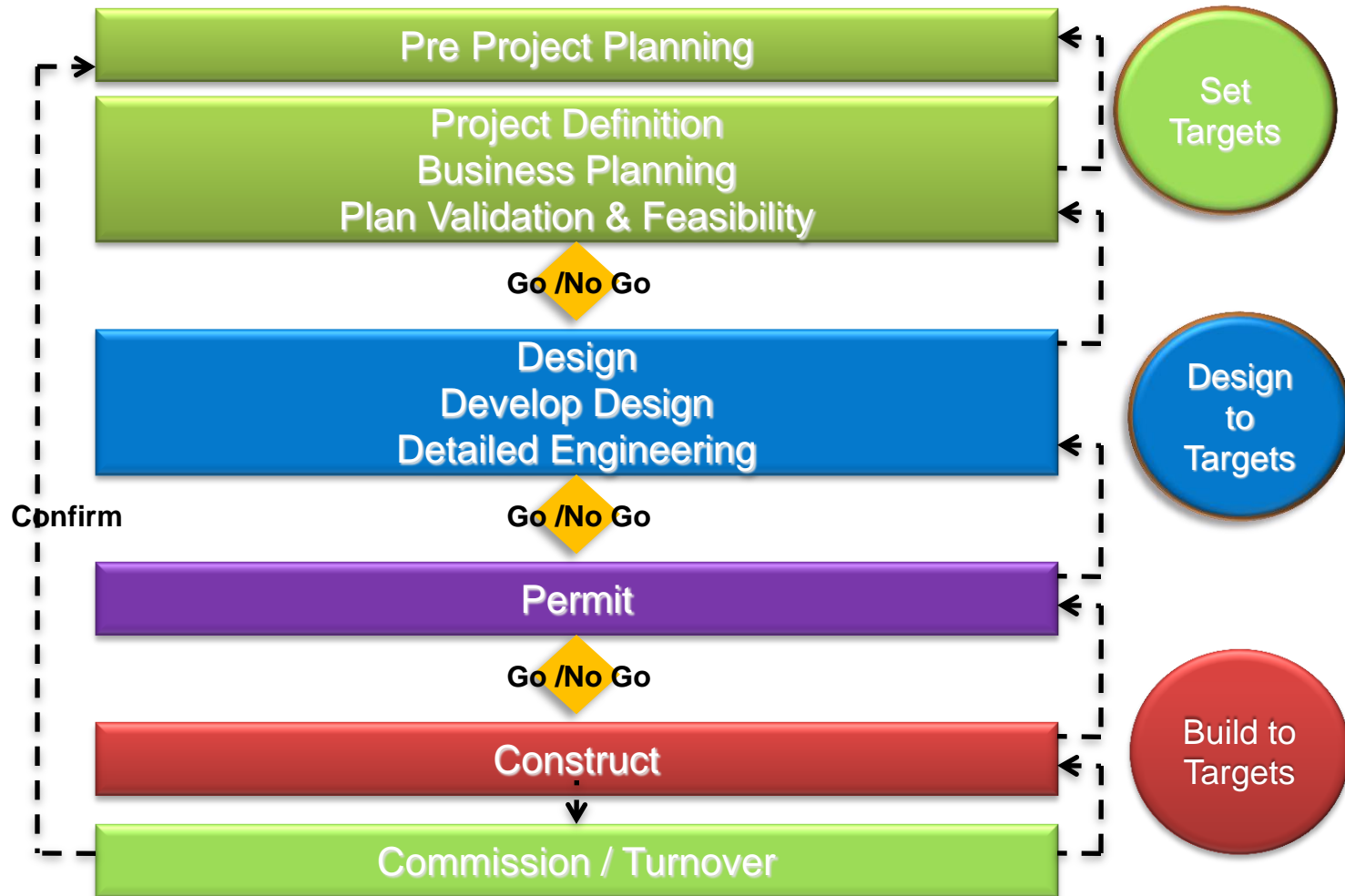
“Anything that does not add value is waste”

KEY CONCEPTS OF LEAN PROCESS IN DESIGN MANAGEMENT

The Objectives of a Collaborative OS

- ✓ **Work together** to define the issues and produce decisions then design to those decisions vs. Design alone and then come together for group reviews and decisions
- ✓ **Work in pairs or a larger group, face to face** vs. Work separately
- ✓ **Design based on a detailed estimate** vs. Estimate based on a detailed design.
- ✓ **Carry design sets far into the design process** vs. Narrow choices to proceed with one design
- ✓ **Design for what is constructible** vs. Evaluate the constructability of a design after it is designed

Lean Project Work Flow



"Target Costing" Lean Construction Institute

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Establish “Client First” Spirit

Hold kickoff & alignment workshops

The Owner, Architect, Builder work as a team to solve the Client’s Problem

Define Perceived Risks and Constraints

Launch meeting schedule

Establish the BIG room and Co-located teams

“Design is principally a social activity.”

--Gregory Howell – Lean Construction Institute



Align Interests & Establish Trust

Expected Outcomes:

1. Agreement by the companies and individuals present concerning their collective appetite for delivering the project under an integrated agreement and using Lean project delivery principles.
2. Agreement on the path forward for developing the team's capabilities to deliver the project on a Lean, integrated basis and for negotiating an operating agreement to govern the team.



Set Goals & Objectives



Team Building



DISCOVERY WORKSHOP – WELLINGTON MUNICIPAL CENTER, SKY TRAIN PHOENIX

WORK TOGETHER FACE TO FACE

Eat Together & Give Prizes



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Last Planner

- People doing the work are best qualified to schedule their Work
- Design and construction projects are a network of commitments.
- Teams must collaborate and make reliable promises to complete the project

Make Team Communication Visual



Target Value Design - TVD

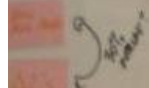


1. Set Target Cost – Typically lower than the budget that assumed current best practice
2. Form Target Value Design Teams by system and allocate the target cost to each team
3. Provide cost and performance standards for the Core Building Elements

Target Value Design - TVD



- ① Entitlements & Permit
- ② Site / Civil / Foundations
- ③ Structure
- ④ Enclosure
- ⑤ MEP Fire Low Voltage
- ⑥ Interiors
- ⑦ Amenities



SET BASED DESIGN

Use a “Set” based Design approach, evaluating Design ALTERNATIVES against target values

1. Embrace & Engage the Supply Chain
2. Design Build 3D prototypes of Concepts
3. Evaluate Sets including Target Budgets
4. Production Team must use & Understand BIM
5. Use A3 Documentation to generate Sets
6. Frequent Review of Sets with key production team members

CARRY DESIGN SETS AS FAR AS POSSIBLE

Set Based Design

Stanford Green Dorm

Building System Matrix

Building System Matrix

		CO ² Impact			Life Cycle Costs											
		Embodied Energy	Mass	Insulation	First Costs	Construction Speed	EQ Losses	Maintenance / Durability	Research Value	Thermal Comfort	Deconstructability	Flexibility	Total (Weighted)	Life Cycle Costs	CO ² Impact	
Dorms / Common Lab Space	weight (1-5)	3	1	1	5	1	3	2	4	2	1	1				
1. Wood Bearing Wall ^{1,2,3,4}		5	2	3	5	3	1	3	1	3	3	2	69	34	20	
2. Steel Frame / Mtl Deck/Concrete Topping ^{7,8,9}		2	4	3	3	5	4	5	4	4	4	5	83	37	13	
3. Wood Post and Beam ^{1,3,4,9}		5	2	3	3	3	2	3	1	3	4	4	65	27	20	
4. Metal Stud Bearing Wall ^{3,4,10}		2	2	3	4	3	2	5	1	3	1	2	58	34	11	
5. Concrete Slab and Walls ^{3,4,10}		1	5	3	1	2	4	5	4	5	1	4	66	24	11	
6. CMU Bearing Wall/Wood Floor ^{1,2,3,10,11}		3	4	3	3	1	2	4	2	2	2	2	58	26	16	
7. Straw-Bale / Wood Frame ^{1,2,3,4,13}		4	4	5	3	3	1	3	2	5	3	1	67	24	21	

Notes

1. FSC Certified Wood

2. Resource Efficient Framing

3. Plywood Shearwalls

4. 1.5" Concrete or Gypcrete Topping

5. Steel Under Discontinuous Walls

6. Low Cement Concrete (70% Slog, 30% Cement)

7. Rocking & Restoring Systems w. Replaceable Fuses (FT Cable, Steel Fuses, ECC Fuses)

8. Moment Frames w. Dampers

9. Structural Insulated Panel (SIP) Skins

10. Plywood Floor Diaphragm

11. Rigid Insulation (3") on Exterior Walls

12. Rocking and Restoring Systems w. PT Cable Reinforcement

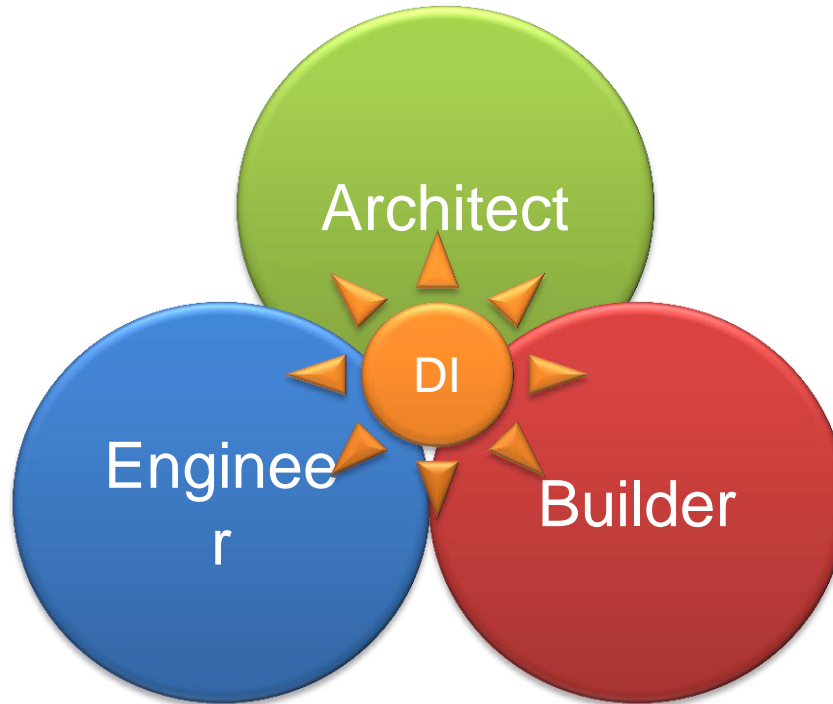
13. Lime Plaster Skins

Architect: EHDD
Contractor: Pankow
Mechanical Engineer: Taylor

TIPPING | MAR



Who “Drives” Design Management?



Design Integrator

Design Integrator is a person whose primary task is to focus on facilitating the Design Management work flow based both on social coordination and technical integration.

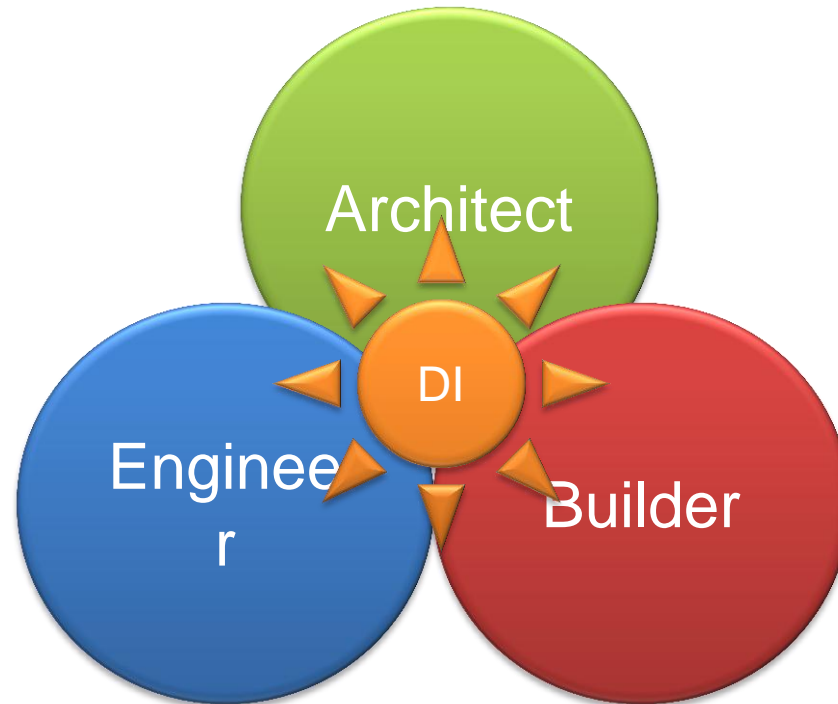
Characteristics of a Good Design Manager

- Empathy with and enthusiasm for the project goals and objectives
- Have a natural ability to direct creative professionals (both designers and builders) toward the project's objectives.
- Ability to make difficult choices – often at odds with some stakeholders
- Integrity, ethics, and a reputation for fair dealing
- Disciplined in maintaining project flow
- Level temperament and patience in working with others
- Willingness to give credit to co-workers when due
- Familiarity with project delivery methods
- Training and broad understanding in both design and construction
- Ability to gain & maintain respect of the Project Team



<http://www.dbiabooks.com/shopexd.asp?id=8395>

Design Manager or Design Integrator



“Responsibility without Authority”

Leveraging Lean Project Planning in Design Management

- *Define Design Work Flow* – Identify Risks
- *Manage the Design* – Use TVD to find the right solutions quickly – from months to days
- *Structure the Work* - Not the same old way
- *Manage the Supply Chain* – establish new strategic vendor relationships
- *Simulate Construction* – 3D,4D & 5D technology schedule, materials & methods
 - *Rapid Prototyping* – *What If's?*
 - *Really Collaborate* – Redefine Risk Reward

Lean Design Management

THE PATH FORWARD

Design Management

FUTURE STATE

- DESIGN TEAM UNDERSTANDS THAT DESIGN IS MANAGEABLE
- REWORK AND BACK TRACKING ARE INEVITABLE – BUILT INTO DESIGN SCHEDULE AND PROCESS
- A COLLABORATIVE ENVIRONMENT IS ESTABLISHED & SUPPORTS AN INTEGRATED AND TRANSPARENT DECISION-MAKING PROCESS
- SHARED OBLIGATIONS, RISKS AND REWARDS ARE AGREED UPON
- A “LEARNING ENVIRONMENT” FOR BEST PRACTICES IS IN PLACE
- VDC-BIM IS USED TO PLAN BY SIMULATIONS AND RAPID PROTOTYPING
- PROJECT IS DESIGNED TO BUDGET (TVD & CLUSTER ESTIMATES)
- EASILY UNDERSTOOD METRICS PLANNED PERCENT COMPLETE (PPC) USED TO TRACK DESIGN TEAMS PROGRESS AND PROJECT BUDGET
- PROJECT TEAMS PRACTICE CONTINUOUS IMPROVEMENT WITH PROCESS CHANGE AND TECHNOLOGICAL INNOVATION

LEAN Design

“Shared Obligations, Risks and Rewards”

- ✓ Mutual Respect & Trust
- ✓ Intensive Planning Early
- ✓ Shared Compensation
- ✓ Shared Risk & Reward
- ✓ Early Participation
- ✓ Co Located Design
- ✓ Not Design/Build!!



Adopting Innovative ways of Project Mgt ...

- Create a Learning Environment
- Devote Time and Resources
- Carefully Plan, Manage & Measure
- Invest in Training
- Use Social Media to Communicate
- Allow for Failure – “Failure is not the end of a conversation but the beginning of another one.”

Focus: Lean Transformation

<u>Goal</u>	<u>Possible metrics</u>
Become a learning organization	# of adopted improvements

Reflection on last 12 month's activities
--

Activity	Rating	Key results / Issues
Implement LPS on Beattitudes		
Implement LPS on Sagewood		
SAT with leadership group		

Start Portico Place project

Signatures

Goals	Activities
Become a learning organization	

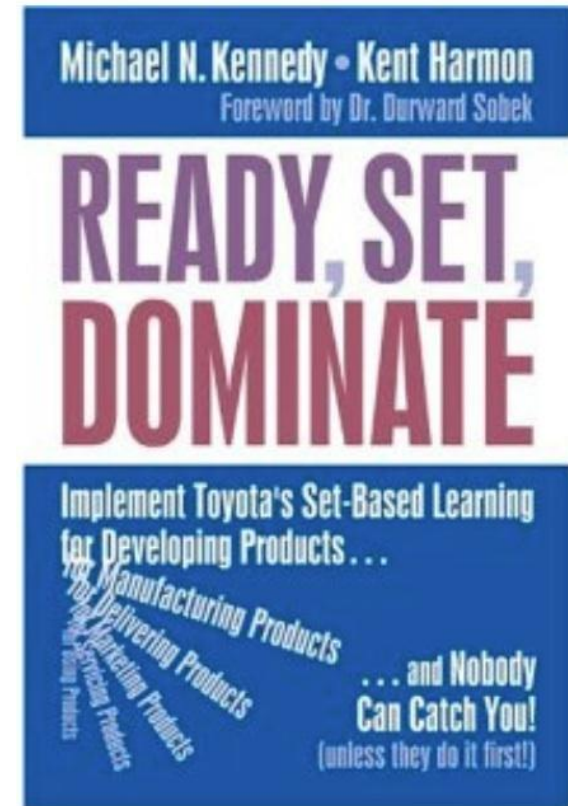
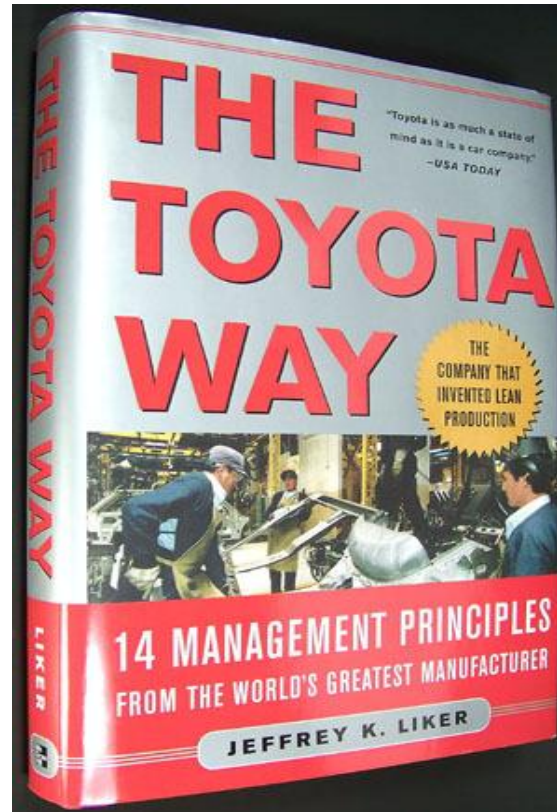
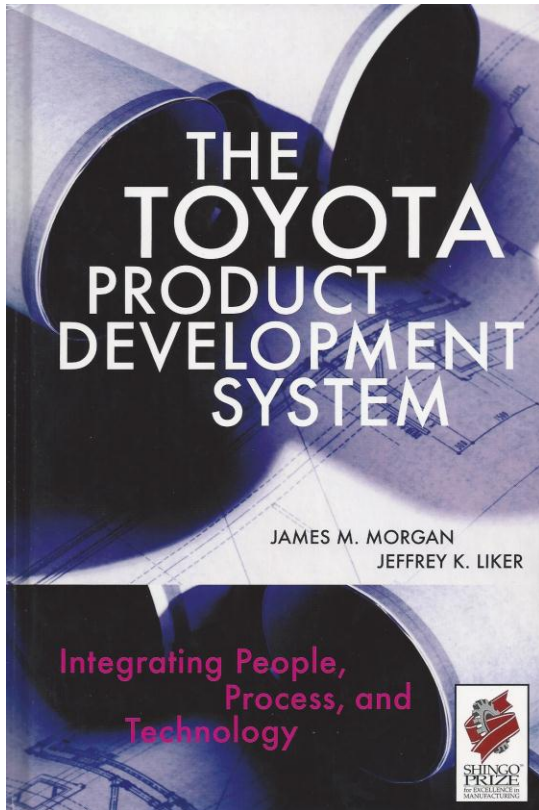
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Followup / Unresolved Issues

Author:
Version and Date:



Lean Resources & References



VDC-BIM Resources & References



2011 BIM Guidelines, Templates & Contracts

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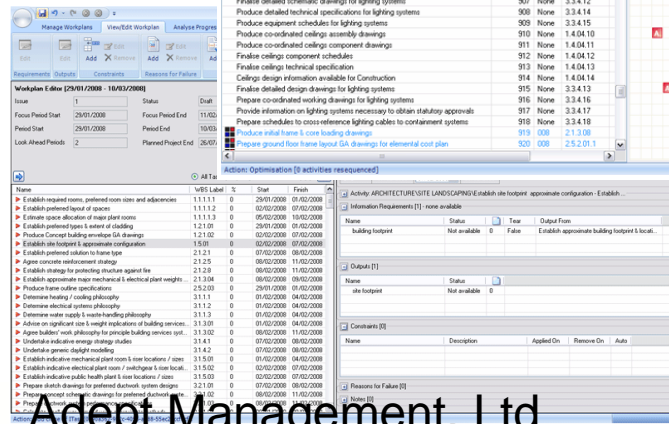
Design Mgt. Resources & References

The ADePT Design software suite lets you plan and control complex, iterative, and information driven project processes.

ADePT
design
software suite



Figure 1: Adept Management's Design Management Framework™



KA Connect 2011 Podcast
Romano Nickerson,
Boulder Associates
“Learning How to be Lean”

Adept Management, Ltd

ADePT Design Manager helps teams to monitor the completion of design tasks and

CLOSE X

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Lean Construction Institute

Building Knowledge in Design and Construction

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Lean Design Forum



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Thoughts to change by

“Don’t let great be the enemy of good.”

“Keep everything simple, make it visible, trust your people to do the the right thing.”

To accomplish great things we must not only act, but also dream; not only plan, but also believe.

“Design Management – A Lean Approach”



Good design
makes a difference™



“Design Management – A Lean Approach”

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