Collaboration and 10-10: New Frontiers in Project Performance Assessment

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- Lecturer, Researcher, and Consultant in the benchmarking of capital projects
- Program Management Expert
- Former employee of Fluor (Constructability Coordinator and Field Engineer), Phillips Petroleum, Bechtel, ePM, and Texas State University
• A consortium of leading owners, contractors, and academics working collaboratively to improve the constructed project and the capital investment process.

• An organized research unit of the Cockrell School of Engineering at The University of Texas at Austin.
Agenda

• NWCCC 2013:
  – Capital Projects should be a **strategic weapon** in the creation of benefits driving shareholder value.
  – Today’s business leaders perceive capital projects as a **“necessary evil”** – as risky and plagued by cost and schedule overruns that erode benefits.
  – Construction Industry Institute (CII) identified the root causes of benefits subtraction as **poor working relationships, dysfunctional team dynamics, and ineffective contract management**.
  – 10-10: How CII is changing the notion of benchmarking in capital projects by **measuring the “softer side” of project management** and how this form of communication radically improves project outcomes.

• NWCCC 2014
  – 10-10 Leading Indicators
  – 10-10 Results from 600+ Projects
  – New Frontiers: **Program Management, Program Renewal, and AWP**
Actual / Estimated Peak Construction Workforce

Project Cost Growth

Actual/ Estimated Peak Construction Workforce
Collaboration?

• Communicate Too Much or Not Enough?
• Lines of Communication = \( \frac{n(n-1)}{2} \)

<table>
<thead>
<tr>
<th># Project Team Members</th>
<th># Lines of Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>21</td>
</tr>
<tr>
<td>15</td>
<td>105</td>
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<td>50</td>
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<td>100</td>
<td>4950</td>
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<td>500</td>
<td>124750</td>
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</table>
Interface Mgmt. vs. Project Cost Growth

- Formal IM projects had lower mean of cost growth and less standard deviation.
• “It’s unbelievable how much you don’t know about the game you’ve been playing all your life.
  – Mickey Mantle
A, B, or C Team? How to Know / Measure?

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

• CII’s 10-10 Program Measures
  – 10 Leading Indicators
  – 10 Performance Outcomes (Cost, Capacity, etc.)
CII’s 10-10 System

- Newest Strategic Weapon for Capital Projects
10 Leading Indicators

1. **Planning:** The work a manager performs to predetermine a course of action. The function of planning includes the following activities: Forecasting, Objective Setting, Program Development, Scheduling, Budgeting, and Policies and Procedures Development.

2. **Organizing:** The work a manager performs to arrange and relate the work to be done so people can perform it most effectively. The function of organizing includes the following activities: Development of Organization Structure, Delegation of Responsibility and Authority, and Establishment of Relationships.
10 Leading Indicators

3. **Leading:** The work a manager performs to cause people to take effective action. The activities involved in the function of leading include: Decision-Making, Communications, Motivation, Selection of People, and Development of People.

4. **Controlling:** The work a manager performs to assess and regulate work in progress and completed. Management controls are achieved through the following activities: Establishment of Performance Standards, Measurement of Performance, Evaluation of Performance, and Correction of Performance.
10 Leading Indicators

5. **Design Efficiency**: Measures if the project team is exhausting all techniques to optimize the design in its use of material quantities to provide maximum capacity at minimum cost.

6. **Human Resources**: Examines if the project is staffed correctly, with a minimum amount of staff turnover and appropriate training. Measures if people are capable of achieving project goals.

7. **Quality**: Measures if the project team is strictly conforming to project requirements. Analyzes if programs are pursued to assure the delivery of material goods as intended.
10 Leading Indicators

8. **Sustainability:** Evaluates steps taken by the project team to reduce the environmental impact of the project during construction and operation.

9. **Supply Chain Management:** Examines the strategies used by the project team to promote enhanced working relationships amongst all project stakeholders including those in the project supply chain.

10. **Safety:** Measures the steps followed by the project team to eliminate any possibility of personal injury or property damage on the project.
Round 1 Results (600+ Global Projects)

- Typical Analysis of a Leading Indicator
Front End Planning (FEP)

- Effect of Leadership
Engineering (Design)

- Impact of Design Efficiency

![Diagram showing the impact of design efficiency on team size and project cost]

74% impact

\[p=0.063\]
Procurement

- Effect of Supply Chain

**TOTAL PROJECT COST / NUMBER OF VENDORS**

38%

\[ p = 0.125 \]

- HIGH: N=27
  - MILLION USD / VENDOR: 1.3

- LOW: N=28
  - MILLION USD / VENDOR: 2.1
Construction

• Impact of Safety

![Graph showing the impact of safety on construction craft force and cost.](image)

- 44% impact
- p=0.034
- High safety group: N=34, 4.9
- Low safety group: N=27, 8.7
Start Up / Commissioning

• Effect of Organizing

![Phase Schedule Growth Chart]

- \( p = 0.223 \)
- High: \( N = 10 \)
- Low: \( N = 9 \)
- 30%
Ongoing CII Research: Arrangement of Phases

Phase:
- Front-End Planning
- Design/Engineering
- Procurement
- Construction
- Start-UP

Legend:
- Heavy (D=0.32%)
- Light (D=0.24%)
- Heavy (D=0.41%)
- Light (D=0.34%)
- Heavy (D=0.45%)
- Light (D=0.46%)
- Heavy (D=0.41%)
- Light (D=0.52%)
- Heavy (D=0.07%)
- Light (D=0.21%)

Overall Duration

- Heavy
  - 0.00%
  - 0.31% 0.32%
  - 0.55%
  - 0.72% 0.78%
  - 0.92% 0.96% 0.99%
- Light
  - 0.00%
  - 0.23% 0.24%
  - 0.40%
  - 0.56%
  - 0.72% 0.78%
  - 0.92% 0.99%
10-10 Program Implementation

• Results
10-10 Program Implementation

- Question Mapping

<table>
<thead>
<tr>
<th>Question</th>
<th>Planning</th>
<th>Organizing</th>
<th>Leading</th>
<th>Controlling</th>
<th>Design Efficiency</th>
<th>Human Resources</th>
<th>Quality</th>
<th>Sustainability</th>
<th>Supply Chain</th>
<th>Safety</th>
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<tbody>
<tr>
<td>G What was the typical foreman to craft ratio?</td>
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<td>G Overall how many workers per safety professional were typically (i.e., in terms of the average workforce) on site?</td>
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<td>4 Did the project objectives change during Construction?</td>
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<td>5 This project experienced a high number of:</td>
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<td>6 Was a turnaround involved in the scope of this project?</td>
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<td>7 Please characterize how project meetings were conducted.</td>
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<td>8 Which of the following statements characterized the decisions made by the manager(s) of this project?</td>
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<td>9 This project used the following methods.</td>
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<td>10 Formal (classroom) safety training was attended:</td>
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<td>11 Did the original primary contractor(s) complete the project?</td>
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<td>13 Was safety performance a criterion for contractor and subcontractor selection?</td>
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<td>14 Were safety toolbox meetings held daily?</td>
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<td>15 Were accidents including near misses formally investigated?</td>
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<td>16 The availability and competency of craft labor was adequate.</td>
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<td>17 The owner level of involvement was appropriate.</td>
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<td>18 The owner and primary contractor(s) maintain a longstanding partnering arrangement.</td>
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</tbody>
</table>
10-10 Program Implementation

• 10-10 System Access
  – https://www.construction-institute.org/10-10

• 10-10 User Manual

• 10-10 General Information
  – http://www.10-10program.org

• Questions about 10-10?
  – e-mail: 10-10program@cii.utexas.edu
NEW FRONTIERS
Background

• Owner’s Capital Budgeting Process
  – Used to select projects for funding
  – Based on financial prioritization (NPV, ROR)

• Asset Development Processes (ADP’s)
  – Track each project through its phases
  – Do not examine portfolio benefits

• Program Renewal
  – Links business and project leadership
  – Ensures that projects are ‘built right’
  – Ensures that ‘right’ projects are ‘built’
Texaco’s ADP

Business Roadmap for Asset & Value Enhancement

- Scoping:
  - Chairman, Vice Chairman, Leadership Councils, Business Unit Management, Facility Management
  - Typical Decision Makers
  - Communications
  - Work Teams
  - Inputs
    - Identify Scoping Team
    - Define Opportunity Concept
    - Agree on Strategic & Business Fit
    - Evaluate Opportunity
    - Document Assumptions & Drivers
    - Prepare Initial Cost Estimate & Economic Evaluation
    - Prepare Scoping Notice
  - Focus Areas
  - Lessons Learned
    - Share
    - Access to Data
    - Prevent Repetitive Mistakes

- Planning/Screening
  - Board of Directors, Leadership Councils, Business Unit Management, Facility Management

- Commercial and Engineering Definition
  - Board of Directors, Leadership Councils, Business Unit Management, Facility Management
  - Engineering Funding
  - Project Execution Plan & Preliminary Design

- Project Execution
  - Business Unit Management, Facility Management
  - Project Funding
  - Project Execution Plan

- Manage Operations and Follow-Up
  - Business Unit Management, Facility Management
  - Handover to Operations
  - Strategic Reviews
  - Divest

Flowchart:
- Scoping Notice
- Approved Scoping Notice
- Approved Business Plan
- Approved Project Execution Plan
- Operations Plan
Program(me) Management

- The coordinated management of a portfolio of projects to achieve a set of business objectives (CCTA 1995)
Project ‘Fallout’ Buffer

- Project “Fallout” Buffer
  - Easier to Gain 2 Weeks on 4 Projects than 10 Weeks on 1 Project
Programmatic Change Management

- Change Management System
  - Wal-Mart makes 170 changes per month to Supercenter prototype
Advanced Work Packaging?
(1) DEFINITION OF PROGRAM PHYSICAL AND NON-PHYSICAL CONTEXT (Policies, Codes, Standards, and Regulations)

(2) PROGRAM DEFINITION PACKAGE (PDP)

(3) PRODUCTION PROCESS PLAN (PPP) (Process Definition)

(4) DESIGN PACKAGE (DP) (Project Definition)

(5) PROGRAM EXECUTION PLAN (PEP)

(6) WORK BREAKDOWN STRUCTURE (WBS) (Integrated Product/Process Definition)

(7) (3D) DESIGN MODEL

(8) COST MODEL

(9) QUALITY MODEL

(10) TIME MODEL

(11) PRODUCTION PROCESS MODEL

(12) INTEGRATED PROGRAM DEFINITION MODEL (IPDM)

Program Execution

Client

A/E Systems Designer

Supply Chain

Constructor

Typically Missing

Feedback
Advanced Work Packaging?
Advanced Work Packaging!

© 2001; Boeing Corporation (DCAC/MRM Initiative)
Benefits: Linking Business and Project Management (after Reiss 1996)

- Direct
  - Projects with direct benefits
- Enabling
  - Projects vital to the delivery of a whole range of benefits from other projects
- Passenger
  - Projects that can only add to benefits expected from other projects
- Synergistic
  - Projects which makes no (or only a small) contribution, unless combined into a program
Program Renewal

• The Program Continuum (after Pellegrinelli 1997)
  – Initiation, Planning, Delivery, Renewal
  – New ‘class’ of dynamically-benchmarked ADP’s
Study and Findings

• 3 Large Building Program Owners
  – 167 Combined Projects
  – Executed Using Program Renewal

• Boeing – 11% Project Development Cost Reduction

<table>
<thead>
<tr>
<th>Program</th>
<th>No. Projects Completed</th>
<th>% Projects Cancelled</th>
<th>% Cost Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996 Restaurant</td>
<td>24</td>
<td>10.5%</td>
<td>12.1%</td>
</tr>
<tr>
<td>1997 Restaurant</td>
<td>44</td>
<td>29.0%</td>
<td>4.9%</td>
</tr>
<tr>
<td>1998 Restaurant</td>
<td>17</td>
<td>38.5%</td>
<td>10.4%</td>
</tr>
<tr>
<td>1999 Restaurant</td>
<td>23</td>
<td>30.0%</td>
<td>5.9%</td>
</tr>
<tr>
<td>2000 Restaurant</td>
<td>32</td>
<td>33.3%</td>
<td>15.5%</td>
</tr>
<tr>
<td>1998 Hotel</td>
<td>13</td>
<td>9.1%</td>
<td>10.5%</td>
</tr>
<tr>
<td>1998 Discount Retailer</td>
<td>14</td>
<td>0.0%</td>
<td>9.5%</td>
</tr>
</tbody>
</table>
• Coming together is a beginning; keeping together is progress; working together is success
– Henry Ford
Questions?

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