Metrics That Matter: Improving Project Progress and Performance Assessment

RT-322
Acknowledgements
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Construction projects are suffering from significant performance inefficiencies

Only ONE in twenty projects is under budget and on time

Source: Construction Industry Institute, 2012
Performance issues cause major cost and schedule deviations, particularly in bigger projects

98% of megaprojects incur cost overruns and schedule delays.

The average cost increase is 80% of the original budget.

The average slippage is 20 months behind original schedule.

Adverse effects of low project performance is crippling the industry

$100 million of every $1 billion invested in projects is wasted

Only TWO out of five projects are profitable for contractors

Sources: Project Management Institute, 2017; Construction Industry Institute, 2014
Majority of project managers believe most of their projects are performing well and meeting targets.

- Successfully met the original goals of the project: 69%
- Finished within their initial budgets: 57%
- Finished within their initially scheduled time: 51%

Source: A.T. Kearney, 2012; Project Management Institute, 2017
Main objective is to improve project control systems for assessment of current and future performance

Objective #1
Develop a systematic project controls framework

Objective #2
Identify the core project control metrics

Objective #3
Generate guidelines for improving the reliability
The research approach is aligned with the objectives to deliver desired outcomes

**Objective #1**
Develop a systematic project controls framework

**Objective #2**
Identify the core project control metrics

**Objective #3**
Generate guidelines for improving the reliability

**Metric Framework and Typology**

**Metric Classification**

**Project Controls Improvement Tool**

**Reliability Improvement**
Various research methods are utilized to produce deliverables and achieve objectives.
Various research methods are utilized to produce deliverables and achieve objectives

1. Literature Review
2. Expert Panel
3. Online Survey
4. Exploratory Analysis
5. Delphi Method
6. Statistical Analyses
7. Case Studies

>100 documents

- Scholarly articles
- Professional publications (e.g., CII, PMI, AACE)
- Government agency reports (e.g., DoD, DoE, DoT)
Various research methods are utilized to produce deliverables and achieve objectives

13 industry professionals
290+ years of cumulative experience
Representing owner (5) and contractor (8) perspectives
Various research methods are utilized to produce deliverables and achieve objectives

- Literature Review
- Expert Panel
- Online Survey
- Exploratory Analysis
- Delphi Method
- Statistical Analyses
- Case Studies

**Part I: Background Information**
- Metrics used in the project

**Part II:**

**Part III: Reliability information**

- 44 completed responses
- Owner vs. contractor balanced
- Predominantly heavy industrial
- Average size: ~$120 million
- Average duration: ~2 years
Various research methods are utilized to produce deliverables and achieve objectives.

<table>
<thead>
<tr>
<th>Literature Review</th>
<th>Expert Panel</th>
<th>Online Survey</th>
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<th>Delphi Method</th>
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<td>![Delphi Icon]</td>
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**Metric Importance**

- Low – High    High – High
- Low – Low    High – Low

**Metric Usage**
Various research methods are utilized to produce deliverables and achieve objectives

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- **Project controls**
- **Subject Matter Experts (SMEs)**

- 16 industry professionals
- 360+ years of cumulative experience
- Representing owner (2) and contractor (14) organizations
Various research methods are utilized to produce deliverables and achieve objectives
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In-depth analysis of selected projects

- 10 projects selected
- Contractor (6) and owner (4) perspectives
- Interviewed 17 project personnel
Various research methods are utilized to produce deliverables and achieve objectives.
A systematic framework and typology that allow transforming data into meaningful insights

- **Strategic Level Decisions**
  - Diagnostic Metrics
    - Help identify progress and performance issues to inform corrective actions.
  - Why Are We Here?
  - Where Are We?
  - Where Should We Be?
  - Where Will We Be?

- **Tactical Level Decisions**
  - Predictive Metrics
    - Help forecast project cost and duration outcomes based on current project progress and performance.
  - Why Are We Here?

- **Operational Level Decisions**
  - Information
  - Data Collection
  - Insight
  - Performance Forecasting
  - Performance Assessment
  - Knowledge
Metric classification was finalized by subject matter experts (SMEs)

- **20 Core metrics**: metrics that provide the greatest insight for indicating the likely project outcomes
Diagnostic Metrics help the user to identify progress and performance issues to inform corrective actions.

Forecasting Metrics help the user to predict project cost and duration outcome based on understanding of the current project progress and performance.
### 20 Core Metrics

<table>
<thead>
<tr>
<th>Category</th>
<th>Metric</th>
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<tbody>
<tr>
<td><strong>Performance Forecasting</strong></td>
<td>Variance at Completion</td>
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<tr>
<td></td>
<td>Estimate at Completion (CPI)</td>
</tr>
<tr>
<td></td>
<td>Estimate to Complete (CPI)</td>
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<tr>
<td></td>
<td>To Complete Performance Index (EAC-CPI)</td>
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<td></td>
<td>Budget at Completion</td>
</tr>
<tr>
<td><strong>Performance Assessment</strong></td>
<td>Cost Performance Index</td>
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<td></td>
<td>Schedule Performance Index</td>
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<tr>
<td><strong>Progress Measurement / Data Collection</strong></td>
<td>Physical Percent Complete</td>
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<tr>
<td></td>
<td>Earned Value</td>
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<td></td>
<td>Planned Value</td>
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<td>Actual Cost</td>
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<tbody>
<tr>
<td><strong>Schedule Diagnostics</strong></td>
<td>Baseline Execution Index for Critical Path</td>
</tr>
<tr>
<td></td>
<td>Number of Critical (or Near Critical) Paths</td>
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<tr>
<td></td>
<td>Schedule Variance</td>
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<tr>
<td><strong>Cost Diagnostics</strong></td>
<td>Unit Rate</td>
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<tr>
<td></td>
<td>Cost Variance</td>
</tr>
<tr>
<td></td>
<td>Procurement Cost Variance</td>
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<tr>
<td><strong>Physical Progress Diagnostics</strong></td>
<td>Efficiency or Productivity Index</td>
</tr>
<tr>
<td></td>
<td>Ratio of Actual to Planned Progress</td>
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<tr>
<td></td>
<td>Percent Key Deliverables Completed on Time</td>
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# 7 Significant Validation Metrics

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<th>Forecasting</th>
<th>Diagnostic</th>
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<td>Estimate at Complete (SPI)</td>
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<td>Estimate to Complete (SPI)</td>
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<tr>
<td>Performance Assessment</td>
<td>Monthly Cost Growth</td>
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<tr>
<td></td>
<td>Percent Activities Started on Time</td>
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<td></td>
<td>Percent Activities Finished on Time</td>
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<td></td>
<td>Critical Path Length Index</td>
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<tr>
<td>Schedule Diagnostics</td>
<td>Cost Diagnostics</td>
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<tr>
<td></td>
<td>Percent Work Packages on Budget</td>
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## 7 Significant Innovative Metrics

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<tr>
<td><strong>Performance Forecasting</strong></td>
<td>Estimate at Completion - Time</td>
</tr>
<tr>
<td></td>
<td>Estimate to Completion - Time</td>
</tr>
<tr>
<td><strong>Performance Assessment</strong></td>
<td>Schedule Performance Index – Time [SPI(t)]</td>
</tr>
<tr>
<td></td>
<td>Earned Schedule</td>
</tr>
<tr>
<td><strong>Progress Measurement / Data Collection</strong></td>
<td>Actual Duration</td>
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<td>Schedule Variance – Time [SV(t)]</td>
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Core Metric Validation

Cost Performance

\[ \rho = 0.34 \]
\[ p -value = 0.025 \]

-50% (Under budget)
±0 (Plan)
+100% (Over budget)

Number of Core Metrics Used
Metric Classification – Summary

- In projects using more Core Metrics:
  - Cost Reduction: 50%
  - Schedule Improvement: 30%

Core Metrics → Insight → Data

Methods:
- Literature Review
- Expert Panel
- Survey
- Exploratory Analysis
- Delphi Methods
- Statistical Analyses