COAA Benchmarking Program
“Project Performance Predictability”

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CII Associate Director
Agenda (20 Minutes)

• How does COAA benchmark projects?
• Activity
• Performance predictability research
• 10-10 Program
• 2013 CII Performance Assessment Workshop
• Questions?
CII History

- CII is an Organized Research Unit (ORU) of the Cockrell School of Engineering at the University of Texas at Austin
- Founded in 1983 by 29 companies; now 135+ members
- Purpose is to MEASURABLY improve the delivery of capital facilities
- CII Benchmarking began in 1995; now 2,100 Projects (incl. COAA)
HOW DOES COAA / CII BENCHMARK CAPITAL PROJECTS?
COAA / CII Benchmarking Process

Three-step Process

1. Online Questionnaire
2. Benchmarking Database
3. Data Mining and Reporting Engine
COAA Project Key Reports

- General Performance
- Engineering Productivity
- Construction Productivity
COAA PAS – Data Miner

• World’s First
ACTIVITY
Arrange the following eight practices
(from highest cost savings to lowest cost savings):

- Front End Planning (FEP) / PDRI
- Working Relationship (Owner / Contractor)
- Contract Method (LS vs. C/R)
- Constructability
- Project Risk Assessment
- Change Management
- Zero Accident Techniques
- Planning for Startup
<table>
<thead>
<tr>
<th>Owners</th>
<th>Contractors</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Working Relationship (36.1%)</td>
<td>• Working Relationship (33.6%)</td>
</tr>
<tr>
<td>• Contract – LS vs. C/R (20.2%)</td>
<td>• Contract – LS vs. C/R (20.3%)</td>
</tr>
<tr>
<td>• Change Mgmt. (11.4%)</td>
<td>• Planning for S/U (10.8%)</td>
</tr>
<tr>
<td>• FEP / PDRI (10.5%)</td>
<td>• FEP / PDRI (6.6%)</td>
</tr>
<tr>
<td>• Planning for S/U (5.2%)</td>
<td>• Constructability (6.2%)</td>
</tr>
<tr>
<td>• Proj. Risk Assmt. (4.8%)</td>
<td>• Change Mgmt. (6.1%)</td>
</tr>
<tr>
<td>• Constructability (-0.6%)</td>
<td>• Proj. Risk Assmt. (6.0%)</td>
</tr>
<tr>
<td>• Zero Acc. Tech. (-2.6%)</td>
<td>• Zero Acc. Tech. (4.4%)</td>
</tr>
</tbody>
</table>
CII PERFORMANCE ASSESSMENT RESEARCH (PERFORMANCE PREDICTABILITY)
CII Owners’ Capital Efficiency  
(Ratio of Cash Flow (CFfOA) to Construction In Progress (CIP))

Early 1990s Recession: 3.68 (1999)  
Early 2000s Recession:  
Late 2000s Recession: 2.53 (2012)  
N=64
Correlation between Construction In Progress (CIP) and Cash Flow (CFfOA) for CII Owners

- 95.2% (1991) N=64
- 20.2% (2008)

$R^2 = 0.88$
CII Owners’ Weighted Average Cost of Capital (WACC)

\[ R^2 = 0.7079 \]

Avg. WACC = 8.2%
## Capital Project Performance - CII Owners

### Owner ($N_{Total} = 975$)

<table>
<thead>
<tr>
<th>Category</th>
<th>Projects</th>
<th>Cost Growth</th>
<th>Schedule Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner</td>
<td>310 (31.8%)</td>
<td>-10.2%</td>
<td>29.1%</td>
</tr>
<tr>
<td></td>
<td>239 (24.5%)</td>
<td>16.2%</td>
<td>32.0%</td>
</tr>
<tr>
<td></td>
<td>271 (27.8%)</td>
<td>-12.7%</td>
<td>-8.2%</td>
</tr>
<tr>
<td></td>
<td>102 (10.5%)</td>
<td>12.3%</td>
<td>-9.8%</td>
</tr>
</tbody>
</table>

69.7% Projects Not Shown
Cash Flow for an “Average” CII Owner Project

Slope of Revenue = 2.7% per year (Incremental Rate of Corporate CFfOA)

“Average” CII Owner Projected Cash Flow

$9.5 M

“Irr = 14.1%” CII Calculated Hurdle Rate For Industrial Projects
(Morningstar Estimated Hurdle Rate for Oil and Gas Companies = 14.7%)
Cash Flow Diagram for an “Average” CII Owner
(Includes Forecast 2012 - 2016)

Source: Capital IQ Courtesy of McCombs School of Business, UT Austin
Scenario 1: High Cost and Schedule Growth

**As-Is Cash Flow**

Year | Cash Flow ($ Million)
--- | ---
2011 | -$2,165 M
2012 | -$2,268 M
2013 | -$2,372 M
2014 | -$2,476 M
2015 | -$2,579 M
2016 | $4,017 M
2017 | $4,155 M
2018 | $4,292 M
2019 | $4,430 M
2020 | $4,567 M

**To-Be Cash Flow**

Year | Cash Flow ($ Million)
--- | ---
2011 | -$2,516 M
2012 | -$2,635 M
2013 | -$2,756 M
2014 | -$2,877 M
2015 | -$2,997 M
2016 | $4,017 M
2017 | $4,155 M
2018 | $4,292 M
2019 | $4,430 M
2020 | $4,567 M

**NPV**

- \( \text{NPV}_{\text{Target}} = $7.6 \) Billion
- \( \text{NPV}_{\text{Scenario 1}} = $5.7 \) Billion

- 25.3% Loss of NPV
Scenario 2: Low Cost and Schedule Growth

As-Is Cash Flow

To-Be Cash Flow

Cost Growth = -12.7%  
Schedule Growth = -8.2%

NPV_{\text{Target}} = $7.6 Billion  
NPV_{\text{Scenario 2}} = $6.8 Billion  
11.1\% Loss of NPV
Net Present Value (Forecast for 2012-2016)

- NPV = $6.4 Billion
- Owner (NTotal=975)
- NPV = $5.7 Billion

- NPV = $6.8 Billion
- Project Schedule Growth
- NPV = $6.6 Billion
- Project Cost Growth

Target

Expected NPV = $6.5 Billion
## NPV Impact of Suggested P.M. Practices

<table>
<thead>
<tr>
<th>Practices</th>
<th>Expected NPV</th>
<th>Gain/Loss</th>
<th>Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>CII Owners’ Average</td>
<td>$ 6.45 Billion</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Contract Method</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Lump Sum</td>
<td>$ 6.81 Billion</td>
<td>$ 360 Million</td>
<td>5.5%</td>
</tr>
<tr>
<td>Cost Reimbursable</td>
<td>$ 5.50 Billion</td>
<td>- $ 950 Million</td>
<td>-14.8%</td>
</tr>
<tr>
<td><strong>Working Relationship</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work w/ CII Contractor</td>
<td>$ 6.80 Billion</td>
<td>$ 350 Million</td>
<td>5.3%</td>
</tr>
<tr>
<td>Work w/ Non-CII Contractor</td>
<td>$ 4.61 Billion</td>
<td>- $ 1,840 Million</td>
<td>-28.5%</td>
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<tr>
<td><strong>PDRI</strong></td>
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<td></td>
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<tr>
<td>&lt;=200</td>
<td>$ 6.48 Billion</td>
<td>$30 Million</td>
<td>0.5%</td>
</tr>
<tr>
<td>&gt;200</td>
<td>$ 6.10 Billion</td>
<td>- $360 Million</td>
<td>-5.6%</td>
</tr>
<tr>
<td><strong>Planning for Startup</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Use</td>
<td>$ 6.45 Billion</td>
<td>$ 0 Million</td>
<td>0.0%</td>
</tr>
<tr>
<td>Low Use</td>
<td>$ 6.23 Billion</td>
<td>- $220 Million</td>
<td>-3.4%</td>
</tr>
</tbody>
</table>

### Best Strategy to Maximize Expected NPV
- Lump Sum Contract, Working with CII Contractor, PDRI<=200, and High Use of Planning for Startup

\[
\sqrt{($360)^2 + ($350)^2 + ($30)^2 + (0)^2} = $496 \text{ Million}
\]

- Expected NPV can increase $496 Million
- Expected NPV can decrease $2,113 Million
Conclusion: Opportunity Exists To Improve

Target NPV: $7.65 B
Expected NPV: $6.45 B
B.P. Enhanced NPV: $6.95 B
Optimal NPV: $8.00 B

KNOWN
UNKNOWN (RESEARCH)
Resource

• Posting to COAA Best Practices Conference Website (Post-Conference)
LESSON (RE)LEARNED: IN CAPITAL PROJECTS, IT IS ABOUT THE TEAM!

EMBODIMENT: “WE STAND FOR THE PROJECT”
CII Performance Assessment: Back to Basics

• 5 Principles of Project Integration
  – Work and Work Process
  – Organizational Engineering
  – Leadership and Governance
  – Communication and Information Flow
  – Culture and Environment

• Best Practices

• Benchmarking / Performance Assessment
THE FUTURE:

CII’S PERFORMANCE ASSESSMENT CAMPAIGN (THE 10-10 PROGRAM)
CII’s 10-10 Performance Assessment Campaign

- Phase-Based Benchmarking (4 pages each)
- Outcome Metrics (e.g., Cost/Capacity)
- 10 metrics (from 10 projects)

- Planning
- Organizing
- Leading
- Controlling
- Design Efficiency
- Human Resources
- Quality
- Sustainability
- Safety
- Partnering & SCM
A PROFESSIONAL DEVELOPMENT OPPORTUNITY...
(DON’T MISS IT!)
2013 CII Performance Assessment Workshop

- Peabody Hotel Memphis, TN
  - June 10-12, 2013
  - “Building Performance Culture”
- Interactive Workshop
  - 4 “Hands On” 10-10 Sessions
  - Detailed Case Studies
- Keynote Speaker Michael Dockery (FedEx)
- Companies Scheduled to Present:
  - Kaiser Permanente, ConocoPhillips, Eli Lilly & Co., Burns & McDonnell, and Others
- Includes Optional Benchmarking Training
CII Support

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Questions?

Thank You!

http://www.construction-institute.org/benchmarking