



Integrated Project Risk Assessment



Construction
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Implementation Resource 181-2
Version 2.0



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Integrated Project Risk Assessment

Prepared by the

Construction Industry Institute

Risk Assessment for International Projects Project Team

Updated by the

Risk Management Integration Team

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Foreword

Welcome to the second edition of Implementation Resource 181-2, *Integrated Project Risk Assessment*, authored by the CII Risk Management Integration Team. The first edition of this document was developed and written by the CII Risk Assessment for International Projects Research Team and published in 2003. Originally titled *International Project Risk Assessment (IPRA)*, this tool's title change was necessary because, in the intervening years, CII found that it is applicable to and effective for a wider variety of projects. The term "integrated" better describes the combination of commercial, location, facilities, and production/operations risk issues that the tool addresses. It also became apparent that the tool can be used for more than just risk assessment, and can serve as the cornerstone of an effective risk management process.

As part of its charter, the CII Risk Management Integration Team reviewed and integrated all CII risk management documentation, including this document. The team believes that these changes improve the usability of the tool. The team rewrote the document to incorporate a better discussion of the risk management process and to discuss the various applications of the tool, both domestically and globally. The IPRA is uniquely suited to enable an integrated project team to identify, assess, and subsequently mitigate significant risks.

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Chapter 1: What Is the IPRA?

Risk has different meanings to different people, and the concept of risk varies according to viewpoint, attitude, and experience. Engineers, designers, and contractors often view risk from a technical perspective, while owners and developers tend to view it from the economic and financial side. Similarly, safety and health professionals take a more hazard impact/mitigation perspective. Some see risk as an abstract concept and, therefore, as something that is difficult to measure. Thus, gaining alignment in terms of how to approach risk on a project is not easy; however, it is essential.

Risk assessment and risk management are critical tasks for construction projects, yet owners and contractors have few evaluation tools or guidelines to help them with these processes. Management of risk is especially important when an organization is considering a complex project that is to be constructed in a jurisdiction with unique challenges. The Integrated Project Risk Assessment (IPRA) tool was initially developed by the Construction Industry Institute's (CII) Risk

The Integrated Project Risk Assessment (IPRA) is an effective tool for assessing the degree of risk on any project, but it is especially useful for complex projects in unfamiliar venues or localities.

Assessment for International Projects Project Team, and subsequently updated by CII's Risk Management Integration Team. The IPRA identifies and describes the issues critical to complex capital projects performed in unfamiliar jurisdictions; it allows project teams to focus on risk factors of potential concern. The IPRA is intended to help teams evaluate their risk exposure, and it provides an indication of the potential impact of risk during the full project life cycle. In effect, it can serve as an "aide memoire" for the project participants. While risk control and mitigation were not within the scope of the initial research mandate, the IPRA has proven to be effective at indicating which project components should be considered for risk mitigation in the context of an overall risk management strategy.

When the IPRA was initially developed it was focused on international projects that were defined at the time as projects performed by North American investors, owners, and/or contractors, and located outside of North America. Originally titled *International Project Risk Assessment*, the tool is now called *Integrated Project Risk Assessment* because in the intervening years CII found that it is applicable to and effective for a wider variety of projects. The Risk Management Integration Team found that the document's title and write-up limited its adoption and was not indicative of actual practice. Moreover, it was apparent that the tool could be used for more than just risk assessment, and could be a cornerstone of an effective risk management process as outlined later in this document. To address these issues, the team produced this new edition.

When risk is discussed, definitions such as “the potential for loss or injury” are used. Risk can also be defined as the exposure to the chance occurrences of events that adversely or favorably affect project objectives as a consequence of uncertainty. Typically risk is considered for different potential events, but many times different risks can be related. Risk is often used to connote an unfavorable event, though that is not always the case. In the construction industry, risk is often referred to as the presence of potential or actual threats or opportunities that influence project objectives during project planning, construction, and commissioning; and these objectives are in the form of cost, schedule, and quality.

When undertaking many capital projects, owners have limited resources to assess a diverse set of political, geographic, economic, environmental, regulatory, security, and cultural risk factors. Likewise, contractors must consider a similar set of risk factors when determining whether to undertake such projects, and how to price, schedule, and successfully deliver the work if they do. Additionally, in many organizations, project practitioners and decision makers do not communicate effectively about the real risks and rewards of the ventures they pursue. Because of the need for a structured process to enhance the assessment and management of a myriad of project risks, CII extensively researched and validated the structured risk identification and assessment process presented here.

The relative risk of any project is based on a combination of many factors, as briefly outlined above. During the development of this document, practitioners repeatedly discussed projects in jurisdictions in which their firms had decades of experience, employees on the ground, and ongoing business operations. Having such experience and presence in a given jurisdiction certainly reduces the risks that a firm will face; however, the approach outlined in this document can still provide value.

The tool can be applied to any project, but is especially useful for projects performed in venues or localities that are new to the participants, or that are changing due to political or demographic shifts. It is also useful for projects or ventures involving major participants from a number of different jurisdictions, projects involving multiple offices and global sourcing of engineering, materials, and services, and, of course, for projects that are considered international or global in nature. Its usefulness increases as the level of complexity of the venture increases. It should be stressed that risk management is only one important aspect of sound project management; other project management practices such as scope definition, design management, team processes, relationships management, project controls, among others, must also be adequately performed.

Globalization of the world's construction markets has continued to increase since the initial publication of the IPRA, and CII has further defined a global project environment as one that has bi-directional value flows. (See CII Research Summary 263-1, *Building a Successful Global Engineering and Construction Company*.) The globalization of engineering and construction (E&C) services is a part of the much broader market trend toward the globalization of all services; this larger trend has had far-reaching impacts in recent decades on work practices, workforce demographics, the economy, and society. In the engineering and construction industry, discussions of globalization have centered largely on two main topics: 1) the *outsourcing of services* from offshore service providers, such as low-cost engineering centers; and 2) the *increasing project scope* of global projects—their larger size and greater complexity require the participation of engineers, contractors, and suppliers from several countries. Yet, a third important trend in the globalization of the industry deserves further investigation: the *market issues* that organizations face as they expand into other countries and as they encounter increasing competition from international organizations working within their own jurisdictions.

The situation in industry today is that, as trade liberalization is increasing, the cost differentials between advanced and developing countries are declining. Market issues are creating a new globalization dynamic, making it difficult for E&C organizations to maintain and increase their market shares domestically and abroad. For these organizations to work effectively in a global market, they must evolve beyond being users of global resources and become creators of ventures that effectively operate in and integrate into a global market. With the importance of globalization in the current business climate, rigorous risk management is a critical success factor, and the IPRA can help with this process.

In spite of this critical need, systematic risk management of project activities is not fully recognized by practitioners in the engineering/design and construction industry. For instance, risk management processes at E&C firms tend to focus primarily on risk to the firms and only incidentally on risk to projects. Out of necessity, owner organizations have a broader outlook, but still lean heavily toward managing organizational risks. That is to say, for an owner, community and environmental risks are considered only for their potential impact on the organization's financial status and reputation. When it comes to mitigation, the emphasis is often on the transfer of risk to other participants. Such organization-centric risk outlooks can have devastating consequences for the health of the venture and on key stakeholders.

CII research projects have indicated that the industry has no standard view of risk, since on a typical project, the owner, investor, designer, and constructor have differing project goals and objectives, and since adverse relationships among project parties are common. Coordinating risk management between project participants is not typically done in a formalized manner, and

this is especially true between contractors and owners. Identifying and managing project risks rather than leaving project participants to consider only their risks provides the following benefits:

- allows for early identification of hazards and opportunities
- communicates risks between project participants
- identifies and manages uncertainty
- identifies and considers worst-case scenarios
- establishes ownership of risks and risk mitigation actions
- enhance risk-based decision-making.

Better risk strategy development and improved communication between project parties are key outcomes of the IPRA tool.

The IPRA is designed to facilitate risk assessment and to help address management of the concerns it identifies. As discussed above, the risk elements identified in the IPRA are those specific and unique to complex projects performed in unfamiliar jurisdictions, either domestically or internationally. Complexity also can arise from unique features of the project such as scale, multi-party project stakeholder involvement, new or emerging technologies, challenging labor markets, and material constraints (even on domestic projects). Because the IPRA cannot capture every potential risk on a project, project teams should take a “common sense” approach when performing an assessment.

The typical IPRA international project can include infrastructure, building, or industrial projects, which include the following:

- office buildings
- power plants
- medical facilities
- institutional buildings
- highways
- hotels
- warehouses
- bridges
- process plants
- education facilities
- research and laboratory facilities
- dams
- retail facilities
- apartments
- parking structures
- manufacturing facilities
- airport facilities
- public assembly/performance halls.

The IPRA consists of four main sections, each of which is divided into a series of categories that, in turn, are further divided into elements (specific risk factors). (See Figure 1.1.) References 1 and 2 explain in detail the development of the IPRA, and summarize the overall research effort. Table 1.1 provides a complete list of the IPRA's four sections, 14 categories, and 82 elements.

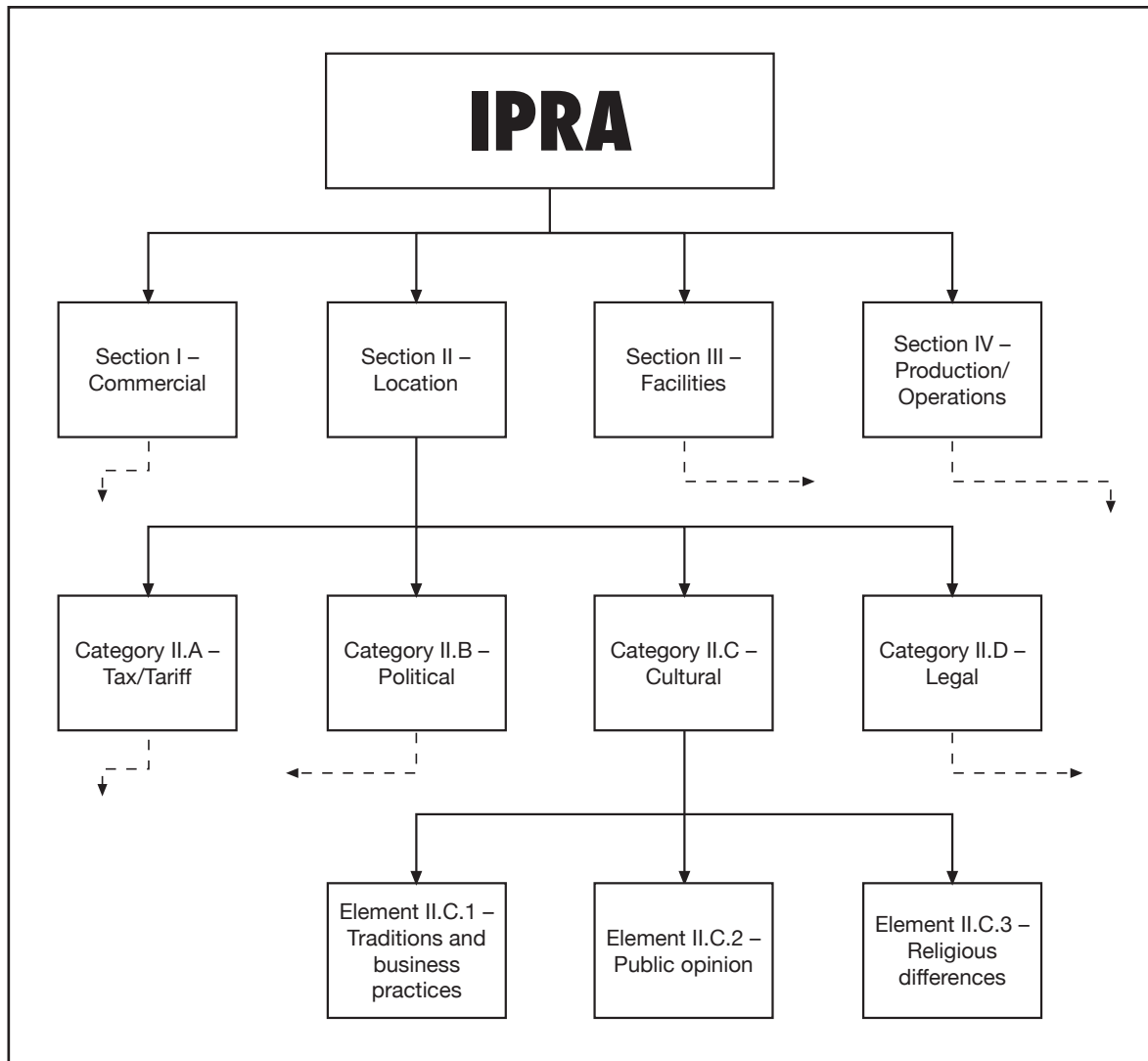


Figure 1.1. IPRA Hierarchy

Table 1.1. IPRA Section, Categories, and Elements

SECTION I – COMMERCIAL I.A. Business plan - I.A1. Business case - I.A2. Economic model/feasibility - I.A3. Economic incentives/barriers - I.A4. Market/product - I.A5. Standards and practices - I.A6. Operations - I.A7. Tax and tariff I.B. Finance/funding - I.B1. Sources & form of funding - I.B2. Currency - I.B3. Estimate uncertainty - I.B4. Insurance SECTION II – LOCATION II.A. Tax/tariff - II.A1. Tariffs/duties - II.A2. Value added tax - II.A3. Legal entity establishment - II.A4. Application of tax laws and potential changes - II.A5. Technology tax - II.A6. Personal income tax - II.A7. Corporate income tax - II.A8. Miscellaneous taxes II.B. Political - II.B1. Expropriation and nationalism - II.B2. Political stability - II.B3. Social unrest/violence - II.B4. Repudiation - II.B5. Government participation and control - II.B6. Relationship with government/owner - II.B7. Intellectual property II.C. Culture - II.C1. Traditions and business practices - II.C2. Public opinion - II.C3. Religious differences II.D. Legal - II.D1. Legal basis - II.D2. Legal standing - II.D3. Governing law/contract formalities and language - II.D4. Contract type and procedures - II.D5. Environmental permitting - II.D6. Corrupt business practices	III.B. Sourcing and supply - III.B1. Engineered equipment/material/tools - III.B2. Bulk materials - III.B3. Subcontractors - III.B4. Importing and customs - III.B5. Logistics III.C Design/engineering - III.C1. Design/engineering process - III.C2. Liability - III.C3. Local design services - III.C4. Constructability III.D. Construction - III.D1. Workforce availability and skill - III.D2. Workforce logistics and support - III.D3. Climate - III.D4. Construction delivery method - III.D5. Construction permitting - III.D6. General contractor availability - III.D7. Contractor payment - III.D8. Schedule - III.D9. Insurance - III.D10. Safety during construction - III.D11. Communication and data transfer - III.D12. Quality III.E. Start-up - III.E1. Trained workforce - III.E2. Facility turnover - III.E3. Feedstock and utilities reliability
SECTION III – FACILITIES III.A. Project scope - III.A1. Scope development process - III.A2. Technology - III.A3. Hazardous material requirements - III.A4. Environment, health, and safety - III.A5. Utilities and basic infrastructure - III.A6. Site selection and clear title - III.A7. Approvals, permits, and licensing	SECTION IV – PRODUCTION/OPERATIONS IV.A. People - IV.A1. Operational safety - IV.A2. Security - IV.A3. Language - IV.A4. Hiring/training/retaining - IV.A5. Localizing operational workforce IV.B. Legal - IV.B1. Governing law/operational liability - IV.B2. Permitting - IV.B3. Insurance - IV.B4. Expatriates - IV.B5. Environmental compliance IV.C. Technical - IV.C1. Logistics and warehousing - IV.C2. Facilities management and maintenance - IV.C3. Infrastructure support - IV.C4. Technical support - IV.C5. Quality assurance and control - IV.C6. Operational shutdowns and start-up

Each section, category, and element of the IPRA has a corresponding detailed description. Each of these descriptions present bulleted examples to help the project team understand the issues related to the component of the risk being considered. Assessment sheets are used to rate the likelihood of occurrence and relative impact for each element. The project team should use the IPRA Assessment Sheets and Element Descriptions (Appendices A–C) together to identify and assess specific risk factors.

Structure of this Document

This implementation resource consists of six chapters, followed by six appendices of supporting information. Chapter 2 highlights the CII definition of the risk management process, and the project performance benefits the IPRA offers. Chapter 3 provides detailed instructions for performing an IPRA project assessment. Chapter 4 describes the various ways in which an IPRA assessment outcome can be analyzed to determine a project's risk potential. Chapter 5 discusses how to use outputs from the IPRA to formulate mitigation strategies. The final chapter summarizes the major uses and benefits of the IPRA and offers recommendations for implementing it on projects. The appendices contain the tool, along with an example of its use and a suggested risk register format.

Chapter 2: The Risk Management Process and the Benefits of the IPRA

Effective risk management improves project performance in terms of cost, schedule, and scope. Many industry leaders recognize the importance of risk assessment and the risk mitigation process that must be an immediate response to an IPRA evaluation. Undertaking this process during the early stages of a project has the potential to significantly affect project success.

Risk management is a process that helps project teams predict and handle project risks. In some cases team members may know these risks, including the probability of their occurrence and the costs were they to occur. (These risks are the “knowns.”) In other cases, the team may know that particular risk events can occur, but may have difficulty understanding the range of their possible outcomes. (These risks are the “known unknowns.”) The worst category of risk, are the issues that a team does not know about or has not envisioned—typically, some of these risks do materialize. (These are the “unknown unknowns.”) The IPRA tool since it was developed to help address all types of risk.

A subset of unknown unknowns—the low-likelihood high-impact risks that are often called “black swans”—can lead to potentially devastating consequences or, in some cases, great opportunities. The term “black swan” is derived from historical references to the rarity and/or presumed impossibility of such a bird among a flock of white swans. The term has become widely used over the past decade as a metaphor for something that is unpredictable in its randomness and devastating in its consequence, i.e., lying outside the realm of usual expectations. Generally black swan events are only identified retrospectively. In many cases, the existence of black swan events depends on the experience and perspective of the person or organization that is involved in a risk assessment. Having flexible and robust approaches to risk and project management can help. Using integrated, team-based risk management processes, along with tools such as the IPRA may help project teams at least envision some events that some participants have not imagined. It should be noted that only assessing the issues indicated in the IPRA tool can be problematic, because, as noted above, no risk management tool can address every possible risk. Again, not all black swans can be perceived or predicted. (A classic, project-based example is the failure to foresee the occurrence and consequences that the massive tsunami had on the Fukushima Nuclear Power plant in 2011, despite many risk assessments.)

Figure 2.1 shows the risk management process. In general, the project team must begin this process as early as possible, and continue to reassess and adjust to new risks as the project progresses. A structured risk management is a process and not a one-time event. Because the risk profile will change, the process involves several formal risk reviews/assessments over the course of a project. The changes in risk profile are the result of several factors: actions taken to manage risk; unintended consequences of decisions made; and events beyond the control of the project. Even as some identified risks are eliminated or mitigated, other previously unidentified risks materialize.

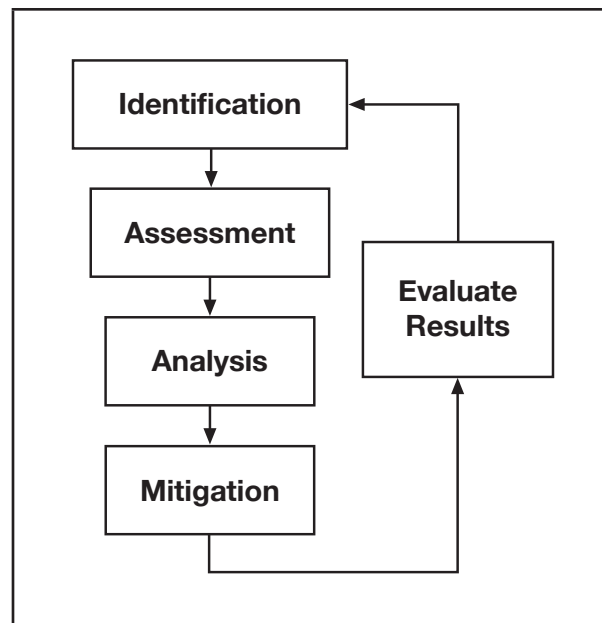


Figure 2.1. Risk Management Process

Figure 2.1 shows the four iterative stages of a total risk management program. Risk identification is the first stage, and involves simply cataloging of risks that may affect the project in question. This list can be compiled from general knowledge and experience, combined with a “what can happen” analysis of the future. In more sophisticated applications, project teams can use tools such as the IPRA to gain a better understanding of these risks; its facilitated process generates a list of potential risks that are discussed and vetted by the entire project team. The identified issues can be tracked and mitigated on the basis of team members’ experience and opinion. Chapter 3 explains the IPRA descriptions of identified risk elements and the tool’s risk identification process.

The second stage of risk management is the assessment or evaluation of identified risks in terms of potential cost or time impact. An infinite number of loss scenarios exist, and the probability of each is a function of many factors. By looking at the likelihood of occurrence and relative impact should a given event occur, the evaluator can decide whether it is a risk worth addressing. This part of the process is sometimes known as deterministic risk analysis, and involves through single-point estimates of potential impacts. The IPRA was developed to facilitate this kind of assessment. Typically, this requires a prioritized list of risks, and/or an expected value for contingency allocation of schedule or cost. These contingency allocations are based on the assessment of likelihood of occurrence and relative impact. Some of the risks can be addressed by simply gathering more information, while others should be managed through more active mitigation methods, as outlined below.

A third stage, called analysis, may be conducted, and it involves probabilistic risk analysis methods. This process is the act of analyzing risk through probability distribution estimates of potential impact, known as Monte Carlo simulations. Typically, this approach involves cumulative distributions of potential outcomes and determination of the probability of meeting project targets. Usually these analyses are applied to major components of the project in order to develop a range of possible outcomes, and hence, to develop contingency estimates for both cost and schedule. This method is not addressed further in this publication, but more information can be found in CII IR 280-2, *Applying Probabilistic Risk Management to Design and Construction Projects*.

Risk mitigation, the fourth stage, is achieved in various ways, such as, for instance, currency hedging and the purchase of insurance. In summary, risk mitigation methods include risk avoidance, retention/acceptance, control/reduction, transfer/deflection, or application of contingency. Risk mitigation and the use of a risk register to manage this process are discussed in detail in Chapter 5.

The IPRA allows the project team to identify and gauge the level of risk on projects prior to and throughout the project's life cycle. By design, it focuses specifically on issues unique to the specific jurisdictions of a given venture. A significant feature of the IPRA is its flexibility to fit the needs of almost any individual project. Elements that are not applicable to a specific project can be ignored, thus eliminating them from further assessment and mitigation actions.

The IPRA can provide numerous benefits to the project team. These include the following uses:

- as a checklist that a project team can use for determining risk potential of a project
- as a source of a standardized risk terminology for ventures outside an organization's usual jurisdiction
- as a process for identifying and assessing risk and for facilitating the prediction of disruptions, potential for disputes, and other impediments to progress
- as a means to monitor the progress of risk control at various stages of the project's life cycle
- as a tool that promotes communication and alignment by highlighting poorly defined areas of risk for investors, owners, and design or construction contractors
- as a tool that facilitates communication and understanding between project participants and decision makers
- as a means for project team participants to reconcile differences using a common basis for project evaluation
- as a risk identification and assessment training tool for organizations and individuals throughout the industry
- as a benchmarking tool for organizations to use to evaluate their risk management processes over time, both internally and externally, in order to predict the probability of success on future projects.

Who Should Use the IPRA?

Anyone wishing to improve his or her overall performance on projects should use the IPRA.

Projects performed in unfamiliar jurisdictions typically involve a diverse group of project participants. From owners/users to investors, from insurance/sureties to designers/consultants, and from contractors to material suppliers, the cast of characters is long and dynamic as the project proceeds through its life cycle. Making sure that risks are addressed during this linear progression is a difficult task. The IPRA gives these diverse project participants a mechanism for communicating and understanding risk.

In addition, with the globalization of the construction industry, many organizations face increasing challenges (and higher risk) as they expand into new markets. Globalization also means that they encounter increasing competition from international organizations working within their home jurisdictions. A sound risk management process can help improve competitiveness.

When it comes to major projects, there may be little distinction between international and domestic projects with regard to risk. This is due to the influences of globalization on the execution of major projects. Procurement of engineered equipment, bulk materials, and pre-fabricated or modularized units has been global for many years. In the last two decades, a significant and increasing amount of design, engineering, and procurement/project management services has been sourced globally. Most large, global EPC firms have “value centers” located in several countries, and others have alliances with low cost engineering firms outside North America, Europe, and Japan.

Other trends include the increasing occurrence of consortia/joint ventures for project execution, and “work-share” among different contractor’s offices—even within the same country/region. The risks on these projects are similar to those of projects using offshore sources, though the extent of consequences may be different. Therefore many of the project risks applicable to international projects apply to all major projects, and in all areas where projects are performed.

Chapter 3: Using the IPRA Tool

To assess a project using the IPRA tool and method, the project team should use the IPRA Assessment Sheet in conjunction with the team's IPRA element descriptions. This process will determine the likelihood of occurrence and relative impact of each of the 82 identified risk issues. Once this assessment is complete, the team should use the risk matrix to plot the frequencies of the identified issues. (These components of the process are illustrated in Figure 3.1.) Each of these steps is discussed in further detail later in this chapter. After making the assessment and isolating the risk issues, the team must proceed to risk mitigation, which is discussed in more detail in Chapter 5.

IPRA Assessment Sheet

CATEGORY	Likelihood of Occurrence (L)					Relative Impact (I)					Baseline	Coordinate L, I	Comments	
	Very Low → Very High					Negligible → Extreme								
	NA	1	2	3	4	5	A	B	C	D				E
I.A. BUSINESS PLAN														
I.A1. Business case												E		
I.A2. Economic model/feasibility												E		
I.A3. Economic Incentives/barriers												D		
I.A4. Market/Product												E		
I.A5. Standards and practices												D		
I.A6. Operations												D		
I.A7. Tax and tariff												D		

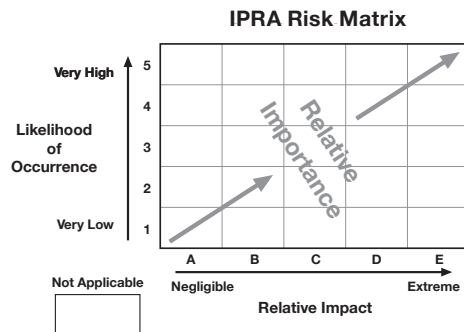
LEGEND

Likelihood of Occurrence

NA - Not applicable to this project
1 = Very low probability and occurs in only exceptional circumstances (<10% chance)
2 = Low chance and unlikely to occur in most circumstances (10% chance <35%)
3 = Medium chance and will occur in most circumstances (35% chance <65%)
4 = High chance and will probably occur in most circumstances (65% chance <90%)
5 = Very high chance and almost certain and expected to occur (90% or greater chance of occurrence)

Relative Impact

A = Negligible and routine procedures sufficient to deal with the consequences
B = Minor and would threaten an element of the function
C = Moderate and would necessitate significant adjustment to the overall function
D = Significant and would threaten goals and objectives; requires close management
E = Extreme and would stop achieve



I.A7. Tax and tariff

Taxes and tariffs affect projects, and early identification of their repercussions is critical, considering the entire life cycle of the venture. Most taxes and tariffs arise under statutes that are administered by governmental agencies and can provide for serious sanctions in cases of violation. The calculation, administration, and reporting requirements related to taxes and tariffs are functions for which local expertise is often required. (See Category C, Section II for a more detailed treatment of tax and tariff.) Taxes and import duties need to be understood for investment, construction, and ongoing facility operation. Items to consider include the following:

- ☐ Basis and rate of charges
- ☐ Volatility for changes
- ☐ Registration and applications
- ☐ Nature of enforcement
- ☐ Type of tax (e.g., income, business, VAT, corporate, and technology)
- ☐ Application of tax and duty laws and their specificity
- ☐ Miscellaneous fees, levies, import duties, and other mandatory payments
- ☐ Other

Figure 3.1. Basic Components of the IPRA Method

Project Assessment Sheets

Individuals involved with assessing the project should use one of two sets of Project Assessment worksheets, either the one provided in Appendix A or the one provided in Appendix B. The difference between the two sets of worksheets is that Appendix A provides worksheets that contain a baseline “relative impact” value, and Appendix B provides worksheets that do not use a baseline. That is, the worksheets in Appendix A, give participants the option of selecting their own “relative impact” level or of using the “baseline relative impact (baseline)” for each element. (See Figure 3.2.) The baseline impact level is based on input from experienced project managers, and is intended for use when specific values are unavailable or when project participants have little knowledge of the potential consequences. Users of the Appendix B worksheets determine their own level of relative impact, and no baseline is provided. The mechanics of going through this process and completing an assessment are outlined below.

CATEGORY	Likelihood of Occurrence (L)					Relative Impact (I)					Baseline	Coordinate L, I	Comments	
	Very Low → Very High					Negligible → Extreme								
	NA	1	2	3	4	5	A	B	C	D				E
I.A. BUSINESS PLAN														
I.A1. Business case												E		
I.A2. Economic model/ feasibility												E		
I.A3. Economic Incentives/ barriers												D		
I.A4. Market/Product												E		
I.A5. Standards and practices												D		
I.A6. Operations												D		
I.A7. Tax and tariff												D		

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NA = Not applicable to this project

1 = **Very low** probability and occurs in only exceptional circumstances (<10% chance)

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Relative Impact

A = Negligible and routine procedures sufficient to deal with the consequences

B = Minor and would threaten an element of the function

C = Moderate and would necessitate significant adjustment to the overall function

D = Significant and would threaten goals and objectives; requires close management

E = Extreme and would stop achievement of functional goals and objectives

Figure 3.2. Sample Baseline Risk Assessment Sheet

How to Assess a Project

To assess the entire project, the project team must address each of the 82 elements. To rate an individual element using either of the detailed assessment sheets, reviewers should first read its explanation in the appropriate section of the IPRA Risk Elements Descriptions document (Appendix C). This appendix provides detailed descriptions of each of the 82 elements and gives checklist examples to clarify concepts and facilitate the understanding of their impacts. Figure 3.3 presents the description and checklist for element I.A7. Tax and Tariff. The checklists are not

all-inclusive, and the user may supplement them as necessary. The descriptions are listed in the same order as they appear in the assessment sheets, and follow the IPRA hierarchy of section, category, and element.

I.A7. Tax and tariff

Taxes and tariffs affect projects, and early identification of their repercussions is critical, considering the entire life cycle of the venture. Most taxes and tariffs arise under statutes that are administered by governmental agencies and can provide for serious sanctions in cases of violation. The calculation, administration, and reporting requirements related to taxes and tariffs are functions for which local expertise is often required. (See Category C, Section II for a more detailed treatment of tax and tariff.) Taxes and import duties need to be understood for investment, construction, and ongoing facility operation. Items to consider include the following:

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- ☐ Registration and applications
- ☐ Nature of enforcement
- ☐ Type of tax (e.g., income, business, VAT, corporate, and technology)
- ☐ Application of tax and duty laws and their specificity
- ☐ Miscellaneous fees, levies, import duties, and other mandatory payments
- ☐ Other

Figure 3.3. Element I.A7. Tax and Tariff Description

The project should be evaluated on the basis of the issues the team raises using the element descriptions and associated checklists as guides. This evaluation requires common sense and reasonable judgment. This identification of risks associated with projects is the first step of the IPRA process. Because the risk issues the tool identifies are unique to the jurisdictions concerned, it is beyond its scope to provide solutions to these issues. This part of the IPRA process corresponds to the “identification” phase of the risk management process discussed in Chapter 2.

The likelihood of occurrence combined with the relative impact at the time of the assessment determines the relative importance of the risk. The difference between the perceived and actual risks of any IPRA element depends on the project participants’ level of knowledge, and includes some of the following factors:

- availability of information
- experience and expertise of project participants

- understanding of the issues creating the risk
- knowledge of local conditions
- extent to which the risks are stable or subject to change
- reliability of assumptions.

The team should base its evaluation of each element on the perception of the known or perceived risk *at the time of the assessment*. Although these variables, likelihood of occurrence and relative impact, may be a challenge to judge, the project team should reach consensus for each element, given the knowledge available.

The assessment worksheet has fields for the evaluation of likelihood of occurrence and includes six pre-assigned values, ranging from a 1 (very low) to a 5 (very high), and an “NA” value corresponding to *Not Applicable* for the given element. All of the elements should be evaluated except for those items that are truly not applicable to the project. If the individual element is not applicable, the corresponding (NA) box should be checked (✓).

Depending on the nature of the element and the specifics of a project, likelihood of occurrence can be expressed as a probability that an event can happen, or as a chance that an existing status will change and require risk mitigation steps or actions in response to the issues identified by the element description. The likelihood consists of identifying all the possible risks that may significantly affect the project’s success. The project team should consider the description, then ask, “Will this issue cause mitigation methods to be employed because a) events are likely to occur, and/or b) information is not known?” Table 3.1 presents a suggested probability division for the likelihood of occurrence. Elements that have a very-high-, high-, or medium-level probability of occurrence generally require the project team’s attention when the relative impacts are low or greater.

Table 3.1. Division for Likelihood of Occurrence

Occurrence	Probability
NA – Not applicable to this project.	Zero
1 – Very low chance of occurrence, rare and occurs only in exceptional circumstances.	(<10% chance)
2 – Low chance and unlikely to occur in most circumstances.	(10% chance of occurrence <35%)
3 – Medium chance and possible to occur in most circumstances.	(35% chance of occurrence <65%)
4 – High chance of happening and will probably occur in most circumstances.	(65% chance of occurrence <90%)
5 – Very high chance of occurrence and almost certain and expected in most circumstances.	(90% or greater chance of occurrence)

Assessment participants should recognize that the likelihood of occurrence can be anticipated for certain IPRA elements whereas for others, it is uncertain, and the probability of their occurrence is not well defined or is even unknown. Often, not enough information exists to determine or assess the likelihood of occurrence. This uncertainty makes it difficult to establish the true chances of occurrence. In these cases, it is advisable to be conservative in the assessment and rate the likelihood as having a higher chance. Such elements obviously need to be investigated further. Once the likelihood of occurrence for the element has been determined, the corresponding box is checked (✓).

For the relative impact section of the assessment worksheet, the project team has the choice of using either the pre-assigned baseline relative impact or the project-specific relative impact. The baseline relative impact or the project-specific relative impact values reflect the perceived or actual impact that may occur if the given risk materializes. As with likelihood of occurrence, it is important for assessment participants to recognize that, while the relative impact may be known for certain IPRA elements, for others, the consequences of the element occurring and its influences on the project can be ill-defined or even unknown. Situations will exist in which not enough information exists to determine or assess relative impact. In these cases, participants should use the baseline relative impact rating derived from industry experience and expertise.

When not using a baseline rating, the project team should choose a project-specific relative impact level. The relative impact ratings range in value from A (Negligible) to E (Extreme). These five letters (A, B, C, D, or E) correspond to degrees of impact as defined in Table 3.2. The project team should first consider the IPRA description and then ask, “If the issue occurs, how will it affect cost, schedule, and the relative success of the project?”

Table 3.2. Relative Impact Definitions

RELATIVE IMPACT	
A	Negligible consequence that routine procedure would be sufficient to deal with the consequences.
B	Low consequence that would threaten an element of the project. Normal control and monitoring measures are sufficient.
C	Moderate consequence would necessitate significant adjustment to the project. Requires identification and control of all contributing factors by monitoring conditions and reassessment at project milestones.
D	Significant consequence that would threaten goals and objectives; requires close management. Could substantially delay the project schedule or significantly affect technical performance or costs, and requires a plan to handle.
E	Extreme consequence would stop achievement of project or organizational goals and objectives. Most likely to occur and prevent achievement of objectives, causing unacceptable cost overruns, schedule slippage, or project failure.

As discussed, the steps above are repeated for each of the 82 IPRA elements. The project team should note the major issues or irregularities identified, and use this information to develop risk monitoring, control, and mitigation measures. This deterministic process corresponds to the assessment phase of the risk management process outlined in Chapter 2.

Risk Matrix

The combination of these two values (likelihood of occurrence and relative impact) will help to determine the relative importance of risk of the given element on the project. Figure 3.4 expresses this combination of values as a matrix. This risk matrix is provided in more detail at the end of Appendix A. The appropriate relative importance risk level can be found by locating the coordinates of relative impact and the likelihood of occurrence. Once the relative importance of the element has been determined, it should be plotted in the specific location on the risk matrix. Risk items that plot in the upper right-hand corner of the matrix represent the greatest risk to the project, while those in the lower left are of lesser concern. Elements with higher relative importance need to be mitigated by the project team.

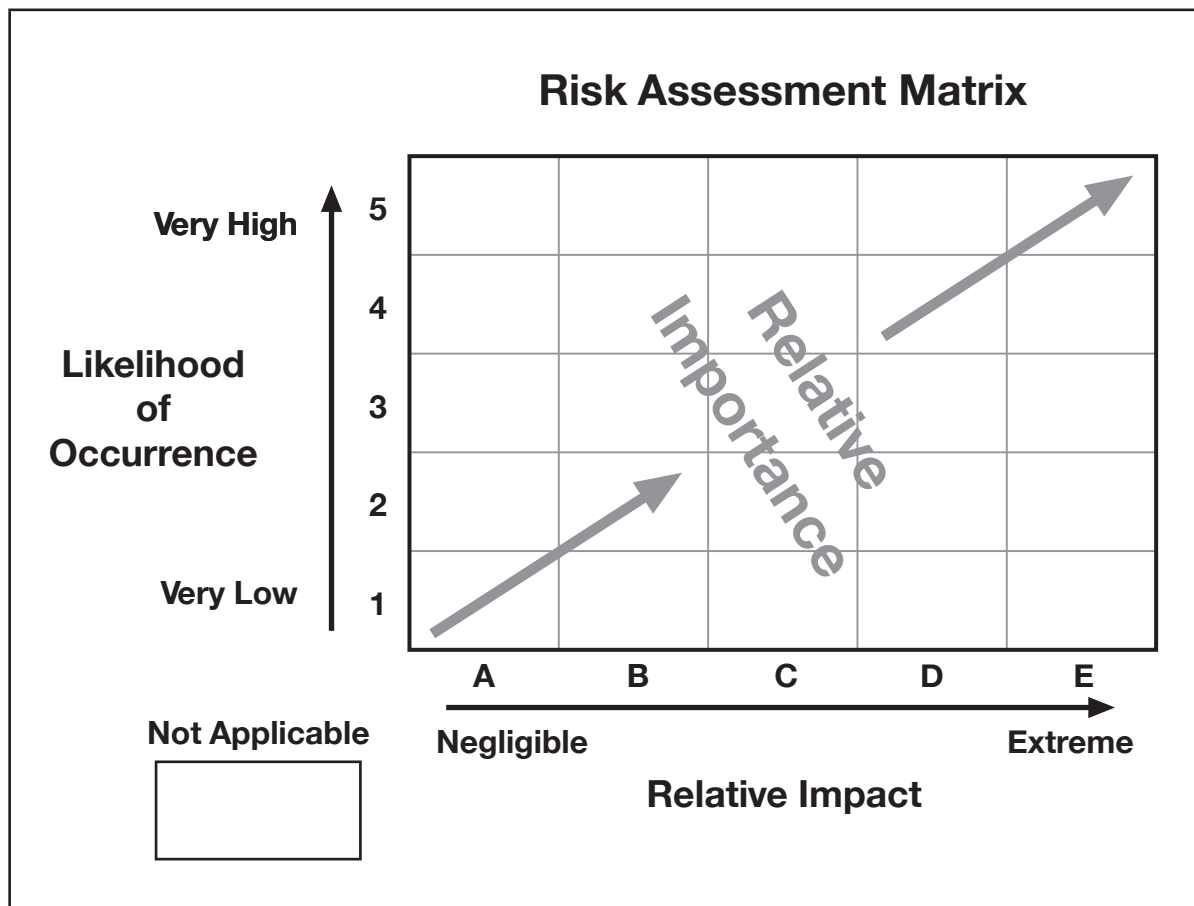


Figure 3.4. IPRA Risk Matrix

Note that many practitioners use color-coding to indicate the importance of the issues within the matrix. For instance, those in the upper right corner of the matrix may be colored red, while those in the lower left are coded as green, with varying shades of yellow or orange in between. The research team did not want to provide this feature in the risk assessment matrix and will leave it up to the organization or team to decide the type of shading, if desired.

The IPRA gives the assessment team a process for gauging the relative importance of the risks it identifies. It should be noted that the relative importance of a specific risk may change throughout the life cycle of the project and, therefore, mitigation methods may need to be adjusted accordingly. Using this guidance, the assessment team should determine the type and level of mitigation for the individual elements as discussed in Chapter 5. Teams may further analyze specific issues of concern by using probabilistic methods as described in Chapter 2.

Example Assessment

To get a better sense of how the IPRA works, consider, for example, that you are on a planning team for a North American contractor responsible for the risk assessment of the proposed expansion of a cement production facility in a medium-sized Bulgarian city. Your team has identified major milestones throughout front end planning that are the moments at which you plan to use the IPRA to evaluate the current risks associated with this project. Assume that at the time of this particular evaluation, the planning effort for this project is underway but is not yet complete.

Your responsibility is to assess the cultural risks that have been identified and defined to date. This information is covered in Section II, Category C, of the IPRA, as shown in Figure 3.5, and consists of three elements: “C1. Traditions and business practices,” “C2. Public opinion,” and “C3. Religious differences.”

CATEGORY	Likelihood of Occurrence (L)						Relative Impact (I)					Baseline	Coordinate L, I	Comments
	Very Low → Very High						Negligible → Extreme							
	NA	1	2	3	4	5	A	B	C	D	E			
II.C. CULTURAL														
II.C1. Traditions and business practices												E		
II.C2. Public opinion												D		
II.C3. Religious differences												B		

Figure 3.5. Category II.C. Cultural

To assess the elements in Section II, Category C, Cultural, follow these steps:

- Step 1: Read the description for each of the elements in Appendix C. Some elements contain a list of items to be considered when their levels of risk are evaluated. These may be used as checklists. See the descriptions for these three elements given on pages 73 and 74 in Appendix C.

Step 2: Collect all data and review project documentation to evaluate the risk for each element in this category. This may require obtaining input from other individuals involved with the project. Preferably, key project participants are available for the assessment session.

Step 3: Select the likelihood of occurrence and relative impact level for each element as explained above and detailed in the examples below. (See Figure 3.6.)

Element C1: Bulgaria has slowly moved to a market economy, and employing Western business practices is still a novel idea outside the major cities. Traditional business practice of letting contracts and payment practices are reminiscent of the former communist system. Few Western contractors have been profitable given the adherence to former ways of doing business. You feel that the likelihood that this element will be an issue that needs to be mitigated is *Very High (5)*, and that the baseline impact of *Extreme (E)* is valid. Coordinate L, I = 5, E

Element C2: Your team knows that local public opinion for this project is very favorable, given that it is one of the largest employers in the region. The proposed expansion also upgrades the existing facility, and emissions will be cut by 85 percent. Local politicians are courting this project as a catalyst for future economic development. The project team feels the likelihood that the Public Opinion element will be negative is *Low (2)*, and disagrees with the baseline impact rating of D for the project. The team lowers the relative impact to *Moderate (C)*. Coordinate L, I = 2, C

Element C3: Your team understands that the majority of the region's residents are Muslim. Your company has successfully worked in countries where observances and holidays required recognition. The team feels comfortable with being able to adjust to religious requirements that may need to be recognized; however, information is insufficient to make a confident assessment on likelihood of occurrence. Given this lack of information, the project team feels the Religious Differences element has a *High (4)* likelihood of being negative, and agrees with the rating of the baseline impact of the relative impact as *Low (B)*. Coordinate L, I = 4, B

Step 4: For each element, the coordinates for likelihood (L) and relative impact (I) are written in the "Coordinate" column. (If the team had felt that any or all of the elements were not applicable to this project, they would have marked the "NA" box.)

CATEGORY	Likelihood of Occurrence (L)						Relative Impact (I)					Baseline	Coordinate L, I	Comments
	Very Low → Very High						Negligible → Extreme							
	NA	1	2	3	4	5	A	B	C	D	E			
II.C. CULTURAL														
II.C1. Traditions and business practices						✓						E	5, E	
II.C2. Public opinion			✓						✓			D	2, C	
II.C3. Religious differences					✓							B	4, B	

Figure 3.6. Category II.C. Cultural, Completed

- Step 5: Transfer the coordinates to the risk matrix and plot them to determine the relative importance of the risk, as shown in Figure 3.7. Repeat this process for each element. The IPRA Risk Matrix gives the assessment team a process to gauge the relative importance of the risks. The baseline impacts are based on input from experienced project managers and are intended to help where project-specific values are not available. Using this guidance, the assessment team should determine the type and level of mitigation for the individual elements.
- Step 6: Take action. In this example, Section II, Category C, “Traditions and business practices” (II.C1) probably requires immediate and detailed attention as to how the team will control and mitigate the risks. The low-risk, lower-impact risks, such as Public Opinion (II.C2) will only require normal control and monitoring.

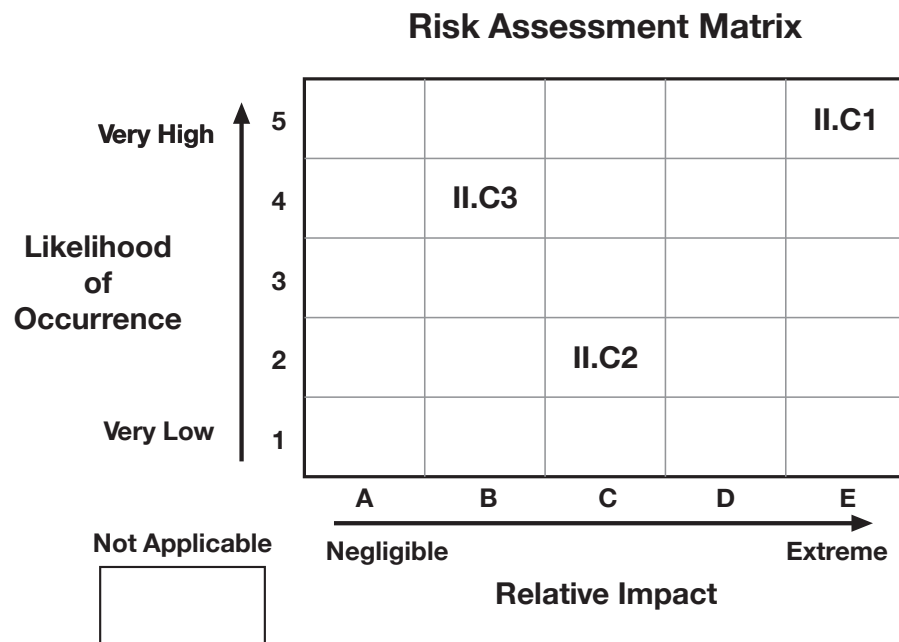


Figure 3.7. Risk Matrix with Three Elements Plotted

Note that, while the example given above is for a project in an international setting involving global partners, the IPRA is also applicable to projects performed in any setting. This is especially true for projects in localities that are unfamiliar, or with partners and project participants that the user has not worked with in the past. Moreover, the kinds of cultural risks cited in the example of element II.C3 given above can exist in domestic jurisdictions in the form of work rules that differ from one locality to another and from one craft to the next—even when there are national labor agreements. (This potential issue is addressed in III.D1, Workforce Availability and Skill.)

When to Use the IPRA

Because previously unidentified risk can arise throughout the project life cycle, its management is an iterative process that should not be limited to a one-time initial phase analysis. Given the evolving nature of risk, the primary value of the tool would be highest during the feasibility and front end planning phases. To be most effective, it should, at a minimum, be deployed at three separate points along the project timeline: 1) validation of project feasibility; 2) project definition; and 3) decision to proceed. Beyond these assessments, the tool can and should be used regularly over the life cycle of the project, especially during project execution. In addition, the tool can be used as a checklist at any time. Figure 3.8 illustrates the points at which the tool is most applicable during the project life cycle.

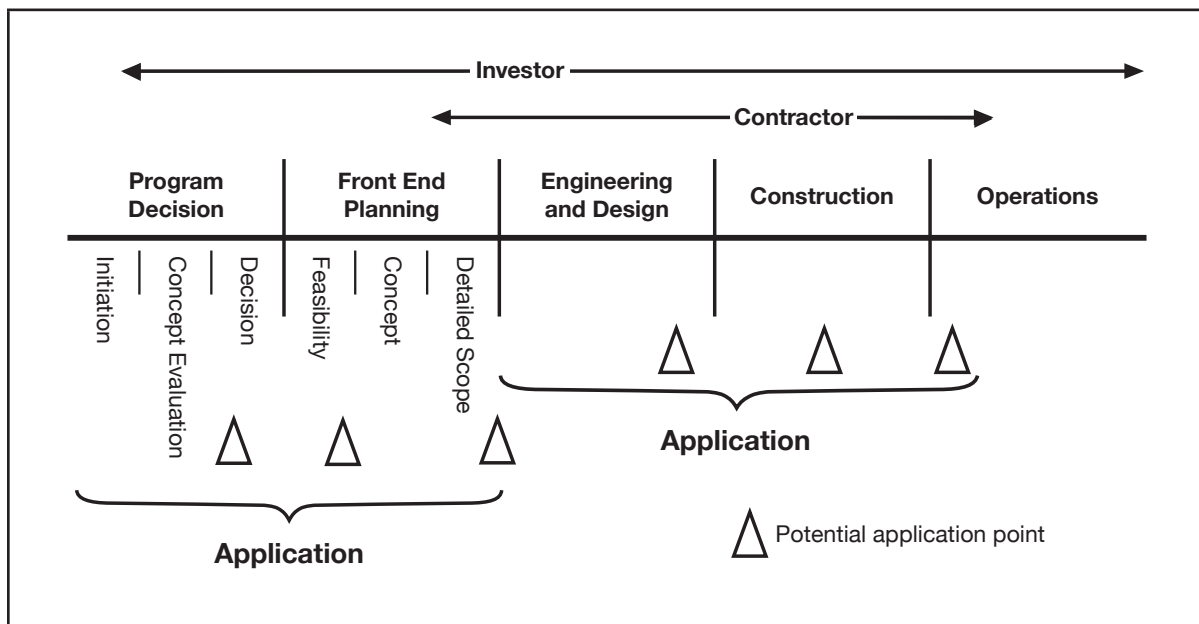


Figure 3.8. Applicability of IPRA in Project Life Cycle

The risk identification phase involves the identification of all the possible risks that may significantly affect the project's success. Potentially, these risks may range from extreme relative impact/very high likelihood to negligible relative impact/very low likelihood. The project team should give special attention to the relative importance of the risks, including accumulations of risk that are related (e.g., if there are several elements of concern under category II.A. Tax/Tariff). Combinations of fairly low risks, which together pose a greater threat than each individually, should not be overlooked.

Teams should assess project risks as early as possible during project development. However, typically, the earlier the risk assessment is performed, the less project information is available. Users can obtain optimal value from the IPRA by using it before the initiation of contract documents. However, it can be used at varying times during the project's life cycle.

Philosophy of Use

Ideally, the project team should conduct an IPRA evaluation at strategic points along the project timeline. The presence of a neutral facilitator who is familiar with the process, along with appropriate members of the project team, optimizes the assessment and limits in-house biases. Such a facilitator also provides objective feedback to the team and controls the pace of the meeting. When this arrangement is not feasible, the alternative approach is to have key individuals first evaluate the project separately, and then come together for consensus. Although personal reviews can be biased, using the IPRA from an individual point of view can be of merit.

The IPRA is best used as a tool to help project participants work as an integrated team to identify risks and determine their relative importance. This integrated project team (IPT) ideally includes representatives from key stakeholders and disciplines, and should strive for consensus around each element before continuing. If action needs to be taken on an element, it should be captured on a flip chart or by some other method of recording action items.

In certain circumstances, a project may be less complex, or the user might want to reduce the level of assessment to one or two of the sections or categories. He or she can perform such a reduced assessment simply by preselecting the discussion topics (elements for assessment) prior to the assessment session. In effect, the user is saying that the rest of the elements are not applicable.

The organization also may want to add issues to the descriptions or otherwise customize the tool to address proprietary concerns or lessons learned from past projects. This is easy to do, given the set-up of the tool. In other cases, the organization may already have a sophisticated risk management process, and may simply wish to compare its process to the IPRA, adapting only those parts of the tool and method that add value.

Using the IPRA early in the project life cycle will help a project team identify many areas of risk. Such an evaluation gives the team a roadmap for control and mitigation. During this early phase of a project, there may be several important issues that can affect the overall viability of the project. During the course of tool development, seven issues were frequently identified as “go/no-go” issues for project participants. (See Table 3.5.) The IPRA user may want to address these issues early, when contemplating whether to proceed with the project. Descriptions of these elements are given in Appendix C.

Table 3.5. Critical Go/No Go Elements in Rank Order

Rank	Element
1.	I.B1. Sources & form of funding
2.	I.A1. Business case
3.	I.A2. Economic model/feasibility
4.	II.B2. Political stability
5.	II.D4. Contract type & procedures
6.	II.B3. Social unrest/violence
7.	II.B6. Relationship with government/owner

The IPRA is a mechanism that can be used by the project team during project formation to identify or discover risks specific to any venture in an unfamiliar location. The tool also helps teams organize their work to diffuse future risks. It also can provide an effective means of “handing off” the project to other entities or of helping to maintain continuity as new project participants join the project.

Owners and contractors alike can apply the tool to their projects. Figure 3.9 shows how both senior management and project managers can use the tool; the project team can make the IPRA Assessment Worksheet the basis for risk mitigation, while senior managers can use risk matrix as a summary roll-up that will help them bridge any communication gaps about the project. Such a roll-up should also contain a brief write-up commenting on the specific areas of concern and summarizing the IPRA analysis. In particular, the assessment can pay attention to elements that show higher relative importance, with ratings in the relative impact zones D and E, as well as in the likelihood zones 3 through 5 of the risk matrix. Appendix D provides an example of this format. Of particular concern are the lists of go/no-go elements and extreme risk elements as presented in this document.

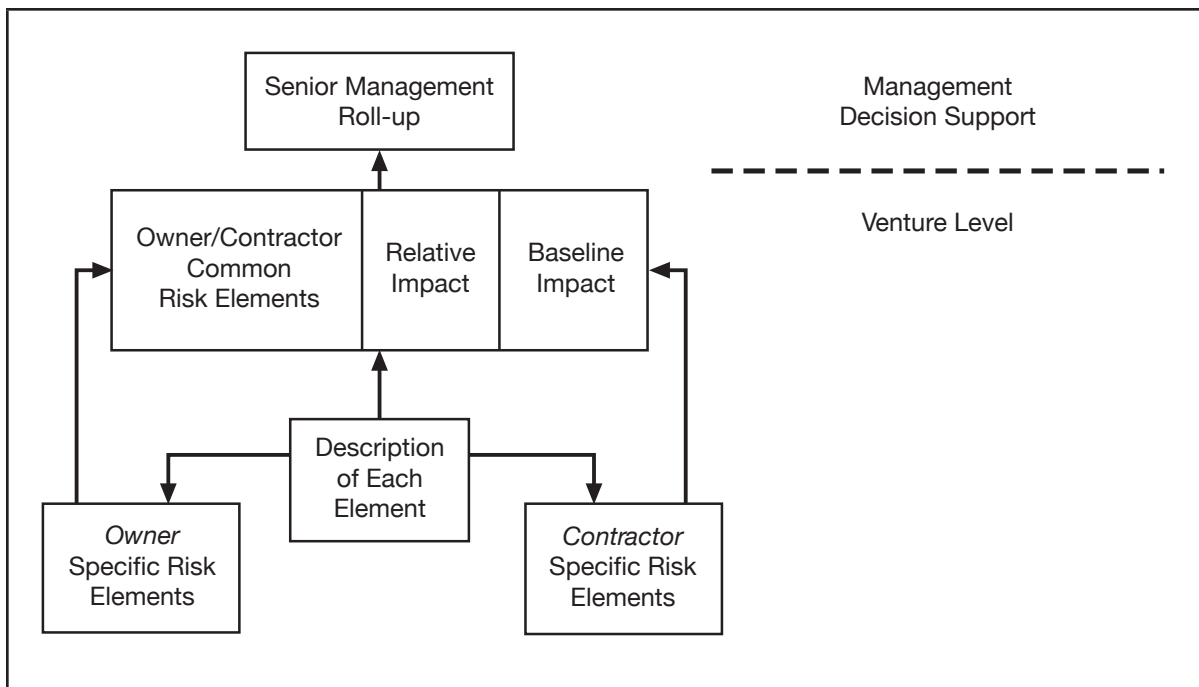


Figure 3.9. Conceptual Framework and Tool Use

IPRA assessment results may change on a day-to-day or week-to-week basis as team members realize that some risk elements are not as critical (or are more critical) or well-defined as initially assumed. It is important to score the elements honestly. Risk management is inherently iterative in nature, and any changes that occur in assumptions or other project parameters must be reconciled with earlier mitigation plans. The relative importance of any specific risk concern may not be as important as the team's progress over time in resolving broader issues that harbor risk.

In many cases, a team does not have the resources to mitigate or address every identified risk. Consequently, it must decide on which issues it will pursue at a given time in the venture. For instance, during the earliest phases of the project, the team may decide to focus only on those items that have a likelihood rating of 3 (medium) and a relative impact rating of C (moderate consequence) or higher; the team would therefore only focus on all issues with values of both 3 or higher and C or higher. Alternatively, the team may multiply the likelihood of occurrence and relative impact together (converting "letters" to numbers) and use the product as an indicator. In this example, the product of the two factors is " $3 \times 3(C) = 9$." Hence, all issues identified with products of nine or above would be addressed. As assessments continue, the team may adjust this focus; or, in some cases, an issue may appear more or less important as the project progresses, changing the attitude toward mitigation.

In practice, risk management is not often a clean process, and the timing of using the tool should be flexible. The tool should first allow for those at the executive and project levels to make decisions, and then to help re-check those decisions as they move forward with project development. Certain types of risks are specific to the parties involved in the project. (Specific differences between owners and contractors are given in Reference 1.) However, a conscious decision has been made to combine the owner and contractor perceptions into this tool because of the benefits that perspective can bring to the parties at hand. For instance, if only owner personnel are performing a risk assessment, then the baseline values at least give them some guidance on the risks across project participants. Conversely, if only contractor personnel are using the tool, the baseline can provide insight into the owner's motives for pursuing the execution strategy that has been planned.

From experience, the risk management process and tools such as the IPRA are most effective when implemented jointly by a project's owner and contractors, working as a unified IPT. This point cannot be overemphasized. Lack of integration means that each party focuses on its risk alone, and the resulting mitigation strategies may not be to the benefit of the project or venture as a whole. As an added benefit, the risk identification and assessment process helps bring the team into alignment.

Chapter 4: What Does an IPRA Assessment Mean?

The IPRA assessment is designed to provide the project team with a relative analysis of those risk categories and their corresponding elements that indicate higher relative likelihood of risk impact.

The risk assessment process described in Chapter 3 will yield a variety of data that when plotted on the Risk Assessment Matrix will indicate those elements that likely will have significant impacts on the project. (See Figure 4.1.) To determine the appropriate mitigation requirements, the project must further investigate these high-impact elements.

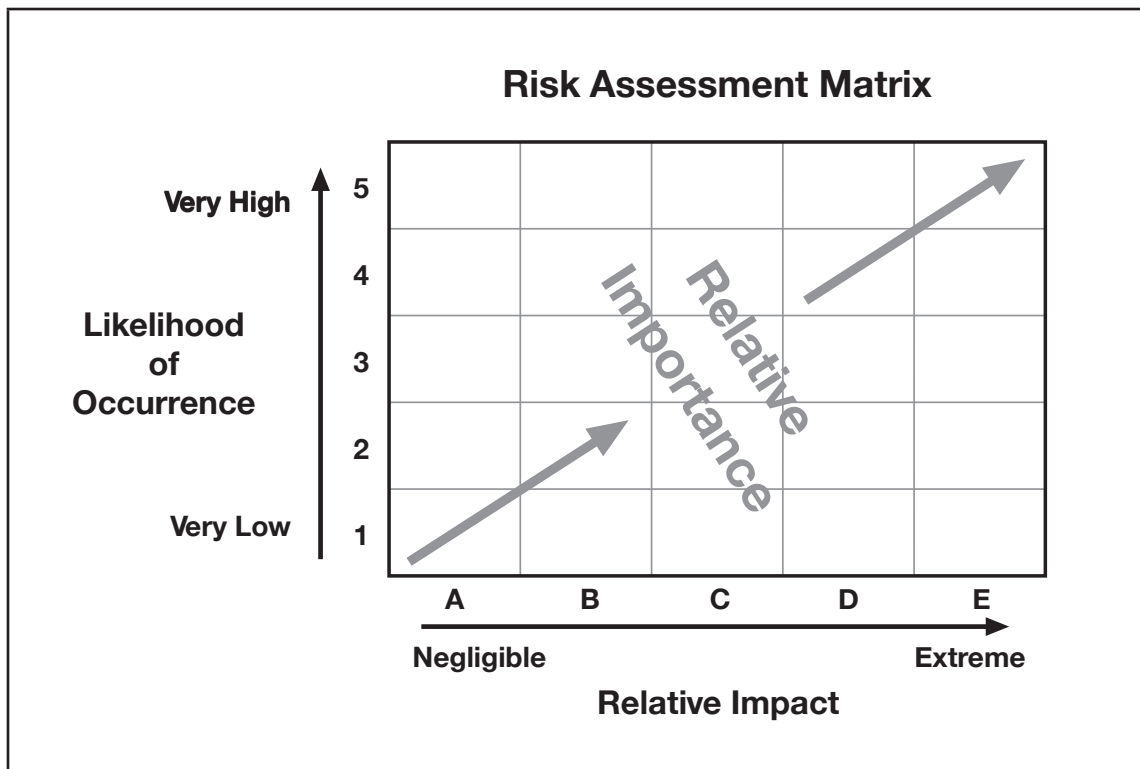


Figure 4.1. Risk Assessment Matrix

In some cases, because the project team lacks information regarding an element (or class of elements), the risk assessment of the element(s) may incorrectly indicate a likelihood of significant impact. For instance, if the project team has little or no current knowledge of Value Added Tax (VAT) matters (Element II.A2), then the team may rank this element as having a medium likelihood of affecting the project and a relatively high impact. In reality, it may be both low in likelihood and impact when the details of the VAT are more fully understood. On the other hand, if the project team has not considered VAT matters in a venue where they are applicable (or if the project team first understood the potential of Value Tax matters as a result of the IPRA process), then it would

be appropriate to rank this risk element as both highly likely and having a significant (*Extreme*) relative impact rating.

As the project team assesses the likelihood and relative impact of each of the 82 elements using the assessment worksheets (introduced in Chapter 3), and then plots them on the Risk Assessment Matrix, a picture of the elements that signal the potential of having both *High* likelihood and significant (*Extreme*) relative impact will emerge. If more than 10 elements are in the upper right-hand corner of the Risk Assessment Matrix, then the project team should carefully consider the viability of the project, until either these *Highly Important* risk elements are more fully understood or until they are mitigated. In any event, the project team must take proactive steps to resolve these issues.

The project team should also consider using the IPRA analysis at various stages in the project life cycle. Referring specifically to Figure 3.1, the research team believes that the IPRA analysis can help project teams identify changing risk considerations as the project moves through its life cycle. At a minimum, the full project team should undertake a second IPRA analysis just before the contracting process for construction begins. The team should, at this point in the project's life cycle, include representation by the owner's operations personnel to address the matters included under Section IV of the IPRA.

IPRA Analysis – What to Look For

The IPRA is of little value unless the project team takes action based on the results of the assessment. Potential uses of IPRA assessment results include the following:

- The rating levels of specific areas of a section, category, or element for each project can be monitored over time. For instance, if 21 of the 82 elements have an *Extreme* impact rating, approximately 25 percent of the risk elements on the international project are not known or are uncertain. The IPRA assessment can be used to redirect mitigation efforts by the project team.
- The individual element assessments can be used to highlight the “critical few” elements for team focus—either through segregating by element category or by relative impact.
- The IPRA analysis can be used to track risk mitigation progress during the project life cycle. Individual elements, categories, and sections can be tracked as well. It is important to remember that the method of analyzing project elements over time (whether in an individual or team-based setting) should be consistent, because it is a subjective rating.
- The Risk Assessment Matrix can be used to compare project-to-project risk assessment over time, in order to look at trends in risk definition and mitigation within an organization's portfolio of projects.
- Lessons learned can be captured for use on future ventures and as a means to modify the project development processes. Lessons learned can be organized around the IPRA structure.

- To produce meaningful portfolio risk assessments for projects that are part of a broader program of projects, project-level risks must be properly assessed and effectively documented.
- In some cases, the project team may want to perform more specific analyses of the IPRA-identified risks, using probabilistic risk analysis techniques such as the Monte Carlo analysis. Many times, these analyses are applied to efforts that are focused on developing cost and schedule estimates based on uncertainty.

Any risk event—if it is going to occur—will occur during a certain span of time during the project. It is important to understand this “timing” of the risk; if the event has not occurred during that span in the project, the risk can be considered as having passed, and thus closed out. This allows the team to focus on the remaining risks. This is where the IPRA and risk management process are extremely useful for the IPT throughout the project, not just for the initial assessment. A dynamic view of risk and continuous use of the IPRA tool to track risks can also improve the management of budget and schedule contingency as the project progresses.

Market demand or other pressures that reduce project cycle times may force a team to begin the design and construction of their projects with underdeveloped risk definition. In these instances the amount of time available for defining the risk of the project decreases. Thus, the ability to understand quickly and accurately those factors that may significantly affect project risk becomes more critical. The risk mitigation effort should focus on the few critical elements that, if poorly addressed on any project, could have the greatest potential to affect project performance negatively. Table 4.1 ranks the 10 elements indicated as extreme risks. Appendix C provides descriptions of these elements, and Appendix E presents the rank ordered list—in descending relative importance—of all 82 IPRA elements.

Table 4.1. Top 10 Severe Risk Elements

Rank	Element
1.	I.B1. Sources and form of funding
2.	I.B3. Estimate uncertainty
3.	I.A1. Business case
4.	I.B4. Insurance
5.	I.A2. Economic model /feasibility
6.	I.B2. Currency
7.	II.B6. Relationship with government/owner
8.	I.A4. Market/product
9.	II.C1. Traditions and business practices
10.	II.D4. Contract type and procedures

Chapter 5: Mitigation Strategies

Performing an IPRA assessment without a proper mitigation plan is probably not worth the effort.

After using the IPRA tool to identify and assess a project's risks, the next step in effectively managing risks is to develop a risk response. This response to risk must be aligned with the project's objectives. It should also include a plan, controls, and documentation.

The mitigation plan sets procedures, policies, goals, and responsibility standards for continuing the risk management process for the project. Generally, the plan should be based on the principle that responsibility for managing the risk should be assigned to those best able to address the source of risk in question. Mitigating risk by lessening its impact is a critical component of risk management. Implemented correctly, a successful risk mitigation strategy should reduce adverse impacts. In essence, a well-planned and properly administered risk mitigation strategy replaces uncertain and volatile events with more predictable or controlled responses. Risk mitigation is a continuous process and should be applied to all phases of the project.

Project teams should be able to lessen the uncertainty of a risk event, as well as the probability of its occurrence or its potential impact, by selecting the appropriate risk mitigation strategy for it. Following are five categories of commonly used mitigation strategies:

- Avoidance – when a risk is not accepted, and other lower-risk choices are available from several alternatives.
- Retention/Acceptance – when a conscious decision is made to accept the consequences should the event occur. The potential cost and schedule impacts of the event may be estimated, and allowed for in the budget and schedule; this amount may be set aside in a risk fund as part of the project contingency. Alternatively, the event may just be monitored, and action may be taken if the event occurs.
- Control/Reduction – when a process of continually monitoring and correcting the condition on the project is used. This process involves developing a risk reduction plan and then tracking the plan. An example would be currency hedging. This mitigation strategy is the most common risk management and handling technique.
- Transfer/Deflect – when the risk is shared with others. Forms of sharing the risk with others include contractual shifting, entering into joint ventures, multiple project funding sources, performance incentives, insurance, warranties, and bonds.
- Contingency – the application of funding or time to the project, to compensate for uncertainty. In many cases, contingency will accompany the four mitigation strategies listed above, or be used as part of one of these strategies. For instance, if a range of possible outcomes is estimated along with cost and schedule impact, risk managers can “retain” the risk by setting aside funds to handle consequences that occur as a result. In some cases, they can