

CONSTRUCTION INDUSTRY INSTITUTE

PRE-PROJECT
PLANNING TOOLS:
PDRI AND ALIGNMENT

Construction Industry Institute

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Pre-Project Planning Tools: PDRI and Alignment

**Prepared by
The Construction Industry Institute
Front End Planning Research Team**

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Executive Summary

Previous CII research found that tools for measuring project scope definition and assisting alignment between project participants needed to be developed. The CII Front End Planning Research Team (RT 113) was formed in 1994 to produce effective, simple, and easy-to-use scope definition and alignment tools. These tools should help owners and contractors better achieve business, operational, and project objectives.

RT 113 first produced the *Project Definition Rating Index (PDRI), Industrial Projects* (CII Implementation Resource 113-2). This book provides a method for measuring project scope development. The PDRI weighted index, based on industry best practices, allows its users to measure the level of scope definition and to compare scope definition to anticipated project success. It consists of 70 elements in a weighted checklist format. The weighted score of a project can range up to 1000 points, with a lower score being better. Based on an analysis of 40 projects, the research team found that projects scoring less than 200 (out of 1000 total points) were significantly more successful than those that scored greater than 200.

The research team also analyzed the impact of alignment between business, project management, and operations personnel of owner companies, as well as the alignment between owners and contractors. As part of the research, over 100 industry participants were interviewed and 20 capital projects evaluated in depth. This led to the identification of 10 critical alignment issues that must be addressed during pre-project planning. These 10 issues were shown to correlate positively with project success. To address these issues, the research team developed an in-process tool called the Alignment Thermometer and published *Alignment During Pre-Project Planning* (CII Implementation Resource 113-3). This research summary provides an overview of the scope definition and alignment research and introduces the tools and their benefits.

Introduction

CII defines pre-project planning as *the process of developing sufficient strategic information with which owners can address risk and decide to commit resources to maximize the chance for a successful project*. Pre-project planning has many aliases such as front-end loading, front-end planning, feasibility analysis, programming, conceptual planning, and others.

Previous CII research has documented that project success is greater when an increased level of pre-project planning is used, yielding:

- increased predictability of cost and schedule.
- reduced probability of project failures.
- improved operational performance.
- better achievement of business goals.
- better definition of risks.
- fewer scope changes.

The CII Front End Planning Research Team, formed as a follow-on to the earlier pre-project planning research effort, had the task of developing implementation tools. As outlined in this summary, research has shown that the tools and techniques developed by the research team can play an important role in improving the overall success of capital projects.

The central premise of the Front End Planning Research Team effort has been that “teams must be working on the right project in a collaborative manner (alignment), and performing the right work (scope definition) during pre-project planning.”

The need to develop tools and information to assist in managing this process is evident. The research team established two major objectives: 1) to develop an easy-to-use scope definition tool containing the critical scope definition elements that can be related to project success, and 2) to identify and define critical issues in gaining and maintaining alignment of project participants during pre-project planning. These objectives have been met and the results are presented in this document. Chapter 2 discusses the development and usage of the Project Definition Rating Index (PDRI). Chapter 3 outlines the definition of alignment, an overview of the research, and the critical issues that must be addressed to insure alignment of organizations during pre-project planning. Best practices and recommendations are given in Chapter 4.

The Project Definition Rating Index (PDRI)

PDRI Development Methodology

To meet the objective of producing a scope definition tool, the research team chose to develop an industrial version, as this segment of the industry is most representative of the CII membership. Versions for other industry segments are being considered.

The research team began by examining previous research in scope development, including CII investigations. It was found that no easy-to-use tool is currently available to measure either the degree of pre-project planning or scope definition. In addition, little documentation is available to define the differences in scope development for industrial, building, and infrastructure projects.

The industry's need for a tool to define scope was apparent, as was the challenge to develop such a tool. The research team met that challenge successfully with its development of the Project Definition Rating Index (PDRI). The PDRI meets the requirement of being easy-to-use, and identifies and precisely defines each critical element in a scope definition package. By doing so, the PDRI allows a quick prediction of factors that will impact project risk.

To develop a detailed list of the required elements within a good scope definition package, four primary sources were utilized: the expertise of the research team, a literature review, documentation from a variety of owner and contractor companies, and a separate workshop of project managers and estimators. Initial topic categories were obtained from previous research and through using the research team's internal expertise. This preliminary list was expanded using scope development documentation from 14 owner and contractor companies. Through affinity diagramming and nominal group techniques, the list was further refined and agreement reached regarding exact terms and nomenclature of element definitions. Once

this was completed, a separate workshop of six individuals representing one owner and three engineering and construction companies who had not seen the approach previously was held to refine the list of elements and their definitions. The final list consists of 70 elements grouped into 15 categories and further grouped into three main sections. This list, which forms the basis of the PDRI, is presented in Table 1. Each of these elements is further described in detail to assist users in determining the level of definition of each.

The research team hypothesized that all elements are not equally important with respect to their potential impact on overall project success. Therefore, each element needed to be weighted relative to the others. More weight was to be assigned to those elements whose lack of definition could have the most seriously negative effect on project performance.

To develop credible weights, it was felt that a broad range of industry expertise would provide the best input. Therefore, 54 experienced project managers and estimators were invited to two workshops. One workshop was held in the northeastern U.S. and the other in the southwestern U.S. to obtain an equitable representation from different geographic regions. At each workshop, the participants were asked to weight each element on the PDRI score sheet in terms of importance based upon their own experience. This input then was used to determine the individual element weights.

The weighting process is fairly complex and beyond the scope of this research summary. Suffice it to say that each of the weighted score sheets (a total of 38 were collected) were based on a standard project that the respondent, or respondent team, had recently completed. The respondent scored each element based on the impact that it would have on total installed cost of the facility in question in terms of level of definition. The score sheets were then each normalized to 1000 points to produce a mean value for each element. (Several statistical tests were performed. For more information on this methodology see References 3 and 4.)

Table 1. PDRI Sections, Categories, and Elements

I. BASIS OF PROJECT DECISION

A. Manufacturing Objective Criteria

- A1. Reliability Philosophy
- A2. Maintenance Philosophy
- A3. Operating Philosophy

B. Business Objective

- B1. Products
- B2. Market Strategy
- B3. Project Strategy
- B4. Affordability/Feasibility
- B5. Capacities
- B6. Future Expansion Considerations
- B7. Expected Project Life Cycle
- B8. Social Issues

C. Basic Data Research & Development

- C1. Technology
- C2. Processes

D. Project Scope

- D1. Project Objective Statement
- D2. Project Design Criteria
- D3. Site Characteristics Existing/ Required
- D4. Dismantling and Demolition Requirements
- D5. Lead/Discipline Scope of Work
- D6. Project Schedule

E. Value Engineering

- E1. Process Simplification
- E2. Design & Material Alternatives Considered/ Rejected
- E3. Design for Constructability Analysis

II. FRONT END DEFINITION

F. Site Information

- F1. Site Location
- F2. Surveys & Soil Tests
- F3. Environmental Assessment
- F4. Permit Requirements
- F5. Utility Sources with Supply Conditions
- F6. Fire Protection & Safety Considerations

G. Process/Mechanical

- G1. Process Flow Sheets
- G2. Heat & Material Balances
- G3. Piping & Instrumentation Diagrams (P&IDs)
- G4. Process Safety Management (PSM)
- G5. Utility Flow Diagrams
- G6. Specifications
- G7. Piping System Requirements
- G8. Plot Plan
- G9. Mechanical Equipment List
- G10. Line List
- G11. Tie-in List
- G12. Piping Specialty Items List
- G13. Instrument Index

H. Equipment Scope

- H1. Equipment Status
- H2. Equipment Location Drawing
- H3. Equipment Utility Requirements

I. Civil, Structural, & Architectural

- I1. Civil/Structural Requirements
- I2. Architectural Requirements

Table 1. PDRI Sections, Categories, and Elements (continued)

J. Infrastructure	L3. Procurement Responsibility Matrix
J1. Water Treatment Requirements	M. Deliverables
J2. Loading/Unloading/Storage Facilities Requirements	M1. CADD/Model Requirements
J3. Transportation Requirements	M2. Deliverables Defined
K. Instrument & Electrical	M3. Distribution Matrix
K1. Control Philosophy	N. Project Control
K2. Logic Diagrams	N1. Project Control Requirements
K3. Electrical Area Classifications	N2. Project Accounting Requirements
K4. Substation Requirements/Power Sources Identified	N3. Risk Analysis
K5. Electric Single Line Diagrams	P. Project Execution Plan
K6. Instrument & Electrical Specs.	P1. Owner Approval Requirements
III. EXECUTION APPROACH	P2. Engineering/Construction Plan & Approach
L. Procurement Strategy	P3. Shut Down/Turn-Around Requirements
L1. Identify Long Lead/Critical Equipment & Materials	P4. Pre-Commissioning Turnover Sequence Requirements
L2. Procurement Procedures and Plans	P5. Start-up Requirements
	P6. Training Requirements