

Global Project Controls and Management Systems: Adapting Your PCMS Program for Success



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*Prepared by the
Global Project Controls and Management System Research Team*

Implementation Resource 244-2

April 2009

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The University of Texas at Austin.

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Printed in the United States of America.

Contents

<i>Chapter</i>	<i>Page</i>
1. Overview	1
2. PCMS Functions Self Diagnostic Assessment Tool	3
3. Influence of Trends on PCMS Performance	5
3.1 Introduction	5
3.2 Trends and Implications	7
3.2.1 Sophistication of Information Technology	7
3.2.2 Project Complexity	9
3.2.3 Speed of Project Execution	10
3.2.4 Recognition of Changes	11
3.2.5 Changing Owner-Organization Direct Involvement	12
3.2.6 Globalization	14
3.2.7 Outsourcing	15
3.2.8 Graying of PCMS	17
3.2.9 Contractor Specialization	19
3.2.10 Increase in Regulatory Oversight	20
3.2.11 Distribution of Project Risks among Organizations	22
3.2.12 Virtual Performers on Project Teams	23
3.2.13 Labor and Materials Availability and Price Elasticity	25
Appendix A: PCMS Functions Self Diagnostic Assessment Tool	27
Appendix B: Prioritized Recommendations for PCMS	43

1

Overview

This document presents a set of tools and resources to help organizations assess their overall project controls and management systems (PCMS). CII established the Global Project Controls and Management Systems Research Team (RT) 244 to provide an update to CII members. As part of this review, RT 244 reviewed a number of project controls practices, conducted a survey of CII members' project controls implementation performance across a range of functions and project phases, and developed a suite of tools and guidance to aid with project controls implementation. This CII Implementation Resource contains a portion of that guidance with respect to seven project controls functions as well as 13 broad trends that are having an impact on PCMS implementation. The research team also produced three companion resources: PCMS Interfaces Management Tool, Best Practice Forecasting, and Learning and Development for PCMS. Each of these is a stand-alone resource, but when combined with this document the group of four publications presents a broad set of tools and recommendations with which organizations can comprehensively address their PCMS programs.

A central finding of RT 244 is that project controls principles remain fundamentally sound and unchanged; what has changed in the past few decades are the project and industry conditions that affect execution. RT 244 developed a set of 13 trends affecting PCMS, explored their implications, and developed a consolidated set of recommendations for improvement. These trends and recommendations are contained in this publication and provide useful starting points from which both to assess project controls systems and to target performance improvements. Additional resources for specific recommendations are detailed and reviewed.

The set of trends and recommendations is accompanied by the PCMS Functions Self-Diagnostic Assessment Tool. Seven PCMS functions (estimating, planning, scheduling, cost control, change management, progressing, and forecasting) are defined and a set of evaluation questions is associated with each function. These questions are presented in a simple Yes/No answer format, where Yes represents good practice and No suggests an action item for improvement. The set of questions across the seven functions provides a detailed review of functional performance;

questions are meant to expose typical weaknesses and hence most companies taking the assessment will likely find several areas for improvement. The set of functional questions together with the broader trends and recommendations provide a holistic assessment and recommendation program that will help organizations achieve superior PCMS performance.

The recommendations discussed below reflect the research work of RT 244, which consisted of 16 industry members with a combined 489 years of experience, 330 of which were devoted to project controls. Recommendations were developed in the context of existing project controls literature and were externally validated with industry experts outside the research team.

PCMS Functions Self Diagnostic Assessment Tool

RT 244 identified a range of practice in project controls and management systems implementation. An initial survey of CII members revealed broad variance in self-reported performance along seven different PCMS functions (estimating, planning, scheduling, change management, cost control, progressing, and forecasting) in the dimensions of systems, tools, and training. While some differences were noted between owner and contractor member companies, overall findings suggest that there is industry-wide room for improvement in each of the seven PCMS functions.

Building on their experience, the research team members developed a set of questions for each of the PCMS functions. Wording and relevance of the questions were validated with project controls professionals at companies not directly involved in RT 244.

Each question is designed to reveal areas of implementation weakness and is intended to be a leading indicator to help focus on specific items. No differences exist between questions for contractors or owners. Each question has a yes or no answer. If yes, the assessment is positive. If no, the question should reveal an action item for remedies. The set of questions was not designed to give an overall score for PCMS implementation – RT 244 felt that such scores are too general and that organizations should prioritize action items from an assessment based on corporate circumstances. Appendix A contains the PCMS Functions Self-Diagnostic Assessment Tool, which details definitions for each of the seven PCMS functions as well as diagnostic questions related to implementation details for each function.

Deployment and follow-up is straightforward. Individuals in each member company with thorough-going knowledge of the each specific PCMS function should answer the questions for that function. As the set of seven functions often cross traditional boundaries (e.g., planning and scheduling may be separate from estimating), it is likely that several persons will need to be involved in the assessment. Companies that split project controls responsibilities across business units may wish to focus the tool and assessment within a specific business unit. After answering the questions, “No” responses should be reviewed and action

items generated. Each individual respondent should generate an initial set of action items and recommendations. Overall responses should be collected by senior leaders, refined, and prioritized. Recommendations and actions developed from the self-diagnostic questions can stand on their own or be combined with advice and remedies generated from other tools developed by RT 244, including those detailed in the next section of this publication. It is important to note that the questions for each PCMS function are meant to reveal common areas of weakness and hence opportunity for improvement; few if any organizations will answer yes to all questions. An honest assessment is necessary for improvement. Those answering questions should not be held accountable for revealing weaknesses but rather rewarded for helping the company improve its performance.

Influence of Trends on PCMS Performance

3.1 Introduction

While several changes in the implementation of project controls and management systems have occurred in the last several decades (perhaps most visible in the ways that information technology (IT) has accelerated reporting of project controls information), RT 244 concludes that the principles of PCMS have not changed. Moreover, these fundamentals persist in spite of the way that the corporate context and conditions within which project controls operates have changed. These changes have been distilled into 13 trends with associated implications for PCMS. These trends are:

1. Sophistication of information technology
2. Project complexity
3. Speed of project execution
4. Recognition of changes
5. Changing owner-organization direct involvement
6. Globalization
7. Outsourcing
8. Graying of PCMS
9. Contractor specialization
10. Increase in regulatory oversight
11. Distribution of project risks among and within organizations
12. Virtual performers on project teams
13. Labor and materials availability and price elasticity

The trends are not ordered in terms of importance. Despite some overlap, they are meant to convey the principal influences on PCMS implementation currently observed in the industry. The relative importance of a given trend may vary by project and industry sector, although all are seen as important.

The trends are described below. Appendix B separately details prioritized recommendations derived from the trends; these recommendations should be considered after review of the following discussion.

RT 244 generated the trends and associated recommendations from a series of structured discussions. A review of the existing PCMS literature and input from other CII members by means of an initial survey also contributed to trend definition and description. Implications, remedies, and leveraging opportunities were generated for each trend. Because the trends were found to overlap in their influence on PCMS, the recommendations have been separated from the discussion of the individual trends. Recommendations were subsequently ranked and prioritized in a two-step process by the research team. The research team interviewed experts in project controls and management systems to validate these trends and recommendations; these experts reviewed brief write-ups of the trends for context and then were asked about the implications and recommendations. Their comments are reflected in the final discussion.

Implementation of the recommendations detailed in Appendix B should help CII members adapt their PCMS program for success in response to the 13 trends. The 26 recommendations have been rank-ordered as well as given an overall importance rating on a 1–10 scale (10 being highest). Ideally, the recommendations should be reviewed after a reading of the description and implications. Each recommendation is specific, but is best viewed in the overall context of all recommendations and trend discussions. Resources (related CII publications) have been identified for each recommendation for more detailed action.

While the recommendations and discussion of the trends can be seen as a stand-alone document, companies wishing a comprehensive review of their PCMS should add the function diagnostic assessment questions presented in Appendix A. An assessment of the seven functions as well as the broader context provided by the 13 trends and associated recommendations provides a well-rounded review of an overall project controls program. The team taking the functional self-diagnostic tool should be involved in the review of recommendations and trends, and senior leaders should combine the results from both assessments into an appropriate action plan.

3.2 Trends and Implications

This section details the 13 trends with a summary, discussion, and set of implications. Trends are numbered for convenience, but the order assumes no specific importance. Prioritized recommendations distilled from the set of trends are presented in Appendix B. As noted above, implementation of the recommendations should be made in the context of the trends detailed below.

3.2.1. *Sophistication of Information Technology*

Summary:

Information technology (IT) has become increasingly sophisticated. Among several benefits, IT allows for analysis of massive amounts of information, speeds the entry and dissemination of PCMS data, and offers the opportunity for innovative discovery and exploration of reports (e.g., through business intelligence tools). Moreover, IT tools and capacities make it easier to integrate PCMS systems with other project management and corporate IT systems (e.g., 4D CAD, accounting). A key negative aspect is that IT can place a focus on data entry and create an over-reliance on computing tools, leading to less time/experience in the interpretation of PCMS output for management decisions.

Discussion:

In recent decades, IT sophistication has dramatically increased, particularly in tool efficiency. By allowing one to track projects at a minute level of detail in near-real time, the details and intricacies of a project can be more accurately discerned. The information is more reliable, with less human error. Field entry of data is possible and the quantity of data to be managed is unlimited. The daily turnaround of data, combined with the system capability and diversity in platform and report format, allows the project stakeholders to discern impacts more easily.

IT also has allowed the integration of data sources (within and outside of PCMS). This integration allows for better benchmarking and metrics, with more historical variables and data available. Technology can also act as a leveler and bar raiser by helping to standardize practices among less sophisticated organizations.

Despite IT advancements, PCMS has not kept pace with the technological sophistication of other industries. Managers of PCMS systems are only now beginning to examine the possibility of using computerized analytical tools, which can provide automated and integrated forecasting and trending tools and processes. Such tools, often called business intelligence, represent the cutting edge of PCMS information technologies.

IT benefits also bring negatives. Advancements in computer technology have made changing the schedule almost too easy, often allowing a project team to lose sight of the project as well as control over it. The information and PCMS systems can be too large and complicated and may contain too much data. Not only has the quantity of the data increased dramatically, the data require much more consideration to organize, sort, and filter. In addition, erroneous data once entered and not recognized circulates just as rapidly as correctly keyed-in data.

Collecting data, unfortunately, has often taken on more importance than interpretation and analysis. Every piece of data has some decision associated with it. The computerization of project controls information provides an imprimatur of authority, and a computer generated report is often accepted without regard to its source or the quality of its data. The accuracy and validity of data needs to be constantly challenged. PCMS personnel must assure that accurate data is being collected, evaluated, and analyzed.

Implications:

- Daily turnaround of data – data no older than one day/shift
- Possibility of computerized analytical tools (business intelligence tools)
- No limit on quantity of data managed
- More reliable information – less human error
- Field entry of data – access to data at the source and input only once
- Integration of data sources (within and outside of PCMS)
- Flexibility in report content and format – project stakeholders able to realize impact more readily
- Near real-time reporting and providing status – more time for decisions
- Able to show all interfaces
- Over-reliance on data

- Over-reliance on computers – lack of skilled interpreters and meaningful analysis
- Inaccurate data circulate rapidly (garbage in, stays in, garbage grows)
- Use of data from legacy systems without examining data integrity

3.2.2. Project Complexity

Summary:

Project complexity has increased exponentially over the past two decades. This increase has many dimensions: mega-projects, designs that approach physical construction limits, construction in remote locations, partnerships, data integration requirements, and various project delivery systems and contracting strategies. Globalization, outsourcing, owners and contractors venturing into new territories, and geographical, social, and political factors add to the complexity of a project.

Discussion:

The recent increase in project complexity differs in nature from the complexity of projects constructed between the 1940s and the 1970s. During that era, projects expanded in size and complexity in the sense that more things were done on a given site than before. Since then, the challenges have included the number of project participants, speed of project delivery, and location of the project, for example.

The increase in project complexity has involved a dramatic increase in interfaces. One manifestation of project complexity is that design can now be developed at multiple offices. Also, the number of deliverables is staggering. This creates the need to define the division of responsibilities at the beginning of the project, actively manage the information flow, and to build in processes to ensure smooth interfaces between parties. IT systems need to be able to support both the quantity of data exchanged and the interfaces between parties.

Adding to project complexity today are geographical and socioeconomic factors that require project managers to develop diplomatic skills in international relations. Language and culture also present new challenges.

Implications:

- Many more interfaces and hand-offs (across and within a function)
- Collection and assembly of data
- Dramatic increase in the amount of data
- More detailed planning and tracking required for all aspects of a project
- Multiple organizations and people accountable for data input
- Necessity to interface among different participants' IT systems
- Major increase in data transmission required
- Language and terminology issues across various project organizations

3.2.3. Speed of Project Execution

Summary:

The demand for increased speed of project execution is tremendous. Today's projects rarely have sequential project phases. Fast tracking – the practice of overlapping design and construction – now is common practice. The pressure for faster project delivery has led to several changes. First, the procurement and subcontract process starts earlier in the project; subcontracting owners often need to order long-lead items to ensure delivery. Second, the popularity of design-build and engineer-procure-construct (EPC) has increased. Third, this trend drives the need for earlier staffing of project teams.

Discussion:

Fast track projects require intense planning up front and accelerate the strategy development and implementation phases. Getting the job kicked off as quickly as possible requires standard systems, structures (e.g., reporting), and templates. It is useful to have templates that define the division of responsibilities and the paths information should take between and among project teams.

Fast track projects sometimes require the schedule to be planned backwards, starting from the product need date. Increases in project execution shorten pre-planning and setup time and require early staffing. The planning phase does not allow much time for details. This trend calls for reliance on standard procedures and systems within the organization.

Keeping a database of historical projects gives an organization a competitive advantage. For example, an established historical project database can reduce the amount of time required to develop a schedule. The key is to put information in a format that allows one to base projects on a common ground.

Implications:

- Pre-planning and setup time shortened
- Early staffing required
- Planning can involve less accurate details
- Shortened timing and increase in number of interfaces
- Overlap of all phases
- Reliance on standard systems within the organization – less customization
- Emphasis on the need for orderly management of data (may or may not be near real-time data)
- This trend exacerbates all trends other than Trend #1 and #10.

3.2.4. Recognition of Changes

Summary:

Change management is one of the greatest challenges to PCMS. As organizations report more changes, they are increasingly emphasizing the performance of the PCMS change control system. Everyone then becomes responsible for the identification of changes, and the number of reported changes increases. This decrease in barriers for bringing changes forward results in more timely change management system. However, increased recognition of changes requires the project team to be more knowledgeable about contracts.

Discussion:

Change management is the responsibility of the entire project team. Project controls facilitate the identification of changes. The greatest change management challenge faced by a project team often lies in getting a good understanding of the project basis (e.g., what the estimate includes). Today, organizations strive to understand the impacts of all changes and look to hire project managers who