

CONSTRUCTION INDUSTRY INSTITUTE

BARRIERS TO IMPLEMENTATION
OF CII CONCEPTS: AN OVERVIEW

CII Member Companies

AT&T	ABB Lummus Crest Inc.
Aluminum Company of America	Guy F. Atkinson Company of California
Amoco Corporation	BE&K Construction Company
Anheuser-Busch Companies, Inc.	Bechtel Group, Inc.
Aramco Services Company	Belcan Engineering Group, Inc.
Atlantic Richfield Company	Black & Veatch
Chevron Corporation	Brown & Root, Inc.
Champion International Corporation	John Brown E&C
Consolidated Edison Company of New York, Inc.	Burns and Roe Enterprises, Inc.
Dow Chemical U.S.A.	Cherne Contracting Corporation
DuPont	Cianbro Corporation
Eastman Chemical Company	Day & Zimmermann International, Inc.
Enron Corporation	Dillingham Construction Holdings Inc.
Exxon Research & Engineering Company	Eichleay Holdings Inc.
FMC Corporation	Fluor Daniel, Inc.
General Motors Corporation	Ford, Bacon & Davis, Inc.
Glaxo Wellcome Inc.	Foster Wheeler USA Corporation
Hoechst Celanese Corporation	Fru-Con Corporation
Hoffmann-La Roche Inc.	Gilbert/Commonwealth, Inc.
Honeywell Incorporated	Graycor, Inc.
Houston Lighting & Power Company	Gulf States, Inc.
Intel Corporation	Huber, Hunt & Nichols, Inc.
International Paper Company	Hudson Engineering Corporation
James River Corporation	International Technology Corporation
Eli Lilly and Company	Jacobs Engineering Group, Inc.
Merck & Co., Inc.	J. A. Jones Inc.
Mobil Corporation	The M. W. Kellogg Company
Monsanto Company	Kiewit Construction Group, Inc.
Naval Facilities Engineering Command	Litwin Engineers & Constructors, Inc.
Northern States Power Company	Marshall Contractors Inc.
Ontario Hydro	Morrison Knudsen Corporation
Phillips Petroleum Company	Murphy Company
The Procter & Gamble Company	North Bros. Company
Rohm and Haas Company	The Parsons Corporation
Shell Oil Company	Raytheon Engineers & Constructors International
Sun Company, Inc.	Rust International Corporation
Tennessee Valley Authority	S&B Engineers and Constructors Ltd.
Texaco Inc.	Skanska Engineering & Construction Inc.
Texas Department of Transportation	Stone & Webster Engineering Corporation
U.S. Army Corps of Engineers	Sverdrup Corporation
U.S. Department of Commerce	TPA, Inc.
U.S. Department of State	Turner Construction Company
U.S. Generating Company	Woodward-Clyde Consultants
U.S. Steel	H. B. Zachry Company
Union Carbide Corporation	
Weyerhaeuser Paper Company	

Barriers to Implementation of CII Concepts: An Overview

Prepared by

Construction Industry Institute

Barriers to Implementation Research Team

Research Summary 42-1

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Overview

Are you getting value from your CII membership?

Are the recognized best practices of the construction industry being implemented on your projects?

Are you realizing the potential cost savings and benefits promoted by CII?

By the year 2000:

20% reduction in cost and schedule

25% reduction in accidents

20% improvement in productivity

95% predictability of cost and schedule

Does your organization have a commitment (with plans and funding) for:

- a CII Champion in your organization?
- education and training that includes CII recommendations?
- implementation of CII concepts?

Do all appropriate project and construction personnel have access to CII Publications?

If you cannot answer YES to all of these questions, you are not getting the most out of your construction dollars!

Preface

CII commissioned the Barriers to Implementation Research Team because of a perceived lack of application of the recommendations from CII research and generally slow progress in construction industry improvements. The research team was to identify and study the impact of barriers to implementation of CII principles and products, determine reasons for their existence, develop an array of alternative ways to avoid or overcome barriers in a variety of circumstances and organizational settings, and to determine the cost effectiveness of alternative solutions.

This publication summarizes the team's efforts. It provides interesting findings and conclusions as to what knowledge and application of CII concepts really exist at the project level, and what can be done about it.

The average level of implementation of constructability on industry projects is:

- a) 95%
- b) 80%
- c) 60%
- d) 35%

Answer on page 11

1

Introduction

CII has embraced several industry “Best Practice” concepts, which were identified by CII member companies as a means to achieve more cost-effective construction, and thereby advance the industry toward the goals of improved project cost, schedule, productivity and safety. Recent research indicates that these practices are not being implemented substantially on projects within these very same member companies. Why not?

Intuitive benefits and cost savings can be realized from the implementation of CII concepts. These are not just one organization’s ideas and recommendations, but collective recommendations for industry best practices from many CII member companies. These companies and individuals are recognized industry leaders, and are certainly among the best of the best. The construction industry is mature, with vast knowledge and experience among industry organizations and participants. There should be no doubt of the credibility of stated or intuitive benefits of the recommendations from CII and its member constituents. That being the case, the question again is: **why does research indicate that CII concepts are not being fully applied?**

Yes, there is some level of implementation of the concepts on all projects, and in all industry sectors, and with all contract types, particularly in the areas of safety and project controls. By and large, however, the level of implementation of the recommended best practices is far below where it can be for U.S. businesses. What is needed to maximize benefits? What is required of industry as a whole to be more competitive in world markets? The dilemma is similar to a common personal situation: Most people recognize if and when they are at least somewhat overweight, and most of them know what to do about it. How many of them are doing something about it?



Caution

Likewise, implementation of cost-effective practices in the construction industry is not going to happen without a serious commitment to action and change. The appropriate knowledge and information have long been available, as have the opportunities for savings.

Yes, barriers exist. Barriers are those things, real or perceived, that tend to inhibit or prevent change. As supported by literature, barriers are likely to exist in situations and organizational settings that make innovation, improvements, and any significant change difficult.

How do you implement a continuous improvement process on construction projects that are vastly different each time? How do you realize long-term benefits from a short-term project (construction) life cycle. Are these reasons or excuses for the construction industry to be lagging in implementation of improvements?

Limited data are available on documented savings from implementation, largely because of limited opportunity to repeat an identical project and measure improvements and savings from application of new and “best practice” techniques. Regardless, companies and individuals are not benchmarking project performance and improvements in the spirit of Total Quality Management (TQM).

Benefits and significant savings on specific projects have been reported. The difficulty has been to quantify the benefits and translate the potential to future projects. Many benefits are realized intuitively and are communicated informally with speculative ranges of cost savings or cost avoidance. For this same reason, the research team was not able to establish the cost effectiveness of successful strategies for implementation of the CII concepts as intended.



*“We don’t
have time or
the budget for
this stuff.”*

There is no “equation for savings.” Benefits and savings will vary from project to project and from organization to organization. However, intuitively there are tremendous opportunities for improvements and savings. Those waiting for concrete evidence of the return on investment will be surpassed by those progressively implementing improvements in the TQM spirit and reaping the benefits.

There is also no cookbook or prescription for answers to the questions or standard solutions to common problems. However, the Barriers to Implementation Research Team has identified a common thread of barriers within company and project organizations, and has outlined positive steps to take for improved levels of implementation of the CII concepts.

The sections that follow summarize the approach taken by the research team, and findings and conclusions from the industry research. Also provided is a sampling of the recommended tools and techniques for improved implementation of the CII concepts to be found in CII Implementation Resource 42-2, *Guideline for Implementation of CII Concepts—Best Practices for the Construction Industry*, prepared by the team.



“Prove it.”

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Research Team Approach

Mission: To identify and study the impact of barriers to implementation of CII principles and products.

The Research Team set out to identify barriers to implementation of CII principles consistent with its mission statement. One of the first barriers encountered by the research team was the lack of a clear definition and listing of CII principles other than those dealing with the objectives and key pursuits of the CII organization.

The team, therefore, defined the principles to be those core “best practice” concepts for the construction industry that have been embraced by CII and promoted in the various CII publications. This became the definition of the term “CII Concepts” that was adopted and used subsequently to avoid confusion.

For lack of an established listing of these core “best practice” concepts, the team reviewed all available CII publications* and established the list of 13 CII Concepts shown of the following page.



“CII Principles?”

* Publications reviewed are those indicated in the Matrix, (Appendix A). Some later publications were not included in the research project interviews. However, it is the opinion of the research team that implementation of the concept was adequately assessed through questions and criteria available in prior and related publications.

2: Research Team Approach

CII Concepts:

Constructability
Continuous Improvement
Contract Relationships and Equitable Risk Sharing
Design Effectiveness
Education and Training
Materials Management
Partnering/Team Building
Project Control
Project Organization and Management
Quality Performance
Management and Measurement
Safety
Scope Definition and Control
Technology Exploitation

In addition to identifying the concepts, the team established a definition for each concept and extracted from the CII Publications key elements for implementation of the concepts. A Concept Summary Sheet was developed for each of the 13 concepts to document the information for future reference. A sample sheet for Constructability is shown on the following page. Concept Summary sheets for all 13 concepts are provided in Appendix B.

In addition to the Concept Summary Sheets, detailed “Checklists for Implementation” were created to provide a comprehensive listing of the elements of implementation of the concepts. These checklists provide a useful reference and tool for improving levels of implementation, and for incorporating recommendations into project plans and procedures. They may also be used as a self-audit tool for a particular project.

The detailed “Checklists for Implementation” are provided in their entirety in CII Implementation Resource 42-2, *Guideline for Implementation of CII Concepts—Best Practices for the Construction Industry*.

CII Concept Summary Sheet

Title: CONSTRUCTABILITY

Definition: Constructability is the optimum use of construction knowledge and experience in planning, design, procurement and field operations to achieve overall project objectives. Constructability is achieved through the effective and timely integration of construction input into planning and design as well as field operations.

Elements:

- The published project execution plan includes constructability as an element of the document.
- The project execution plan identifies the construction manager, the team, and its goals/objectives.
- This plan is updated to meet prevailing project conditions.
- Agendas and meeting notes are published for each review.
- Specific constructability studies are identified and conducted. Recommendations are published, and when implemented, are duly recorded.
- Recommendations are assessed for impact on safety, quality, cost, and schedule.
- Constructability costs are tracked and evaluated for cost effectiveness.
- Unique problems associated with implementation of the constructability program are closely examined to determine how problems can be best overcome on future projects.
- Mandatory documentation for each site: project execution plan; constructability log; agenda and meeting minutes of constructability reviews; and constructability cost-tracking data.

CII Publication References: 3-1, 3-2, 3-3, 6-9, 6-10, 8-1, 8-2, SP-13, 29-2, 34-1

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Industry Research Project

Approach

In order to identify barriers and their impact on implementation, the actual level of implementation of the concepts needed to be established and examined. A significant differential between the actual implementation and CII recommendations would indicate potential barriers to be addressed.

The research project was therefore formulated by the team to develop a systematic data collection procedure to quantify the level of CII implementation in industry, document barriers, and capture successful implementation strategies. The research data collection involved personal interviews with representatives of the owner, engineer and contractor organizations from 22 active projects ranging in size from \$2 million to \$600 million. The interviews were focused at the project level to identify barriers at the working level, rather than to recapture perceived levels of implementation by company management or corporate-level individuals.

The interviews were facilitated by a survey questionnaire, developed by the research team, which would allow scoring of responses to indicate the level of implementation of the concepts. The survey tool was developed from the detailed Checklists for Implementation by converting the key elements for implementation of the concepts into criteria for implementation in question format.

The survey questionnaire is divided into three areas to determine the levels of implementation of each of the 13 CII Concepts. These categories were developed on the premise that in order to achieve implementation, there must be knowledge of the concept, a plan for implementation, and a process for implementation.

Therefore, the categories of measure were defined as follows:

Category	Measure
<i>Knowledge</i>	The level of basic familiarity with the concept and related CII Publications.
<i>Plan</i>	The level of planning and documentation (plans, procedures, logs, etc.) that provide evidence of the intent to implement the concept.
<i>Process</i>	The extent that activities, procedures, and working processes address and include the concept.

(Figure 1a and 1b show a partial sample of the survey tool for the concept of Constructability).

Scoring

The responses to questions during the project interviews were subjectively scored and then multiplied by the weighting of each question to obtain a scoring index. This process was repeated for all question categories and concepts.

The total scores for each concept were averaged and graphed as shown in Figure 2. The top five scores for each concept were also shown to reflect the best levels of implementation in the industry (not skewed by the negligible or non-implementers).