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Metrics That Matter: Improving Project Progress and Performance Assessment

Construction Industry Institute

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**Metrics That Matter:
Improving Project Progress
and Performance Assessment**

**Prepared by
Construction Industry Institute
Research Team 322, Improving Project Progress and Performance**

**Research Summary 322-1
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Executive Summary

The assessment of project progress and performance is critically important to the successful delivery of capital facility projects. Project managers are often misinformed in their perceptions of project performance until the project nears its end. Major challenges are related to the lack of consistent, objective, and reliable metrics and indicators, and the lack of appropriate interpretation of these data for establishing suitable corrective action plans. Research conducted by CII Research Team 322 (RT-322) identified several key Forecasting and Diagnostic metrics that can provide insights into a project's actual progress, performance, and forecast at completion. It also provides information on ways to improve the reliability of these metrics.

The RT-322 research methodology included a broad literature review of more than 120 sources to identify progress, performance assessment, and performance forecasting metrics. The review also identified factors to improve metric reliability in several areas, including project scope definition, execution planning, and risk management. Next, the researchers distributed a survey to collect data on the metrics and reliability techniques used on completed projects. In total, 44 survey responses were collected, representing mostly large, industrial projects. Subsequently, 10 case studies provided more in-depth analysis of some of these projects and their use of metrics. This was followed by a Delphi session with 16 subject matter experts with more than 350 years of combined experience, who evaluated and validated the findings from the survey and the case studies. The Delphi session further refined a list of in-flight project control metrics divided into the following categories: Core ("must have"), Validation (metrics that confirm the validity of the Core metrics), Innovative (metrics that are not currently in wide use, but are considered potentially beneficial), and Other Significant (other metrics that fall outside the previous categories, but are perceived to have value).

Core metrics were initially selected based on the following project characteristics: large, industrial, reimbursable cost, balanced cost and schedule goals, moderate complexity, and contractor perspective. However, when considering Core metrics for other project characteristics, it was discovered that these metrics tended to be the same across projects—the only differences were the frequency of data collection and the level of effort involved in collecting and analyzing these data. Further statistical analysis of survey responses revealed that, compared to projects using fewer Core metrics, projects that used more Core metrics for project controls experienced higher rates of success at meeting their original budgets. A correlation between the use of more Core metrics and better project cost outcomes was observed at the 95% confidence level using the Spearman's rank correlation method.

The RT-322 research identified in-flight project control metrics for determining project progress measurement, performance assessment, and performance forecasting. Critical factors were identified that individually and collectively influence the reliability of project progress and performance assessment metrics. A useful dictionary of Core metrics, including their definitions, uses, and interpretation information, as well as “metric maps” (demonstrating how each metric is calculated), was produced. Furthermore, the Project Controls Improvement (PCI) Tool was created to provide a more standardized or systematic way of assessing a project's progression and performance. Using the PCI Tool, project stakeholders can locate the gaps in their project control systems or learn more about Core metrics and identify steps they could take to improve metric reliability within a dynamic and interactive software environment.

Introduction

The main goal of progress and performance assessment is simple: the successful completion of a project on time and within budget. Unfortunately, many obstacles hinder achievement of this goal. One major obstacle is the subjective and inconsistent use and interpretation of metrics related to progress measurement, performance assessment, and performance forecasting. No systematic approach to the use of project control metrics seems to exist. Some say that the metrics used to assess progress and performance are sound and that the larger issue pertains to nonconformity across the industry. Therefore, CII presented Research Team 322 (RT-322) with the task of answering the following essential questions:

1. How can the construction industry better assess project progress and performance?
2. What are the most useful parameters and indicators for assessment?

To answer these essential questions, the team identified three specific objectives:

- Objective #1: Identify the Core metrics and key indicators for assessing project progress and performance.
- Objective #2: Establish reliability guidelines for key metrics and indicators.
- Objective #3: Establish recommended practices for the use and interpretation of these metrics.

The research approach used to address these objectives involved several steps. First, RT-322 conducted an extensive literature review and discussions to develop a better understanding of key progress and performance assessment metrics. To test the data gathered during the literature review, the research team utilized three approaches: a web-based survey questionnaire, in-depth case studies, and a Delphi Method approach (interactive validation by an expert panel).

Drawing on the data gathered from the survey, case studies, and the expert panel, the team identified 111 potential metrics. Eventually, 48 of these in-flight project control metrics were categorized into two major functional types: Forecasting metrics and Diagnostic metrics. The same metrics were also characterized in terms of level of importance: 20 Core metrics (the “must have” metrics that provide the greatest insight into project controls), and 28 Significant metrics (which supplement or complement Core metrics, and have the potential to become Core metrics if adopted more extensively by the industry). RT-322 also identified 15 Critical Reliability Factors that individually and collectively influence the reliability of project progress and performance assessment metrics. Metrics identified as “Core metrics” were validated using Spearman’s correlation coefficient, and analysis indicated that projects that used more Core metrics in project assessment showed higher success rates of meeting their original budgets.

In order to encourage development of standard definitions and evaluation techniques, this study’s findings have been implemented as a software tool to help project participants better monitor, control, and communicate project progress and performance assessment. Implementation Resource (IR) 322-2, *Project Controls Improvement Tool and User Guide*, is a software package that integrates essential metric and reliability information regarding project controls systems. PCI will be beneficial for various project stakeholders, including engineering managers, project managers, project control teams, cost engineers, and schedulers in owner and contractor organizations.

Research Scope and Limitations

The scope of the proposed research focused on progress measurement, performance assessment, and performance forecasting of large capital projects, from authorization to substantial completion. The following factors were determined to be outside the scope of this research:

- comparison of project performance against industry standards
- quality of baseline plans
- evaluation and standardization of Earned Value Analysis components (e.g., rules of credit)
- program- and/or portfolio-level project progress and performance assessment metrics
- applicable metrics for projects' operations phase
- technologies for real-time progress measurement and data collection.

Methodology

In order to achieve the objectives of this study, RT-322 first conducted an extensive literature review. Various studies, including a number of previous studies by CII, have investigated project progress and performance assessment. A review of this literature provided a strong foundation for understanding the key project control metrics at the project level. By reviewing more than 120 documents from various resources, such as CII reports, scholarly articles, reports from other professional organizations (e.g., Association for Advanced Cost Engineering International and Project Management Institute) and governmental organizations (e.g., Department of Defense and Department of Energy), the team identified 111 potential metrics currently used for in-flight project controls in construction. (See Table A in the appendix for a summary of the major considerations and findings from some of the key resources reviewed.)

Based on the metrics identified during the literature review, RT-322 designed and utilized a research methodology that included three components: a web-based survey questionnaire; in-depth case studies; and a Delphi Method approach (interactive validation by an expert panel). (See Figure 1.) The **web-based survey** collected information from participants regarding the usage and importance of various project progress and performance assessment metrics. This was followed by **in-depth case studies** that gathered detailed information related to the use and interpretation of progress and performance assessment metrics, as well as the critical factors affecting metrics' reliability. Finally, the web-based survey and in-depth case study results were verified and validated through the **Delphi Method approach**, in which a panel of subject matter experts (SMEs) participated in multiple rounds of evaluation.

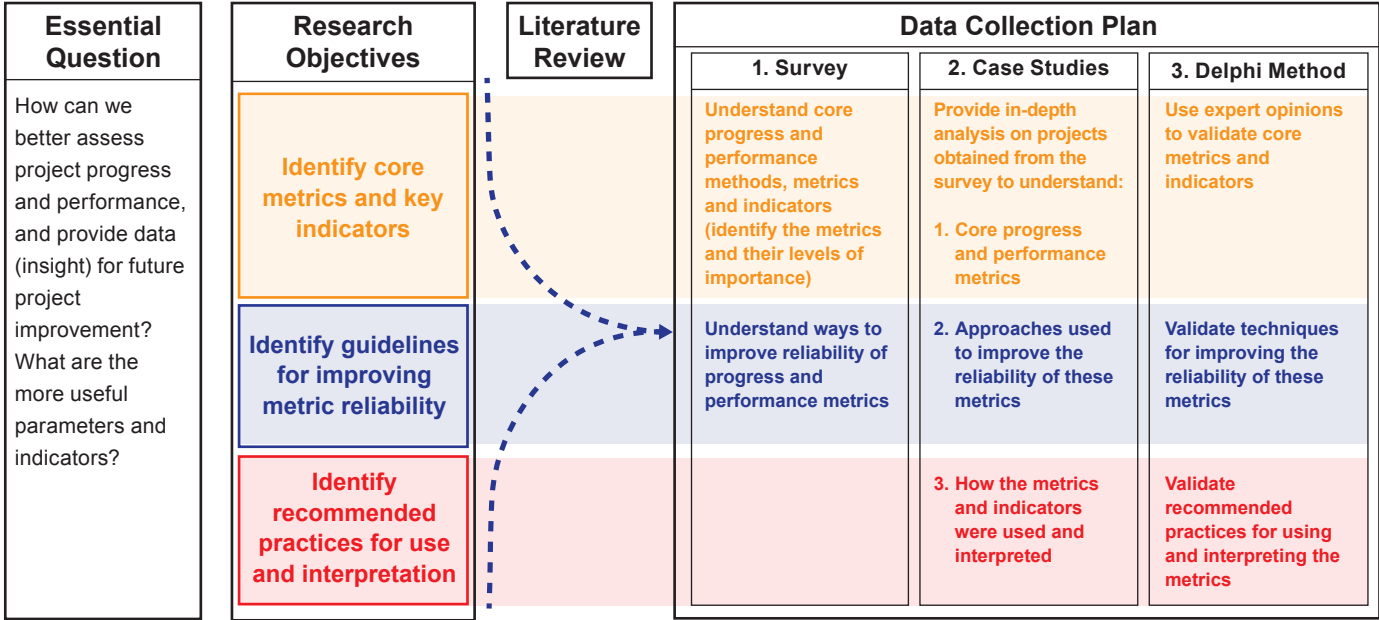


Figure 1. Research Framework Components and Processes