



# Designing & Building for Value and Flexibility in a Technology-Enabled World



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May 2, 2014



# Technology Challenges Creating Value



- Design
- Field Operations
- Operational Applications





# Value



Understand VALUE from the Owner's Perspective

Take Only Those Actions Which Deliver VALUE  
(and which eliminate waste)

Co create *Conditions of Satisfaction* with Project  
Team and Owner

Everyday ask yourself—What value did I bring?





# Create Value for The Customer



- Create a Culture of Continuous Learning
- Develop Technical and Leadership Skill Sets of Their Team
- Leverage Diversity of Team Strengths, Skills and Abilities
- Distribute Leadership
- Utilize the Conditions of Satisfaction in Value Based Decisions
- Listening, Inquiry, Collaboration Versus Silo-ed Approach
- Challenge Team Members for the Good of The Project—Charettes and “Grand Rounds”
- Shared Problem Solving vs. Discipline Specific
- Ignite Passion, Inventiveness, Ongoing Improvement



# Fluid Technology Operational Applications



- Ever evolving while project is developing
- Understand decision points/effects
- Condition of Satisfaction of the Team
- Across the board challenge all industries



# Design Process Tearing Down Silos...





# Collaboration



Not so collaborative ☹️

Collaborative 😊





# Collaborative Risk Management



Identify  
Mitigate  
Track  
Share







# Collaboration in Action





# Probing Questions



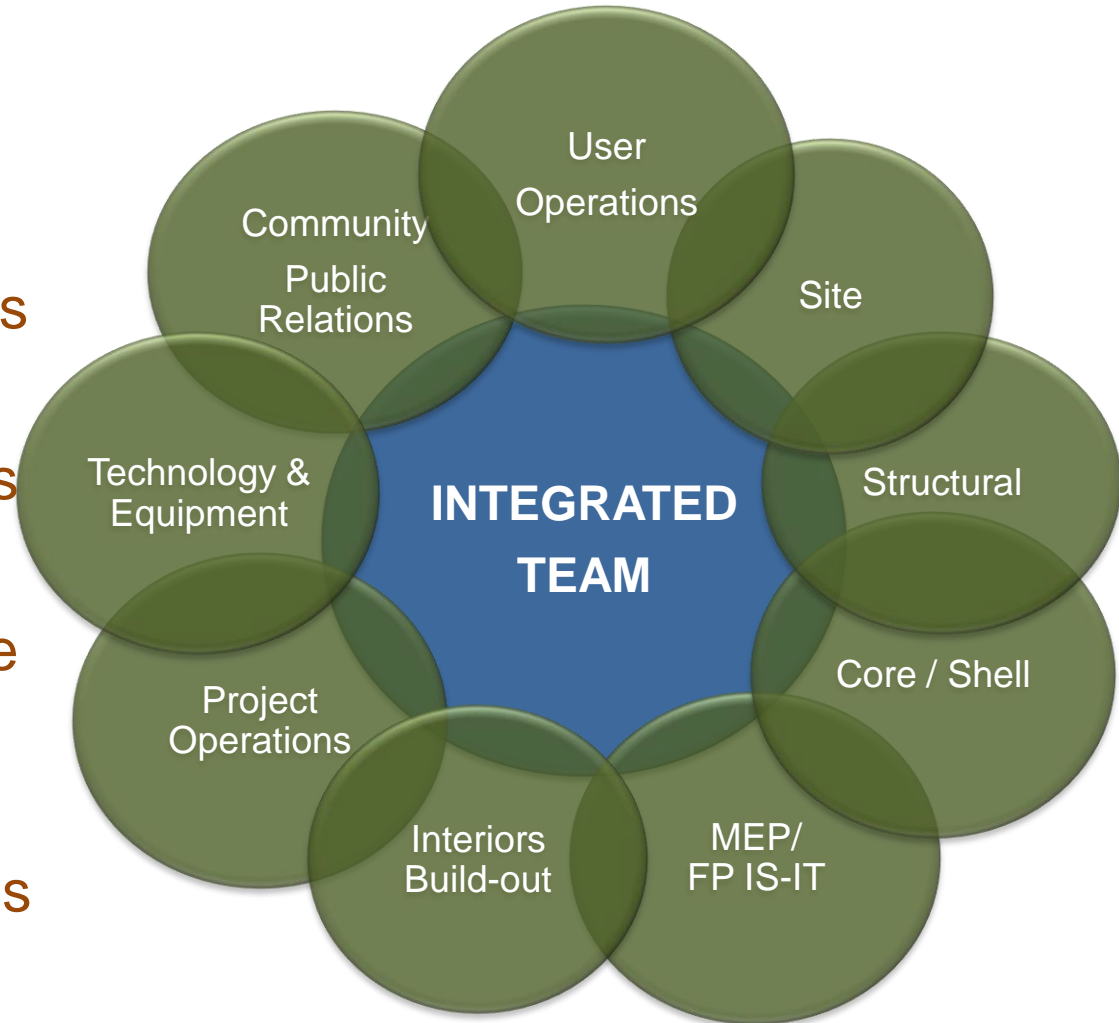
- WHY?
- WHY?
- WHY?
- WHY?
- WHY?
- What did we learn today?
- What should we continue?
- What can we do differently?



# Organization Cluster Formation

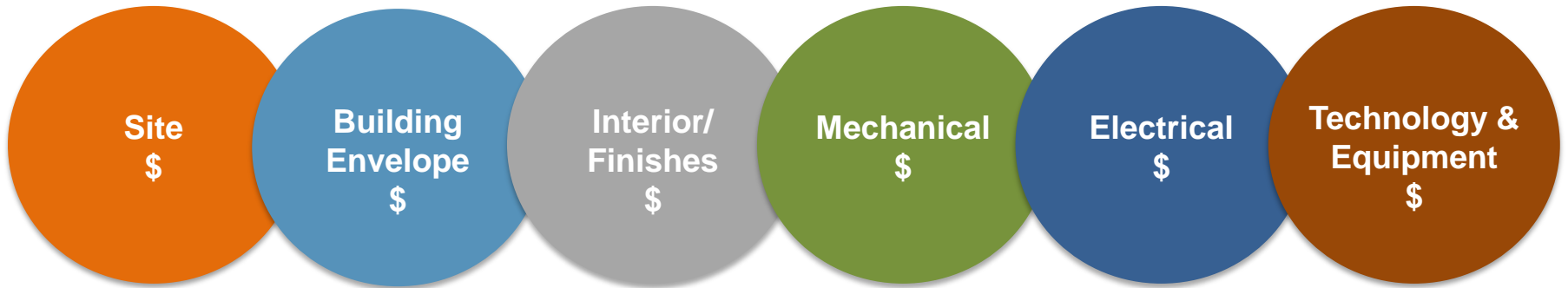


- Shared knowledge of design and construction issues
- Better informed drawings earlier
- More accurate estimates earlier
- More stakeholders in the design
- Understanding of the value of design decisions





# Component-Based Design



**Leader:**  
Civil Engineer

**Team:**  
Project Designer  
Project Architects  
Mechanical Engineer  
Electrical Engineer  
Construction Mgr.

**Leader:**  
Project Designer

**Team:**  
Project Architect  
Structural Engineer  
Mechanical Engineer  
Construction Mgr.

**Leader:**  
Project Designer

**Team:**  
Project Architect  
Architects  
Medical Planners  
Interior Designers  
Mechanical Engineer  
Electrical Engineer  
Construction Mgr.

**Leader:**  
Senior Engineer

**Team:**  
Mechanical Engineer  
Electrical Engineer  
Project Architect  
Structural Engineer  
Services Tech. Group  
Construction Mgr.

**Leader:**  
Senior Engineer

**Team:**  
Electrical Engineer  
Mechanical Engineer  
Project Architect  
Project Designer  
Interior Designer  
Services Tech. Group  
Construction Mgr.

**Leader:**  
Senior Engineer

**Team:**  
Electrical Engineer  
Mechanical Engineer  
Project Architect  
Interior Designer  
Services Tech. Group  
Special Equip Group  
Construction Mgr.

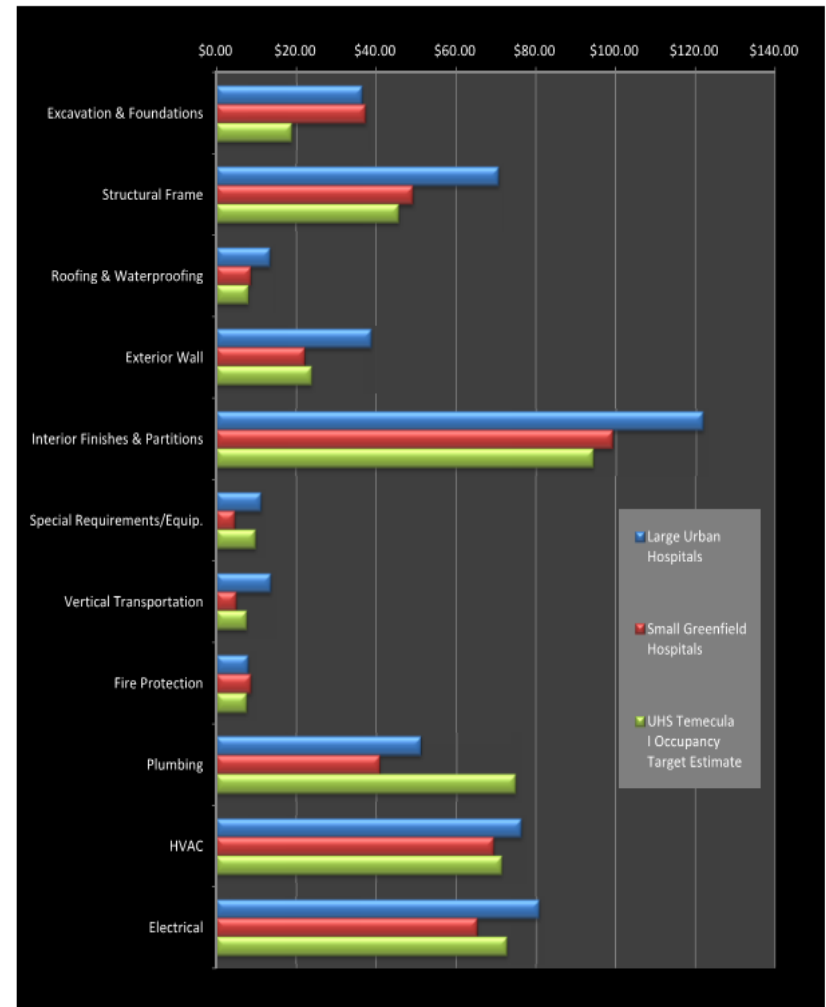




# Target-Value Design



- Budget established initially
- Clear schedule of values
- Use cost databases and benchmark projects to initiate
- Establish owner's expectations well ahead of the completion of the design
- On-going cost modeling
- This limits the need for cost cutting in later stages of development

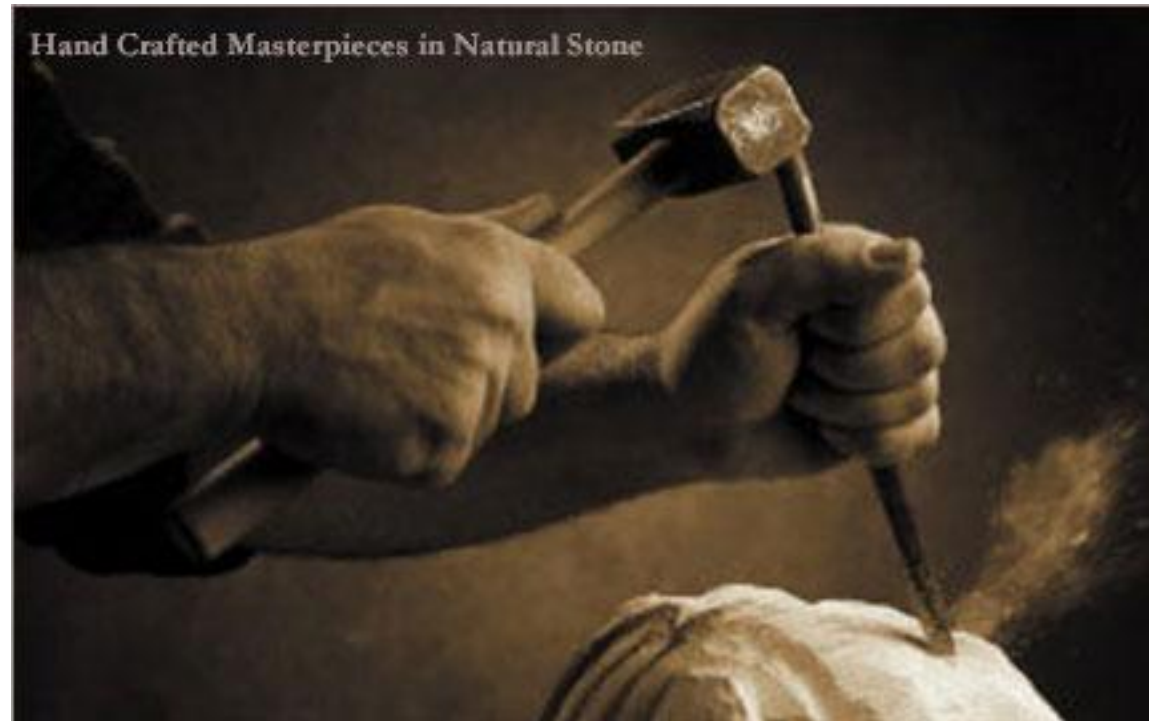




# Small Batch Approach to Design



- Design does not happen in a linear process
- Design should not be iterative
- Design Emerges





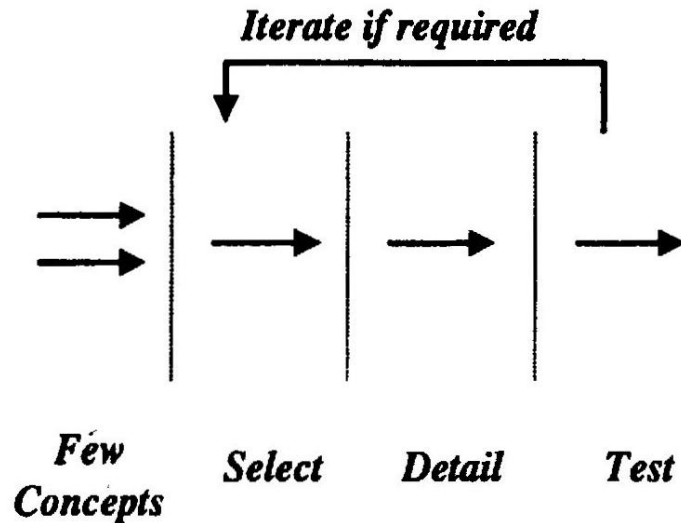
# Set-Based Design

## Last Responsible Moment

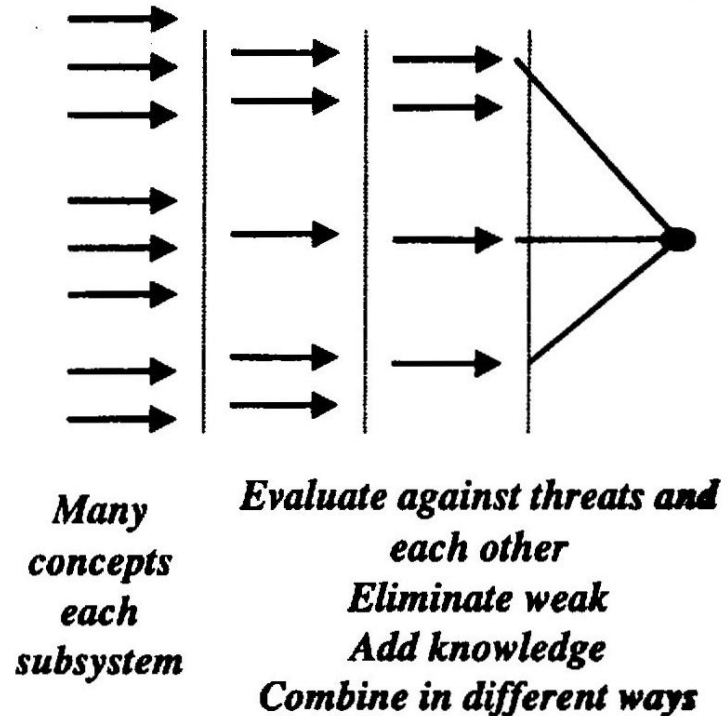


A simple, repetitive development cycle that achieves high innovation in products and manufacturing systems without risk through redundancy, robustness, and knowledge capture.

### Point-based Concurrent Engineering



### Set-based Concurrent Engineering





# Set-Based Solutions from CPR Program



Create

Analyze

Converge

Decide





# Choosing by Advantages



THE OAKS - CBA

	Alternative 1 M & OP bld 100 % new	Alternative 2 M w/ Reno in 2 bldgs	Alternative 5 enlarge M	Alternative 6 Orig. M + 4 Reno	Alternative 7 1story and split floors	Alternative 8 stepped slab M	Alternative 14 100% new Her. Tree Free
<b>Factor:</b>	Building Pad						
Criteria:	less tons is better						
Attribute:	40,771	35,545	43,645	33,963	30,499	33,967	16,302
Advantage:	(2,874)	(8,100)	0	(9,682)	(13,146)	(9,678)	(27,343)
<b>Factor:</b>	Cuts & Fills						
Criteria:	less cost is better						
Attribute:	628,731	536,737	663,224	517,758	505,468	547,086	429,930
Advantage:	-34,493	-126,487	0	-145,466	-157,756	-116,111	-131,254
<b>Factor:</b>	Regular Caliper Trees						
Criteria:	smaller inches is better						
Attribute:	1,497	1,275	1,354	1,189	1,497		707
Advantage:		-222	-143	-308	0		-790
<b>Factor:</b>	Ext. Wall Perimeter						
Criteria:	less linear ft is better						
Attribute:	2,023	2,322	2,322	1,961	2,503		2,219
Advantage:	-695	20	20	-757	-215		-499
<b>Factor:</b>	Structural Concrete						
Criteria:	min/mod/max - min is best						
Attribute:	570	600	600	755	570		380
Advantage:	-185	-155	-155	-20	-185		-175
<b>Factor:</b>	Site Concrete						
Criteria:	min/mod/max - min is best						
Attribute:	156,939	71,136	71,136	177,840			36
Advantage:	-20,901	-106,704	-106,704	0			-166
<b>Factor:</b>	Paving						
Criteria:	less linear ft is better						
Attribute:	2,970	2,930	2,590	2,930			14,000
Advantage:	0	-40	-380	-40			-3,500
<b>Factor:</b>	Speed of Concrete						
Criteria:	faster is better						
Attribute:	14	14	14	14	13	14	12
Advantage:	0	0	0	0	-1	0	-2
<b>Factor:</b>	MEP Systems						
Criteria:	no renovation is better						
Attribute:	none	none	none	35,568	none	none	none
Advantage:	none	none	none	60	none	none	60
<b>Factor:</b>	Exterior Material Options						
Criteria:	no restriction of material selection is better						
Attribute:	yes	yes	yes	yes	no	no	no
Advantage:	40	40	40	40	40	40	40
<b>Factor:</b>	Kitchen Distance From Building Entrance						
Criteria:	less footage distance and inside is better						
Attribute:	300	300	300	300	0	0	0
Advantage:	50	50	50	50	50	50	50
<b>Factor:</b>	Fertile Transitions						
Criteria:	no elevator is better						
Attribute:	no	no	no	no	yes	no	no
Advantage:	100	100	100	100	50	100	100
<b>Factor:</b>	Construction Type						
Criteria:	2B (less than 55000 sf) is better						
Attribute:	IIA	IIB	IIB	IIB	IIB	IIB	IIB
Advantage:	50	50	50	50	50	50	50
<b>Factor:</b>	SCORE						
Attribute:	375	346	304	271	440	490	800
Advantage:					3	2	1
<b>Factor:</b>	RANKING						
Attribute:							

Factors  
Building Pad Size  
Ext. Wall Perimeter

Alternatives  
M Configuration  
Enlarge M

Criteria  
Less Tons is Better  
Less LF Perimeter is better



# Pull-Planning Design





# Last Responsible Moment Pull-Planning



Design Phase

Construction Phase



Last Responsible  
Moment for Decision

Last Responsible  
Moment for Change





# Technology Enablers



- Design
- Field Operations
- Operational Applications







# Design



- Simulation Modeling
- BIM/Revit
- Leverage Technology in the Big Room



- Smart Boards, Wireless Internet Connectivity, Blue Beam



# Field Operations



- Onsite kiosks—  
Computers and Printers
- Laser Scanning—3D Printing
- Robotics
- iPads and Wearable Devices
- Software for Pull Planning
- Real-Time Productivity  
Monitoring





# Technology

## Operational Applications Healthcare



- Consumer-Based Interfaces at Home
- System-wide Data Centers
- Robotics
- Connectivity Between OR Suites, Diagnostic Modalities, EHR, Provider Communication Devices
- Wearable Monitoring Devices



# Technology Infrastructure Lessons Learned



- The future will not be “Hospital Centric” the Healthcare System is a “kit of parts” that must function in unison
- Inventory Legacy Systems
- Infrastructure Needs to Support Interfaces both Local and Proprietary
- IT/IS Needs to be Part of the Project Team, as well as the Owner/End User of the Application





# Internal Evolution Lessons Learned



- Technical skills are a given, ability to collaborate and integrate is a must
- No longer a “captain of the ship” approach; embracing diversity and leveraging each team member’s skills and abilities...Distributed Leadership
- Innovation for the good of the whole
- TRUST and Respect are key
- Transparency and candid conversations develop—they are not natural and need to be encouraged
- Process in place to vote someone of the island
- Owner involvement is a critical success factor



## More Lessons Learned



- Choose by Advantages not Relationship
- Onboard all Partners
- Be Transparent with the Budgets and Monitoring of Productivity
- Decisions Need to be Based on **Value** not Cost (“this and that”)
- Never Underestimate Field Staff and End Users
- Expect/Require Cultural Change



# Shared Lessons Learned ...Questions?



Thank you!

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