

# **Software Risk Evaluation (SRE) Method Description (Version 2.0)**

Ray C. Williams  
George J. Pandelios  
Sandra G. Behrens

*December 1999*

TECHNICAL REPORT  
CMU/SEI-99-TR-029  
ESC-TR-99-029





Carnegie Mellon  
**Software Engineering Institute**

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Pittsburgh, PA 15213-3890

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**Process Improvement Team**

**Software Engineering Process Management**

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FOR THE COMMANDER



Norton L. Compton, Lt Col., USAF  
SEI Joint Program Office

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# Acknowledgements

**NRO** The funding support for this document was provided by the National Reconnaissance Office (NRO). In 1998 Rick Barbour of the Software Engineering Institute (SEI) mentioned to Mr. Gus Neitzel of the NRO that the current funding constraints on risk work at the SEI had left a body of important risk documentation in a semi-finished state, usable for individual client work (such as we were doing at that time for the NRO), but unsuitable for general publication. Mr. Neitzel agreed that this information was important for the software system development community to have and provided the funding for publication of this technical report in FY1999. Brian Gallagher, who succeeded Rick Barbour as technical lead for our NRO work, has continued to encourage the publication effort as FY1999 became FY2000 and has patiently assured funding as document production fell behind schedule.

**Coauthors** The draft version of the Software Risk Evaluation (SRE) Method Description (the body of this technical report) was prepared by George Pandelios and Dr. Sandra Behrens in 1997. I had a hand in shaping that material, but stayed mostly in the background. Without the sound foundation provided by George and Sandi's draft, this document would still be only a dream. Although George is no longer at the SEI, and Sandi is now in the Networked Systems Survivability initiative of the SEI, I acknowledge them as coauthors. Since neither of them had a hand in the final shaping of the document, however, the blame for errors, omissions, and inconsistencies is mine alone.

**US Coast Guard** I am indebted to the US Coast Guard (USCG) for the tremendous support and critical involvement of their staff during an SRE conducted on a software project at USCG Headquarters in 1999. In particular, I wish to thank Captain Clifford Pearson, who sponsored the SRE, and Lieutenant Brian Hofferber, who questioned

everything the SEI did and made sure that the steps were justified and documented either in the SRE Team Member's Notebook or in his own detailed notes. It was through LT Hofferber's notes that I was reminded of the breakthrough application of the "picture of success" in the USCG SRE—it provided a focus for clarifying the purpose of risk identification, analysis, and mitigation strategy planning steps. As a result, this step has been added to both the SRE Method Description and the Team Member's Notebook. Both have also been improved by his commentary and examples.

**Team Member's  
Notebook**

The SRE Team Member's Notebook that is the appendix to this technical report was put together—in virtually the form you see it here—in 1996 and 1997 as a training aid for the SRE course that George Pandelios, Dr. Sandra Behrens, Richard Murphy, William Wilson, and I designed and presented (once). However, the majority of it was lifted from the earlier Risk Identification and Analysis (RI&A) course that several of the same people designed and delivered (twice) along with Julie Walker. It was Julie who originally identified the need for a Team Member's Notebook and put the original one together from both available and new material. The Notebook grew from there.

**SEI Technical  
Communications**

Many people in the Technical Communications group at the SEI contributed to the production of the final text of this technical report. Overall editing was handled by Pennie Walters; detailed editing and revision of the text and graphics were by Laura Bentrem, and additional graphics support was provided Bob Fantazier. Barbara White, Jeannine Caracciolo, Bill Thomas, David Gregg, and Bob Lang all provided editing help or technical counsel at one time or another during the document's long gestation period.

**Development of  
CD-ROM**

The lecture on the CD-ROM of this technical report grew out of original concepts that were shaped in conversations with John Waclo of the SEI Process Improvement Team (PIT) from the Software Engineering Process Management (SEPM) initiative<sup>1</sup>. These ideas were developed further and

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1. The PIT and SEPM are also my home at the SEI. This group inherited the products of the former Acquisition Risk Management initiative (a.k.a. "the Risk Program") that flourished at the SEI from 1990 to about 1998).

taken in a new direction by John Antonucci of the SEI Distance Learning Center. John did the taping and general production of my lecture, and then Roger Van Scoy of TTFN Software Inc. in Gibsonia, Pennsylvania put the lecture, video clips, and slides together using his Just-In-Time Learning™ product.

### **Video Clips**

The video clips themselves were produced in the 1995-96 time-frame to support the RI&A course and later reused for the SRE course. They were shot and produced by Kurt Haverstock and John Antonucci in the SEI video studios, which have since become the SEI Distance Learning Center.

### **The SRE Interview Players**

The players include the following people who were SEI technical staff members at the time:

George Phelps (Interviewer) ..... George J. Pandelios  
Dick Lakeland (Risk Recorder) ..... Richard L. Murphy  
Judy Walner (Session Recorder) ..... Julie A. Walker  
Emma Whitney (Interviewee) ..... Carol Ulrich  
Joe Cleveland (Interviewee) ..... Kurt Wallnau

Of these, only Kurt Wallnau is currently a full-time SEI staff member. Dick Murphy still works with members of the PIT on a part-time basis; he periodically teaches the SEI's CRM course and continues to serve as an SRE team member when asked.

### **Historical Foundations**

From here, I'll go back in time to acknowledge the vast body of earlier SEI work on which the current SRE method was built, in reverse chronological order.

### **Interrelationship Digraph Approach**

F. Michael Dedolph and I introduced the interrelationship digraph technique to the SRE. This reshaped the Interim Report phase and greatly sharpened the focus of the ensuing Mitigation Strategy Planning (MSP) phase.

### **Mitigation Strategy Planning**

Audrey Dorofee and Julie Walker built the MSP phase of the SRE process in its current form. Audrey had already done an enormous amount of work to put together the Planning section of the *Continuous Risk Management Guidebook* by the SEI, and she and

Julie reshaped the MSP approach of the SRE to be more consistent with CRM Planning.

**“Harmonized” SRE  
Process Flow**

Dick Murphy, Sujoe Joseph, Julie Walker, and George Pandelios worked to bring together a number of available and often competing techniques to begin the general process flow design of this Version 2.0 of the SRE. Before this “harmonizing,” we had three different processes in use at the SEI for risk identification and analysis: risk assessments, field tests, and SREs. The SRE process described in this technical report was greatly enriched by this harmonization effort and is distinctly different from any of its predecessors.

**SRE Version 1.0**

Frank Sisti and Sujoe Joseph authored Version 1.0 of the SRE Method Description. Frank Sisti, Sujoe Joseph, William Wood, F. Michael Dedolph, and Carol Ulrich did the field work (the very first SREs) on which that Method Description was based.

**Condition-  
Consequence Risk  
Statement Form**

David Gluch focused us all on the condition-consequence form that is inherent in a truly useful risk statement, and he provided a theoretical basis for it in his 1994 technical report, *A Construct for Describing Software Development Risks* (CMU/SEI-94-TR-14). This was a key insight that rationalized the analysis process for risk statements.

**Risk Taxonomy,  
TBQ, and  
Interviewing  
Technique**

Marvin Carr, Suresh Konda, Ira Monarch, Carol Ulrich, and Clay Walker developed and refined the SEI risk identification technique first described in 1993 in *Taxonomy Based Risk Identification* (CMU/SEI-93-TR-6). They conducted numerous field tests of both the taxonomy they developed and interviewing approaches, pioneering the roles and protocols used in the interview. Their interviewing techniques, the SEI Risk Taxonomy, and the Taxonomy-Based Questionnaire remain the foundation of the RI&A phase of the SRE as practiced today by the SEI.

—Ray Williams, December, 1999

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# Abstract

The Software Risk Evaluation (SRE) is a process for identifying, analyzing, and developing mitigation strategies for risks in a software-intensive system while it is in development. The SRE process has been in evolutionary development at the SEI since 1992 and has been used on over 50 Department of Defense (DoD) and civil (federal and state) contractors and program offices. Version 1.0 of the SRE Method Description was published in December, 1994.

The SRE Method Description provides

- a description of the SRE method's principles, including helpful concepts and applications
- additional insight into the SRE process so that an organization can responsibly customize the process for its own needs
- specific “key results” listings for each process step that can be used to assess quality of execution

The description should allow members of an organization's process improvement staff to perform an initial SRE competently without outside help, and then continuously improve their process over time.



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# Preface

## **Proven but Unpublished Material**

This document has waited a long time to be published, and it has only been made possible today because of the support and encouragement of the National Reconnaissance Office (NRO). The materials in this technical report, its appendix, and the CD-ROM that accompanies them have been in use at the Software Engineering Institute (SEI) in various forms since at least 1995, but have been continually reworked and refined through internal SEI practice and never before published.

## **Getting You to Use the Process**

The intent of this technical report is to make the practice of Software Risk Evaluation (SRE) available for use throughout the software system development community, without requiring that the SEI (or even authorized representatives of the SEI) come to your location to do the process for you. You should be able to follow and customize this process for yourself, ultimately using a self-prepared team of four or five people with facilitation skills to produce a sound risk baseline for a project or program.

## **“Flawless” Conduct of an SRE**

The Method Description has been written to clarify what is important to achieve during each of the five steps of the SRE, and what the products of those steps need to be in order to carry the process forward reliably. In this, we have taken our inspiration from Peter Block’s *Flawless Consulting* (Pfeiffer & Co., 1981), a text that has been used for years in the Consulting Skills Workshop developed by the SEI, and one which I recommend to anyone who is engaged in helping an organization to change the way it approaches its work. Certainly initiating an effective risk management program for a project is an endeavor which will call for the greatest consulting skills that the people involved can muster, whether they are outside consultants or have been drawn from staff positions within the organization.

### **Providing a Basis for Customizing Your Own SRE Process**

The inspiration of Peter Block's book lies in this approach to the SRE Method Description: follow these steps and assure these high-quality products as you proceed, and you will have executed a "flawless" SRE, regardless of the ultimate response of the organization. By emphasizing the principles and "important bits" of the SRE process (in this document they are called the "key results" of a step or phase), the Method Description will allow you to customize the process to suit your target project, whether it is the hundred-person, ten-year projects the SEI has often encountered, or a three-person, six-month project.

### **The Appendix—The SEI's Own SRE Team Member's Notebook**

The appendix, the SRE Team Member's Notebook, is quite different in its approach. It is a *prescriptive* text, designed for use on those hundred-person, ten-year projects. We have been using this Team Member's Notebook for years in our own SREs, but in practice the SRE team leaders have been customizing its directions to suit local conditions. The guidance for this customization has been provided orally, from the experience of others within the SEI who have previously led SREs. The reader should look to the Method Description for the customization guidance that the SEI would provide to its own SRE team leaders.

### **Creating the Risk Statement**

At the heart of the entire process is the construction of the *risk statement*: a short, fact-based, and actionable statement of concern elicited from the members of a project. This statement needs to be accompanied by *context* that will preserve the specific original intent of the risk statement throughout the subsequent risk management process (which can stretch out over years). Together, the risk statement and its context form one of the "data bricks" on which a solid risk management program can be built. The SRE process creates these "data bricks" in a modified interviewing process that draws on the collaborative efforts of the interviewer and the interviewees. Because this creation process is so central to the SRE (and so hard to describe in text), we have created an accompanying CD-ROM that supplements the description of these activities in the Method Description and the Team Member's Notebook. The interview clips were filmed in 1995 to support a course on the Risk Identification and Analysis phase of the SRE, a course which was given publicly only once and then supplanted by a course on the entire SRE process (also given only once, to internal SEI staff).



### **How to Reach the Projects that Would Benefit from the SRE**

The conclusion we reached after offering these courses was that it was prohibitively expensive for organizations to train their proposed SRE team (four or five people with good facilitation skills, travelling to Pittsburgh for three days). Most organizations sent only one employee who was interested in learning about the process, but powerless to implement the newly-learned skills. This sending of “pioneers” is a natural, cautious approach to organizational learning, but in this case it just wasted everyone’s time. How could we reach the teams of people needed to carry out the SRE process? There appeared to be only two feasible solutions:

1. have those organizations that want to institute SREs as a risk baselining technique in their projects enter into a technology transition agreement with the SEI that (for example) will have the SEI perform an SRE on one project, then have the SEI and the home-organization together perform an SRE on a second project, then have the home-organization perform an SRE on a third project with SEI coaching and mentoring; or
2. put the material in the public domain and allow organizations that want to try SREs to put together their own groups and stumble through the process, learning by doing, the way we did when we developed it (but more efficiently, since they shouldn’t have to repeat our mistakes).

### **Designing and Funding the Method Description**

The two approaches are not incompatible, and they both require that the contents of this Method Description, SEI Team Member’s Notebook, and CD-ROM be published. Because risk work at the SEI is now funded exclusively by client contracts, the cost of producing the CD-ROM and editing the document text had to be underwritten by a client who shared our vision of making this information available to the public. The NRO generously provided that funding.

### **How to Start Learning about the SRE**

I suggest you begin your understanding of the SRE process developed by the SEI by reading the “Overview of the Software Risk Evaluation Method” that begins on page 15, and then go to the heart of the process by reading the “Conduct Interviews” section on page 39. After you’ve done that, load up the CD-ROM and watch at least the beginning of my lecture, focusing particularly

on the first video clip that shows one risk statement being constructed. From there, you can learn about the rest of the pieces of the process in any order that suits you; we've designed this document to support a "random access" approach to learning and using the material. Decide for yourself whether this process can help you generate the "critical mass of risks" you need to kick-start a risk program for a project in your organization. Whether you then are interested in having the SEI assist you in making the SRE process work for your organization or believe that you can go it alone, the materials here will get you well along your way.

—Ray Williams, December, 1999

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# Introduction to the Technical Report

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## Components of This Technical Report

This technical report is made up of three major parts:

3. the Software Risk Evaluation (SRE) Method Description, Version 2.0
4. the SRE Team Member's Notebook, Version 2.0
5. a CD-ROM about the SRE interviewing process

### Method Description

The Method Description provides:

- a description of the SRE method's principles, including helpful concepts and applications
- insight into the SRE process so that project managers, risk management champions, and responsible staff members can customize the process for their own purposes without compromising the underlying principles
- specific "key results" listings for each process substep that can be used to determine the quality of an SRE provider's implementation

**SRE Team Member's Notebook**

The SRE Team Member's Notebook (Version 2.0) is a specific implementation of the SRE principles for the Risk Identification and Analysis (RI&A), Interim Report, and Mitigation Strategy Planning (MSP) phases. It should be used as a baseline when creating a custom version that will work for your particular circumstances, keeping in mind the principles of the Method Description.

**CD-ROM**

The CD-ROM portion of this technical report gives specific guidance on the process that is at the very heart of the SRE: the risk identification interview. It does this in a way that is impossible to convey in text: by providing video clips ("vignettes") from various phases of the interview process, with an explanation of what is important about what happens in the clips.

**Context of the SRE within Risk Management**

The SRE is both a stand-alone diagnostic that can help an organization determine how best to assure the success of one of its projects and a solid foundation for risk management programs. The SRE discovers, analyzes, and sets mitigation strategies for the elemental "data bricks" of risk management: risk statements coupled with their descriptive context. Furthermore, the SRE sets out to discover all of these "data bricks" for a project at a given time in its life cycle. These "data bricks" can be used to provide the initial data for a risk management database and to generate the energy and focus that a project needs to effectively confront potential future problems that might otherwise overwhelm it.

The SRE is thus a useful tool for *project* management. There is, in fact, little that restricts it to being a tool applicable only to software projects or even to projects that are developing software-intensive systems. The basic principles you will find in the Method Description can probably be customized for any long-term project with a definable end product, widely-held vision of "success," and specific time in the future when that "success" is desired.

# Overview of Risk Management

## Why Manage Risk?

All projects have some level of risk associated with them. Even if the product under development is simply another version of an existing system or product, risks may appear in areas such as:

- changes in development personnel (and resulting experience levels with the product)
- changing market conditions and customer expectations
- changing business conditions for the development organization

The more you understand the risks, the better equipped you are to manage them.

## SEI Definition of Risk

The Software Engineering Institute (SEI) defines risk as the possibility of suffering loss.

In a development project, the loss describes the impact to the project which could be in the form of diminished quality of the end product, increased costs, delayed completion, loss of market-share, or failure.

## Risk Vs. Opportunity

Risk and opportunity go hand in hand. Success cannot be achieved without some degree of risk. “Risk in itself is not bad; risk is essential to progress, and failure is often a key part of learning. But we must learn to balance the possible negative consequences of risk against the potential benefits of its associated opportunity”<sup>1</sup>.

To be successful, the project manager must face risks head on. Common risks include

- a new development process

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1. Roger L. Van Scoy. *Software Development Risk: Opportunity, Not Problem* (CMU/SEI-92-TR-030). Pittsburgh, Pa.: Software Engineering Institute, Carnegie Mellon University, 1992. Available [www: http://www.sei.cmu.edu/publications/documents/92.reports/92.tr.030.html](http://www.sei.cmu.edu/publications/documents/92.reports/92.tr.030.html).

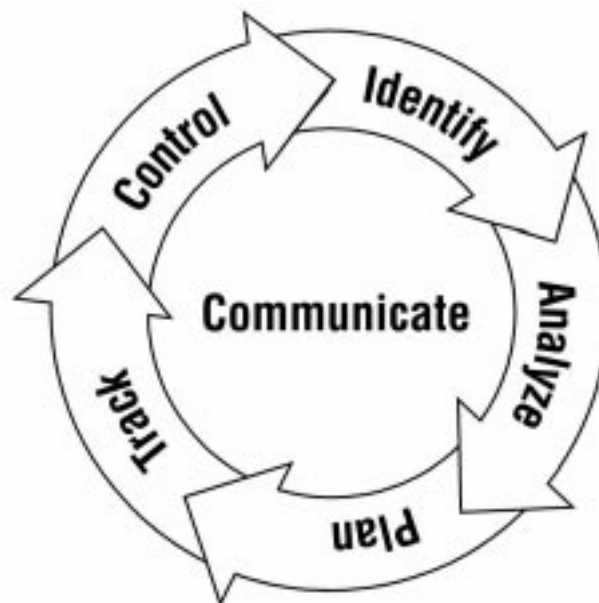
- the technical requirements of the product or system itself
- constraints placed upon the project or product by the customer(s) or market
- aggressive budget and schedule

For the project manager, the challenge is to know the risks facing the project and to manage them. The SRE is a tool that answers that challenge. It is the central and first implementation of the SEI risk management paradigm, explained below.

## SEI Risk Management Paradigm

### Risk Management Paradigm

Risk management is a process that is systematic and continuous and it can best be described by the SEI risk management paradigm.



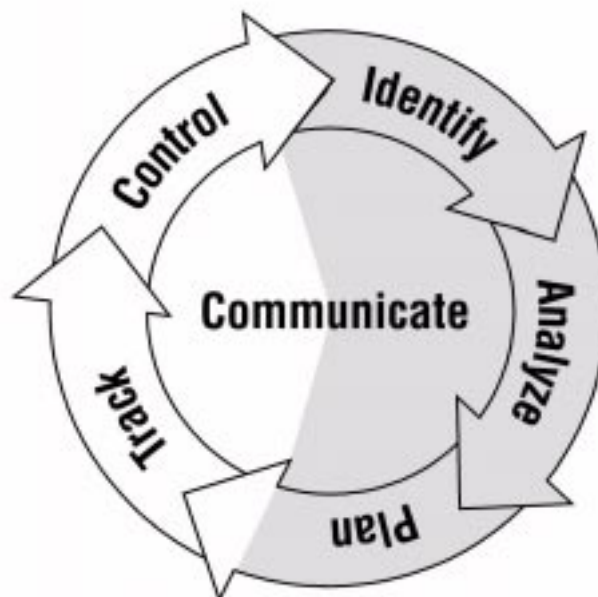
### Elements of the Risk Management Paradigm

The elements of the risk management paradigm are introduced below. These steps take place sequentially but the activity occurs continuously, concurrently (e.g., risks are tracked in parallel while new risks are identified and analyzed), and iteratively (e.g., the mitigation plan for one risk may yield another risk) throughout the project life cycle.

Element	Purpose
Identify	makes all known project risks explicit before they become problems
Analyze	transforms risk data into decision-making information
Plan	translates risk information into decisions and mitigating actions (both present and future) and implements those actions
Track	monitors risk indicators and mitigation actions
Control	corrects for deviations from the risk mitigation plans
Communicate	enables the sharing of all information throughout the project and is the cornerstone of effective risk management

### The SRE and the Paradigm

The SRE addresses the identification, analysis, planning, and communication elements of the SEI Risk Paradigm. The SRE, while not the only identification method available, is typically the initial and most prominent one used on a project. The analysis element is also covered fully by SRE activities. Planning elements are partially addressed through the construction of high-level mitigation strategy plans. The SRE also contributes significantly to the communication element. The remaining elements of the paradigm, tracking and control, are not addressed during an SRE.



## What is an SRE?

**Description** An SRE is a diagnostic and decision-making tool for a project. An SRE is used to identify and categorize specific project risk statements emanating from product, process, and constraint sources. The project's own personnel participate in the identification and analysis of risk statements, and in the mitigation of risk areas (collections of risk statements that are likely to have common mitigation strategies) facing their own development effort. The SRE has the following attributes:

- trains teams to conduct systematic risk identification, analysis, and mitigation planning
- focuses upon risks that can affect the delivery and quality of software and system products
- provides project manager and personnel with multiple perspectives on identified risks
- creates foundation for continuous and team (customer/supplier) risk management

An SRE provides a project manager with a structured early warning mechanism for anticipating and addressing project risks. It also introduces a set of activities that begins the process of managing risks. These activities can be integrated with existing methods and tools to enhance project management practices.

**Purposes of the SRE** The primary purpose of the SRE is to provide a clear and understandable picture of the risks which may affect the project. That picture may be used

- as a diagnostic—Are the risks acceptable for starting a project?
- to create a risk baseline—The SRE identifies critical risks before they become problems so that they can be managed on a continuous basis.
- to prepare for a critical milestone in the project life cycle
- to “recover from crisis”—The SRE provides a way to reset a baseline for a project



## Features of the SRE

The SRE has the following features:

- is principle based—the principles of the SRE described in this Method Description are derived from the seven principles of risk management<sup>1</sup>, primarily *Open Communication, Forward-Looking View, Global Perspective, and Shared Product Vision*
- uses proven group techniques such as the SEI Risk Taxonomy<sup>2</sup>, Xerox Problem-Solving Technique, and the Interrelationship Digraph
- uses structured brainstorming and interviewing techniques to elicit risks from the project staff
- protects confidentiality of SRE participants and enforces non-attribution in the reporting of risks
- involves project staff in the elicitation, analysis, and mitigation of risks
- minimizes interruption to project work schedules
- produces diverse views of project risk

## Benefits of the SRE

Benefits of the SRE include

- creates a shared view of risks facing a project among the staff
- creates a common framework for talking about and mitigating risks
- provides a snapshot of risks
  - enables the tracking of risks systematically (changes in probability and impact)
  - enables the tracking of risk mitigation efforts systematically

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1. Dorofee et al. *Continuous Risk Management Guidebook*. Pittsburgh, Pa: Carnegie Mellon University, 1996.

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2. Carr et al. *Taxonomy-Based Risk Identification (CMU/SEI-93-TR-060)*. Pittsburgh, Pa: Software Engineering Institute, Carnegie Mellon University, 1993. Available www: <http://www.sei.cmu.edu/publications/documents/93.reports/93.tr.060.html>.

- provides an impetus to focused project-level process improvement
- provides decision-making information to the project manager
- accelerates the creation of a shared product vision among project staff

### **Maximizing SRE Benefits**

To maximize the impact of a successful SRE, team members must be trained properly, and the SRE must have an experienced, authorized leader. To conduct an effective SRE, a team of qualified individuals from the organization should receive adequate training in the method.

### **Developing SRE Capability**

What if you can't have all those conditions that will "maximize" the impact of the SRE? What if you can't get the SEI to help you do the first few SREs? There are *no* "SEI-authorized SRE providers" out in the marketplace today, so that's not an alternative.

You're going to have to do it the way the SEI did: develop the capability for yourself. Here is an approach that will work:

1. Select four or five qualified individuals for the SRE team-in-training. These would be people in your organization who have facilitation skills and who probably already are involved in general process-improvement activities for the organization. A typical example would be members of the organization's software engineering process group (SEPG), if there is one.
2. Have the team study the materials in this technical report: the Method Description, the SRE Team Member's Notebook, and the CD-ROM.
3. Have the team create its own Team Member's Notebook based on the SEI example.
4. Make a series of projects available on which the team can use the process. These should be available in fairly rapid succession (say, one every three months) so that the team can complete its work on one and analyze the lessons learned before confronting the next one. It should not be critical for the first two SREs to identify important risks, so choose healthy projects that are likely to be reasonably successful regardless of the outcome of the process.

5. Convene a postmortem meeting of the SRE team after each phase of the process and record which key results of the Method Description were and were not achieved and document lessons learned for the next time.
6. When the SRE for next project is being planned, get the team to dust off the lessons learned from last time, read them, and refine the process for this time.

The SRE team-in-training will soon be comfortable with the process and able to identify and analyze a sizeable quantity of risk statements after a few opportunities.

## The SRE Within Risk Management

### Role of the SRE

When discussing the role of the SRE within risk management, there are two views that must be considered. First, the SRE is useful as a stand-alone diagnostic. However, the SRE is most effective as the initiator of continuous risk management (CRM)<sup>1</sup> within the project or parent organization and team risk management (TRM)<sup>2</sup> among customers and suppliers. The SRE provides a foundation for CRM and TRM by providing a “baseline” of risks. A baseline is a “critical mass” of risks that serves as a focus for later mitigation and management activities.

### Continuous Risk Management (CRM)

Continuous risk management (CRM) is a software engineering practice with processes, methods, and tools for managing risks in a project. It provides a disciplined environment for proactive decision making to:

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1. Dorofee et al. *Continuous Risk Management Guidebook*. Pittsburgh, Pa: Carnegie Mellon University, 1996.
  2. *Team Risk Management: A New Model for Customer-Supplier Relationships* (CMU/SR-94-SR-005). Pittsburgh, Pa: Software Engineering Institute, Carnegie Mellon University, 1994. Available [www: http://www.sei.cmu.edu/publications/documents/94.reports/94.sr.005.html](http://www.sei.cmu.edu/publications/documents/94.reports/94.sr.005.html)
-

- assess continuously what could go wrong (risks)
- determine which risks are important to deal with
- implement strategies to deal with those risks

When using CRM, risks are assessed continuously and used for decision making in all phases of a project. Risks are carried forward and dealt with until they are resolved or turn into problems and are handled as such.

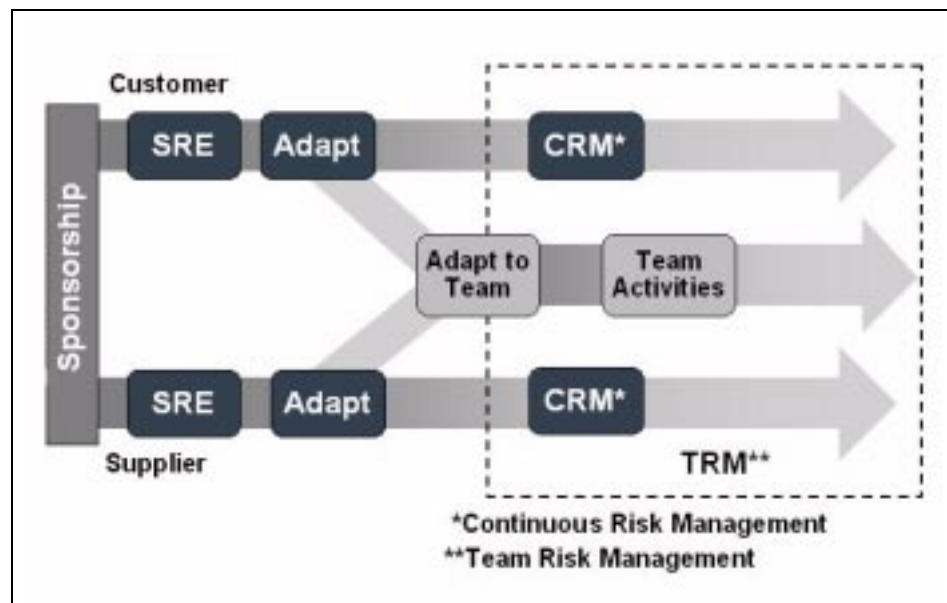
### Team Risk Management (TRM)

Team risk management (TRM) is a new paradigm for managing projects by developing a shared product vision, focusing on results, and using the principles and tools of risk management to cooperatively manage risk and opportunities.

TRM establishes an environment built on a set of processes, methods, and tools that enables the customer and supplier to work together cooperatively, continuously managing risk through the life cycle of a software-dependent development project.

### TRM Roadmap

The TRM roadmap, shown below, illustrates the progression towards the joint management of risk and the establishment of a trusted customer/supplier network.



**Definitions** Items listed on the diagram are defined as follows:

- The SRE is a service that helps projects establish an initial baseline set of risks and mitigation plans—one of the key first steps for putting risk management in place.
- The Risk Clinic is the workshop that initiates the installation of CRM within an organization. This clinic can be used to tailor CRM to suit a client's specific needs and implement it in one or more projects.
- CRM builds upon the results of the SRE and uses various methods to advance projects to managing risk on a continuing basis and to install a CRM process at the organizational level.
- The Team Risk Clinic is the workshop that initiates the installation of TRM. This clinic can be used to tailor TRM to suit the clients' specific needs and implement it in all the partners in a program (e.g., customer, supplier, subcontractors).
- TRM extends CRM to include all partners in a program. TRM brings about joint management of risks in a collaborative fashion.

## Getting Help from the SEI on SREs

Most organizations interested in the SRE and risk management fall into one of these categories:

- those wanting to conduct an SRE on a specific project, but with no long-term needs for this capability, and
- those wanting to acquire self-sufficiency in conducting SREs

**Conducting an SRE** To simply have an SRE conducted on one of your projects, please contact SEI Customer Relations at (412) 268-5800.

**Becoming Self-Sufficient at Conducting SREs** If your organization wants to conduct multiple SREs or acquire this capability for repeated use at a later time, we recommend that

you engage the SEI to transition the SRE into your organization. A typical transition might proceed as follows:

1. The SEI would lead the first SRE.
2. Either the team-members-in-training or the SEI would lead the second SRE (depending on the comfort level that was achieved with the first one), but the involvement of the organization's team-members-in-training in process planning and interview roles would be greatly increased in any case.
3. The team-in-training would lead the third SRE, with the SEI taking a mentoring/coaching role in the process.
4. The organization would then be considered self-sufficient in the SRE.

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# Overview of the Software Risk Evaluation Method

**Description** This chapter provides an overview of the Software Risk Evaluation (SRE) method, defines terms and definitions used throughout the document, discusses the applicability of the method, and in general terms, introduces the overall concepts of risk management, briefly describes the SRE method, and discusses its place within the framework of risk management.

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Terms and Definitions	13
Overview of the SRE Method	15

## Terms and Definitions

### Terms Used in this Method Description

The following terms are used in this document.

Term	Definition
project manager	person who is responsible for managing the project. The project manager has control over the visibility and distribution of findings and reports. The project manager is the ultimate customer of the SRE and commits funds, personnel, and other resources to the activity.
project	the group of people, plans, and resources involved in the development of a product or system

*Table 1: Terms and Definitions Used in This Document*

Term	Definition
organization	the larger group that is home to the project. Typically, organizations have more than one project.
customer	<p>the organization acquiring systems (typically designated as programs or projects) and responsible for</p> <ul style="list-style-type: none"> <li>• defining the requirements</li> <li>• obtaining funding</li> <li>• selecting the supplier/contractor</li> <li>• negotiating the contract</li> <li>• accepting the product</li> </ul> <p>Customers are often prime candidates for SREs because of their responsibility for specifying the system.</p>
end user	the organization or set of individuals that will ultimately use the product or system under development. The “end user” is often synonymous with the “customer” (see above).
interviewee	a project staff member interviewed during the Risk Identification & Analysis phase (see page 33)
participants	a project staff member taking part in any process of the Risk Identification & Analysis phase (see page 33) or the Mitigation Strategy Planning phase (see page 73). Participants may be referred to as “interviewees.”
SRE provider	the group providing the SRE service (may be the SEI, another outside organization, or a staff group that is outside the project having the SRE but within the organization)
SRE team leader	the individual leading the SRE (usually supplied by the SRE provider). This person is ultimately responsible for the quality of the output (SRE closure) and the fidelity to the process.

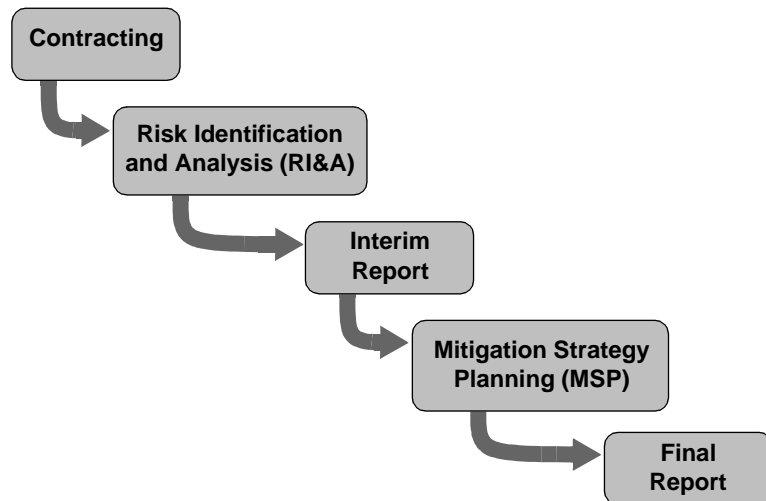
*Table 1: Terms and Definitions Used in This Document*



Term	Definition
SRE team	group of four to eight individuals who will conduct the SRE process on the selected project. This team typically consists of one leader and three to seven team members. Usually, the SRE provider supplies the team leader and one to two team members. The organization supplies the remaining SRE team members.
site coordinator	This individual is responsible for managing the logistical issues—arranging for conference rooms, scheduling participants for meetings, and supplying the SRE team with the items necessary to conduct the activity.
supplier	the organization developing and producing the system. The supplier is responsible for implementing the requirements under the terms of the contract, which include cost and schedule.

*Table 1: Terms and Definitions Used in This Document*

## Overview of the SRE Method



**Description** The SRE is implemented in five phases—Contracting, Risk Identification and Analysis (RI&A), Interim Report, Mitigation Strategy Planning (MSP), and Final Report.

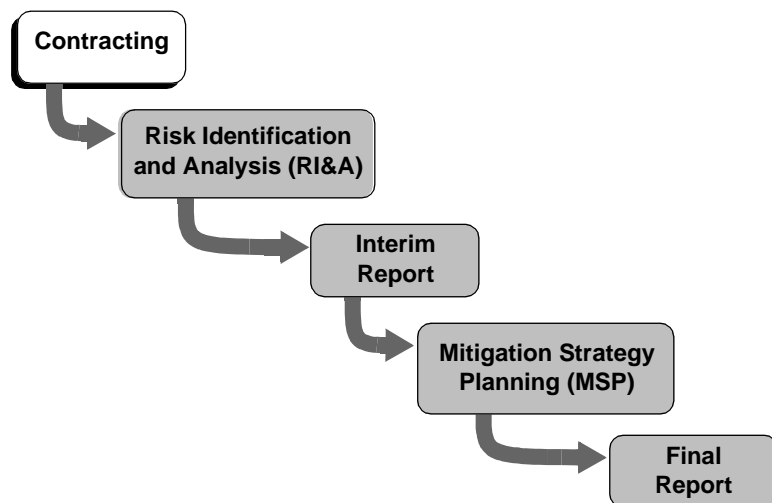
<b>Contracting Phase</b>	The Contracting phase consists of the activities needed to identify project goals, obtain agreements for the SRE, and coordinate resources for its conduct.
<b>Risk Identification &amp; Analysis (RI&amp;A) Phase</b>	During the Risk Identification & Analysis (RI&A) phase, the SRE team visits the project's development site and conducts structured interviews with staff members to elicit risk statements. The risk statements are analyzed, prioritized with regard to impact on the project, and grouped into risk areas. The SRE team then presents these findings to the involved project staff and manager.
<b>Interim Report Phase</b>	During the Interim Report phase, the SRE team reanalyzes the risk areas and prepares a recommendation of those to be addressed in Mitigation Strategy Planning (MSP) for the project manager. This recommendation is agreed to by the project manager before proceeding with the MSP phase.
<b>Mitigation Strategy Planning (MSP) Phase</b>	The Mitigation Strategy Planning (MSP) phase is focused on the construction of high-level mitigation plans for the selected subset of risk areas. Project staff, management, and the SRE team work together to create goals, strategies, and activities which will mitigate the concerns identified within the risk areas. Project staff, now equipped with the necessary information, plans, and sponsorship, can begin mitigating their most critical risks.
<b>Final Report Phase</b>	The mitigation strategy plans are added to the information already compiled and the final report is assembled. The final report and the associated risk data are presented to the project manager.

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# Contracting Phase

**Description** In many ways, the Contracting phase is the most important part of the Software Risk Evaluation (SRE). By properly setting the expectations of all players, explicitly agreeing upon the deliverable items produced by the event, and securing sponsorship from project management, a high degree of success is assured. It is important that everyone involved in the SRE understands what will be accomplished.

## Process Diagram



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## Expectations

### **Project Manager Challenges**

To accomplish anything of value, the project itself (and therefore the project manager) must take on risk, and typically faces several major challenges, such as

- a new development process
- the technical requirements of the product or system itself
- constraints placed upon the project or product by the customer(s) or market
- aggressive budget and schedule

### **Project Manager's Expectations**

The project manager may have some unrealistic expectations or be unaware of what the SRE can actually accomplish. (See “What is an SRE?” on page 6 for a discussion of the purpose, features, and benefits of the SRE in general.) The project manager's expectations should be revealed, understood, and responded to as early in the Contracting phase as possible. The SRE process is flexible and can usually accommodate some of the more common project manager issues shown below:

- “I need to identify areas where my staff needs technical assistance or expertise.”
- “What is the effect of having taken on a particular technical risk? Is it being handled? Is it affecting other portions of the project?”
- “Are we going to make our schedule?”
- “What are we not paying attention to that can hurt us?”

Once alerted to project manager's important issues, the SRE team can discuss them with the project manager and determine the appropriate amount of attention to spend on them during the process. While the SRE cannot provide answers with 100% certainty, it does afford some insight into these types of questions by providing two perspectives on the risks:

1. participant's view – expressed as risk statements and collective top risks
2. team's view – expressed as evaluated, analyzed, and prioritized risk statements and risk areas proposed for prioritized mitigation

## **Stakeholder Expectations**

Other stakeholders may have expectations regarding the activities and impact of the SRE. Some of the other potential stakeholders are

- the project manager's superior – This individual may view the SRE as a “report card” on the performance of the project manager. This expectation must be set aside before an SRE can be conducted. This constitutes misuse of the SRE (see “What is an SRE?” on page 6).
- sponsor – Sometimes the project manager is not the sponsor or did not request an SRE. Nonetheless, the results of the SRE belong to the project manager and may not be shown to the sponsor without the project manager's permission. For the remainder of this document, we will use the term project manager to represent both the project manager and sponsor.
- project staff members – Often these individuals are uncertain or unclear about the use of the SRE results, so their expectations must be set properly early in the process. Usually the opening briefing is the first opportunity to do so.
- members of the organization's software engineering process group (SEPG) – These staff members are committed to process improvement within the entire organization. Performing an SRE often starts project-level, process-improvement activities. The SEPG may be able to provide assistance in such matters. Frequently, SEPG members may be recruited as SRE team members.

## **Sponsor Support**

### **Who Can Sponsor an SRE?**

The following discussion assumes that the project manager sponsors the SRE. This arrangement has proven to be the most natural, as it allows the risk information generated in the SRE process to be controlled within the project itself, generally assuring the greatest cooperation from the interviewees because there is usually less concern that the information will be used later to punish the project staff.

We have seen two major exceptions to this in our years of conducting SREs:

- In one case, there was an antagonistic relationship between the project manager and the project staff; the information was used internally to punish the project staff.
- In another case, the SRE was used by an outside examination team to evaluate a project that had come under a cloud and was being threatened with cancellation.

The first case should have been normal and satisfactory, and the SEI assumed all was normal until the Risk Identification and Analysis (RI&A) phase had been completed. The second case should have normally have been avoided, but careful work in the Contracting phase assured that the SRE team leader, the leader of examination team, and the project manager had consistent expectations of the SRE and that confidentiality and non-attribution would be scrupulously maintained. As a result, the SRE was most successful and helped the project demonstrate its ability to confront the risks facing it.

Receiving sponsorship only from the project manager is generally the safest approach. If you become aware of conditions like the first case, it is best to avoid doing the SRE at all. Leave tricky conditions like the second case until you have built up a solid experience base in performing successful SREs.

### **Sponsor Responsibilities**

A successful SRE depends as much upon the contributions of the project manager and staff as the efforts of the SRE team. Active support and involvement are required from the project manager. Sponsorship is more than mere endorsement; it means that the organization or individual sponsoring the activity is willing to provide visible and active support and the resources necessary to get the job done. The support needed from the project manager includes

- sponsorship—not just endorsement
- a site-visit coordinator
- a “risk-management champion”
- team participation
- SRE participation

<b>Sponsorship</b>	Sponsorship is the project manager's active participation and visible support for the risk management activities. Simply telling project staff to "do risk management" is not sufficient. If the manager does not lead by example, or fails to adopt the principles of managing risk, the project staff will not change their work habits or activities to support it either. Sponsorship is the involvement with, rewarding of, recognition of, and consistent behavior in support of risk management which is visible to all members of the project.
<b>Site-Visit Coordinator</b>	The project manager will assign a site-visit coordinator to make the necessary arrangements for SRE activities. Ideally, this person is an administrative assistant or skilled at coordinating and arranging facilities and the schedules of personnel.
<b>"Risk-Management Champion"</b>	The sponsor should appoint a person in the organization who will be the "conscience" or "cheerleader" for risk-management activities. This person should have the respect of the project staff, so that the importance of risk-management activities is clear to the project. The "champion" will be the person to see that risk is on meeting agendas, risk activities are maintained and kept visible, and that risk information is passed both up the line to the sponsor and down the line to the project.
<b>SRE Team Members</b>	The project manager and SRE team leader should discuss and agree on recruiting well-qualified, experienced, and capable people from within the organization to be team members. "Working Agreement" on page 22 discusses the selection of SRE team members from within the organization.
<b>SRE Participants</b>	The project manager is also responsible for assigning knowledgeable, well-respected project staff members as SRE participants. The quality of SRE results depend on it. (This is also covered in "Selection of Participants" on page 25.)
<b>Key Considerations</b>	<ul style="list-style-type: none"> <li>• To be successful, the client organization must provide support and resources.</li> <li>• Engineering staff typically make poor site coordinators.</li> </ul>

## Working Agreement

**Description** The SRE working agreement is important to both the SRE team leader and the sponsor, because it helps assure that their relationship will mutually beneficial and that the responsibilities for success are shared as equally as possible. The working agreement operates as a “contract” between the two parties, whether it is formally written and signed or not. Such contracts have two main attributes, which also apply to consulting relationships generally: *mutual consent* and *valid consideration*<sup>1</sup>.

- mutual consent – when both sides enter the agreement freely and by their own choosing. The concept of mutual consent directly addresses the issue of how motivated the parties are in conducting an SRE.
- consideration – the exchange of something of value between the parties. Project managers will receive information that they typically could not obtain in any other fashion. SRE providers (the SRE team leader and the members of the outside SRE team) will receive, in addition to monetary consideration (if any), access to people and information in the project, the time of people in the project, and the ability to impact the future course of action for the project. Most importantly, the team will get to handle real project risk information and learn how to preform SREs successfully in the future.

### Inputs for the Working Agreement

The following topics should be considered as part of a working agreement between the SRE supplier and the project conducting the SRE:

- boundaries of the activity
- objectives of the SRE
- kinds of information sought
- SRE team role
- products the team will deliver

If the scope changes, it may become necessary to renegotiate the working agreement. For example, at the Mitigation Strategy Planning (MSP) meeting, it may become clear that other types of interventions are appropriate.

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1. Block, Peter. *Flawless Consulting—A Guide to Getting Your Expertise Used*. San Diego, Ca.: Pfeiffer & Company, 1981.



It may become necessary to bring other skills, such as organizational capability, process improvement, domain-specific knowledge, and problem-solving techniques to bear on the project's issues.

**Boundaries  
of the SRE Activity**

The boundary describes the limit or margin within which the SRE activity will be conducted. Risks or issues which are identified as beyond the boundary of the SRE are not dismissed, but rather captured and recorded for the client sponsor's awareness. Some of the questions for determining the boundary are

- Which part(s) of the client project/program will be the subject of the SRE?
- Which parts will not be considered?
- Which parts of the organization should/will participate?

An example of this boundary is "The SRE will address and include Release 1.3 of the operating system."

**Objectives of the  
SRE**

The project manager and SRE supplier should be clear about the purposes of the SRE which are to

- Identify and analyze risks to the project.
- Prepare high-level, strategic mitigation plans for major risks and risk areas, creating a way to further define and incorporate tasks into the overall project development plan.
- Address project manager expectations (see "Expectations" on page 18).

**Kinds of Information  
Sought**

The primary objective is to identify the risks which may affect the project. The data being sought will include

- a clear "picture of success" for the project in the eyes of the project members
- issues, worries, and concerns about achieving that picture of success
- specific conditions existing in the project that are generating those issues, worries, and concerns

## **SRE Team Role**

The primary role of the SRE team is to provide a clear and understandable picture of the risks which may affect the project. Doing this involves

1. identifying risks
2. analyzing risk data
3. consolidating risks into areas for management action
4. facilitating the creation of mitigation strategy plans for selected risk areas

In addition, the SRE team

- enhances the risk management capabilities of the target project
- develops project staff awareness of risk management
- helps project staff prepare for future risk management activities in their organization, such as continuous risk identification and analysis, creation and support of a risk database, and development of a risk management plan

## **Products the SRE Team Will Deliver**

The SRE process results in an identifiable number of products which are designed to collect the relevant data and provide the sponsor with a rich source of information about project risks, high priority risks, and risk areas that can be selected for MSP. These products include

- data confirmation briefing
- interim SRE report
- mitigation strategy plans and briefing
- final SRE report and briefing/closure meeting

Project managers are the primary customers of SREs. ***The results of the SREs belong to them.*** They determine who receives copies of the outputs, and ultimately, what is done with the results.

## **Selection of SRE Team**

The composition of the SRE team is an important success factor. In most cases, the team members will be selected for their judgment and experience in the application domain.

A typical team consists of an SRE team leader and three to five team members. Team leaders are usually supplied by the SRE provider and should meet the following qualifications:

- at least five years of software system development experience
- not part of the project under consideration
- experienced facilitator or leader of small groups
- well respected within the organization (if coming from within the organization conducting the SRE)

Although not required, knowledge of interviewing skills is also desirable.

One or two team members are supplied by the SRE provider, while one to seven of them come from the client organization. Best results are achieved if all team members meet the following requirements:

- at least 2 years software system development experience
- not part of the project being evaluated
- knowledgeable about the project's work
- have an understanding of the organizational climate, politics, and environment

### **Selection of Participants**

Project personnel are needed for the following situations:

- as participants in the risk interviews held during the RI&A phase of the SRE. These participants are the first “voice” in the process. The objective is to schedule an effective cross-section of the project staff. This will achieve a breadth and depth of expertise to identify the risks and uncertainties. The following is a list of typical group sessions and their participants from the project staff:

<b>Group Session</b>	<b>Participants</b>
Technical Leads	two to five team or subsystem leaders in the project
Design	two to five designers/implementors of the system (software developers)

Group Session	Participants
Functional	three to five members from such staff support groups as Testing and Evaluation (T&E), Quality Assurance (QA), Integrated Logistics Support (ILS), Configuration Management (CM), Validation and Verification (V&V), and so on.
Management	project manager

- Just prior to the MSP phase, project staff members will be assigned ownership of risk areas for mitigation. As such, they take part in the construction of mitigation plans during the MSP phase of the SRE, and then are responsible for completing the mitigation activities for their respective areas.

## Schedule and Time

The project manager and SRE team leader need to work out a reasonable schedule for accomplishing the activities of the SRE. These are the guidelines the SEI has used for scheduling the RI&A phase:

1. Allow a half-day (four hours) for preparatory meetings such as the following:
  - a. a briefing by a project representative explaining to the SRE team the technical challenges facing the project, project organization, schedule, and cost constraints
  - b. a briefing by the SRE team leader explaining to the people who are to be interviewed (and any other people in the project who are interested in what is happening) the process that will be followed and what will happen to the information gathered
  - c. a meeting of the SRE team to provide just-in-time training to the people who are local and may be new to the SRE process

Briefing (a) and meeting (c) could be completed a week or more in advance of the interviews, but briefing (b) should be within one day of the first interview.
2. Allow a half-day (four hours) for each interview and the team analysis session that will follow it.
3. Allow at least 10 hours (and one good night's sleep) to complete the team's analysis steps and prepare the briefing.
4. Allow one hour for the data confirmation briefing that presents the rolled-up analysis of the risk information gathered in the interviews.

5. If at all possible, keep the entire process to a week. If that isn't possible, schedule some interviews the week before the data confirmation briefing (but keep the majority of the interviews during the week of the data confirmation briefing).

A notional schedule for a four-interview RI&A schedule is portrayed in the Team Member's Notebook (Appendix A, page 3 and 15-19).

Allow two weeks to prepare the interim report, and a week or more to get the project manager's decision about the risk areas to be addressed in the MSP phase.

The SEI developed guidelines for scheduling the MSP phase:

1. Allow a full work day for the first risk area to be addressed.
2. Allow a half-day (four hours) for each subsequent risk area to be addressed (NOTE: We have often been unable to complete the process in four hours. Schedule more time if you can!)
3. If it will be necessary to use different project decision-makers in the various risk area sessions, schedule an MSP cross-area strategy session to last a half-day (four hours).
4. Allow a half-day (four hours) to consolidate the strategy information from the various MSP sessions and prepare a briefing.
5. Allow an hour for the briefing itself.

Allow two weeks to prepare the final report.

## **Use of Data**

Confidentiality and non-attribution are non-negotiable issues. The successful SRE depends on open, unconstrained communication between the participants and the SRE team. The participants must be confident that what they say will not be revealed. Make this clear to the project manager—explain that you will not reveal who identified any specific risk statement, or even the session that it came from.

It's a good idea to write a confidentiality agreement that will be signed by every member of the SRE team, and to review the

agreement with the project manager, so that they all understand the extent of the team members' obligation to maintain confidentiality and non-attribution.

### **The Project's "Picture of Success"**

Before discussing the topic of Risk Exposure with the project manager, it is important to lay the groundwork by asking for the project manager's "picture of success." Have the project manager imagine a time in the future when the project is completely successful. What will have been accomplished? How will this part of the world have been improved? Focus on three key questions:

- **When will it be?** Determine how far in the future the project manager is focused. Are they talking about delivery of a product? Long-term use by satisfied customers? Leaving a legacy to mankind?
- **What will it be?** Get a high level description of the product(s) the project will have produced at that time, with some information about the important attributes of the product(s)
- **What makes it a "success"?** What is the reward the project manager foresees at the end of the project? Is it enhanced national defense? Becoming legends of the industry? Becoming rich?

At the end of the discussion, write the "Picture of Success" in a way that the project manager can edit it and amend it (e.g., on a flip chart or on a computer screen) until it is satisfactory.

### **Example**

The following is an example of a picture of success:

*By March 1, 1986, The Toivolia Telephone Company will have the new Computerized Directory Assistance System in full operation, with operators clearing three times as many directory assistance calls per person-hour as was ever possible before. The interconnected hardware of ten computer with 500 operator stations will have started up flawlessly and will have had negligible downtime to date. This will make a significant contribution to Toivolia's bottom line and will provide S3I with a demonstration site for potential customers that will assure strong sales to other telephone companies well into the 1990's.*

### **Purpose**

Risks need to be identified in terms of some desired end-state. If I am focused on arriving safely at my destination tomorrow, my list of risks will be completely different from the list I would define if I were focused

on successfully raising a family, or getting my children through college. By getting the project manager’s “Picture of Success” you have an expectation that you can present the same vision to the interviewees during the RI&A phase, and they can identify the conditions in the project that put that vision at risk. The three “key questions” called out above relate directly to the SEI risk management principles *Forward-Looking View*, *Shared Product Vision*, and *Global Perspective*.<sup>1</sup>

## Risk Exposure

**Description** Risk exposure is a measure used during the analysis portion of the RI&A phase and is created by combining the impact and probability of the risk, should it materialize. The table below defines these terms at the level of detail that the SEI found useful in its SREs (four levels of impact and three of probability, translating to six levels of risk exposure).

<b>impact</b>	the effect of the particular risk on the project which is determined on the basis of the risk’s effect on the software’s performance, supportability, cost, and schedule. The levels of impact are <ul style="list-style-type: none"> <li>• 4—catastrophic</li> <li>• 3—critical</li> <li>• 2—marginal</li> <li>• 1—negligible</li> </ul>
<b>probability</b>	the chance that particular impact will occur. The levels of probability are <ul style="list-style-type: none"> <li>• 3—very likely</li> <li>• 2—probable</li> <li>• 3—improbable</li> </ul>
<b>risk exposure</b>	the function of probability and impact rated on a 6-point scale are computed by the simple look-up table shown in Figure 1 on page 30

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1. The SEI’s *Continuous Risk Management Guidebook*, Pittsburgh, PA: Carnegie Mellon University, 1996, pp. 7-9

With just three levels of probability, the SEI has found it is relatively easy to achieve common understanding of what the probability means. We explain it as follows.

First, choose the level of impact you think is appropriate for this risk to the project. Next consider the probability that the risk will have *this* impact.

- If you think it's about a "coin toss" that this will be the impact of the risk, assign it the probability "2—probable."
- If you think it's significantly more probable than a "coin toss," assign it the probability "3—very likely."
- Conversely, if you think it's significantly less probable than a "coin toss," assigning it the probability "1—improbable."

The actual titles used for the levels of probability are not important—"probable-likely-not likely" would be a reasonable alternative set of probability titles, for example.

Also, in Figure 1 the words "High" (associated with risk exposures 5 and 6), "Medium" (3 and 4), and "Low" (1 and 2) are simply characterizations of these levels of risk exposure. In discussions with the project manager, the team leader will probably set the goal that the SRE and any resulting risk program should set mitigation strategies in place to deal with all risks that are evaluated as "High" (i.e., 5 or 6).

		Probability →		
		3 Very Likely	2 Probable	1 Improbable
Impact ↓	4—Catastrophic	<b>6</b> High	<b>5</b> High	<b>4</b> Medium
	3—Critical	<b>5</b> High	<b>4</b> Medium	<b>3</b> Medium
	2—Marginal	<b>4</b> Medium	<b>3</b> Medium	<b>2</b> Low
	1—Negligible	<b>3</b> Medium	<b>2</b> Low	<b>1</b> Low

Figure 1: Lookup Table for Risk Exposure



## Project Manager's Input on Definitions

The project manager can provide excellent guidance to SRE team and group session participants by refining the definitions of impacts to make them more meaningful to the project. The figure below gives generic definitions of the terms “Negligible,” “Marginal,” “Critical,” and “Catastrophic,” but the SRE team leader should get the project manager to adjust these definitions for local conditions. For example, if just a 20% cost overrun would be “catastrophic” for this project, the definitions of “catastrophic,” “critical,” and “marginal” should all be adjusted to reflect this local reality. Likewise, the vague performance definitions should be sharpened to reflect the real performance goals of the project.

In these discussions, it may be necessary to explain to the project manager that “negligible” does not mean “no impact”—it means that this risk *by itself* will not cause the project to miss its performance, support, cost, or schedule goals, but it could combine with another risk to have that result.

Figure 1 can also be customized for local conditions. For example, if the project manager considers *any* “catastrophic” impact to be a “High” risk exposure, regardless of the associated probability, the table can be changed to reflect this (i.e., change the intersection of “Catastrophic” and “Improbable” from “4—Medium” to “5—High”).

Component → Category ↓	Performance	Support	Cost	Schedule
<b>Catastrophic</b>	nonachievement of technical performance	unsupportable software	major budget overrun (>50%)	unachievable IOC
<b>Critical</b>	significant degradation of technical performance	major delays in software modifications	serious budget overrun (~30%)	serious delay in IOC (>30% late)
<b>Marginal</b>	some reduction in technical performance	minor delays in software modifications	budget overrun (~10%)	delay in IOC (>10% late)
<b>Negligible</b>	minimal to small reduction in technical performance, at detail level	irritating and awkward maintenance	consumption of some budget cushion	consumption of some slack—not on critical path

Figure 2: Risk Exposure Matrix

**Key Results from  
the Contracting  
Phase**

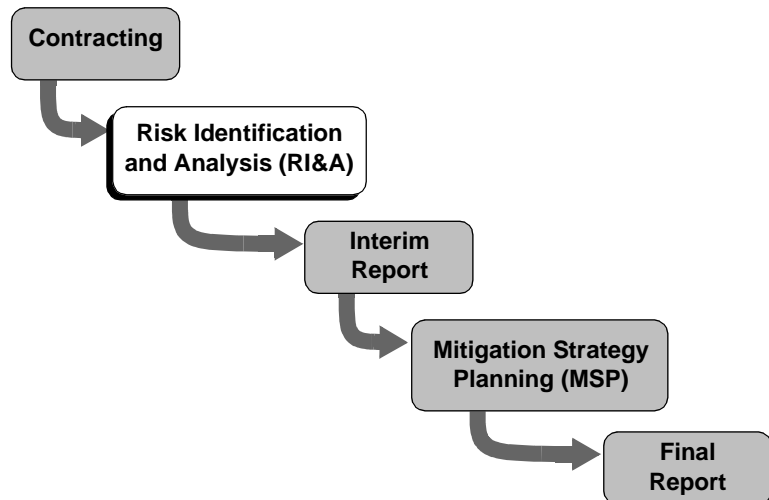
- ☐ The SRE team leader and project manager understand one another's expectations for the SRE.
- ☐ The project manager is engaged as an active sponsor of the SRE process, assuring that project personnel have been told through the project's "informal communications channels" that the success of the SRE is important.
- ☐ Support for the confidentiality and non-attribution of the interviews in the RI&A phase has been assured.
- ☐ The SRE team leader has a written statement of the project's "picture of success," defined from the project manager's viewpoint.
- ☐ The project manager has taken ownership of the definitions of risk impact and risk exposure by customizing them for the project. (This helps assure consistent expectations for the SRE.)

---

# Risk Identification and Analysis Phase

**Description** The Risk Identification and Analysis (RI&A) phase of the SRE is designed to help project members identify and analyze risks facing their development effort. The SRE team elicits and captures the risk statements from the project members who are interviewed; analyzes the statements for probability, impact, and risk exposure; collects them into groups (risk areas) for mitigation in the Mitigation Strategy Planning (MSP) phase; and makes a first assessment of the relative importance of both the risk statements and risk areas. These results are presented to the people who were interviewed to confirm the general picture that emerges.

## Process Diagram



Section	Page
Conduct Project Briefing	34
Conduct Opening Briefing	36
Prepare SRE Team	38
Conduct Interviews	39
Participants' Evaluation	51
Session Analysis	54
Consolidation	56
Data Confirmation Briefing	59

### **Sessions Discussed**

In the discussion that follows, we refer to the group session, and describe the interview and participants' evaluation sessions in some detail. The term "group session" includes both the interview session and the participants' evaluation session, because the process is structured around performing those two activities back-to-back in a single three-hour time slot.

### **Using the CD-ROM to Understand the Interview Process**

The heart of the entire SRE process is the construction of the risk statement in the condition-consequence form, and this construction is accomplished in the interview session. The CD-ROM will provide you with a far more vivid understanding of how risk statements are created, because it contains video clips of the interview session and the participants' evaluation session that immediately follows it. I recommend that when you are ready to tackle this subject, you skim the material in the sections titled "Conduct Interviews" and "Participants' Evaluation," and then watch the lecture on the CD-ROM. The five video clips of the group session in progress are embedded in the lecture, and the lecture and clips cover the the same material as the text beginning on page 51.

## **Conduct Project Briefing**

### **Description**

The project briefing is the opportunity for the SRE team to obtain project context and background before the interviews begin. Typically, the project manager presents the briefing to the SRE team. This briefing should

- provide the team with a project overview
- help the team to understand the organization, goals, and purpose of the project
- afford an opportunity for the team to clarify knowledge and issues about the project

It is important that the SRE team understands the above items before starting the RI&A activities. The more the team knows

about the context, basic assumptions, and current status of the project, the better it will assimilate the risk data it receives.

### **Who's Involved**

The participants for this step are

- project manager (or designated substitute) who gives the project briefing
- any other project members the project manager chooses to invite
- SRE team members

### **Example Project Briefing Topics**

A typical project briefing might contain the following topics:

- What is the project's current "picture of success"?
- a description of the product or system being built by the project staff
  - What does it do?
  - What makes it a challenge?
  - What need or market does it serve?
  - Who is the customer?
- the project personnel
  - Who are the people the team will be seeing in the interviews?
  - Where do these people fit into the project organization and operations?
- Where is the work being done? Where will the product be delivered?
- the project schedule
  - When must the product be delivered to the customer?
  - What are the milestones and contractual dates of the project?
  - Where is the project on the schedule right now?
- How is the product being developed? What processes are being followed?
- How does the project budget compare with the current estimate of cost at completion?

## Key Results from the Project Briefing

All SRE team members understand the following:

- ☐ the desired future state—the date, products to be delivered, and performance criteria
- ☐ the organizational structure of the project and the general project roles and responsibilities
- ☐ the technical challenges (and associated opportunities) of the project
- ☐ the project schedule and progress to date (Has the project been missing milestones? Has there been re-planning of the schedule?)
- ☐ cost constraints and current estimate of cost at completion

## Conduct Opening Briefing

### Description

The opening briefing is usually the first SRE activity that is visible to the project staff and officially begins the SRE. During the opening briefing, the project manager typically introduces the SRE members to the project staff, explains their purpose in visiting, asks for complete cooperation and candor, and turns the meeting over to the SRE team leader. Then the team leader discusses the SRE process, sets the participants' expectations, reviews the scheduled activities, and answers questions.

### Who's Involved

The following people take part in this step:

- project manager (extremely important)
- all project members who will be interviewed during the RI&A phase (strongly recommended)
- other project personnel for information purposes (recommended, but optional)
- SRE team leader (typically presents the majority of the opening briefing)
- all other SRE team members (should be a requirement)

### Example Briefing Agenda

The typical opening briefing discusses

- who the SRE team is and why they are here (presented by the project manager)

- the purpose, desires, and objectives of the project manager in conducting an SRE (presented by the project manager)
- overview of risk and risk management (presented by the SRE team leader)
  - attributes of risk
  - construction of risk statements
- overview of the SRE process
  - what to expect during the interviews
  - confidentiality and non-attribution
  - what the other steps are
- confirmation of the RI&A phase schedule
- confirmation of participants' schedule (who will be where and when)

**Key Results from  
the Opening  
Briefing**

When this step is completed, all project members who are to be interviewed should understand

- ☐ why this process is being used
- ☐ the condition —> consequence structure of the risk statements they will be helping to write during the interviews
- ☐ that the organization's management and the project manager are committed to making the SRE activity a success
- ☐ what will happen to the information that is gathered, and the rules of confidentiality and non-attribution that will be applied during the process
- ☐ the interview session schedule (where they are expected to be, and *when*)

## Prepare SRE Team

**Description** This is a short period of training conducted for the benefit of organization members who have joined the SRE team. It provides operational guidance for team roles in the execution of the RI&A phase of the SRE. Typically this training is conducted by the SRE team leader and provides

- an overview of the SRE process
- activities and schedule for the upcoming RI&A phase
- guidance for SRE team behaviors during the RI&A phase
- an opportunity for SRE team members to ask questions regarding the process

**Inputs** The inputs for this step are

- the SRE orientation materials
- SRE Team Member's Notebook

**Outputs** When this step is completed, participants should understand their roles and activities during the RI&A phase of the SRE.

**Who's Involved** The participants for this step are

- SRE team leader—in the role of instructor
- SRE team members from the project or organization—in the role of students

**Example** Below is a typical set of topics for the team preparation:

1. risk management basics
  - definition and attributes of risk
  - risk statement definitions
  - SEI Risk Taxonomy (or other guide to be used in interviewing to assure full coverage of risk sources)
2. SRE process overview
3. RI&A topics



- interview technique
  - note-taking techniques
  - interview roles for SRE team members
  - participant evaluation of risk and use of risk exposure matrix
  - team evaluation of risk
  - classification
4. consolidation activities
    - risk areas
    - briefing preparation
  5. review of logistical arrangements and support tools

### **Key Results from SRE Team Preparation**

- ☐ New SRE team members understand what is expected of them and what opportunities may be available for them to take one of the major roles (interviewer, risk recorder, session recorder) in the interviews.
- ☐ If more is expected of the new SRE team members during the interviews than to watch, listen, and keep notes, this is made explicit by the SRE team leader.
- ☐ The roles of interviewer, risk recorder, and session recorder are assigned for at least the first two interviews.
- ☐ The strategy for each interview is set (e.g., beginning in Taxonomy Class A—risks that arise from the product being developed—for “worker bees” on the project, but beginning in Taxonomy Class B—sources of risks that arise from the people and processes the project has chosen to use—when interviewing the first line managers of the project).

## **Conduct Interviews**

### **Description**

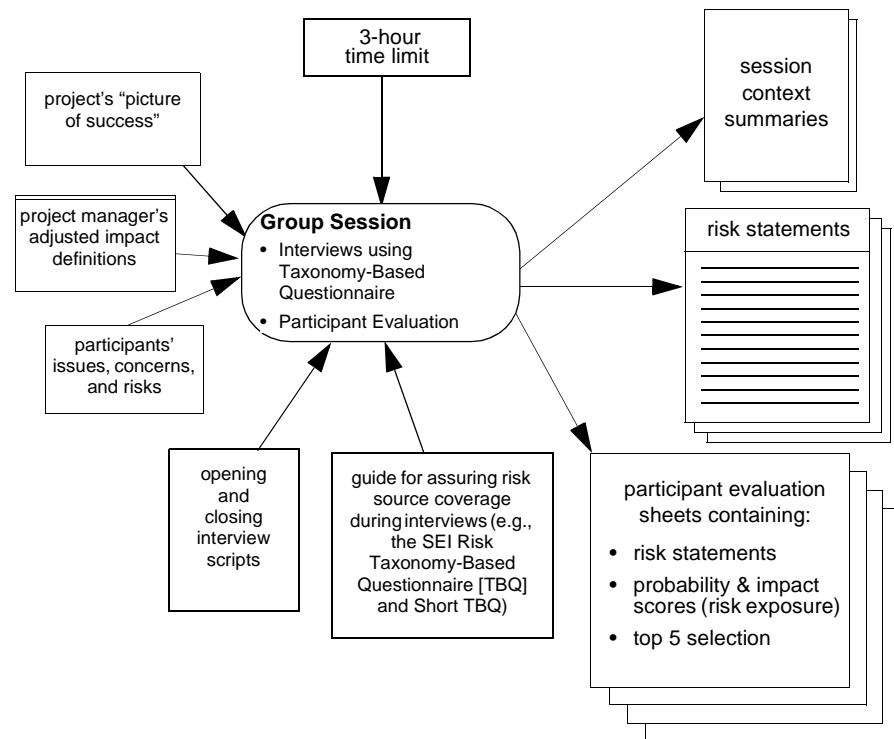
An RI&A phase can contain any number of group sessions. Each group session is three hours long and includes the following:

- risk interview segment (2.5 hours) – in which the project members are asked questions designed to elicit risks within the project. The SRE team conducts the interviews, collects context, and captures risk statements put forth by project members.
- participant evaluation segment (0.5 hours) – in which project members are asked to individually score the collectively generated risk statements for probability and impact (risk exposure) and then to choose the top five risks to the project

The risk interview is the basic information-gathering activity of the SRE. Risk interviews are structured interviews of selected key project people which focus on their individual knowledge of the project risks. The activity brings the participants' knowledge out into the open in a non-threatening way by adhering to the principles of non-attribution and confidentiality. The risk interview generally supports the principle of individual knowledge (i.e., for the most part, risks in the project are known by the individuals working on the project). In general, the risk interview is an engine that creates the fundamental output of the SRE: the risk statement.

## Interview Diagram

A diagram of the inputs, constraints, supporting information, and outputs (intermediate products) of the SRE interview process is shown below.



*SRE Interview Diagram*

- Inputs**      The inputs for the risk interview include
- the project’s “picture of success” from the Contracting phase and/or the Project Briefing
  - participants’ issues, concerns, and risks—which they bring to the interview in their heads (no special preparation is required)
  - the project manager’s adjusted values for the risk exposure matrix (from the Contracting phase)

- Outputs**      The outputs of this step include
- a set of 15-40 risk statements for each session
  - context summaries for the interview – session recorder(s) are responsible for capturing the spoken context for each risk statement. After the session, that session’s recorder(s) polls other team members for context notes, aggregates the notes, and duplicates and distributes the aggregated set to all team members.
  - completed participant evaluation forms – one per participant with each risk statement scored for probability and impact definitions from the Contracting phase. Each participant then selects the most important risk statements that could affect the project’s success.

- Who’s Involved**      SRE team members participate in the roles of
- interviewer – asks questions from the Taxonomy-Based Questionnaire, asks probing questions, follows up discussion points, and leads the session
  - risk recorder – assists the participants in wording the risk statements. Captures risk statements on flipchart for all to see.
  - session recorder – captures the discussion and non-verbal communications (context) surrounding the raising of a risk
  - data compiler – captures risk statements in a spreadsheet and produces the risk evaluation forms for use by participants in the next step

Participants (project staff) gather in peer groups of one to five. Participants must be peers—no perceived or explicit reporting relationships can exist within the group. The following are typical of the groups interviewed:

- project manager – (Note: If the project manager has a deputy and the functions in a relationship that makes them almost peers, interviewing the project manager and deputy together will greatly enhance the process of creating risk statements. Interviewing just one person at a time is generally undesirable, but is often necessary in the case of the project manager.)
- team leaders – technical staff leading teams of developers. (Teams may be aligned along subsystem or functional lines.)
- designers – staff involved in the development of the project software (software engineers)
- support engineers – staff involved in supporting the project in the areas of configuration management, testing, software quality assurance, or project-assigned members of the organization's software engineering process group (SEPG)

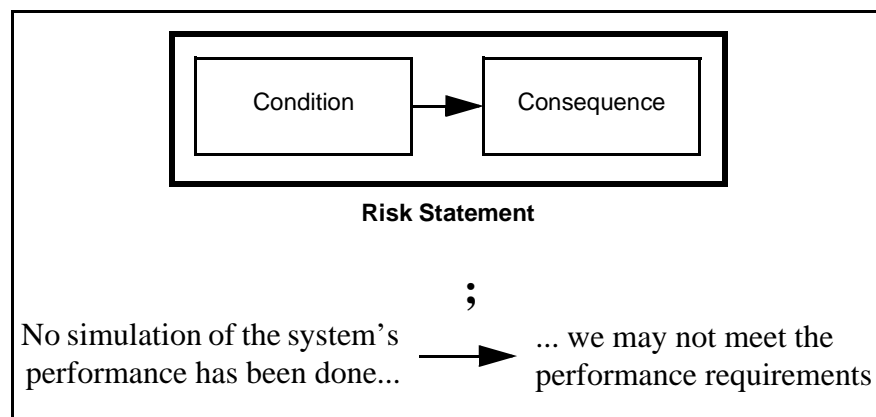
### **The Risk Statement**

The risk statement is the product of the risk interview step and consists of

- a condition: something that is true or accepted as true
- a separator: either a semicolon, arrow, or linking phrase
- a consequence: something that may occur as a result of the condition

### **Risk Statement Diagram**

A diagram depicting the form of the risk statement, including an example, is shown below.



**Typical Number of  
Risk Statements**

SEI experience has shown that a 2.5 hour interview will generate 15-40 risk statements.

**SEI Risk  
Taxonomy**

The diagram in Figure 3 shows the general structure of the SEI Risk Taxonomy (see page 44). The SRE uses the Taxonomy-Based Questionnaire (TBQ) to elicit risks from the interview participants. In the Session Analysis step, the Taxonomy is used as a classification framework for risk statements created in the interview.

**Alternative  
Frameworks  
to Assure  
Completeness  
and Closure**

The SEI Risk Taxonomy, Taxonomy-Based Questionnaire (TBQ), and Short TBQ (on page 53 of the Appendix) are not *required* for a “flawless” SRE process; however, some near-analogues for each of them will have to be created if you do not use the SEI products. The essential issues/principles you need to apply are these:

1. ***Taxonomy*** – You need a conceptual framework of all the potential sources of risk to your project. This framework needs to consider all the risk sources that are
  - inherent in or driven by the product the project is creating. (In the SEI Risk Taxonomy, these sources are grouped into the class called *Product Engineering*),
  - associated with the way the project has chosen to go about its development (*Development Environment* in the SEI Risk Taxonomy)
  - outside the project’s control (*Program Constraints* in the SEI Risk Taxonomy)
2. ***TBQ*** – You need a specific set of questions for probing into each area of the conceptual framework. These need to be written out fully so that different interviewers always ask the same question the same way, and so that the questions can be improved over time.
3. ***Short TBQ*** – You need an alternative set of questions or an approach that will let you jump to a more inclusive way of asking about sources of risk as time begins to run out in the interview. This is needed to assure *coverage* (or completeness) of the interview.

# Software Development Risk

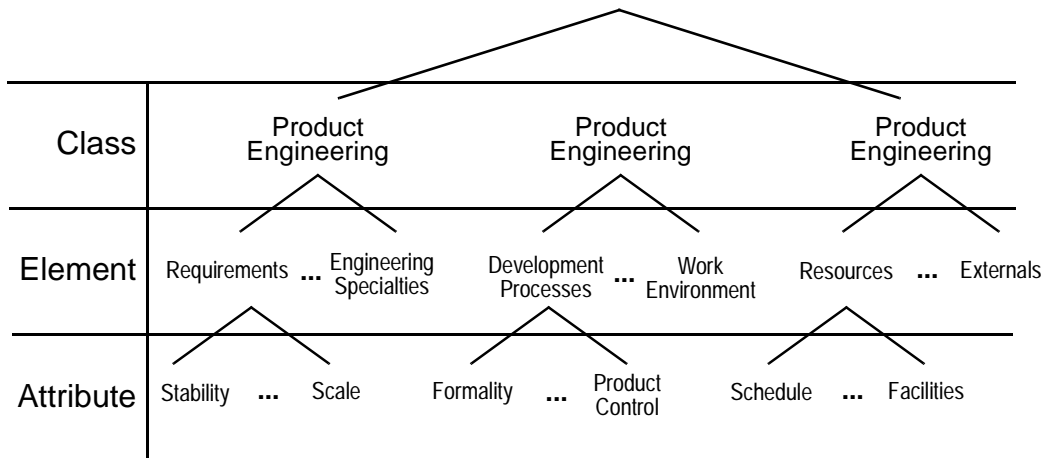
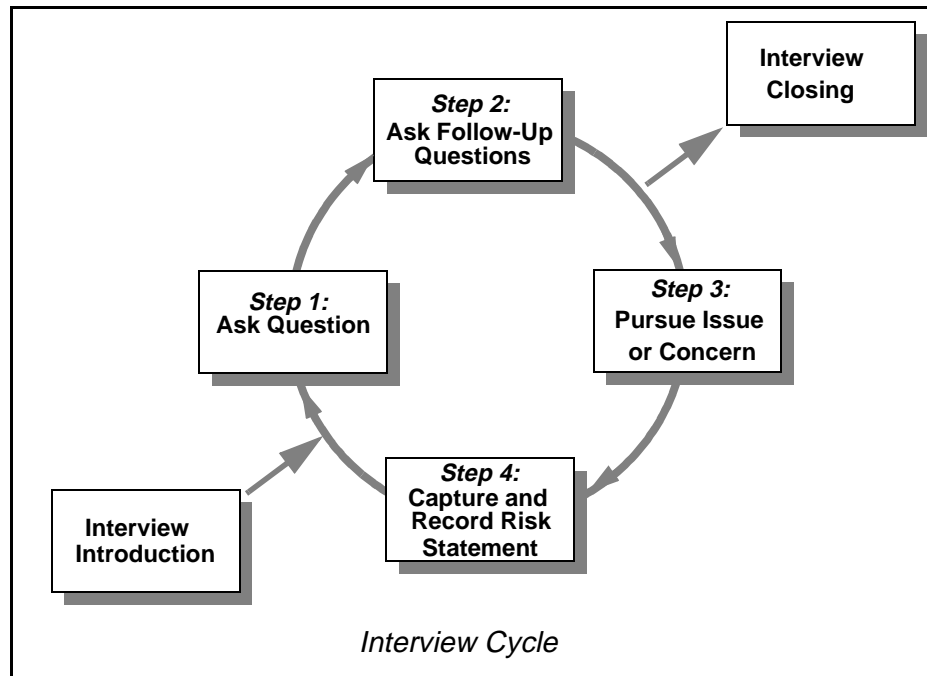


Figure 3: SEI Risk Taxonomy

## Interview Protocol

Risks are elicited and captured during an interview. An interview protocol is used which combines the use of a structured question *list* (e.g., the SEI TBQ) and follow-up questioning or “probing” for a potential risk. The overall process is depicted graphically below.



After the introductory phase (best handled by reading a standard script, to assure consistency from interview to interview), follow these steps for each question:

**Step 1:** The interviewer should maintain a strict discipline of reading the question *exactly* as written (again to assure consistency and maintain the intended “suspense” of the question). ***If the response to the question indicates there is reason for concern in that area, proceed directly to Step 3.***

**Step 2:** If the question in Step 1 elicits no issue or concern, and if there is a follow-up question available for further probing of the area, ask the follow-up question(s), *exactly* as written and ask the next question. ***If there is still no issue or concern in this area, return to Step 1.***

**Step 3:** The interviewer is now in free-form pursuit of a risk statement. This can be a further clarification and discussion of the concerns, or it can be as specific as, “That sounds like an issue we ought to capture; can you phrase that for us in Condition-Consequence form?”

**Step 4:** The risk recorder steps to the flipchart and writes out the statement in Condition-Consequence form, in full view of the interviewees, following the guidance of the particular interviewee who is articulating the issue. The risk recorder asks for confirmation that what is written is exactly what the interviewee means. Then the interviewer asks for confirmation that the other interviewees understand the issue that has been captured. ***It is not necessary for the other interviewees to agree that the statement is a “risk,” and this should be pointed out as often as necessary until they all understand that point.*** Upon confirmation, the interviewer can proceed to the next question (i.e., Step 1).

This process is continued cyclically until time is running out (10 to 20 minutes before the end of the 2-1/2 hour interview period, depending on whether all the sources of risk are being covered efficiently or not—twenty if the interviewer has not gotten very far into the questions, ten if half to two-thirds of the questions have been covered). Then the interviewer switches to a higher-level question format (the SEI Short Taxonomy-Based Question-

naire, for example), but still maintains the Step 1 – Step 4 process until the 2-1/2 hours are up. The “Interview Closing” step occurs in the following half hour.

**Interviewer** The SRE RI&A interviewing process is based on the principle that the interviewer is always in charge of the pacing and direction of the interview. *The interviewer is always in charge*, except when the responsibility for closure on the exact wording of a risk statement has shifted to the risk recorder. As a general rule, other team members should not address follow-up questions to the interviewees, but should rather ask the interviewer to inquire more deeply in to a subject, or point out that some other interviewee appeared to have something to say on that last subject, and so on.

**Risk Recorder** The risk recorder has the responsibility of writing the risk statements clearly, putting them into proper condition-consequence form, and confirming with the interviewee whose concern is being captured that the words written are accurate. The important point is that the risk recorder forces the interviewee to take *ownership* of the statement as it is written on the flipchart; it must never be perceived by the interviewees as the *risk recorder’s* risk statement. In addition, the risk recorder needs to do whatever is necessary to make sure that *all* the risk statements captured during the interview session remain visible to the interviewees at all times. (The interviewees have historically done an excellent job of policing themselves during the interview, making sure that the discussion doesn’t “double back” and start capturing issues that are already covered by the risk statements on the flipcharts.)

**Session Recorder** The responsibility for capturing the context that is associated with the risk statements falls primarily on the session recorder. Context for the risk statements is critical, because of the transient nature of people’s memories. A risk statement that seemed perfectly clear when it was written can become unclear within a matter of hours or—worse yet—change in interpreted meaning within hours, and many will become unclear over the course of several interviews over two or three days.

The technique that the SEI has used most successfully for capturing context has been to have one person (the session recorder) responsible for creating a “stream of discussion” set of notes during the interview. The technique has been that of a good note-taker in a college course, and peo-



ple who have good skills at that have made the best session recorders. To aid in subsequent discussion and analysis, the session recorder needs to maintain two special sets of “pointers” in the notes:

1. the number of the question from the interviewer’s questionnaire, at the chronological point where it is asked (so that the discussion and any risk statements that are created can be traced back to the triggering question)
2. the number of the risk statement at the chronological point where the risk recorder begins to write it on the flipchart

The session recorder should not write down the question or the risk statement in the notes (since they already are captured), but should concentrate on the interviewee’s discussion.

Other team members who are not in one of the other interview roles should also be capturing notes the same way as the session recorder is. After the interview is over, the session recorder should gather all the other notes that were made and reconcile them with the official record.

### **Data Compiler**

This is a role that the SEI never wanted to create and has constantly tried to figure out how to eliminate. The data compiler is responsible for getting the risk statements from the flipcharts into a printable spreadsheet, and for doing this efficiently enough that the spreadsheet can be formatted, printed, duplicated, and in the interviewees’ hands within ten minutes of the end of the interview session. This has typically required most of the attention of someone who is adept at manipulating computer spreadsheets and prevented the data compiler from participating fully in the interview dialogue.

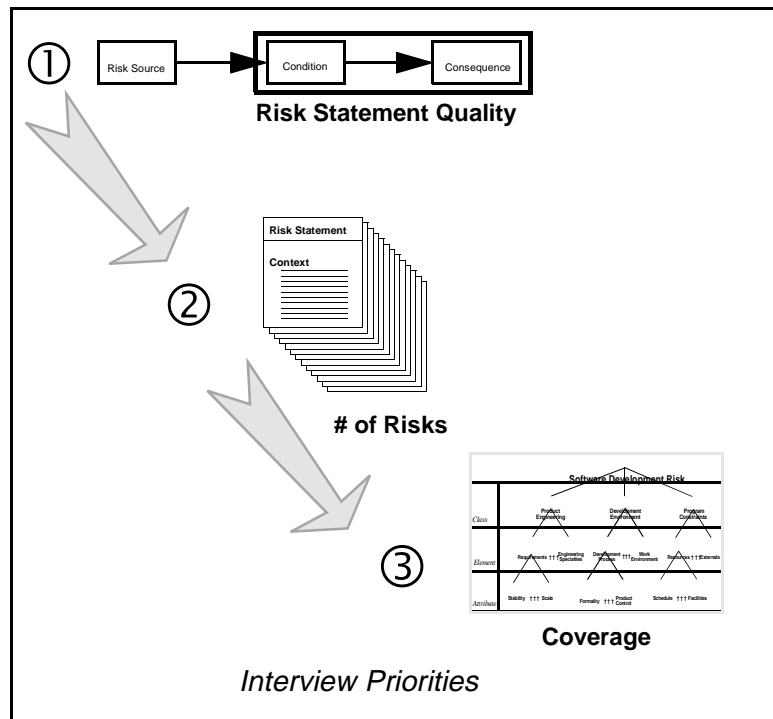
## Commentary on Interviewing

The following insightful commentary was provided by the US Coast Guard's Lieutenant Brian Hofferber, based on his observations of the process used during four SEI interview sessions:

***Identifying Risks:** Other than posing the taxonomy-based questions, the Interviewer's primary job is to continually scan the content of the interview dialog for identifiable risks and stop the conversation to capture the risks within a formulated Risk Statement on the flip chart. However, during some conversations, interviewees will occasionally make comments which implicitly point to potential risks which are not directly related to the main flow of the dialog. In such instances, the Interviewer should not interrupt the main flow of the conversation but rather make a written note of the potential risk and return to it at the end of the conversation before the next question is posed. Recognizing both explicit and implicit risks within the content of an interview and knowing when the conversation should be stopped to capture a risk on the flip chart and when a potential risk should merely be captured within the Interviewer's notes to be addressed at a later moment is a skill that only comes with experience in the Interviewer role.*

## Changing Priorities During the Interview

During the 2-1/2 hour interview process, the interviewer needs to change his priorities through three distinct phases, depicted in the graphic below:



1. For the first one or two risk statements, it is critical that the interviewees understand exactly how the Condition-Consequence form is created from their own words. Once they have seen it happen correctly and have positive feedback from the interviewer and risk recorder that what they have created are indeed satisfactory statements in form, the interviewees will be able to police themselves and construct properly formed statements quickly, with little further help.
2. In the middle of the interview, the interviewer focuses on getting as many risk statements as possible written. This mostly means avoiding the pitfalls of allowing “problem solving” or digressions into examples or “war stories.”
3. Toward the end of the interview, it is necessary for the interviewer to “shift gears” and turn to an alternate set of questions written at a higher level (i.e., more inclusive in the scope of risk sources being pursued) to assure that all sources of risks are covered in the remaining time. The SEI Short

Taxonomy-Based Questionnaire (on page 53 in the Appendix) is an example of such a higher level set of questions, 13 of which were derived from the 194-question SEI Taxonomy-Based Questionnaire; however, a similar set of questions can be derived from any set of detailed interview questions. An alternative approach is to show them the “roadmap” of the coverage items (e.g., the SEI often shows the interviewees a one-page table of the titles of the Risk Taxonomy Classes, Elements, and Attributes) as a prompt to consider areas that were not brought up in the interview questions.

## Tools

- a Team Member’s Notebook (use the appendix as a baseline for constructing one that is more suitable for your purposes)
- a conference room for the interviews that is private (floor-to-ceiling walls and door)
- flipcharts, markers, and tape for capturing risk statements
- portable computer (laptop) with spreadsheet software for capturing risk statements and a printer (either connected, or available within a short distance to “sneaker-net” a floppy disk copy of the risk evaluation form)
- portable computer (laptop) for capturing the session recorder’s notes (strongly recommended)

## Sample Risk Statements

Typical risk statements are shown below.

---

Requirements seem to be changing; can’t be sure that the test cases cover all requirements.

---

There is no formal change control process that coordinates all affected groups; test plans are not keeping up with changes.

---

There have been instances where programmers have been relaxing argument typing to facilitate compilation (C++ allows this); this may cause unpredictable system behavior and extensive system debugging time.

---

## Key Results from the Interview

- ☐ flipcharts listing all the risk statements created during the interview and remaining visible during the entire interview (e.g., taped on the walls in front of the interviewees as they are filled up)
- ☐ a risk evaluation form with all the risk statements generated during the interview, one copy for each interviewee and SRE team member

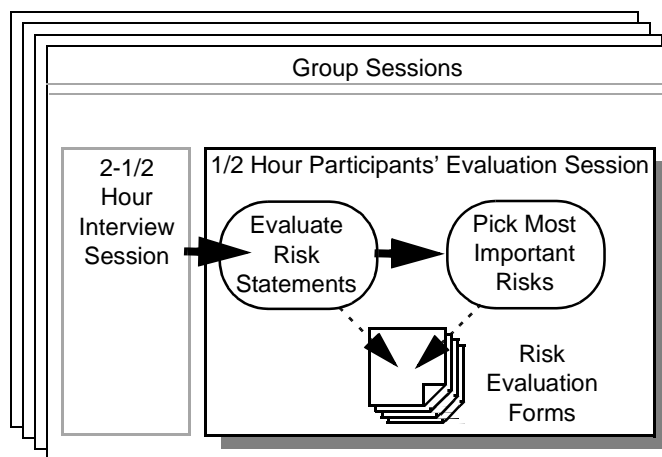
- ❑ at least one “stream-of-discussion” set of notes with pointers embedded in it that show when the interviewer asked which question, and when each risk statement was captured
- ❑ a lot of good risk statements. The SEI expects no fewer than 15 risk statements from a 2-1/2 hour interview; fewer than that, and we would want to analyze what went wrong and consider arranging another interview (with an alternative group of the same type) to be sure that the risk coverage is complete

## Participants' Evaluation

**Description** Immediately following the risk interview, participants are asked to evaluate the risks they just created. Participants are given copies of the risks statements on an evaluation form and asked to individually

- score the risk statements for probability and impact using the impact definitions from the Contracting phase
- select the most important risks to the project

**Diagram** The following diagram shows the relationship of the participant evaluation activity to the group session.



**Who's Involved** The participants in the risk interview individually evaluate the risk statements for probability and impact and choose the top five project risks.

- Guidance to the Participants**
1. Each participant should fill out an evaluation form without consulting other participants.
  2. Show the participants the definitions of levels of impact that were defined with the project manager's help in the Contracting phase (see page 17). These will help to "calibrate" their perception of the meaning of terms like "catastrophic" and "critical."
  3. Have participants pick the impact first, then decide what probability should be associated with that level of impact. Give them practical examples of the various levels of probability you are using to help them do this.
  4. *After they have filled in their estimates of impact and probability*, have them pick what they think are the most important 3, 4, or 5 risks threatening the success of the project. If the total number of interviewees in all the sessions is small (fewer than 10), have them pick 5; if it is large (15 to 20 total participants), have them pick 3. The SEI has typically instructed the participants to put "1" next to the risk statement they think is most important, "2" next to the one they think is the next most important, and so on.

**Use of the Information Gathered** The SEI has used only the participants' choices of the most important risks to the project in subsequent analysis steps and in the data confirmation briefing; their judgement of impact and probability is not used at all. So why have them go through that step?

Recall that the risk statement is made up of a condition and a consequence. Often, the condition part is a *problem* that exists today and may already have high visibility in the project, with a great deal of effort already underway to solve it. Our concern is that by simply asking the participants to pick the most important risks, they would pick the most important *conditions* (i.e., the most important problems). By first getting the participants to focus on the *consequences* of the conditions rather than the conditions themselves, we believe that they are more accurate in picking the most important future risks to the project. This is, however, an unproven working hypothesis.

- Tools**
- definitions of impact and probability that were confirmed with the project manager during the Contracting phase
  - a printed evaluation form for each participant and SRE team member
  - portable computer (laptop) with spreadsheet software for data entry of completed risk evaluation sheets

**Example** The following is an example of a completed participant evaluation sheet:

Risk ID	Participant's Name-> Risk Statement	R. B. Everett		
		Impact	Probability	Top 5
G2.1	There are two competing developmental models in use—waterfall and incremental build; this may be causing confusion among the system developers.	1	2	
G2.2	Software Quality Assurance and Configuration Management seem not to have formal, controlled plans at this time; could increase our costs and development time, we may lose or overwrite modules.	3	2	
G2.3	Concern that waterfall methodology that is in use is not the proper approach; may cause major problems at “big bang” integration and test time.	1	1	
G2.4	There is concern that the software development group is not reviewing integration and test plans carefully and not giving feedback; at integration and test time there may be a major confrontation between the groups.	1	3	
G2.5	Requirements seem to be changing; can't be sure that the test cases cover all requirements.	4	2	3
G2.6	There is no formal change control process that coordinates all affected groups; test plans are not keeping up with changes.	1	2	
G2.7	There have been instances where programmers have been relaxing argument typing to facilitate compilation (C++ allows this); this may cause unpredictable system behavior and extensive system debugging time.	3	2	4
G2.8	There is a lack of training in C++; system developers don't know which features are “safe” to use and which should be left alone.	3	2	5

### **Closing the Group Session**

After all the completed forms have been collected, the interviewer closes the group session by

1. reviewing all that has been accomplished during the group session
2. thanking them for their participation in this effort
3. reminding the participants of the rules of confidentiality and non-attribution under which the session was conducted
4. asking them all to be present for the data confirmation briefing

### **Key Results from the Evaluation Session**

- ☐ Participants have been shown how problems (“conditions”) can create risks that are different from the problems themselves.
- ☐ Participants have had the experience of determining impact and probability based on a set of project standards.
- ☐ Each participant has picked the top three to five risks to the project identified during the interview.

## **Session Analysis**

### **Description**

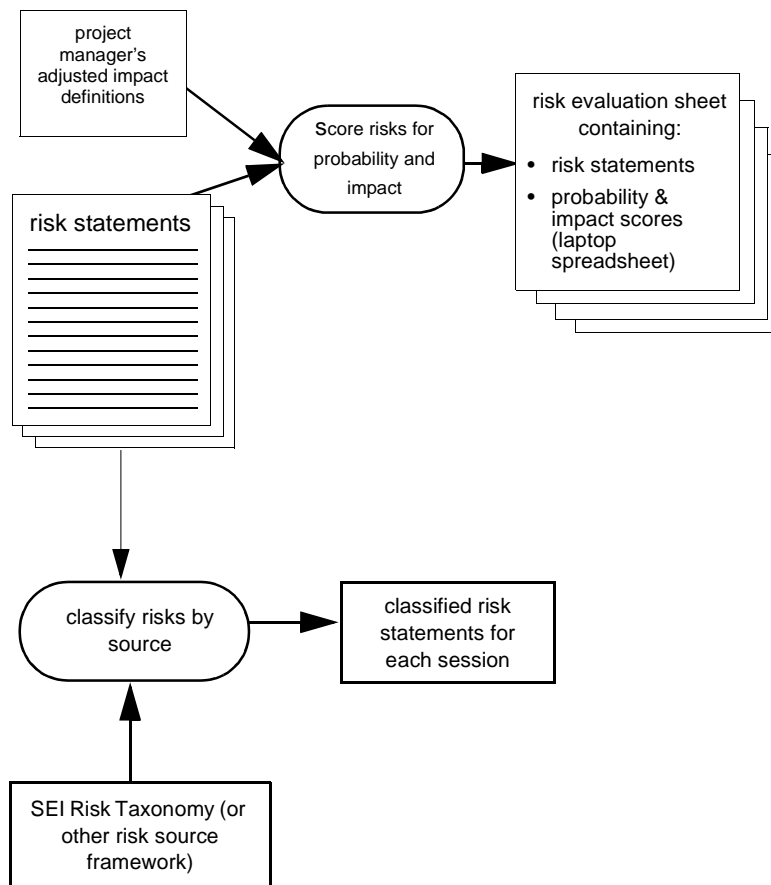
Following each risk interview (or while the participants were doing theirs during the evaluation session), the SRE team members individually evaluate the risk statements (using the same definitions of impact and probability that the participants use). The team collectively classifies the risk statements (to the element level) using the SEI Risk Taxonomy. Classification is a consensus activity.

While classification is taking place or during a break, the team’s data compiler collects each individual team member’s scoring evaluation of the risk statements. The risk exposure lookup table that was confirmed (or modified) by the project manager during the Contracting phase is used to convert the impacts and probabilities into risk exposures (can be done automatically by the spread-



sheet, if it is set up for this) on a combined team members' risk evaluation sheet.

**Diagram** The diagram below shows the general process followed during session analysis.



**Who's Involved** This is an SRE team-only activity. Every effort is made to complete these two activities before the next group session. However, if time runs out, the team completes these activities for the day's group sessions before adjourning for the day.

## Key Results of Session Analysis

- ❑ a completed evaluation worksheet (containing probability, impact, and computed risk exposure values for each risk statement) for each team member
- ❑ a classification for each risk statement according to the general risk source framework being used for the SRE. This can be done conveniently using a wall chart to which the risk statements are taped in the appropriate “pigeonholes,” *provided* that the wall chart is in another room or is covered when interviewees are in the room during subsequent group sessions. (It could affect the new interviewees’ identification of risks.)

## Consolidation

### Description

Consolidation is an SRE team-only step that consists of the following substeps:

- context review – Team members individually review the aggregated context notes for each session and select quotes and observations for use in the data confirmation briefing.
- reconcile scoring – These risk exposures were then arranged in descending order from those the team had the most disagreement on to the least. During this substep, the team revisits the risks, discussing each and attempting to come to a consensus or to understand why team members scored them as they did. Values that change as a result of these discussions are revised and re-entered into the team’s reconciled scoring worksheet.
- rearrangement into risk areas – The classification of all risk statements is revisited in order to create risk areas, which are logical collections of risks that the team feels can be mitigated as a group.
- preparation of the data confirmation briefing – The SRE team prepares slides for each risk area and a histogram showing (on a per risk area basis) the total number of risk statements, the number of participants’ critical risk statements, and the number of team’s critical risk statements.

### Inputs

The inputs for this step include

- team members’ scoring summary worksheet

- context summaries for each group session
- taxonomic classification of each risk statement

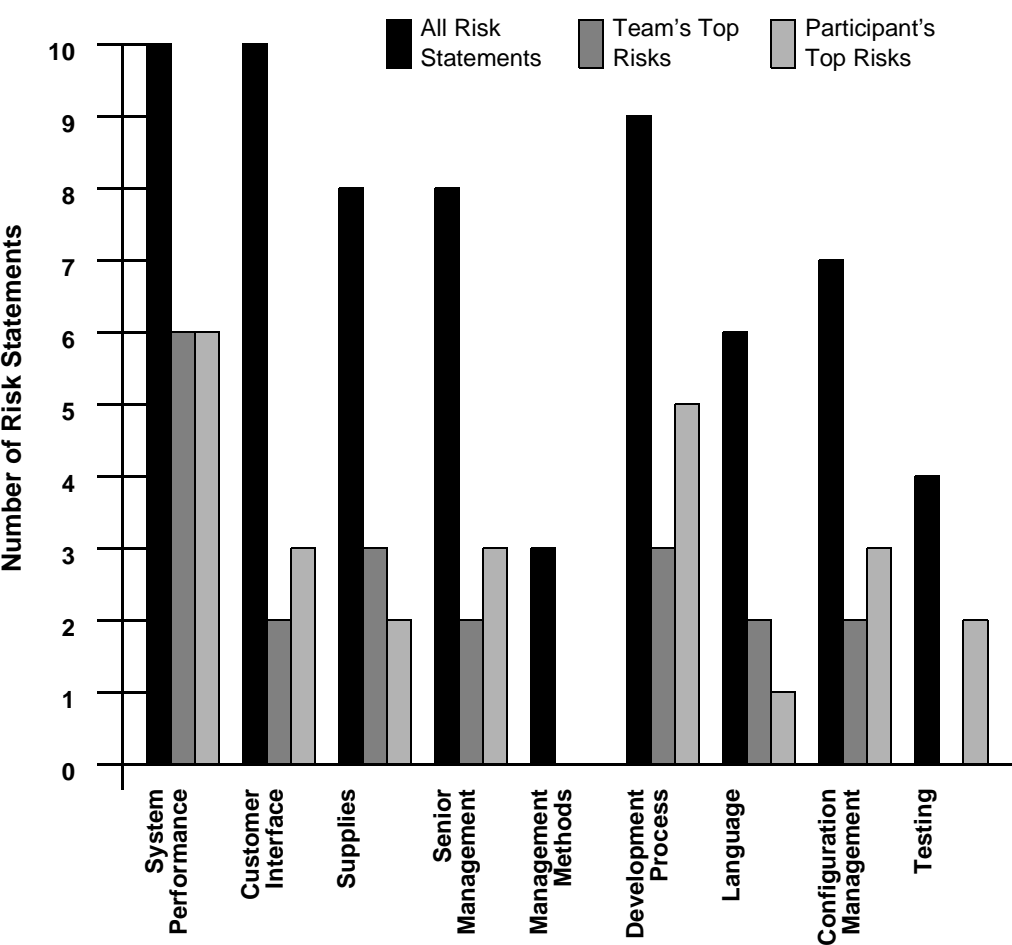
**Outputs**      The outputs for this step include

- reconciled team members' scoring summary worksheet
- risk areas
- slides for each risk area
- column chart

**Who's Involved**      SRE team members execute this step.

- Tools**
- classification wall chart
  - portable computer (laptop) with spreadsheet software and printer

**Examples** The following is a sample column chart that would be created in the consolidation step and used in the data confirmation briefing, the next step in the RI&A phase.



- Key Results of Consolidation**
  - ☐ a completed and reconciled team scoring spreadsheet that supports a conclusion by the team as to which risk statements are most important
  - ☐ all risk statements categorized into 7 to 11 risk areas that are affinity grouped on the basis of risks that are likely to allow mitigation by the same general strategies
  - ☐ a set of persuasive briefing slides that include
    - a description of the process that was followed and the results obtained (e.g., how many interviews, resulting in how many risk statements, resulting in how many risk areas)

- a graphic showing the relative number of risk statements in each risk area and the relative importance that the SRE team members and interview participants attached to the risk statements in each risk area
  - a characterization of each risk area and the attributes that support the affinity of the risk statements in that area
  - a listing of the exact risk statements included in each area
- ☐ a relaxed and confident SRE team leader who knows exactly how to present these results persuasively to the people who were interviewed

## Data Confirmation Briefing

**Description** Following consolidation, the SRE team conducts the data confirmation briefing. This 30-45 minute presentation (but allow a full hour, to handle any questions that may come up) is usually carried out by the SRE team leader and includes

- recapping the SRE process, participants, and progress to date
- presenting a graphical overview of the risk statements (and their relative importance, as seen by both the SRE team and the interviewees) categorized by risk area
- discussing each risk area slide
- discussing the next steps in the SRE

The purpose of the data confirmation briefing is to present the findings of the SRE team and confirm their accuracy with the participants.

**Who's Involved** The following people take part in this step:

- project manager
- all participants
- SRE team members in the following roles:
  - The team leader presents the data confirmation briefing.

- Other team members watch the project staff (participants) for verbal and non-verbal communications regarding its acceptance and accuracy.

### Example Outline of Data Confirmation Briefing

The following is a sample outline of a data confirmation briefing:

Section	Description
Cover Page	<ul style="list-style-type: none"> <li>• sets the stage</li> <li>• time for team leader's introductory comments</li> </ul>
SRE Objectives	<ul style="list-style-type: none"> <li>• overall objectives of this SRE</li> </ul>
SRE Process Overview	<ul style="list-style-type: none"> <li>• shows the larger context into which this RI&amp;A effort fits</li> </ul>
RI&A Process	<ul style="list-style-type: none"> <li>• schedule of work sessions for the participants and team members ("where we've been")</li> <li>• RI&amp;A process flowchart ("what we've been through")</li> </ul>
Summary of Activities	<ul style="list-style-type: none"> <li>• numbers: how many sessions, how many participants, how many risk statements, and so on.</li> </ul>
Summary of Findings	<ul style="list-style-type: none"> <li>• risk area names</li> <li>• risk statements by risk area (risk area column chart)</li> <li>• summary analysis of team and participant scores</li> </ul>
Findings by Risk Area	<ul style="list-style-type: none"> <li>• observations for each area</li> <li>• direct quotes and risk statements, as appropriate</li> </ul>
Next Steps	<ul style="list-style-type: none"> <li>• interim report: why and when</li> <li>• mitigation strategy planning: when and how</li> </ul>

### Ownership of the Information

RI&A findings and the data confirmation briefing are still "raw data." They should be considered the property of the project manager and the team. The SRE team should not release the results (or even talk about them) to anyone outside of the project without the project manager's *explicit* permission.

**Key Results of Data  
Confirmation  
Briefing**

- ☐ The interviewees as a group confirm that
  - The overall analysis makes sense. The SRE team captured risk statements and key context accurately.
  - No important risk issue was missed.
- ☐ The SRE team has noted any corrections that need to be made to the conclusions before carrying them forward.
- ☐ The participants in the RI&A phase of the SRE understand what is going to happen next and *when*.



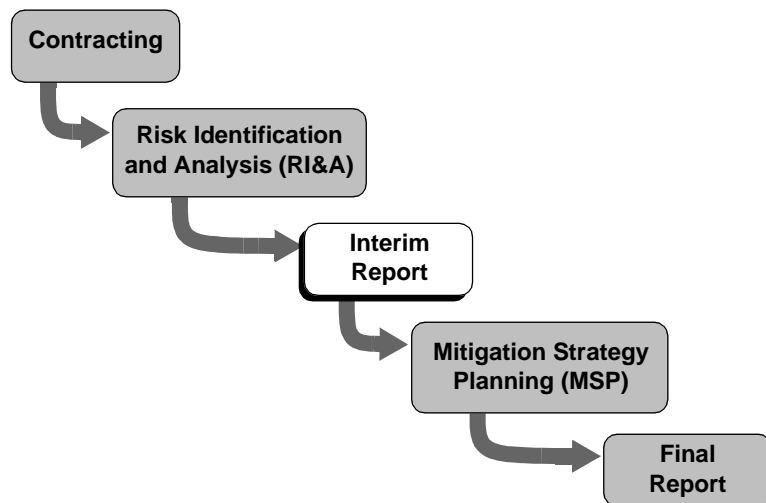


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# Interim Report Phase

**Description** During the Interim Report phase, the results of the Risk Identification and Analysis (RI&A) phase are reanalyzed from the perspective of the interrelationship of the risk areas. The results of the RI&A phase are formally documented, and a recommendation of the risk areas to be addressed in the Mitigation Strategy Planning (MSP) phase is made to the project manager. An agreement is reached on those risk areas, and the MSP phase is scheduled.

## Process Diagram



Section	Page
Interrelationship Digraph	64
Report Preparation	68
MSP Preparation Meeting	70

# Interrelationship Digraph<sup>1</sup>

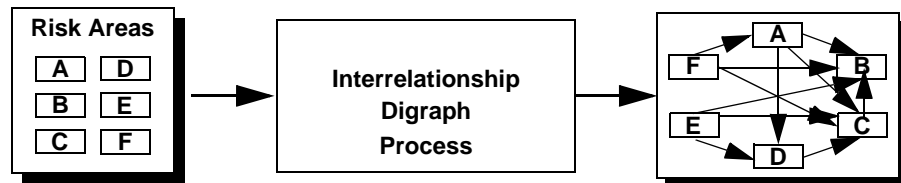
**Description** The interrelationship digraph is used to discern dependency relationships among the risk areas captured during the RI&A phase of the SRE.

**Inputs** Inputs for this include

- risk areas, which consist of the area title and the risk statements under it
- group session context summaries

**Outputs** The output of this activity is the interrelationship digraph which is useful for illustrating the cause and effect relationship (if any) of risk areas. It also helps the SRE team to prioritize risk areas for mitigation.

**Process Flow** To create an interrelationship digraph you first examine the risk statements in each risk area for their impacts on other risk areas. These impacts are assigned a weighting and noted on the diagram as outgoing arrows. Next, you determine the most important effects and the relative direction of the arrows. The result is a cause and effect diagram of risk areas, such as the one shown on page 65.



*Creating the Interrelationship Digraph*

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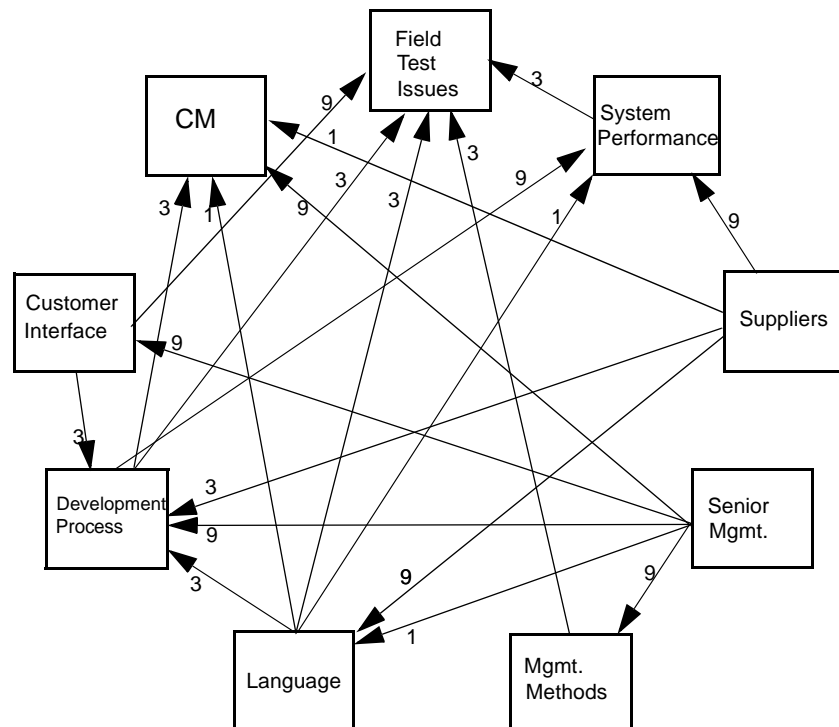
1. The material in this section is based on The *Continuous Risk Management Guidebook*, developed by the SEI, which was, in turn, based largely on *The Memory Jogger™ II: A Pocket Guide of Tools for Continuous Improvement & Effective Planning*. Please refer to those sources for a better understanding of the process of constructing an interrelationship digraph and of such terms as “Cause/Driver” and “Result/Rider.”

A large number of outgoing arrows from one risk area indicates that the area has a causal or influential effect on a number of other risk areas, and it may be a root cause or an item that must be dealt with first. This risk area can be thought as a “Cause/Driver.”

A large number of incoming arrows indicates that the risk area is affected or influenced by a number of other risk areas. This risk area can be thought of as a “Result/Rider.”

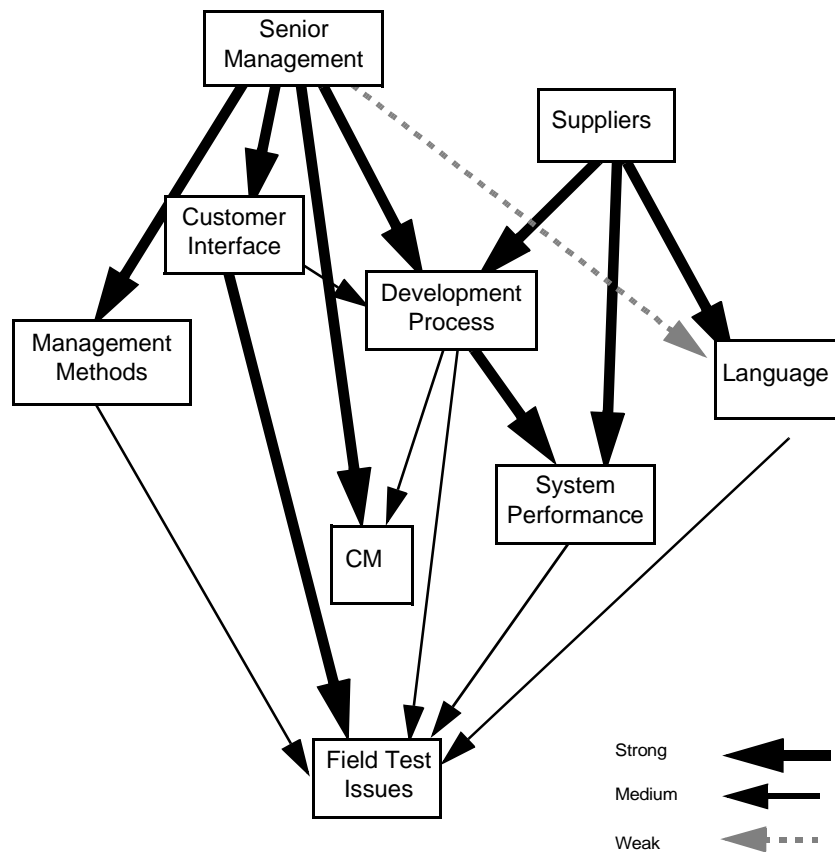
**Who’s Involved** SRE team members create the interrelationship digraph.

**Examples** The following diagram is an interrelationship digraph.



## The Hierarchical Interrelationship Digraph<sup>1</sup>

The *hierarchical* interrelationship digraph is simply a rearrangement of the interrelationship digraph described above to make it tell a more persuasive story. The figure below shows virtually the same information as the example in the previous section, but with the risk areas that are the most significant *drivers* of the other risk areas moved to the top half of the figure, and the risk areas that are mostly just the *result* of risks in other areas moved to the bottom half of the figure:



## Interpretation of the Hierarchical Interrelationship Digraph

The hierarchical interrelationship digraph can be used to make this argument to the project manager:

1. The risk statements that have been grouped in the *Senior Management* risk area are strongly driving the risk areas *Methods Manage-*

1. The hierarchical interrelationship digraph is *not* based the previously mentioned references. It was invented to support the SRE process, and is—so far as we know—original.

*ment, Customer Interface, Configuration Management (CM) and Development Process, and are also weakly driving the risk area Language.*

2. The risk statements that have been grouped in the *Suppliers* risk area are strongly driving the risk areas *Development Process, System Performance, and Language.*
3. Although the RI&A phase found numerous and significant risk statements in the *Customer Interface* and *Development Process* risk areas (these were the most significant risk areas described at the data confirmation briefing), the risk statements in those risk areas appear to be more symptomatic than causal. The same can be said about the *System Performance* risk area, which was the fourth most significant area in terms of number of risk statements and the number judged by the SRE team to be most significant to the project.
4. The team should recommend that the MSP process address the *Senior Management* and *Suppliers* risk areas, continuing on to the *Customer Interface* risk area if time permits, and if the mitigation strategies developed for the first two do not fully mitigate the significant risk statements in the *Customer Interface* risk area.

#### **Key Results of the Interrelationship Digraph Process**

- ☐ Team members have explored the ways in which the conditions of the risk statements in each risk area impact on the risk statements in other risk areas.
- ☐ Risk statements have been moved from one risk statement to another if the group analysis indicated that the groupings constructed during RI&A contained inconsistencies (NOTE: if more than two or three risk statements move between risk areas, the results classification process may need to be reconsidered as a whole.)
- ☐ A hierarchical interrelationship digraph has been constructed for inclusion in the interim report.
- ☐ A recommendation of the first, second, and third most important risk areas to address is agreed upon by the SRE team.

## Report Preparation

<b>Description</b>	<p>The interim report forms the basis of the MSP work in the remainder of the SRE. It is an important document that provides</p> <ul style="list-style-type: none"><li>• a snapshot of the risks facing the project</li><li>• background and discussion surrounding the risk areas and information presented at the data confirmation briefing</li><li>• all the risk statements and their risk exposure scores</li><li>• decision-making information to the project manager regarding which risk areas to mitigate first</li></ul>
<b>Inputs</b>	<p>The inputs for constructing the interim report include</p> <ul style="list-style-type: none"><li>• data confirmation briefing slides</li><li>• context summaries for all group sessions</li><li>• interrelationship digraph for risk areas (described in the previous section)</li><li>• opening briefing slides</li><li>• project profile</li></ul>
<b>Outputs</b>	<p>The output for this activity is the interim report itself.</p>
<b>Who's Involved</b>	<p>While the entire SRE team may participate and such participation is encouraged, the ultimate responsibility for the production of the interim report remains with the SRE team leader.</p>

## Sample Interim Report Outline

Below is a sample outline for an interim report:

Section	Description
<i>Executive Summary</i>	<ul style="list-style-type: none"> <li>summary of risk findings and risk areas</li> <li>near-term recommendations (“bleeders to be stopped”)</li> <li>observed strengths (optional—always good for public relations, though)</li> </ul>
<i>Introduction</i>	<ul style="list-style-type: none"> <li>“caveats” (e.g., “This deals only with risk statements that came out in the interview—it is not an independent identification of risks to the project”; “We may not have the technical expertise on the team to evaluate the area in detail”; “This is only a snapshot in time—conditions can change quickly.”)</li> <li>layout of this report (how to read it)</li> </ul>
<i>SRE Process Overview</i>	shows the larger context into which this RI&A effort fits
<i>Background</i>	<ul style="list-style-type: none"> <li>SRE objectives</li> <li>SRE team makeup</li> <li>review of the RI&amp;A method used</li> </ul>
<i>Findings</i>	<ul style="list-style-type: none"> <li>risks by area</li> <li>Interrelationship Digraph results</li> <li>high-level mitigation recommendations by area (the “low-hanging fruit”)</li> </ul>
<i>Conclusions</i>	<ul style="list-style-type: none"> <li>next steps</li> <li>timing of MSP preparation meeting</li> </ul>
<i>Appendices</i>	<ul style="list-style-type: none"> <li>RI&amp;A schedule</li> <li>risk statement listing</li> <li>(optional) data confirmation briefing slides</li> <li>(optional) opening briefing slides</li> </ul>

## Guidelines

- It may not be practical to have the entire SRE team participate in the writing of the entire report. All members should contribute portions (particularly the description of the findings), but a single person (typically the team leader) should edit the entire document to assure a consistent “voice.”

- The timeliness of this report is critical. The SEI *strongly* recommends that this report be completed no later than two weeks after the end of the RI&A phase.
- The team leader should assure that there is a strictly controlled distribution of the document. Depending on the sensitivity of the material to the project manager, it may be necessary to produce only one physical copy of the report, which is given to the project manager alone. The project manager may reproduce and distribute the report, but the SRE team leader may not.

#### **Key Results of the Interim Report Preparation Process**

- ☐ The findings of the RI&A phase are documented in a clear and readable report.
- ☐ The recommendation of the risk areas to be addressed during MSP is presented in a clear, logical, and persuasive manner.
- ☐ The project manager has the report in hand while the issues addressed in it are still fresh.

## **MSP Preparation Meeting**

#### **Description**

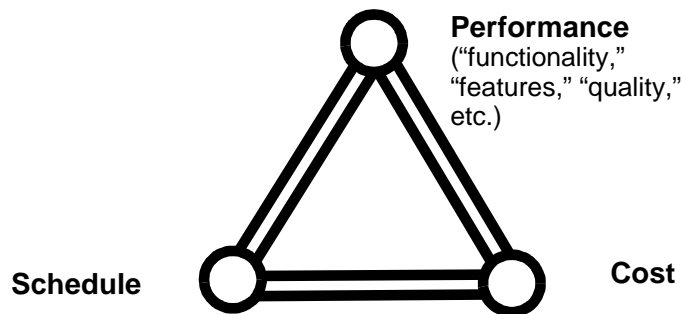
The MSP preparation meeting is a “re-contracting” process between the SRE team leader and the project manager. Its ostensible purpose is to line up the dates, people, and risk areas that will combine to make a successful MSP phase. However, it is also an important opportunity for the SRE team leader and the project manager to discuss what has happened to this point in the SRE, and the extent to which their expectations about the process have been met.

#### **Mitigation Goals and Priorities**

An important point of discussion in the MSP preparation meeting should be the elicitation of the project manager’s goals and priorities to guide the MSP process. These will probably hinge on the tension among the com-



peting demands of performance, cost, and schedule as depicted in the “iron triangle” of project management:



*The “Iron Triangle” of Project Management*

Every project sets out to satisfy the constraints at all three corners of the “iron triangle” simultaneously. However, responsible risk management requires a widely-held understanding of which constraints are the most important when all *cannot* be achieved simultaneously. A project that is developing a software/hardware system that will be part of a space satellite might have this lineup of priorities:

1. ***Schedule***—because the launch date must be met, no matter what
2. ***Performance***—because there will not be another opportunity for the instruments in this system to be carried into space, and they must function as designed
3. ***Cost***—This *has* to be the dependent variable, simply by the process of elimination.

The project manager would express the mitigation goals for the MSP sessions as, “Do whatever it takes to meet the schedule, and make sure that all the most important experiments are built into the delivered system. I’ll worry about the budget and resources it will take to carry out the strategies that come out of the MSP sessions.”

#### **Face-to-Face or By Telephone?**

It is always preferable for the meeting to be face-to-face. However, if a having a face-to-face meeting would necessitate signifi-

cant travel by one of the participants, and if no major planning or re-contracting issues are anticipated, it is reasonable to have the meeting by telephone or teleconference.

**Who's Involved**

The following people are involved in the MSP preparation meeting:

- SRE team leader
- project manager
- SRE team members (optional/as needed)

**Key Results of the  
MSP Preparation  
Meeting**

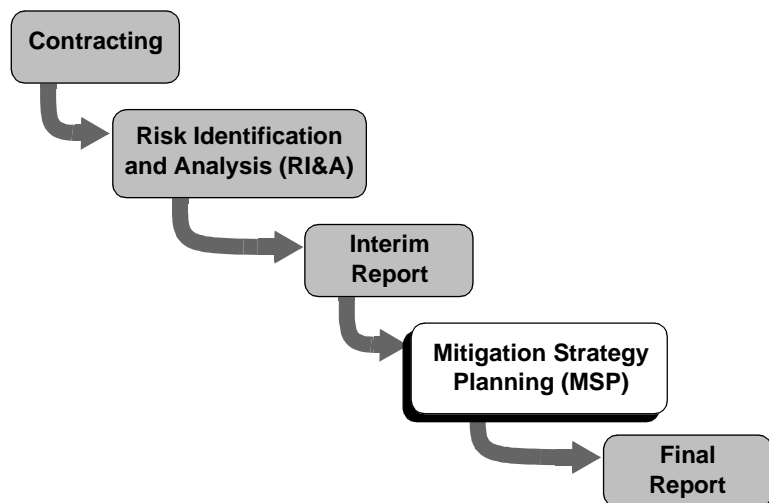
- ☐ The schedule for the MSP sessions is set.
- ☐ The project personnel to be available for the MSP sessions are identified.
- ☐ The risk areas to be addressed during the MSP process are spelled out and clearly agreed to by the project manager and the SRE team leader.
- ☐ The SRE team leader has the project manager's mitigation goals and strategies.

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# Mitigation Strategy Planning Phase

**Description** The Mitigation Strategy Planning (MSP) phase begins the strategy to develop a concrete plan for managing and mitigating some of the most important risks identified during the Risk Identification and Analysis (RI&A) phase. During the MSP phase, project teams learn an effective process and a set of methods that can be used to manage identified risks. Metrics that can be used to track risk and mitigation plan progress are identified, and plans are made for evaluating the success of the mitigation strategies.

## Process Diagram



Section	Page
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MSP Sessions	75
Cross-Area Strategy Session	79
MSP Results Briefing	81

## Team Preparation

<b>Description</b>	The MSP phase is important for the successful outcome of the SRE. It is therefore essential that the SRE team has the information and skills needed to conduct the MSP sessions. In addition to the information obtained during the prior phases, team members need to use their problem-solving and decision-making skills.
<b>Inputs</b>	<p>The following must occur before beginning the first MSP session:</p> <ul style="list-style-type: none"><li>• The team needs to understand the outcome of the MSP preparation meeting, including any issues or concerns that the project manager identified, the areas to be mitigated, and the schedule for MSP sessions.</li><li>• Team roles need to be assigned for session facilitator, session recorder, and the team member responsible for the context.</li><li>• The media for capturing plan components needs to be selected (e.g. flipchart and marker).</li></ul>
<b>Outputs</b>	The result of the Team Preparation step is that the team is ready to begin the MSP sessions.
<b>Who's Involved</b>	The participants for this activity include the SRE team members, session facilitator, context recorder, and session recorder (optional).
<b>Context Keeper</b>	It may be necessary for one member of the SRE team to serve as “context keeper” if the session notes from the RI&A phase have not yet been sanitized. This person would have a copy of the unsanitized notes at hand and be prepared to paraphrase the context of a given risk statement if any member of the project team expresses concern about the exact meaning of that statement.
<b>“Hip-Pocket” Mitigation Approaches</b>	Possible mitigation strategies often occur to members of the SRE team prior to the MSP phase. A suggestion may have been made during the RI&A phase, or an area may seem similar to one addressed during a prior SRE. Such approaches can be shared during the MSP sessions to get the ball rolling or contribute a good idea that should be considered. Such “hip-pocket” approaches should never be used to shortcut this phase,

because the value of the session relies on the ideas generated by project members themselves.

**Guidance** The experience of the SEI with MSP sessions has been that they are far more “relaxed” and less structured than the RI&A phase group sessions are. For example, it has not proved difficult for the facilitator to also be the stand-up scribe for the process. Also, we have not found it necessary to record session notes for the MSP sessions.

**Key Results of Team Preparation**

- ☐ Each SRE team member knows what to do during the MSP sessions.
- ☐ Session notes from the RI&A phase are on hand.
- ☐ “Hip-pocket” mitigation strategies have been outlined.
- ☐ The room(s) for the sessions are prepared with flip charts and suitable markers.

## MSP Sessions

**Description** During MSP sessions, in-depth, structured discussions of each mitigation area are conducted. The goal of these sessions is to begin to identify and document how the risk areas might be mitigated. The depth of planning in an MSP session is dependent on the group problem-solving skills of the project members who have been assembled. If this is a completely unfamiliar process for them, or if the junior members of the group are unable to participate fully in the company of their superiors, it can take a long time to achieve full participation.

The first MSP session usually lasts a full day. Subsequent sessions can last from half a day to a full day.

**Typical Session Activities**

A typical session should include:

- opening the session: this involves setting the stage and discussing the rules of engagement and other issues about how the session will be conducted. It is important to emphasize that these are problem solving sessions, in which all ideas are captured and considered.
- reviewing the “Picture of Success” defined (and possibly refined) during the Contracting and RI&A phases and refining it further (if necessary)
- discussing and identifying possible causes of the risks
- discussing and identifying mitigation goals for the risks
- discussing and determining possible mitigation strategies
- discussing and determining mitigation activities that would support suggested strategies
- beginning to identify key measures that will be used to track and control mitigation activities
- discussing possible resources and constraints for suggested strategies
- estimating the scope of effort needed
- reviewing and closing out the MSP session

**Logistical Considerations**

Logistical considerations are important to a successful MSP session and include the following:

- Participants must be able to see what the session facilitator is writing.
- All plan components should be visible to all participants.
- Each strategy and action developed for a given risk area should have a unique numerical designator.
- There should be ready access to copy machines, computers, printers, and other services that keep the activity running smoothly.

**Inputs**

The inputs to the MSP sessions include

- the mitigation areas that have been determined and agreed upon
- the roles and assignments that have been determined for conducting the sessions
- the schedule for MSP sessions

- the project manager's mitigation goals and priorities (from the Interim Report phase)

Additional support would include risk statements and context captured during the RI&A phase, domain expertise, project schedules, plans, and budgets.

**Outputs** For each risk area addressed, outputs of the MSP sessions should include

- a mitigation goal specific to the risk area
- sources of the conditions of the risk statements for the risk area
- strategies
- actions
- metrics
- a budget estimate
- a schedule estimate
- actions, metrics, and goals that are linked to schedule and project milestones
- briefing slides suitable for presentation to the project manager

**Who's Involved** Those involved include

- SRE team members
- session facilitator
- individual responsible for locating and contributing the context captured during the RI&A phase
- risk area owner(s)
- session recorder (optional)

The MSP sessions are conducted by the session facilitator, who ensures that a true problem-solving approach is used. As ideas are generated (usually using a brainstorming approach), the session facilitator captures the components of the mitigation plan. The person designated to capture context does so carefully for each plan.

**Methods** Throughout each step of the MSP sessions, beginning with the identification of causes, the risk area being addressed should be displayed so that everyone in the room can easily see it. Each participant in the session should be given a chance to discuss the area and possible causes of the risks in it. The goal is for everyone involved to understand the risk area and the alternatives being considered. Ideas should be shared and discussed openly.

- Guidance**
- These sessions rely on an effective, proactive session facilitator, who is skilled in leading a team through effective brainstorming techniques, such as structured, unstructured, anonymous, and public. Because prioritization facilitation is also needed, facilitators need to be comfortable with prioritization, techniques such as nominal group. They must be flexible in the use of a mix of these techniques, depending on how the sessions progress.
  - While it is important to establish a session schedule, it may need to be amended. The team should not cut an area or topic short simply to adhere to the proposed schedule. If the schedule does need to be amended, the session facilitator should be careful that all activities are given sufficient time to be addressed.
  - The metrics for risk management are difficult to articulate; a great deal of work remains to be done in this area. Therefore, do not let the session bog down in the pursuit of metrics. If suitable metrics to show progress in mitigating the risk area do not present themselves readily, move on to other MSP session tasks.
  - The budget estimate work can be deferred to a later time, after the MSP phase, and it can be left to the project to complete.
  - The preparation of briefing slides can be deferred to an SRE team-only session after the MSP and cross-area strategy sessions have been completed, using the material on the flipcharts from the sessions
  - To estimate the true effort required to mitigate a risk area, determine the resource allocations needed, and establish a schedule, the project should break down the activities into tasks. Realistic estimates can be determined only after the tasks to be performed and the actual resources that are available to implement them are delineated. The individuals responsible for implementing the plans can use these estimates as a guide. However, final documentation of plans should not be conducted until the conclusion of all on-site activities. The outcome of the cross-area strategy session, described in the next section, may result in changes to individual mitigation plans.



## Key Results from the MSP Session

While you should strive for all the results listed under “Outputs,” above, you should consider the session successful if you collect these results:

- ☐ a mitigation goal for the risk area
- ☐ a comprehensive listing of the sources of the risk statement conditions
- ☐ a set of mitigation strategies to pursue (typically three to five strategies)
- ☐ a listing of activities that will be taken in pursuit of these strategies, each of which includes
  - a specific description of the activity
  - a date by which that activity will be completed
  - the name of a person who is responsible for assuring that the activity is completed, and who has agreed to that commitment

## Cross-Area Strategy Session

### Description

The cross-area strategy session identifies conflicts and synergies among the strategies and actions developed for each mitigation area. Conflicts and synergies among strategies often occur when MSP sessions are conducted by parallel teams or when different people are involved with each session. Conducting a cross-area strategy session minimizes the potential for conflicting plans or duplicated effort, and maximizes the impact of strategies, resources, and actions.

### Typical Session Organization

The cross-area strategy session is conducted by the session facilitator who captures the identified conflict and synergies in clear view of all participants. The suggested schedule for this session is as follows:

- opening the session
- reviewing mitigation area results

- identifying conflicts, commonalities, dependencies, and possible sequencing
- resolving conflicts
- prioritizing strategies and actions
- reviewing and closing out the cross-area strategy session
- documenting the overall mitigation plan which can be completed off-line or in parallel with the MSP results preparation activities
- reconciling individual risk area plans

**Inputs** The cross-area strategy session requires all of the outputs from the individual MSP sessions:

- a mitigation goal
- strategies
- actions
- metrics
- a budget estimate
- a schedule estimate

Additional inputs include the interim report and any relevant information concerning program constraints, policies, or regulations.

**Outputs** The cross-area strategy session has these results:

- Mitigation strategies and action conflicts are resolved.
- Mitigation strategies and actions from each risk area are improved by adding applicable strategies and actions that came out of other sessions.

**Who's Involved**

- SRE team members
- session facilitator
- individual responsible for locating and contributing the context captured during the RI&A phase
- risk area owner(s)
- session recorder (optional)

<b>Methods</b>	This session is conducted as a problem-solving and decision-making activity, in which methods such as brainstorming and structured facilitation should be used.
<b>Guidance</b>	<ul style="list-style-type: none"> <li>• The cross-area strategy session is optional and may not be necessary if either the same people participated in all MSP sessions or the mitigation areas are clearly unrelated with no overlap in strategies and actions.</li> <li>• Before determining whether a cross-area strategy session is needed, the team should review all mitigation plans to check for potential conflicts and synergies. Mitigation area prioritizing that results from the MSP planning meeting should be revisited at the conclusion of all MSP sessions. If the team puts a process in place that reviews the individual MSP sessions in this way, the cross-area strategy session may not be needed.</li> </ul>
<b>Key Results of the Cross-Area Strategy Session</b>	<p>The session will have the following key results for each risk area addressed:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> a mitigation goal for the risk area which does not conflict with the goals of any other risk area</li> <li><input type="checkbox"/> a set of mitigation strategies to pursue that does not conflict with that of any other risk area. (If it does, specific rules for when that strategy will be invoked should be included, e.g., strategy 1 will be pursued for three months, and if the risk does not appear to be decreasing, we will switch to strategy 2.)</li> <li><input type="checkbox"/> a fully reconciled listing of activities that will be taken in pursuit of these strategies</li> </ul>

## MSP Results Briefing

<b>Description</b>	The MSP results briefing is a formal presentation in which all of the MSP participants see the results of the overall mitigation plan, and learn how their own planning efforts contributed to these results. Project members are shown how the risk areas addressed in the MSP phase will be mitigated.
--------------------	--

This briefing includes an introduction, summary, individual session results, and a discussion of the appropriate next steps such as determining the process to complete and implement mitigation plans.

**Inputs** Prior to delivering the MSP results briefing, presentation transparencies must have been prepared, along with a “leave behind” copy of the presentation for the project manager.

Additionally, the following inputs, which are the results of the MSP sessions, are needed:

- list of key or root causes
- list of mitigation goals
- list of mitigation strategies
- list of mitigation activities for each strategy
- list of key measures (if developed in the MSP session)
- an estimate for all activities associated with a given strategy (number of people, number of person-days, number of days/week—if developed in the MSP session)

**Who’s Involved** Everyone involved in the MSP phase should be at the meeting, including

- the project manager
- all MSP participants
- any other project members the project manager chooses to invite
- the SRE team

**Guidance** The MSP results briefing enables the identification of the appropriate next steps, such as

- getting required authorizations, contract modifications, or approvals
- defining needs for more detailed plans
- clarifying cost, personnel, and facility estimates
- determining the frequency of data collection, evaluation, and reporting
- establishing the means by which to report status

**Key Results of MSP  
Results Briefing**

- ☐ Everyone understands the mitigation goals, mitigation strategies, and activities to carry out those strategies that were developed in each MSP session.
- ☐ All project members involved in the MSP phase have had an opportunity to get their questions and concerns addressed.
- ☐ Everyone understands the timing and content of the next step of the SRE (delivery of the final report and risk data).

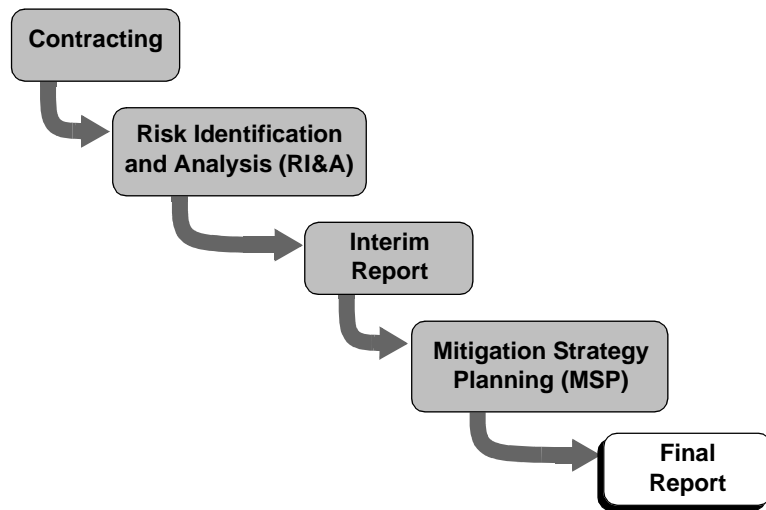


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# Final Report Phase

**Description** The Final Report phase provides the final report, the raw material with which the project can create a risk database, and recommendations to the project manager or sponsor of the SRE. This phase also brings the SRE process to an end. The SRE team assists the team leader in writing the report; then the leader meets with the project manager to present the results and close out the SRE.

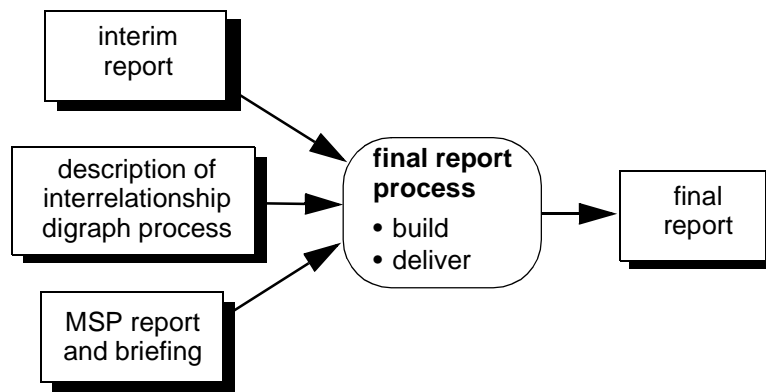
## Process Diagram



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## Write Final Report

**Description** The final report is the consolidation of the Risk Identification and Analysis (RI&A) phase results (as documented in the interim report) and the results of the Mitigation Strategy Planning (MSP) sessions. The final report summarizes and integrates all of the results into a report format and makes any final recommendations for follow-on activities. Generation of the final report is largely a matter of integrating, editing, polishing, and refining the contents of the interim report and MSP briefing.



*Final Report Process*

**Inputs** The inputs for this step include

- interim report
- description of interrelationship digraph process
- MSP report and briefing

**Outputs** The output of this step is the final report. Its contents should include

- results of the RI&A activities, namely the list of prioritized risks, risk areas, evaluation results, and any identified issues
- recommendations from the interim report
- results from the MSP Sessions, including the intermediate results of planning steps, recommended strategies and actions, task and action assignments, identified issues, follow-on activities, schedules, and so on



- final recommendations resulting from the SRE and any recommendations for follow-on risk management activities

**Who's involved**

The participants for this step include

- SRE team leader who coordinates all inputs and additional writing
- SRE team members who may write or edit specific sections

**Tools**

No specific tools are used for this step other than standard word processing tools. Accessing the results of other SRE activities may require using tools from those activities.

## Data for Project Risk Database

**Description**

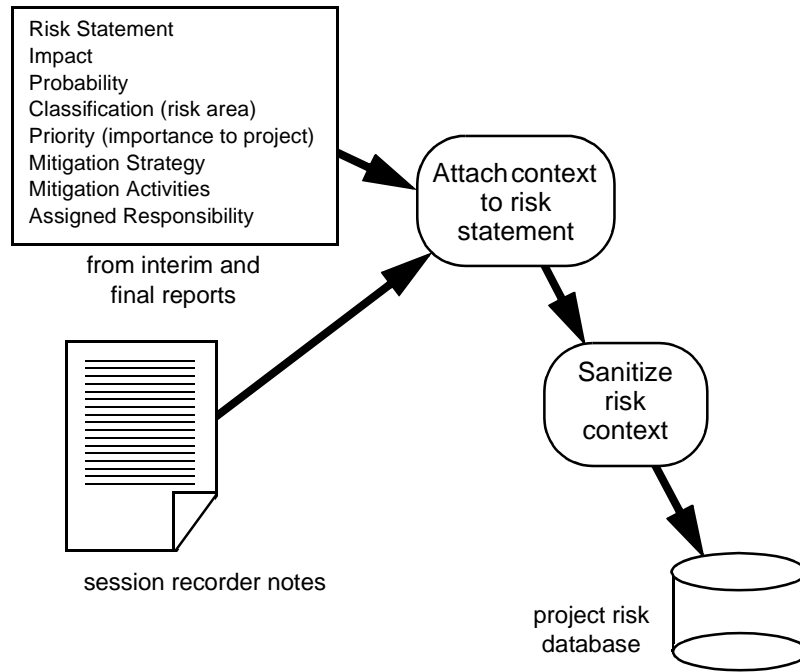
One of the most important “legacies” that the SRE can leave with a project is leaving input data for a risk database around which project members can build a continuous risk management program. The project itself must build the database to suit its own needs; it is not the team’s responsibility to provide a database. However, expediency and common sense virtually dictate that the information be collected in an electronic spreadsheet or simple database. The information should be given to the project in an electronic form that the project can handle, rather than on paper.

All the pieces were developed in the course of the SRE: risk statements; context; evaluations of the individual risks for impact and probability; classification of risk statements into risk areas; prioritization of the individual risk statements; mitigation strategies; responsible individuals; and mitigation plans in the form of action items. If the program is ever to “kick start” a risk program, this is the opportunity.

Unfortunately, all the raw risk data in the SRE team’s hands is not suitable to be turned over to the project—doing so would break the team’s commitment to the interviewees of maintaining confidentiality and non-attribution. The team still needs to break the

session recorder notes into fragments that are associated with the individual risk statements (thereby providing the statements with *context*) and then “sanitize” the context fragments.

**Diagram** A depiction of the process to prepare the SRE data for a project risk database is shown in the diagram below:



### *Preparing Data for Project Database*

#### **Who's Involved**

- the SRE team leader
- the interview session recorder(s)
- other team members as required

#### **Attaching Risk Context to Risk Statements**

To do this, use the following general procedure for any risk statement:

1. Scan through the session recorder notes to find the pointer to the risk statement number for which you are isolating context.

2. Back up in the notes until you find the pointer to the last-asked interview question. Place this reference in the context. (NOTE: If you used the SEI Taxonomy-Based Questionnaire or Short Taxonomy-Based Questionnaire in the Appendix, this “reference” would be the question number.)
3. Scan forward until you find the first sentence that could possibly be leading to the articulation of the risk statement. Begin context capture at that point.
4. Continue scanning forward past the pointer to the risk statement until you reach the last sentence that could possibly still be about the issues surrounding the risk statement.
5. Place all text from the sentence isolated in step (3) through that isolated in step (4) in the context for the risk statement.

#### **Guidance for Attaching Context**

- Always err on the side of including more context than necessary.
- To make sense of the raw session recorder notes, you must have preserved the original risk numbering scheme and the mapping from those numbers to the identifiers that were used for the RI&A data confirmation briefing and the interim report (and final report, if it includes all the risk information of the Interim Report).
- It is best to do this during or immediately after the RI&A phase, while the memory of the interview session still has some freshness. It can be very easy to put this off until “later,” simply because it is not needed in this form during RI&A or MSP.
- It is up to the project to add to the context for the risk statement as more is learned about it in the future. The risk statement is not edited or changed over time, but its context should be. Remind the project of this maintenance responsibility.

#### **Sanitizing Context**

“Sanitizing” context is the process of changing any words in the text that could possibly link the risk statement to an individual interviewee or group. It must be done by a team member who was present at the interview. It demands great care and sensitivity, and should probably be done by the SRE team leader unless either the leader *absolutely* trusts someone else’s judgement for this, or the

leader happened not to be in the room during that particular interview session.

At the simplest level, sanitizing is the elimination of all names and references to the group session from which the context is taken. At the more subtle level, it requires sensitivity to and the elimination of “catch phrases” or characteristic expressions that may identify the speaker.

### **Guidance for Sanitizing Context**

- First, get rid of all names and references to the group, levels of responsibility, technical expertise, and so on.
- Either blank out names or rewrite sentences in passive voice.
- Look for wording that reflects a particular perspective in the project: “The programmers only worry about meeting their milestones and productivity bogeys, then they throw the programs over the transom to us.” This is probably coming from a tester or a member of Quality Assurance. Also, an expression like “over the transom” may be unique to an individual or department in that organization. The context might have to be completely flattened: “The project incentives that drive the program developers are milestones and productivity, rather than the performance of the product.”
- Still, you want to preserve colorful images and powerful metaphors: “It’s like having a Ferrari on a desert island”; “The various departments here just play Liar’s Poker with the project schedule”; “We’re just re-arranging the deck chairs on the Titanic”—all these can enrich the context, but at the same time can point to one individual or group. If you’re not sure, rewrite the context to flatten it out (i.e., take the color and power out of it).

### **Destroy SRE Process Artifacts**

The final obligation of the SRE team is to ensure that all artifacts of the SRE process have been destroyed. Examples include

- flipcharts from the interview sessions
- session recorder notes
- notes kept by individual team members during the interviews
- interviewee and team member risk evaluation forms
- risk statement numbering “maps” that show the correlation between interview risk statement numbers and the numbers used for those statements in the Interim Report

At the end of the SRE process, each risk statement and its context should be complete and freestanding, with no history except in the context itself, and no association with other risk statements except in the risk area.

Once this destruction of SRE artifacts is complete, the SRE team leader has completed the process obligations relating to confidentiality and non-attribution. The team and leader are still bound by the terms of the confidentiality agreement (if this was effected) or professional ethics not to attribute any particular risk statement to any individual interviewee or interview group.

**Key Results of Data Preparation**

- ☐ Each risk statement is complete with its context—it has become a freestanding data object.
- ☐ No risk statement’s context contains information making it traceable to the originator.
- ☐ All process artifacts of the RI&A phase have been destroyed.

## **Present Report to Customer**

**Description**

The final report and the data from the SRE are given to the project manager.

**Who’s Involved**

the SRE team leader and the project manager

**Process**

There is no special process. The report may be mailed to the project manager or delivered in person. The data for the risk database may be delivered on a portable medium such as a floppy disk, or it may be emailed.

**Guidance on Sending the Report Electronically**

Common sense requires that the report not be delivered to the project in an editable “soft-copy” form; it would be too easy for it to get into the wrong hands and be changed from the as-delivered wording. Sending or hand-carrying a single paper copy to the project manager is always the best course of action.

If the report *must* be delivered electronically (e.g, dictated by distance and some critical need for speed), send it in a form like *portable data format* (PDF) that can be read and printed out in a static, non-editable form by a PDF viewer such as Adobe Acrobat™.

#### **Key Results of Report Presentation**

- ☐ The project manager has the final report in hand on or before the date promised by the SRE team leader.
- ☐ The project manager has the risk statement, context, and associated data from the RI&A and MSP phases in an electronic form that can be readily reshaped electronically to populate a risk database.

## **Closure Meeting**

#### **Description**

The closure meeting is optional, but strongly recommended. It is intended to get feedback on the SRE process itself from the customer and a verbal commitment to support a follow-up meeting. The closure meeting can be used as an opportunity to present the final report to the customer. It is also an opportunity to answer any final questions, discuss any remaining issues, and set the stage for establishing a continuous process of managing risks. Any additional recommendations or findings that arose after the completion of the MSP sessions should be highlighted during this presentation.

#### **Inputs**

The inputs to this step include

- final report
- original contract for this SRE
- recommendations from the final report
- additional information relative to getting a continuous process of managing risks put in place

#### **Guidance**

Possible goals for this meeting include:

- agreement from the project manager that all deliverables have been met

- acceptance of the final report. If the project manager's demands change, they should be negotiated and the final agreement documented (the corrected final report should be sent to the project manager later, but as soon as possible.)
- consideration by the project manager continuous process for managing risks, and understanding/acceptance that some kind of risk management process needs to be built on the SRE foundation
- feedback and recommendations from the project manager for improvement to the SRE
- verbal commitment to support a return visit from the SRE provider at a later time (any appropriate time from a month to a year) to evaluate additional progress with risk management

### **Who's Involved**

The participants for this step include

- SRE team leader
- an additional member of the contracting team, if needed
- additional customer representatives if desired by the project manager

### **Possible Follow-On Work**

The following approaches are recommended after an SRE has been completed:

- To continue the momentum in managing risks provided by the SRE, a continuous practice of managing risks needs to be implemented. Without this, the SRE risks most likely will not be tracked to closure, and new risks will be ignored.
- It may be useful to expand risk management to other partners in the program; that is, team or joint management of risks, through the addition of team-based activities to highlight and discuss the top risks to the program as identified by all partners.

### **Key Results from Closure Meeting**

- ☐ Constructive feedback on the SRE process has been solicited and captured.
- ☐ Possible next steps that the SRE provider can undertake for the project have been outlined.

- ❑ The project manager has been presented with the arguments for quickly constructing a risk database and building a continuous risk management process.



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# Summary

**Purpose** The purpose of this section is to give a final, high-level listing of all the things that define the SEI Software Risk Evaluation process. Regardless of the customization required by your local conditions (e.g, size of project, length of development cycle), if you achieve the following characteristics, you may credit yourself with having conducted a “flawless” SRE process.

**Characteristics of a  
“Flawless” SRE**

- ☐ A large number (50 or more) risk statements in condition-consequence form have been captured, along with clarifying context information for each statement.
- ☐ These risk statements have been generated by the interview techniques described in this document and the CD-ROM, using a disciplined interviewing team that performs the interview roles as described, and under the assurance of confidentiality and non-attribution to the people interviewed.
- ☐ At least three interviews of representative peer groups have been conducted, of the appropriate length (2-1/2 hours or more), and no more than one of those interviews was with an individual (groups of 3-5 interviewees are the goal).
- ☐ The risk statements have been evaluated for potential impact and probability by both the interviewees and the SRE team, classified into “risk areas” by the SRE team, and prioritized on the basis of “importance to the project” by both the interviewees and the SRE team.
- ☐ The resulting “risk picture” has been presented by the SRE team to the assembled interviewees from all interview sessions and has had its credibility confirmed.
- ☐ The risk areas have been analyzed for their interrelationships, based on the “condition” portions of their member risk statements.

- ☐ The data assembled to this point has been summarized in a document that also presents a recommendation of the two or three risk areas to address in Mitigation Strategy Planning (MSP).
- ☐ Two or more risk areas have been addressed in MSP, resulting in (1) the definition of an overall mitigation goal for each risk area, (2) a listing of the key causes of all the “conditions” of the risk statements each risk area (3) a listing of the mitigation strategies chosen to deal with each risk area as a whole, and (4) a listing of the initial activities for carrying out the strategies, with an assigned (and accepted) responsibility and due date for each.
- ☐ Final results have been summarized and presented to the project manager in a formal document.
- ☐ Data from the SRE has been sanitized and turned over to the project for its use.
- ☐ The establishment of a risk management process for the project that is defined, methodical, and continuous has been encouraged at every opportunity.

**What If It Wasn’t  
“Flawless”?**

All SRE process deliveries, even “flawless” ones, should be followed by a SRE team postmortem that documents

1. any items in the above listing (or in the more detailed listings of “Key Results” elsewhere in this Method Description) that were not achieved
2. aspects of the process that went particularly well (seemed “right on target,” were clear to all team members, and functioned smoothly)
3. aspects of the process that seemed awkward and should be listed for follow-up study in subsequent SREs (but not changed at this time)
4. items that need to be fixed *now*, before the next SRE is undertaken

A “flawless” SRE can be achieved only by the honest assessment of lessons learned and continuous improvement of delivery based on feedback.

***The first truly “flawless” SRE has yet to be completed.***

---

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