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Risks of International Projects: Reward or Folly?

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Abstract

Assessing and managing risk is a complex and critical task for international construction projects that support new business ventures. Indeed, it could be argued that the word "risk" and the term "international projects" could be used interchangeably. Driven by such factors as new markets, domestic competition, and trade liberalization, U.S. owners and contractors have in recent years aggressively pursued international business opportunities and projects. International work requires owners to assess a diverse set of political, geographic, economic, environmental, regulatory, and cultural risk factors when contemplating an international capital project. In addition, contractors must consider a similar set of risk factors in determining whether to undertake such projects, and how to price and schedule the work if they do. A limited amount of research has been undertaken to address these issues, and current efforts to assess and evaluate the risks associated with international construction are fragmented and fail to provide adequate assistance to project managers. Can risks be systematically addressed and mitigated on these types of projects or is it folly to attempt this process?

This paper will report the results of our research project focused on international projects sponsored by the Center for Construction Industry Studies (CCIS), the Construction Industry Institute (CII) and the Project Management Institute (PMI). This research included input from over 100 industry experts representing 58 organizations. Data from 65 international projects, with a total cost of approximately $27 billion (U.S.) were analyzed. We will present key risk issues and a management approach to help mitigate risks. Included in that discussion will be the *International Project Risk Assessment (IPRA)* tool developed in collaboration with industry. This management tool provides a systematic method to identify, assess, and determine the relative importance of international-specific risks across the project's life cycle. The reward of risk management on international ventures will be explored. How industries other than construction can gain from this research will be outlined.

Introduction

Construction is a major worldwide industry accounting for approximately $3.4 trillion USD, or almost ten percent of global Gross Domestic Product (ENR 2000; Batchelor 2000; Bon 2001). Proportionally, the majority of international construction activity is conducted by local, regional, or national entities, yet an increasing percentage of industry participants operate on an international level (Bon 2001). Although the United States is the largest construction market—estimated at over $800 billion USD—projects completed outside of the domestic market, have become an even greater part of the capital investment portfolio of U.S. owners. Historically, U.S. companies have been significant participants in most global markets and U.S.-based contractors have a long tradition of overseas work. The growth and activities of multinational corporations has been a major contributor to the creation of an international construction market (United Nations 2001).

Facility construction involves a wide variety of risks. International projects — defined as those in which the investor, owner and/or contractor are from a country different than where the project is physically located — typically involve a wider range of risks than "domestic" projects. In effect, moving outside of one's usual business jurisdiction interjects many unknowns. Political interference, social unrest, and currency exchange are some of the concerns that add to the complexity of international ventures. Assessing and managing risk is therefore a complex and critical task for international construction projects and has proven to

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be difficult for owners, contractors, and to the growing number of other participants that include investors and insurance interests.

Driven by such factors as new markets, domestic competition, and trade liberalization, U.S. owners and contractors have aggressively pursued international business opportunities and projects. International work requires owners to assess a diverse set of political, geographic, economic, environmental, regulatory, security, and cultural risk factors when contemplating an international capital project. In addition, contractors must consider a similar set of risk factors in determining whether to undertake such projects, and how to price and schedule the work if they do. Organizations are more likely to successfully plan and deliver international ventures when they have a more comprehensive understanding of the commercial, political, construction and operations uncertainties and risks with such project. A limited amount of research has been undertaken to address these issues. Current efforts to assess and evaluate the risks associated with international construction are fragmented and often fail to provide adequate assistance to project managers because few management tools or techniques exist to identify, assess, and help manage the risks.

Most industry analysts agree that international business opportunities will continue to attract U.S. foreign investment and the international construction market will attract U.S. contractors. U.S. Owners aggressively pursue international opportunities to seek out new markets or improve cost effectiveness in manufacturing operations. The globalization of international construction markets provides tremendous opportunities for contractors to expand into new foreign markets (Hann and Diekmann 2002). Respondents to a survey on the future of international construction markets for the next 25 years agreed that American firms in specialized construction services possess a competitive advantage, and will continue to export construction services (Bon 2001).

The Center for Construction Industry Studies (CCIS), the Construction Industry Institute (CII), and the Design, Procurement and Construction Specific Interest Group of the Project Management Institute (DPC-SIG) funded our research study in 2000 to improve risk assessment procedures for international construction. CCIS is a multi-disciplinary research program studying the construction industry located at the University of Texas at Austin and is part of the Sloan Foundation's Industry Centers program.. CCIS was created with a grant from the Alfred P. Sloan Foundation and the Construction Industry Institute (CII) to perform multi-disciplinary, long-range studies addressing construction industry challenges in order to complement the traditionally short-term research process employed by CII and others. This study was sponsored by CCIS to focus on it research thrust areas in project execution processes and economics, finance, and dispute resolution. CII is a research organization whose mission is to improve the competitiveness of the construction industry. It is a consortium of approximately 90 leading owners and contractors who have joined together to find better ways of planning and executing capital construction programs. PMI participation with this research effort was promoted by the interdisciplinary scope of the research, and the desire to continue its efforts to evaluate the changing nature of the project execution process and the implication of these changes on the industry.

The goal of our collaborative research effort was to develop a risk management process to increase the success of international capital facilities for owners and contractors, with project success defined as budget and schedule achievement, and meeting technical and operational objectives. Principal beneficiaries of the results are project managers in the industrial, building, and infrastructure construction sectors, including both private and public organizations that conduct international operations and activities. The tools and techniques that were developed are relevant to organizations outside of construction given that many project risk issues and factors are generic and systemic.

Completed in December 2003, our investigation produced the *International Project Risk Assessment (IPRA)* tool (CII Implementation Resource 181-2 and CII Research Report 181-11). The tool and supporting documentation provides a systematic method to identify, assess, and determine the relative importance of international-specific risks across the project's life cycle and spectrum of participants to allow for subsequent mitigation. The associated research report describes in detail the research performed including the methodology, data analysis, and value of the research to industry. The IPRA is the first management tool of its kind that allows for the identification and assessment of the life cycle risk issues specific to international construction for both owners and contractors. Furthermore, the tool is unique because the created Baseline Relative Impact values are based upon empirical data using industry expert inputs reporting on actual projects, and the IPRA identifies the risk factors of highest importance to the project team.

This paper provides an overview of risk management, IPRA tool development and research findings, and a brief explanation on how the tool is used. Also included are recommendations to practitioners who are pursuing international projects as well as areas for future research. Our research investigation has shown that the tools and techniques developed can assist in improving the overall success of international capital projects. Project teams performing risk management activities are rewarded. Those that "go it blindly" do so at their own folly.

Risk Management

A myriad of risk and risk-related definitions are applied to construction projects, and no standard definitions or procedures exist for what constitutes a risk assessment. In the construction industry, risk is often referred to as the presence of potential or actual treats or opportunities that influence the objectives of a project during construction, commissioning, or at time of use (RAMP 1998). Risk is also defined as the exposure to the chance of occurrences of events adversely or favorably affecting project objectives as a consequence of uncertainty (Al-Bahar 1990). Dias and Ioannou (1995) concluded that there are two types of risk: 1) pure risk when there is the possibility of financial loss but no possibility of financial gain, and 2) speculative risk that involves the possibility of both gains and losses. CII's definitive work on construction risks (CII 1988) uses classic operations research literature to distinguish the concepts of risk, certainty, and uncertainty, and is consistent with the literature (ASCE 1979; CIRA 1994; Kangari 1995; Hastak and Shaked 2000; PMI 2000; Smith 2001) on what is considered as the sequential procedures for construction risk management: 1) identification, 2) assessment, 3) analysis of impact, and 4) management response.

Increased concerns about project risk have given rise to various attempts to develop risk management methodologies. An example of such is the Risk Analysis and Management of Projects (RAMP) method produced by the Institute of Civil Engineers and the Institute of Actuaries in the United Kingdom (RAMP 1998). This method uses a project framework to identify and mitigate risk through the accepted framework of risk identification and project controls by focusing on risks as they occur during the project life cycle. It requires users to follow a rational series of procedures and to undertake this analysis at scheduled intervals during the life cycle of a project. RAMP applies to all types of project but does not focus on international issues.

Traditional risk assessment for construction has been synonymous with probabilistic analysis (Liftson 1982, Al-Bahar 1990). Such approaches require events to be mutually exclusive, exhaustive, and conditionally independent. However, construction involves many variables, and it is often difficult to determine causality, dependence and correlations. As a result, subjective analytical methods that rely on historical information and the experiences of individuals and companies have been used to assess the impact of construction risk and uncertainty (Bajaj, Oluwoye, and Lenard 1997).

Although contracts are the mechanism to allocate liabilities and responsibilities of project participants in construction, contract language alone is insufficient to specify and appoint all the risks (ACEC/AGC, 1992, Rahman and Kumaraswamy 2002). An ideal process would address the individual needs of each organization and each project (Chapman and Ward 1997).

The distribution of risk between the client and contractor tends to overshadow effective management strategies and investigations show that contactors and owners give minimal consideration to risks outside the realm of their own concerns (Kim and Bajaj 2000, ENR 2002). Although the owners project team must identify with the business mission of the company, there are often disconnects. CII research has shown the failure to align business goals and specific project goals due to poor pre-project planning is a major industry challenge (CII 1997).

Determination of risk responsibilities and ownership is critical yet can be difficult to allocate for international projects. The Fédération Internationale des Ingénieurs Conseils (the International Federation of Consulting Engineers, FIDIC) and the International European Construction Federation (FIEC) publish two well-known and widely-accepted forms of conditions of contract for international construction projects (the Red and Yellow Books) that include provisions on the fair and equitable risk sharing between the owner and the contractor as well as risk responsibilities, liabilities, indemnity, and insurance. A discussion on risk sharing is included in an analysis of the FIDIC Red Book (Bunni 1997) that includes a series of flow diagrams of the risks in construction, and their ensuing responsibilities, liabilities and how these are dealt with by the Red Book (Conditions of Contract for work of Civil Engineering Construction).

Understanding the relationship between risk management and project phases for capital projects can be a difficult task. International projects are often first- or one-time efforts where project progress and phasing decisions can be isolated from risk management. For most international projects, different participants are responsible for and control the various phases of a project's life cycle. In most cases, the project owner is largely responsible for program analysis, a third-party is often hired to manage and control design and engineering to meet the initial constraints set by the owner, and a contractor is hired to construct the project, who turns the results over to the owner for operations or production.

Structuring projects with distinct phases and responsibilities can increase risk by isolating the project participants in such a manner that minimal attention is given to overarching project concerns. Individual project participants become concerned with only their own project risks and either willingly or unwillingly try to transfer these risks to other project participants (Kim and Bajaj 2000).

Mitigating risk by lessening their 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 is a replacement of uncertain and volatile events with a more predictable or controlled response (Chapman and Ward 2002).

The uncertainty of a risk event as well as the probability of occurrence or potential impact should decrease by selecting the appropriate risk mitigation strategy. Four mitigation strategy categories commonly used are:

- **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.
- **Control/Reduction** – when a process of continually monitoring and correcting the condition on the project is used. This process involves the development of a risk reduction plan and then tracking the plan. 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, performance incentives, insurance, warranties, bonds, etc.

Successful project management requires the identification of the factors impacting project scope definition, cost, schedule, contracting strategy and work execution plan. However, much of the research related to risk identification, assessment and management for constructed facilities is focused on specific issues such as location, categories of risks aspects, or types of projects. For example, lists of relevant construction project risks have been developed (Kangari 1995, RAMP 1998, Smith 1999, Hastak and Shaked 2000, Han and Diekmann 2001) as well as political risk are available (Ashley and Bonner 1987, Howell 2001).

The value of systematic risk management of project activity is not fully recognized by the construction industry (Walewski, Gibson, and Vines 2002). Since no common view of risk exists, owners, investors, designers, and constructors have differing objectives and adverse relationships between the parties are common. Attempts at coordinating risk analysis management between all of the project participants have not been traditionally formalized and this is especially true between contractors and owners.

International project risks are sometimes overlooked or assessed haphazardly. Such risks include war, civil war, terrorism, expropriation, inability to transfer currency across borders, and trade credit defaults by foreign or domestic customers (Wells and Gleason 1995, Hastings 1999). Although risks such as civil unrest and economic stability are typically outside the scope of normal business, understanding and dealing with these risks are critical for companies working internationally. A 2001 study by Aon Trade Credit discovered that, in the Fortune 1000, only about 26 percent of companies had in place systematic and consistent methodologies to assess political risks (Aon 2003). Working in an international setting often requires a much wider view of the project's context than with domestic projects (Miller and Lessard, 2000; Mawhinney 2001).

In summary, the purpose of risk management is to mitigate risks by planning for factors that can be detrimental to project objectives and deliverables. Although risk management is a relatively known and practiced process, few organizations have conquered its successful implementation. Much of what is practiced is based on intuition or personal judgment. The need to manage risks is important to all project stakeholders and critical for project success, especially in the international project arena.

The International Project Risk Assessment (IPRA) Tool

Background Investigation

Our research project was guided by an industry research team composed of twelve individuals. This team met periodically to guide our efforts and to provide input into our development activities. Our investigation began with an extensive literature review on the topics of risk identification, assessment, and management, as well as issues related to international construction. Information was also gleaned from industry practices for assessing international project risks and CII's periodic globalization forums to gain additional insight on these issues.

To further evaluate the approaches that organizations use to manage the risks incurred on international projects, we conducted 26 structured interviews with mid- to upper-level management personnel, including eight each from contractor and owner organizations, and the remainder 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 2003).

Both the literature review and these interviews showed that a variety of techniques and practices exist to identify and assess risks that occur on international projects, but there was no standard technique or practice specifically targeted for such projects (CII 1989, Walewski et al. 2002). We found that decisions on country-specific risks are often 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. As such, compartmentalization of the risks occurs, and international projects are often organized and managed in ways that create information and communication disconnects.

Development of the Tool

To address a structured management approach, we developed a detailed list of the risk elements that impact the project's life cycle (planning, design, construction, and operations) of international facilities—effectively this is the "risk identification" portion of the risk management process. We used help from five primary sources for this list: the expertise of the research team, literature review results, the structured interviews, input from 10 CII Globalization Committee members, and further review by industry representatives. Initial topic categories were gathered from previous research and the structured interviews and screened using the research team's expertise. The final list of international risks was further refined and an agreement reached regarding exact terms and nomenclature of element definitions. Once this effort was completed, separate reviews were performed by Globalization Committee members and vetted again by participants during 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. This list, which forms the basis of the IPRA tool, is presented in Figure 1. This list can be considered very comprehensive for pursuing capital projects outside of one's home jurisdiction. Each Section, Category, and Element of the IPRA 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. An example element description is given in Appendix A. The IPRA Assessment Sheets and Element Descriptions are used in concert by a project manager and project team members to identify and assess specific risk factors, including the likelihood of occurrence and relative impact for each element.

We hypothesized that all elements are not equally important with respect to their relative impact on overall project success. These issues are different depending on the project type and location as well. Our industry sponsors believed there would be significant benefit if a standard baseline (impact) risk value could be determined for each element. This guidance value of a risk's effect on the project would be of assistance when the risk is unknown by project participants, and could also provide a framework to rank order risk elements on the project for subsequent mitigation.

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 – COUNTRY

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

SECTION III – FACILITIES

III.A. Project scope

- 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

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 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 startup

Figure 1. IPRA Structure

In practice, the likelihood of occurrence for a particular risk is usually not known with absolute precision because of a lack of information or uncertainty of the situation. As a result, we decided that looking back to the time of contract formation (i.e., the point in time when the facility owner contracted for detailed design and/or construction) on completed projects would be the most useful strategic point to determine the level of risk that existed.

When taking a *retrospective* view of risk at a given point in time, uncertainty is no longer an issue because the event has either taken place or not occurred, and the likelihood of occurrence component of risk assessment is no longer an unknown being assessed in a predictive manner. In essence, the retrospective look at risk leads to a determination of relative impact to the project. With adequate input from experts across a multitude of international projects, an aggregate baseline impact factor could be developed for each IPRA element. Then, as a predictive tool, likelihood of occurrence would always have to be assessed and the impact component of risk would be either this predetermined aggregate baseline level or a self-determined level by project participants.

Workshops

We decided 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. From September 2002 to January 2003, we hosted four risk assessment workshops. Held in various locations in North America, a total of 44 industry executives with extensive international experience reporting results on approximately $23 billion worth of projects from 20 different countries were involved. 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 recently completed 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 2003).

Workshop participants proceeded in order through the 82 elements with each IPRA element description reviewed in the context of their project. An analysis of the data created a rank-order of the IPRA elements by their relative impact and these were sorted from 1 to 82. Relative Impact designations were developed for the 82 IPRA elements. 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 Figure 2. The Baseline Relative Impact values of the significant and extreme elements are given in Appendix B of this article. A detailed discussion of this development effort is beyond the scope of this paper; for more information on how these values were developed, please see CII Research Report 181-11.

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.

Figure 2. **Relative Impact Definitions**

In summary, responses from the workshops were evaluated and the collective input was used to develop a Baseline Relative Impact value for each IPRA risk element. The Relative Impact value is composed of the element's rank based on its potential impact to the project within its category, section, and the overall IPRA tool. Several statistical tests—described in detail in CII 181-11—were performed and the Relative Impact values were incorporated into the final version of the IPRA worksheets.

Likelihood of Occurrence values were also developed by dividing probability that the identified risk will occur into the following five designations (with numerical range from 1 to 5): 1 = Very Low (<10%), 2 = Low (10% to <35%), 3 = Medium (35% to <65%), 4 = High (65% to <90%), and 5 = Very High (90% or greater). These designations are based on the research team's review and assessment of the literature and industry practices in determining and assigning risk probabilities. Figure 3 gives the probability division for the Likelihood of Occurrence used 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)

Figure 3. Division for Likelihood of Occurrence in the IPRA

As a supplement to the workshops, the October 2002 CII Emerging Markets Forum in Baltimore, Maryland, USA, provided an opportunity for 29 industry representatives to test the mechanics of using the IPRA Tool and Element Descriptions on a case study cement production facility located in Bulgaria. Forum participants were also asked to assess and comment on the theory, structure, and usefulness of our work. Introducing the IPRA to the Forum participants and having them participate in this case study evaluation provided value. The case study issues and expectations of Forum participants were well-defined during an introduction to the IPRA. These factors combined with an interactive group discussion on assessing the project risks and then reporting the results helped to: 1) create a high level of interest in the IPRA, 2) check the thoroughness of the tool, and 3) provide an excellent opportunity to observe the personal interaction of participants when using the tool. In the concluding discussion session at the

Forum, participants made it clear that their preference was for the IPRA tool to provide separate assessment scales for likelihood of occurrence and relative impact for each element.

Consistency Testing

To verify the usefulness and to assess the viability of the Baseline Relative Impact values, we tested the IPRA on completed and ongoing capital projects. Data from 22 projects in 18 countries, representing greater than $4.2 billion in project value, were used to test the efficacy of the IPRA. This sample included a retrospective look at 15 recently completed projects and observation of IPRA use on seven projects that were ongoing at the time of the study. Further details and summary information on the test projects are provided in CII Research Report 181-11 (CII 2003b).

The completed test projects were a convenience sample nominated by research team members and others. On each sample project, historical project data were collected for all 82 project risk elements at the time of contract formation. These data were used to build risk profiles for each of the 82 elements so that a rank ordering for the test projects could be developed and compared to the Baseline rankings developed using the workshop data.

In general, the relative impacts of the 82 risk issues on these test projects were similar to the predicted Baseline Relative Impact values. There were, however, some differences. The test sample consisted mainly of projects from developing nations with experienced owner and contractor involvement. Therefore, some risk elements related to working in a developing country (mostly in Section III of the IPRA), and those risk elements related to funding and marketing (mostly in Section I of the IPRA) were significantly different than predicted by the Baselines. This assessment underscores the need to tailor the Baseline values to the project at hand and to ensure that experienced individuals are available to perform the assessment.

We asked respondents to identify risk issues not addressed at contract formation that had Severe or Extreme impacts on cost, schedule, and/or business drivers for the sample projects. Figure 4 gives a summary of these IPRA risk elements, listed by frequency of occurrence. We also asked the respondents to identify the unforeseen Severe and Extreme risks that existed at the contract formation phase of their projects, the impacts of those issues to the project's ultimate performance, and mitigation steps taken. A selected sub-sample of these unforeseen issues is given in Figure 5.

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

Figure 4. Frequency of IPRA elements identified during testing, having a significant project impact not addressed at the time of contract formation (N = 15)

Sample Project	Risk Element	Performance Issues
1	III.A1. Scope development process III.D8. Schedule	The initial agreement to stay within scope was not followed by the owner who spent $3 million more than budget without increasing the project schedule. The follow-on schedule compression had severe impacts on the contractor and resulted in increased labor workloads, costs, and availability on other projects.
2	II.A2. VAT II.B6. Relationship with government III.D8. Schedule	The government sold the project to private investors and the sale impacted the contractor's financing, cash flow, and the schedule. To maintain schedule, the contractor had to use $3 million of its own fund that resulted in VAT and other tax issues.
5	III. C.3 Local design service III.D8. Schedule	The requirement to have a local architect and engineer approve plans and specifications was not taken into consideration and project contingency was used to pay for the added cost of additional design services and schedule delays.
9	II.C3. Religious differences III.D8. Schedule	The observance of holidays, daily prayer times, and work schedules (local work week was Saturday to Thursday) decreased productivity. The religious and cultural differences required the contractor to provide more on-site management than originally planned.
9	III.A2 Technology III.D8. Schedule III.E2. Facility turnover	The use of experimental technology by process technology supplier increased plant capacity and process water system specifications for this remote project. However there were unforeseen problems with the technology that occurred during start-up and this adversely affected both cost and schedule. The contractor's site staff was required to work with the client and technology provider to resolve the problems.
12	II. C1. Traditions and business practices III.D12. Quality	In-country building practices made it difficult to achieve plans and specifications. As a result the owner required the construction manager to increase the number of supervisors to monitor project performance.

Figure 5. Selected Examples of Unforeseen Project Risk Issues Impacting Performance

In addition, we developed detailed risk status reports as outputs of the full IPRA assessments for 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 to identify and evaluate a wide spectrum of risks on real international projects using either a team or an individual project participant. In each case, the IPRA gave project participants a viable platform to discuss project specific issues and helped identify critical risk issues. Members of the research team were involved directly in observing the usage of the tool on most of these projects and used the information to modify the assessment sheet slightly and to help in writing instructions on its application for field use.

As summarized in Figure 6, we performed a variety of activities and received input from 113 different industry experts in developing and testing the IPRA. Although the consistency test used a relatively small non-random sample of 22 projects, and is susceptible to bias, the collective results from this phase of the research show that the tool is a comprehensive and sound method to identify and assess the relative impact of the majority of risk issues encountered on international capital facilities (CII 2004).

Activity	Number of Participants*
Research team 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	11
Consistency Test – Ongoing projects	22
* Participation is only counted once as some individuals contributed to more than one activity	Total 113

Figure 6. Summary of PT 181 Activities and Industry Input

Though the IPRA provides an excellent basis for performing risk assessment on international projects, we submit that there is no single blueprint for assessing the risks associated with international projects. Use of the IPRA tool must be tailored to adjust for country, user, and business sector concerns. The tool can assist with the identification of issues not typically considered, but does not lead to improvement unless experienced team members use excellent project management practices along with a structured mitigation process to address these issues.

Application and Use of the IPRA

Because risks can arise throughout the project life cycle, we believe that effective risk management should be 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 pre-project planning phases and to be most effective, the authors recommend that the IPRA 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. Secondary use of the tool could occur during project execution and operations. In addition, the tool can be used as a checklist at anytime. Figure 7 illustrates where the tool is most applicable during the project life cycle.

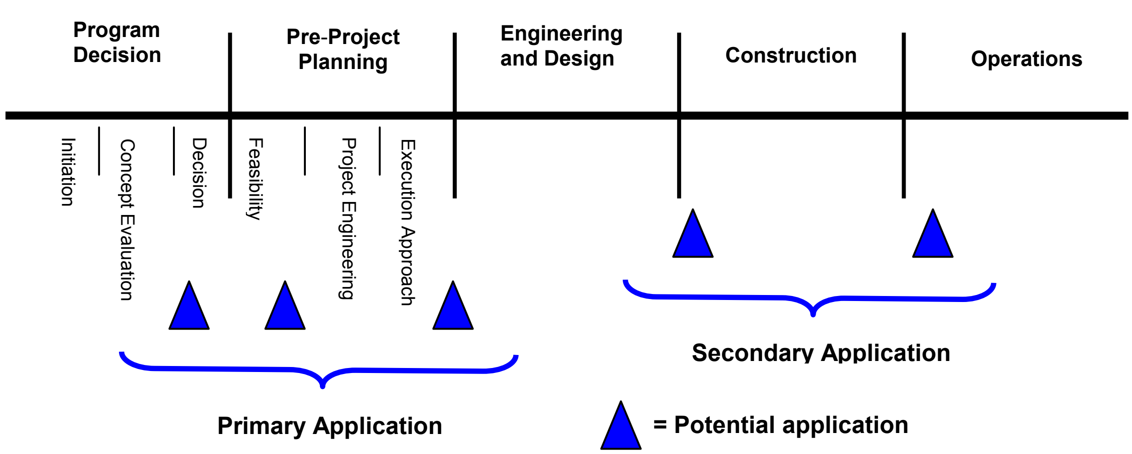

Figure 7. Application of the IPRA during the Project Life Cycle

Preparation

Individuals involved with the project should become familiar with the format of the IPRA and use the IPRA Project Assessment Worksheets when evaluating a project. Two Worksheets are available—the difference being that participants have the option of selecting their own Relative Impact level or using the Baseline Relative Impact for each element. Figure 8 gives an example of the structure of the IPRA Assessment Sheet that includes the Baseline. 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 non-baseline assessment sheets determine their own level of Relative Impact and no Baseline is provided.) The mechanics of this process and completing an assessment are outlined below.

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 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 achievement of functional goals and objectives

Figure 8. Example IPRA Assessment Sheet, Category I.A. Business Plan, with Baseline Values

How to Assess a Project

To assess the project each of the 82 elements must be addressed. To evaluate an individual element using either of the detailed assessment sheets, reviewers first read its explanation in the IPRA Risk Elements Descriptions document. For each of the 82 elements, detailed descriptions are provided and examples are shown as checklists to clarify concepts and facilitate the understanding of their impact. These checklists are not all-inclusive and the user may supplement them as necessary.

The project is evaluated based on the issues raised by the team using the element descriptions and associated checklists as guides. This process requires common sense and reasonable judgment. The IPRA is a process tool to help identify and assess risks associated with international projects, but does not provide solutions to these issues because they are unique to the jurisdiction and beyond the scope of this development effort. It should be noted that one of the key aspects of performing an adequate assessment is to make sure that knowledgeable participants are included, including business, project management, and operations.

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 level of knowledge of the project participants and includes such things as:

• Availability of information
• Experience and expertise of project participants
• Understanding of the issues creating the risk
• Extent to which the risks are stable or subject to change
• Reliability of assumptions

The team evaluates each IPRA element based 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 challenging to judge, the project participants 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) probability, and a 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 is 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 a chance that an element's existing status will change and require risk mitigation steps to take place in response to issues identified by the element description. The likelihood consists of identifying all the possible risks that may significantly impact the project's success. The project team should consider the description, then ask the question, "Will this issue cause mitigation methods to be employed because: a) events are likely to occur, and/or b) information is not known?" 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.

Assessment participants should realize that the Likelihood of Occurrence can be anticipated for certain IPRA Elements, whereas for others, the likelihood is uncertain and the probability of its occurrence is not well-defined or even unknown. Often not enough information exists to determine or assess the Likelihood of Occurrence. In these cases, it is recommended that participants be conservative in their assessment and rate the likelihood as having a higher chance. These 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. These values are in response to the perceived or actual impact that may occur if the given risk materializes. As with Likelihood of Occurrence, assessment participants should recognize that the Relative Impact may be known for certain IPRA elements, but for others the consequences of the element occurring and how it influences the project can be ill-defined or even unknown. Situations will exist where not enough information exists to determine or assess Relative Impact. In these cases, it is recommended that participants use the Baseline Relative Impact rating. When the Baseline rating is not used, the project team chooses a project-specific Relative Impact level. The project team should consider the IPRA description, and then ask the question, "If the issue occurs, how will it impact cost, schedule, and the relative success of the project?

As discussed, the steps above are repeated for each of the 82 IPRA elements. Major issues or irregularities should be noted by the project team and this information would be used to develop risk monitoring, control, and mitigation measures. The combination of these two values (Likelihood of Occurrence and Relative Impact) will help to determine the Relative Importance of risk for the given element on the project. This combination is shown in Figure 9. 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 indicated in the 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, while those in the lower left are of lesser concern. Subsequently, elements with higher relative importance need to be mitigated by the project team.

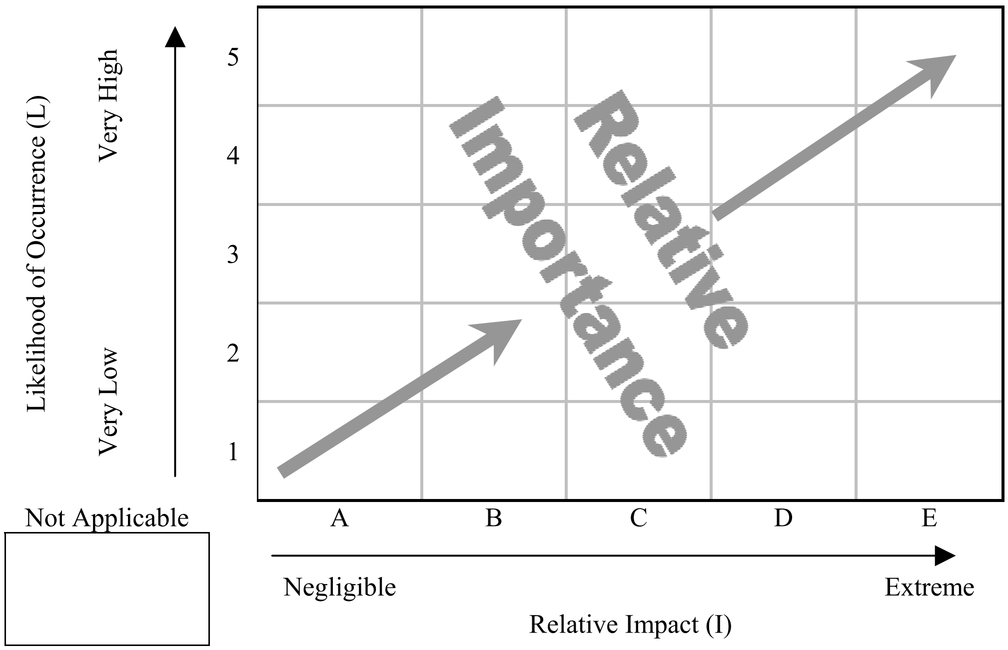

Figure 9. IPRA Risk Matrix

The IPRA gives the assessment team a process to gauge the Relative Importance of the risks. 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 mitigation occurs. The intent of using the risk register is to identify and systematically track specific risks of concern that result from an IPRA assessment. Because risk mitigation was not included in our scope of work, only a high-level methodology to identify and track individual risk issues was developed in this effort (CII 2003a).

Philosophy of Use

Ideally the project team conducts an IPRA evaluation at strategic points in the project. A neutral facilitator familiar with the process, along with appropriate members of the project team, optimizes the assessment and limits in-house biases. The facilitator also provides objective feedback to the team and controls the pace of the meeting. When this arrangement is not feasible, the alternate 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 from an individual point of view can be of merit.

We suggest that the IPRA is best used as a tool to help project participants facilitate risk identification and determine their relative importance. The team should strive for consensus around each element before moving to the next. If action needs to be taken on an element, these should be captured on a flip chart or other method of recording action items. Using the IPRA 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 can affect the overall viability of the project.

The IPRA is a mechanism that can be used to identify or discover risks specific to international ventures and organize its work to diffuse future risks. It also can provide an effective means of "handing off" the project to other entities or helping 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 the communication gap concerning project understanding. In addition to the Risk Matrix, the summary should also contain a brief write-up commenting on the specific areas of concern and summarize the IPRA analysis. In particular the assessment can give attention to the elements that show higher Relative Importance in the relative impact zones D and E, as well as Likelihood zones 3 through 5 of the Risk Matrix.

Conclusions

So, the question still remains: *Is it reward, or is it folly to pursue an international venture?* Obviously, the answer should be "it depends." International ventures that perform thorough due diligence prior to pursuing project execution and subsequent in-country business operations will have a better opportunity to succeed. Yet, that opportunity should be tempered with a high potential rate of return to offset higher risks. Our development effort in this project has identified the risk issues that are different on international capital ventures and we feel that this will, in turn, lead to better due diligence.

The contributions from 113 individuals representing 58 different organizations have highlighted the complexity of international projects and the diversity of risk assessment and management techniques employed. Most contractors and owners engage in some type of risk assessment, although the depth and quality vary. Most organizations in our study reported a process in place for early identification of risks, although few were able to translate this to management actions. Few organizations used this initial assessment of risk to create or enhance risk-based decision-making. No standard terminology existed prior to our effort.

The value of identifying and managing overarching project risks, rather than each participant giving exclusive consideration to only risks within their influence, was acknowledged by many but practiced by few. Project participants are often segmented into project phases that create information and communication disconnects. Combined with historically adversarial owner-contractor relationships, 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 project fall outside of those typically found on domestic projects. As such, almost all participants in this research agreed that an improved process is needed to identify and assess international risks and there would be benefit of having a structured tool/process. We believe that effective risk management improves project performance on international projects in terms of cost, schedule, and meeting business objectives. The international project risk assessment (IPRA) tool fills this void.

Is this just a "construction industry" tool? The projects and ventures that we reviewed in this study, along with the individuals and organizations that we interfaced with, cut a wide swath across the face of modern business. From pharmaceuticals to petrochemicals to infrastructure to resorts to embassies, we identified critical risk issues that are common when moving out of ones' typical jurisdiction. No matter the industry sector, an international venture in most cases must have a "brick and mortar" presence in some form. Our development efforts are applicable in assessing risks to all of these types of ventures.

Risk Management to Improve Project Performance

For international construction projects, we recommend the following risk response as a critical phase of the overarching risk management process. These are suggested actions that can help the project team effectively implement the IPRA:

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 pre-project planning, analysis, and engineering*. CII considers pre-project planning to be a best practice. Tools such as the PDRI (Project Development Rating Index) are complementary to the IPRA (CII 1996; CII 1999).
5. *Partner with owner and contractor management*. In too many international construction projects the relationship between the investor, project sponsor/owner, the project management contractor, the designer, and the construction contractor is 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.

The IPRA is intended to assist all project participants in proactively managing international project risks during the project life cycle of a capital facility. In effect, it serves as an "aide memoir" for project participants and allows its users to develop effective risk mitigation strategies as part of an overall project development process.

Recommendations for Future Research

Through the course of this research, we identified several topics as potential areas for further study. The first is to develop a systematic and objective mechanism for measuring how specific risk elements impact project cost and schedule. Few organizations track how risks influence performance and true validation of risk and performance impacts require the monitoring of projects from initial assessment through project completion and post-mortem. Tracking Likelihood of Occurrence and Relative Impact of risks and their associated project performance impacts from ongoing projects would allow for an analysis of those risk factors having the most influence on project performance. In addition, jurisdictionally-specific issues impact risk and an area for future research is to address regional and/or country differences with regards to the risk types, likelihood, and impact.

Risk identification and assessment are only part of the overall risk management strategy. Risk analysis, response, and mitigation measures are critical to the risk management process. However, these components were not a focus of this research. Identifying which risk analysis techniques and risk mitigation measures are the most effective are recommended areas for future research. Based on the findings of this research, applying the IPRA tool to on-going international projects and monitoring its accuracy is the most desirable method to validate the model.

The authors suggest that the IPRA should be applied extensively in a specific industry sector. For example, growth in the pharmaceutical industry is global and facilities are high-risk investments. Owners and contractors of such facilities would benefit by using the IPRA tool to identify potential areas of risk during the early phases of project development that may otherwise go undetected and ultimately result in severe negative consequences. Subsequently, an understanding of the risk issues specific to similar project types could lead to increased project performance within that industry sector.

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Appendix A

Structure and Content of a Typical IPRA Risk Element Description

To generate a clear understanding of the terms used for the International Project Risk Assessment (IPRA) tool, descriptions have been developed for each of the 82 risk elements, as well as the 14 categories and 4 sections. The descriptions are listed in the same order as they appear in the Assessment Sheets, and organized in a hierarchy by section, and categories within each section. Element descriptions have a section, category, and element designation. For the example element Business case shown below: ***I*** *is the section,* ***A*** *is the category, and* ***1*** *is the element number within the category. Each description includes a checklist to clarify concepts and facilitate ideas when assessing the risk for each element. The IPRA element "Business Case" is shown below to illustrate the structure and content of a typical IPRA risk element.*

I.A1. Business case

The overarching business objectives should define the strategies and assumptions that support the project's justification in relation to corporate strategy and investment goals. The business case must also include an assessment of corporate competence, managerial challenges, and technical feasibility of delivering international projects. The rationalization to pursue the international project includes the following items:

- ☐ Potential funding sources
- ☐ Project fit with the organization's business strategy
- ☐ Current or planned business presence in the jurisdiction
- ☐ Joint venture/partnering considerations
- ☐ Adequate human resource infrastructure and the existence of the management wherewithal and expertise
- ☐ Experience and history with this type of project, venture, and market
- ☐ Experience with other partners, contractors/suppliers, and/or labor-base in this country
- ☐ Timing of project aligning with demand
- ☐ Existence of an executive/corporate champion
- ☐ Attention to corporate image and responsibility
- ☐ Receptiveness and culture of host governments and citizens
- ☐ Mutuality and alignment of expectations between investors and host
- ☐ Social and political issues surrounding and impacted by the business venture
- ☐ Social unrest/violence
- ☐ Other

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

Rank	IPRA Element	Element Description	Baseline Relative Impact*
1.	I.B1	Source and form of funding	E
2.	I.B3	Estimate uncertainty	E
3.	I.A1	Business case	E
4.	I.B4	Insurance	E
5.	I.A2	Economic model/feasibility	E
6.	I.B2	Currency	E
7.	II.B6	Relationship with government/owner	E
8.	I.A4	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.	I.A6	Operations	D
15.	III.A1	Scope development process	D
16.	I.A5	Standards and practices	D
17.	IV.A1	Operational safety	D
18.	III.C1	Design/engineering process	D
19.	I.A3	Economic Incentives/barriers	D
20.	I.A7	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