



Project Definition Rating Index



Infrastructure Projects



Implementation Resource 268-2

Version 4.0



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PDRI:
Project Definition Rating Index –
Infrastructure Projects

Project Definition Rating Index for Infrastructure Projects Research Team
Construction Industry Institute

Implementation Resource 268-2
Version 4.0

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Foreword

Welcome to the fourth edition of the *PDRI: Project Definition Rating Index – Infrastructure Projects*, a document developed by the CII Research Team 268, PDRI for Infrastructure Projects. The significant software revisions of this edition were a part of a larger CII effort to revise and update all of the tools included in Implementation Resource 213-3, Version 4.0, *The CII Front End Planning Toolkit*.

Because it focuses on infrastructure projects, this PDRI tool filled a gap in CII's front end planning body of knowledge. With the original release of this publication, CII completed the "trilogy" of planning tools focused on major capital projects, the other two of which are Implementation Resource 113-2, *PDRI for Industrial Projects*, and Implementation Resource 155-2, *PDRI for Building Projects*. Each of these three resources complements the others and will be applicable to most capital projects being constructed today, both new construction and renovation projects. Indeed, infrastructure planners will undoubtedly use a combination of these three tools, depending on the horizontal/vertical construction mix of their particular programs.

In addition to this publication, an updated macro-enabled spreadsheet helps project teams assess their projects. This Excel® file can be downloaded from the CII online store, along with this publication, or found in the enclosed CD.

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What Is the PDRI?

The PDRI for Infrastructure projects is a simple and easy-to-use tool for measuring the degree of scope development.

The Project Definition Rating Index (PDRI) for Infrastructure Projects is a powerful and easy-to-use tool that offers a method to measure project scope definition for completeness. It identifies and precisely describes each critical element in a scope definition package. It also allows the project team to quickly identify project risk factors related to the desired outcomes for cost, schedule, and operating performance. Using the PDRI method, project 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. (Note that there are two other versions of the PDRI: one for building projects, CII Implementation Resource 155-2, and one for industrial projects, Implementation Resource 113-2.) This implementation resource addresses the infrastructure version of the method.

An infrastructure project is defined as a capital project that provides transportation, transmission, distribution, collection, or other capabilities that support commerce or the interaction of goods, services, or people. Infrastructure projects generally cover a wide geographical area and affect multiple jurisdictions and stakeholder groups. They are characterized as projects with a primary purpose that is integral to the effective operation of a system. These collective capabilities provide a service and are made up of nodes and vectors that form a grid or system (e.g., pipelines are vectors that connect to nodes such as water treatment plants). Further examples of vectors fall under the following categories:

People and freight:

- highways
- railroads
- access ramps
- toll booths
- tunnels
- airport runways
- security fencing

Energy:

- electricity transmission/distribution
- fiber optic networks
- electrical substations/switch gears
- towers
- wide area networks

Fluids:

- pipelines
- aqueducts
- pumping and compressor stations
- locks, weirs
- reservoirs
- meters and regulator stations
- pig launchers and receivers
- canals
- water control structures
- levees

Nodes/centralized facilities:

- dams
- power generation facilities
- steam or chilled water production
- marine, rail or air terminals
- water/waste water/solid waste processing
- refineries.

In the context of built systems and according to this definition, an infrastructure project provides the needed services and connections (vectors) that enable industrial facilities and buildings to function effectively. If any of these vectors are disrupted and redundancy is not built into the system, the entire system will fail to function effectively. The diagram in Figure 1.1 illustrates such an integrated system, showing how infrastructure vectors such as pipelines, electrical distribution, canals, rail, and highways connection industrial facilities and buildings to a larger built system.

The PDRI is designed for use during front end planning (FEP), a project stage that encompasses the project activities shown in Figure 1.2. As shown, these FEP activities are performed up to Phase Gate 3 (the point at which the decision to fund design and construction is made) and include feasibility, concept and detailed scope definition. Front end planning has many other terms associated with it, including “front end loading,” “pre-project planning,” “programming,” “schematic design,” “design development,” and “sanctioning,” among others. Although the term “front

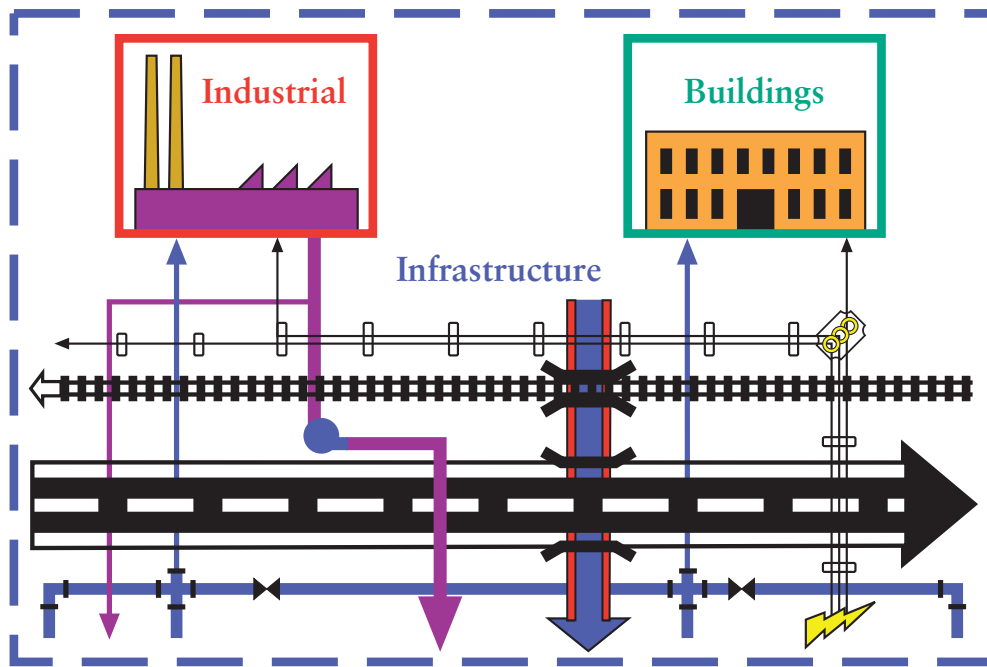


Figure 1.1. Infrastructure Interrelationship Diagram

end planning” is used in this document, it should be considered synonymous to the analogous term used in your business process. (More detailed information on timing and process is provided below.) The original PDRI was envisioned as a decision metric for funding detail design and project execution at Phase Gate 3, but experience has shown that, depending on project size and complexity, it should be used more than once prior to arriving at this gate.

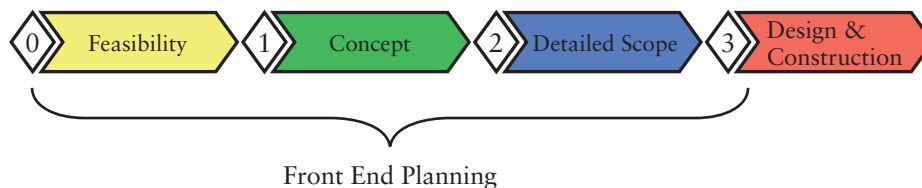


Figure 1.2. Project Life Cycle Diagram

The PDRI–Infrastructure offers a comprehensive checklist of 68 scope definition elements in an easy-to-use score sheet format. Each element is weighted based on its relative importance to the other elements. Since the PDRI score relates to risk, the areas that need further work can easily be isolated; once these problem areas are identified mitigation actions can be documented. (The weighting

system is described in detail in Chapter 4.) As part of the development process for the PDRI–Infrastructure, input was gained from 64 industry professionals representing 37 organizations—15 owners and 21 contractors—with over 1400 years of individual experience in infrastructure projects.

The main characteristics of infrastructure, building, and industrial projects are summarized in the Table 1.1. The table can be used to select the most appropriate PDRI for any project under consideration.

Table 1.1. 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	pipng, 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 reader may also refer to the following facility examples for further clarification on PDRI selection. Applicable infrastructure-type projects may include the horizontal construction of the following types of projects:

People and freight:

- highways
- railroads
- access ramps
- tunnels
- airport runways
- security fencing

Energy:

- electricity transmission/distribution
- fiber optic networks
- electrical substations/switch gears
- towers
- wide area networks

Fluids:

- pipelines
- aqueducts
- pumping and compressor stations
- locks, weirs
- reservoirs
- meters and regulator stations

Nodes/centralized facilities:

- dams
- power generation facilities
- steam or chilled water production
- marine, rail or air terminals
- water/waste water/solid waste processing
- refineries.

The Building PDRI (CII IR 155-2) is typically applied to the following types of facilities:

- 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.

The Industrial PDRI (CII IR 113-2) is typically applied to the following types of facilities:

- 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.

All versions of the PDRI consider 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 include additional structures and systems to achieve a more functional, serviceable, or desirable condition. These modifications include improvements in profitability, reliability, efficiency, safety, security, environmental

performance, or compliance with regulatory requirements. R&R projects may be known by numerous other names, such as repair, upgrade, modernization, restoration, among others. More details about how to adapt the PDRI to R&R projects will be given below. (For more information on how to manage front end planning of R&R projects, see Implementation Resource 242-2, *Front End Planning of Renovation and Revamp Projects*.)

PDRI

The PDRI consists of three main sections, each of which is broken down into a series of categories. The diagram of one part of the PDRI hierarchy in Figure 1.3 shows how these categories are divided into elements. Table 1.2 provides a complete list of the PDRI's three sections, 13 categories, and 68 elements.

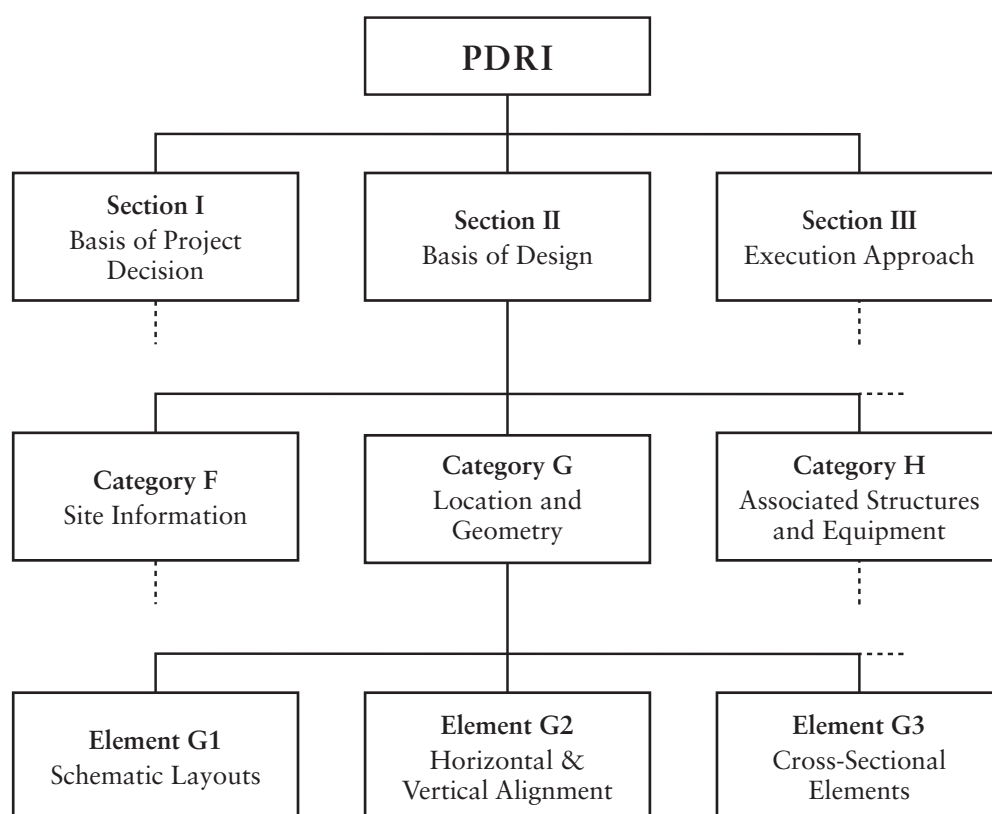


Figure 1.3. PDRI Partial Hierarchy

Table 1.1. PDRI Sections, Categories, and Elements

I. BASIS OF PROJECT DECISION A. Project Strategy - A1 Need & Purpose Documentation - A2 Investment Studies & Alternatives Assessments - A3 Key Team Member Coordination - A4 Public Involvement B. Owner/Operator Philosophies - B1 Design Philosophy - B2 Operating Philosophy - B3 Maintenance Philosophy - B4 Future Expansion & Alteration Considerations C. Project Funding and Timing - C1 Funding & Programming - C2 Preliminary Project Schedule - C3 Contingencies D. Project Requirements - D1 Project Objectives Statement - D2 Functional Classification & Use - D3 Evaluation of Compliance Requirements - D4 Existing Environmental Conditions - D5 Site Characteristics Available vs. Required - D6 Dismantling & Demolition Requirements - D7 Determination of Utility Impacts - D8 Lead/Discipline Scope of Work E. Value Analysis - E1 Value Engineering Procedures - E2 Design Simplification - E3 Material Alternatives Considered - E4 Constructability Procedures	H. Associated Structures and Equipment - H1 Support Structures - H2 Hydraulic Structures - H3 Miscellaneous Elements - H4 Equipment List - H5 Equipment Utility Requirements I. Project Design Parameters - I1 Capacity - I2 Safety & Hazards - I3 Civil/Structural - I4 Mechanical/Equipment - I5 Electrical/Controls - I6 Operations/Maintenance
II. BASIS OF DESIGN F. Site Information - F1 Geotechnical Characteristics - F2 Hydrological Characteristics - F3 Surveys & Mapping - F4 Permitting Requirements - F5 Environmental Documentation - F6 Environmental Commitments & Mitigation - F7 Property Descriptions - F8 Right-of-Way Mapping & Site Issues G. Location and Geometry - G1 Schematic Layouts - G2 Horizontal & Vertical Alignment - G3 Cross-Sectional Elements - G4 Control of Access	III. EXECUTION APPROACH J. Land Acquisition Strategy - J1 Local Public Agencies Contracts & Agreements - J2 Long-Lead Parcel & Utility Adjustment Identification & Acquisition - J3 Utility Agreement & Joint-Use Contracts - J4 Land Appraisal Requirements - J5 Advance Land Acquisition Requirements K. Procurement Strategy - K1 Project Delivery Method & Contracting Strategies - K2 Long-Lead/Critical Equipment & Materials Identification - K3 Procurement Procedures & Plans - K4 Procurement Responsibility Matrix L. Project Control - L1 Right-of-Way & Utilities Cost Estimates - L2 Design & Construction Cost Estimates - L3 Project Cost Control - L4 Project Schedule Control - L5 Project Quality Assurance & Control M. Project Execution Plan - M1 Safety Procedures - M2 Owner Approval Requirements - M3 Documentation/Deliverables - M4 Computing & CADD/Model Requirements - M5 Design/Construction Plan & Approach - M6 Intercompany & Interagency Coordination & agreements - M7 Work Zone and Transportation Plan - M8 Project Completion Requirements

The PDRI should be used in conjunction with Implementation Resource 113-3, *Alignment during Pre-Project Planning*, to ensure that critical risk issues are addressed and that stakeholder interests are represented effectively in the front end planning process.

Use the PDRI score sheet that is most closely related to your project's use or type.

In some cases, a project may include more than one type of facility. In such cases, project team members should use their discretion in selecting the most applicable PDRI (or combination of PDRIs), basing their decision on the relative size and importance of the facilities. In general, when a project involves a hybrid of infrastructure, industrial, and building types that have primarily been designed by civil engineers, the PDRI for Infrastructure Projects should be used. It should also be used if the project includes extensive horizontal construction and right-of-way acquisition. If the primary designers for the project are architects, then the PDRI for Buildings should be used. If the primary designers are process (chemical) engineers or industrial (mechanical) engineers, then the PDRI for Industrial Projects should be used. Alternatively, the team may look at the composition of the project in terms of work (design or construction expenditures) to make the decision. In some circumstances, the team may decide to use more than one PDRI for the same project.

Following are examples of hybrid cases and the PDRIs appropriate to them:

Example 1: Toll Road

The project is a medium-sized toll road in Florida consisting of roads, bridges, and toll stations. Toll roads and their associated structures (e.g., typical bridges and toll stations) are considered as an infrastructure projects. Therefore, the Infrastructure PDRI should be utilized in the definition rating of the whole project. However, the owner may elect to treat the bridges and toll stations as separate from the roads, due to their large construction costs or complexity. In such an instance, the project team would need to use more than one PDRI. The Infrastructure PDRI would be used for the toll road, the Building PDRI for the toll stations, and a combination of the two PDRIs would be used for the bridge.

Example 2: Hydroelectric Dam

The project is an integrated hydroelectric and irrigation project in Brazil that consists of a reservoir, a network of irrigation canals, a major dam, a hydroelectric plant, an electrical substation, and a long transmission line. Due to the high costs of the major project components, using multiple PDRI's should probably be considered at the project team's discretion. For example, the team could use an Infrastructure PDRI for the network of irrigational canals, a separate Infrastructure PDRI for the long transmission line, and the industrial PDRI for the dam, reservoir, hydroelectric plant and associated substation.

Many infrastructure projects (a pipeline, for example) require various types of buildings to support the operations and maintenance efforts they require. These facilities could consist of the following types of buildings:

- administration buildings
- toll booths
- warehouses
- control buildings
- maintenance facilities
- pumping stations
- security facilities.

In these cases, the Infrastructure PDRI should be used on the horizontal component of the project, while the PDRI–Buildings should be used on each building. If an entire assessment of each building is not possible, the PDRI–Buildings score sheet should at least be used as a check list.

In addition, the user should determine whether the project is a renovation or revamp project. Further, he or she should use the additional descriptions provided in the tool to address critical R&R issues during front end planning. Figure 1.4 provides a decision diagram to determine this further effort. (Note that, if the project includes a shutdown/turnaround/outage scenario, it is important that the project planning team also use the Shutdown Turnaround Alignment Readiness (STAR) front end planning tool provided in Implementation Resource 242-2, *Front End Planning of Renovation and Revamp Projects*, to help with the unique issues associated with these types of events.)

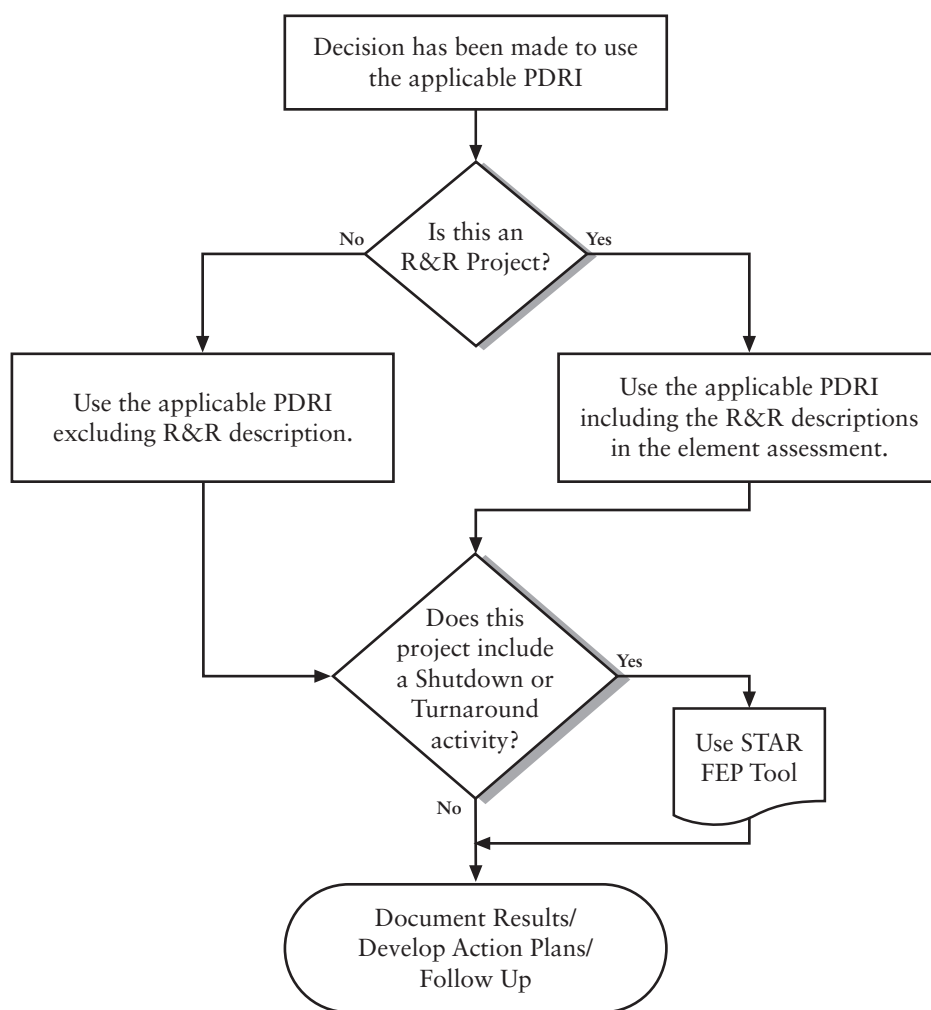


Figure 1.4. Use of Additional Tools to Supplement PDRI

Benefits of the PDRI

Effective early project planning improves project performance, both in terms of cost and schedule as it reinforces the importance of early scope definition and in terms of its impact on project success. The PDRI allows a project planning team to quantify, rate, and assess the level of scope development on projects prior to detailed design and construction. Moreover, it is a means by which project enablers can be identified early and acted upon. The PDRI is a pro-active project management tool.

A significant feature of the PDRI is that it can be scaled or modified to fit the needs of almost any individual project, small or large. 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 for Infrastructure functions can be used:

- 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 infrastructure 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 to **monitor progress**—when used successively—at various stages of the front end planning effort
- as a tool that promotes **communication and alignment** between owners and design contractors by highlighting poorly defined areas in a scope definition package
- as a means for project team participants to **reconcile differences**, when used as a common basis for project evaluation
- as a means by which members of a project team can **identify enabling tasks and act upon them** before the project schedule becomes delayed
- as a **training tool** for organizations and individuals 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.

Extent of Usage

A survey was conducted of the CII membership in 2004 to determine the extent of PDRI usage; seventy of 92 CII members responded (76 percent). (Note that the survey was conducted prior to development of the PDRI for Infrastructure.) Of the 70 respondents, 43 organizations were then in the process of using the PDRI on their capital projects, including 18 of 34 contractor and 25 of 36 owner respondents. The PDRI for industrial projects had been used for an average of 4.3 years, while the PDRI for building projects had been used for an average of 2.7 years. Of importance within the survey was a description of how the tool was used. (See Table 2.1.) These implementation uses are discussed in more detail below.

Table 2.1. Frequency of Use Among Organizations Using PDRI (N=43)

The PDRI is used:	Frequency
As a planning checklist in early project development	81%
As a “gate” check before moving to project execution	72%
In conjunction with other front end planning measurement methods (i.e., prepare for third party evaluations, internal measures)	72%
As a means of measuring or benchmarking front end planning process performance	70%
More than once on most projects	42%
As an audit tool	42%
In a modified form for small or unusual projects	33%
To help capture lessons learned	28%
With the help of an outside facilitator	29%

Who Should Use the PDRI?

Any organization wishing to improve the overall performance on its projects should use the PDRI.

The PDRI can benefit owners, designers, and constructors. Owners can use it as an assessment tool for establishing a comfort level that, when reached, prompts them to move forward with projects. Designers and constructors can use it as a method of identifying poorly-defined project scope elements. By functioning 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. Because the PDRI for Infrastructure can accommodate the jurisdictional intricacies, engineering complexities, and critical phasing issues that are inherent to most infrastructure projects, it is a tool that offers unique benefits to owners, users, and the public.

Owners should use the tool as a formal checklist of items that need to be clearly defined and communicated to ensure that the design team fully understands the project business objectives and drivers. Initially, owners should focus on the elements in Section I, the Basis of Business Decision. Accurate definition of these items will provide the strongest possible foundation on which the design team can make its decisions going forward. These items should be well defined at Phase Gate 2. As the project passes through the other phases, the owners should participate in the PDRI assessment sessions to ensure that the design team has correctly understood its requirements and is meeting the owner team expectations. Attendance at these sessions also provides an opportunity for the owner and the stakeholders—including operations and maintenance—to gain an understanding of the project and any issues pertaining to compliance with mandates. This sustained communication is essential to ensure that the design team is meeting the expectations and requirements of the owner stakeholders.

The PDRI is valuable for planning inter-jurisdictional infrastructure projects because, at an early stage, it prompts the owner and design team to validate their business and design assumptions against the will of the public and jurisdictional requirements. This assessment should be undertaken at Phase Gates 0 and 1, and then should be confirmed with the public and any stakeholder jurisdictions in hearings and meetings prior to proceeding with detailed scope development. Use of the PDRI–Infrastructure at this early stage will identify public issues prior to engagement, and the project team can have properly researched solutions and recommendations ready for public comment.

Contractors may become involved in projects at various points of the front end planning process and should use the PDRI to organize their work. Contractors should also use the PDRI as an alignment tool to understand and participate in the development of the owner’s business objectives and drivers; using it in this way facilitates the design team’s understanding of the elements defined in Section I, the Basis of Business Decision. The team should use this alignment check to make decisions concerning cost, quality, and schedule as the project progresses through the scope definition stage and into execution. As front end planning progresses, the

PDRI process helps the contractor clarify requirements outlined in Sections I and II of the PDRI. It also ensures the right input from key owner stakeholders, such as operations and maintenance, process engineering, research and development, manufacturing, and business, among others. The elements contained in Section III of the PDRI helps the contractor coordinate and execute planning in conjunction with the owner organization.

Contractors are often given a request for proposal (RFP) on projects for which the owner has defined all or a portion of the project scope, or for which the owner has hired a third party engineering firm to develop the scope definition package. In such instances, it is imperative that the contractor perform a PDRI assessment as a risk analysis to determine the degree of definition; this kind of risk analysis will help the contractor identify the 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 this PDRI assessment session to assure that the team is making the correct evaluations and assumptions before proceeding to the next stage.

Contractors also may use the PDRI to determine if 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 if, prior to the start of underground work or to the selection of a subcontractor to perform the work, sufficient definition has been developed to minimize schedule and/or cost impacts that may trigger mitigating strategies. This can also be done prior to starting other major activities at the construction site.

Many infrastructure projects are broken into separate segments or phases, and a PDRI–Infrastructure assessment should be conducted for each. In these situations, coordination should be performed to ensure that critical issues are addressed and that lessons are learned.

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 Sheet shown in Appendices A and B when assessing a project. Two score sheets are provided: the first is simply the unweighted checklist in Appendix A; the second contains the weighted values and allows a front end planning team to quantify the level of scope definition at any stage of the project on a 1000-point scale. The unweighted version should be used in the team scoring process to prevent bias in choosing the level of definition and 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 use the supplemental issues to consider that are provided in selected element descriptions.

When to Use PDRI

The PDRI is a powerful tool that should be used at points throughout front end planning to ensure continued alignment, process check-ups, and a continual focus on the key project priorities. Many companies now find value in utilizing this tool at various points in the early project planning process.

Project size, complexity, and duration will help determine the optimum times that the PDRI tool should be used. To aid in the expanded use of this tool, Figure 3.1 illustrates four potential application points at which the PDRI could be useful.

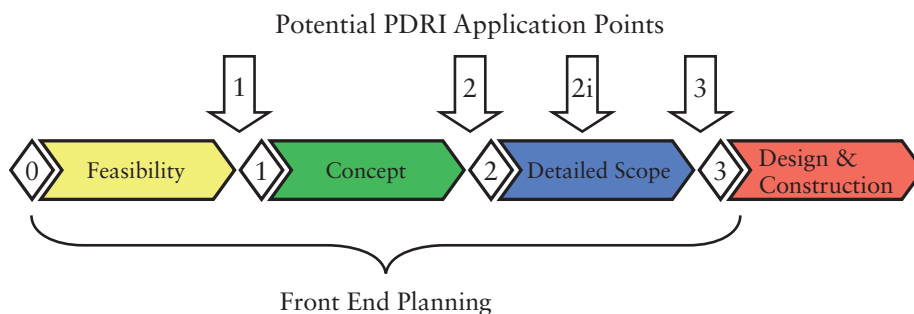


Figure 3.1. Employing the PDRI, Application Points

Regardless of the timing of the PDRI assessment, the same checklist/descriptions should be used. The evaluation should be conducted according to the guidelines outlined below. Objectives and overall scores of the PDRI assessments are given in the following discussions.

PDRI 1 Review – This is a high-level assessment of the project following Feasibility and prior to Phase Gate 1. It is part of the decision criteria for proceeding to the next phase. This assessment is typically held for projects at the initial project kick-off meeting, when an architect/engineering firm is brought on board. The PDRI 1 Review should focus on the following areas:

- aligning the team with project objectives
- ensuring good communication between business/sponsor to project/contractor team
- highlighting stakeholder expectations to facilitate reasonable engineering estimates.

Typical PDRI scores at this assessment will be in the range of 550–800.

PDRI 2 Review – This is a high-level assessment of the project following the Concept Development phase of the project, or Phase Gate 2. It is part of the decision criteria for proceeding to the next phase. PDRI Section I, the Basis of Project Decision, should be well-defined (with a low relative PDRI score) at the end of this phase. For small or relatively simple projects, this assessment may not be necessary. In addition, the PDRI 2 Review should focus on the following areas:

- aligning project objectives and stakeholders needs
- identifying high priority project deliverables that need to be completed
- helping to eliminate late project surprises
- facilitating communication across the project team and stakeholders.

Typical PDRI scores at this phase of the project may be in the range of 450–600. The assessment will highlight the areas on which resources need to be focused during the succeeding phase of front end planning.

PDRI 2i Review – This is an intermediate (i) assessment of the project during the Detailed Scope phase of a project. It typically should be held midway through this phase. Section II, the Basis of Design, and Section III, the Execution Approach, should be well-defined during this phase of the project. The PDRI 2i Review should focus on the following areas:

- assuring alignment of project objectives and stakeholders needs
- confirming that resources are properly deployed to get the largest value for the time and effort being applied
- verifying scope in relation to the original project goals
- identifying and planning remaining activities to achieve the level of detail necessary to complete front end planning in preparation for Phase Gate 3.

Typical PDRI scores at this phase of the project may be in the range of 300–450.

PDRI 3 Review – This is typically the final assessment of the project at the end of front end project planning, prior to Phase Gate 3. The PDRI 3 assessment should be conducted for all projects. At this stage, risk issues have been identified and mitigation plans are in place or are being developed. Typical scores for this review are 150 to 250, with a target of typically 200 or below.

In addition to the four PDRI reviews outlined above, the tool can be used at other points. For instance, it can be used early in Feasibility as a checklist to help organize work effort, or during the design phase (after Phase Gate 3) to verify the design before moving on to construction. It has been used effectively as an alignment tool during the kick-off of design/build projects.

Figure 3.2 shows approximate ranges of overall project scores based on the timing of the assessment during front end planning. As planning progresses, the level of definition improves and the overall score is reduced.

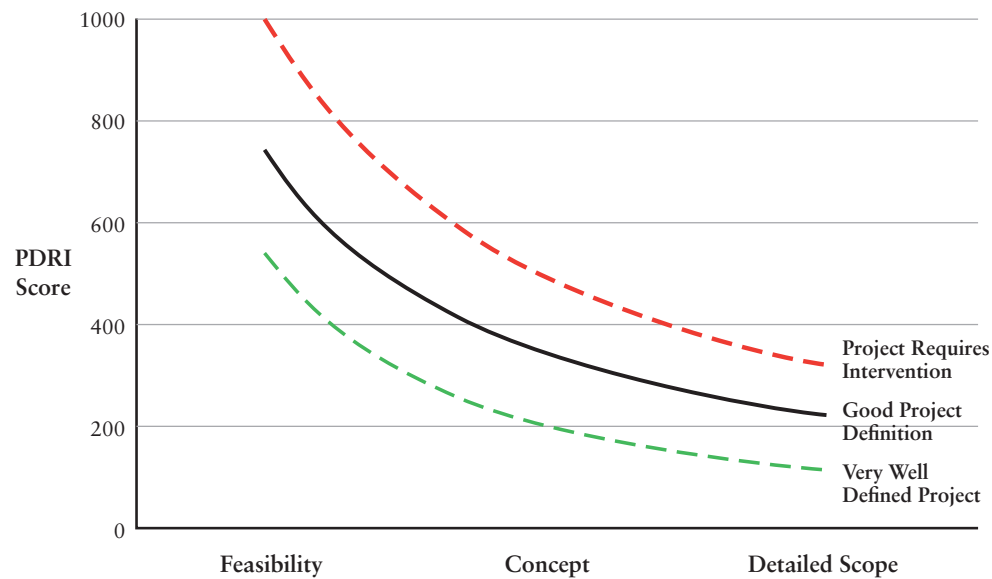


Figure 3.2. Score Ranges versus Planning Phase

As noted above, the PDRI consists of three main sections that are broken down into 13 categories. The categories are further divided into 68 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, 1 – complete definition to 5 – incomplete or poor definition, as indicated in the legend at the bottom of the score sheet. The elements that are as well-defined as possible should receive a perfect definition level of “one.” Elements that are not completely defined should receive a “two,” “three,” “four,” or “five,” depending on their levels of definition as determined by the team. A score of 2 indicates minor deficiencies, a score of 3 indicates some deficiencies, and a score of 4 indicates major deficiencies. Those elements deemed not applicable to the project under consideration should receive a “zero,” and thus will not affect the final score.

It should be noted that establishing the basis for determining the level of definition depends on developing the overall project scope of work such that the project has a higher probability of achieving a cost or schedule estimate at the ± 10 percent level at Phase Gate 3. This level of definition roughly relates to approximately 25–30 percent of design completion for the entire project.

Figure 3.3 outlines a method of assessing the level of definition of an element at a given point in time. For those elements that are completely defined, no further work is needed during front end planning. For those elements 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 minor issues identified will need to be tracked and addressed as the project proceeds into the design phase. Elements that are assessed as having some deficiencies, as having major deficiencies, or as incomplete should be addressed during front end planning so that the project can move through Phase Gate 3.

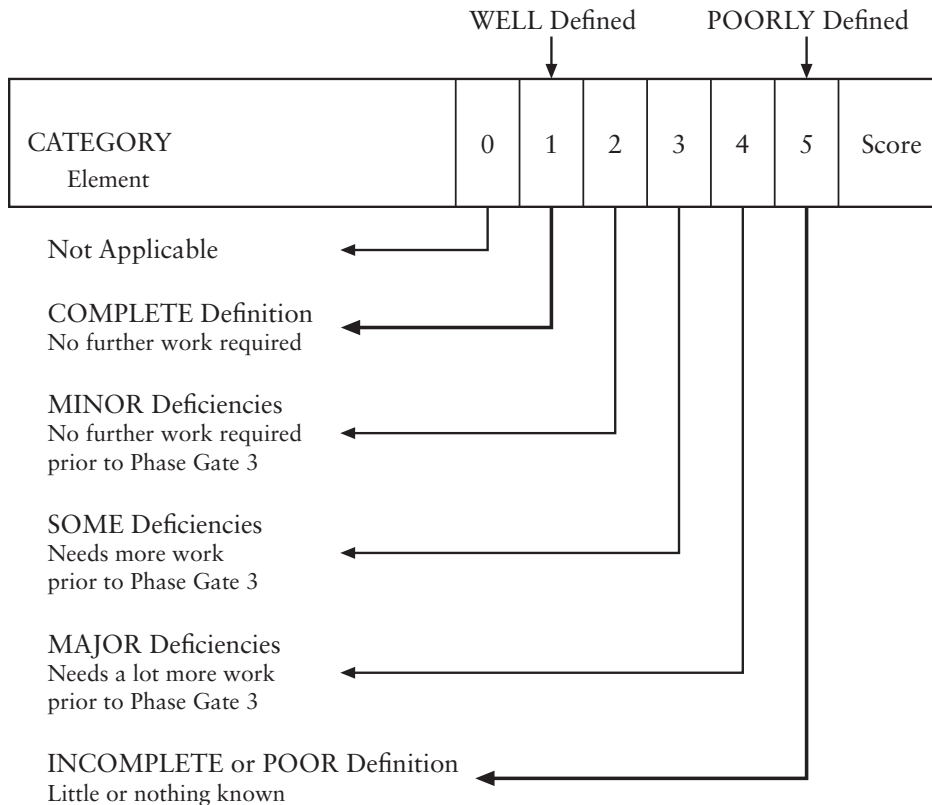


Figure 3.3. PDRI Definition Levels versus Further Work Required During Front End Planning

The relative level of definition of a PDRI element is also tied to its importance to the project at hand. The PDRI's flexibility 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 to reduction of risk), the team can perhaps rate the issue at definition level "three," "four," or even "five". 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 at definition level "two." As the old saying goes, "do not turn off your brain" when you are using this tool.

Assessing a PDRI Element

To assess an element, first refer to the Project Assessment Sheet in Appendix A or B. Next, read its corresponding description 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. Additional issues may be applicable for renovation projects. All elements have five pre-assigned scores, one for each of the five possible levels of definition.

Choose only one definition level (0, 1, 2, 3, 4, or 5) for each element based on the perception of how well it has been addressed. The suggested method for making this determination is open discussion among the project team members. When considering the completeness of the PDRI elements, the front end planning team needs to take into account the project's desired operating performance alongside the desired cost and schedule outcomes. It is important that all participants understand the issues surrounding each of the elements and that the project leaders promote a common understanding of the work required to achieve complete definition. It is important to defer to the team members who are most knowledgeable about any given issues (for example, storm water issues are deferred to the civil and environmental discipline leads), while respecting the concerns of any of the other team members. As the discussion unfolds, capture action items or "gaps." An example action item (gap) list is given in Appendix G.

Once you have chosen the appropriate definition level for the element, write the value of the score that corresponds to the level of definition chosen in the "Score" column. Do this for each of the 68 elements on the Project Score Sheet. Be sure to assess each element.

The scores for all of the elements within a category should be added to produce a total score for that category. The scores for all of the categories within a section should then be added to arrive at a section score. Finally, the three section scores should be added to achieve a total PDRI score.

Assessment Example

Consider that you are a member of a front end planning team responsible for developing the scope definition package for a roadway project that will provide vehicular access to a new midfield terminal project that is currently under

construction at a major international airport. Throughout front end planning, your team has identified major milestones at which you plan to use the PDRI to evaluate the current level of “completeness” of the scope definition package. Assume that at the time of this particular evaluation the scope development effort is underway, but it is not yet complete.

Your responsibility is to evaluate how well the project control requirements have been identified and defined to date. This information is covered in PDRI Category L, Project Control. As shown below, this category consists of five elements: L1 Right-of-Way & Utilities Cost Estimates; L2, Design & Construction Cost Estimates; L3, Project Cost Control; L4, Project Schedule Control; and L5, Project Quality Assurance & Control. The unweighted assessment sheet is recommended when projects are evaluated in a team setting.

CATEGORY Element	Definition Level						Score
	0	1	2	3	4	5	
L. PROJECT CONTROL							
L1. Right-of-Way & Utilities Cost Estimates							
L2. Design and Construction Cost Estimates							
L3. Project Cost Control							
L4. Project Schedule Control							
L5. Project Quality Assurance & Control							

Definition Levels

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

To fill out Category L, Project Control, follow the steps below:

- 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 data that you may need to properly evaluate and select the definition level 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 show below.

Element L1: Requirements for right-of-way and utility cost estimates have been well defined. The project is being constructed on existing airport property, therefore there are no property acquisition costs. However, utilities must still be brought to the site, and existing utilities will require modification. The cost estimates for the third party utility work to bring power to the site are not entirely complete. You feel that this element has *some deficiencies* that should be addressed prior to authorization of the project. **Definition Level = 3.**

Element L2: Your team has prepared a thorough design and construction cost estimate based upon the project's current design status. Reasonable contingencies as well as labor/material escalation values have been established. Your team recognizes that there are unique insurance requirements that are necessary on jobsites located around an operational airfield; however, these have not yet been fully identified nor have their costs been determined. You feel that this element has some *minor deficiencies* that should be addressed prior to authorization of the project. **Definition Level = 2.**

Element L3: Although your team plans to specify methods for cost control and financial reporting, it has not yet done this work. Prior to starting work on this element, your team had been focusing its efforts on completing the costs elements as defined in element L2. The team is particularly concerned about cash flow projections and the costs of each of the project's multiple phases. It is *incomplete*. **Definition Level = 5.**

Element L4: Requirements for the project's schedule are well defined:

- the baseline schedule for both design and construction has been established
- project phases have been identified
- long lead items have been researched and considered

- municipality and airport review requirements have been reviewed and their timing requirements have been incorporated
- procurement methods and timing have been established.

The project requires significant coordination and phasing with numerous user groups and multiple construction contracts. While the milestones for each of these phases have been defined, not all of the current completion dates for each of these phases have been verified and updated. You feel that this element has some *minor deficiencies* that should be addressed prior to the authorization of the project. **Definition Level = 2.**

Element L5: Your team has outlined the basic framework for the project's quality assurance and control. However, these requirements only exist in outline format. Decisions regarding responsibility of QA/QC during the construction phase have not been finalized. The type and requirements for the QA/QC system have been started, but are also only in outline format. This element has *major deficiencies*. **Definition Level = 4.**

CATEGORY Element	Definition Level						Score
	0	1	2	3	4	5	
L. PROJECT CONTROL							
L1. Right-of-Way & Utilities Cost Estimates				X			
L2. Design and Construction Cost Estimates			X				
L3. Project Cost Control						X	
L4. Project Schedule Control			X				
L5. Project Quality Assurance & Control					X		

Definition Levels

0 = Not Applicable

2 = Minor Deficiencies

4 = Major Deficiencies

1 = Complete Definition

3 = Some Deficiencies

5 = Incomplete or Poor Definition

As the discussion progresses, be sure to capture action items and comments for use during the final step of the PDRI process. This accrued set of items and comments is referred to as a “gap” list because it isolates the issues that need to be addressed to move the project forward and identifies any gaps in the planning activities.

Step 4: For each element, write 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 for a 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: Add 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 45. Add category scores to obtain section scores.

CATEGORY Element	Definition Level						Score
	0	1	2	3	4	5	
L. PROJECT CONTROL (Maximum Score = 80)							
L1. Right-of-Way & Utilities Cost Estimates	0	1	3	5	7	10	7
L2. Design and Construction Cost Estimates	0	2	8	14	20	25	8
L3. Project Cost Control	0	1	5	9	13	15	15
L4. Project Schedule Control	0	1	5	9	13	17	5
L5. Project Quality Assurance & Control	0	1	4	7	10	13	10
CATEGORY L TOTAL							45

Definition Levels

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

Add section scores to obtain a total PDRI score. Completed PDRI score sheets for fluid, people and freight, and energy projects are included in Appendix D for reference.

Step 6: Take Action. In this example, Category L has a total score of 45 (out of 80 total points). The element scores indicate that the project needs more work for elements L2, L3 and L5. Use the gap list to identify issues that need additional attention.

Philosophy of Use

Ideally, the project team conducts a PDRI evaluation at various points in the project. Experience has shown that the scoring process works best in a team environment, with a neutral facilitator who understands the process. The facilitator provides objective feedback to the team and controls the pace of team meetings. (See Appendix F for details on facilitation.) If this team-facilitator arrangement is not possible, an alternative approach is to have key individuals evaluate the project separately, then evaluate it together and ultimately agree on a final evaluation. Even using the PDRI from an individual standpoint provides a method for project evaluation. For example, the right-of-way (ROW) discipline lead may utilize applicable portions of the PDRI to isolate land acquisition and jurisdictional issues in order to stimulate discussion on areas of interest and/or to evaluate potential risk areas. Such targeted assessments may help the project team determine long lead or extended timeframe areas.

Experience has shown that the PDRI is best used as a tool to help project managers (i.e., project coordinators and project planners) organize and monitor the progress of the front end planning effort. In many cases, a planner may use the PDRI prior to the formation of a team in order to understand major risk areas. Using the PDRI early in the project life cycle will usually lead to high PDRI scores. This initial result is normal, and the completed score sheet will give a road map of areas that are weak in terms of definition.

The PDRI provides an excellent tool to use in early project team meetings insofar as it provides a means for team members to align themselves on the project and organize their work. Experienced PDRI users feel that the final PDRI score is less important than the process used to arrive at that score. The PDRI can also provide an effective means of handing the project off to other entities or of maintaining continuity as new project participants are added to the project.

If the organization has front end planning procedures, execution standards, and deliverables in place, many PDRI elements may be partially defined when the project begins its front end planning. An organization may want to standardize many of the PDRI elements to improve cycle time of planning activities.

PDRI scores may change on a day-to-day or week-to-week basis as team members realize that some elements are not as well defined as they initially assumed. It is important to assess the elements honestly. The planning process

is inherently iterative in nature, and any changes that occur in assumptions or planning parameters need to be resolved with planning decisions as quickly as possible. The target score may not be as important as the team's ability over time to resolve issues that harbor risk in a timely manner.

The PDRI was developed as a “point-in-time” tool with elements that are as discrete as possible. Most of these elements constitute deliverables to the planning process. However, a close review of the elements shows an embedded logic. Certain ones must first be defined well before others can be defined. This sequential logic works within project phases and from one phase to the next. Thus, the PDRI was designed for iterative use during front end planning and is often used during each project phase to evaluate progress prior to the next approval level.

In some instances, infrastructure projects can last many years or even decades, with associated delays—especially in the public sector. In other cases, these projects can be delayed for shorter periods as project personnel await administrative decisions. For instance, delays can be caused by changes in political will, reallocation of funding, or new regulations. It is important in these situations that the PDRI assessments and planning documents be kept in order so that momentum can be regained quickly in case of a re-start of the project.

Figure 3.4 outlines the logic at a section level. In general, Section I elements must be well defined before the elements in Section II and III can be defined. This process does not follow a typical construction project management (CPM) approach, wherein certain elements must reach a minimum point of completion before the elements downstream can start. With the PDRI, elements can often be pursued concurrently; as information is gained downstream, elements already defined can be revisited and redefined.

Figure 3.5 outlines the general logic flow of the PDRI categories. Again, the flow does not follow a traditional CPM model. Moreover, the diagram is given only as a guideline; with the PDRI, there are many other ways to organize the work. For instance, if information gained in Category F, Site Information diverges from what is expected or assumed, then the planner should assess the impact of that difference on Categories A, B, C, D and E.

If an organization wants to standardize its front end planning process, the logic presented in these diagrams could provide the basis for that development. Full-sized color versions of Figures 3.4 and 3.5 are provided in Appendix E.

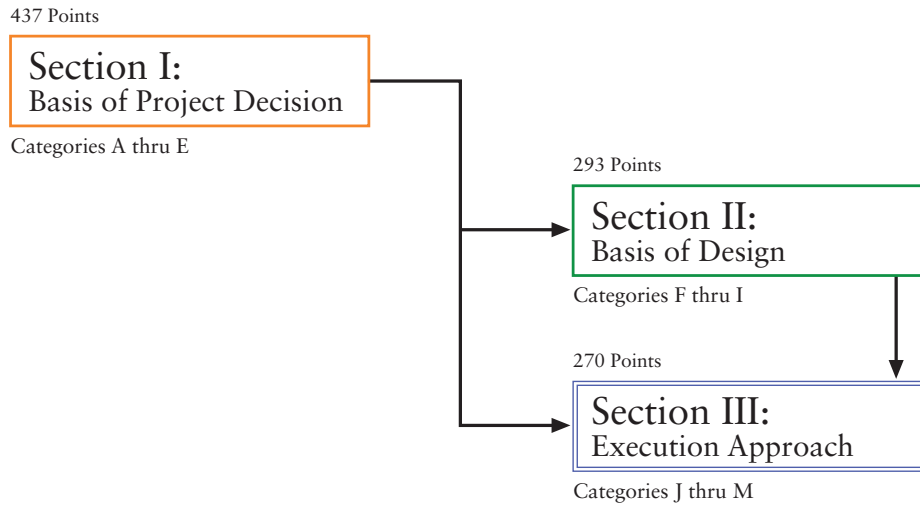


Figure 3.4. Infrastructure PDRI Section Logic Flow Diagram

Use of PDRI on Small or Renovation Projects

The PDRI can be customized to meet any organization's needs.

Small or renovation/upgrade projects can also benefit from the PDRI process, even if they are small, short in duration, and frequently performed. Many large organizations have a number of these types of projects at any one time. Such projects may be driven by environmental regulations, safety requirements, or by the need to keep a facility in repair or in operation. They may also be focused on restoring an historically significant building or on relocating a business function or production line.

On small projects or renovations, the scope may not encompass many of the elements contained in the entire PDRI. In particular, some of the Basis of Project Decision elements found in Section I of the PDRI may not be clearly defined on these kinds of projects. Although business planning is generally performed on an owner's overall program of small projects, it may be difficult to determine whether specific business decisions directly apply to one individual project. Long term use has shown that customizing the PDRI to reflect each individual project is highly beneficial.

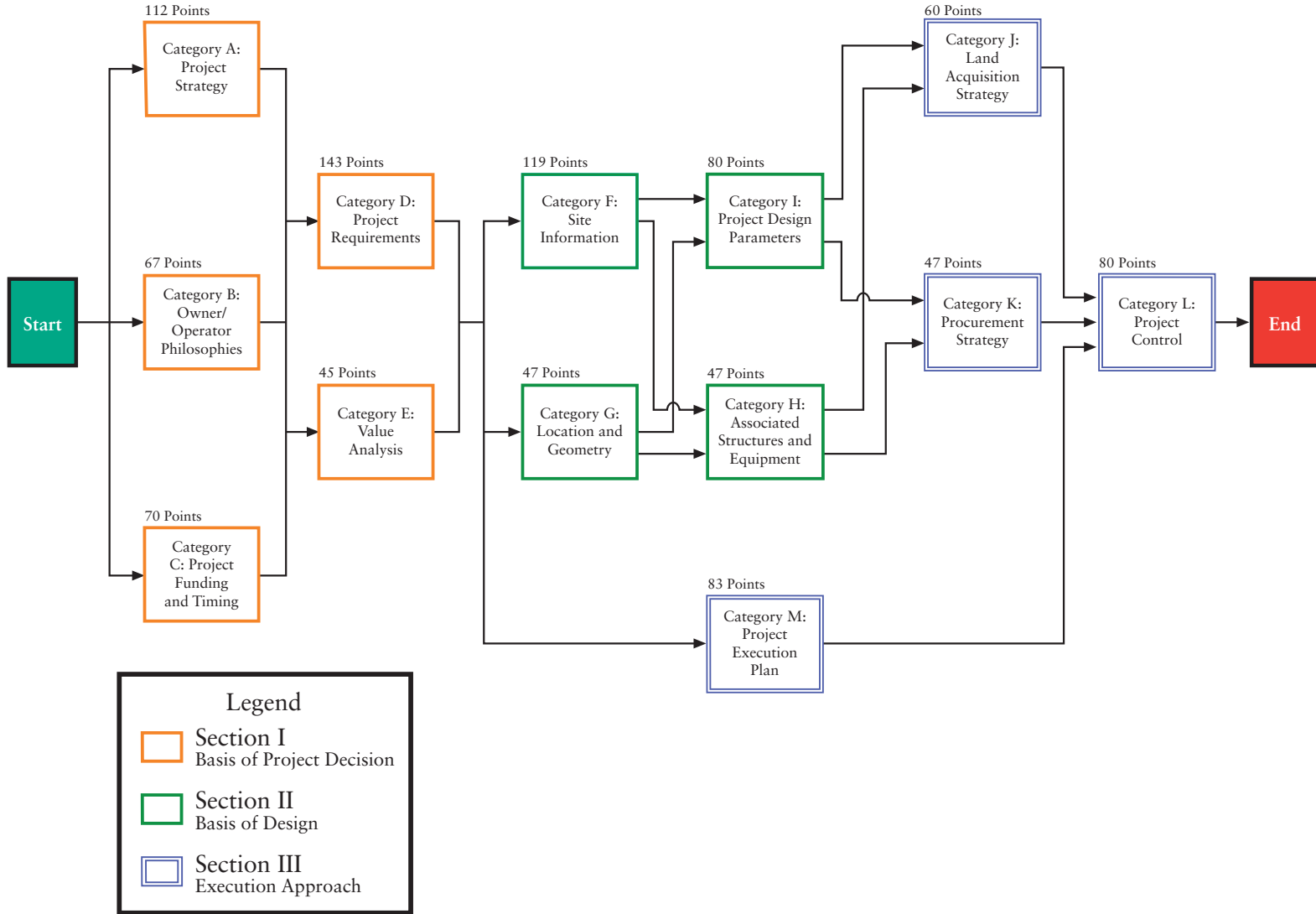


Figure 3.5. Infrastructure PDRI Category Logic Flow Diagram

After the release of the initial PDRI in 1996, many companies attempted to customize the elements to fit the needs of smaller projects. The description list of PDRI includes language that should make it adaptable to smaller projects or renovations. Experience has proven that gathering the project team around a well understood and customized PDRI can save time, money, and frustration.

Smaller projects may range in size from \$50,000 to \$5,000,000 in total project costs. Some may consist of one or two of the following design disciplines:

- environmental project to improve drainage and capture storm runoff
- airport runway or road pavement repairs or upgrades
- pipeline compressor or pump station upgrades
- repair or replacement of pipelines and manholes
- new electrical transmission feed
- instrument upgrade project.

In any of the above projects, the PDRI can be a very helpful tool in highlighting gaps in thinking and execution. The following are some guidelines for using the PDRI on small or “single-discipline” projects:

1. “Cross out” all elements that clearly do not apply.
Example: A storm water or drainage improvement project may not have any instrumentation or equipment requirements. In such cases, cross out (mark as NA) the Equipment List (Element H4), Electrical/Controls (Element I5), and other elements as necessary prior to the assessment session. Note: if there is any doubt regarding an element, then leave it in until the team has had time to discuss it.
2. Convene the project team and assess the project using only the PDRI elements that remain to be assessed; be sure to include those elements specifically designated for renovation projects, if applicable. At the conclusion of the PDRI assessment session, have representatives of each discipline sign off to signify their agreement with the definition of the project.
3. Revert to the normalized score (percentage) as a basis for determining how well the project is defined.
4. Since some of the most heavily weighted items of Section I could receive a “zero,” the facilitator should make the team aware of the elements that have the most impact on the final score. Other elements may become more important to predicting project success.

5. Alternatively, the tool can be used strictly as a checklist to identify issues that need to be addressed to develop a good scope. Use of the PDRI as an early checklist can have a great positive effect on the project and help focus the project team toward a common goal. If the project is a renovation, pay particular attention to the issues that have been identified for these types of projects.

Normalizing the Score

If an organization decides to create a scaled-down version of the PDRI, it must be aware of the fact that this procedure will alter the maximum possible score from 1000 points to some lower number. Each time an element is deleted from the score sheet, the maximum score for the project is reduced by that element's total weight. Further, not only will the maximum score be reduced, but the lowest possible score that can be achieved with complete definition will also drop from 70 points to some lower number.

Rework example: For example, on infrastructure revamp projects, the PDRI can be used effectively with some modification. Some elements may be “zeroed” as not applicable, e.g., Public Involvement (A4) and Surveys and Mapping (F3). A “not applicable” element essentially provides no risk (no potential negative impact) to the project. Other elements may become more critical, e.g., Permitting Requirements (F4) and Site Characteristics Available vs. Required (D5). After the assessment, if the organization's scaled-down version has a maximum possible score of 752 (after certain elements are rated “not applicable” in the score sheet), it may determine that a score of 120 (16 percent of the total applicable points) must be reached before authorizing its small projects for design.

Teams on small-projects must also determine new PDRI target scores, which, when reached, will trigger the project's authorization for detailed design and construction. Each organization should develop an appropriate threshold range of scores for each phase of front end planning. These thresholds are dependent upon the size, type, and complexity of each project.

Caution: Using the PDRI for this purpose should be done carefully, or else elements that are more important for small projects may be given less emphasis than needed. The imperative for using the PDRI in these situations is “use common sense.” An experienced facilitator can help in this regard.

Implementation across an Organization

The first requirement for implementation of the PDRI across any owner or contractor organization—i.e., using it on all projects—is the unwavering support of upper management. Upper management must create a procedure that requires the utilization of the PDRI before a project is authorized to proceed into the execution phase. Many successful organizations require a PDRI report as a part of their project approval process at Phase Gate 3. Some organizations require a specific score of 200 or less before a project can be approved for the next phase.

There is some danger in too much focus on scoring, however. Some smaller maintenance projects may be fully acceptable at a much higher PDRI score, as long as the project risks have been defined and a mitigation plan is in place to control the project. As stated above, common sense should prevail when PDRI results from a project are being reviewed. Requiring teams to reach a specific score could result in a team artificially adjusting the score so that its project can be executed (to the detriment of the organization, the project, and the team participants). In most cases, it is more beneficial for the sponsor to have a PDRI assessment with a score above 200—along with identified risk issues (gap list) and corresponding mitigation steps—than to have a PDRI assessment with a lower score and no commentary. Sponsors should focus on the gap list generated in the assessment session, not only on the PDRI score. Placing too much emphasis on the score can lead to the use of the tool as merely an administrative exercise.

The second requirement for implementation across an organization is a local champion. This person is an enthusiastic supporter and advocate of the application of this tool. He or she gains knowledge about the tool and fosters its widespread application by staying in contact with other organizations that use the PDRI.

The third requirement for implementation is training. Several facilitators should be trained, with the number will varying by organization and according to the number of projects that require approval. The objective is to ensure that every project has access to a trained facilitator in a timely manner. The facilitator should NOT be a member of that project team. In many organizations, project managers are trained as facilitators for their peers' projects.

In addition to developing a cadre of facilitators, every organization should ensure that all of its key members should understand the PDRI. In most cases, this is accomplished with just-in-time training. At the outset of each session, the

facilitator will brief the participants on the purpose of the PDRI process and explain their respective roles in making the session a success. The facilitator should further take the opportunity to comment on specific behaviors as the team progresses through the assessment session. Soon, key members will be well trained and know what to expect during future PDRI assessment sessions.

If the PDRI is implemented across an organization, its use should be monitored. Many organizations have modified PDRI element descriptions to address proprietary concerns and lessons learned, or to include specific terminology based on its business environment.

What Does A PDRI Score Mean?

A low PDRI score represents a project definition package that is well-defined and, in general, corresponds to an increased probability for project success. Higher scores signify that certain elements within the project definition package lack adequate definition.

The PDRI, in its various forms, has been used on hundreds of projects worth billions of dollars in investment. As part of the tool-testing process during its development, the PDRI for Infrastructure was used to assess the efficacy of the front end planning efforts on four projects representing over \$2 billion in investment; planning was also assessed on an additional 21 completed projects representing almost \$6 billion in capital investment. These projects covered a wide range of infrastructure projects and included tunnels, security perimeters, pipelines, wharfs, electrical distribution, airport runways and taxiways, and roadways.

Table 4.1 compares project performance for the sample of 21 infrastructure projects, using a 200-point PDRI score cutoff. Each project was assessed by a key project participant and a PDRI score was determined after the fact, at a point just prior to detailed design; actual performance results were captured rather than estimated at that point. The 200-point cut-off has been used in previous PRDI tools and represents a good break point in the validation data. Additionally an analysis at the 150-point level is shown for comparison in Table 4.2.

The data show the mean performance for the projects as against the execution estimate for design and construction. These data also show the absolute value of changes as a percentage of total project cost. Projects with a PDRI score under 200 (a lower score is better) outperformed projects with a PDRI score above 200 in terms of cost, schedule, and change orders. The same can be said of projects with a PDRI score below 150 and those scoring above 150. For this relatively small sample, the differences in performance parameters are all statistically significant. (For more information on this data analysis, see Reference 9.)

Table 4.1. Comparison of Projects with PDRI–Infrastructure Projects Scores Above and Below 200

Performance	PDRI Score	
	< 200	> 200
Cost	5% below budget	25% above budget
Schedule	13% behind schedule	30% behind schedule
Change Orders	3% of budget (N=12)	10% of budget (N=9)

Table 4.2. Comparison of Projects with PDRI–Infrastructure Projects Scores Above and Below 150

Performance	PDRI Score	
	< 150	> 150
Cost	6% below budget	24% over budget
Schedule	7% behind schedule	28% behind schedule
Change Orders	2% of budget (N=7)	8% of budget (N=14)

The projects used in these samples were submitted from industry professionals from 15 different organizations, with project sizes ranging from approximately \$400,000 to over \$2 billion and with an average cost of approximately \$282 million. The evaluations provided here are valid for the samples as given. These samples may or may not be indicative of projects in your organization and the samples may be biased because of the size and types of projects making up the sample. However, the results are convincing in terms of performance predictability.

The analysis revealed a significant difference in performance between the projects scoring above 200 and the projects scoring below 200 prior to detailed design and construction, for the PDRI–Infrastructure. An even larger difference was seen for those projects scoring below 150 and projects above 150.

Other PDRI Assessment Data

A large number of building and industrial projects were evaluated with the appropriate PDRI in a prior CII investigation. For each of these projects, PDRI scores and project success criteria were computed. (Note: these projects were also scored after the fact.) An analysis of these data yielded a strong correlation between low (good) PDRI scores and high project success. For more information on the validation sample and methodology, see Reference 6. These results are consistent with those obtained from the PDRI–Infrastructure.

Table 4.3 compares project performance for a sample of 108 building projects worth \$2.3 billion, using a 200-point PDRI score cut-off. These data show the mean performance for the projects as against the execution estimate for design and construction. The data also show the absolute value of changes as a percentage of total project cost. Projects with a PDRI score under 200 (a lower score is better) statistically outperformed projects with a PDRI score above 200 in terms of cost, schedule, and change orders. The PDRI score was determined just prior to the beginning of detailed design, and the differences in performance parameters are statistically significant.

Table 4.3. Comparison of Projects with PDRI–Building Projects Scores Above and Below 200

Performance	PDRI Score	
	< 200	> 200
Cost	3% above budget	9% above budget
Schedule	5% behind schedule	21% behind schedule
Change Orders	8% of budget (N=25)	11% of budget (N=83)

A similar evaluation was performed on a sample of 129 industrial projects representing approximately \$6.7 billion. Table 4.4 summarizes the project performance and PDRI score using the same 200-point PDRI score cut-off. Again, projects with better scope definition (lower PDRI score) outperformed projects with poorly defined scope in terms of cost performance at the 95 percent confidence level.

Table 4.4. Comparison of Projects with PDRI–Industrial Projects Scores Above and Below 200

Performance	PDRI Score	
	< 200	> 200
Cost	4% below budget	4% over budget
Schedule	4% behind schedule	10% behind schedule
Change Orders	7% of budget (N=75)	8% of budget (N=54)

The projects used in these samples were voluntarily submitted. The Building PDRI sample included data from 24 organizations, including office, control building, recreation, institutional, and research facilities. Project sizes ranged from approximately \$630,000 to \$251 million, with an average cost of approximately \$22 million. The Industrial PDRI sample included data from 53 organizations and represented heavy and light industrial projects, including chemical, pharmaceutical, power, pulp and paper, refining, and metals facilities. Project size ranged from \$120,000 to \$635 million, with an average size of approximately \$53 million.

Concluding Remarks

The PDRI can benefit owners, developers, designers, and contractors. Facility owners, developers, and lending institutions can use it as an assessment tool for establishing a comfort level at which they are willing to move forward on projects. Designers and constructors can use it as a means of negotiating with owners when identifying poorly defined project scope definition elements. The PDRI provides a forum for all project participants to communicate and reconcile differences; because it is an objective tool, it provides a common basis for project scope evaluation. It also provides excellent input into the detailed design process and a solid baseline for design management.

The PDRI for Infrastructure can benefit the public as well. Since infrastructure typically spans the public domain, the transparent communication of project objectives and expectations to the public can enhance and facilitate planning. Moreover, the PDRI can help the project team anticipate the public's main concerns and begin to address them pro-actively. Soliciting and acting upon public input is an essential element of the PDRI for Infrastructure.

Anyone who wishes to improve the overall performance of their infrastructure projects should use the PDRI.

How to Improve Performance on Future Projects

The following suggestions are offered to individuals or organizations who adopt the PDRI with the desire to improve performance on their infrastructure projects:

- **Commit to early project planning.** Effective planning in the early stages of infrastructure projects can greatly enhance cost, schedule, and operational performance while minimizing the possibility of financial failures and disasters.
- **Gain and maintain project team alignment** by using the PDRI throughout front end planning. Discussions around the scope definition checklists are particularly effective in helping with team alignment.