Understanding Target Cost Delivery

InsideOut Consulting
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Operating System: Principles + Tools

- Transparency
- Collaborative Planning
- Collaborative Communication
- Collaborative Innovation

Principles Lean Thinking Behaviors
Collaborative Innovation

- BIM
- Creative Tension
- Collaborative Design Conversation
- Choosing By Advantages
- Pre-Fabrication
- Set-based Solutions
- PDCA

Target Cost Estimate

Advantages
A management approach that drives design to deliver to defined customer values within project constraints.
Guideline 1

Develop clear Conditions of Satisfaction (CoS) – what is of value to the client
Economics of Trust
From “The Speed of Trust”
Traditional Risk Management

Used with permission from Will Lichtig, Boldt Construction
Open-Face Risk Management
Profit Pool / Combined Contingency

- Architect
- Glazing
- Engineering
- Drywall
- Electrical
- Mechanical
- Civil
- Ext. Structure
- CM
- Direct Cost
- Profit / Overhead
- Contingency

Inside Out Consulting Inc.
Sharing of Savings

Owner %

Validated Expected Cost

Design/Production Contingency

Savings $$

Actual Cost

Incentive Pool %

Metrics
Project Phases

Set Target Cost

Design to Target

Build to Target

Project Definition
Business Case (deliver X for Y)

Validation

Design Development/Documentation

Construction/Production

Commission/Turnover

Owner's Project Budget

Design Budget

Construction Budget

On-going Cost Model

On-going Cost Model

Set Target Cost

Design to Target

Build to Target

Project Definition
Business Case (deliver X for Y)

Validation

Design Development/Documentation

Construction/Production

Commission/Turnover
CONSENSUSDOCS 300
STANDARD FORM OF TRI-PARTY AGREEMENT FOR
COLLABORATIVE PROJECT DELIVERY

ARTICLE 8
CONSTRUCTION BUDGET AND COST MODELING AND CONSTRUCTION
CONTROL ESTIMATE
Guideline 2

- Develop a detailed estimate and design to it – any cost over run is a team wide problem
  - Estimate real-time through-out the design to keep the design on “target”
  - Embed estimation with all components/clusters - estimators become part of the design team
  - Traditional – estimate after the fact and value engineer
Target Cost Components

Component Leaders

- Mechanical
- Structure
- Site
- Landscape
- Technology
- Electrical
- Interior / Finishes
- Building Envelope
Component-Based Design

- **Site**
  - Leader: Civil Engineer
  - Team: Project Designer, Project Architects, Mechanical Engineer, Electrical Engineer, Construction Mgr.

- **Building Envelope**
  - Leader: Project Designer
  - Team: Project Architect, Structural Engineer, Mechanical Engineer, Construction Mgr.

- **Interior/Finishes**
  - Leader: Project Designer

- **Mechanical**
  - Leader: Senior Engineer
  - Team: Mechanical Engineer, Electrical Engineer, Project Architect, Structural Engineer, Services Tech. Group, Construction Mgr.

- **Electrical**
  - Leader: Senior Engineer

- **Technology**
  - Leader: Senior Engineer
Design/Budget/Schedule/Constructor

Each cluster should integrate estimating, schedule, and constructor with design.

Integrated Team
Overall Budget/Macro Schedule

CLUSTER
Design/Estimate/Schedule/Constructor

CLUSTER
Design/Estimate/Schedule/Constructor

CLUSTER
Design/Estimate/Schedule/Constructor

CLUSTER
Design/Estimate/Schedule/Constructor

Leads to break-downs/miscommunication
Target – Based Cost Modeling

- Thermal Comfort: 28% ($3,682,532)
- Interior: 20% ($2,224,886)
- Envelope: 16% ($1,719,343)
- Structure: 13% ($1,472,704)
- Site: 11% ($1,082,510)
- Power: 8% ($533,176)
- Tech.: 4% ($269,605)

Total: $13,290,000
<table>
<thead>
<tr>
<th>Cost Summary</th>
<th>Large Urban Hospitals</th>
<th>Small Greenfield Hospitals</th>
<th>I Occupancy Target Estimate</th>
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<tbody>
<tr>
<td></td>
<td>$177,637 gsf</td>
<td>$177,637 gsf</td>
<td>$177,637 gsf</td>
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<tr>
<td><strong>Total Cost</strong></td>
<td>$120,844,450</td>
<td>$89,153,987</td>
<td>$92,975,951</td>
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<tr>
<td>Demolition &amp; Patching</td>
<td>$2,883,058</td>
<td>$2,819,091</td>
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<td>Excavation &amp; Foundations</td>
<td>$8,421,550</td>
<td>$6,562,845</td>
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<tr>
<td>Structural Frame</td>
<td>$12,533,960</td>
<td>$8,732,233</td>
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<tr>
<td>Roofing &amp; Waterproofing</td>
<td>$2,323,624</td>
<td>$1,494,016</td>
<td>$1,369,895</td>
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<tr>
<td>Exterior Wall</td>
<td>$6,893,996</td>
<td>$3,901,268</td>
<td>$4,208,606</td>
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<tr>
<td>Interior Finishes &amp; Partitions</td>
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<td>$17,594,759</td>
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<tr>
<td>Special Requirements/Equip.</td>
<td>$1,924,435</td>
<td>$792,060</td>
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<td>Vertical Transportation</td>
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<td>Fire Protection</td>
<td>$1,354,778</td>
<td>$1,478,361</td>
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<tr>
<td>Plumbing</td>
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<td>HVAC</td>
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<td>Electrical</td>
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<td>$11,579,199</td>
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<tr>
<td><strong>Subtotal Building</strong></td>
<td>$95,223,555</td>
<td>$72,834,787</td>
<td>$76,875,340</td>
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<tr>
<td>Sitework</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
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<tr>
<td>Tenant Finishes</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
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<tr>
<td><strong>Subtotal</strong></td>
<td>$95,223,555</td>
<td>$72,834,787</td>
<td>$76,875,340</td>
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<tr>
<td>P&amp;P Bond</td>
<td>$1,122,633</td>
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<td>Construction Contingency</td>
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<td>$1,543,233</td>
<td>$3,670,067</td>
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<td>General Conditions</td>
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<td>General Requirements</td>
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<td>Insurance</td>
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<td>Subguard</td>
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<tr>
<td>Fee</td>
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<td><strong>Combined Markups</strong></td>
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<td>$18,100,611</td>
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<tr>
<td><strong>Unit Costs</strong></td>
<td>$18.29</td>
<td>$1.58</td>
<td>$0.00</td>
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</table>
Transparency

- Root Cause 5-Why
- Knowledge Sharing
- Make Visible
- Open Sharing
- Continuous Improvement
- Go & See (Gemba)
- Reflection/PDCA

Big Room
Guideline 3

- Spend time together – work in with a “big room” concept

  - Set detailed agendas about the day(s) together – set expected outcomes/required participants

  - Traditional – work in isolation and throw work over the wall
Guideline 4

- Constantly plan together – how are you going to meet the schedule
  
  - Pull plan weekly in the big room – re-plan constantly
  
  - Traditional – Schedules are done in isolation and are not a “plan” (but a hope and a prayer)
Guideline 5

- Design in conversation prior to drawing

- Determine the issues from multiple perspectives and form decision together – design to the decisions

- Traditional - is to design then discuss and revise
Collaborative Design Conversation
Guideline 6

- Collaborate with the Constructors for constructability of the design

  - Include constructors in the conversations and development of the design at a detailed level – constructors are designers

  - Traditional - is to “review, comment and revise”
Guideline 7

- Design in “sets of solutions” and hold off converging on a solution until right time
  - Gain input from all stakeholder perspectives – use A3 process to gain alignment and document
  - Make decisions based on optimizing the whole
  - Traditional - is to make decisions from narrow perspectives and revise – value engineer
Set-based Design is

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

- Iterate if required
- Few Concepts
- Select
- Detail
- Test

Set-based Concurrent Engineering

- Many concepts each subsystem
- Evaluate against threats and each other
- Eliminate weak
- Add knowledge
- Combine in different ways

(Figure 5b)
Create
### Section 1 - Background

The UHS Tecumseh Team Planning Cluster is tasked with identifying the Universal Care Unit treatment room. Room configuration and size influence the overall layout and efficiency of the UCU located on the first floor.

**Design constraints common to all sets:**
- Wall thickness: 5" nominal shown (sound control TBD)
- Entry: 3 panel sliding door with 3" opening and break away swing option for 7" opening. Privacy curtain at door.
- Headwall (assembly TBD) to include: nurse call, compressed air, oxygen, vacuum, normal power, emergency power, and data outlets
- Patient lift TBD
- Dialysis Option TBD

**Equipment/Furniture to be included in room:**
- Patient bed with over-bed table
- Guest chair
- Wall mounted television
- Wall mounted computer monitor for charting
- IV staged hand wash sink (C/D 224.14.1.6)
- Soiled linen hamper, waste can, Bio-Hazard waste can
- Sharps disposal, gloves dispenser

### Section 2 - Problem Statement/Current State

**Conditions of satisfaction:**
1. Clearance around patient bed (3'-0" min clearance)
2. Clinical work zone - located on the door side of patient bed and at foot of patient bed
3. Handwash sink location - back to back with adjacent room is beneficial
4. Wall mount v. countertop sink
5. Assess to and sequence of using PPE and waste receptacles, closer is better
6. Adequate supply storage and work counter space
7. Family zone
8. Side chair next to bed
9. Patient Transfer
10. Adequate working clearances to transfer patient from gurney to bed in room
11. Orientation of bed to door (parallel or perpendicular)
12. Equipment to be relocated during transfer
13. Headwall
14. Back to back with adjacent room is beneficial
15. Room area
16. Total area impacts size and efficiency of overall universal care unit
17. Narrow width decreases travel distance along corridor

### Section 3 - Future State/Goal

Decide on typical UCU Treatment Room design to incorporate first floor plan.
Section 1 – Background
The USF Termocub Team Core/Shell Cluster is tasked with detailing the exterior wall fenestration as cost effectively as possible.

Section 2 – Problem Statement/Current State
The current design places the windows flush to the exterior face of the walls. It was assumed that this would be the most cost effective approach. However, this leads to the need for interior sill adapters and finished returns at the jambs & heads.

There appear to be three different approaches to this detail as illustrated in Section 4.

Section 3 – Future State/Goal
Determine the most cost effective detail.

Section 4 – Analysis

| SET 1: WINDOW FLUSH TO OUTSIDE W/ DRYWALL RETURNS AT INTERIOR JAMB/HEAD |
|-----------------|-----------------|-----------------|
| WINDOW COST     | Mullion adapters at interior sills only | Mullion adapters at interior jamb/heads/sills | No mullion adapters |
| DRYWALL COST    | Drywall on interior jambs and head | No interior drywall returns | No interior drywall returns |
| FLASHING COST   | Shallower flashing around rough opening | Shallower flashing around rough opening | Deeper flashing around rough opening |

| SET 2: WINDOW FLUSH TO OUTSIDE W/ MULLION ADAPTER RETURNS AT INTERIOR JAMB/HEAD |
|-----------------|-----------------|-----------------|
| WINDOW COST     | Mullion adapters at interior sills only | Mullion adapters at interior jamb/heads/sills | No mullion adapters |
| DRYWALL COST    | Drywall on interior jambs and head | No interior drywall returns | No interior drywall returns |
| FLASHING COST   | Shallower flashing around rough opening | Shallower flashing around rough opening | Deeper flashing around rough opening |

| SET 3: WINDOW FLUSH TO INSIDE |
|-----------------|-----------------|-----------------|
| WINDOW COST     | Mullion adapters at interior sills only | Mullion adapters at interior jamb/heads/sills | No mullion adapters |
| DRYWALL COST    | Drywall on interior jambs and head | No interior drywall returns | No interior drywall returns |
| FLASHING COST   | Shallower flashing around rough opening | Shallower flashing around rough opening | Deeper flashing around rough opening |

Section 5 – Proposal

Section 6 – Follow up
Guideline 8

- Set “no-compromise” goals – creative tension
  - The 3-legged stool
  - Traditional – one leg must be compromised
### Creative Tension

#### The Toyota Way

<table>
<thead>
<tr>
<th>Requirement</th>
<th>YET</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Great high-speed handling/stability</td>
<td>YET</td>
<td>A pleasant ride</td>
</tr>
<tr>
<td>Fast and smooth ride</td>
<td>YET</td>
<td>Low fuel consumption</td>
</tr>
<tr>
<td>Super quiet</td>
<td>YET</td>
<td>Light weight</td>
</tr>
<tr>
<td>Elegant styling</td>
<td>YET</td>
<td>Great aerodynamics</td>
</tr>
<tr>
<td>Warm</td>
<td>YET</td>
<td>Functional interior</td>
</tr>
<tr>
<td>Great stability at high speed</td>
<td>YET</td>
<td>Great $C_D$ value (low friction)</td>
</tr>
</tbody>
</table>

**Figure 5-4. “No-compromise” goals**
Creative Tension
CoS

| Maintain a construction budget of $25 million **YET** implement new features to improve employee efficiency and safety. |
| Provide infrastructure to allow growth of services &/or building **YET** minimize construction budget impact. |
| Design a facility that allows for a Phase II expansion **YET** minimizes construction impact on site, patients and staff. |
| Foster staff involvement to solicity, understand, receive and respond to any needs, real or perceived **YET** not grow the building or bust the target value. |
| Learn through an improving process and outcome **YET** reduce rework and wasted energy. |
Guideline 9

- Eliminate waste and innovate
  - Learn to “see” waste and become creative in eliminating
  - Drive cross-team innovative ideas – create a focus

- Traditional – waste, waste, waste and fear of innovation
Coordinated Design to Fabrication

3D Model

Field Installation
Pre-fab
The 40% Dividend (World-class Trust) from “The Speed of Trust”

- High collaboration & partnering
- Effortless communication
- Positive, transparent relationships
- Fully aligned systems & structures
- Strong innovation, engagement, confidence & loyalty