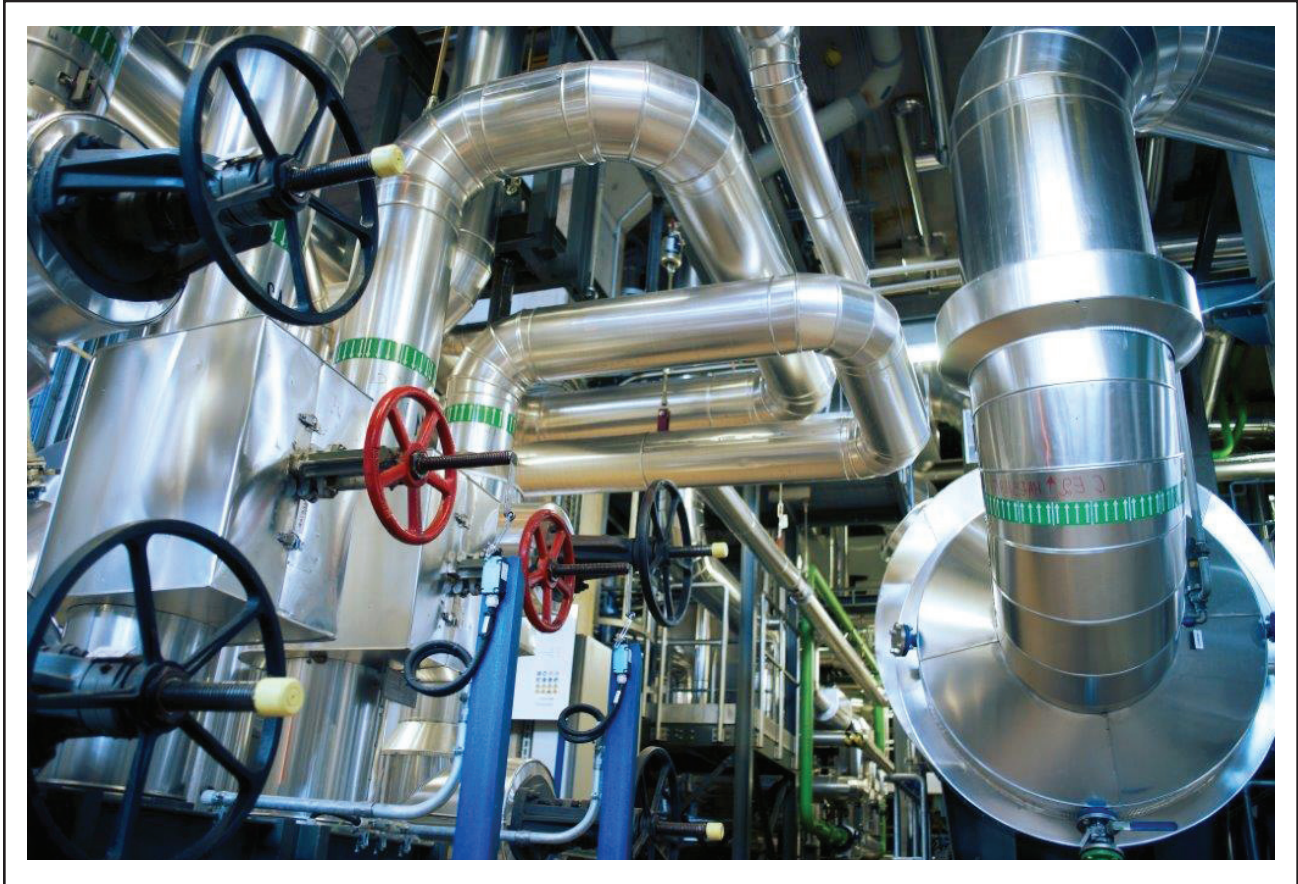




Project Definition Rating Index



Small Industrial Projects

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PDRI:
Project Definition Rating Index –
Small Industrial Projects

*Research Team 314, A Project Definition Rating Index
for Small Industrial Projects*

Construction Industry Institute

Implementation Resource 314-2

September 2015

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Foreword

Welcome to the first edition of the *PDRI: Project Definition Rating Index – Small Industrial Projects*. CII Research Team 314, PDRI–Small Industrial Projects, developed this resource to address a critical industry need. Past work by CII, published in 1991 and 2003, described the difficulty of defining the term “small project.” The RT 314 research investigation defined small projects as those generally valued at less than \$10 million (U.S. dollars) in expenditure, with construction durations of between three and six months, and of less overall complexity than large projects, based on several indicators; these projects annually comprise more than 70 percent of all completed projects by number in most organizations’ portfolios. In addition to producing this publication, the team created a macro-enabled spreadsheet to help project teams assess their projects. This Excel-based file is available as a download or on CD.

With this publication, CII has filled a gap in its front end planning body of knowledge. This document and the Excel-based tool will help project teams develop scope definition on small industrial projects, whether they involve new construction or renovation. It is complementary to CII Implementation Resource (IR) 113-2, *PDRI–Industrial Projects*, which was developed specifically to assess the scope definition of large, complex industrial projects. Two other PDRI tools also focus on large, complex projects. They include IR 155-2, *PDRI–Building Projects*, and IR 268-2, *PDRI–Infrastructure Projects*. (Note that at publication, no small-project PDRI versions exist for the building or infrastructure sectors.)



Contents

<i>Chapter</i>	<i>Page</i>
Foreword	iii
1. What Is the PDRI?	1
2. Benefits of the PDRI	15
3. Instructions for Assessing a Project	19
4. What Does a PDRI Score Mean?	35
5. Concluding Remarks	39
Appendix A. Unweighted Project Score Sheet	41
Appendix B. Weighted Project Score Sheet	45
Appendix C. Element Descriptions	49
Appendix D. Industrial PDRI Selection Guide Tool	79
Appendix E. Examples of Completed PDRI	83
Appendix F. Logic Flow Diagrams	91
Appendix G. Facilitation Instructions	97
Appendix H. Example Action List	103
References	105

What Is the PDRI?

The PDRI is a powerful, easy-to-use tool for measuring the degree of scope development.

The Project Definition Rating Index (PDRI) is a powerful, easy-to-use tool for measuring the completeness of project scope definition. It identifies and precisely describes each critical element in a scope definition package. It also quickly allows project teams to identify project risk factors related to desired outcomes for cost, schedule, and operating performance. Using the PDRI method, teams can capture mitigation action items as well. It is designed to evaluate the completeness of scope definition at any point prior to detailed design and construction. While three previously developed versions of the PDRI apply to large and complex projects for building, industrial, and infrastructure projects (IR 155-2, IR 113-2, and IR 268-2, respectively), this version addresses small industrial projects.

Table 1.1 can help PDRI users decide which versions of the PDRI are most applicable to particular projects, since it lists practical applications for each one. For further clarification, Table 1.2 summarizes the main characteristics of infrastructure, building, and industrial projects. Together, these tables can guide the selection of the most appropriate PDRI for any project under consideration.

Table 1.1. Applicable Project Types for Each PDRI

Industrial Projects (IR 113-2, IR 314-2)		
• Oil/gas production facilities • Textile mills • Chemical plants • Pharmaceutical plants • Paper mills	• Steel/aluminum mills • Power plants • Steam heat/chilled water plants • Manufacturing facilities	• Food processing plants • Refineries • Water/wastewater treatment • Plant upgrade/retrofit
Infrastructure Projects (IR 268-2)		
• Pipelines • Aqueducts • Pumping and compressor stations • Locks, weirs • Reservoirs • Meters and regulator stations • Pig launchers and receivers	• Water control structures • Levees • Highways • Railroads • Access ramps • Tunnels • Airport runways • Canals • Security fencing	• Electricity transmission/distribution • Fiber optic networks • Wide area networks • Electrical substations/switch gears • Towers
Building Projects (IR 155-2)		
• Offices • Schools (classrooms) • Banks • Research and laboratory facilities • Medical facilities • Nursing homes • Institutional buildings • Stores and shopping centers	• Dormitories • Apartments • Hotels and motels • Parking structures • Toll booths • Warehouses • Light assembly and manufacturing • Churches • Airport terminals	• Recreational and athletic facilities • Public assembly and performance halls • Industrial control buildings • Government facilities

Table 1.2. Project Sector Characteristics

PDRI Selection Matrix			
Characteristics	Infrastructure	Building	Industrial
<i>Primary Designer</i>	Civil engineer	Architect	Chemical, mechanical, industrial
<i>Project Orientation</i>	Horizontal	Vertical	Vertical
<i>System</i>	Vector	Node	Node
<i>Utilization</i>	Conveyance	Functional use	Transformation
<i>Operational</i>	Flow dynamics, networked into a grid	Nodal terminations	Consumptions and production
<i>Interface with Public</i>	Extensive	Moderate	Minimal
<i>Environmental Impact</i>	Extensive	Moderate	Extensive
<i>Primary Cost</i>	Earthwork, materials, associated structures	Building, building system	Piping, mechanical, equipment
<i>Installed Equipment Cost</i>	Minimal	Moderate	Extensive
<i>Land Cost</i>	Moderate to high	Low to high	Low to moderate
<i>Jurisdiction Interface</i>	Extensive	Moderate	Moderate

The PDRI is intended for use during front end planning, the project phase that encompasses activities such as feasibility, concept, and detailed scope definition. (See Figure 1.1.) It is noteworthy that “front end planning” has many other equivalent and associated terms, including “front end loading,” “pre-project planning,” “programming,” “schematic design,” “design development,” and “sanctioning.” Although the term “front end planning” is used in this document, it should be considered synonymous with the analogous term within the user’s business process. (More detailed information on timing and process is provided below.) Although, the original PDRI was envisioned as a decision-support metric for funding detail design and project execution at Phase Gate 3, experience has shown that, depending on project size and complexity, it should be used more than once prior to arriving at this gate.

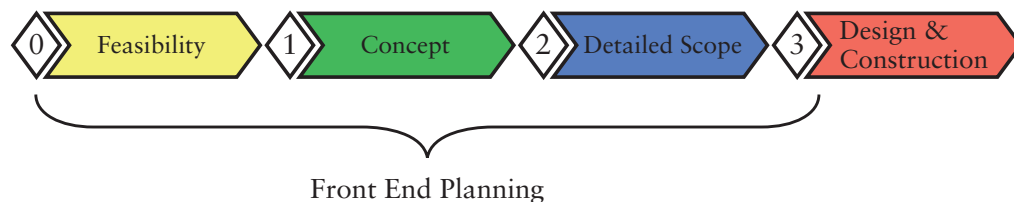


Figure 1.1. Project Life Cycle Diagram

All versions of the PDRI include specific risk factors relating to new construction (greenfield) projects and renovation and revamp (R&R) projects. An R&R project is defined as one that is focused on an existing facility but does not involve routine maintenance activities. It includes the act, process, or work of replacing, restoring, repairing, or improving the facility with capital funds or non-capital funds. It may also include the construction of additional structures and systems to achieve a more functional, serviceable, or desirable condition. These modifications address such considerations as profitability, reliability, efficiency, safety, security, environmental performance, or compliance with regulatory requirements. The R&R project may be known by numerous other names, such as repair, upgrade, modernization, or restoration, among others. More details on how to adapt the PDRI to R&R projects are presented below. (For more information on how to manage front end planning of R&R projects, see IR 242-2, *Front End Planning of Renovation and Revamp Projects*.)

How Is This PDRI Different?

Industrial projects with substantial scope, complexity, schedule duration, and cost are typically considered large, while projects with lower costs and smaller scope are categorized as small. Organizations expend considerable effort to ensure success on large projects, since they view them as critical to their overall financial prosperity. Also, because they view small projects as having low risk and, thus, as not warranting a structured planning approach, they often place minimal emphasis on detailed front end planning. Moreover, organizations often use small projects as training grounds for younger or inexperienced project managers and engineers, to prepare them for work on larger future projects. In reality, it is shortsighted to assume that a small project inherently carries lower risk or is less critical to an organization. Indeed, because small projects make up seventy to ninety percent of all projects completed in the industrial sector every year, poorly planned small projects can have a major cumulative impact on an organization's bottom line. CII chartered RT 314 to develop the PDRI–Small Industrial Projects to address this highly important and prevalent project type.

The team defined small projects as those generally with less than \$10 million (U.S. dollars) in expenditures, three to six months in construction duration, and less overall complexity than large projects based on several indicators; these projects annually comprise more than 70 percent of all completed projects by number in most organizations' portfolios. The speed and concurrent phasing of small projects make it more difficult to provide guidance on the best time to conduct a PDRI review. On many small projects, the entire project may be charged against a funding budget, hence users will want to perform an initial assessment to “get on track.” In other situations, there may be a funding point after the initial decision to proceed with the development, and the optimal time to use the tool may be just prior to that second funding decision. Figure 1.2 shows that a small project may be phased such that feasibility, concept, detailed scope, design, procurement, and construction all overlap. Engaging in so much concurrent activity may not be the optimal way to proceed with a project, but it may reflect the reality of typical small industrial projects.

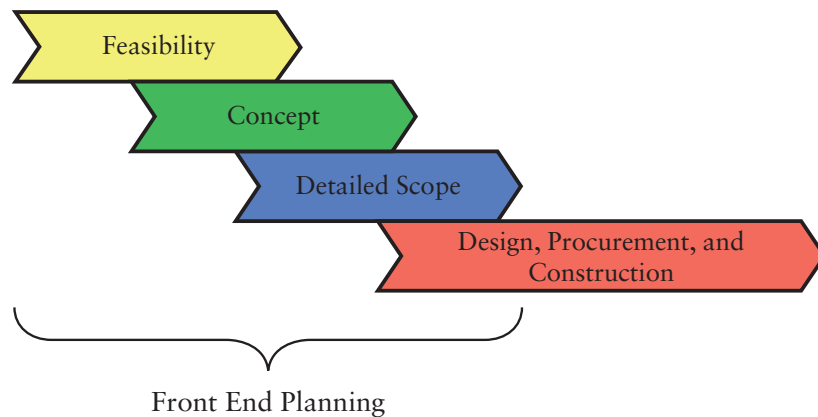


Figure 1.2. Project Life Cycle Diagram – Typical Small Industrial Projects

RT 314 designed the PDRI–Small Industrial Projects so that it could be used multiple times throughout the FEP process, or as a one-time-use tool. By utilizing the tool multiple times, project teams can benefit from iterative reviews within a narrower time frame consistent with a shorter project schedule. However, when used only once in the FEP process, a project team may find the tool comparably effective if deployed properly. For one-time use, it will work best with proper review-team development, effective capture of and follow-up on action items, and open and honest discussion aimed at revealing project scope concerns. Also, if a project is assessed only once, the earlier in the project life cycle this occurs, the better. (See Chapter 3 for further details regarding timing of use.)

The PDRI–Small Industrial Projects assesses specific risk factors related to repetitive programs, which consist of many similar projects executed throughout an organization’s portfolio, typically using company-wide standards. Typical drivers of repetitive programs include the following: replacements and upgrades to meet new regulations; equipment failures (end of life); safety; expansions; and security concerns. Ideally, all projects in these programs should be developed and executed consistently with the overall program standards. These program requirements are likely to be developed at a higher programmatic level and should flow down into a given project being evaluated with this tool.

The research team also created the PDRI–Small Industrial Projects to assess both process- and non-process-related projects. The team defines a process-related project as any project in an industrial facility related to constructing or refurbishing the systems, equipment, utilities, piping, and/or controls that directly affect the production rate, efficiency, quantity, or quality of a product. These projects typically have a stated return on investment (ROI) expectation directly related to improved production factors; and this improvement may affect how the product is marketed to consumers (e.g., as of a higher quality than before or as available in more quantities). In most cases, project teams need to create or update documents pertaining to the ongoing operations of facilities (e.g., piping and instrumentation diagrams and process safety management plans).

A non-process-related project is any project in an industrial facility that is ancillary to production processes, but that does not directly affect the quantity or quality of the product. Examples of such projects include the following: any addition to or expansion of the infrastructure that supports a facility; facility updates necessary for environmental or safety compliance; and replacement-in-kind of facility components (e.g., equipment, structural, or piping) that do not directly affect the nature of the product. If an ROI is required on these projects, it is typically tied to improving facility operating efficiencies not directly related to production, such as increased energy efficiency from installing variable frequency drives (VFDs) on HVAC equipment, or installing solar panels to lessen the amount of power needed from a public utility provider. The project team may or may not need to create or update documents pertaining to the ongoing operations of the facility (e.g., piping and instrumentation diagrams or process safety management plans).

Following are examples of small industrial projects:

PROCESS-RELATED

Oil/gas refining facilities

- Stack monitoring and flare line replacement
- Replacement of desalter effluent cooler fin fans
- Installation of a gasoline cooler in a pipeline
- Addition of a hydrogen plant within an existing refinery
- Replacement-in-kind of process piping

Pulp/Paper Mills

- Replacement of entangling section
- Replacement of internal screens in a digester vessel
- Replacement of a headbox section
- Replacement of components associated with a wood-yard log chipping line

Manufacturing Facilities

- Installation of a new packaging line
- Modifications to existing packaging line
- Addition of a motor control center

Breweries

- Replacement of cooker coils
- Upgrade coders on a can line
- Chemical Plants
- Installation of new technology nylon compounding extruder and pack-out
- Replacement of an injection molder

NON-PROCESS-RELATED

Plant Upgrade/Retrofit

- Replacement of existing elevators
- Replacement of existing HVAC equipment
- Repointing of existing masonry structures
- Replacement of or upgrades to existing power supply
- Installation of a raw-materials railcar offload station
- Water conservation projects
- Replacement of constant speed electric feed-water pumps with variable-frequency driven pumps
- Addition of waste water clarifier to a storm sewer system
- Installation of new dust collection equipment and ducting
- Installation of environmental monitoring or noise abatement equipment
- Installation of new security cage and associated security system within an existing operating warehouse facility

PDRI Structure

The PDRI–Small Industrial Projects offers a comprehensive checklist of 41 scope definition elements in an easy-to-use score sheet format. (Note that IR 113-2, *PDRI for Industrial Projects*, has a total of 70 elements.) Each element is weighted on the basis of its relative importance to the other elements. Since the PDRI score relates to risk, users can easily isolate areas in need of further work, and then identify and document mitigation actions. (See Chapter 4 for a detailed description of the weighting system). To develop the PDRI–Small Industrial Projects, the research team collected input and feedback from 26 industry professionals representing owner organizations and 39 representing contractors. Altogether representing 29 organizations, these 65 industry veterans had an average of more than 20 years of individual experience in managing small industrial projects.

The PDRI consists of three main sections, each of which is broken down into a series of categories. Figure 1.3 shows how these categories are divided into elements in one part of the PDRI hierarchy. Table 1.3 provides a complete list of the PDRI's three sections, eight categories, and 41 elements.

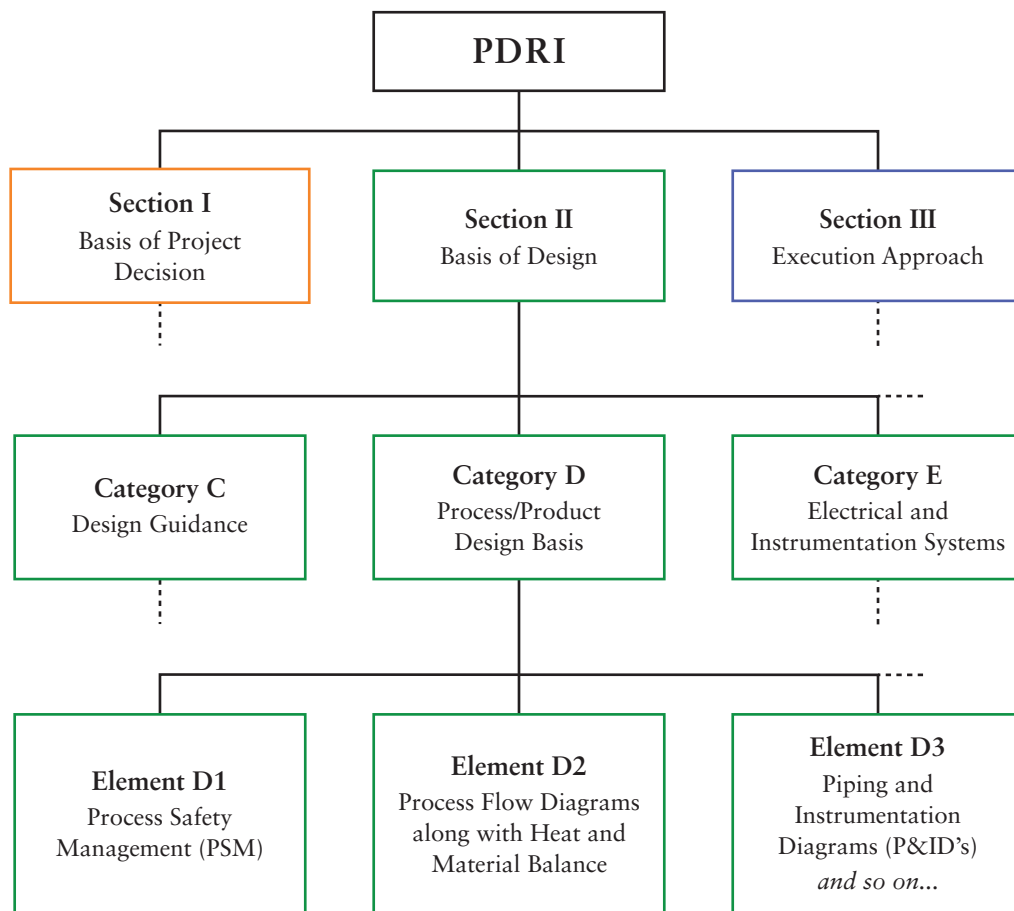


Figure 1.3. Partial PDRI Hierarchy

Table 1.3. PDRI Sections, Categories, and Elements

I. BASIS OF PROJECT DECISION	
A. Project Alignment	B. Project Performance Requirements
A1. Project Objectives Statement	B1. Products
A2. Project Strategy and Scope of Work	B2. Capacities
A3. Project Philosophies	B3. Processes
A4. Location	B4. Technology
	B5. Physical Site
II. BASIS OF DESIGN	
C. Design Guidance	D. Process/Product Design Basis
C1. Lead/Discipline Scope of Work	D1. Process Safety Management (PSM)
C2. Project Design Criteria	D2. Process Flow Diagrams along with Heat and Material Balance
C3. Project Site Assessment	D3. Piping and Instrumentation Diagrams (P&IDs)
C4. Specifications	D4. Piping System Stress Analysis
C5. Construction Input	D5. Equipment Location Drawings
	D6. Critical Process/Product Items Lists
E. Electrical and Instrumentation Systems	F. General Facility Requirements
E1. Control Philosophy	F1. Site Plan
E2. Functional Descriptions and Control Narratives	F2. Loading/Unloading/Storage Requirements
E3. Electrical Single Line Diagrams	F3. Transportation Requirements
E4. Critical Electrical Items Lists	F4. Additional Project Requirements
III. EXECUTION APPROACH	
G. Execution Requirements	H. Engineering/Construction Plan and Approach
G1. Procurement Plan	H1. Engineering/Construction Methodology
G2. Owner Approval Requirements	H2. Project Cost Estimate
G3. Distribution Matrix	H3. Project Accounting and Cost Control
G4. Risk Management Plan	H4. Project Schedule and Schedule Control
G5. Shutdown/Turnaround Requirements	H5. Project Change Control
G6. Precommissioning, Start-up, and Turnover Sequence Requirements	H6. Deliverables for Design and Construction
	H7. Deliverables for Project Commissioning/Closeout

The PDRI should be used in conjunction with Implementation Resource 113-3, *Alignment During Pre-Project Planning: A Key to Project Success*, to ensure that critical risk issues are addressed and that stakeholder interests are represented

effectively in the front end planning process. In addition, users should determine whether the project is a renovation or revamp project. If it is either of these, they should use the additional descriptions provided in the tool (in the “Renovation and Revamp” sub-section) to address critical R&R issues during front end planning. Figure 1.4 provides a decision diagram to help users determine the most effective use of the PDRI–Small Industrial Projects tool. (Note that, if the project includes a shutdown/turnaround/outage scenario, the project planning team should also use the Shutdown Turnaround Alignment Readiness tool provided in IR 242-2, *Front End Planning of Renovation and Revamp Projects*, to address the unique issues associated with these types of events.)

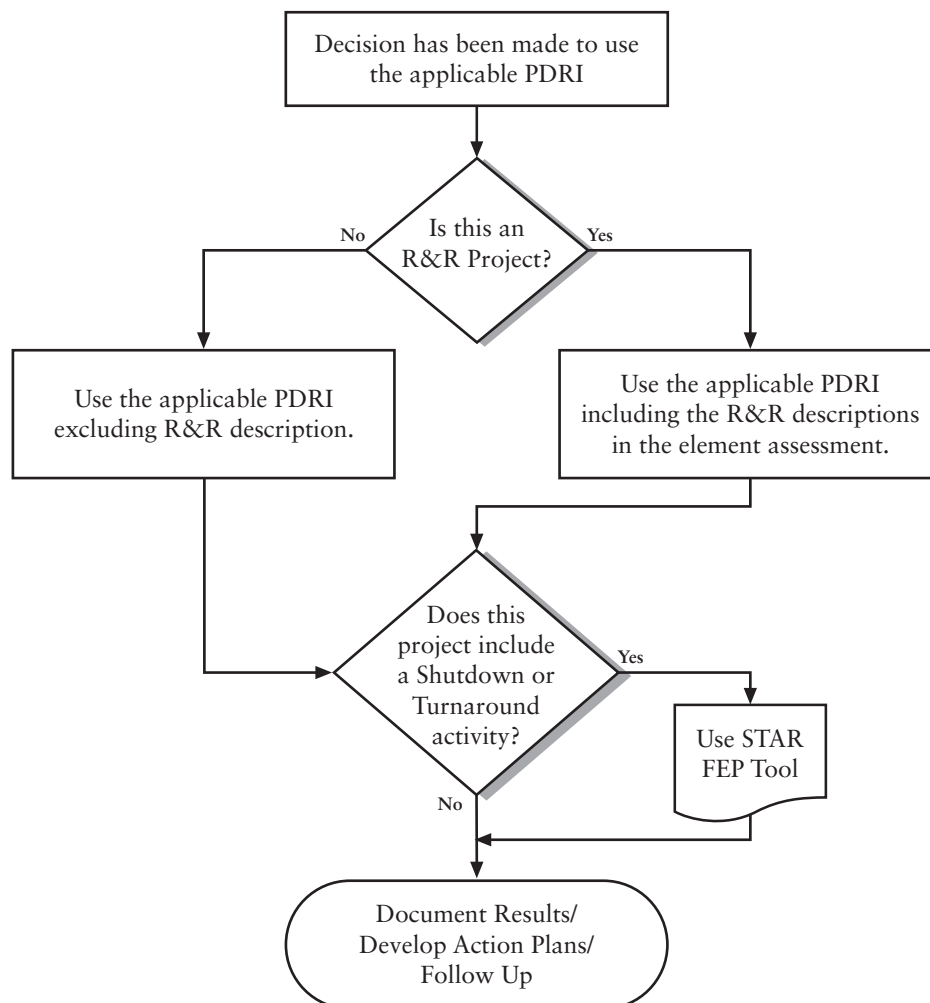


Figure 1.4. Use of Additional Tools to Supplement the PDRI

Choosing the Appropriate Industrial PDRI

Simply put, a small industrial project is not a large industrial project. While this statement may seem flippant, it reflects the fact that, over time, project professionals have had considerable debate over the distinction between small and large projects. Indeed, past CII research explored this topic and concluded that a clear, consistent definition of a small project does not exist. However, what is clear is that a project viewed as small by one organization may not necessarily be viewed as small by another.

Small projects should not be differentiated from large projects solely on the basis of static project cost levels within an organization or across the industry at large. Complexity is the true differentiator between small and large projects. A complex is defined as a group of obviously related units among which the degree and nature of inter-relationship is imperfectly known. Complexity is the quality or state of having such incompletely understood components. Industrial construction projects can fall anywhere along a spectrum of complexity, from projects with little to no complexity (i.e., simple maintenance projects) to highly complex projects (i.e., mega-projects). The rigor of planning efforts expended on a project should match its level of complexity. The PDRI–Small Industrial Projects focuses on lower-complexity projects.

Table 1.4 provides data from a study of 90 industrial projects with varying levels of complexity. It gives the averages of nine separate project attributes for typical small and large industrial projects. This table, along with the PDRI Industrial Selection Guide tool (provided in Appendix D), can be used as a method to determine the appropriate industrial PDRI for use on a project.

Table 1.4. PDRI Industrial Selection Guide

Project Complexity Indicator	PDRI–Small Industrial Projects	PDRI–Industrial Projects
<i>Total Installed Cost</i>	Less than \$10 million (U.S. dollars)	More than \$10 million (U.S. dollars)
<i>Construction Duration</i>	3–6 months	9–15 months
<i>Level of Funding</i>	Between regional and corporate	Between corporate and Board of Directors
<i>Project Visibility</i>	Moderate	Significant
<i>Number of Core Team Members</i>	7–9 individuals	10–15 individuals
<i>Availability of Core Team Members</i>	Part-time availability	Combination of part-time and full-time to completely full-time
<i>Extent of Permitting</i>	None to minimal permitting	Minimal to significant permitting
<i>Types of Permits</i>	None to local/state permits	Local/state to national permits
<i>Number of Trade Contractors</i>	3–4 separate trade contractors	7–8 separate trade contractors

This matrix provides direction for selecting the appropriate PDRI tool for use on an industrial project, but should not be used as a strict guideline. In some organizations, projects with total installed costs of US\$10 million may be very small, while in other organizations, projects of this caliber would be considered very large. In choosing a suitable tool for a specific project, users are urged to consider such factors and let common sense prevail. If project team members feel that a certain project should be considered small based on their experiences in their organization, it probably is. The same can be said about large projects.

Users should keep in mind that RT 314 developed the PDRI–Small Industrial Projects just for assessing small projects. The tool is *not* intended as a short-cut to use in lieu of assessing a project with PDRI–Industrial Projects. Some organizations may wish to base the selection criteria on the characteristics of their typical projects; however, RT 314 validated the results presented in this document for projects meeting the criteria presented in Table 1.4.

Benefits of the PDRI

Effective early project planning improves project performance in terms of both cost and schedule, since it reinforces the positive impact of early scope definition on project success. The PDRI allows a project team to assess, quantify, and rate the level of scope development and readiness for project execution, prior to detailed design and construction. Moreover, it is a means by which project enablers can be identified early and acted upon. Its ability to provide these early measures and indicators makes the PDRI a remarkably powerful proactive project management tool.

A significant feature of the PDRI–Small Industrial Projects is that one can quickly go through an assessment and evaluate scope definition on both process- and non-process-specific industrial projects. Elements that are not applicable to a specific project can be zeroed out, thus eliminating them from the final scoring calculation. Following is a list of the ways the PDRI–Small Industrial Projects functions:

- as a **checklist** that a project team can use to determine the necessary steps for defining project scope, for both greenfield and R&R projects
- as a listing of **standardized scope definition terminology** for small industrial projects
- as an industry standard for rating the completeness of the project scope definition package to facilitate **risk assessment** and prediction of escalation potential for disputes
- as a means of **monitoring progress**—when used successively—at various stages of the front end planning effort
- as a partial forensic assessment tool for **evaluating design and construction readiness**
- as a tool that promotes **communication and alignment** among owners, designers/engineers, and construction contractors by highlighting poorly defined areas in a scope definition package
- as a means by which project team participants can **reconcile differences**, when used as a common basis for project evaluation

- as a means by which members of the project team can **identify gap-list tasks and act upon them** before the project cost, schedule, or quality are negatively affected
- as a **training tool** for organizations and individuals (particularly those with less experience) to understand the requirements of scope definition of small industrial projects throughout the industry
- as a **benchmarking tool** for comparing completion of scope definition on current projects against performance on past projects, both within organizations and externally, in order to predict the probability of success on future projects.

Who Should Use the PDRI?

Any organization wishing to improve the overall performance of its small industrial projects should use the PDRI.

The PDRI can benefit owners, designers, and constructors. Owners can use it as an assessment tool to establish a comfort level that, when reached, prompts them to move forward with projects. Designers and constructors can use it to identify poorly-defined project scope elements. As an objective tool that provides a common basis for project scope evaluation, the PDRI provides a means for all project participants to communicate and reconcile any differences they have.

Owners should use the tool as a formal checklist of items to be defined and communicated to ensure that the design team fully understands the project business objectives and drivers. It also provides an opportunity for the owner and stakeholders—including operations and maintenance—to gain an understanding of the project, including compliance with mandates. Communication is essential to ensuring that the design team is proceeding to meet the expectations and requirements of the owner stakeholders. Engineers and contractors may become involved in projects at various points of the front end planning process and should use the PDRI to organize their work. They should use it as an alignment tool to understand and participate in the development of the owner's business objectives and drivers, facilitating the design team's understanding of the elements defined in Section 1, the Basis of Project Decision. The project team should use this alignment check to make decisions concerning cost, quality, and schedule as the

project progresses from the scope definition stage into project execution. As front end planning progresses, the PDRI helps project participants clarify requirements, and it ensures the right input from key owner stakeholders representing areas such as operations and maintenance, process engineering, research and development, manufacturing, and business, among others. The PDRI also supports coordination and execution planning with the owner organization.

Contractors are often given a request for proposal (RFP) on a project that has had all or a portion of the project scope defined by the owner, or the owner has utilized a third-party engineering firm to develop the scope definition package. In such instances, the contractor could use a PDRI assessment as a risk analysis to determine the degree of definition and identify any potential weaknesses/areas of concern, before responding to the RFP. The contractor should make every attempt to get as many of the project stakeholders as possible involved in the PDRI assessment session, to ensure that the team is making the correct evaluation and assumptions before proceeding to the next stage.

Contractors may also use the PDRI to determine whether the work within their control is ready to move to the next step. Many contractors spend a portion of the project development effort performing design, procurement, and constructability reviews prior to the work starting in the field. For instance, the PDRI can be used to determine whether, prior to the start of the underground work or selection of a subcontractor to perform the work, there is sufficient definition to minimize schedule and/or cost impacts that could trigger mitigating strategies. Such assessments of definition can also be done prior to starting other major activities at the construction site.

In some cases, small projects are performed repetitively across many sites, and the PDRI–Small Industrial Projects assessment can be conducted for each one. In such cases, the assessments should be coordinated to ensure that critical issues are addressed and lessons are learned. Also, many organizations perform small projects very rapidly, with much concurrency among planning, design, and construction activities. By highlighting gaps and risks, the PDRI–Small Industrial Projects can help project participants quickly assess scope definition to keep these overlapping efforts on track.

Instructions for Assessing a Project

Assessing a project is as easy as 1-2-3.

Individuals involved in front end planning should use the project score sheets shown in Appendices A and B when assessing a project. Appendix A provides a simple unweighted checklist, while the checklist in Appendix B contains the weighted values and allows a front end planning team to quantify the level of scope definition at any stage of a project on a 1,000-point scale. The unweighted version should be used in a team scoring process to prevent bias in choosing the level of definition or in “targeting” a specific score. The team leader or facilitator can easily score the project as the weighting session is being held. If the project includes renovation work, the team should consider the supplemental issues that are provided in selected element descriptions.

When to Use the PDRI

The PDRI is a powerful tool that may be used at points throughout a project’s front end planning effort to ensure continued alignment, conformance to organizational procedures, and a continual focus on project priorities. Many organizations find value in utilizing a PDRI tool at multiple points in the front end planning process. Project size, complexity, and duration will help determine the optimal time to use the PDRI tool. To aid in the expanded use of this tool, Figure 3.1 illustrates suggested application points for the PDRI–Small Industrial Projects. As shown in Figure 1.4, there may be significant overlap in the three stages of front end planning. This overlap is a characteristic of many small projects, and is not typical of larger, more complex projects, where these stages are completed sequentially.

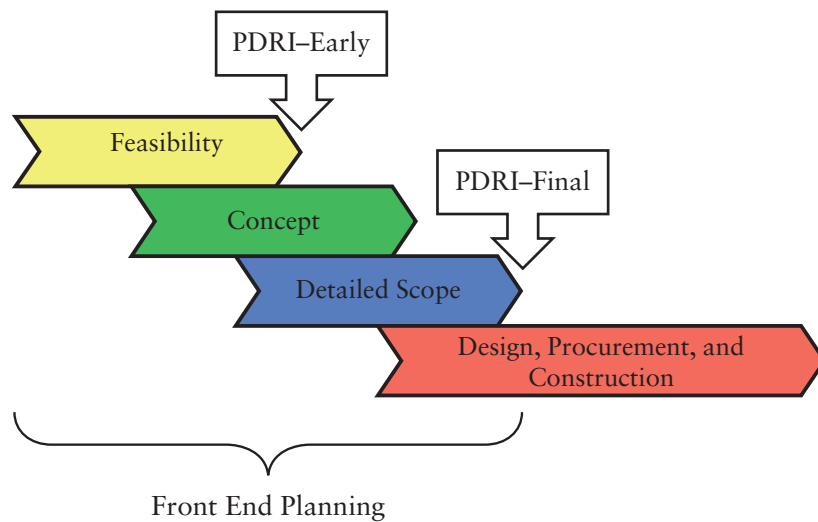


Figure 3.1. Employing the PDRI, Application Points

The purpose of completing a PDRI is to help stakeholders ensure that they are doing the right project at the right time in the right place, that they have considered all design parameters and put the appropriate processes in place to handle a variety of circumstances, and that they will execute and close out the project according to plan. In order for the PDRI to help with these assurances, though, project teams must conduct the review before the related project activities begin. If the PDRI review is performed only once, and it is completed during or at the end of the feasibility stage, it may help with the business case development; however, it may be necessary to complete a second review at a later point in the project. If the review is done later, say, at the end of the detailed scope stage, the team may discover misalignment on key project objectives within the project team, causing rework, delay, and additional cost.

Regardless of the timing of the PDRI assessment, participants should all use the same checklist/descriptions and follow the guidelines outlined below. The following sections discuss the objectives and overall scores of PDRI assessments.

PDRI–Early Review – This is a high-level assessment of the project following the feasibility stage. It is one of the decision criteria for continuing development of the detailed scope. PDRI Section I, Basis of Decision, should be well-defined (with a low relative PDRI score) at this point. This assessment is typically held for projects at the initial project kickoff meeting, when an engineering firm is brought on board. The PDRI–Early review should focus on the following outcomes:

- aligning the team with project objectives
- ensuring good communication between business/sponsor and project/contractor team
- highlighting stakeholder expectations to facilitate reasonable engineering estimates
- identifying high-priority project deliverables
- helping to eliminate late project surprises; providing opportunities to prevent costly rework, changes, and schedule delays, later in the project life cycle.

Typical PDRI scores at this assessment will be in the range of 400 to 800.

PDRI–Final Review – This is typically the final assessment of the project and it comes at the end of front end project planning (at the end of Detailed Scope). The PDRI–Final review should be completed for all projects. At this stage, the project team has identified risk issues and is developing or has put mitigation plans in place. Typical scores for this review are 150 to 400, with a target of 300 or below.

In addition to these two PDRI reviews, the tool can be used at other points. For instance, it can be used early in the feasibility stage as a checklist to help organize work effort. It can also be conducted during the design, procurement and construction to verify the design before moving into construction.

Assessing a PDRI Element

To assess an element, the user should first refer to the score sheet in Appendix A or B, and then read its corresponding description in Appendix C. Some elements contain a list of items to be considered as their definition levels are evaluated. These lists may be used as checklists. Additional issues may be applicable for renovation/shutdown/turnaround projects. All elements have six pre-assigned scores, one for each of the six possible definition levels.

As noted earlier, the PDRI consists of three main sections that are each broken down into eight categories. These eight categories are further broken down into 41 elements. The elements are individually described in Appendix C, Element Descriptions. Elements should be rated numerically from 0 to 5. The scores range from 0 – Not Applicable, to 1 – Complete Definition, to 5 – Incomplete or Poor Definition, as indicated in the legend at the bottom of each score sheet. The elements that are as well-defined as possible should receive a 2, 3, 4, or 5 rating, depending on the team’s assessment of them. Those elements deemed not applicable for the project under consideration should receive a 0, so as not to affect the final score.

Users should choose only one definition level (1, 2, 3, 4, or 5) for an element, based on their perception of how well it has been addressed. The suggested method for making this determination is through open discussion among the project team members. In considering the completeness of the PDRI elements, the project team should consider the desired outcome alongside the optimal cost and schedule performance. The team must have an adequate understanding of the element issues and the work required to achieve complete definition. On certain issues, it is important to defer to the most knowledgeable team members (for example, piping issues should be deferred to the process engineer), while at the same time respecting the concerns of other team members. As the discussion unfolds, it is critical to capture action items or “gaps.” Appendix G provides an example of an action item (gap) list.

Figure 3.2 outlines a method of assessing an element’s level of definition at a given point in time. For elements that are completely defined, no further work is needed during front end planning. For ones with minor deficiencies, no further work is needed during the front end planning phase, and the issue will not affect cost and schedule performance; however, the project team will need to track and address the minor issues identified as the project proceeds into the design phase. For those elements that are assessed as having some problems or major deficiencies,

or are incomplete, the team will have to perform further mitigation during front end planning before the end of the detailed scope phase.

Once users have chosen the appropriate definition level for each of the 41 elements, they write the value of the score that corresponds to that level on the project score sheet. Alternatively, the PDRI–Small Industrial Projects Excel-based spreadsheet can be used to capture each score. Regardless of where the scores are recorded, it is important to assess each element.

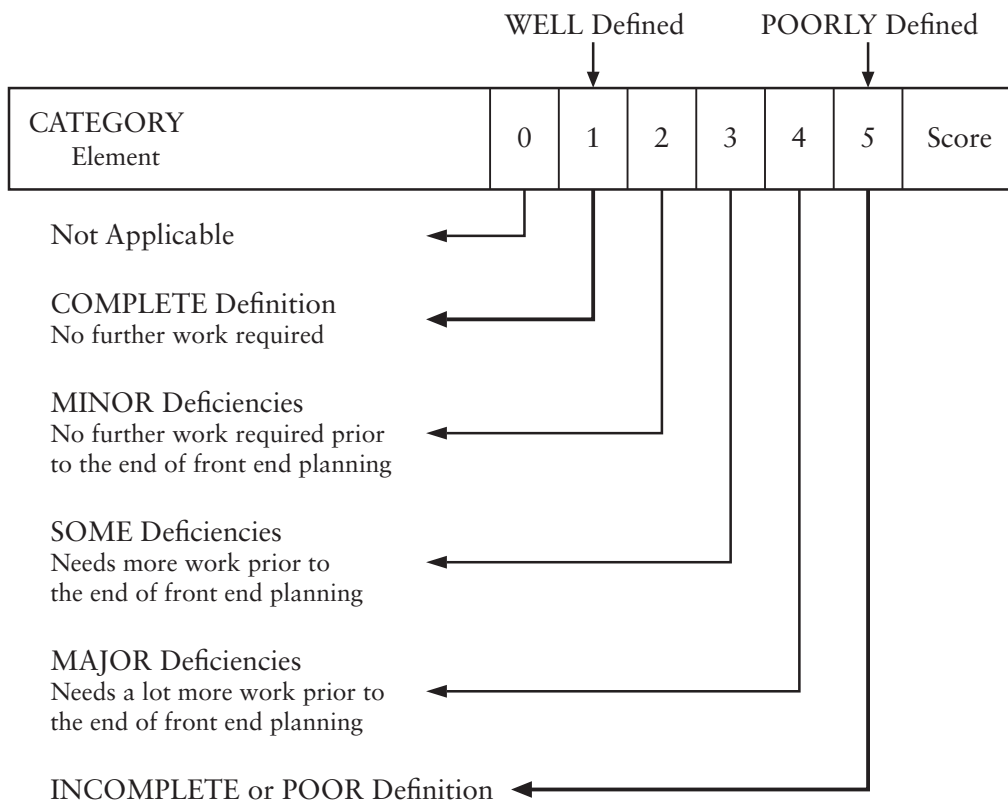


Figure 3.2. PDRI Definition Levels versus Further Work Required during Front End Planning

All of the element scores within a category should be added together to produce a total score for that category. Then, the scores for each of the categories within a section should be summed to arrive at a section score. Finally, the three section scores should be combined to determine the total PDRI score. The PDRI–Small Industrial Projects spreadsheet performs these calculations automatically. It should be noted that the research team established the levels of definition with a focus on developing the overall project scope of work, such that a project has a higher probability of achieving an acceptable cost or schedule outcome.

The relative level of definition of a PDRI element is also tied to its importance to the project at hand. The flexibility of the PDRI allows the project team some leeway in assessing individual element definitions. For instance, if the issues missing from the scope documentation of a particular PDRI element are integral to project success (and reduction of risk), the team can perhaps rate the issues at a definition level 3, 4, or even 5. On a different project, the absence of definition of these same issues within a PDRI element may not be of concern, and the team might decide to rate the element as at level 2. Maximizing the tool's flexibility and, thus, its consistent effectiveness, requires users to be alert to the unique priorities of each project.

Assessment Example

Following is an example of how a member of a front end planning team that is responsible for developing the scope definition package for a small industrial project would proceed through the steps of a PDRI assessment. The project will replace and upgrade sections of process piping to allow for increased capacity in a major oil refinery. The team has just completed the feasibility phase and plans to use the PDRI to evaluate the current level of “completeness” of the scope definition package. At the time of this particular evaluation, the scope development is underway, but is not yet complete. The front end planning team's responsibility is to evaluate how well the project alignment has been defined to date. This information is covered in Category A of the PDRI, as shown below, and consists of four elements: A1. Project Objectives Statement; A2. Project Strategy and Scope of Work; A3. Project Philosophies; and A4. Location. For the team setting of this assessment, the unweighted assessment sheet is the appropriate one to use. The steps the team will take to conduct the assessment are presented below.

SECTION I – BASIS OF PROJECT DECISION							
CATEGORY Element	Definition Level						Score
	0	1	2	3	4	5	
A. PROJECT ALIGNMENT							
A1. Project Objectives Statement							
A2. Project Strategy and Scope of Work							
A3. Project Philosophies							
A4. Location							

Definition Levels

0 = Not Applicable

2 = Minor Deficiencies

4 = Major Deficiencies

1 = Complete Definition

3 = Some Deficiencies

5 = Incomplete or Poor Definition

- Step 1:** Read the description for each element in Appendix C. Some elements contain a list of items that should be considered when their levels of definition are evaluated. These lists may be used as checklists.
- Step 2:** Collect all the data that you may need to evaluate and select the definition level properly for each element in this category. This may require input from other individuals involved in the scope development effort.
- Step 3:** Select the definition level for each element as described and shown below.

Element A1: The overall project objectives and priorities for meeting the business needs have been well defined. The requirements of the new piping and installation during a specified turnaround have been established.
Definition Level = 1

Element A2: The team has not yet completed a detailed scope of work of the project, nor has construction provided input on a plan for installation. An engineering and procurement plan is in place. Since this is a fast-track project, a funding plan must be determined to allow for early engineering and material procurement. Details of replacing existing spring supports and instrumentation must be determined, as well as a plan for analyzing the existing support structure, due to higher piping loads. This element has some major deficiencies that should be addressed prior to authorization of the project. **Definition Level = 4**

Element A3: Since this is a renovation and revamp project, there needs to be close coordination with engineering, turnaround group, construction, and operations, to allow for sufficient time for removal of old piping and installation of new piping within the prescribed turnaround period. There is also coordination required with other turnaround projects in the same area. The team feels there are some deficiencies in this area which need to be addressed. **Definition Level = 3**

Element A4: The scope of this project involves replacing existing piping with new piping. The planning team determined that the piping would be replaced in the exact same location, therefore the location is completely defined. **Definition Level = 1**

SECTION I – BASIS OF PROJECT DECISION							
CATEGORY Element	Definition Level						Score
	0	1	2	3	4	5	
A. PROJECT ALIGNMENT							
A1. Project Objectives Statement		X					
A2. Project Strategy and Scope of Work					X		
A3. Project Philosophies				X			
A4. Location		X					

Definition Levels

0 = Not Applicable

2 = Minor Deficiencies

4 = Major Deficiencies

1 = Complete Definition

3 = Some Deficiencies

5 = Incomplete or Poor Definition

Action items/comments should be captured as the discussion progresses for later reference (in Step 6). This list is referred to as a “gap” list, in that it identifies those issues that need to be addressed to move the project forward and in that it identifies a gap in the planning activities.

Step 4: For each element, enter the score that corresponds to its level of definition in the “Score” column. If the team feels that any or all of the elements in a category are **not applicable to this project**, they should be given a definition level of “0” and zeroed out. The weighted score sheet is given below with the elements circled for the chosen definition levels in this example.

Step 5: Sum the element scores to obtain a category score. Repeat this process for each element in the PDRI. In this example, the category has a total score of 52. Add up category scores to obtain section scores.

SECTION I – BASIS OF PROJECT DECISION							
CATEGORY Element	Definition Level						Score
	0	1	2	3	4	5	
A. PROJECT ALIGNMENT							
A1. Project Objectives Statement	0	2	13	24	35	47	2
A2. Project Strategy and Scope of Work	0	3	13	24	34	45	34
A3. Project Philosophies	0	2	8	14	19	25	14
A4. Location	0	2	11	19	28	36	2
CATEGORY A TOTAL							52

Definition Levels

0 = Not Applicable 2 = Minor Deficiencies 4 = Major Deficiencies
 1 = Complete Definition 3 = Some Deficiencies 5 = Incomplete or Poor Definition

Add up all the section scores to obtain a total PDRI score. Completed PDRI score sheets for process-related and non-process-related industrial projects are included in Appendix D for reference.

Step 6: Take Action. In this example, Category A has a total score of 52 (out of 153 total points) and needs more work, particularly for elements A2 and A3. Use the gap list to identify issues that need additional attention. The gap list provided below is an excerpt from the PDRI–Small Industrial Projects spreadsheet.

PDRI E – Low Definition Items							
Section	Element	Element Description	Level	Comments	Additional Comments	Assigned To	Target Date
I	A2	Project Strategy and Scope of Work	Level 4	The team needs to develop a project strategy and scope of work to include early engineering and procurement involvement		Mike Smith	12/14/20XX
I	A3	Project Philosophies	Level 3	Ensure close coordination with engineering turnaround group and with construction and operations, to allow time to remove pipe and install new pipe during turnaround operation period		Jenny Taylor	12/31/20XX

The project team leader should evaluate the gap list and then direct action towards those elements that are of a critical nature, as indicated by element scores and levels of definition.