

RISK IDENTIFICATION AND ASSESSMENT FOR INTERNATIONAL CONSTRUCTION PROJECTS

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Abstract

The International Project Risk Assessment (IPRA) Tool and its supporting documentation provides a systematic method to identify, assess, and determine the relative importance of the international-specific risks across a project's life cycle and of the spectrum of participants needed to allow for subsequent mitigation. In the course of this research it became clear that participants valued the identification and management of overarching project risks and recognized the dangers of exclusive attention to only risks within their areas of influence. Although the need for comprehensive risk identification, assessment, and management was acknowledged by all, it was practiced by few. This paper provides an overview of the IPRA tool development, research findings, and recommendations for managing the risks associated with international construction projects.

Keywords: International, risk, construction, assessment

Construction is a major worldwide industry accounting for approximately US\$3.5 trillion, or almost ten percent of global gross domestic product. New markets, domestic competition, and trade liberalization have impelled owners, contractors, and investors to aggressively pursue business opportunities and projects outside their home jurisdictions. While international projects may appear to be attractive investments, such projects usually involve elevated levels of risk and uncertainty. International work requires owners to assess a diverse set of political, geographic, economic, environmental, regulatory, and cultural risk factors. Moreover, contractors must consider a similar set of risk factors in determining whether to take on such projects and how to price and schedule the work once they have engaged in it. A limited amount of research has been undertaken to address these unique issues, and most efforts to assess and evaluate the risks associated with international construction are fragmented and fail to provide adequate assistance to project managers. In short, poor cost and schedule performance of international construction projects is more often the rule than the exception, and the successful delivery of such projects has proven to be difficult for the parties involved.

Industry practices and the academic literature are in agreement that risks should be allocated to the party in the best position to manage them. However, evidence shows that there is a gap between existing risk management techniques and their application and use by contractors and owners (Han and Diekmann, 2001). The research suggests that this gap is due in large part to the complexity of the ventures and the extensive resource commitment necessary to perform good risk management. Complicating the situation is the fact that no easy-to-use management tool is available to identify and assess the risks specific to international construction.

The purpose and need for such a tool were identified initially and championed by the Construction Industry Institute's (CII) Globalization Committee. In 2001, the CII, with additional support from the Center for Construction Industry Studies (CCIS) and the Design, Procurement, and Construction Specific Interest Group (DPC SIG) of the Project Management Institute (PMI),

commissioned a research effort (Project Team 181, Risk Assessment for International Projects [PT 181]) to assist with the development of a tool that could help owners and contractors to improve the performance of international projects. Along with the authors, a research team composed of representatives from CII owner and contractor organizations and the DPC SIG participated in this effort.

Completed in December 2003, PT 181 produced the *International Project Risk Assessment (IPRA) Tool* (CII Implementation Resource 181 -2; CII, 2003a). The tool and its supporting documentation provide s a systematic method to identify, assess, and determine the relative importance of the international -specific risks across a project's life cycle and of the spectrum of participants needed to allow for subsequent mitigation. The reports generated from this study describe in detail the research performed, including the methodology, data analysis, and value of the research to the industry (CII Research Report 181 -11; CII, 2003b).

The IPRA tool is unique because its baseline relative impact values were developed using empirical data from industry experts reporting on actual projects. Subsequently, the IPRA tool assists in identifying the risk factors of highest importance to a project team. The IPRA tool also fits within the project risk management area of the project management body of knowledge (PMBOK), specifically with regard to risk identification and risk quantification and, to a lesser extent, risk response development and control (PMI, 2000).

Because no common and overarching methodology to assess and manage these risks exists, owners, investors, designers, and constructors do not fully recognize and realize the value of a systematic risk management process. Differing objectives and the adversarial relationships these differences generate between the parties are also common. Consequently, the overall inability of project participants to understand the risks associated with international project constitutes an industry blind spot that particularly plagues contractors and owners. This paper provides an overview of the IPRA tool development, research findings, and recommendations for managing the risks associated with international construction projects.

Research Objectives

The primary objectives of this research investigation were (1) to develop a user-friendly, systematic management tool and process to identify and assess the risks specific to international construction, with the ultimate goal of improving project performance, (2) to quantify and prioritize the relative importance of the identified risks in order to gauge which risks have the highest impact, and (3) to provide guidance when risk impacts are unknown or when uncertainty is high.

Development of the IPRA Tool

The research investigation began with an extensive literature review on the topics of risk identification, assessment, and management, as well as on issues related to international construction. To gain additional insight into these issues, information also was gleaned from a review of industry practices for international project risk assessments and from CII's globalization forums.

To further evaluate the approaches that organizations use to manage the risks incurred on international projects, 26 structured interviews were conducted with middle - to upper-level management personnel. Eight were contractors, eight were owner organizations, and the remaining 10 were distributed among legal, professional service, financial, and insurance experts.

Construction industry experience of interviewees ranged from 20 to over 50 years, and all participants had at least 10 years of working experience with international projects of various types and sizes (Walewski and Gibson, 2003a).

The literature review and structured interviews showed that a number of techniques and practices exist to identify and assess risks that occur on international projects, but there was no standard technique or practice specifically tailored to such projects (CII, 1989; Walewski et al., 2002). Decisions on country-specific risks often are made by top management and separated from other business, technical, and operational risks of the project. Few project participants have a complete understanding of the portfolio of risks that happen on such projects, and a life-cycle view of the risks is uncommon. Given these limits of perspective, compartmentalization of the risks occurs, and international projects often are organized and managed in ways that create information and communication disconnects.

A detailed list of the risk elements that affect the project's life cycle (i.e., planning, design, construction, and operations) of international facilities was developed from five primary sources: the expertise of the research team, literature-review results, the structured interviews, input from members of CII's Globalization Committee, and further review by industry representatives. Initial topic categories were gathered from previous research and from the structured interviews and then screened using the research team's expertise. The resulting list of international risks was further refined, and an agreement was reached regarding exact terms and nomenclature of element definitions. Once this effort was completed, separate reviews were performed by Globalization Committee members and vetted at a series of workshops.

The final list consists of 82 elements grouped into 14 categories and further grouped into four main sections that reflect the project's life cycle. Presented in Table 1, this list forms the basis of the IPRA tool and can be considered comprehensive for pursuing capital projects outside of one's home jurisdiction. Each section, category, and element of the IPRA tool has a corresponding detailed description to assist project participants in gaining an understanding of the issues related to that component of the risk being considered. The IPRA assessment sheets and element descriptions are to be used together by a project team to identify and assess specific risk factors, including the likelihood of occurrence and relative impact for each element.

Table 1 IPRA Structure

<p>SECTION I – COMMERCIAL</p> <p>I.A. Business Plan</p> <ul style="list-style-type: none"> 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 <p>I.B. Finance/funding</p> <ul style="list-style-type: none"> I.B1. Sources & form of funding I.B2. Currency I.B3. Estimate uncertainty I.B4. Insurance <p>SECTION II – COUNTRY</p> <p>II.A. Tax/tariff</p> <ul style="list-style-type: none"> 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 <p>II.B. Political</p> <ul style="list-style-type: none"> 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 <p>II.C. Culture</p> <ul style="list-style-type: none"> II.C1. Traditions and business practices II.C2. Public opinion II.C3. Religious differences <p>II.D. Legal</p> <ul style="list-style-type: none"> 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 <p>SECTION III – FACILITIES</p> <p>III.A. Project scope</p> <ul style="list-style-type: none"> III.A1. Scope development process III.A2. Technology III.A3. Hazardous material requirements III.A4. Environmental, health, and safety III.A5. Utilities and basic infrastructure III.A6. Site selection and clear title III.A7. Approvals, permits, and licensing 	<ul style="list-style-type: none"> III.B1. Engineered equipment/material/tools III.B2. Bulk materials III.B3. Subcontractors III.B4. Importing and customs III.B5. Logistics <p>III.C Design/engineering</p> <ul style="list-style-type: none"> III.C1. Design/engineering process III.C2. Liability III.C3. Local design services III.C4. Constructability <p>III.D. Construction</p> <ul style="list-style-type: none"> 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 <p>III.E. Start-up</p> <ul style="list-style-type: none"> III.E1. Trained workforce III.E2. Facility turnover III.E3. Feedstock and utilities reliability <p>SECTION IV – PRODUCTION/OPERATIONS</p> <p>IV.A. People</p> <ul style="list-style-type: none"> IV.A1. Operational safety IV.A2. Security IV.A3. Language IV.A4. Hiring/training/retaining IV.A5. Localizing operational workforce <p>IV.B. Legal</p> <ul style="list-style-type: none"> IV.B1. Governing law/operational liability IV.B2. Permitting IV.B3. Insurance IV.B4. Expatriates IV.B5. Environmental compliance <p>IV.C. Technical</p> <ul style="list-style-type: none"> 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 startup
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Risk Assessment Workshops

The research team hypothesized that all elements are not equally important with respect to their relative impact on overall project success. Their importance varies depending on the project type and location as well. The research team believed that there would be a significant benefit if a standard baseline (impact) risk value could be determined for each element. A standard guidance value of a risk's effect on a project would be of assistance when the risk is unknown by project participants and also could provide a framework to rank order risk elements on the project for subsequent mitigation.

We determined that the best way to develop reasonable and credible relative impact values for each element was to rely on the expertise of a broad range of construction industry experts. The research team hosted four risk assessment workshops in which a total of 44 industry executives were involved. These executives reported results on approximately US\$23 billion worth of international projects from 20 different countries. Participants represented 25 organizations and were made up of 26 contractor and 18 owner representatives. In addition to having an owner-contractor balance, a fairly equitable distribution of project types and locations was achieved. Each participant completed a series of documents at the workshops; in addition to personal history, participants were asked to consider and document a typical international project that they had completed recently for the organization they represented. The details regarding the workshops and the projects used for this effort are provided in CII Research Report 181-11 (CII, 2003b) and are beyond the scope of this chapter.

The element rankings obtained from the workshops were developed statistically and yielded the relative impact value for each element. The *relative impact* value of each element is its rank, the calculation of which is based on its potential impact to the project within its category, section, and the overall IPRA tool. Definitions were developed for each of the five values based on a review of the literature and industry practices. The overall rankings were broken into five levels of corresponding relative impact that were given letter designations ranging from A to E, with A = negligible, B = minor, C = moderate, D = significant, and E = extreme, corresponding to degrees of impact as defined in Table 2. The baseline relative impact values of the significant (D) and extreme (E) elements are given in Appendix A.

Table 2 Relative Impact Definitions

RELATIVE IMPACT	
A	Negligible consequence that routine procedure would be sufficient to deal with the consequences.
B	Minor 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.

Likelihood of occurrence values also were developed by dividing the probability that the identified risk will occur into the following five designations (with numerical range from 1 to 5): 1 = very low (<10 percent), 2 = low (10 to less than 35 percent), 3 = medium (35 to less than 65 percent), 4 = high (65 to less than 90 percent), and 5 = very high (90 percent or greater). These designations are based on the research team's review and assessment of the literature and industry

practices for determining and assigning risk probabilities. Table 3 gives the probability division for the likelihood of occurrence used in the IPRA tool.

Table 3 Division for Likelihood of Occurrence in the IPRA

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)

Consistency Test

In order to verify its completeness and to assess the relationship to actual performance, the IPRA tool was used on 25 recently completed and ongoing projects representing greater than US\$4.6 billion in project value. Project performance data were collected on 16 of these 25 completed test projects in order to identify the relationship between risk and project performance. More than a third of these projects reported that at least one risk not identified at contract formation occurred and had a significant impact on project performance. These issues are identified in Table 4.

Table 4 Frequency of IPRA elements identified during testing, having a significant project impact not addressed at the time of contract formation (N = 16)

IPRA Risk Elements	Frequency of Occurrence (Percent)
III.A1. Scope development process	33
III.A2. Technology	33
III.D8. Schedule	27
I.B3. Estimate uncertainty	20
II.C1. Traditions and business practices	20
III.D10. Safety during construction	20
III.E1. Trained workforce	20

The IPRA tool also was used on nine ongoing projects to observe its effectiveness in helping project teams assess international risks. On seven of these projects, the authors facilitated an IPRA assessment session with project team members. In each case, the IPRA tool gave the project team a comprehensive mechanism to identify and assess project risks and to determine which risks had the highest relative importance at the time of the assessment.

The IPRA results from the nine ongoing projects demonstrate the tool's ability to assist in proactively identifying issues that can have a significant impact on project performance. It also can assist in the identification and preclusion of issues not typically considered at contract

formation. The results to date show that early and consistent application of the IPRA tool is an effective risk management approach.

Detailed risk status reports were generated from the full IPRA assessments of the ongoing projects used in the sample. These assessment sessions took from one to four hours each and proved that the tool was an effective mechanism for identifying and evaluating a wide spectrum of risks on real international projects whether used by a team or an individual project participant. In each case, the IPRA tool gave project participants a viable platform for discussing project-specific issues and helped to identify critical risk issues. Members of the research team were involved directly in observing the use of the tool on most of these projects. Their observations were useful for modifying the assessment sheets slightly and helped them in writing instructions on its application for field use.

The research indicates that many of the highest-impact risks occur in the first two sections of the IPRA tool and relate to jurisdictional and financial issues. Organizations that have been in a country performing projects appear to have the ability to identify and better manage these risks, indicating that the issue of jurisdictional experience is important.

Using the IPRA risk register and a lessons-learned database system could allow companies to shorten the learning curve for becoming successful on international projects. Use of these tools in association with proactive and repeated use of the IPRA tool can improve the chances that organizations with little or no experience in a jurisdiction will be able to avoid or mitigate the risks. This research also illustrated that there is no single “blueprint” for assessing the risks associated with international projects and that use of the IPRA tool must be tailored to adjust for country, user, and business-sector concerns.

In addition to recognizing these limitations of the IPRA tool, the researchers acknowledge the reduced scope that comes from their generalization of the sample characteristics to a larger population. In this study, relatively small samples were used for the both development of baseline relative impact values and the consistency test investigation. Furthermore, because the sample project selection was based on organizations volunteering projects and not on a random selection process, organizations may have selected projects with a bias toward success, which may have influenced the results.

As summarized in Table 5, the research team performed a variety of activities and received input from 119 different industry experts from 52 different firms to develop and test the IPRA tool. Although the consistency test used a relatively small nonrandom sample of 25 projects and is susceptible to bias, the collective results from it show that the tool is a sound, comprehensive method to identify and assess the relative impact of the majority of risk issues encountered on international capital facilities (CII, 2004).

Table 5 Summary of PT 181 Activities and Industry Input

Activity	Number of Participants*
PT 181 meetings and deliberations	12
Globalization Committee review and assessments	10
Structured interviews	22
Risk scoring workshops	38
CII Globalization Committee emerging market forum	20
Consistency Test – completed projects	12
Consistency – ongoing projects	28
Total	119

* Participation is only counted once as some contributed to more than one activity

Application and Use of the IPRA Tool

Because risks can arise throughout the project life cycle, effective risk management is an iterative process and not limited to a one-time analysis. Given the evolving nature of risk, the primary value of the tool is highest during the program decision and preproject planning phases. To be most effective, we recommend that the IPRA tool should be deployed at three points on the project timeline: (1) program decision, (2) validation of project feasibility, and (3) decision to proceed with detailed engineering and construction. Further use of the tool could occur during project execution and operations. In addition, the tool can be used as a checklist at any time. Figure 1 illustrates where the tool is most applicable during the project life cycle.

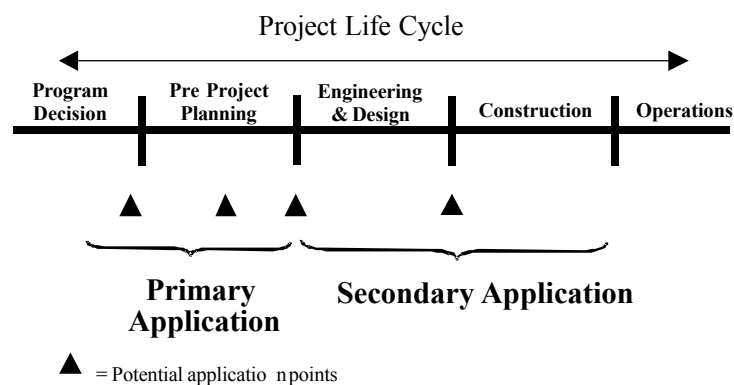


Figure 1 Application of the IPRA tool during the project life cycle.

Individuals involved with the project should become familiar with the format of the IPRA tool and use the IPRA project assessment worksheets when evaluating a project. Two types of worksheets are available—the difference between them being that participants have the option of

selecting their own relative impact level or using the baseline relative impact for each element. Table 6 gives an example of one of the 14 categories within the worksheets, showing the structure of the IPRA tool with the baseline values. The baseline is intended for use when specific values are unavailable or when project participants have little knowledge of the potential consequences. (Users of the nonbaseline assessment sheets determine their own level of relative impact, and no baseline is provided.) The mechanics of this process and of completing an assessment are outlined in succeeding sections.

Table 6 Example IPRA Assessment Sheet, Category I.A. Business Plan, with Baseline Values

CATEGORY	Likelihood of Occurrence (L)					Relative Impact (I)					Baseline	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												D		
I.A3. Economic Incentives / barriers												E		
I.A4. Market/Product												D		
I.A5. Standards and practices												D		
I.A6. Operations												D		
I.A7. Tax and tariff												D		

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 probably occur in most circumstances (35% chance <65%)
- 4 = **High** chance and will occur in most circumstances (65% chance <90%)
- 5 = **Very High** chance, almost certain and expected to occur (90% or greater chance of occurrence)

Relative Impact

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

The combination of likelihood of occurrence and relative impact determine the relative importance of risk for a given element on a project. This combination is shown in Figure 2. The appropriate relative importance risk level can be found by locating the coordinates of the likelihood of occurrence (L) and relative impact (I). Once the relative importance for the element has been determined, it is plotted at its specific location on the risk matrix. Risk items that plot in the upper right-hand corner of the risk matrix represent the greatest risk to the project, whereas those in the lower left are of lesser concern. Obviously, elements with higher relative importance need to be mitigated by the project team. Major project dangers and/or irregularities should become apparent to the project team as the assessment proceeds, and this prospective view should prove to be useful in the project's risk monitoring, control, and mitigation measures.

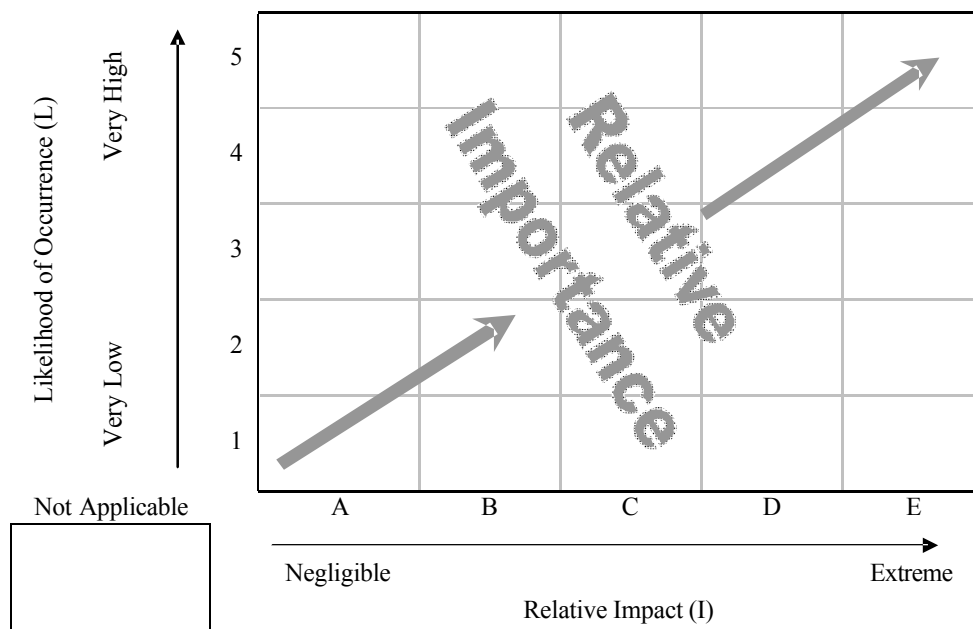


Figure 2 IPRA Risk Matrix

The IPRA gives the assessment team a process to gauge the relative importance of the project’s risk. It should be noted that the relative importance of a specific risk may change during the life cycle of the project, and therefore, mitigation methods may need to be adjusted accordingly. Using this guidance, the assessment team determines the type and level of mitigation for the individual elements. Elements with high relative importance need to be further addressed.

A risk register can be used to track and ensure that mitigation occurs. The intent of using the risk register is to systematically identify and track specific high -priority risks that result from an IPRA assessment. A high -level methodology to identify and track individual risk issues was undertaken by the research team, and further details are provided in CII Implementation Resource 181-2 (CII, 2003a).

Philosophy of Use

Ideally, the project team conducts an IPRA evaluation at strategic points in the project. Engaging a neutral facilitator familiar with the process, along with appropriate members of the project team, improves the assessment and limits in-house biases. The facilitator also provides objective feedback to the team and controls the pace of the assessment meeting. When this arrangement is not feasible, the alternative approach is to have key individuals evaluate the project separately and then come together for consensus. Although personal reviews can be biased, using the IPRA tool from an individual point of view can be of merit in situations where an expedited review is necessary or very early on in project development.

The IPRA tool is best used to help project participants arrive at a studied understanding of risk. The team should strive for consensus around each IPRA element before moving to the next. If action needs to be taken on an element, possible remedies should be captured on a flip chart or by another method of recording action items. Using the IPRA tool early in the project life cycle

will identify many areas of risk and gives the project team a roadmap for control and mitigation. In this early phase, several important issues typically affect the overall viability of the project, such as scope development and the alignment of project participants. The IPRA tool is a mechanism that can be used to identify or discover risks specific to international ventures and to organize the work to diffuse future risks. It also can provide an effective means of “handing off” the project to other entities or helping to maintain continuity as new project participants are added to the project.

The IPRA assessment worksheet serves as a basis for risk mitigation by the project team. The IPRA risk matrix can be used as a summary roll-up for senior management, in effect, helping to bridge any communication gaps concerning project understanding. In addition to the risk matrix, the summary also should contain a brief write-up addressing the specific areas of concern, and it should summarize the IPRA analysis. In particular, the assessment can focus attention on the elements that show higher relative impact (levels D and E), as well as higher likelihood of occurrence (levels 3 through 5), on the risk matrix.

Conclusions

In the course of this research it became clear that participants valued the identification and management of overarching project risks and recognized the dangers of exclusive attention to only risks within their areas of influence. Although the need for comprehensive risk identification, assessment, and management was acknowledged by all, it was practiced by few. Project participants are often segmented into project phases and disciplines that create information and communication disconnects. Complicated by the historically adversarial owner - contractor relationship, new risks go unnoticed or are not addressed, exacerbating disconnects between the project team and executive management. As a result, few project participants have an understanding of all the risks involved. Many of the risks that influence international projects fall outside those typically found on domestic projects. Acknowledging this reality, almost all the participants in this research agreed that an improved process is needed to identify and assess international risks and that there would be a benefit to having a structured tool/process. Effective risk management improves project performance on international projects in terms of cost, schedule, and market viability. The fundamental conclusions of this research are :

1. The IPRA tool is a comprehensive and sound method for identifying and assessing the relative impact of the majority of risk issues encountered on international capital facilities.
2. The IPRA tool and the baseline relative impact values help the project team to identify the risk factors of highest importance to the project team.

This research was an exploratory effort that has expanded the body of knowledge and research regarding international construction risk management. It offers a systematic and integrated risk identification, assessment, and management method for international projects; this method addresses both the full project life cycle and the portfolio of risks encountered by both owners and contractors.

The development of 82 discrete IPRA risk elements and associated descriptions and the worksheets that generate a ranking of them provides a unifying process to organizations involved with international projects; it gives them a common point of departure as well as a project touchstone once work is underway. No industry-wide process to evaluate the risks specific to international projects existed previous to the IPRA tool. Because its structured risk identification

and assessment process can rank the relative importance of a project's risk, this work also contributes an additional precursive analytical method to the more vexed process of detailed analysis, quantification, and modeling of risk issues that are more elaborate than necessary.

Unique to this effort was the development of baseline relative impact values for individual risk elements based on data collected from industry experts who were reporting on recently completed projects. Because few organizations collect and track information related to risk severity, the baseline values fill a knowledge gap and can provide some guidance when risk impacts are unknown or when uncertainty is high. This is especially critical during the business and preproject planning phases because failure to identify risks early in the project life cycle can cause serious ramifications.

Risk Management to Improve Project Performance

Based on the wisdom collected and organized by this research, we recommend the following risk response actions as a critical phase of a project's overarching risk management process:

1. *Organize and formalize a risk management process and keep it as simple as possible.* The project manager for an international construction project must create the proper context and environment for the risk assessment and management process to occur.
2. *Begin early to be most effective.* Most successful projects take the time and allocate resources to collectively identify, analyze, and develop risk mitigation and control approaches during the early, formative stages of the project.
3. *Keep a broad perspective to get the diversified input required.* It may be necessary to bring in special expertise from outside the project to get fresh insights and perspectives into the risks. Brainstorming sessions guided by a person trained in conducting such sessions may be beneficial.
4. *Undertake adequate preproject planning, analysis, and engineering.* Preproject planning facilitates a better understanding of the project's scope of work, thus leading to a better knowledge of risk. Preproject planning tools such as the CII's PDRI (project development rating index) are complementary to the IPRA tool (CII, 1996; CII, 1999).
5. *Partner with owner and contractor management .* In too many international construction projects the relationships between the investor, the project sponsor/owner, the project management contractor, the designer, and the construction contractor are not optimal for effective risk management.
6. *Recognize that certain projects are more prone to risk and that experience in a jurisdiction is important.* Projects having one or more of the following factors are significantly more likely to need a comprehensive, detailed risk management process:
 - Substantial resources
 - Significant novelty
 - Long planning horizons
 - Large size
 - Complexity
 - Several organizations
 - New jurisdiction for one or more major project participants
 - Significant political issues

Many international construction projects have several of these characteristics, and in general, the more experience an organization has within a jurisdiction, the better its ability to manage risks. 7. *Document project risks effectively*. Owners and contractors can profit by keeping records of their risk management results on various projects. These results are of much more value if they are shared. Given this shared knowledge, the result is more efficient project implementation and lower overall costs.

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APPENDIX A

Rank Order of IPRA Risk Elements by Relative Impact, Extreme and Severe Elements

Rank	IPRA Element	Element Description	Baseline Relative Impact*
1.	IB1	Source and form of funding	E
2.	IB3	Estimate uncertainty	E
3.	IA1	Business case	E
4.	IB4	Insurance	E
5.	IA2	Economic model/feasibility	E
6.	IB2	Currency	E
7.	II.B6	Relationship with government/owner	E
8.	IA4	Market/Product	E
9.	II.C1	Traditions and business practices	E
10.	II.D.4	Contract type and procedures	E
11.	II.B2	Political stability	D
12.	II.B3	Social unrest/violence	D
13.	III.E1	Trained workforce	D
14.	IA6	Operations	D
15.	III.A1	Scope development process	D
16.	IA5	Standards and practices	D
17.	IV.A1	Operational safety	D
18.	III.C1	Design/engineering process	D
19.	IA3	Economic Incentives/barriers	D
20.	IA7	Tax and tariff	D
21.	II.C2	Public opinion	D
22.	II.B5	Government participation and control	D
23.	IV.A4	Hiring/training /retaining	D
24.	II.D3	Governing law/contract formalities and language	D
25.	III.C3	Local design services	D
26.	III.B3	Subcontractors	D
27.	II.D5	Environmental permitting	D

*** Levels of Relative Impact:**

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

D = Significant and would threaten goals and objectives