

SUBJECT

RISK ANALYSIS

SESSION 4 : Uncertainty and Limited Information

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Overview of Risk Reporting

To provide visibility of risks and progress in mitigating them, the following reports should be distributed on a regular basis as part of the normal project status reporting system:

Table 1 - Risk Reporting Sections

<i>TITLE</i>	<i>LEVEL</i>	<i>DESCRIPTION</i>
<i>Risk Watch List</i>	Organization & Project	Lists risks to facilitate monitoring risks and initiating risk responses.
<i>Risk Mitigation Plan</i>	Organization & Project	Lists avoidance/mitigation actions, if and when risks occur.
<i>Risk Profile</i>	Project	Displays planned, actual and projected progress in reducing risks.

Management Contribution to Risk Management

The keys to effective risk resolution are early identification, communication, and risk management. All issues and risks must be identified and recorded in one place for easy reference by every project team member. Every user and team member must be aware of outstanding issues and accept ownership for their existence (and possible resolution). Finally, the Project Manager must manage and control the issues through an established documented procedure.

The Project Manager must use a structured approach to resolving issues and problems. By clearly defining the underlying problem (root cause), by identifying alternative solutions, and by objectively evaluating the consequences, the Project Manager can minimize adverse effects on the project. Three (3) major issue types are relevant to the any major project:

- *Business,*
- *Technical, and*
- *Team.*

The project stakeholders review the business and technical issues while the team issues remain internal to the project team. When defining and resolving technical issues, priority is a factor. Prioritization of technical issues is handled using a 1-5 scale.

Resolving issues is an ongoing process that occurs throughout the life cycle of any project. Expect, however, that some issues cannot be resolved within the scope of a project. Still, the

Project Manager should identify those issues that cannot be resolved and develop action plans to resolve them at a later time.

When resolving issues, a priority should be assigned to help determine the appropriate resolution. Low, medium, high, and emergency can be assigned to issues associated with the project.

Risk Management Response

Risk management alternatives include either:

1. Risk avoidance,
2. Transfer / sharing of risk (insurance),
3. Prevent the risk, or
4. Develop a risk mitigation and / or contingency plan.

Mitigation of Global Risks

The cost / benefit and funding requirements of both potential and encountered risks should be documented in the finalized business requirements.

Appropriate measures should be taken to protect each parties' interests incorporated in contractual arrangements. This will be achieved through

the project Statement of Work (SOW) or Document of Understanding (DOU).

Mitigation of Scope Related Risks

The scope of a project should be completely defined to help avoid inadvertent requirements' omissions, errors, and misunderstandings via Statements of Work and the Project Management Plan. Management is expected to honor its commitments and to provide the necessary resources required to have a positive and timely outcome. There must be well-defined and enforced acceptance requirements in order to have a successful outcome.

Mitigation of Timeline-Related Risks

There must be specific support in providing resources outside of the immediate development group via internal / external contract agreements and coordination with organization management. Everyone must agree to multiple phases of a project in order to achieve short-term objectives.

Mitigation of Cost-Related Risks

The financial situation must continue to be assessed and justified, based on up-to-date business case and economic evaluations. All costs should be reviewed with the section responsible for funding the software development effort.

Mitigation of Quality/Performance Risks

Acceptance criteria and quality and technical performance criteria (as defined by the requirements and state standards) must be documented. Any State performance standard must be followed under a client/server project.

2. Risk Management Process Guidelines

Identify Risks

Identifying specific risks is occasionally a precarious task. Not all risks can be identified or mitigated contiguously. In this section, you will need to concentrate on identifying underlying problems, based on visible symptoms. Symptoms are often the only indication of an underlying project problem or issue. Many symptoms act as a facade to the real problem. The Project Manager must isolate the actual risk and to filter out the symptoms to identify the root cause.

Note:

There is no shortcut to identifying problems. Experience, communication, and intuition assist the Project Manager in getting to the "root cause of the risk, problem, or issue."

The general risk management process to be followed begins with reviewing the planning documents that specify the project including:

- Deliverables and work processes,
- Milestones and schedule dates,
- Resource estimates/needs/sources, and
- Performance requirements.

Talk with appropriate stakeholders and other experts to develop a comprehensive list of potential risks. This process may include:

- Getting the right people involved,
- Staff meetings,
- Gathering business requirements,
- Analytical sessions,
- Scheduling user community meetings, or
- Conducting a Kulik and Lazarus high-level project assessment.

Risks or potential risks will also be identified by observation through:

- Management staff interaction, and
- “Reading” personnel actions and reactions.

Potential Areas of Risk

Table 2 - Areas of Potential Risk

NEW TECHNOLOGY	APPLICATION	USER/CLIENT	PROJECT TEAM	ORGANIZATION	PROJECT MANAGER
Database Software	Project Size	Systems Knowledge	Contract or Full Time	Stability of Organization	Contract or Full Time
Communications Software	Functional Complexity	Change Propensity	Transition Time	Stability of User Organization	Problem Solving Skills
Programming Language	New vs. Replacement	Turnover of Key People	Technical Skills	Senior Management Commitment	Managerial Identity
Tools or Aids	Quality of Available Information	Client and Customer Relations	Level of Morale	Availability of Champion	Influence Skills
Communications Network	Vulnerability to Change	Readiness for Takeover	Staff Availability	Continued Budget Availability	Achievement Drive
Mainframe	Stability of Business Need	Design Participation	Commitment to Team	Charge-back System	Experience with Users

NEW TECHNOLOGY	APPLICATION	USER/CLIENT	PROJECT TEAM	ORGANIZATION	PROJECT MANAGER
Testing Resource	Intensity of Business Need	Change process	Applications Knowledge	Project Standards Used	Experience with Application
PCs or Desktops	Organizational Impact	Level of Commitment	Staff Turnover	Accountability for Change	Experience with Organization
Information Center	Interface Existing Applications	Attitude toward IS	Familiarity with Each Other	Availability of Support Organization	Experience with Technology
Geographic Dispersion	Dependent on other Projects	Applications Knowledge	Staff Conflicts	Extended Team Commitment	Experience with Project Team
Reliability of Personnel	Conversion Difficulty	Acceptance Test Participation	Size of Team	Conflict Resolution Mechanism	Planning Skills
Configuration Management	Implementation Time Frame			Sign-off/approval process	Estimating Skills
Staff / Resource	Personnel Turnover				Communication Skills
					Possibility of Turnover

Classify Risks by Type

Categorize risks along the lines shown in a risk classification document (table 4), to aid in subsequent determination of risk controllability and selection of appropriate risk mitigation actions.

Assess Risks

Step 1: Assess the likelihood of occurrence (probability of occurrence) by eliminating any risks which, on reflection, you believe will not occur. Roughly classify the remaining risks as *high, medium, or low* probability of occurrence.

Step 2: Assess the severity of impact by:

- Evaluating each risk in terms of its possible impact on the project baselines of effort, cost, time (schedule), and requirements (scope, performance, acceptance, quality)
- Eliminating any risks which you believe have no or only trivial impact on the baselines
- Roughly classifying the remaining risks as *high, medium, or low* severity of impact.

Step 3: Prioritize the identified risks on the basis of the rough assessments. The contributing factors are the likelihood of occurrence and severity of impact.

Step 4: Quantify the risk based on probability by assigning numerical values to various aspects of each risk to provide a consistent basis for combining them into an overall Risk Profile and determining risk mitigation opportunities and actions. Assign a value from "1" to "5" to each risk (based on the likelihood of occurrence) using the scale below:

Table 3 - Scaling Risk

ASSESSMENT OF LIKELIHOOD	VALUE SCALE
<i>Very unlikely</i>	1
<i>Somewhat unlikely</i>	2
<i>50/50 chance</i>	3
<i>Highly likely</i>	4
<i>Nearly certain</i>	5

Step 5: Quantify the risk (based on severity of impact) using the table below:

Table 4 - Assessment of Risk Severity

ASSESSMENT OF SEVERITY	VALUE
<i>Minor impact on cost, schedule, performance</i>	1
<i>Moderate impact on cost, schedule, performance</i>	2
<i>Significant impact on project baselines</i>	3
<i>Very significant impact on project baselines</i>	4
<i>Disastrous impact, probable project failure</i>	5

Step 6: Quantify the risk (in terms of level of controllability) using the table below:

Table 5 - Risk Controllability Assessment

ASSESSMENT OF CONTROLLABILITY	VALUE
<i>Essentially avoidable through selected risk mitigation actions</i>	1
<i>Highly controllable through organization or project actions</i>	2
<i>Moderately controllable through organization or project actions</i>	3
<i>Largely uncontrollable by the organization or the project</i>	4
<i>Uncontrollable by the organization or the project</i>	5

Step 7: Determine risk mitigation actions. Identify and record potential actions that could be taken in order to avoid or mitigate the individual risks (based on their level of controllability) using the table below:

Table 6 - Risk Controllability Rating

CONTROLLABILITY RATING	TYPE OF MITIGATION
1 or 2	Actions which should be immediately incorporated into the project management plan
3 or 4	Actions which should be documented as contingent risk responses to be incorporated in the project management plan in the event of the risk occurring
5	None. By definition, such risks cannot be avoided or mitigated

Caution: The above guidelines are suggestive, not hard and fast. On any given risk, for example, it may be possible to identify actions, which should be immediately incorporated into the project to partially reduce the risk, as well as actions that should be treated as contingent risk responses. Risk classification may also change during the system development life cycle.

For any risks on which multiple, alternative responses were identified, evaluate the responses and select the preferred ones. If time is limited, consider performing only the following:

- Avoidance or mitigation actions to be immediately included in the project management plans
- Decomposition of the selected risk responses into their constituent work tasks (the level of detail should be consistent with that used to plan the work in the Project Schedule)
- Estimating the resources needed to perform the risk mitigation and scheduling the detailed work activities including:
 - Modifying the Project Schedule for actions that are to be incorporated immediately
 - Determining activity duration (not specific schedule dates) for contingent risk responses

Note:

Incorporating these actions may impact the project baselines.

Step 8: Prepare a Risk Watch List that summarizes the results of the risks that have been identified. All of the information needed to prepare this document is available (as a result of the preceding work), except that assessment must be made of the target dates for reduction of each risk. Input all of the risk information on the riskreport.xls spreadsheet. Making these assessments requires reference to the project schedule to determine when the work associated with the risk is scheduled to be performed.

Step 9: Develop a Baseline Risk Profile. Calculate a Significance Level rating for each risk by summing its ratings for Likelihood of Occurrence and Severity of Impact. Construct an original Baseline Risk Profile by plotting a curve based on the summation of the risk Significance Levels, considering the target dates for reducing each risk by 50% and in total.

Step 10: Monitor Risk Status. As work is performed, monitor and assess:

- Progress in reducing risk (e.g., completion of work that achieves the targets of 50% and total risk reduction)
- Occurrence of risks that call for initiation of contingent risk responses
- Effectiveness of implemented risk reduction and risk mitigation actions and any needs to modify these actions.

Step 11: Maintain a Risk Watch List. Update the Risk Watch List to reflect the results of monitoring risk status. Also reflect the effect of any project change requests.

Step 12: Maintain a Risk Profile. Update the risk profile to reflect the current risk status. This involves the plotting of curves to reflect:

- Actual progress in reducing risks
- Revised risk reduction baseline, considering actual progress, new risks identified, and effects of change orders and re-planning changes.

Step 13: Report Risk Status. The Risk Watch List is issued as a regular component of the standard monthly project performance reporting packages (e.g., status reports, project plan milestones, Gantt charts).

Risk Mitigation Plan

This section defines the actions that need to be taken in order to reduce or eliminate the impact of risks on the project or on individual functions. A Risk Mitigation Plan is done during initial project analysis and planning. Maintain it in connection with the project execution. This process is also utilized in connection with the detailed project planning activities and is updated (as needed) in subsequent cycles of re-planning. It is applicable to all projects and can be applied to ongoing functions of the project management office when relevant.

Risk Mitigation Guidelines

Risks can arise from any aspect of a project. Thus, a complete identification of all project risks can only be obtained by involving a sufficient number of people to ensure that in-depth competence and experience is applied to the process for all significant aspects of the project scope.

Some project risks can be identified by simply deducing the defined project risks that are applicable to the project. It may be necessary to restate these risks in the context of the project scope. Other project risks

can only be identified by carefully analyzing the project management plan, project schedule and requirements.

Some of the risk mitigation actions can be incorporated into the Project Management Plan in conjunction with detailed project planning activities. Other risk mitigation actions represent contingency plans to be implemented only if the risk actually occurs.

A secondary use of the Risk Mitigation Plan occurs if and when implemented risk responses do not prove effective. When this happens, the Risk Mitigation Plan provides information on other, alternative risk responses that should be reconsidered for implementation.

Recording Risk Mitigation

Table 7 - Risk Mitigation Table is self-explanatory, except as follows:

1. Category - Project Management normally specifies the standard categories of risks. The categories that will be used are found in Table 1;
2. Object - The object, task, phase, or activity (at the project level) to which the risk applies;
3. Severity - A subjectively assigned numerical rating from low to high of the expected level of impact on the project if the risk occurs (see Table 4 - Assessment of Risk Severity);
4. Alternative responses - Detailed plans (or cross-references to attached detailed plans) that specify the alternative sets of actions that can be taken to avoid or mitigate the identified risks;
5. Rank of Response - The preferred ranking of the alternative responses starting at "1" (most preferred). Refer to Table 8 for detailed descriptions of control rank responses;
6. Response Taken - "Contingent" is entered if the response is only to be acted upon, when the risk occurs;
7. Assign responsibility - Assign the risk to the appropriate individual. This does not need to be tracked in the "Suggested Risk Mitigation Table" but may be included in the Comments section and must be included in the project schedule with the associated resources.

8. Comments / Closure - All risks need to come to a conclusion, even if that conclusion is “no action taken”. Risks requiring a “developed” solution will be reflected in the project schedule.

A suggested Risk Mitigation Table format is defined in Table 9.

Table 7 - Risk Mitigation Table Format

Category	Object	Severity	Impact Area	Alternative responses	Rank of Response	Response Taken	Comments Closure
Schedule	Case Screen not Delivered on time	4	Call Reception	Wait until Complete	2	Build Bridge to existing system	Waiting Management Approval

Risk Profile

The Risk Profile graphically portrays the project's exposure to risk. It shows the planned, projected (if different from plan), and actual risk reduction achieved as the project progresses. The Risk Profile is created from the Risk Watch List.

Risk Profile

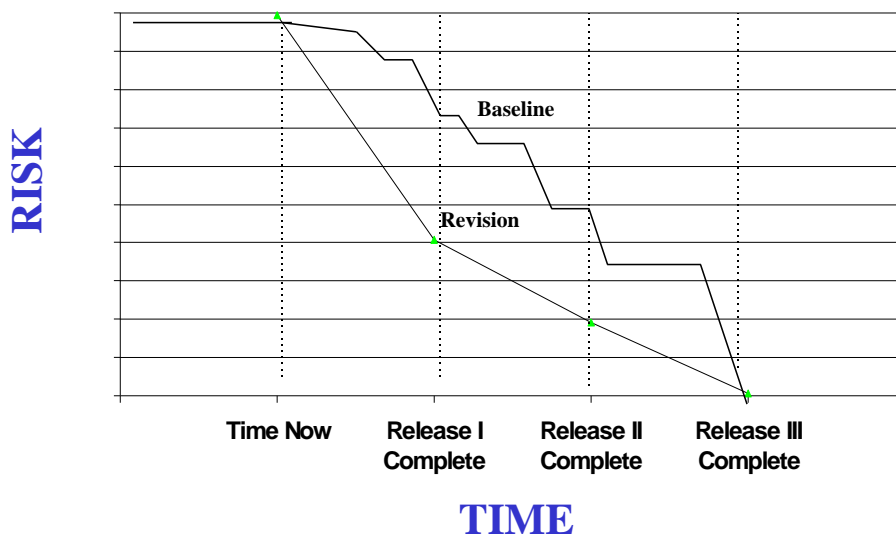


Figure 5 - Graphical Risk Profile

Risk Profile Guidelines

The Risk Profile risk reduction curves are determined as follows:

- Step 1: An overall numerical measure is established for each risk. Typically, this is computed by multiplying the Estimated Level of Impact Rating times Level of Confidence Rating where:
- The Level of Impact Rating is a number that represents the severity of the impact if the risk occurs.
 - The Level of Confidence Rating is a number that represents the expected probability that the risk will occur.
- Step 2: Dates are established representing the times when each risk is planned to be reduced (first by 50% and then in total).
- Step 3: The values for these measures are reduced as progress is made in reducing the risks.

Step 4: The results of the above calculations are summed for the project by time period (usually months), taking into consideration:

- Planned Risk Reduction, to derive the planned risk profile
- Achieved Risk Reduction, to derive the actual risk profile
- Projected Risk Reduction, to extrapolate a projected risk profile (if actual varies significantly from plan).

One option is to show two planned risk reduction curves, the original plan, and the current or revised plan. Attached, as Appendix C is a detailed list of references for additional risk management research.

Risk Watch List

A *risk watch list* is a list of current risks that typically shows type of risk, level of impact, importance, ways of identifying and handling the risk, time frame for risk reduction, responsibility for management of the risk.

Risk Watch Guidelines

One option is to include a rating for each risk that is a combination of the Level of Impact and Level of Confidence ratings.

Another option is to identify and include in this Section "Risk Triggers", which are symptoms to watch for that signal potential or actual occurrence of the risk.

A simple scheme should be used to quantify risks. The quantification process is somewhat subjective, regardless of the method used to assign the numerical values. Using a more complex quantification scheme will probably not do much to reduce this inherent subjectivity.

Consideration should be given to devising a scheme for quantifying the impact of joint occurrence of multiple, closely related risks. The effect of such occurrences may be much more significant than is implied by simply summing their individual values. The likelihood of such occurrences is usually calculated by multiplying the individual risks' estimated probability of occurrence by each other. The usual handling of joint risks is:

- To combine them and reassess the resulting, more global risk
- To define an additional risk described as a joint occurrence risk and assess it in terms of the incremental impact of the joint occurrence over and above that of the individual risks.

Consideration should also be given to relating each risk to the corresponding level of Project planning. This will prove helpful in keeping management attention to each risk at an appropriate level of detail.

Risk Watch Required Elements

The typical data shown in Table 8 - Suggested Risk Watch List, is self-explanatory, except as follows:

1. Risk Category - Type of risk, based on standard categories established by Project Management. One typical categorization scheme is:
 - Financial - Almost everything results in cost. Limit these entries to estimating errors, budget effecting overruns.
 - Resource – Most application development efforts involve the use and availability of people and skills.
 - Schedule - Anything that directly affects the schedule as defined in the Project Schedule (e.g. estimating/scheduling errors, resource availability problems, and overruns).
 - Technical - Anything that is directly related to the technology chosen to provide a solution (e.g. requirements complexity and/or changes, immature technology, integration problems).
 - Management – Project management skills or organizational management focus and commitment are essential elements of all software development efforts.
 - Communication – The inability to understand user requirements and avoid project surprises are key project success measures.
 - Operational - Implementation problems due to conflicts, poor training, physical resource unavailability.
 - Political – Effect on the citizens and citizen services.

- Organizational - Events outside the project such as marketplace developments, regulatory changes and strategy changes.
2. Related Work - When applicable, a cross-reference to the work that gives rise to the risk. In a project-level document, it will normally be a deliverable associated with the risk.
 3. Risk Response - A summary statement of the risk response(s) which is preferred or which has been initiated. Note that the details of the response are spelled out in the Risk Mitigation Plan.
 4. Level of Impact, Level of Confidence, Level of Control - Judgmentally assigned numerical ratings of the expected severity of the effect, estimated probability of occurrence, and expected ability to control each of the identified risks. Any number scale can be used, but a 3-point scale (i.e. "1" to "3") is usually sufficient and does not imply an undue level of precision.
 5. Date to Reduce by 50% and Completion Date - These dates show the risk reduction targets for management control purposes. They also provide the data needed to plot the time axis of the Risk Profile.

Risk Watch List Suggested Format

Table 8 - Suggested Risk Watch List Format

CATEGORY	DESCRIPTION	RESPONSE	TYPE	SEVERITY	LIKELIHOOD	SIGNIFICANCE (SEVERITY + LIKELIHOOD)	LEVEL OF CONTROL	DUE DATE
Schedule	Case screen not delivered on time.	Build bridge to existing system	I	4	5	9	5	Change Request pending

Technical	Cannot support MobileCom™ alpha paging; interactive software does not run under UNIX	Build an Internet interface to accomplish alpha paging	1	3	5	8	1	Change Request pending
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